United States Air Force

Environmental Restoration Program

Eielson Air Force Base, Alaska

Source Evaluation Report
Phase 2 Investigation
Limited Field Investigation

Final

October 1994

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LEGAL NOTICE

EXECUTIVE SUMMARY

The source evaluation report Phase 2 limited field investigation for Eielson Air Force Base near Fairbanks, Alaska, was conducted to address issues and answer unresolved questions regarding a group of potential contaminant sources. Six sources are discussed in this report; these sources are LF01, LF02, WP32 and WP33 (considered as one site in this report), SS56, DP55, and ST58. The objective was to allow remedial project managers to determine if a site required 1) no further action, 2) a remedial investigation/feasibility study, or 3) interim removal action.

The conclusions of this report are as follows. At LF01, LF02, and DP55, no further action is indicated. At WP32, WP33, and SS56, further investigations and/or removal actions are suggested. ST58 will be the subject of a *Comprehensive Environmental, Response, Compensation, and Recovery Act* remedial investigation/feasibility study under an operable unit to be named later.

Groundwater, surface water, soil, and biota at Eielson Air Force Base will continue to be monitored. If any contaminant releases are determined to originate from one of the sites listed for no further action, the site will be reevaluated.

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TABLES

ACRONYMS

ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
BTEX	benzene, toluene, ethylbenzene, and xylene
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
DDD	2,2-bis(para-chlorophenyl)-1,1-dichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
EPA	U.S. Environmental Protection Agency
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act*
TPH	total petroleum hydrocarbon

CONVERSION FACTORS

To Convert From	To	Multiply By
Length	meter	
foot		3.048 E-01
inch		2.540 E-02
mile (U.S. survey)		1.609 E+03
Area	$meter^2$	
acre		4.046 E+03
$foot^2$		9.290 E-02
$inch^2$		6.452 E-04
$yard^2$		8.361 E-01
Volume	$meter^1$	
$foot^3$		2.832 E-02
gallon (U.S. liquid)		3.785 E-03
$inch^3$		1.639 E-05
$yard^3$		7.646 E-01

1.0 Introduction

1.0 INTRODUCTION

This report describes the limited field investigation work done to address issues and answer unresolved questions regarding a collection of potential contaminant sources at Eielson Air Force Base (AFB), near Fairbanks, Alaska (Figure 1.1). These sources were listed in the Eielson AFB Federal Facility Agreement (EPA et al. 1990) supporting the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) cleanup of the base. The limited field investigation began in 1993 to resolve all remaining technical issues and provide the data and analysis required to evaluate the environmental hazard associated with these sites. The objective of the limited field investigation was to allow the remedial project managers to sort each site into one of three categories: requiring remedial investigation/feasibility study, requiring interim removal action, or requiring no further remedial action.

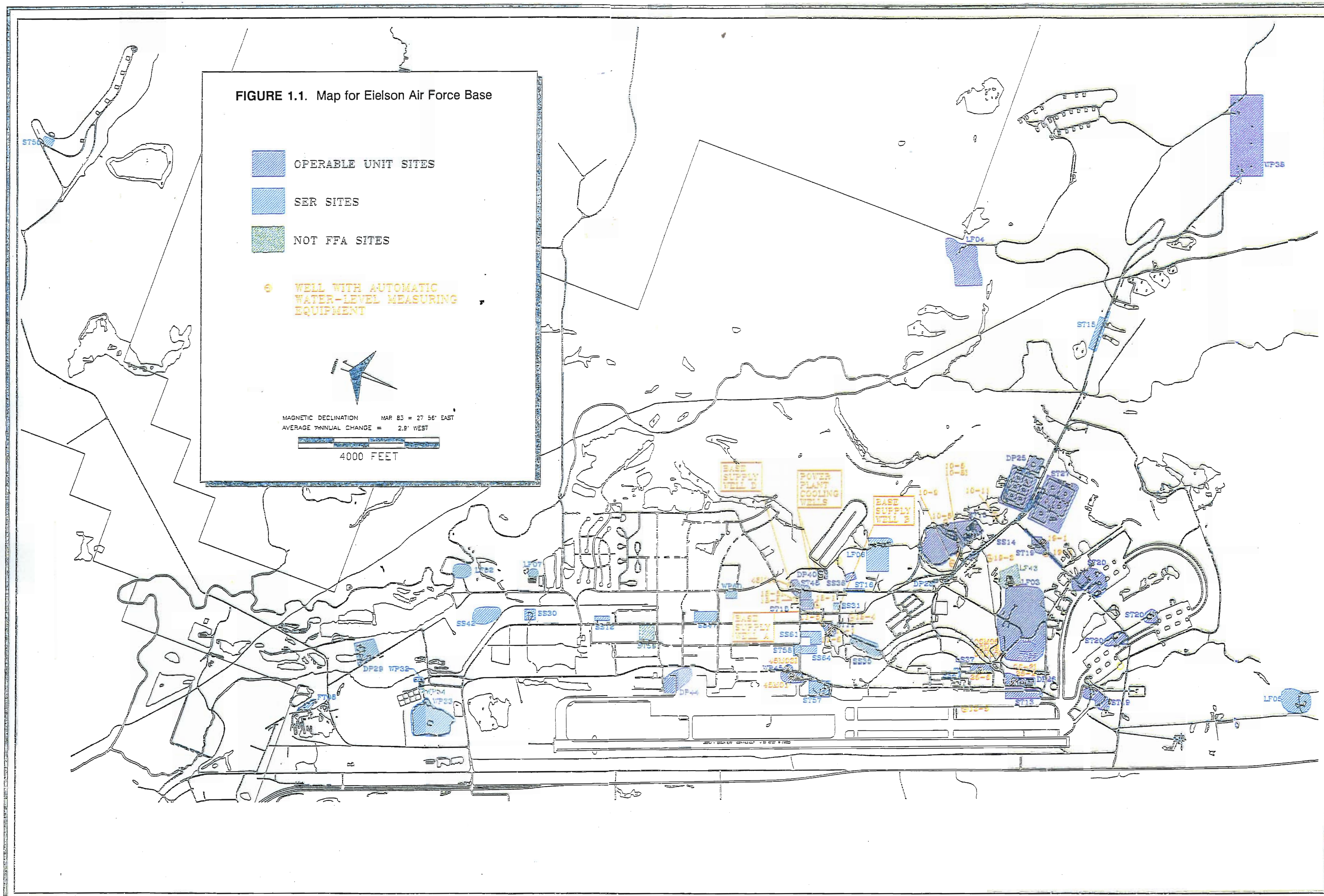


FIGURE 1.1. Map for Eielson Air Force Base

2.0 Background

2.0 BACKGROUND

2.1 HISTORY

Eielson Air Force Base (AFB) is located in central Alaska approximately 40 km southeast of Fairbanks, Alaska, and 160 km south of the Arctic Circle (Figure 1.1). The base, originally constructed in 1943, was used by the U.S. Army during World War II as a satellite installation of Ladd Field (now Fort Wainwright). The base closed at the conclusion of the war, but reopened in 1947 after control was transferred from the U.S. Army to the U.S. Air Force. Major facility expansion occurred between 1947 and 1954. Additional base development and construction have continued through the years as Eielson AFB has become an integral part of the Pacific Air Force that provides tactical support to the Alaska Air Command.

The base includes 80,070 km^2 (19,790 acre) containing aircraft runways, taxiways, aprons, hangars, maintenance facilities, communication facilities, munitions storage areas, administrative offices and support buildings, residential housing, schools, and community recreational facilities. Other facilities not contiguous with Eielson AFB are the Blair Lakes Target Facility, about 72 km southeast of Fairbanks and 56 km southwest of the primary base area, and the Birch Lake Recreation Area, about 48 km south of the base.

Over the years, some areas have been contaminated by petroleum fuels and hazardous materials. The base uses a variety of fuels (aviation gasoline, motor gasoline, diesel, JP-4, JP-8), oils, lubricants, solvents, cleaners, paints, and pesticides in operational and maintenance activities. In the past, wastes from these activities were often burned, used for road oiling, discharged to surface pits, or placed in landfills on the base. These past activities have created areas of contamination that may be hazardous to human health or the environment.

To identify and evaluate potential problems from past activities at military installations, the Department of Defense established the Installation Restoration Program. The Installation Restoration Program consists of four phases:

- **Phase I--Records Search**. Identify and set priorities for past disposal source areas containing contaminants that pose a hazard to public health or the environment either from migration to surface water or groundwater, or from persistence in the environment.

- **Phase II--Confirmation and Quantification**. Confirm the presence and extent of contamination, characterize the waste, and identify entire or portions of source areas where remedial action would be required (see Phase IV).

- **Phase III--Technology Development**. Develop a database from which to prepare a comprehensive remedial action plan.

- **Phase IV--Remedial Action Plan.** Develop and implement the remedial action plan.

Installation Restoration Program implementation for Eielson AFB began in 1982. The initial records search identified 43 potential disposal or spill areas at Eielson AFB and recommended that confirmation studies be conducted on the basis of high migration potential (CH2M Hill 1982). These studies were followed by Phase IV investigations and feasibility studies, which concluded in 1991. During the Installation Restoration Program investigations and as a result of recent on-base construction activities, 21 contaminated areas were identified.

On November 21, 1989, the U.S. Environmental Protection Agency (EPA) added Eielson AFB to the National Priorities List (54 FR 48184). The National Priorities List designated the facility as a federal Superfund site subject to the remedial response requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act*. Remedial investigation and response activities at Eielson AFB must now fully comply with CERCLA requirements as outlined in the National Contingency Plan (40 CFR 300.420). The entire Eielson AFB, including Blair Lakes Target Facility and Birch Lake Recreation Area, is defined as the Superfund site.

On May 21, 1991, the U.S. Air Force, the EPA, and the Alaska Department of Environmental Conservation (ADEC) signed the Federal Facility Agreement (EPA et al. 1990) for Eielson AFB: the Federal Facility Agreement listed 64 potential source areas. The agreement established a procedure and schedule for developing, implementing, and monitoring appropriate response actions at the base in accordance with CERCLA; the National Contingency Plan; Superfund guidance and policy; the *Resource Conservation and Recovery Act* (RCRA) guidance and policy; and applicable Alaska state law. Under the terms of the Federal Facility Agreement, the environmental impacts associated with past and present on-base activities will be investigated, and removal and/or remedial action will be taken to protect the public health and welfare, and the environment. The agreement also identifies the need for a site-wide remedial investigation/ feasibility study that integrates the findings and recommendations of individual operable unit (OU) remedial investigation/feasibility study, source evaluation reports, site-wide investigations, and assessments into a comprehensive record of decision.

Sixty of the 64 potential source areas listed in the Federal Facility Agreement were identified for further analysis under CERCLA. The agreement grouped 26 of the source areas into six OUs to be evaluated under the remedial investigation/feasibility study process. The source areas were grouped based on <u>similar source characteristics</u> and not by physical location. The six OUs are as follows:

- Operable Unit 1 (OU 1)--source areas contaminated with petroleum, some with recent evidence of floating product
- Operable Unit 2 (OU 2)--source areas contaminated with petroleum, some with past but not recent evidence of floating product
- Operable Unit 3 (OU 3)--source areas contaminated with solvents
- Operable Unit 4 (OU 4)--source areas used for land disposal of sludge, drums, and asphalt
- Operable Unit 5 (OU 5)--source areas used for landfill activities
- Operable Unit 6 (OU 6)--Ski Lodge well area contaminated with petroleum.

Thirty-four potential source areas listed in the Federal Facility Agreement were not assigned to an OU. In the agreement, these areas were divided into three source evaluation report groups for Phase 1 and/or Phase 2 source evaluations. Phase 1 activities were limited to "desk-top" or historical data evaluation, comparable in scope to the preliminary assessment phase of a CERCLA investigation. Phase 2 activities, described in this report, are a limited field investigation that contributed additional site data that was necessary to ensure final Phase 2 activities were done on six potential source areas. The sources are

LF01	Original Base Landfill and Drum Disposal Area
LF02	Old Base Landfill
WP32 and WP33	Wastewater Treatment Plant
SS56	Engineer Hill Spill Site
DP55	Birch Lake Recreation Area
ST58	Old Service Station

The final source evaluation report will present one of the following recommendations for each potential source area evaluated: no further action, referral to another state or federal program, interim remedial or removal action, or assignment to an OU for remedial investigation/feasibility study. Recommendations for no further action will be documented in one of the record of decisions, and new OUs will be created, as necessary, for the source areas that are referred for interim action or remedial investigation/feasibility study.

Other CERCLA activities being conducted at Eielson AFB include OU interim action, remedial investigation/feasibility study activities, site remedial investigation/feasibility study activities, and innovative technology demonstration activities. These activities evaluate existing site information; collect additional site characterization data as appropriate; assess pathways, exposures, and risks; and evaluate and select remedial action alternatives.

2.2 PURPOSE OF THE SOURCE EVALUATION REPORT PROCESS

The purpose of the two-phase source evaluation report process is to provide information sufficient to allow the remedial project managers to make a final dispensation of remaining sources at Eielson AFB.

At the conclusion of the source evaluation process, the U.S. Air Force will present a formal recommendation to EPA and ADEC for disposition of each evaluated source area. When recommendations are made, supporting documentation from this report will be included in the Administrative Record. The final recommendations, with the concurrence of EPA and ADEC will be documented in one of the record of decisions prepared for Eielson AFB.

2.3 ORGANIZATION OF THE SOURCE EVALUATION REPORT

This report is organized as follows:

- Section 1 provides an introduction.
- Section 2 provides background information of the Eielson AFB CERCLA action.
- Section 3 discusses the screening criteria that were used to conduct preliminary screening risk assessments for each of the potential source areas.
- Section 4 briefly describes the environment at Eielson AFB, which is relevant to the evaluation of all potential source areas.

- Section 5 summarizes the results of Sections 6 to 11.
- Sections 6 to 11 discuss the individual sites, limited field investigation findings, and the recommendations for further action.
- Section 12 is a reference list.
- Appendix A presents background soil and groundwater concentration for Eielson AFB.
- Appendix B is the site inspection photographs, as well as the geologic logs and as-built well construction diagrams recorded during subsurface field work.
- Appendix C presents EPA risk-based screening concentrations for groundwater and soil.

2.4 DATA QUALITY ANALYSIS

Data quality objectives for this investigation were developed using EPA (1987) and previous remedial project managers decisions. The data generated by this study will support a decision by these remedial project managers for each source on these two questions:

Question 1	Should this source be included in the Eielson AFB remedial investigation/feasibility study?
Question 2	Is this source a candidate for an interim remedial action?

Question 2 depends on a negative answer to question 1. A false positive for question 1 (i.e., include the source when unknown information would exclude the source) would result in unneeded expense. A more detailed remedial investigation would likely uncover this error. A false negative for question 1 would conceal additional source terms from the baseline risk assessment. Continuing base-wide monitoring would likely reveal this error. A false positive for question 2 would result in excessive expense; however, any proposed interim remedial action would have a low relative impact on the cleanup budget. A false negative for question 2 would support an inappropriate no further action decision. Again, base-wide monitoring limits the risk of this outcome.

Based on this analysis, the quality of analytical data required for this study is EPA Analytical Level III, with documentation necessary to provide confidence in the data for a regulatory risk of minimal consequence to human health and the environment. Accuracy and precision criteria are discussed in the limited field investigation work plan (U.S. Air Force 1993c). The data is used to estimate a risk to human and ecological receptors. The estimate will be similar in scope to a preliminary assessment/site investigation. Receptors include Eielson AFB personnel, ecological systems, and the public, where appropriate. Table 2.1 is a sampling matrix showing all the samples and methods used in this investigation.

2.5 BASE-WIDE BACKGROUND DATA

Chemical data obtained for this investigation was compared with Eielson AFB background soil and water data (U.S. Air Force 1993a, 1993b). This comparison was used to provide additional risk screening in cases where regulatory or risk-based criteria are already exceeded by media uncontaminated by Eielson AFB current and past activities. These background data are presented in Appendix A.

As in the case of any background data set, uncertainty exists regarding the representativeness of the analyzed sample set relative to the entire population. The cited reports (1993a, 1993b) contain the rationale for selecting the samples locations and contain details on the quality assurance used during the background investigations. Geologic investigations generally are attended by significant uncertainty due to the complexity of the phenomena described. Assuming that proper sampling procedures are followed, the uncertainties in this type of investigation fall into several categories (Hunter and Mann 1992):

> **(1) Uncertainty about completeness:** Because soil is not spatially continuous or homogeneous, it is not known whether all types of soil media have been represented by the background investigation. In addition, the mineralization of the parental rock in the Yukon-Tanana Uplands has created a strongly variable concentration of metal contaminants of concern in the background soils. There may also be uncertainty about the continuity, number, and chemical composition of unique groundwater bodies throughout the site.
>
> **(2) Uncertainty about representativeness:** It is not always valid to use soil samples from heterogenous alluvial terrain to generalize conditions in unsampled areas. This extrapolation requires information not completely known at Eielson AFB. Groundwater sampling is complicated by the unpredictable compositional variability of suspended material. Because the suspended fraction of a groundwater sample is in part controlled by well design and current condition, a further uncertainty and/or bias is introduced.
>
> **(3) Uncertainty about conceptualization:** Using background values to estimate risk and to apply this estimate to the source evaluation report sites requires many conceptual assumptions about the geology and hydrology of the site. In general, this conceptual model is reasonably well understood, but, in detail, much of the site-wide geology and hydrology of the base has not been studied. Thus, the uncertainty inherent in the base-wide conceptual model is very great.

Summarizing these uncertainties, there are many unevaluated technical aspects of the background data that impact the uncertainty of the data. Despite this, the uncertainty associated with background at Eielson AFB, as compared to other CERCLA sites (EPA 1993, Case Histories) is relatively low and is adequate for this action.

TABLE 2.1. Sampling Matrix for Source Evaluation Report Phase 2 Investigation

		well number	location no.	total metals 3010/6010	lead 3050/7421	arsenic 3050/7060	BTEX,ch. voc 5030/8021	pesticides 3500 ser./8080	semi voc, PAH, phenol 3500 ser./8270	anions 300/D4327-88
LF01 drum storage area	soil		S1	3	3	3	3	3	3	0
			S2	3	3	3	3	3	3	0
			S3	3	3	3	3	3	3	0
			S4	3	3	3	3	3	3	0
			S5	3	3	3	3	3	3	0
			S6	3	3	3	3	3	3	0
			S7	3	3	3	3	3	3	0
	water		W1	1	1	1	1	1	1	0
			W2	1	1	1	1	1	1	0
			W3	1	1	1	1	1	1	0
			W4	1	1	1	1	1	1	0
			W5	1	1	1	1	1	1	0
			W6	1	1	1	1	1	1	0
original landfill	soil		S4B	1	1	1	1	1	1	0
	water	01M03	W4	1	1	1	1	1	1	0
		01M04	W5	1	1	1	1	1	1	0
LF02	soil		S1	1	1	1	1	0	0	0
			S2	1	1	1	1	0	0	0
			S3	1	1	1	1	0	0	0
			S4	1	1	1	1	0	0	0
	water	02MO2	W1	1	1	1	1	0	0	0
		02MW9	W2	1	1	1	1	0	0	0
		02MOB	W3	1	1	1	1	0	0	0
		02M01	W4	1	1	1	1	0	0	0
WP32,33,34 spill ponds	soil		S1	2	2	2	2	2	2	0
			S2	2	2	2	2	2	2	0
	water		W1	1	1	1	1	1	1	0
			W2	1	1	1	1	1	1	0
sludge beds	soil		S3	2	2	2	0	0	2	0
			S4	2	2	2	0	0	2	0
	water		W3	1	1	1	0	0	1	0
			W4	1	1	1	0	0	1	0
	water	32MO2	W5	0	0	0	1	0	1	1
SS56	soil		S1	2	2	2	2	0	2	0
	water		W1	1	1	1	1	0	1	0
			water	17	17	17	16	10	14	1
			soil	36	36	36	32	26	32	0
			Trip Blanks	0	0	0	10	0	0	0
			Rinse Blanks	2	2	2	1	1	2	0
			Duplicates	2	2	2	2	1	3	1
				57	57	57	61	38	51	2

3.0 Screening Criteria

3.0 SCREENING CRITERIA

To determine if the potential source areas pose risk, the source areas were evaluated against screening criteria that have been developed based on regulations or risk. Because screening criteria must be applicable to a wide range of source areas and data quality, the assumptions used in the development of the criteria must necessarily be conservative.

For the Phase 2 source evaluation report, screening criteria were used to identify those source areas where contaminant concentrations are below levels of concern and do not require further action. In this section, the overall approach to the screening criteria is presented, followed by discussions of both regulatory- and risk-based criteria.

3.1 APPROACH

The first step in formulating screening criteria for contaminant concentrations is to determine what constitutes a level of concern, in other words, what level of exposure is considered not to be protective of public health and the environment. For the Phase 2 source evaluation report, "level of concern" has been defined as follows:

> A contaminant concentration greater than that which leads to an estimated excess lifetime cancer risk of one in one million (1×10^{-6}) for carcinogens **OR** a hazard quotient greater than 1 for noncancer effects **OR** a concentration that exceeds a regulatory standard.

This definition gives equal weight to both regulatory- and risk-based criteria, because the source evaluation report will not determine the applicability of regulations or develop remedial goals that would balance the requirements of both criteria.

When applying this guideline to a source area, the issue arises regarding whether this approach is acceptable for exposure to multiple contaminants. For carcinogens, U.S. Environmental Protection Agency (EPA) has defined an action criterion for cumulative excess lifetime cancer risk of 10^{-4} (OSWER Directive 9355.0-30). By adopting a cancer risk value of 10^{-6}, the decision criterion is acceptable in cases where there are multiple contaminants at a source area, because more than 100 contaminants with exposure concentrations at the 10^{-6} risk level would be needed to exceed the protective range. For noncancer effects, multiple exposures require further consideration. The sum of the hazard quotients (i.e., the hazard index) should not exceed 1 for all systemic toxicants that act with the same end point on the same organ. Therefore, for source areas where there are several contaminants that have hazard index less than but near 1, further evaluation may be necessary to determine if the hazard quotient for a particular systemic toxic end point exceeds 1, thereby presenting an unacceptable risk.

3.2 REGULATORY SCREENING CRITERIA

In the following sections, regulations and guidelines are discussed that provide criteria for determining protective exposure concentrations in water and soil.

3.2.1 Safe Drinking Water Act. The *Safe Drinking Water Act* defines maximum contaminant levels and maximum contaminant level goals for drinking-water supplies. Because maximum contaminant level goals are generally lower than maximum contaminant levels, they should be used as the screening criteria. If a maximum contaminant level goal has been set at zero, the maximum contaminant level should be used as the criterion (40 CFR 300.430). Maximum contaminant levels and maximum contaminant level goals for the potential contaminants of concern at Eielson Air Force Base (AFB) are presented in Table 3.1.

Because groundwater is the sole source of drinking water for Eielson AFB and the surrounding area, maximum contaminant levels and maximum contaminant level goals were not used as screening criteria for surface water.

3.2.2 Ambient Water Quality Criteria. Federal ambient water quality criteria, promulgated under the *Clean Water Act*, summarize information on the health and environmental effects of surface-water pollutants (Table 3.1). These criteria are divided into two groups: criteria for the protection of human health and criteria for the protection of aquatic life. The criteria that protect human health are subdivided into those pertinent to ingestion of both contaminated water and contaminated aquatic organisms, and those pertinent to ingestion of aquatic organisms only. The criteria that serve to protect aquatic life are subdivided into groups for marine and freshwater species. Only the criteria for freshwater species are applicable to Eielson AFB. Criteria levels are provided for both acute and chronic toxicity.

Although surface water is not a source of drinking water at Eielson AFB, it is used for recreational fishing and irrigation of family gardens. To evaluate the effects of this usage, the ambient water quality criteria that protect human health from consumption of aquatic organisms were used as screening criteria. Freshwater chronic toxicity values were used as screening criteria for ecological receptors, and acute toxicity values were used when chronic values were unavailable.

The state of Alaska has also set water quality standards for total aromatic hydrocarbons and total petroleum hydrocarbons (TPHs). These standards are shown in Table 3.2. Potentially toxic substances, for which federal or state water quality criteria have not been promulgated, were evaluated on a source area-specific basis to determine if there is potential for a hot spot, or if the concentration may present a hazard.

3.2.3 Alaska Petroleum Cleanup Standards. The state of Alaska criteria for cleanup of petroleum products (18 AAC 78) in soil are summarized in Table 3.3. These criteria are based on the need to protect the groundwater from leaching of the more toxic components of petroleum, primarily benzene. Cleanup levels were established based on the sensitivity of the groundwater system to contamination. Generally, the standards for the most sensitive environments were used as screening criteria, unless there was enough information about the source area to support the use of higher standards. Emphasis was placed on benzene, toluene, ethylbenzene, and xylene (BTEX) as the contaminants of concern. However, TPH values were also considered in the screening process.

3.2.4 Guidance on Polychlorinated Biphenyl Action Levels. Guidelines for determining action levels for polychlorinated biphenyl (PCB) contamination at Superfund sites are provided in OSWER Directive 9355.4-01 (August 1990). For soils, the starting point action level is 1 ppm where unlimited exposure under residential land use is assumed. Higher starting point values (10 to 25 ppm) are suggested for sites where the exposure scenario is industrial. For groundwater, the action level is the proposed maximum contaminant level of 0.0005 ppm.

Regulatory screening criteria for the source evaluation report were 1 ppm in soils, unless it was demonstrated that the source area is located in an industrial area. In that case, 10 ppm was used. For groundwater, the proposed maximum contaminant level (0.0005 ppm) served as the regulatory screening criterion.

3.3 RISK-BASED SCREENING CRITERIA

This section presents the risk-based screening criteria that were used in the source area evaluations. Potential exposure pathways applicable to Eielson AFB are discussed, and the pathways that are most representative of current and future on-base conditions are defined.

3.3.1 Potential Exposure Pathways. To develop risk-based screening criteria for source areas at Eielson AFB, a conceptual understanding is necessary of the possible ways in which human or environmental receptors may contact site contaminants. An exposure pathway describes how a contaminant may move from its source to a receptor (a potentially exposed organism). A complete exposure pathway, which is an important concept in the risk assessment process, has five primary elements:

1. a chemical source
2. a mechanism of release
3. an environmental medium
4. an exposure point (receptor location)
5. a feasible route of exposure (e.g., ingestion).

An example of a complete exposure pathway (for a typical waste site) is shown in Figure 3.1. An exposure pathway is complete if there is a reasonable likelihood that a receptor may take in contaminants through inhalation, ingestion, or dermal contact with contaminated media. Exposure does not exist (and thus no risk) unless the exposure pathway is complete. For the Phase 2 source evaluation report, contaminant sources, release mechanisms, and migration pathways for each source area were assessed using information from previous investigations. Potential exposure points, exposure routes, and receptors were also evaluated on a site-specific basis.

The possible current and future exposure pathways to potential human receptors, based on a current understanding of the base, are presented in Figure 3.2. This figure applies to the base as a whole. A pertinent subset of these exposure pathways was developed during the evaluation of each source evaluation report source area. The following is a discussion of the possible human exposure pathways for the particular media on and around the base.

3.3.1.1 Groundwater Exposure Pathways. Human exposures to groundwater contaminants can occur by ingestion of drinking water, by dermal contact with contaminated water, or by inhaling contaminants volatilized from water during showering, cooking, or other household activities. Currently, the water used domestically on-base is taken from three water supply wells near the center of the base and is treated before use to remove iron and manganese. Citizens of Moose Creek, a community down gradient of the base, use private wells for their drinking-water supply.

3.3.1.2 Surface Water and Sediment Exposure Pathways. Several surface-water bodies pass through or near the base, including Garrison Slough, Piledriver Slough, French Creek, and various lakes and streams. These surface-water bodies may receive some level of groundwater discharge from the base. In addition, contaminants may migrate to surface-water bodies through periodic surficial runoff. Human exposure to chemicals in surface water and sediments may occur by skin contact or by incidental ingestion during swimming or other water-related recreational activities. While no known potable use of surface water occurs on or near the base, people have been known to fish and play near some water bodies, making incidental ingestion or dermal contact a possibility. Such occurrences, however, would be limited to warmer months.

Aquatic organisms can be exposed to contaminants in sediments or surface water through direct uptake or through a foodchain.

3.3.1.3 Soil Exposure Pathways. Human exposure to contaminated surface soils could occur on-base. The frequency, duration, extent, and route of exposure would depend on the particular activity of the receptor and the location of the activity.

Because much of the base is covered with gravel fill, pavement, or vegetation, direct contact with surface soils is limited. Also, snow cover limits access to surface soils during much of the year. However, current or future residents, workers, and visitors could come into direct contact with contaminated surface soil in exposed areas. Exposure could occur by incidental ingestion, dermal absorption of chemicals, or inhalation of airborne dusts.

Short-term exposure to subsurface soils could occur, for example, during on-base excavations and trenching to repair or place utility lines or pipes. Potential receptors would be short-term on-site workers.

3.3.1.4 Air Exposure Pathways. Air exposure pathways develop when contaminants volatilize from soil or water, or when wind transports contaminants into the air as dust. These may not be major release pathways for the base because of limited exposed soils and surface contamination. Snow cover and wet, cold conditions limit volatilization or soil entrainment by wind for much of the year. During warmer months, exposures could occur if people near uncovered contaminated areas breathe contaminated dusts and vapors that might be released.

3.3.2 EPA Risk-Based Screening Concentrations. EPA has compiled a list of risk-based concentrations for target compound list organic compounds and target analyte list inorganic compounds. These values reflect only the ingestion pathway.

3.4 SUMMARY

For the Phase 1 source evaluation report, the source area evaluations are based on a conservative interpretation of regulatory criteria and on a conservative set of exposure assumptions. Regulatory criteria considered include maximum contaminant levels and maximum contaminant level goals, ambient water quality criteria, Alaska petroleum cleanup standards for soils, and Superfund guidelines for PCBs in soil and groundwater. Exposure scenarios used to develop risk-based criteria include ingestion of groundwater, inhalation of volatile contaminants, and ingestion of soils. Exposures via these three pathways are much greater than the exposures that would occur via dermal contact with soil or groundwater or inhalation of windblown dust and volatile compounds from soil. Therefore, the use of ingestion pathways with an inhalation component for volatile groundwater contaminants, conservative exposure time periods, and conservative intake levels is judged to be sufficiently protective of human health.

Note that when concentrations detected in a source area exceed a criterion, the source area does not necessarily present an unacceptable health risk to humans or to ecological receptors. Instead, an exceedance of the screening criteria is meant only to indicate that further evaluation of the source area may be necessary to determine if an unacceptable risk exists. Therefore, these screening criteria are meant to be used in conjunction with other decision criteria to determine the proper course of action for a particular source area.

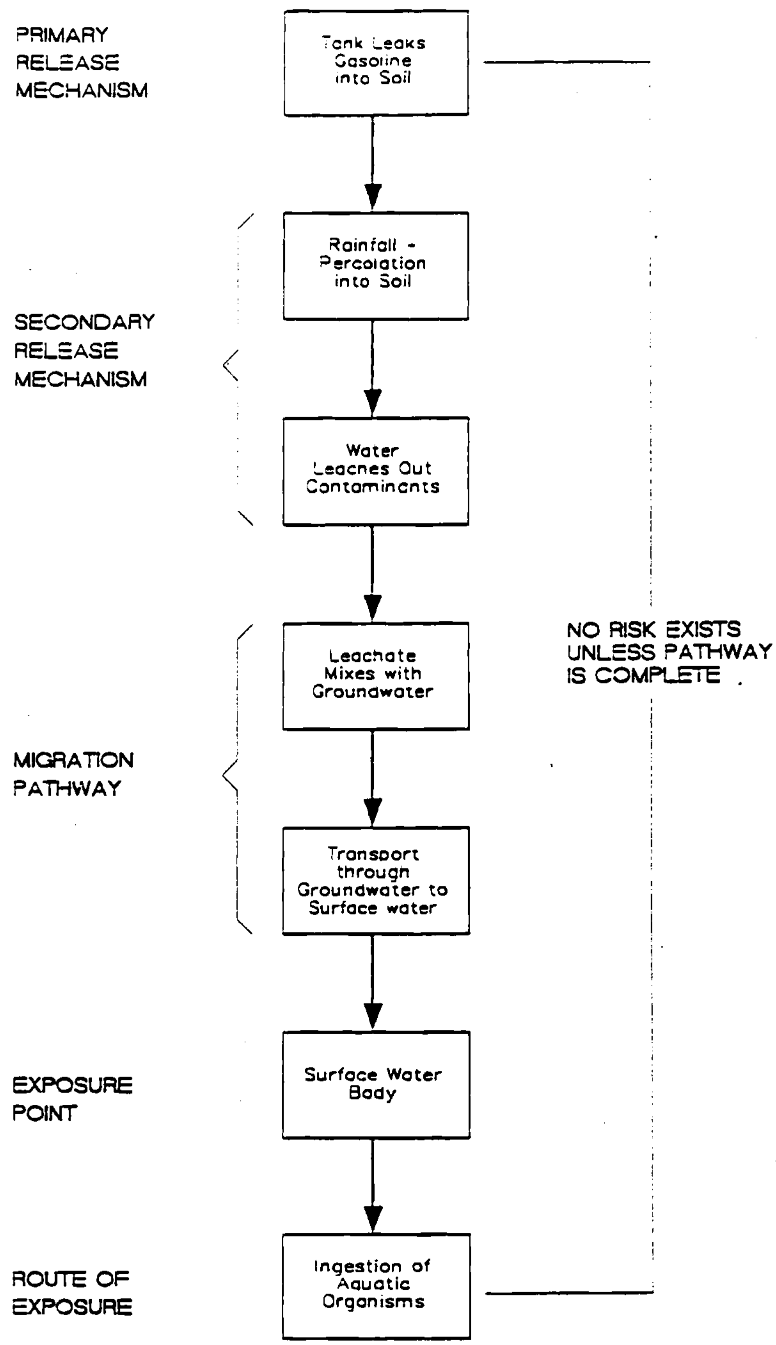


FIGURE 3.1. Elements of a Complete Exposure Pathway

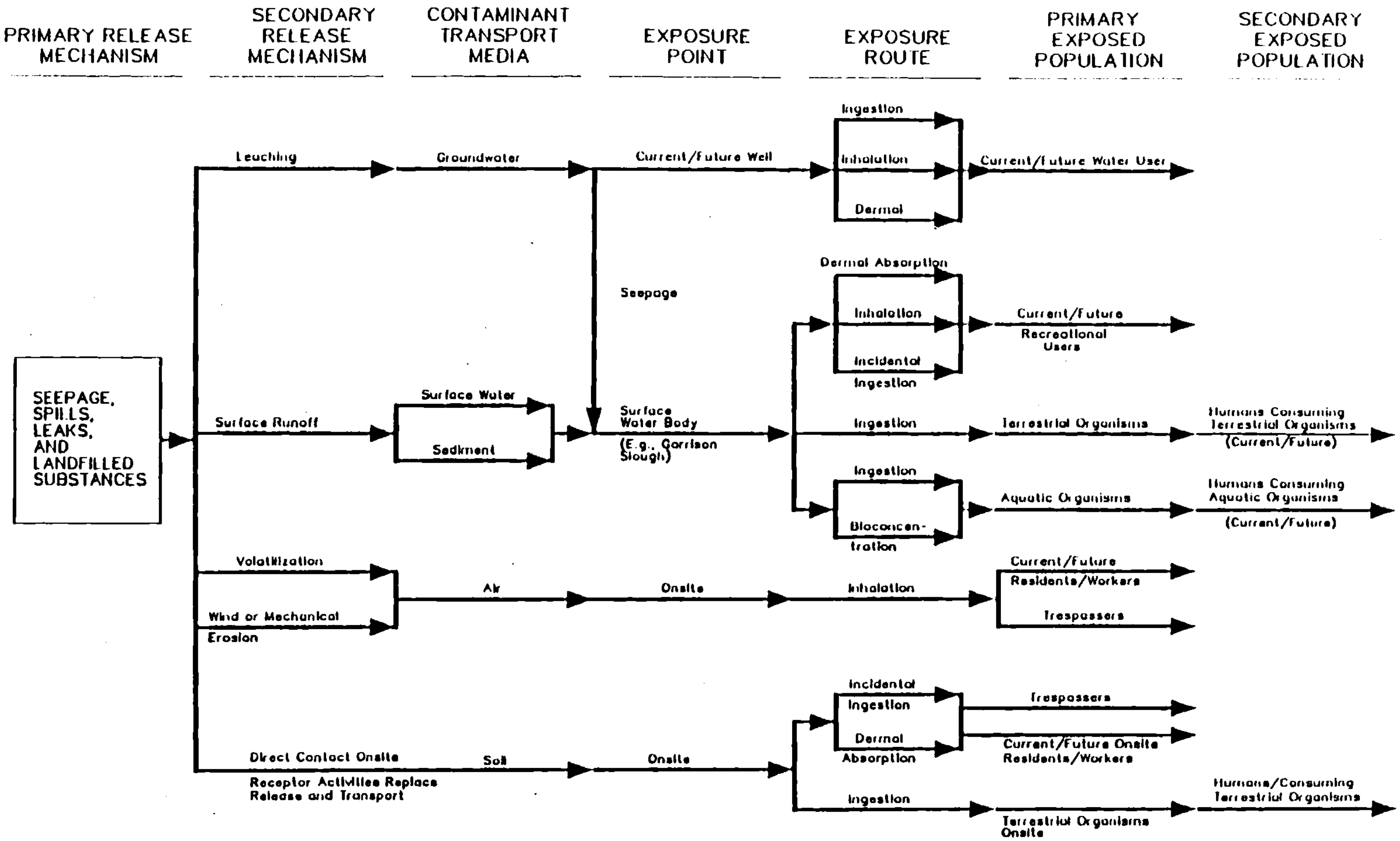


FIGURE 3.2. Conceptual Site Model for Potential Human Exposure

TABLE 3.1. Regulatory Criteria for Groundwater and Surface Water

Chemical Name	Safe Drinking Water Act		RCRA	Clean Water Act Ambient Water Quality Criteria			
				Protection of Human Health		Protection of Aquatic Life	
	MCLs (mg/L)	MCLGs (mg/L)	Groundwater Protection Standard (mg/L)	Water and Fish Ingestion (mg/L)	Fish Ingestion Only (mg/L)	Freshwater Acute (mg/L)	Freshwater Chronic (mg/L)
Acenaphthene						1.7	0.52
Acrolein				0.32	0.78	0.068	0.021
Acrylamide		0					
Acrylonitrile				0.000058[a]	0.00065[a]	7.5	2.6
Alachlor	0.002	0					
Aldicarb	0.003	0.001					
Aldrin				0.000000074[a]	0.000000079[a]	0.003	
Antimony and compounds				0.15	45	9	1.6
Arsenic and compounds	0.05[b]		0.05	0.0000022[a]	0.000018[a]		
Arsenic III						0.360	0.190
Arsenic V						0.850	
Asbestos	$7x10^6$ fiber/L[c]	$7x10^6$ fiber/L[c]					
Atrazine	0.003	0.003					
Barium and compounds	1	2	1				
Benzene	0.005	0		0.00066[a]	0.04[a]	5.3	
Benzidine				0.00000012[a]	0.00000053[a]	2.5	
Beryllium and compounds				0.0000037[a]	0.000064[a]	0.13	0.0053
Bis(2-chloroethyl)ether				0.00003[a]	0.0014[a]		
Bis(2-chloroisopropyl)ether				0.035	4.4		

TABLE 3.1. (Contd)

Chemical Name	Safe Drinking Water Act: MCLs (mg/L)	Safe Drinking Water Act: MCLGs (mg/L)	RCRA: Groundwater Protection Standard (mg/L)	Clean Water Act Ambient Water Quality Criteria — Protection of Human Health: Water and Fish Ingestion (mg/L)	Clean Water Act Ambient Water Quality Criteria — Protection of Human Health: Fish Ingestion Only (mg/L)	Clean Water Act Ambient Water Quality Criteria — Protection of Aquatic Life: Freshwater Acute (mg/L)	Clean Water Act Ambient Water Quality Criteria — Protection of Aquatic Life: Freshwater Chronic (mg/L)
Bis(2-chloromethyl)ether				3.76E-9[a]	0.0000018[a]		
Bis(2-ethylhexyl)phthalate					50	400	360
Cadmium and compounds	0.005[d]	0.005	0.01	0.01		0.0018[e]	0.00066[e]
Carbofuran	0.04	0.04					
Carbon tetrachloride	0.005	0		0.0004[a]	0.0069[a]	35.2	
Chlordane	0.002	0		0.00000046[a]	0.00000048[a]	0.0024	0.0000043
Chlorinated napthalenes						1.6	
Chlorinated benzenes						0.25	0.05
4-chloro-3-methyl phenol						0.03	
Chloroalkyl ethers						238	
Chloroform	0.10[f]			0.00019[a]	0.0157	28.9	1.24
2-chlorophenol						4.38	
Chromium and compounds	0.05[g]	0.1	0.05				
Chromium III and compounds				170	3,433	0.98[e]	0.12[e]
Chromium VI and compounds				0.05		0.016	0.011
Copper and compounds		1.3[h]				0.0092[e]	0.0065[e]
Cyanides				0.2		0.022	0.0052
2,4-D	0.07	0.07	0.1	0.1			
DDD						0.0006	

TABLE 3.1. (Contd)

Chemical Name	Safe Drinking Water Act		RCRA	Clean Water Act Ambient Water Quality Criteria			
				Protection of Human Health		Protection of Aquatic Life	
	MCLs (mg/L)	MCLGs (mg/L)	Groundwater Protection Standard (mg/L)	Water and Fish Ingestion (mg/L)	Fish Ingestion Only (mg/L)	Freshwater Acute (mg/L)	Freshwater Chronic (mg/L)
DDE						1.05	
DDT and metabolites				0.000000024[a]	0.000000024[a]	0.0011	0.000001
Dibromochloropropane	0.0002	0					
Dibutyl phthalate					154		
Dichlorobenzenes				0.4	2.6	1.12	0.76
1,2-dichlorobenzene	0.6	0.6					
1,3-dichlorobenzene	0.6	0.6					
1,4-dichlorobenzene	0.075	0.075					
Dichlorobenzidine				0.00001[a]	0.00002[a]		
1,2-dichloroethane	0.005	0		0.00094[a]	0.24[a]	118	20
Dichloroethylenes						11.6	
1,1-dichloroethylene	0.007	0.007		0.000033[a]	0.00185[a]		
cis-1,2-dichlorethylene		0.07					
trans-1,2-dichlorethylene		0.1					
2,4-dichlorophenol				3.09		2.02	0.365
1,2-dichloropropane	0.005	0				23	5.7
1,3-dichloropropene					14.1	6.06	0.244
Dieldrin				0.000000071[a]	0.00000076[a]	0.0025	0.0000019
2,4-dimethylphenol						2.12	
Dimethylphthalate				313	2,900		
Dinitrophenol				0.07	14.3		
Dinitrotoluene				0.00011	0.0091	0.33	0.23

TABLE 3.1. (Contd)

Chemical Name	Safe Drinking Water Act		RCRA	Clean Water Act Ambient Water Quality Criteria			
				Protection of Human Health		Protection of Aquatic Life	
	MCLs (mg/L)	MCLGs (mg/L)	Groundwater Protection Standard (mg/L)	Water and Fish Ingestion (mg/L)	Fish Ingestion Only (mg/L)	Freshwater Acute (mg/L)	Freshwater Chronic (mg/L)
Dioxin (2,3,7,8-TCDD)					1.4×10^{-12}	0.00001	0.00000001
1,2-diphenylhydrazine				0.000042[(a)]	0.00056[(a)]	0.27	
Endosulfan				0.074	0.159	0.00022	0.000056
Endrin	0.0002		0.0002	0.001		0.00018	0.0000023
Epichlorohydrin		0					
Ethylbenzene	0.7	0.7		1.4	3.28	32	
Ethylene dibromide	0.00005	0					
Fluoranthene				0.042	0.054	3.98	
Fluorides	4	4					
Heptachlor	0.0004	0		0.0000002[(a)]	0.0000002[(a)]	0.00052	0.0000038
Hexachlorobenzene					0.00000074	0.006	0.0037
Hexachlorobutadiene				0.00045[(a)]	0.05[(a)]	0.09	0.0093
Hexachlorocyclohexane (technical)				0.0000052[(a)]	0.0000174[(a)]	100	
Hexachlorocyclopentadiene				0.206		0.007	0.0052
Hexachloroethane				0.0019[(a)]	0.00874[(a)]	0.98	0.54
Iron							1
Isophorone				5.2	520	117	
Lead and compounds	0.015	0	0.015	0.05		0.034[(e)]	0.0013[(e)]

TABLE 3.1. (Contd)

Chemical Name	Safe Drinking Water Act		RCRA	Clean Water Act Ambient Water Quality Criteria			
				Protection of Human Health		Protection of Aquatic Life	
	MCLs (mg/L)	MCLGs (mg/L)	Groundwater Protection Standard (mg/L)	Water and Fish Ingestion (mg/L)	Fish Ingestion Only (mg/L)	Freshwater Acute (mg/L)	Freshwater Chronic (mg/L)
Phenol				3.5		10.2	2.56
Phthalate esters						0.94	0.003
Selenium and compounds	0.01[l]	0.05	0.01	0.01		0.020	0.005
Silver and compounds	0.1[l]		0.05	0.05		0.92	0.00012
Styrene	0.1	0.1					
1,1,2,2-tetrachloroethane				0.00017[a]	0.0107[a]		2.4
Tetrachloroethylene	0.005	0		0.0008[a]	0.00885[a]	5.28	0.84
Thallium and compounds				0.013	0.048	1.4	0.04
Toluene	1	1		14.3	424	17.5	
Total trihalomethanes	0.1			0.00019[a]	0.0157[a]	11	
Total nitrate plus nitrite	10[k]	10					
Toxaphene	0.003	0	0.005	0.00000071[a]	0.00000073[a]	0.00073	0.0000002
2,4,5-TP Silvex	0.05	0.05	0.01	0.01			
1,1,1-trichloroethane	0.2	0.2			1,030	18	
1,1,2-trichloroethane				0.0006[a]	0.042[a]	18	9.4
Trichloroethylene	0.005	0		0.0027[a]	0.0807[a]	45	21.9
2,4,5-trichlorophenol				2.6		0.1	0.063
2,4,6-trichlorophenol				0.0012[a]	0.0036[a]		0.97
Vinyl chloride	0.002	0		0.002[a]	0.525[a]		

TABLE 3.1. (Contd)

Chemical Name	Safe Drinking Water Act		RCRA	Clean Water Act Ambient Water Quality Criteria			
				Protection of Human Health		Protection of Aquatic Life	
	MCLs (mg/L)	MCLGs (mg/L)	Groundwater Protection Standard (mg/L)	Water and Fish Ingestion (mg/L)	Fish Ingestion Only (mg/L)	Freshwater Acute (mg/L)	Freshwater Chronic (mg/L)
Xylenes	10	10					
Zinc and compounds	5[i]					0.065[e]	0.059[e]

[a]Criteria are based on carcinogenic risk. A value of 10^{-6} excess cancer risk is used.
[b]MCL is under EPA review.
[c]MCLG is 7 million fibers/L for fibers longer than 10 μm. The MCL will not change, effective 30 July 1992.
[d]MCL will be reduced from 0.01 to 0.005 mg/L, effective 30 July 1992.
[e]Criteria are hardness dependent (50 mg/L as calcium carbonate).
[f]Standard is for total trihalomethanes.
[g]MCL will be raised to 0.1 mg/L, effective 30 July 1992.
[h]Copper has an action level of 1.3 mg/L in no more than 10% of the samples.
[i]Secondary maximum conteminant level under the SDWA.
[j]MCL will be raised to 0.05, effective 30 July 1992.
[k]MCLs added, effective 30 July 1992.

Sources: National Primary Drinking Water Regulations (40 CFR 141), National Secondary Drinking Water Regulations (40 CFR 143), RCRA Regulations for Owners and Operators of Treatment, Storage and Disposal Facilities (40 CFR 264.94), and Quality Criteria for Water 1986, as updated.

MCLs = maximum contaminant levels.
MCLGs = maximum contaminant level goals.
RCRA = *Resource Conservation and Recovery Act.*

TABLE 3.2. Alaska Water Quality Standards

Chemical Name	Protection of Aquatic Life Freshwater Chronic (mg/L)
Total aromatic hydrocarbons	10
Total petroleum hydrocarbons	15

TABLE 3.3. Alaska Soil Cleanup Standards for Petroleum

Type of Environment (determined from the matrix)[a]	Cleanup Levels (mg/kg)			
	Diesel	Gasoline or Unknown Product		
	Diesel Range TPH	Gasoline Range TPH	Benzene	BTEX
Level A	100	50	0.1	10
Level B	200	100	0.5	15
Level C	1,000	500	0.5	50
Level D	2,000	1,000	0.5	100

[a]Matrix score--calculated by (A) + (B) + (C) + (D) + (E) where Level A is a score >40, Level B is a score of 27 to 40, Level C is a score of 21 to 26, and Level D is a score <20.

(A)	1. Depth to subsurface water	
	<5 ft	(10)
	5 to 15 ft	(8)
	15 to 25 ft	(6)
	25 to 50 ft	(4)
	>50 ft	(1)
(B)	2. Mean annual precipitation	
	>40 in.	(10)
	25-40 in.	(5)
	15-25 in.	(3)
	<15 in.	(1)
(C)	3. Soil type (Unified Soil Classification)	
	Clean, coarse-grained soils	(10)
	Coarse-grained soils with fines	(8)
	Fine-grained soils (low organic carbon)	(3)
	Fine-grained soils (high organic carbon)	(1)
(D)	4. Potential receptors	
	Public well within 1,000 ft or private well(s) within 500 ft	(15)
	Municipal/private well within 1/2 mile	(12)
	Municipal/private well within 1 mile	(8)
	No known well within 1/2 mile	(6)
	No known well within 1 mile	(4)
	Nonpotable groundwater	(1)
(E)	5. Volume of contaminated soil	
	>500 cubic yards	(10)
	100 to 500 cubic yards	(8)
	25 to 100 cubic yards	(5)
	>De Minimis-25 cubic yards	(2)
	De Minimis	(0)

4.0 Site Description

4.0 SITE DESCRIPTION

This section is divided into eight subsections. Section 4.1 describes the physiography; Section 4.2 - geology; Section 4.3 - surface soils and permafrost; Section 4.4 - hydrology; Section 4.5 - climate and meteorology; Section 4.6 - ecological resources; Section 4.7 - historical and cultural resources; Section 4.8 - surrounding land use and demographics of Eielson Air Force Base (AFB).

4.1 LOCATION AND PHYSIOGRAPHY

Eielson AFB is in the eastern-central portion of interior Alaska, about 3 km east of the Tanana River (see Figure 4.1). The base is located about 40 km southeast of Fairbanks and about 160 km south of the Arctic Circle. Eielson AFB encompasses approximately 80,070 km^2 (19,790 acre).

Eielson AFB is located in the middle Tanana River Valley, a large sediment-filled basin between the Alaska Range on the south and the Yukon-Tanana Uplands on the north (Pewe and Reger 1983). The Tanana River Valley is underlain by Quaternary fluvial to glaciofluvitile sediments shed from the rapidly uplifted Alaska Range, approximately 160 km south (Pewe 1982). The Tanana River is a braided stream heading in the Alaska Range near the Canadian border and joining the Yukon River near the community of Tanana. A small eastern portion of Eielson AFB lies in the Yukon-Tanana Uplands, primarily underlain by Paleozoic and Precambrian schist and phyllite and Mesozoic granitic intrusions (Pewe et al. 1966; Weber et al. 1978). The flood plain of the Tanana River is interrupted by erosional remnants of crystalline bedrock.

Within the developed portion of Eielson AFB, the topography is flat and somewhat featureless, and elevations range from 160 to 168 m above mean sea level, sloping downward to the north-northwest. Elevations in the hilly, eastern portion of the base rise as high as 343 m above mean sea level. Except for some fuel storage areas, a ski area, and the Trans-Alaska Pipeline, the eastern portion of the base is largely undeveloped.

4.2 GEOLOGY

No detailed geologic map of Eielson AFB exists and the subsurface geology of the area is not completely known. Precambrian and Paleozoic-age pyelitic schists, micaceous quartzites, and subordinate phyllite and marble outcrop within the hills northeast of the base. These units have been locally metamorphosed by a series of Cretaceous to lower Tertiary granodioritic to quartz monzanitic intrusions. The intrusions are also related to precious metal deposits near Eielson AFB and elsewhere in the Fairbanks region. The headwaters of both French Creek and Moose Creek are underlain by Tertiary granodiorite of the Eielson pluton (Weber et al. 1978).

During the Quaternary period, rapid uplift of the Alaska Range combined with alternating glacial advances and retreats built up enormous alluvial fans along the southern margin of the Tanana River Valley. Aggradation of the river plain built up a thick and heterogeneous sequence of unconsolidated silts, sands, and gravels. Unconsolidated sediments are approximately 60 to 90 m thick beneath Eielson AFB. Glacial outwash plains at the base of the Alaska Range provided wind-blown silts that have been transported northward and deposited as loess mantles along the crystalline uplands. Silt has also accumulated at lower elevations with plant debris in ubiquitous organic muck deposits. Other silt deposits make up the abundant permafrost that is primarily found in the northern half of the base. Many of these permafrost areas are relict and were formed during the last glacial maximum (Pewe and Reger 1983).

Numerous small faults are mapped in the pre-Tertiary metamorphic units. Larger regional faults border the major petrologic units within the bedrock and probably extend under the Tanana flood-plain deposits (Beikman 1980). In 1937, a magnitude 7.3 earthquake occurred with an epicenter at Salchna Bluff, about 21 km southeast of Eielson AFB (Pewe 1982).

4.3 SURFACE SOILS AND PERMAFROST

Soils developed over the lowland part of Eielson AFB are primarily of the Salchaket series very fine sand loam. These soils are well drained and uncommonly form permafrost. Gravels are found in greater abundance near the principal stream beds. Vegetation includes paper birch, white spruce, and balsam poplar. To the east and upland, silty loams of the Goldstream and Tanana series are common, and soils are frequently saturated above permafrost. Vegetation includes sedges and grass with shrubs and black spruce.

Permafrost is primarily found at depths of 1 to 40 m in the northeastern half of the base near Ski Hill (HLA 1991).

4.4 HYDROLOGY

The hydrologic description is subdivided into groundwater occurrence and aquifer characteristics, groundwater use, surface water, and surface water and groundwater interactions.

4.4.1 Groundwater Occurrence and Aquifer Characteristics. An extensive regional aquifer occurs in the unconsolidated alluvial/glaciofluvitile deposits in the Tanana River Valley. The unconfined aquifer is about 70 to 80 m wide at Eielson AFB (CH2M Hill 1982) and about 60 to 90 m thick (U.S. Air Force 1993e). The aquifer consists primarily of interbedded layers or lenses of unconsolidated sand and gravel. The extent of groundwater in the underlying Precambrian bedrock is not well defined.

No continuous aquitard units have been identified within the unconsolidated deposits. One deep well near the central heating and power plant is known to have encountered a 6-m-thick silt layer at 35 to 41 m below ground surface (HLA 1990). The lateral extent, continuity, and hydraulic properties of this silt unit are unknown.

Groundwater occurs primarily under unconfined or semiconfined conditions. Semiconfined conditions also occur in areas containing permafrost (see Section 4.3).

The regional groundwater gradient is generally north-northwest, parallel to the Tanana River (Figure 4.2) at about 0.8 to 1 m/km, locally up to 2.5 m/km. Depth to the water table is typically less than 3 m (HLA 1990). The direction and gradient of groundwater flow may be locally influenced by 1) buried stream channels of the high relative hydraulic conductivity, 2) local surface drainages, and 3) zones of permafrost. The vertical hydraulic gradient within the aquifer is unknown. Primary sources of recharge to the aquifer include the Tanana River and tributaries, and vertical percolation of rainfall and snowmelt (CH2M Hill 1982).

Pumping tests have been performed on a number of the on-base water supply wells (HLA 1990). Although these tests have provided information on well productivity, little useful information has been produced about the actual hydraulic characteristics of the aquifer. The cited pumping tests have resulted in hydraulic conductivity estimates at about 450 and 150 m/day

(U.S. Air Force 1993e). These values are consistent with a hydraulic conductivity of approximately 87 m/day estimated by Dames & Moore (1985). They are also consistent with slug test data (HLA 1989), as re-analyzed by the U.S. Air Force (1993e).

Groundwater velocity is a function of hydraulic gradient, hydraulic conductivity, and porosity. Although a fairly low hydraulic gradient generally exists throughout Eielson AFB, the groundwater velocity is not necessarily correspondingly low because of the high permeability of the subsurface material. The groundwater velocity can be estimated using Darcy's Law, an assumed porosity of 25%, an average hydraulic gradient of 0.9 m/km, and a hydraulic conductivity of 91 m/day. The groundwater velocity is estimated at 0.3 m/day.

A second groundwater flow system occurs within the bedrock upland at the eastern edge of the base. Little is known about the hydraulic characteristics of this aquifer. A conceptualized hydrogeologic cross section near the east side of the base is shown in Figure 4.3.

4.4.2 Groundwater Use. Groundwater is used for all base operations, including firefighting, industrial, domestic, and household uses (HLA 1990). Groundwater is the principal source of potable drinking water at Eielson AFB for private citizens in the communities near the base. The potable water is treated to remove iron, manganese, and sulfide; treatment also includes lime addition and chlorination. Current average daily consumption is 4.5 ML/day, with a peak of 5.7 ML/day.

Water supply wells associated with base facilities were identified during a records search. The details of well construction are presented in Table 4.1. Fourteen of these wells are designated as abandoned and one is out-of-service. Information could not be found on the status of Wells 6 and 10.

Most of the base derives its potable water from large-capacity Wells A, B, and D; Well D being the primary water source. Well C, also large capacity, is reserved to fight fires. In addition, seven low-capacity wells and 12 firefighting wells serve remote areas of the base. Two large-capacity wells (21 and 22) supply cooling water to the power plant.

In 1990, (HLA compiled an inventory of off-base wells within a 5-km radius of the base. The inventory is presented in Table 4.2 and includes 41 wells. The majority of the wells are located north-northwest of the base, in or near the community of Moose Creek. Most are shallow (6 to 12 m deep) and are used for household water supply. A few are used to irrigate crops or water livestock.

4.4.3 Surface Water. Surface-water bodies near Eielson AFB include rivers, creeks, sloughs, lakes, ponds, and wetlands. Eielson AFB is about 3 km east of the Tanana River. The Tanana River drainage basin is about 114,000 km^2 in size, heading in the southeastern Alaska Range near the U.S.-Canada border. Surface drainage at Eielson AFB is generally north-northwest, parallel to the Tanana River.

Several small sloughs or creeks pass through the base and discharge to the Tanana River. Moose Creek is the main receiving stream for small local drainages around the base. Both French Creek, along the eastern edge of the base, and Piledriver Slough, along the western edge, discharge to Moose Creek just above its confluence with the Tanana River.

Garrison Slough, which is surface drainage, also discharges to Moose Creek. Garrison Slough passes directly through the developed portion of the base and consists primarily of engineered drainage channels. Portions of Garrison Slough are enclosed in culverts near the refueling loop area. Before 1979, effluent from the base sewage treatment plant was discharged to Garrison Slough (CH2M Hill 1982). Stream characteristics for French Creek, Moose Creek, Piledriver Slough, and Garrison Slough are presented in Table 4.3.

Eielson AFB contains 13 lakes totaling 1266 km^2 (313 acre), 54 ponds totaling 1072 km^2 (265 acre), and 10 designated wetlands totaling about 1019 km^2 (252 acre). One of the lakes and six of the ponds are natural; the remaining 12 lakes and 48 ponds are old borrow pits or gravel pits (HLA 1990).

4.4.4 Surface Water and Groundwater Interactions. Surface-water features such as lakes, ponds, or sloughs affect local groundwater flow patterns, especially at shallow depths (i.e., 0 to 4.6 m). Surface-water bodies can recharge the aquifer or receive discharge, depending on seasonal changes in surface flow and water availability. Variations in water levels caused by precipitation and recharge in the upland part of the base are expected to have an important effect on groundwater levels. For example, during the period from 1972 to 1976, precipitation at the Fairbanks International Airport was about 75% of normal (Nelson 1978). Variations of this magnitude have the potential for affecting infiltration rates and leachate production in buried waste sites.

An unusual seasonal discharge variation is seen in Eielson AFB streams. Water levels of creeks (e.g., Moose Creek, French Creek) that drain the Yukon-Tanana uplands in the northeast rise with the spring thaw and reach their highest discharge in the late spring and early summer. The sloughs (e.g., Piledriver Slough) and channels of the Tanana River respond to glacial outflow cycles in the Alaska Range and generally lag the other maxima by a month. This pattern results in a complex variation of bank storage and surface-to-groundwater interaction across the base.

Little is known about the specific interaction between the groundwater system and local ponds, lakes, and wetlands because of the lack of synchronous groundwater and surface water elevation measurements. Generally, in the eastern portion of Eielson AFB, French Creek is an influent stream losing water to the subsurface system. In the western portion of the base, French Creek is an effluent stream gaining water from the subsurface (HLA 1990). Moose Creek is influent in the northeast portion of the base and effluent in the western portion. Garrison Slough is effluent throughout the base (HLA 1990; SAIC 1989). The northern part the base has a greater areal percentage of surface water and wetlands, suggesting a groundwater gradient sloping to the north.

Data from the LF02 (Old Base Landfill) investigation (see Section 7.0) reflected the seasonal pattern and gradient reversal of French Creek, relative to its banks. In June, French Creek is a gaining stream, possibly augmented by snowmelt-derived infiltration at LF02. In August, the gradient is reversed and French Creek becomes a losing stream.

4.5 CLIMATE AND METEOROLOGY

Eielson AFB is in the continental climatic zone that covers interior Alaska. The climate in this zone is characterized by great diurnal and annual temperature variations, low precipitation, and low humidity. The climate is semiarid because moist maritime air masses are blocked in the south by the Alaska Range and in the north by the Brooks Range (Pewe 1982). Large annual variations in temperature and solar radiation occur because of the latitude.

Historical climatic data for the period 1944 through 1984 are presented in Table 4.4. Average summer temperatures range between 6.7° and 16°C. Average temperatures during the winter season range between -26° and -12°C. Extreme temperatures recorded during this time period at Eielson AFB were 34°C for July and -53°C for January.

Annual precipitation in this area averages 36 cm, which includes 183 cm of snow. Average monthly precipitation ranges from 1.3 to 6.4 cm, with rainfall generally highest in July and August. The evaporation rate is approximately 36 cm/year, which equals the mean annual precipitation.

4.6 ECOLOGICAL RESOURCES

The *Base-wide Ecological Risk Assessment* (U.S. Air Force 1994a) specifically discusses the impact of the source evaluation report sites to the overall ecological health of the base using the data of the source evaluation report Phase 2 limited field investigation.

4.6.1 Flora. The undisturbed plant community at Eielson AFB is characterized as lowland spruce/hardwood forest. The forest, which covers 64,299 km^2 (15,892 acre), ranges from dense to open stands of evergreen and deciduous trees. The primary evergreen species are black spruce, found in poorly drained lowlands, and white spruce in upland areas. Paper birch and balsam poplar are among the more common hardwood trees. Approximately 24,377 km^2 (6025 acre) of the forest are commercially forested (HLA 1990).

Understory shrubs include several willow and alder species, dwarf birch, labrador tea, low bush cranberry, and blueberry. Small bogs and muskegs are found in depressions. Vegetation around the periphery of these lakes and bogs includes birch, willow, alder shrubs and trees, plus sedge, cattail, and bog cranberry. The banks of Garrison Slough support some riparian vegetation, especially upstream from Central Avenue and downstream from Manchu Road. However, within the more intensely developed area of Eielson AFB, these banks are predominantly covered by grass and low herbaceous plants, which are maintained by mowing.

4.6.2 Wildlife. Wildlife species that inhabit Eielson AFB include moose and black bear. Moose and black bears are mainly found east of the housing area between Quarry Hill (east of the south end of the runway) and Engineer Hill (northeast of the north end of the runway). Few black bears remain near the undeveloped eastern border of the base, whereas the migratory moose may be seen in populated areas. While black bears are year-round residents, moose are normally seen only during the summer grazing. The moose normally migrate across the Tanana River during calving and winter grazing seasons. Other wildlife species include owls, grouse, ptarmigan, ducks, geese, red foxes, minks, beavers, muskrats, snowshoe hares, red squirrels, voles, lemmings, mice, shrews, and numerous smaller birds and mammals. The hares and smaller rodents are eaten by predatory mammals and birds.

Many species of birds, such as songbirds and predatory birds, nest and forage seasonally in forested, riparian, and other ecological communities at Eielson AFB. The on-base lakes and bogs provide excellent habitat for ducks and geese migrating to the area. These waterfowl, as well as other water birds (e.g., horned grebes), nest on or near the ponds and wetlands and use the pond for rearing their young.

4.6.3 Fish. The major aquatic features on Eielson AFB are the Tanana River, French Creek, Moose Creek, Garrison Slough, Piledriver Slough, and a number of lakes formed in old borrow and gravel pits.

Fish species reported in these bodies include

Arctic char	Humpbacked whitefish	Northern pike
Arctic grayling	King salmon	Rainbow trout
Arctic lamprey	Lake chub	Round whitefish
Burbo	Lake trout	Sheefish
Chum salmon	Least cisco	Slimy sculpin
Coho salmon	Longnose sucker	

A number of the on-base lakes are used for recreational fishing and are regularly stocked with fish. The commonly stocked fish are arctic char, arctic grayling, fingerling silver salmon, and rainbow trout.

4.6.4 Threatened and Endangered Species. No threatened or endangered plant or animal species reside on Eielson AFB. The closest known active nesting site for the peregrine falcon, which is listed as threatened and endangered, is in the Salcha Bluff area about 8 km southeast of Eielson AFB. Eielson AFB is within the foraging radius of this nest.

4.7 HISTORICAL AND CULTURAL RESOURCES

No structures on Eielson AFB are listed in the National Register of Historic Places, and no World War II structures are eligible for the list. No known archeological sites exist on the main portion of the base, although a commemorative marker to Ben Eielson is considered a historical site (HLA 1990).

4.8 SURROUNDING LAND USE AND DEMOGRAPHICS

Eielson AFB is within the Fairbanks North Star Borough, a county-scale local government. Fairbanks is the urban center of the Fairbanks North Star Borough, and College, North Pole, and Moose Creek are suburban or rural areas within the borough. North Pole is about 11 km northwest of the base (population 5000), and Moose Creek is about 4.8 km north of the base (population 510). An 8 km section of the Trans-Alaska Pipeline crosses the middle of the base; it enters from the north and exits to the south.

The land surrounding the base is primarily used for military training associated with Fort Wainwright, located west of Eielson AFB. All lands north and east of the base are owned by the U.S. Army. Northwest of Eielson AFB is Moose Creek and the Chena Flood Project, which is owned by the state of Alaska. The base owns the land west to Piledriver Slough. The land from Piledriver Slough to the Tanana River is in privately held agricultural parcels. Twenty-Three Mile Slough is a subdivision of residences located southwest of the base. All land west of the Tanana River is part of Fort Wainwright and is owned by the U.S. Army.

Approximately 5500 people reside on Eielson AFB. Military housing is located in the central portion of the base, east of Industrial Drive. Eielson AFB includes an elementary school, a junior high school, and a high school that are administered by the Fairbanks North Star Borough School District. Some children that live off-base also attend these schools.

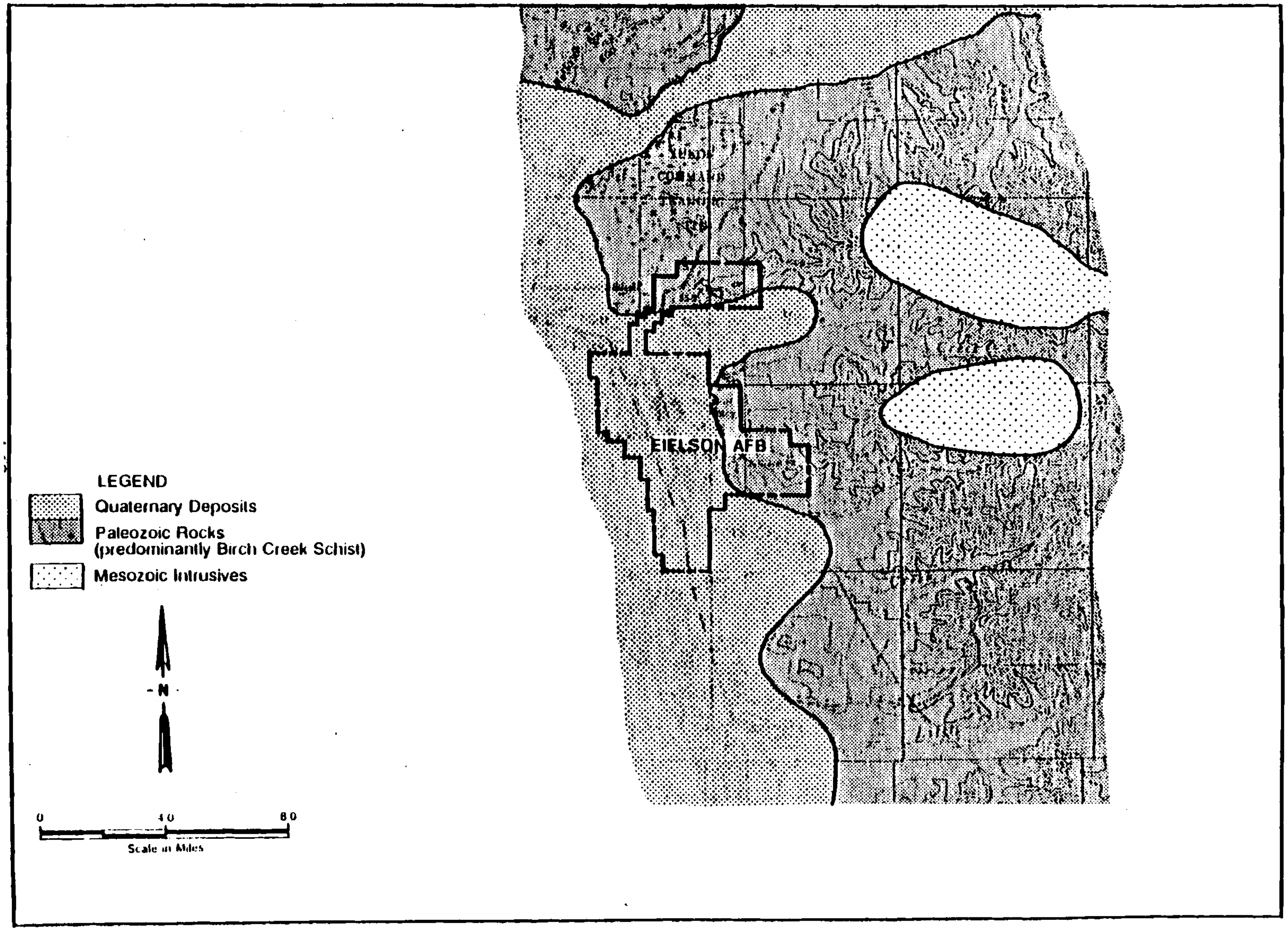


FIGURE 4.1. Geologic Map of the Area Around Eielson AFB

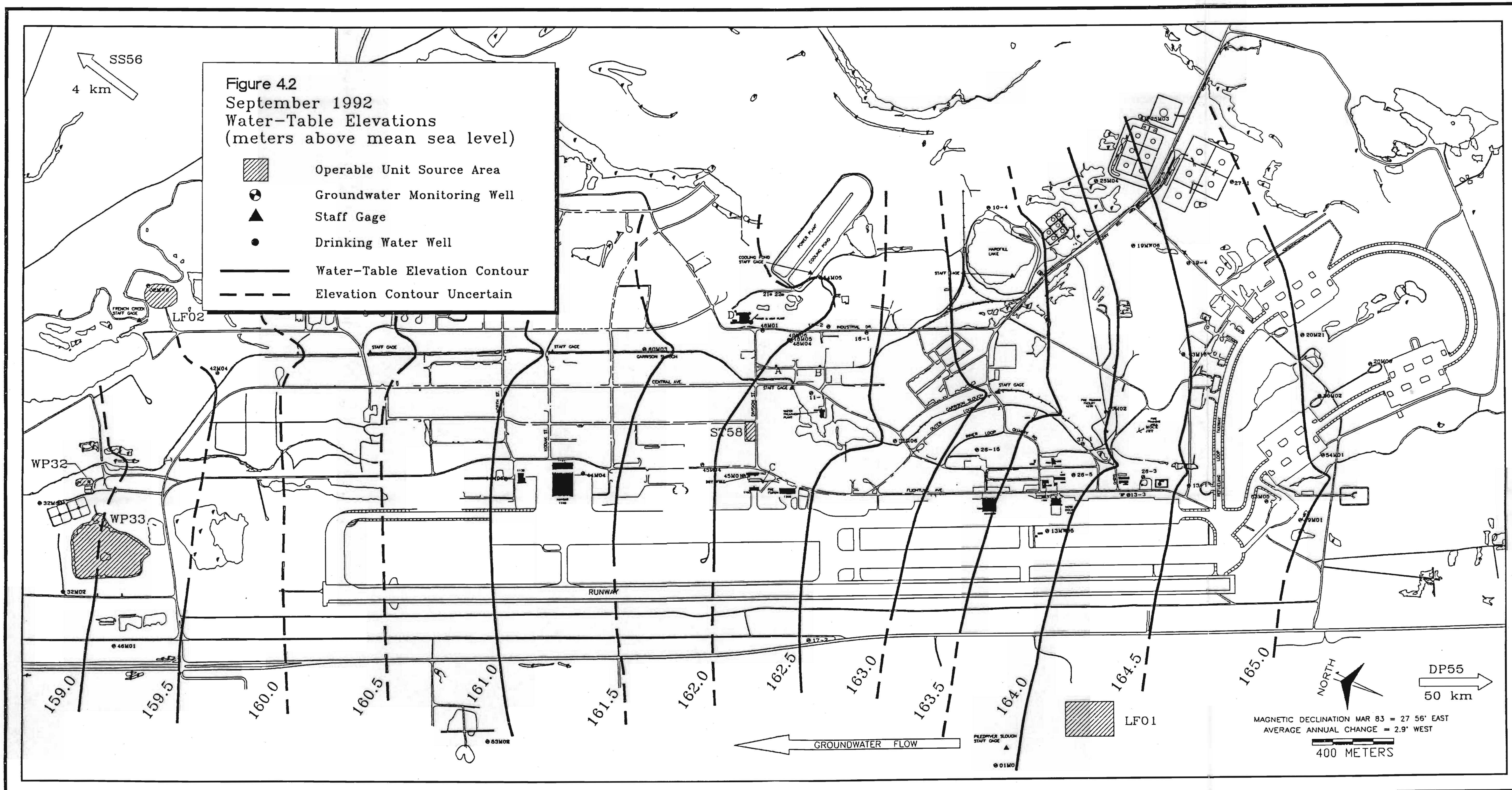


Figure 4.2
September 1992
Water-Table Elevations
(meters above mean sea level)
Operable Unit Source Area
Groundwater Monitoring Well
Staff Gage
Drinking Water Well
Water-Table Elevation Contour
Elevation Contour Uncertain
SS56
4 km
DP55
50 km
LF02
WP32
WP33
ST58
LF01
RUNWAY
GROUNDWATER FLOW
159.0
159.5
160.0
160.5
161.0
161.5
162.0
162.5
163.0
163.5
164.0
164.5
165.0
NORTH
MAGNETIC DECLINATION MAR 83 = 27 56' EAST
AVERAGE ANNUAL CHANGE = 2.9' WEST
400 METERS

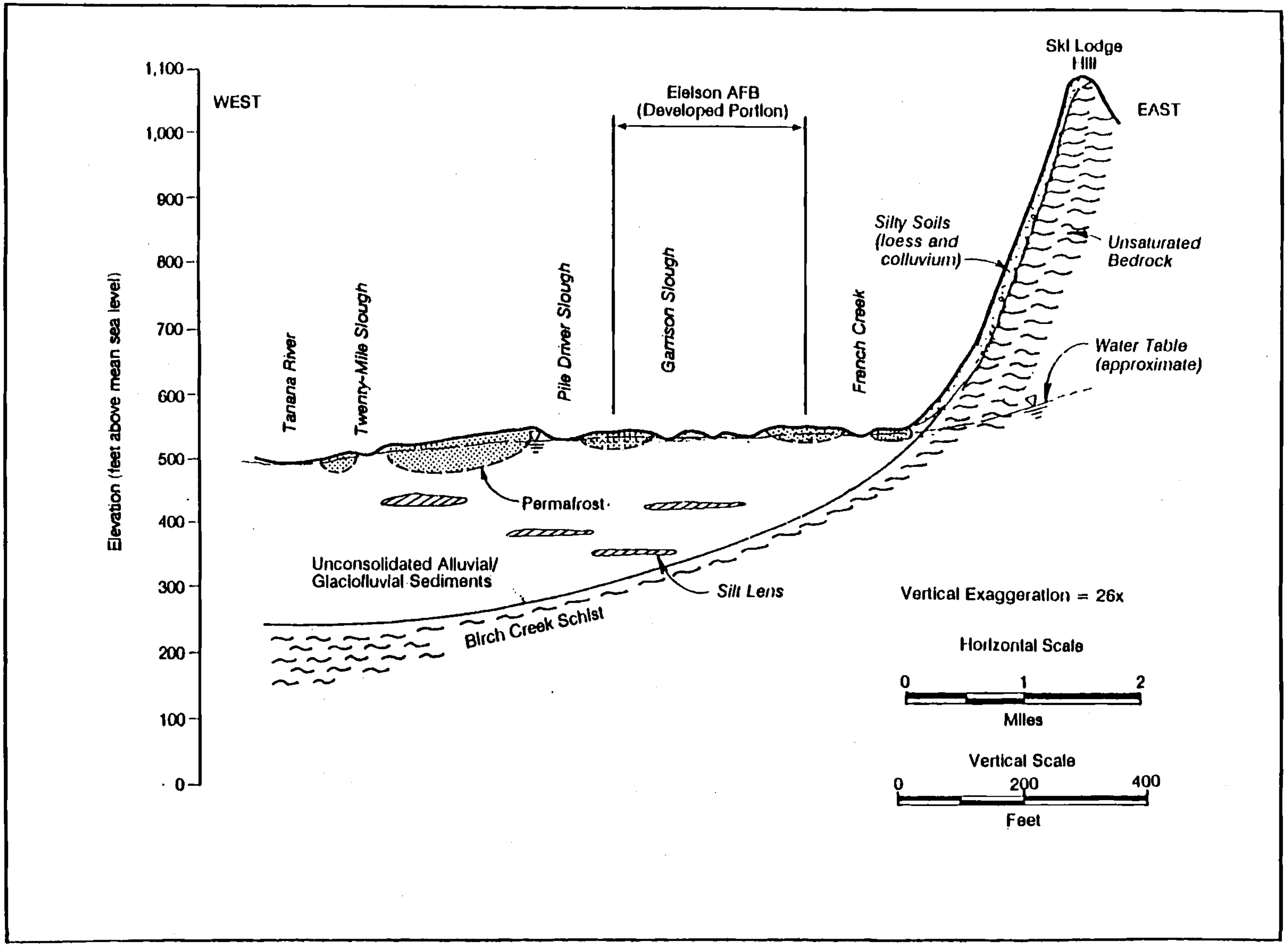


FIGURE 4.3. Conceptualized West-East Hydrogeologic Cross Section of Eielson AFB

TABLE 4.1. Construction Details of Potable Water Supply Wells at Eielson AFB

TABLE 4.1. Construction Details of Potable Water Supply Wells at Eielson AFB

Well	Building	Depth (ft)	Diameter (in.)	gpm	Description
A	3408	96	12	1,000	Main system
B	3430	96	12	1,000	Main system
C	1201	96	12	1,000	Main system/(fire well) emergency
D	6204	96	18	2,000	Main system
1	4355	96	8	80-250	Abandoned, pump removed--line cut and plugged
2	N223800 E388200	96	8	80-250	Abandoned, pump removed--line cut and plugged
3	N223900 E388600	96	8	80-250	Abandoned, pump removed--could not find well--line cut and plugged
4	N227300 E387900	96	8	80-250	Abandoned
5	1225	96	4	80-250	Abandoned, pump removed
5A	T-1164	96	8	490	Out-of-service, no pump
6					No information (not on map)
7	1301	96	12	1,000	Fire well--not connected to main system
7A	1301	96	6	150	Fire well--secondary main system
8	1307	90	4	10	Water supply
9	M226000 E388400				Abandoned (not on map)
10					No information (not on map)
11	N226600 E389300				Abandoned
12	2318	96	12	150	Sewage treatment plant, used in restrooms
13	1317	90	4		Abandoned
14	6224	96	6		Water only used in building, not used for drinking
15	1216	90	4		Weather site/abandoned, pump removed

TABLE 4.1. (Contd)

Well	Building	Depth (ft)	Diameter (in.)	gpm	Description
16	6395	150	6		Ski Lodge basement/abandoned, pump removed (three wells at location, see note)
17	500	96	8	85	Transmitter site/abandoned (not on map, see note)
18	6151	250	6	150	Engineer Hill (two wells at location, see note)
19	2030	140	4	8	Birch Lake (off map)
20	3351	80	6	120	Abandoned
21	6200	112	20	3,000	Water supply--power plant
22	6201	118	20	3,000	Water supply--power plant
	1314				Fire well--pump, plumbed to fire system
	1310				Fire well--pump, plumbed to fire system
	1250				Fire well--pump, plumbed to fire system
	1235				Fire well--pump, plumbed to fire system
	1210				Fire well--pump, plumbed to fire system
	1170				Fire well--pump, plumbed to fire system
	1142				Fire well--pump, plumbed to fire system
	1139				Fire well--pump, plumbed to fire system
	2212				Fire well--pump, plumbed to fire system
	1118				Fire well--pump, plumbed to fire system
	Bear Lake				Water supply
	Blair Lake	120	6		Water supply

TABLE 4.1. (Contd)

Well	Building	Depth (ft)	Diameter (in.)	gpm	Description

Notes:

1. Tom Peluso, Base Plumbing (377-2265) is the reference for much of this information.
2. Well 16 is in the basement of the ski lodge. There is also a nominal 5-in.-diameter unequipped well about 100 ft up the slope from the ski lodge that could be sampled/logged if the welded cap is cut off. There is also a third abandoned well near the lodge, down a gravel road to the south.
3. Tom Peluso said Building 500 listed as the location of well 17 may have been a temporary building that is no longer there.
4. Old well 18 is no longer used. Building 6151 that covered the old well now covers new well 18, but the building is now identified as Building 6156. New well 18 is located about 20 ft southwest of the old well. The new well 18 is about 450 ft deep and 6 in. diameter, and pumps about 10 gpm.
5. There is a well in Building 100 at Blair Lakes (off map).
6. The well marked "abandoned well" on the map (just west of well 13) is unidentified. It may be one of the abandoned wells listed in the table that is not on the map.

TABLE 4.2. Inventory of Offbase Water Supply Wells Within a 3-Mile Radius of Eielson AFB

ADNR Water Rights Designation	Original Well Owner	Owner's Address	Legal Description[a]						Coordinates[b]		Remarks[c]
			QQ	Q	S	TWN	RNG	M	Latitude	Longitude	
LAS 5353	William David Young	PO Box 4715 Eielson AFB AK 99702	NW	NW	28	002S	003E	F	0644307.1N	1471017.1W	Drilled well.
LAS 4758	Robert C. Brody	PO Box 56109 North Pole AK 99705	NW	NW	28	002S	003E	F	0644258.6N	1471004.9W	Hand-driven well, 30 ft deep.
LAS 11412	Kory D. Lander	4708 Rivers St North Pole AK 99705	SE	NW	28	002S	003E	F	0644256.7N	1470933.0W	Hand-driven well, 33 ft deep.
LAS 4656	Charles Eugene Holt, Sr.	4714 Rivers St North Pole AK 99705	SE	NW	28	002S	003E	F	0644256.0N	1470930.0W	Hand-driven well, 30 ft deep.
LAS 46196	Thomas A. Jones	Moose Creek Apts Mile 22, Richardson Hwy Fairbanks AK 99701	SE	NW	28	002S	003E	F	0644251.0N	1470917.0W	SIC 0782, Lawn and garden.
LAS 5569	Gerry Ostrow	1470 Chena Hot Spr Rd Fairbanks AK 99712	NE	SW	28	002S	003E	F	0644241.1N	1470936.1W	Drilled well, 40 ft deep.
LAS 7110	Daniel D. Washington	4743 Daniece Ave North Pole AK 99705	NW	SE	28	002S	003E	F	0644235.9N	1470917.8W	Drilled well.
LAS 7100	Joseph M. Allen	PO Box 58504 Fairbanks AK 99711	SW	NW	27	001S	001E	F	0644806.8N	1473224.4W	Hand-driven well.
LAS 3011	Fairbanks North Star Borough	PO Box 1267 Fairbanks AK 99707	NE	SW	28	002S	003E	F	0644235.2N	1470926.9W	Drilled well, 100 ft deep. Used for sanitary facilities and equipment maintenance, Moose Creek Fire Station.
ADL 48215	Porter D. Putnam Eielson Development Co.	Mile 24 Richardson Hwy Fairbanks AK 99701	NW NW NW	SE SE SE	28 28 28	002S 002S 002S	003E 003E 003E	F F F	0644234.0N 0644234.6N 0644234.0N	1470902.6W 1470859.6W 1470905.7W	Three drilled wells used in steam plant.
ADL 46213	Robert Portman	PO Box 110 Fairbanks AK 99701	SE NW	NW SE	27 28	002S 002S	003E 003E	F F	0644245.7N 0644243.7N	1470746.9W 1470850.5W	Two drilled wells used for industry and irrigation. SIC 0191, Farms general.
LAS 4708	Raymond E. Dickerson	4815 Daniece Ave. North Pole AK 99705	SW	SE	28	002S	003E	F	0644230.7N	1470852.0W	Hand-driven well, 20 ft deep.

TABLE 4.2. (Contd)

ADNR Water Rights Designation	Original Well Owner	Owner's Address	Legal Description[a]						Coordinates[b]		Remarks[c]
			QQ	Q	S	TWN	RNG	M	Latitude	Longitude	
ADL 403416	Kirby R. Wheeler	4830 Cul De Sac Court North Pole AK 99705	SE	SE	28	002S	003E	F	0644233.4N	1470844.8W	No information.
LAS 5449	Duane Bratten	PO Box 74651 Fairbanks AK 99707	SE	SE	28	002S	003E	F	0644230.1N	1470842.9W	SIC 6514, Multi unit house.
LAS 5420	James E. Weigers	1426 Third Ave Fairbanks AK 99701	SE	SE	28	002S	003E	F	0644229.4N	1470845.9E	Drilled well.
LAS 1961	James F. Cavanaugh	4823 Daniece Ave North Pole AK 99705	SE	SE	28	002S	003E	F	0644226.2N	1470844.4W	30-ft well.
LAS 2026	James F. Cavanaugh	4823 Daniece Ave North Pole AK 99705	SE	SE	28	002S	003E	F	0644226.2N	1470847.5W	30-ft well.
LAS 2261	William J. Jennings	PO Box 56097 North Pole AK 99705	SE	SE	28	002S	003E	F	0644225.5N	1470845.9W	30-ft well. SIC 6514, Multi unit house.
ADL 400601	Daniel McCurdy	PO Box 56336 North Pole AK 99705	SW	SW	27	002S	003E	F	0644220.4N	1470257.0W	SIC 0191, Farms general.
LAS 4809	Walden E. McFarland	3283 Baker Rd North Pole AK 99705	SE SE	SE SE	20 20	002S 002S	003E 003E	F F	0644312.4N 0644314.4N	1471024.8W 1471024.8W	Three hand-driven wells. Water is also withdrawn from Moose Creek. SIC 0200, Animals; SIC 0139, Field crops.
LAS 3130	Charles Adkins	PO Box 56154 North Pole AK 99705	NW	NW	29	002S	003E	F	0644309.0N	1471209.3W	Hand driven well, 18 ft deep.
LAS 2036	Richard J. Cards	PO Box 4553 Eielson AFB AK 99702	NW	NE	29	002S	003E	F	0644309.0N	1471116.1W	23-ft well.
LAS 3153	Billy M. Thompson	4492 Lauesen Ave North Pole AK 99705	NW	NE	29	002S	003E	F	0644309.0N	1471053.3W	Hand driven well, 40 ft deep.
LAS 5476	James Isaac Styers	2490 Marigold Rd North Pole AK 99705	NW	NE	29	002S	003E	F	0644309.0N	1471111.6W	Drilled well, 30 ft deep.
LAS 5291	Ellis L. Delaney	4431 Lauesen Ave North Pole AK 99705	NW	NE	29	002S	003E	F	0644305.8N	1471116.1W	Hand driven well, 30 ft deep.

TABLE 4.2. (Contd)

ADNR Water Rights Designation	Original Well Owner	Owner's Address	Legal Description[a]						Coordinates[b]		Remarks[c]
			QQ	Q	S	TWN	RNG	M	Latitude	Longitude	
LAS 5090	Eugene L. Riley, Jr.	3331 Baker Rd North Pole AK 99705	NE	SW	13	002S	003E	F	0644424.8N	1471524.8W	Drilled well, 40 ft deep.
LAS 5054	Peter B. Apted	PO Box 55261 North Pole AK 99705	SE	NE	29	002S	003E	F	0644257.4N	1471027.5W	Drilled well, 36 ft deep.
ADL 61755	Dwayne H. Hofschulte	PO Box 55226 North Pole AK 99705	NE	NE	29	002S	003E	F	0644259.0N	1471026.0W	No information.
LAS 502	Harold Douglas Worthen	PO Box 1121 Fairbanks AK 99707	NE	SW	08	003S	003E	F	0644003.9N	1471125.9W	Drilled well used for irrigation.
LAS 7219	Dennis A. Ulvestad	PO Box 622 Valdez AK 99686	NW	NE	16	003S	003E	F	0643929.3N	1470918.5W	Five hand-driven wells used for irrigation.
LAS 2623	Alan J. Hilcoske	5767 Crazy H Lane Salcha AK 99714	NW NW NW	NE NE NE	12 12 12	004S 004S 004S	003E 003E 003E	F F F	0643515.8N 0643512.6N 0643515.8N	1470247.6W 1470252.1W 1470258.1W	38-ft well. 28-ft well. 30-ft well.
LAS 7009	Stephen Thomas Farmer	6442 Richardson Hwy Salcha AK 99714	SE	SE	12	004S	003E	F	0643438.2N	1470235.5W	Hand-driven well, 35 ft deep.
LAS 7086	Paul A. Lockwood	6466 Richardson Hwy Salcha AK 99714	SE	SE	12	004S	003E	F	0643434.3N	1470226.4W	Hand-driven well, 35 ft deep.
LAS 7079	Jinnet J. De Pina	PO Box 4518 Eielson AFB AK 99702	NE	NE	13	004S	003E	F	0643418.8N	1470238.5W	Hand-driven well, 26 ft deep.
LAS 7065	Daniel Lyle Ellison	5709 Armitage Ave Salcha AK 99714	NW	NE	13	004S	003E	F	0643418.8N	1470311.7W	Hand-driven well, 40 ft deep.
LAS 1955	John W. Underwood	PO Box 55252 North Pole AK 99705	SE	SE	13	004S	003E	F	0643345.0N	1470229.4W	40-ft well.
LAS 7087	Thomas C. Dolan	PO Box 55273 North Pole AK 99705	SE	NW	02	004S	003E	F	0643553.1N	1470518.4W	Hand-driven well, 40 ft deep.
LAS 7090	William R. Kitts	5871 Old Valdez Trail Salcha AK 99714	NW	NW	02	004S	003E	F	0643606.7N	1470551.7W	Hand-driven well, 30 ft deep.

TABLE 4.2. (Contd)

ADNR Water Rights Designation	Original Well Owner	Owner's Address	Legal Description[a]						Coordinates[b]		Remarks[c]
			QQ	Q	S	TWN	RNG	M	Latitude	Longitude	
LAS 7064	George Haralovich	474 Trainer Gate Rd Fairbanks AK 99701	NE	NW	02	004S	003E	F	0643610.6N	1470533.5W	Two hand driven wells, 25 and 40 ft deep.
ADL 400817	Ken Cauffman	PO Box 55232 North Pole AK 99705	SE	SE	02	004S	003E	F	0643531.1N	1470433.6W	No information.
LAS 340	Larry Melvin Patty	2306 Campion St North Pole AK 99705	NW	SE	08	003S	003E	F	0643956.8N	1471055.6W	Four hand-driven wells used for irrigation.

[a]Legal description is given as quarter/quarter, quarter, section, township, range, and meridian.
[b]Latitude and longitude are in degrees/minutes/seconds, i.e., 0644307.1 = 64 degrees, 43 minutes, and 7.1 seconds.
[c]Wells are used in single family dwellings, unless otherwise noted. SIC = Standard Industrial Code.

Source: Electronic data base (1988) available through Alaska Department of Natural Resources.

TABLE 4.3. Estimated Stream Characteristics, Eielson AFB, August 20, 1987

Creek	Location	Width (ft)	Depth (ft)	Substrate	Flow (cfs)	Velocity (ft/s)
French Creek	Quarry Road	15-20	2-3	Rocky, 1- to 3-in.-diameter gravel	20-30	2-3
French Creek	Manchu Road	20	2-3	Gravel with rubble and rocks	20-30	5-10
Garrison Slough	Division Street	--	--	Sand, some gravel	5-10	1-2
Garrison Slough	Manchu Road	8-10	1-2	Sand with gravel	5-10	5
Garrison Slough	Transmitter Road	6-8	2-3	Sand, silt, and organic matter	5	--
Garrison Slough	Unnamed Road	6-10	1-2	Mud and muck	1-2	<1
Moose Creek	Transmitter Road	15	2-4	Sand	25-30	--
Piledriver Slough	Moose Creek Bluff	30-50	4-6	Gravel	100-200	3-4

Source: HLA (1989).

TABLE 4.4. Climatological Data for Eielson AFB, Averaged over 40-Year Period, 1944-1984

Month	Precipitation (in.)	Maximum Temperature (°F)	Minimum Temperature (°F)	Average Temperature (°F)
January	0.88	+49	-64	-11.1
February	0.62	+50	-60	-5.1
March	0.56	+52	-50	+9.8
April	0.50	+74	-26	+29.0
May	0.77	+92	-01	+47.0
June	1.61	+93	+31	+57.8
July	2.55	+92	+36	+60.3
August	2.29	+88	+22	+55.6
September	1.34	+82	+05	+44.4
October	1.06	+68	-36	+24.6
November	0.83	+50	-44	+3.4
December	0.85	+45	-61	-10.0

Average yearly total for precipitation: 13.87 in.
Average temperature over 40-year period: +25.5°F.

Source: SAIC (1989) Volume II, Appendix A.

5.0 SER Phase 2 Findings

5.0 SOURCE EVALUATION REPORT PHASE 2 FINDINGS

The six source evaluation report sites identified in the *SER Phase 1 Final Report* (U.S. Air Force 1993e) are described in this section (Table 5.1). The sites have been screened as to their human health and ecological risk on a scale comparable to a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) preliminary assessment/site investigation action. Recommendations based upon the screening have been submitted to the U.S. Environmental Protection Agency (EPA), the Alaska Department of Environmental Conservation (ADEC), and the U.S. Air Force. Sites that are accepted for no further action will be included in a record of decision. Sites that require further investigation will be included in an appropriate cleanup program as decided by EPA, ADEC, and U.S. Air Force.

The 1993 limited field investigation and other investigations suggest that LF01, LF02, and DP55 are appropriate for no further action. Furthermore, WP32, WP33, and ST58 require inclusion in a remedial investigation/feasibility study. At SS56, the recommendation is that the supply well be permanently abandoned and sealed. A new, deeper location should be found for wastewater effluent disposal.

Two source evaluation report Phase 1 sites, LF06 (Old Landfill) and SS64 (Transportation Maintenance Drum Storage Site), were recommended for further sampling and analysis during review of the Phase 1 report and subsequent to the finalization of the source evaluation report Phase 2 work plan. These sites will be the subject of additional investigations during calendar year 1994, but will not be resolved in the Phase 2 report.

The groundwater at Eielson Air Force Base (AFB) will continue to be monitored as part of the site-wide groundwater monitoring program. If any contaminant releases to the groundwater are determined to originate from a source evaluation report site recommended for no further action, that source evaluation report site will be reevaluated. This reevaluation may include additional sampling and/or site characterization.

TABLE 5.1. Summary of Source Evaluation Report Recommendations for Eielson AFB

Source Area Number	Source Area Name	Recommendation
LF01	Original Base Landfill	SER Limited Sampling
LF02	Old Base Landfill	SER Limited Sampling
LF05	Old Army Landfill	No Further Action
LF06	Old Landfill	No Further Action
LF07	Test Landfill	No Further Action
FT08	Fire Training Area (Past)	No Further Action
SS12	JP-4 Spill, Building 2351	No Further Action
ST15	Multiproduct Fuel Line Spill	No Further Action
ST16	MOGAS Fuel Line Spill	No Further Action
ST17	Canol Pipeline Spill	No Further Action
SD21	Road Oiling at Quarry Road	No Further Action
SD22	Road Oiling at Industrial Drive	No Further Action
SD23	Road Oiling at Manchu Road	No Further Action
SD24	Road Oiling at Gravel Haul Road	No Further Action
DP28	Fly Ash Disposal Site	No Further Action
DP29	Drum Burial Site	No Further Action
SS30	PCB Storage Facility Building 2339	No Further Action
SS31	PCB Storage Facility Building 3424	No Further Action
WP32	Sewage Treatment Plant Spill	SER Limited Sampling
WP33	Sewage Treatment Plant Effluent Filtration Ponds	SER Limited Sampling
SS35	Asphalt Mixing Area	Move to OU-4
DP40	Power Plant Sludge Pit	No Further Action
SS41	Past Auto Hobby Shop	No Further Action
SS42	Miscellaneous Storage and Disposal Area	No Further Action
SS47	Commissary Parking Lot Fuel Spill	No Further Action
DP55	Birch Lakes Burial Site	SER Limited Sampling
ST56	Engineer Hill Spill Site	SER Limited Sampling
ST57	Fire Station Parking Lot Spill	Move to OU-3
ST58	Old QM Service Station	SER Limited Sampling
WP60	New Auto Hobby Shop	No Further Action
SS61	Vehicle Maintenance Building Dry Well	Base Construction
SS62	Garrison Slough	No Further Action
SS63	Asphalt Lake Spill Site	Combine with SS39 in OU4
SS64	Transportation Maintenance Drum Storage Site	SER Limited Sampling

6.0 Source Area LF01

6.0 LF01 ORIGINAL BASE LANDFILL AND DRUM DISPOSAL AREA

6.1 LOCATION

LF01 (Original Base Landfill and Drum Disposal Area) is between Richardson Highway (AK 2) and Piledriver Slough, about 3.5 km south of the Eielson Air Force Base (AFB) south gate. LF01 includes an abandoned landfill and a drum disposal area about 300 m from the highway (Figure 6.1). A power line right-of-way runs about 60 m north of LF01. The landfill access road leaves Richardson Highway about 400 m north of the drum storage road. The landfill is about 300 m east of the end of the road, which is near Piledriver Slough. The drum storage area can be approached along a dirt road that leaves the west side of Richardson Highway and continues about 275 m to the south. The storage area is about 1 km^2. The minimum distance from Piledriver Slough to the drum storage area is about 250 m. The minimum distance from Piledriver Slough to the landfill is about 30 m.

6.2 HISTORICAL USE

The landfill was used throughout the 1950s and received domestic and base operations wastes. This landfill received (CH2M Hill 1982) garbage, lumber, metal, construction debris, and empty cans. Flight line shop solvent wastes, waste oils, and paint residue were also reported. Disposal practices are not documented but waste was not burned. During this period, Landfill 4 (LF04), the Old Army Landfill (LF05), and the Old Landfill (LF06) were also receiving base refuse. The landfill was last used by Eielson AFB in 1960 and was subsequently covered with a soil cap. Currently, the cap has deteriorated and the refuse is essentially uncovered. Material extends along a 1.2- to 2.5-m (4- to 8-ft) embankment for about 300 m (1000 ft). Cans, bottles, paint cans, drums, batteries, electrical equipment, metal debris, and broken household items are found throughout with domestic rubbish predominating in the northern half. No full containers or puddled fluids were observed in the landfill. Along the eastern margin, standing water has ponded and is in contact with some refuse. A shallow surface drainage appears to transmit this surface water parallel to the scarp in the direction of Piledriver Slough.

Little is known about the drum storage area (Figure 6.2). There is no historical record of its use. In early 1992, the area of LF01 was expanded to include a previously unregulated section of forest that included the drum storage area. No written or anecdotal information was uncovered during this investigation. Conversations with Eielson AFB personnel revealed the following site history. In September 1992, approximately 2500 drums were removed to the borough landfill (2 drums were removed by Hazmat teams). Also, all vegetation was removed. The area was surveyed in January 1993, and the location of removed and remaining drums was mapped.

6.3 HISTORICAL DATA AND ASSUMPTIONS

6.3.1 Site Observations. The refuse piles associated with LF01 were located during an early June site inspection (see photographs in Appendix B). Mounds of refuse mixed with soil and vegetation extend in a continuous line (Figure 6.1). No constructed cap is obvious. Debris include drums, household refuse, wood, metals, and other common domestic and military landfill material. During the inspection, no liquid waste was observed as surface stains or puddles. Vegetation appears to be unstressed. Surface water was ponded behind one of the mounds but did not have any discoloration or surface sheen. Aerial photographs support this LF01 history.

At the drum storage area, hardened asphaltic material is abundant, as puddled patches and as spills from broken and punctured drums. About 1000 empty drums remained on site (Figure 6.2), as of June 1993. The drums are either in a narrow windrow of soil and debris or scattered around the area, singly or in small groups. Most of the drums appear to have contained asphalt material and many are crushed and unlabeled. A large amount of metal strapping and wood debris is also mixed into the main windrow. Stressed vegetation is not obvious, although the area has been scraped clear.

6.3.2 Previous Investigations. Four previous investigations were done in the area adjacent to LF01 (CH2M Hill 1982; Dames & Moore 1985, 1986; HLA 1989); however, none of these studies located the landfill or the drum storage area. Harding Lawson Associates (1990) reported the landfill location and performed a cursory investigation of the drum storage area. Monitoring wells were drilled in three locations at the end of the gravel access road near Piledriver Slough (Table 6.1). Data collected from previous investigations at the landfill (Tables 6.2 through 6.4) indicated detectable amounts of 1,2-dichloroethane in one groundwater sample and DDT, DDD, and DDE in soil. Metals data suggested that arsenic, barium, chromium, lead, iron, and magnesium might be elevated in groundwater. Polychlorinated biphenyls (PCBs), semivolatile organic compounds, phenol, other pesticides, nitrates, and lead (groundwater) concentrations were below detection limits. Benzene, toluene, ethylbenzene, and xylene concentrations were above detection limits in a soil gas screening survey but not in groundwater. No samples have been collected from the drum storage area.

6.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

6.4.1 Potential Contaminants of Concern. In addition to the contaminants detected, several other compounds were probably disposed at LF01. Solvents, degreasers, paints, thinners, and de-icer/antifreeze solutions are expected waste of routine base activities. Pesticide/herbicides, PCBs, waste oils, diesel, gasoline, and hydraulic fluids could be expected. Heavy metals (as components in batteries), photographic solutions, paint, and fly ash may also have been introduced. Asphalt cement was found at the drum storage area. Based on the expected components of these materials, the potential contaminants of concern are

arsenic
cadmium
chromium
copper
lead
nickel
zinc
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
1,2-dichloroethylene
1-methylnaphthalene
1,1,1-trichloroethane
1,1,2,2-tetrachloroethane
acetone
benzene
DDT, DDD, DDE
ethylbenzene
naphthalene
polycyclic aromatic hydrocarbon (PAH)
PCB
tetrachloroethylene
tetraethyl lead
tetramethyl lead
toluene
trichloroethylene
trichlorofluoromethane
vinyl chloride
xylene

6.4.2 Conceptual Model. Site-specific geology and hydrology data are sparse. Soil borings located west of the landfill revealed loose- to dense-packed silt, sandy gravel, and gravelly sand to 7.8 m. Natural gamma logging of the borings did not locate any sharp stratigraphic discontinuities. In general, the depositional model for these sediments would include overbank and braided channel deposits associated with the Piledriver-Tanana fluvial system. Water levels in wells vary from 1.8 to 2.4 m during the spring to fall. Significant seasonal variation is expected because of the proximity to Piledriver Slough and expected ground-surface water interaction. The regional groundwater gradient is to the north-northwest, sub-parallel to the Tanana River at about 0.9 m/km. The local gradient, impacted by bank storage and recharge from Piledriver Slough, may be less well defined and vary seasonally.

The conceptual model for LF01 suggests release of contaminants from the buried refuse or drums and transport of leachate to the soils and groundwater. Secondary transport by sediment or groundwater to the surface waters of Piledriver Slough was also assumed with subsequent contamination of aquatic biota. Exposure is assumed to include ingestion of soil, ground, and/or surface water. Inhalation and dermal contact were presumed less conservative. Ingestion of contaminated aquatic biota was also considered.

The model is constrained by simple advective travel times of 120 days for the landfill and 960 days for the drum storage area, assuming no retardation and a groundwater velocity of 0.37 m/day. This suggests that volatile components originating in the landfill may have been dispersed but that dense nonaqueous phase liquids and hydrophobic species may remain.

6.4.3 Sampling Objective and Strategy. Because of the likelihood of multimedia pathways, the potential contaminants of concern required assessment in soil and groundwater. Although surface water and sediment are a potential exposure pathway, the conceptual model suggests that data from the surface water bodies and sediment could easily reflect multiple, complex releases unrelated to this site. Contamination of the proximal groundwater and soil is very likely given a release from the landfill or drum storage area and would give a more definitive indication of the need for further CERCLA work at LF01.

In summary, the following sampling strategy was used at LF01.

Objective: To evaluate contamination at LF01 that is the result of the landfill and the drum storage area.

Action: Install monitoring Well 01MW03 at the drum storage area and Well 01MW04 at the landfill.

Sample soil underlying the drum storage area and within the surface drainage down gradient of the landfill.

Sample groundwater at both locations.

Activity: Soil was sampled at regular intervals from the surface to the top of the water table. A grab sample of pit water was taken. Soil and water were analyzed for inductively coupled plasma metals, lead, arsenic, pesticides, volatile organic compounds, and semivolatile organic compounds.

Water was sampled from both monitoring wells and analyzed for inductively coupled plasma metals, lead, arsenic, pesticides, volatile organic compounds, and semivolatile organic compounds.

Surface soil was removed from the surface drainage down gradient of the landfill and analyzed for inductively coupled plasma metals, lead, arsenic, pesticides, volatile organic compounds, and semivolatile organic compounds.

6.4.4 Limited Field Investigation Field Work. Sampling of soil and groundwater included efforts at the landfill and the drum storage area (Figures 6.1 and 6.2). Sampling at the drum storage area included soil at the three areas of multiple drums, three locations adjacent to the windrow of excavated drums, and one at the area of asphalt cement puddles (Figure 6.2). Sites were trenched with a backhoe to the top of the water table and samples were taken from the surface, the top of the water table, and one from a median depth. Surface soil samples were a composite of the material from the ground surface to the depth of the first backhoe cut, generally about 0.5 m. A grab sample of unfiltered groundwater was taken from each excavation. Three soil samples and one groundwater sample were generated per station. Soil samples were analyzed for volatile and semivolatile organic compounds, PAHs, pesticides, total metals, and PCBs. Groundwater samples were analyzed for the same parameters.

A soil sample was taken from the surface drainage below the landfill. This sample was analyzed for volatile and semivolatile organic compounds, pesticides/herbicides, and total metals.

A down gradient well (01MW03) was drilled along the drum storage area access road, directly adjacent to the Department of Public Works borrow pit pond (Figure 6.1). Groundwater and soil were sampled at this location. A second well (01MW04) was drilled adjacent to the landfill mounds (Figure 6.1). In addition, work planned by the base-wide background sampling task includes sampling at the older Harding Lawson Associates wells. Details on this work are in a report by the U.S. Air Force (1994).

Geologic logs for the two wells and the seven pits reveal a consistent stratigraphy (Appendix B). The landfill is underlain by about 3.3 m (11 ft) of light brown sandy loam, followed by 1.2 m (4 ft) or greater of dark grey, medium sand and gravel. Groundwater was encountered at 2.6 m (8.5 ft) below surface. Photoionization detector and LEL meters did not detect any methane or isobutylene. The first four pits at the drum storage area were similar and all probably reflect axial Tanana River sands and gravel overlain by overbank, fluvial deposits of Holocene age. Groundwater levels were observed at 1.5 to 2.9 m (4.8 to 9.4 ft) below the surface. At Pits 5, 6, and 7, a distinctive organic-rich, fetid, sandy silt layer was encountered at about 0.1 to 0.45 m (0.5 to 1.5 ft) below the surface. At about 0.9 to 2 m (3 to 6 ft) below the surface, the axial sand and gravel was encountered. This stratigraphic sequence appears to trace a buried alluvial channel and may represent a distinct geologic environment relative to background metal concentrations.

Groundwater and soil, including unfiltered grab samples of pit water, were analyzed for semivolatile organic compounds (Tables 6.5 and 6.6); pesticides/herbicides (Tables 6.7 and 6.8); and volatile organic compounds and inductively coupled plasma metals, arsenic, and lead (Tables 6.9 and 6.10). A pit water sample was not taken at Pit 7 because of extreme turbidity.

6.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

The Phase 2 limited field investigation data have been compared to regulatory, risk-based and background criteria. All soil and groundwater samples at both the landfill and drum storage area are below detection limits in semivolatile organic compounds (Tables 6.5 and 6.6) except for one value. Diethylphthalate (1700 μg/kg) was found at the drum storage area, Pit 3, at a value far below risk-based criteria (Table 6.11). This analyte is a common laboratory contaminant.

Pesticide values (Table 6.7) were below detection limits in groundwater from both wells. The soil sample from the landfill drainage contained trace amounts of DDD (1.8 μg/kg) and DDT (1.4 μg/kg). Pit samples also contained DDD at 2.0 μg/kg (Pit 2) and 6.0 μg/kg (Pit 4). DDT was also detected at Pit 4 (20 μg/kg). Delta BHC was also detected at Pit 3 in the water grab sample at 0.0065 μg/L. All of the values are well below risk-based criteria (Table 6.11).

Volatile organic compound data (Table 6.8) were not recovered for well water at the drum storage site. Pit grab samples are represented by values below detection limits in most cases. Although these pit water samples were unfiltered and not representative of dissolved metals, they did not indicate contamination by organic compounds. Methylene chloride was reported from pit water at Pit 1 (0.16 μg/L) but at a level far below all criteria (Table 6.9). The groundwater and surface soil samples from the landfill well have no detectable levels of volatile analytes, suggesting that historical groundwater values of 1,2-dichloroethylene (Table 6.2) were not representative of the landfill. Recall, this sample was collected before the true location of LF01 was uncovered and from wells that were located closer to Piledriver Slough. Data retrieved from these wells are probably more representative of surface to groundwater contamination from the slough. The pit samples from the drum storage area contained detectable levels at Pit 1 of ethylbenzene (0.3 μg/kg), tetrachloroethylene (0.17 μg/kg), xylene (0.95 μg/kg), and at Pit 6 of toluene (0.25 μg/kg), but all values are below risk-based and regulatory criteria.

Historical data suggest that arsenic, barium, chromium, lead, iron, and magnesium might be a problem in groundwater at the landfill (Table 6.2). The data were taken from incorrectly located wells, relative to the true position of the landfill. Heavy metals, including arsenic and lead (Table 6.9), were below risk-based criteria in groundwater from the wells at both the drum storage area and the landfill. Iron was greater than background values (Appendix A) in both wells. The landfill soil sample was below risk-based criteria in every metal except arsenic, which was below background. Among the pit soils, lead and arsenic are both above regulatory or risk-based criteria but are well below background values indicating that background risks exceed those attributable to the sampled soils. Arsenic is slightly above background values (15,000 μg/kg) at Pits 5 (15,000 μg/kg), 6 (16,000 μg/kg), and 7 (18,000 μg/kg). First, although arsenic-containing pesticides might have been stored at the site, there is no evidence for a major source of arsenic in the mostly asphalt-containing drums that were removed. Second, the three pits uncovered a thick sequence of organic-rich silt overlying sandy gravel (Appendix B), a stratigraphic sequence common to the Fairbanks area as a placer gold host formation (Pewe et al. 1976). Arsenic concentrations commonly increase in alluvial stream deposits from the Fairbanks area derived from gold-bearing bedrock (Weber 1986). This suggests that arsenic and precious metals may be abundant in the sequence and may be slightly elevated with respect to the main base. The highest values of copper and chromium are also found at Pit 6. Grab samples of pit water were turbid and had values of lead, arsenic, and all other metals higher than background, clearly attributable to suspended sediment. Iron also is elevated relative to background in groundwater sampled at both wells. The values (5700 and 8000 μg/L) are well within the upper 95% confidence interval of 11,000 μg/L established by Krumhardt (1982) for the area around North Pole, less than 15 km west of the base.

Data gathered from the four previous investigations of LF01 were recorded without understanding the correct extent of the landfill. Because of this, soil and groundwater samples and the conceptual model of the source were all fundamentally flawed. By located wells along Piledriver Slough, it is not clear that groundwater contaminated by landfill leachate was ever sampled. River stage fluctuations strongly influence the groundwater gradient in alluvial aquifers (Larkin and Sharp Jr. 1992) and without explicit consideration of this factor, samples from the earlier wells could be sampling groundwater flowing parallel, transverse, or oblique to Piledriver Slough. The well constructed during the limited field investigation was located less than 10 m adjacent and down gradient of the true landfill and would be much less influenced by surface water dynamics.

6.6 RISK CHARACTERIZATION

6.6.1 Soil. No volatile or semivolatile organic compounds, pesticides, or herbicides were detected in the soil at the landfill. All metal concentrations were below risk-based criteria or background. This suggests that the pathway for soils at the landfill is not complete. Volatile and semivolatile organic compounds at the drum storage area were well below regulatory and risk-based criteria. Pesticides do not exceed risk-based criteria. Metals at the drum storage area are below background levels except for arsenic. This appears to reflect local geological conditions and suggests that soil is not a complete pathway at LF01. Iron also is elevated relative to background in ground water sampled at both wells. The values (5700 and 8000 μg/L) are above the upper 95% confidence interval limit of 2545 μg/L for base background (Appendix A) but are well within the upper 95% confidence interval limit of 11,000 μg/L established by Krumhardt (1982) for the area around North Pole, less than 15 km west of the base.

6.6.2 Groundwater. As discussed in Section 6.5, seasonal fluctuations in surface to groundwater interactions are not expected to affect the data retrieved from the two wells at LF01. In any case, well water samples at both the landfill and drum storage area were not contaminated. This indicates that groundwater is not a complete pathway at LF01.

6.6.3 Surface Water. Because surface soil is not contaminated at the landfill, it is unlikely that surface water would be contaminated by overland flow. The sample of surface soil taken from the down slope drainage at the landfill was not contaminated above background or risk-based criteria. Groundwater at this site is also not contaminated and surface to groundwater contamination of Piledriver Slough is also not likely.

Surface soil at the drum storage area is uncontaminated. This suggests that the surface water pathway is incomplete at LF01.

6.6.4 Air. Any free, uncontained volatile compounds would have evaporated in the time elapsed since the landfill was abandoned (1960). No full or partially full drums or other containers of solvents, fuel, or other volatile-compound containing waste have been found at LF01. In any case, levels of such contaminants in soil and groundwater were below regulatory or risk-based criteria.

Because there was no evidence for contamination of the surface soils found at either the landfill or the drum storage site at levels greater than the criteria, the resuspension pathway does not appear to be complete. At the drum storage area, all volatile compounds are within regulatory and risk-based limits. Surface soil is uncontaminated. This suggests that no complete air pathway exists at LF01.

6.7 CONCLUSIONS AND RECOMMENDATIONS

Based upon the data of the Phase 2 source evaluation investigation, no evidence exists that LF01 is a source of contamination to human or ecological receptors. As part of the site-wide Eielson AFB groundwater monitoring plan, wells 01MW04 and 01MW03 should be monitored for RCRA Subtitle D landfill constituents.

In addition, the site should be restored and maintained in such a way as to minimize physical hazards due to exposed debris and to reduce infiltration and the formation of leachate.

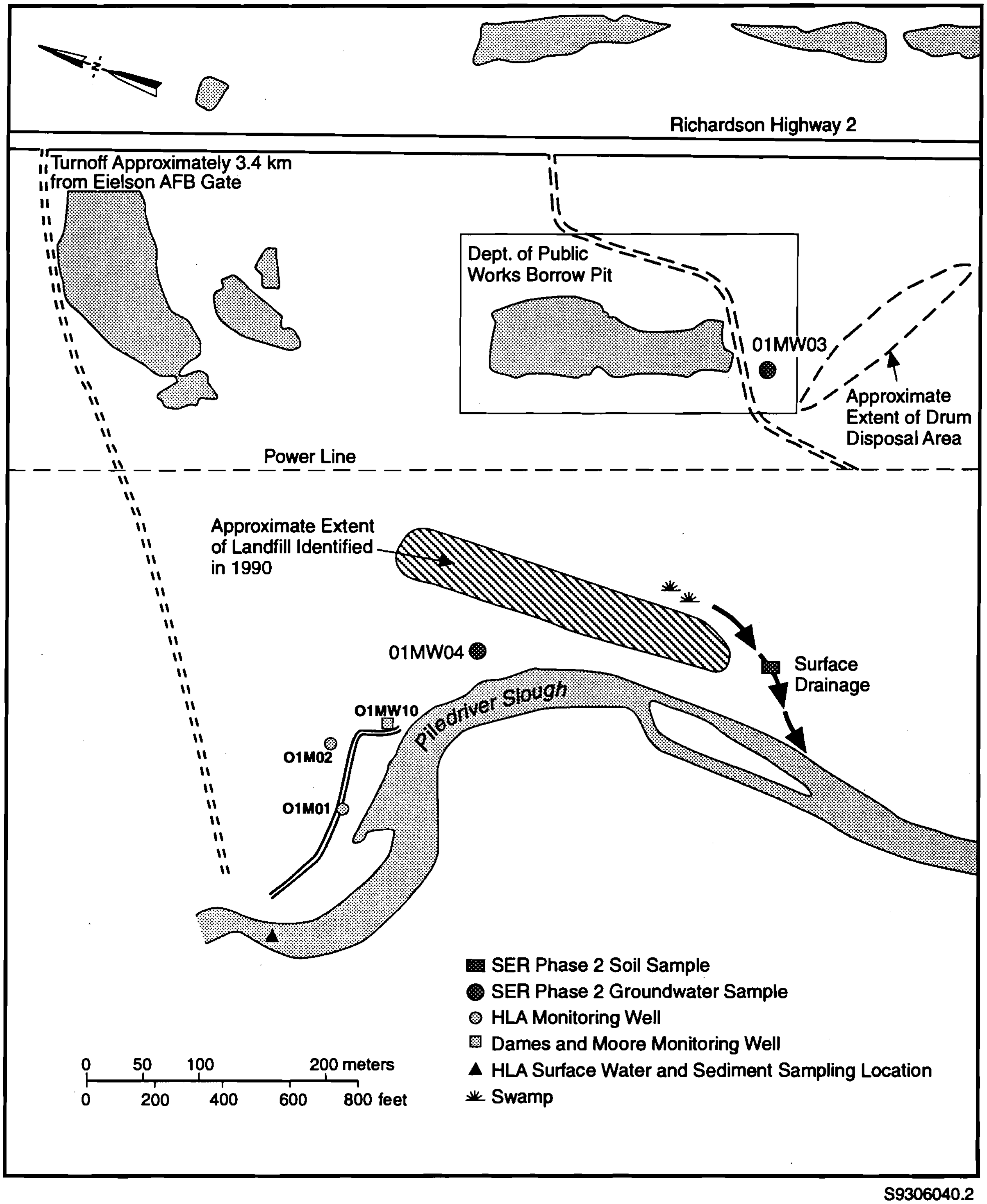


FIGURE 6.1. Map of LF01 with Phase 2 Sampling Stations

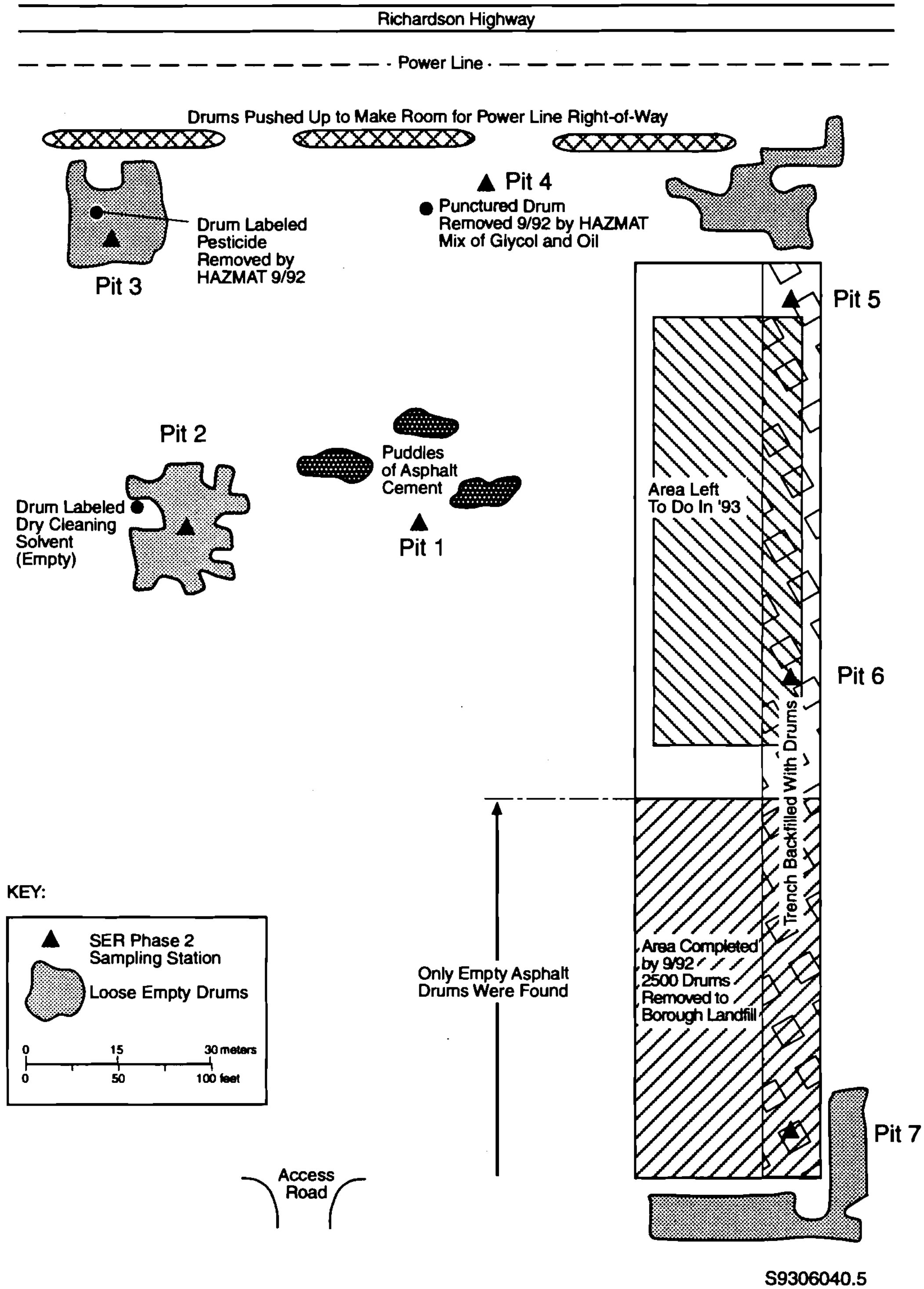


FIGURE 6.2. Detailed Map of LF01 Drum Storage Area, Before Removal and Cleanup with Source Evaluation Report Phase 2 Sampling Stations

TABLE 6.1. Monitor Well Construction Details and Survey Data, LF01

LF01 Monitor Well Construction Details and Survey Data												
Well No. (Old No.)	Year Constr.	Depth (ft)	Screened Int. (ft)	Years Sampled	Water Table Elevation (ft)							
					Jun-84	Dec-84	Sep-86	1987	10/17/88	10/18/88	10/29/88
01M01	1988	25.0	4.5 - 20.0	1988						535.7	536.16
01M02	1988	25.0	4.5 - 20.0	1988					535.88	- -	536.05
01MW10 (W-10)	1984	25.0	5 - 25	1984, 86, 87, 88	535.1	536.6	537.59	N/A	535.99	- -	536.18

No Entry Well not constructed.
- - Water table elevation not measured
N/A Data not available.

TABLE 6.2. Groundwater Sample Data From Previous Investigations, LF01

LF01 Ground Water Sample Data From Previous Investigations

		Det.	01M01		01M02	01MW10				Conc.	Location
Parameter Analyzed	Units	Limit	1988	1988-Dup	1988	1984	1986	1987	1988	Range	of Max.
Oil and Grease	µg/L	500				2000				2000	01MW10
PCBs	µg/L	0.5				ND					
Pesticides	µg/L	.002-.02									
Phenols	µg/L	10				ND					
TDS	µg/L	1000	196000	222000	188000	- -	180000	Unknown	204000	188000-222000	01M01
TOC	µg/L	1000				1000				1000	01MW10
TOX	µg/L	10				89				89	01MW10
pH (field)						6.85				6.85	01MW10
Spec. Cond. @ 25°C	µmhos/cm					211				211	01MW10
Petroleum Hydrocarbons			ND				ND	Unknown			
Purgeable Halocarbons											
Chlorobenzene	µg/L	0.34	ND	0.371	ND		ND		ND	0.371	01M01
Chloromethane	µg/L	0.4	ND	ND	0.566		ND		2.06	0.566-2.06	01M02
1,2-Dichloroethane	µg/L	0.2	ND	ND	ND		ND		0.387	0.387	01MW10
Trichlorfluoromethane	µg/L	0.44	ND	ND	ND		3		ND	3	01MW10
Purgeable Aromatics											
Benzene	µg/L	0.15	ND	0.23	ND		ND		ND	0.23	01M01
Toluene	µg/L	0.25	ND	0.35	ND		ND		ND	0.35	01M01
Semi-VOC			ND	ND	ND				ND		
Arsenic											
Arsenic, total	µg/L	1.8	8.9	16.9	11.7				3.1	3.1-16.9	01M01
Arsenic, dissolved	µg/L	1.8	5	6	ND				ND	5-6	01M01
Lead											
Lead, total	µg/L	1.4	23.8	64.7	53	20	ND		6.2	6.2-100	01M01
Lead, dissolved	µg/L	1.4	6	ND	ND				ND	6	01M01
Mercury											
Mercury, total	µg/L	0.2	ND	ND	0.6				ND	0.6	01M02
Mercury, dissolved	µg/L	0.2	ND	ND	ND				ND		
ICP Metals Scan											
Aluminum, total	µg/L	30	17900	59600	102000				4960	4960-102000	01M02
Arsenic, total	µg/L	40	8.9	16.9	11.7				3.1	3.1-16.9	01M01
Barium, total	µg/L	1.8	377	914	1240				127	127-1240	01M02
Barium, dissolved	µg/L	1.8	100	200	100				90	90-200	01M01
Cadmium, total	µg/L	3	ND	ND	3.8				ND	3.8	01M02
Calcium, total	µg/L	1.3	60800	76100	83000				51400	51400-83000	01M02
Calcium, dissolved	µg/L	1.3	52200	54200	44300				48000	42200-54200	01M01
Chromium, total	µg/L	6	28.1	120	198				ND	28.1-198	01M02
Cobalt, total	µg/L	6	19.1	62.9	83.4				8.2	8.2-83.4	01M02
Copper, total	µg/L	3	84.0	325	322				17.2	17.2-325	01M01
Iron, total	µg/L	20	23400	92300	164000				7360	7360-164000	01M02
Iron, dissolved	µg/L	20	40	40	40				30	30-40	01M01/02
Lead, total	µg/L	30	ND	100	100				ND	100	01M01/02
Magnesium, total	µg/L	44	16100	33800	50000				11300	11300-50000	01M02
Magnesium, dissolved	µg/L	44	9880	10300	8180				9100	8030-10300	01M01
Manganese, total	µg/L	1.4	1240	2360	3180				435	435-3180	01M02
Manganese, dissolved	µg/L	1.4	800	900	40				10	10-900	01M01
Nickel, total	µg/L	20	37.4	117	197				ND	37.4-197	01M02
Potassium, total	µg/L	408	6400	12800	15800				3950	3950-15800	01M02
Potassium, dissolved	µg/L	408	2520	2670	2310				2480	2290-2670	01M01
Sodium, total	µg/L	82	7190	11500	14700				4720	4720-14700	01M02
Sodium, dissolved	µg/L	82	4220	4380	4000				4020	3800-4380	01M01
Vanadium, total	µg/L	10	42.2	169	288				ND	42.2-288	01M02
Zinc, total	µg/L	2	72.1	270	418				30.8	30.8-418	01M02
Zinc, dissolved	µg/L	2	40	40	40				40	40	01M01/02/W10
Common Anions											
Chloride	µg/L	200	1849	1259	1167				1198	1167-1849	01M01
Sulfate	µg/L	500	32420	30900	33150				31420	30900-33150	01M02
Nitrogen			ND	ND	ND				ND		

No Entry — Parameter not analyzed for.
ND — Parameter not detected.
- - — Parameter in suite of analyses for well, but not analyzed.
Unknown — Reference unavailable at this time.

TABLE 6.3. Surface Water Sample Data From Previous Investigations, LF01

LF01 Surface Water Sample Data
From Previous Investigations

Parameter Analyzed	Units	Det. Limit	01S01 1988
Oil and Grease	µg/L	500	
PCBs	µg/L	0.5	
Pesticides	µg/L	.002-.02	
Phenols	µg/L	10	
TDS	µg/L	1000	174000
TOC	µg/L	1000	
TOX	µg/L	10	
pH (field)			
Spec. Cond. @ 25°C	µmhos/cm		
Petroleum Hydrocarbons			ND
Purgeable Halocarbons			ND
Purgeable Aromatics			ND
Semi-VOC			ND
Arsenic			
Arsenic, total	µg/L	1.8	ND
Arsenic, dissolved	µg/L	1.8	ND
Lead			
Lead, total	µg/L	1.4	ND
Lead, dissolved	µg/L	1.4	ND
Mercury			
Mercury, total	µg/L	0.2	ND
Mercury, dissolved	µg/L	0.2	ND
ICP Metals Scan			
Aluminum, total	µg/L	30	76.2
Barium, total	µg/L	1.8	53.3
Barium, dissolved	µg/L	1.8	50
Calcium, total	µg/L	1.3	44500
Calcium, dissolved	µg/L	1.3	42200
Iron, total	µg/L	20	196
Iron, dissolved	µg/L	20	30
Lead, total	µg/L	30	ND
Magnesium, total	µg/L	44	8470
Magnesium, dissolved	µg/L	44	8030
Manganese, total	µg/L	1.4	71.2
Manganese, dissolved	µg/L	1.4	70
Potassium, total	µg/L	408	3070
Potassium, dissolved	µg/L	408	2290
Sodium, total	µg/L	82	4090
Sodium, dissolved	µg/L	82	3800
Zinc, total	µg/L	2	15.9
Zinc, dissolved	µg/L	2	20
Common Anions			
Chloride	µg/L	200	1307
Sulfate	µg/L	500	31470
Nitrogen			ND

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 6.4. Soil Sample Data From Previous Investigations, LF01

LF01 Sediment Sample Data From Previous Investigations											
Parameter Analyzed	Units	Det. Limit	01M01 1988	01M02 1988	01MW10 1984	B1-A 1986	B1-B 1986	B1-C 1986	B1-D 1986	Conc. Range	Location of Max.
Oil and Grease	mg/g	0.008			0.009					0.009	01MW10
PCBs	µg/g	0.05			ND						
Phenol	µg/g	5			ND						
Moisture	%				14	13	24	17	13	13-24	B1-B
Lead	µg/g	6			ND						
<u>Pesticides</u>											
o,p-DDT	µg/g	0.005			0.009					0.009	01MW10
p,p-DDT	µg/g	0.005			0.057					0.057	01MW10
DDD	µg/g	0.002			0.023					0.023	01MW10
4,4'-DDD	mg/kg	0.0002				0.002	ND	0.003	ND	.002-.003	B1-C
4,4'-DDE	mg/kg	0.0005				0.004	0.003	0.001	ND	.001-.004	B1-A
4,4'-DDT	mg/kg	0.0005				0.007	0.02	0.004	0.003	.003-.02	B1-B
<u>Petroleum Hydrocarbons</u>	mg/kg	10.2	ND	21.1						21.1	01M02
<u>Volatile Organics</u>											
Methylene Chloride	mg/kg	0.15	ND	0.29						0.29	01M02
<u>Semi-Volatile Organics</u>			ND	ND							

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 6.5. Semivolatile Organic Compounds Analyzed for and Detected in Groundwater, LF01

LF01 GROUND-WATER	Method	Units	MDL	01M03 Aug-93	01M04 Aug-93	Range of Values	Location / Date of Maximum
o-Cresol	8270	µg/L	1.80	ND	ND	ND	N/A
m-Cresol	8270	µg/L	1.44	ND	ND	ND	N/A
p-Cresol	8270	µg/L	3.54	ND	ND	ND	N/A
Kerosene	8270	µg/L	1.03	ND	ND	ND	N/A
Naphthanlene	8270	µg/L	6.50	ND	ND	ND	N/A
Pentachlorophenol	8270	µg/L	8.07	ND	ND	ND	N/A
Phenol	8270	µg/L	0.833	ND	ND	ND	N/A
Tributyl Phosphate	8270	µg/L	4.42	ND	ND	ND	N/A
Tris-2-Chloroethyl Phosphate	8270	µg/L	2.88	ND	ND	ND	N/A
Benzothiazole	8270	µg/L	2.55	ND	ND	ND	N/A
Bis(2-Ethylhexyl)Phthalate	8270	µg/L	4.07	ND	ND	ND	N/A
2,4-Dichlotophenol	8270	µg/L	2.80	ND	ND	ND	N/A
2-Nitrophenol	8270	µg/L	3.96	ND	ND	ND	N/A
p-Dichlorobenzene	8270	µg/L	4.64	ND	ND	ND	N/A
2-Methyl Pyridine	8270	µg/L	5.83	ND	ND	ND	N/A
Acenaphthene	8270	µg/L	2.88	ND	ND	ND	N/A
Acenaphthylene	8270	µg/L	3.96	ND	ND	ND	N/A
Acetophenone	8270	µg/L	2.38	ND	ND	ND	N/A
2-Acetylaminofluorine	8270	µg/L	2.83	ND	ND	ND	N/A
2-Aminobiphenyl	8270	µg/L	3.83	ND	ND	ND	N/A
Aniline	8270	µg/L	3.53	ND	ND	ND	N/A
Anthracene	8270	µg/L	2.95	ND	ND	ND	N/A
Aramite	8270	µg/L	8.60	ND	ND	ND	N/A
Benzo(A)Anthracene	8270	µg/L	2.34	ND	ND	ND	N/A
Benzo(B)Fluorathene	8270	µg/L	4.41	ND	ND	ND	N/A
Benzo(K)Fluorathene	8270	µg/L	2.21	ND	ND	ND	N/A
Benzo(G,H,I)Perylene	8270	µg/L	3.65	ND	ND	ND	N/A
Benzo(A)Pyrene	8270	µg/L	1.70	ND	ND	ND	N/A
Benzyl Alcohol	8270	µg/L	5.16	ND	ND	ND	N/A
Bis(2-Chloroethoxy)Methane	8270	µg/L	7.13	ND	ND	ND	N/A
Bis(2-Chloroethyl)Ether	8270	µg/L	2.90	ND	ND	ND	N/A
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/L	3.35	ND	ND	ND	N/A
4-Bromophenyl-Phenylether	8270	µg/L	2.34	ND	ND	ND	N/A
Butylbenzylphthalate	8270	µg/L	5.94	ND	ND	ND	N/A
p-Chloroanaline	8270	µg/L	13.2	ND	ND	ND	N/A
Chlorobenzilate	8270	µg/L	8.69	ND	ND	ND	N/A
p-Chloro-m-Cresol	8270	µg/L	7.41	ND	ND	ND	N/A
2-Chloronaphthanlene	8270	µg/L	3.02	ND	ND	ND	N/A
2-Chlorophenol	8270	µg/L	1.91	ND	ND	ND	N/A
4-Chlorophenyl Phenyl Ether	8270	µg/L	3.04	ND	ND	ND	N/A
Chrysene	8270	µg/L	1.70	ND	ND	ND	N/A
Diallate	8270	µg/L	3.15	ND	ND	ND	N/A
Dibenz(A,H)Anthracene	8270	µg/L	1.92	ND	ND	ND	N/A
Dibenzofuran	8270	µg/L	2.54	ND	ND	ND	N/A
Di-N-Butylphthalate	8270	µg/L	4.34	ND	ND	ND	N/A
o-Dichlorobenzene	8270	µg/L	3.77	ND	ND	ND	N/A
m-Dichlorobenzene	8270	µg/L	7.85	ND	ND	ND	N/A
3,3'-Dichlorobenzidine	8270	µg/L	3.88	ND	ND	ND	N/A
2,6-Dichlorophenol	8270	µg/L	3.47	ND	ND	ND	N/A
Diethylphthalate	8270	µg/L	8.94	ND	ND	ND	N/A
Thionazin	8270	µg/L	3.04	ND	ND	ND	N/A
Dimethoate	8270	µg/L	10.0	ND	ND	ND	N/A
p-(Dimethylamino)Azobenzene	8270	µg/L	3.36	ND	ND	ND	N/A
7,12-Dimethylbenz[A]Anthracene	8270	µg/L	1.82	ND	ND	ND	N/A
Pyridine	8270	µg/L	4.57	ND	ND	ND	N/A
3,3'-Dimethylbenzidine	8270	µg/L	10.4	ND	ND	ND	N/A
A,A-Dimethylphenethylamine	8270	µg/L	37.80	ND	ND	ND	N/A
2,4-Dimethylphenol	8270	µg/L	5.88	ND	ND	ND	N/A
Dimethylphthalate	8270	µg/L	5.55	ND	ND	ND	N/A
m-Dinitrobenzene	8270	µg/L	9.35	ND	ND	ND	N/A
4,6-Dinitro-o-c-Cresol	8270	µg/L	5.55	ND	ND	ND	N/A
2,4-Dinitrophenol	8270	µg/L	4.46	ND	ND	ND	N/A
2,4-Dinitrotoluene	8270	µg/L	2.59	ND	ND	ND	N/A
2,6-Dinitrotoluene	8270	µg/L	2.85	ND	ND	ND	N/A
Di-N-Octylphthalate	8270	µg/L	2.98	ND	ND	ND	N/A
Diphenylamine	8270	µg/L	2.86	ND	ND	ND	N/A
Ethyl Methane Sulfonate	8270	µg/L	2.07	ND	ND	ND	N/A

TABLE 6.5. (Contd)

LF01 GROUND-WATER	Method	Units	MDL	01M03 Aug-93	01M04 Aug-93	Range of Values	Location / Date of Maximum
Famphur	8270	µg/L	12.80	ND	ND	ND	N/A
Fluoranthene	8270	µg/L	4.62	ND	ND	ND	N/A
Fluorene	8270	µg/L	2.56	ND	ND	ND	N/A
Hexachlorobenzene	8270	µg/L	2.38	ND	ND	ND	N/A
Hexachlorobutadiene	8270	µg/L	4.29	ND	ND	ND	N/A
Hexachlorocyclopentadiene	8270	µg/L	2.62	ND	ND	ND	N/A
Hexachloroethane	8270	µg/L	4.73	ND	ND	ND	N/A
Hexachlorophene	8270	µg/L	19.60	ND	ND	ND	N/A
Hexachloropropene	8270	µg/L	3.68	ND	ND	ND	N/A
Indeno(1,2,3-Cd)Pyrene	8270	µg/L	3.21	ND	ND	ND	N/A
Isodrin	8270	µg/L	1.44	ND	ND	ND	N/A
Isophorone	8270	µg/L	3.29	ND	ND	ND	N/A
Isosafrole	8270	µg/L	2.25	ND	ND	ND	N/A
Kepone	8270	µg/L	9.59	ND	ND	ND	N/A
Methapyraline	8270	µg/L	8.45	ND	ND	ND	N/A
3-Methylcholanthrene	8270	µg/L	2.63	ND	ND	ND	N/A
Methyl Methane Sulfonate	8270	µg/L	1.61	ND	ND	ND	N/A
2-Methylnaphthalene	8270	µg/L	2.76	ND	ND	ND	N/A
1,4-Naphthoquinone	8270	µg/L	10.0	ND	ND	ND	N/A
1-Naphthylamine	8270	µg/L	25.30	ND	ND	ND	N/A
2-Naphthylamine	8270	µg/L	15.60	ND	ND	ND	N/A
o-Nitroaniline	8270	µg/L	7.82	ND	ND	ND	N/A
m-Nitroaniline	8270	µg/L	9.52	ND	ND	ND	N/A
p-Nitroaniline	8270	µg/L	21.40	ND	ND	ND	N/A
Nitrobenzene	8270	µg/L	3.16	ND	ND	ND	N/A
p-Nitrophenol	8270	µg/L	1.52	ND	ND	ND	N/A
4-Nitroquinoline-1-Oxide	8270	µg/L	6.00	ND	ND	ND	N/A
N-Nitrosodi-n-Butylamine	8270	µg/L	3.22	ND	ND	ND	N/A
N-Nitrosodiethylamine	8270	µg/L	2.90	ND	ND	ND	N/A
N-Nitrosodimethylamine	8270	µg/L	3.81	ND	ND	ND	N/A
N-Nitrosodiphenylamine	8270	µg/L	2.11	ND	ND	ND	N/A
N-Nitrosodipropylamine	8270	µg/L	3.67	ND	ND	ND	N/A
N-Nitrosomethylethylamine	8270	µg/L	2.83	ND	ND	ND	N/A
N-nitrosomorpholine	8270	µg/L	3.27	ND	ND	ND	N/A
N-Nitrosopiperidine	8270	µg/L	4.35	ND	ND	ND	N/A
N-Nitrosopyrolidine	8270	µg/L	2.78	ND	ND	ND	N/A
5-Nitro-o-Toluidine	8270	µg/L	5.25	ND	ND	ND	N/A
Parathion	8270	µg/L	3.90	ND	ND	ND	N/A
Pentachlorobenzene	8270	µg/L	3.99	ND	ND	ND	N/A
Pentachloronitrobenzene	8270	µg/L	2.49	ND	ND	ND	N/A
Pentacetin	8270	µg/L	4.78	ND	ND	ND	N/A
Phenanthrene	8270	µg/L	5.27	ND	ND	ND	N/A
p-Phenylenediamine	8270	µg/L	3.09	ND	ND	ND	N/A
Pronamide	8270	µg/L	3.42	ND	ND	ND	N/A
Pyrene	8270	µg/L	3.69	ND	ND	ND	N/A
Safrole	8270	µg/L	3.22	ND	ND	ND	N/A
2,3,4,6-Tetrachlorophenol	8270	µg/L	4.39	ND	ND	ND	N/A
1,2,4,5-Tetrachlorobenzene	8270	µg/L	4.77	ND	ND	ND	N/A
Tetraethyl Dithiopyrophosphate	8270	µg/L	2.81	ND	ND	ND	N/A
o-Toluidine	8270	µg/L	2.27	ND	ND	ND	N/A
1,2,4-Trichlorobenzene	8270	µg/L	4.14	ND	ND	ND	N/A
2,4,5-Trichlorophenol	8270	µg/L	4.01	ND	ND	ND	N/A
2,4,6-Trichlorophenol	8270	µg/L	2.54	ND	ND	ND	N/A
0,0,0-Triethylphosphorothioate	8270	µg/L	5.19	ND	ND	ND	N/A
syn-Trinitrobenzene	8270	µg/L	3.74	ND	ND	ND	N/A

NOTE: 01M03 is near the Drum Storage Area.
01M04 is near the Landfill.

TABLE 6.6. Semivolatile Organic Compounds Analyzed for and Detected in Soil, LF01

LF01		Soil		Water		Surface	Pit 1 - Soil			Pit 1 - Water	Pit 2 - Soil			Pit 2 - Water
SOIL	Method	Units	MDL	Units	MDL	LF01_S4_B 0.9-ft Aug-93	LF01_S1_1 2.3-ft Aug-93	LF01_S1_2 3.6-ft Aug-93	LF01_S1_3 8.4-ft Aug-93	LF01_W1 8.4-ft Aug-93	LF01_S2_1 1.8-ft Aug-93	LF01_S2_2 4.7-ft Aug-93	LF01_S2_3 6.6-ft Aug-93	LF01_W2 6.6-ft Aug-93
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND	ND	ND	660	ND	ND	ND	ND	ND
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-(Dimethylamino)Azobenzene	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Surface	Pit 1 - Soil			Pit 1 - Water	Pit 2 - Soil			Pit 2 - Water
		Soil		Water		LF01_S4_B	LF01_S1_1	LF01_S1_2	LF01_S1_3	LF01_W1	LF01_S2_1	LF01_S2_2	LF01_S2_3	LF01_W2
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	8.4-ft Aug-93	8.4-ft Aug-93	1.8-ft Aug-93	4.7-ft Aug-93	6.6-ft Aug-93	6.6-ft Aug-93
7,12-Dimethylbenz[A]Anthracene	8270	μg/Kg	227	μg/L	1.82	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyridine	8270	μg/Kg	205	μg/L	4.57	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dimethylbenzidine	8270	μg/Kg	10.4	μg/L	10.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
A,A-Dimethylphenethylamine	8270	μg/Kg	358	μg/L	37.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	8270	μg/Kg	357	μg/L	5.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	8270	μg/Kg	57.0	μg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Dinitrobenzene	8270	μg/Kg	74.5	μg/L	9.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-c-Cresol	8270	μg/Kg	201	μg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	8270	μg/Kg	157	μg/L	4.46	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	8270	μg/Kg	169	μg/L	2.59	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	8270	μg/Kg	168	μg/L	2.85	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octylphthalate	8270	μg/Kg	225	μg/L	2.98	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	8270	μg/Kg	497	μg/L	2.86	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Methane Sulfonate	8270	μg/Kg	118	μg/L	2.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
Famphur	8270	μg/Kg	317	μg/L	12.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	8270	μg/Kg	212	μg/L	4.62	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	8270	μg/Kg	166	μg/L	2.56	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	8270	μg/Kg	241	μg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	8270	μg/Kg	182	μg/L	4.29	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	8270	μg/Kg	168	μg/L	2.62	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	8270	μg/Kg	146	μg/L	4.73	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorophene	8270	μg/Kg	1190	μg/L	19.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloropropene	8270	μg/Kg	135	μg/L	3.68	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-Cd)Pyrene	8270	μg/Kg	152	μg/L	3.21	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	8270	μg/Kg	94	μg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	8270	μg/Kg	163	μg/L	3.29	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isosafrole	8270	μg/Kg	155	μg/L	2.25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Kepone	8270	μg/Kg	1404	μg/L	9.59	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methapyraline	8270	μg/Kg	120	μg/L	8.45	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylcholanthrene	8270	μg/Kg	170	μg/L	2.63	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Methane Sulfonate	8270	μg/Kg	132	μg/L	1.61	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	8270	μg/Kg	30.6	μg/L	2.76	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Naphthoquinone	8270	μg/Kg	263	μg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-Naphthylamine	8270	μg/Kg	119	μg/L	25.30	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Naphthylamine	8270	μg/Kg	720	μg/L	15.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Nitroaniline	8270	μg/Kg	121	μg/L	7.82	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Nitroaniline	8270	μg/Kg	253	μg/L	9.52	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitroaniline	8270	μg/Kg	1119	μg/L	21.40	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	8270	μg/Kg	161	μg/L	3.16	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitrophenol	8270	μg/Kg	195	μg/L	1.52	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroquinoline-1-Oxide	8270	μg/Kg	362	μg/L	6.00	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-Butylamine	8270	μg/Kg	82.0	μg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiethylamine	8270	μg/Kg	134	μg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	8270	μg/Kg	178	μg/L	3.81	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	8270	μg/Kg	143	μg/L	2.11	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodipropylamine	8270	μg/Kg	164	μg/L	3.67	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosomethylethylamine	8270	μg/Kg	124	μg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-nitrosomorpholine	8270	μg/Kg	135	μg/L	3.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopiperidine	8270	μg/Kg	27.9	μg/L	4.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopyrolidine	8270	μg/Kg	171	μg/L	2.78	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-Nitro-o-Toluidine	8270	μg/Kg	186	μg/L	5.25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	8270	μg/Kg	257	μg/L	3.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorobenzene	8270	μg/Kg	186	μg/L	3.99	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Surface	Pit 1 - Soil			Pit 1 - Water	Pit 2 - Soil			Pit 2 - Water
		Soil		Water		LF01_S4_B	LF01_S1_1	LF01_S1_2	LF01_S1_3	LF01_W1	LF01_S2_1	LF01_S2_2	LF01_S2_3	LF01_W2
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	8.4-ft Aug-93	8.4-ft Aug-93	1.8-ft Aug-93	4.7-ft Aug-93	6.6-ft Aug-93	6.6-ft Aug-93
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	ND	ND	ND	ND	ND
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	ND	ND	ND	ND	ND
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Pit 3 - Soil			Pit 3 - Water	Pit 4 - Soil			Pit 4 - Water
		Soil		Water		LF01_S3_1	LF01_S3_2	LF01_S3_3	LF01_W3	LF01_S4_A1	LF01_S4_2	LF01_S4_3	LF01_W4_1_1
SOIL	Method	Units	MDL	Units	MDL	2.1-ft Aug-93	4.4-ft Aug-93	9.0-ft Aug-93	9.4-ft Aug-93	2.1-ft Aug-93	4.7-ft Aug-93	7.4-ft Aug-93	7.4-ft Aug-93
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	ND	ND	ND	ND
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	ND	ND	ND	ND
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	ND	ND	ND	ND
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	ND	ND	ND	ND
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	ND	ND	ND	ND
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	ND	ND	ND	ND
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	ND	ND	ND	ND
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	ND	ND	ND	ND
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND	1700	ND	ND	ND	ND	ND	ND
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND
p-(Dimethylamino)Azobenzene	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

I.F01						Pit 3 - Soil			Pit 3 - Water	Pit 4 - Soil			Pit 4 - Water
		Soil		Water		LF01_S3_1	LF01_S3_2	LF01_S3_3	LF01_W3	LF01_S4_A1	LF01_S4_2	LF01_S4_3	LF01_W4_1_1
SOIL	Method	Units	MDL	Units	MDL	2.1-ft Aug-93	4.4-ft Aug-93	9.0-ft Aug-93	9.4-ft Aug-93	2.1-ft Aug-93	4.7-ft Aug-93	7.4-ft Aug-93	7.4-ft Aug-93
7,12-Dimethylbenz[A]Anthracene	8270	µg/Kg	227	µg/L	1.82	ND	ND	ND	ND	ND	ND	ND	ND
Pyridine	8270	µg/Kg	205	µg/L	4.57	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	µg/L	10.4	ND	ND	ND	ND	ND	ND	ND	ND
A,A-Dimethylphenethylamine	8270	µg/Kg	358	µg/L	37.80	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	8270	µg/Kg	357	µg/L	5.88	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	8270	µg/Kg	57.0	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND
m-Dinitrobenzene	8270	µg/Kg	74.5	µg/L	9.35	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	8270	µg/Kg	157	µg/L	4.46	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	8270	µg/Kg	169	µg/L	2.59	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	8270	µg/Kg	168	µg/L	2.85	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octylphthalate	8270	µg/Kg	225	µg/L	2.98	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	8270	µg/Kg	497	µg/L	2.86	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Methane Sulfonate	8270	µg/Kg	118	µg/L	2.07	ND	ND	ND	ND	ND	ND	ND	ND
Famphur	8270	µg/Kg	317	µg/L	12.80	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	8270	µg/Kg	212	µg/L	4.62	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	8270	µg/Kg	166	µg/L	2.56	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	8270	µg/Kg	241	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	8270	µg/Kg	182	µg/L	4.29	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	8270	µg/Kg	168	µg/L	2.62	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	8270	µg/Kg	146	µg/L	4.73	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorophene	8270	µg/Kg	1190	µg/L	19.60	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloropropene	8270	µg/Kg	135	µg/L	3.68	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	µg/L	3.21	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	8270	µg/Kg	94	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	8270	µg/Kg	163	µg/L	3.29	ND	ND	ND	ND	ND	ND	ND	ND
Isosafrole	8270	µg/Kg	155	µg/L	2.25	ND	ND	ND	ND	ND	ND	ND	ND
Kepone	8270	µg/Kg	1404	µg/L	9.59	ND	ND	ND	ND	ND	ND	ND	ND
Methapyraline	8270	µg/Kg	120	µg/L	8.45	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylcholanthrene	8270	µg/Kg	170	µg/L	2.63	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Methane Sulfonate	8270	µg/Kg	132	µg/L	1.61	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	8270	µg/Kg	30.6	µg/L	2.76	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Naphthoquinone	8270	µg/Kg	263	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND
1-Naphthylamine	8270	µg/Kg	119	µg/L	25.30	ND	ND	ND	ND	ND	ND	ND	ND
2-Naphthylamine	8270	µg/Kg	720	µg/L	15.60	ND	ND	ND	ND	ND	ND	ND	ND
o-Nitroaniline	8270	µg/Kg	121	µg/L	7.82	ND	ND	ND	ND	ND	ND	ND	ND
m-Nitroaniline	8270	µg/Kg	253	µg/L	9.52	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitroaniline	8270	µg/Kg	1119	µg/L	21.40	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	8270	µg/Kg	161	µg/L	3.16	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitrophenol	8270	µg/Kg	195	µg/L	1.52	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	µg/L	6.00	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiethylamine	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	8270	µg/Kg	178	µg/L	3.81	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	8270	µg/Kg	143	µg/L	2.11	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodipropylamine	8270	µg/Kg	164	µg/L	3.67	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosomethylethylamine	8270	µg/Kg	124	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND
N-nitrosomorpholine	8270	µg/Kg	135	µg/L	3.27	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopiperidine	8270	µg/Kg	27.9	µg/L	4.35	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopyrolidine	8270	µg/Kg	171	µg/L	2.78	ND	ND	ND	ND	ND	ND	ND	ND
5-Nitro-o-Toluidine	8270	µg/Kg	186	µg/L	5.25	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	8270	µg/Kg	257	µg/L	3.90	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorobenzene	8270	µg/Kg	186	µg/L	3.99	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Pit 3 - Soil			Pit 3 - Water	Pit 4 - Soil			Pit 4 - Water
		Soil		Water		LF01_S3_1	LF01_S3_2	LF01_S3_3	LF01_W3	LF01_S4_A1	LF01_S4_2	LF01_S4_3	LF01_W4_1_1
SOIL	Method	Units	MDL	Units	MDL	2.1-ft Aug-93	4.4-ft Aug-93	9.0-ft Aug-93	9.4-ft Aug-93	2.1-ft Aug-93	4.7-ft Aug-93	7.4-ft Aug-93	7.4-ft Aug-93
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	ND	ND	ND	ND
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	ND	ND	ND	ND
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	ND	ND	ND	ND
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	ND	ND	ND	ND
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	ND	ND	ND	ND
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	ND	ND	ND	ND
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	ND	ND	ND	ND
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01		Soil		Water		Pit 5 - Soil			Pit 5 - Water	Pit 6 - Soil			Pit 6 - Water
						LF01_S5_1_1	LF01_S5_1_2	LF01_S5_1_3	LF01_W5_1_1	LF01_S6_1_1	LF01_S6_1_2	LF01_S6_1_3	LF01_W6_1_1
SOIL	Method	Units	MDL	Units	MDL	1.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	5.9-ft Aug-93	1.4-ft Aug-93	3.7-ft Aug-93	6.3-ft Aug-93	6.2-ft Aug-93
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	ND	ND	ND	ND
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	ND	ND	ND	ND
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	ND	ND	ND	ND
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	ND	ND	ND	ND
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	ND	ND	ND	ND
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlotophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	ND	ND	ND	ND
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	ND	ND	ND	ND
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	ND	ND	ND	ND
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND	ND	ND	ND	ND	ND	ND	ND
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND
p-(Dimethylamino)Azobenzene	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Pit 5 - Soil			Pit 5 - Water	Pit 6 - Soil			Pit 6 - Water
		Soil		Water		LF01_S5_1_1	LF01_S5_1_2	LF01_S5_1_3	LF01_W5_1_1	LF01_S6_1_1	LF01_S6_1_2	LF01_S6_1_3	LF01_W6_1_1
SOIL	Method	Units	MDL	Units	MDL	1.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	5.9-ft Aug-93	1.4-ft Aug-93	3.7-ft Aug-93	6.3-ft Aug-93	6.2-ft Aug-93
7,12-Dimethylbenz[A]Anthracene	8270	µg/Kg	227	µg/L	1.82	ND	ND	ND	ND	ND	ND	ND	ND
Pyridine	8270	µg/Kg	205	µg/L	4.57	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	µg/L	10.4	ND	ND	ND	ND	ND	ND	ND	ND
A,A-Dimethylphenethylamine	8270	µg/Kg	358	µg/L	37.80	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	8270	µg/Kg	357	µg/L	5.88	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	8270	µg/Kg	57.0	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND
m-Dinitrobenzene	8270	µg/Kg	74.5	µg/L	9.35	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	8270	µg/Kg	157	µg/L	4.46	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	8270	µg/Kg	169	µg/L	2.59	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	8270	µg/Kg	168	µg/L	2.85	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octylphthalate	8270	µg/Kg	225	µg/L	2.98	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	8270	µg/Kg	497	µg/L	2.86	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Methane Sulfonate	8270	µg/Kg	118	µg/L	2.07	ND	ND	ND	ND	ND	ND	ND	ND
Famphur	8270	µg/Kg	317	µg/L	12.80	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	8270	µg/Kg	212	µg/L	4.62	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	8270	µg/Kg	166	µg/L	2.56	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	8270	µg/Kg	241	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	8270	µg/Kg	182	µg/L	4.29	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	8270	µg/Kg	168	µg/L	2.62	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	8270	µg/Kg	146	µg/L	4.73	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorophene	8270	µg/Kg	1190	µg/L	19.60	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloropropene	8270	µg/Kg	135	µg/L	3.68	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	µg/L	3.21	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	8270	µg/Kg	94	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	8270	µg/Kg	163	µg/L	3.29	ND	ND	ND	ND	ND	ND	ND	ND
Isosafrole	8270	µg/Kg	155	µg/L	2.25	ND	ND	ND	ND	ND	ND	ND	ND
Kepone	8270	µg/Kg	1404	µg/L	9.59	ND	ND	ND	ND	ND	ND	ND	ND
Methapyraline	8270	µg/Kg	120	µg/L	8.45	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylcholanthrene	8270	µg/Kg	170	µg/L	2.63	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Methane Sulfonate	8270	µg/Kg	132	µg/L	1.61	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	8270	µg/Kg	30.6	µg/L	2.76	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Naphthoquinone	8270	µg/Kg	263	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND
1-Naphthylamine	8270	µg/Kg	119	µg/L	25.30	ND	ND	ND	ND	ND	ND	ND	ND
2-Naphthylamine	8270	µg/Kg	720	µg/L	15.60	ND	ND	ND	ND	ND	ND	ND	ND
o-Nitroaniline	8270	µg/Kg	121	µg/L	7.82	ND	ND	ND	ND	ND	ND	ND	ND
m-Nitroaniline	8270	µg/Kg	253	µg/L	9.52	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitroaniline	8270	µg/Kg	1119	µg/L	21.40	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	8270	µg/Kg	161	µg/L	3.16	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitrophenol	8270	µg/Kg	195	µg/L	1.52	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	µg/L	6.00	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiethylamine	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	8270	µg/Kg	178	µg/L	3.81	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	8270	µg/Kg	143	µg/L	2.11	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodipropylamine	8270	µg/Kg	164	µg/L	3.67	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosomethylethylamine	8270	µg/Kg	124	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND
N-nitrosomorpholine	8270	µg/Kg	135	µg/L	3.27	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopiperidine	8270	µg/Kg	27.9	µg/L	4.35	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopyrolidine	8270	µg/Kg	171	µg/L	2.78	ND	ND	ND	ND	ND	ND	ND	ND
5-Nitro-o-Toluidine	8270	µg/Kg	186	µg/L	5.25	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	8270	µg/Kg	257	µg/L	3.90	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorobenzene	8270	µg/Kg	186	µg/L	3.99	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Pit 5 - Soil			Pit 5 - Water	Pit 6 - Soil			Pit 6 - Water
		Soil		Water		LF01_S5_1_1	LF01_S5_1_2	LF01_S5_1_3	LF01_W5_1_1	LF01_S6_1_1	LF01_S6_1_2	LF01_S6_1_3	LF01_W6_1_1
SOIL	Method	Units	MDL	Units	MDL	1.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	5.9-ft Aug-93	1.4-ft Aug-93	3.7-ft Aug-93	6.3-ft Aug-93	6.2-ft Aug-93
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	ND	ND	ND	ND
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	ND	ND	ND	ND
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	ND	ND	ND	ND
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	ND	ND	ND	ND
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	ND	ND	ND	ND
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	ND	ND	ND	ND
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	ND	ND	ND	ND
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.6. (Contd)

LF01						Pit 7 - Soil			Soil Summary		Water Summary	
		Soil		Water		LF01_S7_1_1	LF01_S7_1_2	LF01_S7_1_3	Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	1.5-ft Aug-93	3.6-ft Aug-93	4.9-ft Aug-93	Soil Values	of Maximum	Water Values	of Maximum
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	N/A	ND	N/A
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	N/A	ND	N/A
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	N/A	ND	N/A
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	N/A	ND	N/A
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	N/A	ND	N/A
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	N/A	ND	N/A
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	N/A	ND	N/A
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	N/A	ND	N/A
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	N/A	ND	N/A
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	N/A	ND	N/A
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND	ND	ND	ND	N/A	ND	N/A
2,4-Dichlotophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	N/A	ND	N/A
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	N/A	ND	N/A
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	N/A	ND	N/A
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	N/A	ND	N/A
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	N/A	ND	N/A
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	N/A	ND	N/A
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	N/A	ND	N/A
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	N/A	ND	N/A
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	N/A	ND	N/A
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	N/A	ND	N/A
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	N/A	ND	N/A
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	N/A	ND	N/A
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	N/A	ND	N/A
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	N/A	ND	N/A
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	N/A	ND	N/A
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	N/A	ND	N/A
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	N/A	ND	N/A
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	N/A	ND	N/A
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	N/A	ND	N/A
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	N/A	ND	N/A
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	N/A	ND	N/A
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	N/A	ND	N/A
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	N/A	ND	N/A
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	ND	N/A	ND	N/A
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	N/A	ND	N/A
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	N/A	ND	N/A
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	N/A	ND	N/A
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	N/A	ND	N/A
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	N/A	ND	N/A
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	N/A	ND	N/A
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	N/A	ND	N/A
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	N/A	ND	N/A
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	N/A	ND	N/A
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	N/A	ND	N/A
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	N/A	ND	N/A
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	N/A	ND	N/A
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	N/A	ND	N/A
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	N/A	ND	N/A
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND	ND	ND	ND - 1700	Pit 3/4.4-ft Aug-93	ND	N/A
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	N/A	ND	N/A
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	N/A	ND	N/A
p-(Dimethylamino)Azobenzene	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	N/A	ND	N/A

TABLE 6.6. (Contd)

LF01						Pit 7 - Soil			Soil Summary		Water Summary	
		Soil		Water		LF01_S7_1_1	LF01_S7_1_2	LF01_S7_1_3	Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	1.5-ft Aug-93	3.6-ft Aug-93	4.9-ft Aug-93	Soil Values	of Maximum	Water Values	of Maximum
7,12-Dimethylbenz[A]Anthracene	8270	μg/Kg	227	μg/L	1.82	ND	ND	ND	ND	N/A	ND	N/A
Pyridine	8270	μg/Kg	205	μg/L	4.57	ND	ND	ND	ND	N/A	ND	N/A
3,3'-Dimethylbenzidine	8270	μg/Kg	10.4	μg/L	10.4	ND	ND	ND	ND	N/A	ND	N/A
A,A-Dimethylphenethylamine	8270	μg/Kg	358	μg/L	37.80	ND	ND	ND	ND	N/A	ND	N/A
2,4-Dimethylphenol	8270	μg/Kg	357	μg/L	5.88	ND	ND	ND	ND	N/A	ND	N/A
Dimethylphthalate	8270	μg/Kg	57.0	μg/L	5.55	ND	ND	ND	ND	N/A	ND	N/A
m-Dinitrobenzene	8270	μg/Kg	74.5	μg/L	9.35	ND	ND	ND	ND	N/A	ND	N/A
4,6-Dinitro-o-c-Cresol	8270	μg/Kg	201	μg/L	5.55	ND	ND	ND	ND	N/A	ND	N/A
2,4-Dinitrophenol	8270	μg/Kg	157	μg/L	4.46	ND	ND	ND	ND	N/A	ND	N/A
2,4-Dinitrotoluene	8270	μg/Kg	169	μg/L	2.59	ND	ND	ND	ND	N/A	ND	N/A
2,6-Dinitrotoluene	8270	μg/Kg	168	μg/L	2.85	ND	ND	ND	ND	N/A	ND	N/A
Di-N-Octylphthalate	8270	μg/Kg	225	μg/L	2.98	ND	ND	ND	ND	N/A	ND	N/A
Diphenylamine	8270	μg/Kg	497	μg/L	2.86	ND	ND	ND	ND	N/A	ND	N/A
Ethyl Methane Sulfonate	8270	μg/Kg	118	μg/L	2.07	ND	ND	ND	ND	N/A	ND	N/A
Famphur	8270	μg/Kg	317	μg/L	12.80	ND	ND	ND	ND	N/A	ND	N/A
Fluoranthene	8270	μg/Kg	212	μg/L	4.62	ND	ND	ND	ND	N/A	ND	N/A
Fluorene	8270	μg/Kg	166	μg/L	2.56	ND	ND	ND	ND	N/A	ND	N/A
Hexachlorobenzene	8270	μg/Kg	241	μg/L	2.38	ND	ND	ND	ND	N/A	ND	N/A
Hexachlorobutadiene	8270	μg/Kg	182	μg/L	4.29	ND	ND	ND	ND	N/A	ND	N/A
Hexachlorocyclopentadiene	8270	μg/Kg	168	μg/L	2.62	ND	ND	ND	ND	N/A	ND	N/A
Hexachloroethane	8270	μg/Kg	146	μg/L	4.73	ND	ND	ND	ND	N/A	ND	N/A
Hexachlorophene	8270	μg/Kg	1190	μg/L	19.60	ND	ND	ND	ND	N/A	ND	N/A
Hexachloropropene	8270	μg/Kg	135	μg/L	3.68	ND	ND	ND	ND	N/A	ND	N/A
Indeno(1,2,3-Cd)Pyrene	8270	μg/Kg	152	μg/L	3.21	ND	ND	ND	ND	N/A	ND	N/A
Isodrin	8270	μg/Kg	94	μg/L	1.44	ND	ND	ND	ND	N/A	ND	N/A
Isophorone	8270	μg/Kg	163	μg/L	3.29	ND	ND	ND	ND	N/A	ND	N/A
Isosafrole	8270	μg/Kg	155	μg/L	2.25	ND	ND	ND	ND	N/A	ND	N/A
Kepone	8270	μg/Kg	1404	μg/L	9.59	ND	ND	ND	ND	N/A	ND	N/A
Methapyraline	8270	μg/Kg	120	μg/L	8.45	ND	ND	ND	ND	N/A	ND	N/A
3-Methylcholanthrene	8270	μg/Kg	170	μg/L	2.63	ND	ND	ND	ND	N/A	ND	N/A
Methyl Methane Sulfonate	8270	μg/Kg	132	μg/L	1.61	ND	ND	ND	ND	N/A	ND	N/A
2-Methylnaphthalene	8270	μg/Kg	30.6	μg/L	2.76	ND	ND	ND	ND	N/A	ND	N/A
1,4-Naphthoquinone	8270	μg/Kg	263	μg/L	10.0	ND	ND	ND	ND	N/A	ND	N/A
1-Naphthylamine	8270	μg/Kg	119	μg/L	25.30	ND	ND	ND	ND	N/A	ND	N/A
2-Naphthylamine	8270	μg/Kg	720	μg/L	15.60	ND	ND	ND	ND	N/A	ND	N/A
o-Nitroaniline	8270	μg/Kg	121	μg/L	7.82	ND	ND	ND	ND	N/A	ND	N/A
m-Nitroaniline	8270	μg/Kg	253	μg/L	9.52	ND	ND	ND	ND	N/A	ND	N/A
p-Nitroaniline	8270	μg/Kg	1119	μg/L	21.40	ND	ND	ND	ND	N/A	ND	N/A
Nitrobenzene	8270	μg/Kg	161	μg/L	3.16	ND	ND	ND	ND	N/A	ND	N/A
p-Nitrophenol	8270	μg/Kg	195	μg/L	1.52	ND	ND	ND	ND	N/A	ND	N/A
4-Nitroquinoline-1-Oxide	8270	μg/Kg	362	μg/L	6.00	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosodi-n-Butylamine	8270	μg/Kg	82.0	μg/L	3.22	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosodiethylamine	8270	μg/Kg	134	μg/L	2.90	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosodimethylamine	8270	μg/Kg	178	μg/L	3.81	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosodiphenylamine	8270	μg/Kg	143	μg/L	2.11	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosodipropylamine	8270	μg/Kg	164	μg/L	3.67	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosomethylethylamine	8270	μg/Kg	124	μg/L	2.83	ND	ND	ND	ND	N/A	ND	N/A
N-nitrosomorpholine	8270	μg/Kg	135	μg/L	3.27	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosopiperidine	8270	μg/Kg	27.9	μg/L	4.35	ND	ND	ND	ND	N/A	ND	N/A
N-Nitrosopyrolidine	8270	μg/Kg	171	μg/L	2.78	ND	ND	ND	ND	N/A	ND	N/A
5-Nitro-o-Toluidine	8270	μg/Kg	186	μg/L	5.25	ND	ND	ND	ND	N/A	ND	N/A
Parathion	8270	μg/Kg	257	μg/L	3.90	ND	ND	ND	ND	N/A	ND	N/A
Pentachlorobenzene	8270	μg/Kg	186	μg/L	3.99	ND	ND	ND	ND	N/A	ND	N/A

TABLE 6.6. (Contd)

LF01						Pit 7 - Soil			Soil Summary		Water Summary	
		Soil		Water		LF01_S7_1_1	LF01_S7_1_2	LF01_S7_1_3	Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	1.5-ft Aug-93	3.6-ft Aug-93	4.9-ft Aug-93	Soil Values	of Maximum	Water Values	of Maximum
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	N/A	ND	N/A
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	N/A	ND	N/A
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	N/A	ND	N/A
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	N/A	ND	N/A
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	N/A	ND	N/A
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	N/A	ND	N/A
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	N/A	ND	N/A
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	N/A	ND	N/A
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	N/A	ND	N/A
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	N/A	ND	N/A
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	N/A	ND	N/A
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	N/A	ND	N/A
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	N/A	ND	N/A
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	N/A	ND	N/A
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	N/A	ND	N/A
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	N/A	ND	N/A

TABLE 6.7. Pesticides Analyzed for and Detected in Groundwater, LF01

LF01 GROUND-WATER	Method	Units	MDL	01M03 Aug-93	01M04 Aug-93	Range of Values	Location / Date of Maximum
Aldrin	8080	µg/L	0.05	ND	ND	ND	N/A
alpha-BHC	8080	µg/L	0.012	ND	ND	ND	N/A
beta-BHC	8080	µg/L	0.0026	ND	ND	ND	N/A
delta-BHC	8080	µg/L	0.0014	ND	ND	ND	N/A
Lindane	8080	µg/L	0.0021	ND	ND	ND	N/A
Chlordane	8080	µg/L	0.0057	ND	ND	ND	N/A
4,4-DDD	8080	µg/L	0.0005	ND	ND	ND	N/A
4,4-DDE	8080	µg/L	0.0009	ND	ND	ND	N/A
4,4-DDT	8080	µg/L	0.011	ND	ND	ND	N/A
Dieldrin	8080	µg/L	0.019	ND	ND	ND	N/A
Endosulfin I	8080	µg/L	0.0029	ND	ND	ND	N/A
Endosulfin II	8080	µg/L	0.004	ND	ND	ND	N/A
Endosulfansulfate	8080	µg/L	0.0072	ND	ND	ND	N/A
Endrin	8080	µg/L	0.008	ND	ND	ND	N/A
Endrin aldehyde	8080	µg/L	0.011	ND	ND	ND	N/A
Heptachlor	8080	µg/L	0.0019	ND	ND	ND	N/A
Heptachlorepoxide	8080	µg/L	0.0008	ND	ND	ND	N/A
Methoxychlor	8080	µg/L	0.1	ND	ND	ND	N/A
Toxaphene	8080	µg/L	0.89	ND	ND	ND	N/A

NOTE: 01M03 is near the Drum Storage Area.
01M04 is near the Landfill.

TABLE 6.8. Pesticides Analyzed for and Detected in Soil, LF01

LF01						Surface	Pit 1 - Soil			Pit 1 - Water	Pit 2 - Soil			Pit 2 - Water
		Soil		Water		LF01_S4_B	LF01_S1_1	LF01_S1_2	LF01_S1_3	LF01_W1	LF01_S2_1	LF01_S2_2	LF01_S2_3	LF01_W2
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	8.4-ft Aug-93	8.4-ft Aug-93	1.8-ft Aug-93	4.7-ft Aug-93	6.6-ft Aug-93	6.6-ft Aug-93
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	1.8	ND	ND	ND	ND	ND	2.0	ND	ND
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	1.4	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin I	8080	µg/kg	4.30	µg/L	0.0029	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin II	8080	µg/kg	0.28	µg/L	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfansulfate	8080	µg/kg	1.70	µg/L	0.0072	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	8080	µg/kg	2.50	µg/L	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlorepoxide	8080	µg/kg	5.70	µg/L	0.0008	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	8080	µg/kg	13.0	µg/L	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.8. (Contd)

LF01						Pit 3 - Soil			Pit 3 - Water	Pit 4 - Soil			Pit 4 - Water
		Soil		Water		LF01_S3_1	LF01_S3_2	LF01_S3_3	LF01_W3	LF01_S4_A1	LF01_S4_2	LF01_S4_3	LF01_W4_1_1
SOIL	Method	Units	MDL	Units	MDL	2.1-ft Aug-93	4.4-ft Aug-93	9.0-ft Aug-93	9.4-ft Aug-93	2.1-ft Aug-93	4.7-ft Aug-93	7.4-ft Aug-93	7.4-ft Aug-93
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	ND	ND	0.0065	ND	ND	ND	ND
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	ND	ND	ND	ND	6.0	ND	ND	ND
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	ND	ND	ND	ND	20	ND	ND	ND
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin I	8080	µg/kg	4.30	µg/L	0.0029	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin II	8080	µg/kg	0.28	µg/L	0.004	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfansulfate	8080	µg/kg	1.70	µg/L	0.0072	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	8080	µg/kg	2.50	µg/L	0.011	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlorepoxide	8080	µg/kg	5.70	µg/L	0.0008	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	8080	µg/kg	13.0	µg/L	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.8. (Contd)

LF01		Soil		Water		Pit 5 - Soil			Pit 5 - Water	Pit 6 - Soil			Pit 6 - Water
						LF01_S5_1_1	LF01_S5_1_2	LF01_S5_1_3	LF01_W5_1_1	LF01_S6_1_1	LF01_S6_1_2	LF01_S6_1_3	LF01_W6_1_1
SOIL	Method	Units	MDL	Units	MDL	1.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	5.9-ft Aug-93	1.4-ft Aug-93	3.7-ft Aug-93	6.3-ft Aug-93	6.2-ft Aug-93
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	ND	ND	ND	ND	ND	ND	ND
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND	ND	ND	ND	ND	ND	ND	ND
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin	8080	µg/kg	4.30	µg/L	0.0029	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfin	8080	µg/kg	0.28	µg/L	0.004	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfar	8080	µg/kg	1.70	µg/L	0.0072	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ald	8080	µg/kg	2.50	µg/L	0.011	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	8080	µg/kg	5.70	µg/L	0.0008	ND	ND	ND	ND	ND	ND	ND	ND
Methoxych	8080	µg/kg	13.0	µg/L	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 6.8. (Contd)

LF01		Soil		Water		Pit 7 - Soil			Soil Summary		Water Summary	
SOIL	Method	Units	MDL	Units	MDL	LF01_S7_1_1 1.5-ft Aug-93	LF01_S7_1_2 3.6-ft Aug-93	LF01_S7_1_3 4.9-ft Aug-93	Range of Soil Values	Location / Date of Maximum	Range of Water Values	Location / Date of Maximum
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	ND	ND	ND	N/A	ND	N/A
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	ND	ND	ND	N/A	ND	N/A
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	ND	ND	ND	N/A	ND	N/A
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	ND	ND	ND	N/A	ND - 0.0065	Pit 3 Aug-93
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND	ND	ND	ND	N/A	ND	N/A
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND	ND	ND	ND	N/A	ND	N/A
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	ND	ND	ND	ND - 6.0	Pit 4/2.1-ft Aug-93	ND	N/A
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND	ND	ND	ND	N/A	ND	N/A
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	ND	ND	ND	ND - 20	Pit 4/2.1-ft Aug-93	ND	N/A
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND	ND	ND	ND	N/A	ND	N/A
Endosulfin	8080	µg/kg	4.30	µg/L	0.0029	ND	ND	ND	ND	N/A	ND	N/A
Endosulfin	8080	µg/kg	0.28	µg/L	0.004	ND	ND	ND	ND	N/A	ND	N/A
Endosulfar	8080	µg/kg	1.70	µg/L	0.0072	ND	ND	ND	ND	N/A	ND	N/A
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	ND	ND	ND	N/A	ND	N/A
Endrin ald	8080	µg/kg	2.50	µg/L	0.011	ND	ND	ND	ND	N/A	ND	N/A
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	ND	ND	ND	N/A	ND	N/A
Heptachlor	8080	µg/kg	5.70	µg/L	0.0008	ND	ND	ND	ND	N/A	ND	N/A
Methoxych	8080	µg/kg	13.0	µg/L	0.1	ND	ND	ND	ND	N/A	ND	N/A
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	ND	ND	ND	N/A	ND	N/A

TABLE 6.9. Volatile Organic Compounds and Metals Analyzed for and Detected in Groundwater, LF01

LF01 GROUND-WATER	Method	Units	MDL	01M03 Aug-93	01M04 Aug-93	Range of Values	Location / Date of Maximum	
Benzene	8020	µg/L	0.105		ND	ND	N/A	
Carbon Tetrachloride	8010	µg/L	0.121		ND	ND	N/A	
Chloroform	8010	µg/L	0.043	No analyses	ND	ND	N/A	
p-Dichlorobenzene	8010/8020	µg/L	0.107	due to a	ND	ND	N/A	
1,1-Dichloroethane	8010	µg/L	0.337	broken container.	ND	ND	N/A	
1,2-Dichloroethane	8010	µg/L	0.139		ND	ND	N/A	
cis-1,2 Dichloroethylene	8010	µg/L	0.127		ND	ND	N/A	
trans-1,2 Dichloroethylene	8010	µg/L	0.149		ND	ND	N/A	
Ethylbenzene	8020	µg/L	0.046		ND	ND	N/A	
Methylene Chloride	8010	µg/L	0.056		ND	ND	N/A	
Tetrachloroethylene	8010	µg/L	0.049		ND	ND	N/A	
Toluene	8020	µg/L	0.056		ND	ND	N/A	
1,1,1-Trichloroethane	8010	µg/L	0.072		ND	ND	N/A	
1,1,2-Trichloroethane	8010	µg/L	0.043		ND	ND	N/A	
Trichloroethylene	8010	µg/L	0.065		ND	ND	N/A	
Vinyl Chloride	8010	µg/L	0.266		ND	ND	N/A	
Xylene	8020	µg/L	0.202		ND	ND	N/A	
Aluminum	6010	µg/L	32.5	5900	2300	2300 - 5900	01M03	Aug-93
Antimony	6010	µg/L	69.4	ND	ND	ND	N/A	
Barium	6010	µg/L	0.001	160	120	120 - 160	01M03	Aug-93
Beryllium	6010	µg/L	0.814	1.4	ND	ND - 1.4	01M03	Aug-93
Cadmium	6010	µg/L	4.7	ND	ND	ND	N/A	
Calcium	6010	µg/L	20.9	54000	51000	51000 - 54000	01M03	Aug-93
Chromium	6010	µg/L	5.42	11	7.5	7.5 - 11	01M03	Aug-93
Cobalt	6010	µg/L	4.05	ND	5.8	ND - 5.8	01M04	Aug-93
Copper	6010	µg/L	2.65	11	5.9	5.9 - 11	01M03	Aug-93
Iron	6010	µg/L	10.3	8000	5700	5700 - 8000	01M03	Aug-93
Magnesium	6010	µg/L	26.0	12000	1100	1100 - 12000	01M03	Aug-93
Manganese	6010	µg/L	1.35	1200	600	600 - 1200	01M03	Aug-93
Nickel	6010	µg/L	17.9	ND	ND	ND	N/A	
Potassium	6010	µg/L	662	5200	4600	4600 - 5200	01M03	Aug-93
Silver	6010	µg/L	2.87	2.9	ND	ND - 2.9	01M03	Aug-93
Sodium	6010	µg/L	40.9	5200	4500	4500 - 5200	01M03	Aug-93
Tin	6010	µg/L	51.1	ND	ND	ND	N/A	
Vanadium	6010	µg/L	3.84	17	12	12 - 17	01M03	Aug-93
Zinc	6010	µg/L	3.44	32	16	16 - 32	01M03	Aug-93
Lead	7421	µg/L	0.6	4.9	4.1	4.1 - 4.9	01M03	Aug-93
Arsenic	7060	µg/L	2	3.6	3.9	3.6 - 3.9	01M04	Aug-93

NOTE: 01M03 is near the Drum Storage Area.
01M04 is near the Landfill.

TABLE 6.10. Volatile Organic Compounds and Metals Analyzed for and Detected in Soil, LF01

LF01						Surface	Pit 1 - Soil			Pit 1 - Water	Pit 2 - Soil			Pit 2 - Water
		Soil		Water		LF01_S4_B	LF01_S1_1	LF01_S1_2	LF01_S1_3	LF01_W1	LF01_S2_1	LF01_S2_2	LF01_S2_3	LF01_W2
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	8.4-ft Aug-93	8.4-ft Aug-93	1.8-ft Aug-93	4.7-ft Aug-93	6.6-ft Aug-93	6.6-ft Aug-93
Benzene	8020	µg/kg	0.174	µg/L	0.105	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	8010	µg/kg	0.302	µg/L	0.121	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	8010	µg/kg	0.086	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8010/8020	µg/kg	0.093	µg/L	0.107	ND	0.18	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	8010	µg/kg	0.303	µg/L	0.337	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8010	µg/kg	0.296	µg/L	0.139	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	µg/L	0.127	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	µg/L	0.149	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	8020	µg/kg	0.157	µg/L	0.046	ND	0.30	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	8010	µg/kg	3.360	µg/L	0.056	ND	ND	ND	ND	0.16	ND	ND	ND	ND
Tetrachloroethylene	8010	µg/kg	0.154	µg/L	0.049	ND	0.17	ND	ND	ND	ND	ND	ND	ND
Toluene	8020	µg/kg	0.151	µg/L	0.056	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	8010	µg/kg	0.119	µg/L	0.072	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	8010	µg/kg	0.075	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	8010	µg/kg	0.088	µg/L	0.065	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	8010	µg/kg	0.130	µg/L	0.266	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	8020	µg/kg	0.611	µg/L	0.202	ND	0.95	ND	ND	ND	ND	ND	ND	ND
Aluminum	6010	µg/kg	3220	µg/L	32.5	10000000	11000000	8000000	4900000	36000	11000000	7800000	6100000	50000
Antimony	6010	µg/kg	4270	µg/L	69.4	6100	5400	ND	ND	ND	7100	ND	6300	ND
Barium	6010	µg/kg	115	µg/L	0.001	85000	85000	140000	57000	450	100000	62000	38000	700
Beryllium	6010	µg/kg	96.7	µg/L	0.814	350	340	260	220	1.8	360	340	190	2.1
Cadmium	6010	µg/kg	330.0	µg/L	4.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	6010	µg/kg	1520	µg/L	20.9	7100000	7000000	4600000	2500000	81000	10000000	4800000	3400000	120000
Chromium	6010	µg/kg	766	µg/L	5.42	21000	21000	17000	9200	64	20000	16000	9200	75
Cobalt	6010	µg/kg	653	µg/L	4.05	7300	8000	6000	2900	29	8400	5300	3600	39
Copper	6010	µg/kg	1080	µg/L	2.65	20000	20000	17000	8200	120	24000	14000	11000	170
Iron	6010	µg/kg	1723	µg/L	10.3	20000000	21000000	16000000	8400000	68000	21000000	15000000	11000000	66000
Magnesium	6010	µg/kg	768.0	µg/L	26.0	5500000	5500000	4300000	2500000	30000	5900000	4000000	3000000	47000
Manganese	6010	µg/kg	139	µg/L	1.35	330000	310000	380000	120000	2000	320000	230000	120000	2600
Nickel	6010	µg/kg	2340	µg/L	17.9	23000	23000	19000	9600	81	24000	16000	12000	110
Potassium	6010	µg/kg	45990	µg/L	662	880000	830000	730000	490000	8000	1000000	710000	810000	12000
Silver	6010	µg/kg	326	µg/L	2.87	370	920	ND	ND	3.6	330	ND	ND	4.0
Sodium	6010	µg/kg	15400	µg/L	40.9	610000	580000	360000	250000	7700	500000	420000	250000	11000
Tin	6010	µg/kg	5120	µg/L	51.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	6010	µg/kg	547	µg/L	3.84	47000	43000	37000	17000	100	36000	40000	22000	130
Zinc	6010	µg/kg	451	µg/L	3.44	46000	48000	34000	21000	160	53000	35000	23000	230
Lead	7421	µg/kg	300	µg/L	0.6	6300	7000	3300	2800	15	5400	4300	6200	14
Arsenic	7060	µg/kg	200	µg/L	2	12000	9600	6200	3300	50	9700	5600	4000	32

TABLE 6.10. (Contd)

LF01						Pit 3 - Soil			Pit 3 - Water	Pit 4 - Soil			Pit 4 - Water
		Soil		Water		LF01_S3_1	LF01_S3_2	LF01_S3_3	LF01_W3	LF01_S4_A1	LF01_S4_2	LF01_S4_3	LF01_W4_1_1
SOIL	Method	Units	MDL	Units	MDL	2.1-ft Aug-93	4.4-ft Aug-93	9.0-ft Aug-93	9.4-ft Aug-93	2.1-ft Aug-93	4.7-ft Aug-93	7.4-ft Aug-93	7.4-ft Aug-93
Benzene	8020	µg/kg	0.174	µg/L	0.105	ND	ND	ND	ND	ND	ND	ND	(a)
Carbon Tetrachloride	8010	µg/kg	0.302	µg/L	0.121	ND	ND	ND	ND	ND	ND	ND	
Chloroform	8010	µg/kg	0.086	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	
p-Dichlorobenzene	8010/8020	µg/kg	0.093	µg/L	0.107	ND	ND	ND	ND	ND	ND	ND	
1,1-Dichloroethane	8010	µg/kg	0.303	µg/L	0.337	ND	ND	ND	ND	ND	ND	ND	
1,2-Dichloroethane	8010	µg/kg	0.296	µg/L	0.139	ND	ND	ND	ND	ND	ND	ND	
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	µg/L	0.127	ND	ND	ND	ND	ND	ND	ND	
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	µg/L	0.149	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	8020	µg/kg	0.157	µg/L	0.046	ND	ND	ND	ND	ND	ND	ND	
Methylene Chloride	8010	µg/kg	3.360	µg/L	0.056	ND	ND	ND	ND	ND	ND	ND	
Tetrachloroethylene	8010	µg/kg	0.154	µg/L	0.049	ND	ND	ND	ND	ND	ND	ND	
Toluene	8020	µg/kg	0.151	µg/L	0.056	ND	ND	ND	ND	ND	ND	ND	
1,1,1-Trichloroethane	8010	µg/kg	0.119	µg/L	0.072	ND	ND	ND	ND	ND	ND	ND	
1,1,2-Trichloroethane	8010	µg/kg	0.075	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	
Trichloroethylene	8010	µg/kg	0.088	µg/L	0.065	ND	ND	ND	ND	ND	ND	ND	
Vinyl Chloride	8010	µg/kg	0.130	µg/L	0.266	ND	ND	ND	ND	ND	ND	ND	
Xylene	8020	µg/kg	0.611	µg/L	0.202	ND	ND	ND	ND	ND	ND	ND	
Aluminum	6010	µg/kg	3220	µg/L	32.5	12000000	8600000	5100000	35000	10000000	6700000	5400000	57000
Antimony	6010	µg/kg	4270	µg/L	69.4	5100	5500	ND	ND	6800	4500	7900	ND
Barium	6010	µg/kg	115	µg/L	0.001	99000	70000	48000	470	88000	65000	59000	880
Beryllium	6010	µg/kg	96.7	µg/L	0.814	390	340	140	3.0	450	150	140	2.7
Cadmium	6010	µg/kg	330.0	µg/L	4.7	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	6010	µg/kg	1520	µg/L	20.9	11000000	5100000	2700000	91000	6000000	4200000	3000000	80000
Chromium	6010	µg/kg	766	µg/L	5.42	22000	15000	9200	48	19000	12000	10000	94
Cobalt	6010	µg/kg	653	µg/L	4.05	7900	5600	3000	21	7800	4200	3700	71
Copper	6010	µg/kg	1080	µg/L	2.65	25000	14000	9500	110	21000	15000	15000	210
Iron	6010	µg/kg	1723	µg/L	10.3	20000000	15000000	9700000	48000	10000000	11000000	9200000	110000
Magnesium	6010	µg/kg	768.0	µg/L	26.0	5500000	4200000	2900000	29000	5000000	3400000	2800000	36000
Manganese	6010	µg/kg	139	µg/L	1.35	330000	270000	140000	1900	310000	180000	150000	5900
Nickel	6010	µg/kg	2340	µg/L	17.9	22000	18000	11000	71	21000	14000	10000	150
Potassium	6010	µg/kg	45990	µg/L	662	990000	680000	560000	8500	800000	580000	370000	9900
Silver	6010	µg/kg	326	µg/L	2.87	350	ND	ND	3.8	370	ND	ND	6.3
Sodium	6010	µg/kg	15400	µg/L	40.9	740000	510000	210000	8700	590000	310000	240000	8800
Tin	6010	µg/kg	5120	µg/L	51.1	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	6010	µg/kg	547	µg/L	3.84	38000	35000	19000	86	38000	23000	19000	170
Zinc	6010	µg/kg	451	µg/L	3.44	48000	34000	23000	140	45000	25000	20000	270
Lead	7421	µg/kg	300	µg/L	0.6	8000	4400	2300	23	12000	3200	2600	86
Arsenic	7060	µg/kg	200	µg/L	2	13000	5300	4000	32	5300	4500	2700	84

(a) No analyses due to broken container.

TABLE 6.10. (Contd)

LF01						Pit 5 - Soil			Pit 5 - Water	Pit 6 - Soil			Pit 6 - Water
		Soil		Water		LF01_S5_1_1	LF01_S5_1_2	LF01_S5_1_3	LF01_W5_1_1	LF01_S6_1_1	LF01_S6_1_2	LF01_S6_1_3	LF01_W6_1_1
SOIL	Method	Units	MDL	Units	MDL	1.9-ft Aug-93	2.3-ft Aug-93	3.6-ft Aug-93	5.9-ft Aug-93	1.4-ft Aug-93	3.7-ft Aug-93	6.3-ft Aug-93	6.2-ft Aug-93
Benzene	8020	µg/kg	0.174	µg/L	0.105	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	8010	µg/kg	0.302	µg/L	0.121	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	8010	µg/kg	0.086	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8010/8020	µg/kg	0.093	µg/L	0.107	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	8010	µg/kg	0.303	µg/L	0.337	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	8010	µg/kg	0.296	µg/L	0.139	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	µg/L	0.127	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	µg/L	0.149	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	8020	µg/kg	0.157	µg/L	0.046	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	8010	µg/kg	3.360	µg/L	0.056	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	8010	µg/kg	0.154	µg/L	0.049	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	8020	µg/kg	0.151	µg/L	0.056	ND	ND	ND	ND	0.25	ND	ND	ND
1,1,1-Trichloroethane	8010	µg/kg	0.119	µg/L	0.072	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	8010	µg/kg	0.075	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	8010	µg/kg	0.088	µg/L	0.065	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	8010	µg/kg	0.130	µg/L	0.266	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	8020	µg/kg	0.611	µg/L	0.202	ND	ND	ND	ND	ND	ND	ND	ND
Aluminum	6010	µg/kg	3220	µg/L	32.5	10000000	10000000	7600000	110000	11000000	14000000	6700000	380000
Antimony	6010	µg/kg	4270	µg/L	69.4	ND	4800	6000	ND	ND	7200	ND	96
Barium	6010	µg/kg	115	µg/L	0.001	82000	96000	67000	1500	77000	120000	84000	5100
Beryllium	6010	µg/kg	96.7	µg/L	0.814	220	290	200	4.3	220	400	180	10
Cadmium	6010	µg/kg	330.0	µg/L	4.7	ND	ND	ND	ND	ND	ND	ND	9.4
Calcium	6010	µg/kg	1520	µg/L	20.9	7000000	6600000	6900000	140000	5300000	9900000	5200000	260000
Chromium	6010	µg/kg	766	µg/L	5.42	18000	19000	14000	190	19000	27000	13000	680
Cobalt	6010	µg/kg	653	µg/L	4.05	6500	7500	5300	120	7900	9700	4800	320
Copper	6010	µg/kg	1080	µg/L	2.65	24000	22000	17000	410	24000	35000	15000	1400
Iron	6010	µg/kg	1723	µg/L	10.3	21000000	17000000	13000000	200000	20000000	25000000	12000000	640000
Magnesium	6010	µg/kg	768.0	µg/L	26.0	5200000	5200000	4200000	70000	5600000	7600000	3500000	220000
Manganese	6010	µg/kg	139	µg/L	1.35	310000	400000	310000	11000	280000	460000	190000	14000
Nickel	6010	µg/kg	2340	µg/L	17.9	18000	21000	16000	290	20000	27000	14000	800
Potassium	6010	µg/kg	45990	µg/L	662	830000	1000000	750000	17000	1000000	1600000	670000	43000
Silver	6010	µg/kg	326	µg/L	2.87	ND	ND	ND	10	ND	ND	ND	25
Sodium	6010	µg/kg	15400	µg/L	40.9	560000	550000	440000	13000	560000	620000	370000	28000
Tin	6010	µg/kg	5120	µg/L	51.1	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	6010	µg/kg	547	µg/L	3.84	34000	36000	29000	330	32000	43000	27000	1100
Zinc	6010	µg/kg	451	µg/L	3.44	47000	46000	33000	680	50000	67000	30000	2000
Lead	7421	µg/kg	300	µg/L	0.6	7300	7900	3700	140	6300	8700	3700	350
Arsenic	7060	µg/kg	200	µg/L	2	12000	13000	15000	130	16000	8500	4200	220

TABLE 6.10. (Contd)

LF01						Pit 7 - Soil			Soil Summary		Water Summary	
		Soil		Water		LF01_S7_1_1	LF01_S7_1_2	LF01_S7_1_3	Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	1.5-ft Aug-93	3.6-ft Aug-93	4.9-ft Aug-93	Soil Values	of Maximum	Water Values	of Maximum
Benzene	8020	μg/kg	0.174	μg/L	0.105	ND	ND	ND	ND	N/A	ND	N/A
Carbon Tetrachloride	8010	μg/kg	0.302	μg/L	0.121	ND	ND	ND	ND	N/A	ND	N/A
Chloroform	8010	μg/kg	0.086	μg/L	0.043	ND	ND	ND	ND	N/A	ND	N/A
p-Dichlorobenzene	8010/8020	μg/kg	0.093	μg/L	0.107	ND	ND	ND	ND - 0.18	Pit 1 Aug-93	ND	N/A
1,1-Dichloroethane	8010	μg/kg	0.303	μg/L	0.337	ND	ND	ND	ND	N/A	ND	N/A
1,2-Dichloroethane	8010	μg/kg	0.296	μg/L	0.139	ND	ND	ND	ND	N/A	ND	N/A
cis-1,2 Dichloroethylene	8010	μg/kg	0.196	μg/L	0.127	ND	ND	ND	ND	N/A	ND	N/A
trans-1,2 Dichloroethylene	8010	μg/kg	0.169	μg/L	0.149	ND	ND	ND	ND	N/A	ND	N/A
Ethylbenzene	8020	μg/kg	0.157	μg/L	0.046	ND	ND	ND	ND - 0.30	Pit 1 Aug-93	ND	N/A
Methylene Chloride	8010	μg/kg	3.360	μg/L	0.056	ND	ND	ND	ND	N/A	ND - 0.16	Pit 1 Aug-93
Tetrachloroethylene	8010	μg/kg	0.154	μg/L	0.049	ND	ND	ND	ND - 0.17	Pit 1 Aug-93	ND	N/A
Toluene	8020	μg/kg	0.151	μg/L	0.056	ND	ND	ND	ND - 0.25	Pit 1 Aug-93	ND	N/A
1,1,1-Trichloroethane	8010	μg/kg	0.119	μg/L	0.072	ND	ND	ND	ND	N/A	ND	N/A
1,1,2-Trichloroethane	8010	μg/kg	0.075	μg/L	0.043	ND	ND	ND	ND	N/A	ND	N/A
Trichloroethylene	8010	μg/kg	0.088	μg/L	0.065	ND	ND	ND	ND	N/A	ND	N/A
Vinyl Chloride	8010	μg/kg	0.130	μg/L	0.266	ND	ND	ND	ND	N/A	ND	N/A
Xylene	8020	μg/kg	0.611	μg/L	0.202	ND	ND	ND	ND - 0.95	Pit 1 Aug-93	ND	N/A
Aluminum	6010	μg/kg	3220	μg/L	32.5	9800000	9000000	10000000	4900000-14000000	Pit 6 Aug-93	35000 - 380000	Pit 6 Aug-93
Antimony	6010	μg/kg	4270	μg/L	69.4	7100	ND	5400	ND - 7900	Pit 4 Aug-93	ND - 96	Pit 6 Aug-93
Barium	6010	μg/kg	115	μg/L	0.001	84000	74000	85000	38000 - 140000	Pit 1 Aug-93	450 - 5100	Pit 6 Aug-93
Beryllium	6010	μg/kg	96.7	μg/L	0.814	330	290	280	140 - 450	Pit 4 Aug-93	1.8 - 10	Pit 6 Aug-93
Cadmium	6010	μg/kg	330.0	μg/L	4.7	ND	ND	ND	ND	N/A	ND - 9.4	Pit 6 Aug-93
Calcium	6010	μg/kg	1520	μg/L	20.9	6900000	8400000	7200000	2500000-11000000	Pit 3 Aug-93	80000 - 260000	Pit 6 Aug-93
Chromium	6010	μg/kg	766	μg/L	5.42	19000	16000	19000	9200 - 27000	Pit 6 Aug-93	48 - 680	Pit 6 Aug-93
Cobalt	6010	μg/kg	653	μg/L	4.05	7600	6100	7700	2900 - 9700	Pit 6 Aug-93	21 - 320	Pit 6 Aug-93
Copper	6010	μg/kg	1080	μg/L	2.65	26000	18000	22000	8200 - 35000	Pit 6 Aug-93	110 - 1400	Pit 6 Aug-93
Iron	6010	μg/kg	1723	μg/L	10.3	20000000	16000000	18000000	8400000-25000000	Pit 6 Aug-93	48000 - 640000	Pit 6 Aug-93
Magnesium	6010	μg/kg	768.0	μg/L	26.0	5400000	4700000	5300000	2500000-7600000	Pit 6 Aug-93	29000 - 220000	Pit 6 Aug-93
Manganese	6010	μg/kg	139	μg/L	1.35	320000	270000	310000	120000 - 460000	Pit 6 Aug-93	1900 - 14000	Pit 6 Aug-93
Nickel	6010	μg/kg	2340	μg/L	17.9	20000	17000	21000	9600 - 27000	Pit 6 Aug-93	71 - 800	Pit 6 Aug-93
Potassium	6010	μg/kg	45990	μg/L	662	790000	720000	1100000	370000 - 1600000	Pit 6 Aug-93	8000 - 43000	Pit 6 Aug-93
Silver	6010	μg/kg	326	μg/L	2.87	ND	ND	ND	ND - 920	Pit 1 Aug-93	3.6 - 25	Pit 6 Aug-93
Sodium	6010	μg/kg	15400	μg/L	40.9	470000	550000	490000	210000 - 740000	Pit 3 Aug-93	7700 - 28000	Pit 6 Aug-93
Tin	6010	μg/kg	5120	μg/L	51.1	ND	ND	ND	ND	N/A	ND	N/A
Vanadium	6010	μg/kg	547	μg/L	3.84	33000	31000	31000	17000 - 47000	Pit 4 Aug-93	86 - 1100	Pit 6 Aug-93
Zinc	6010	μg/kg	451	μg/L	3.44	50000	39000	48000	20000 - 67000	Pit 6 Aug-93	140 - 2000	Pit 6 Aug-93
Lead	7421	μg/kg	300	μg/L	0.6	5100	6800	6500	2300 - 12000	Pit 4 Aug-93	14 - 350	Pit 6 Aug-93
Arsenic	7060	μg/kg	200	μg/L	2	18000	8900	9500	2700 - 18000	Pit 7 Aug-93	32 - 220	Pit 6 Aug-93

TABLE 6.11. Decision Criteria for Sampling Recommendations, LF01

GROUND WATER						
CONTAMINANT	HIGHEST DETECT µg/l	SDWA MCL µg/l	FRESHWATER CHRONIC µg/L	CARCINOGENS µg/l	SYSTEMIC TOXICANTS µg/l	CRITERIA RESULTS
arsenic	**16.9**	**50**		**0.042**		**above††**
barium	**1240**	**1000**			**1800**	**above††**
zinc	**418**	**5000**	**59**			**above††**
cadmium	3.8	5			18	below
chromium	**198**	**50**				**above††**
diethylphthalate	660				30000	below
lead	**64.7**	**15***				**above††**
mercury	0.6	2			11	below
nickel	197				730	below
copper	325	1300†			1400	below
iron	**160000**	**300**				**above††**
manganese	**3180**	**50**			**3700**	**above††**
1,2-dichloroethylene	**0.387**	**5**		**0.2**		**above**

† MCLG * ACL
†† May be background

SOIL					
CONTAMINANT	HIGHEST DETECT mg/kg	ALASKA SOIL CLEAN UP mg/kg	CARCINOGENS mg/kg	SYSTEMIC TOXICANTS mg/kg	CRITERIA RESULTS
DDT	0.066		1.9		below
DDD	0.023		2.7		below
DDE	0.004		1.9		below

7.0 Source Area LF02

7.0 LF02 OLD BASE LANDFILL

7.1 LOCATION

LF02 (Old Base Landfill) is an abandoned, 18-km^2 (approximate) landfill located about 0.8 km northwest of the intersection of Manchu Road and the Gravel Haul Road on the banks of French Creek, a tributary of Moose Creek (Figure 7.1). LF02 is about 100 m west of Bear Lake, a 370-km^2 (approximate) surface water body. A gravel road provides access from Gravel Haul Road. LF02 boundaries were located through a surface electromagnetic survey (HLA 1989). The minimum distance from LF02 to French Creek is about 6 m.

7.2 HISTORICAL USE

LF02 was used as the primary base landfill from 1960 to 1967. Previous to this time, landfills LF01 (closed in 1960), LF06 (closed in 1963), LF05 (closed in 1959), and LF04 (still used) were used. Landfill LF06 was used contemporaneously from 1959 to 1963. After 1967, landfills LF03 and LF07 were in operation. Similar to LF01, LF02 received household garbage, scrap lumber, scrap metal, construction debris, and empty cans and drums from base operations. It has been reported that waste oils, paint thinners, and solvents were also disposed of at this location. Refuse was burned from 1960 until 1964, when this practice was discontinued. Burial of refuse continued until 1967, when the landfill was closed and capped. Capping material included soil and fly ash from the base power plant. The cap was graded at closure. The area has been used as a snow disposal area, and for at least 9 months of the year, snow and ice overlie the cap. This snow layer is piled 6 to 9 m deep on the margins of the landfill and somewhat less near the center. During annual breakup, this material melts and an unknown amount infiltrates through the landfill.

7.3 HISTORICAL DATA AND ASSUMPTIONS

7.3.1 Site Observations. During the limited field investigation, the site was inspected several times during the spring and summer (1993) (see photographs in Appendix B). The cap appears to be in good condition with no visible signs of disturbance. Accumulations of snow in the winter and spring were observed with limited runoff during breakup. Presumably, a large amount of the snowmelt infiltrates the cap and landfill. Household trash is scattered about on the surface of the cap, but it appears to be litter and does not suggest that landfill material is being uncovered.

No stressed vegetation or surface staining were noted at the site.

7.3.2 Previous Investigations. Five previous investigations were conducted in the area adjacent to LF02 (CH2M Hill 1982; Dames & Moore 1985, 1986; HLA 1989, 1991). During Phase I (1982) of the Installation Restoration Program investigation, a records search suggested that base maintenance, operations, and housing all sent refuse to the landfill. During Phase II (July 1984), monitoring Wells W-8 and 02MW9 were constructed (Table 7.1). Soil samples were analyzed (Table 7.2) for polychlorinated biphenyls (PCBs) and not detected at levels below detection limit (0.5 μg/g). Samples were also analyzed for oil and grease and not detected at levels below detection limit (0.008 mg/g). Groundwater samples were analyzed for total organic carbon, total organic halides, total dissolved solids, lead, and phenol. In 1986, Wells 02M0B and 02M0C were constructed and all wells were resampled (Table 7.3). Concentrations of purgable halogenated organic compounds, purgable aromatic compounds, metals, pesticides, and total petroleum hydrocarbons (TPHs) were determined. Well W-8 was subsequently frost heaved and abandoned.

In October 1988, a soil vapor study was conducted (Table 7.4). Groundwater in Wells 02MW9, 02M0B, and 02M0C were sampled and one grab sample of surface water and sediment was taken from French Creek. Also, two soil samples were collected from Wells 02N01 and 02M02. The soil parameters analyzed (Table 7.2) included purgable halocarbons, purgable aromatic compounds, semivolatile organic compounds, dissolved metals, and TPHs. Surface water was examined (Table 7.5) for the same parameters as soil, plus total metals. Soil samples were analyzed (Table 7.2) for purgable halocarbons, purgable aromatic compounds, and TPHs.

The 1988 soil-gas probes detected benzene, toluene, ethylbenzene, and xylene (BTEX) as well as 1,1-dichloroethylene (Table 7.4). Trace levels of 1,2-dichloroethane, methylene chloride, and 1,1,2,2-tetrachloroethanewere found in Well 02M0C but no BTEX. In 1990, soil probes detected BTEX, 1,1-dichloroethylene, trichloroethylene, and 1,1-dichloroethane.

Two soil samples were collected in 1988 (Table 7.2) from Wells 02N01 and 02M02 and analyzed for TPHs, and volatile and semivolatile organic compounds. Soil samples from the banks of French Creek showed detectable levels of TPH and 4-methylphenol (Table 7.2).

In September 1990, a second round of remedial investigation/feasibility study sampling was conducted by Harding Lawson Associates (Table 7.2) (HLA 1991). Wells 02M01 and 02M02 were installed. A series of groundwater probes were installed and screened for purgable aromatic compounds and purgable halogenated organic compounds. Five groundwater samples were analyzed from the new wells for purgable aromatic compounds and purgable halogenated organic compounds.

The data from each of these investigations are unusually varied. Despite 4 years of sampling, no organic species have ever been found at any well from one year to the next. For example, no organic compounds other than trichlorofluoromethane, a common laboratory contaminant, were detected in 1986. Benzene was found in Well 02M0B, toluene was found in Well 02M02, and trichloroethylene and trans-1,2-dichloroethene were found in Well 02M01 (October 1990).

Elevated concentrations of trace metals were occasionally found in both surface water and groundwater. In groundwater, arsenic was always detected where analyzed. However, lead varied between 73 (1988) and <1.4 μg/L. Among filtered and unfiltered aliquots of the same samples, lead concentrations for filtered samples were always less than detection limits. Four surface samples were collected from French Creek and one from Bear Lake and analyzed for purgable aromatic compounds and purgable halogenated organic compounds (Table 7.2). No organic compounds have been detected from any surface water at Bear Lake or soil samples at French Creek. Trace levels of 1,2-dichloroethane and 1,1,2,2-tetrachloroethanewere found in French Creek.

7.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

7.4.1 Potential Contaminants of Concern. In addition to the contaminants detected, several other compounds were probably disposed at LF02. Solvents, degreasers, paints, thinners, and deicer/antifreeze solutions are expected wastes of routine base activities. Pesticide/herbicides and PCB could be expected. Waste oils, diesel, gasoline, and hydraulic fluids could also be expected and may have been introduced as contaminated snow. Heavy metals (as components in batteries), photographic solutions, and paint may also have been introduced. Fly ash was used as a cap material. Based on the expected components of these materials, the potential contaminants of concern are

arsenic	1,1,1-trichloroethane	PAH
cadmium	1,1,2,2-tetrachloroethane	PCB
chromium	acetone	propylene glycol
copper	benzene	tetrachloroethylene
lead	DDT, DDD, DDE	tetraethyl lead
nickel	ethylbenzene	tetramethyl lead
zinc	ethylene glycol	toluene
1,1-dichloroethane	isopropyl alcohol	trichloroethylene
1,2-dichloroethane	methyl ethyl ketone	trichlorofluoromethane
1,1-dichloroethylene	n-hexane	vinyl chloride
1,2-dichloroethylene	naphthalene	xylene.

7.4.2 Conceptual Model. The soil, geologic, and hydrologic description of LF02 is very incomplete. Sandy silts to silty sands with trace amounts of gravel from 1.5 to 1.8 m and gravelly sands below 1.8 m were described from the soil borings of previous investigations (HLA 1991). At Well 02M0B, permafrost was encountered from 0.8 to 7.5 m. These soils and strata are similar to fluvial deposits associated with the active French Creek depositional system. Water levels in the wells vary between 1.8 and 2.7 m (below casing) and are seasonally correlated. Figure 7.2 shows the fluctuation measured at Well 02MW09 from August 1991 to December 1992 showing a 0.3-m range in water levels. A wide variation in water level occurred between May and September 1992. Other wells have demonstrated a similar variability and pattern.

One objective of this limited field investigation was a more accurate understanding of the seasonal effects on groundwater dynamics, specifically the infiltration of snowmelt through the landfill cap and transport of landfill leachate toward French Creek. Recall that this site is a storage site for snow removed from the base and that snow depths at LF02 can exceed 9 m. By understanding these seasonal variations, the wide range in historical site data can be more realistically interpreted.

The following hypothesis was developed to explain the variability in water level. The regional hydraulic gradient for the base is north-northwest. Past studies have demonstrated that a significant local deflection of this gradient occurs at LF02. Dames & Moore (1985) calculated a groundwater gradient toward French Creek of 0.4 m/km in December and 3.6 m/km in June. In September, the gradient reversed in direction 1.7 m/km toward the landfill. The potentiometric surface, inclined in the direction of the creek, probably reverses during late summer. This implies that French Creek goes from a gaining to a losing stream over the reach bounding LF02. Presumably, snowmelt during spring and early summer infiltrates the landfill and increases head from the landfill to the stream, transporting leachate components toward the wells. As the creek flow increases, bank storage and recharge increase while infiltration declines, driving uncontaminated water from the creek toward the wells.

If this conceptual model is valid, concentrations of leachate-derived components should become more dilute as bank storage and recharge dominate the groundwater dynamics in late summer. Unfortunately, very few parameters have been consistently analyzed over the four previous field investigations.

An alternative hypothesis suggests that contamination was being introduced from French Creek by recharge of the shallow aquifer adjacent to LF02. Heavy metals and organic compounds have been found in samples from French Creek and there is evidence that French Creek is a losing stream during the late summer. If, however, these components were migrating from

French Creek, some of these species would likely be abundant in the sediments. This is not the case, and this hypothesis is not considered further.

7.4.3 Sampling Objective and Strategy. Surface water and soil were not sampled from French Creek because the conceptual model suggests that results from the creek could reflect upstream surface water releases from OU 2, OU 6, or LF04 that are unrelated to LF02. These sources could contribute a variety of historical petroleum product components, solvents, and various industrial chemicals. None of the data suggest clear evidence of LF02 releases to French Creek.

Seasonal variations and the dynamics of surface to groundwater interaction at LF02 suggest a complex hydrologic system. If the conceptual model is correct, leachate mixes with bank storage and shallow groundwater during times of high infiltration from the landfill. The potential for release of this material to French Creek is likely. This scenario represents the contaminant release of highest risk-based significance.

An objective of this limited field investigation was to determine if the time of maximum infiltration at the landfill occurred simultaneous to the highest level of concentration in the monitoring wells. This result would help resolve the conflicting data from previous investigations and permit a regulatory decision that correctly identified the source and dynamics of contaminants at LF02.

In summary, the following sampling strategy was used at LF02.

Objective: To evaluate contamination at LF02 that is the result of the landfill and determine if a seasonal dependance in contaminant levels is suggested.

Action: Sample groundwater in the late spring at four wells.

Sample groundwater in the late summer at the same four wells.

Sample soil between the wells and the landfill.

Activity: During late June, Wells 02M01, 02M02, 02MW9, and 02M0B were sampled and analyzed for volatile organic compounds, inductively coupled plasma metals, arsenic, and lead. Water levels were recorded.

During August, the same four wells were resampled and analyzed for the identical parameters. Water levels were measured again.

During August, soil was excavated to the top of the water table and sampled. Soil and water was analyzed for inductively coupled plasma metals, lead, arsenic, volatile organic compounds, and semivolatile organic compounds.

7.4.4 Limited Field Investigation Field Work. Two sampling trips were made to LF02, one on June 25 during the time of high infiltration from the landfill, and a second trip on August 18 when the local groundwater gradient was unperturbed. The shallow soil adjacent to the well sites (Figure 7.1) was sampled in August. Samples were bottled and analyzed for volatile organic compounds, inductively coupled plasma metals, lead, and arsenic (Table 7.6).

On August 29, excavations were made with a backhoe at locations adjacent to Wells 02M01, 02MW9, and 02M02 (Figure 7.1). Surface soil samples were a composite of the material from the ground surface to the depth of the first backhoe cut, generally about 0.5 m. An excavation was also dug at the road leading to 02M0B. Logs of the excavations are in Appendix B. The excavation at Well 02M02 uncovered landfill debris and a strong, fetid odor at about 4.7 ft below the ground surface. Photoionization detector sampling of the air over the pit did not indicate methane or other organic gases. At each pit, soil samples were removed from the backhoe bucket, taking care to sample soil that had not contacted the sides of the bucket and was relatively undisturbed. The soils were bottled, shipped to the laboratory, and analyzed for volatile organic complexes, inductively coupled plasma metals, lead, and arsenic.

7.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

Analytical data obtained for LF02 suggest that several of the contaminants of concern are present in groundwater and soil adjacent to the landfill. Volatile organic components detected in water samples included 1,2-dichloroethylene (both isomers), methylene chloride, tetrachloroethylene, trichloroethylene, and BTEX. Among the metallic contaminants of concern, arsenic, barium, cadmium, chromium, lead, nickel, vanadium, and zinc were found in detectable amounts. One sample from the pit adjacent to Well 02M01 contained trace amounts of cis-1,2-dichloroethylene. No other organic compound was detected in soil samples from LF02 and all metals were well below Eielson AFB alluvial soil background level.

Similar to other analytes, concentrations of zinc in Wells 02M02, 02MW9, and 02MOB (9.3 to 37 μg/L) were above background levels (Appendix B, <10 μg/L) during the spring, but declined during the summer. No value exceeded the human health criteria, but Well 02M01 exceeded (100 μg/L) ambient water quality criteria for aquatic life (chronic, 65 μg/L) during the spring. Past investigations from LF02 (Table 7.3) indicate that the zinc concentration declines between unfiltered (162 to 2780 μg/L) and filtered (30 to 40 μg/L) samples. This suggests that zinc is transported as a suspended phase. Although ground to surface water migration is probable at LF02, it is unlikely that extended groundwater transport to French Creek of suspended zinc phases is possible. Surface water data (U.S. Air Force 1993c) from French Creek (8.1 μg/L to below detection limits) does not indicate elevated zinc levels.

7.6 RISK CHARACTERIZATION

7.6.1 Soil. Data from this limited field investigation suggest that soils at the site are not contaminated relative to regulatory or risk-based criteria (Table 7.7). Soil values were all well below both background, risk-based, and regulatory values. Analysis of the fly ash (U.S. Air Force 1993d) used as a cap reveals no evidence for a source of contamination to the soil or any other pathway. Human and ecological exposure through soil is therefore not a complete pathway.

7.6.2 Groundwater. Other potential pathways for ingestion and dermal contact are leaching of waste by infiltration followed by groundwater mixing and contamination. The nearest down gradient water supply well is off base, about 2.8 km northwest in the community of Moose Creek. The nearest residence is less than 0.8 km away from LF02.

Groundwater levels from the site taken in June and August are presented in Figure 7.2. This data does not suggest a large change in the water table and does not suggest a seasonal component to French Creek bank storage or groundwater "mounding" at LF02. This may suggest that seasonal fluctuations at French Creek do not greatly affect the shallow groundwater at LF02. A more detailed investigation of the dynamics of French Creek would be necessary if this hypothesis is to be completely evaluated. There is a near-monotonic variation in groundwater composition between the June and August sampling periods. At Well 02M01 almost every contaminant of concern detected in June decreases in concentration in August. Similarly, metal concentrations also decline between the two months. This suggests that, if the metals and organic complexes are derived from the landfill leachate, the greatest flux of contaminants occurs in the late spring/early summer following snowmelt. Infiltration of the snowmelt into the landfill increases the soil-water pressure head directly under the cap, driving the migration of leachate into the adjacent subsurface (Rawls et al. 1993).

The very high metal results of past investigations are elevated relative to the applicable maximum contaminant levels and risk-based criteria (Table 7.7). The data have been questioned because of the erratic fluctuation of contaminant concentrations and the possibility that past values were not representative. Many of these values came from the Phase III Installation Restoration Program investigation in 1988 (HLA 1989). These samples were obtained in the spring of 1988 from Well 02M0B and probably reflect infiltration of snowmelt water. Resampling of Well 02M0B during the limited field investigation resulted in much lower metal values in every case. Beryllium was not found above the detection limit in any well. Cadmium, chromium, nickel, and barium were all at or below maximum contaminant levels or risk-based criteria. Lead levels were below background. Arsenic and iron were above both the criteria and base background groundwater values (background: arsenic 15 μg/L; iron 2545 μg/L) during both June and August sampling periods. These elements were also elevated in historical data (Table 7.2). Zinc exceeds ambient water quality criteria. This result is discussed in Section 7.6.3.

The high organic compound values were not repeated during either sampling round. Of the species detected, trichloroethylene was found (6.5 μg/L) above the maximum contaminant level (5 μg/L) in June but below (4.5 μg/L) in August. This is the first time that trichloroethylene has exceeded regulatory or risk-based criteria at LF02.

For these reasons, there does not appear to be a complete groundwater pathway for human or ecological receptors, if snow is not stored at the site and infiltration is limited to normal precipitation. However, arsenic, iron, and manganese concentrations were not seasonally affected and may require additional information to fully constrain these risks.

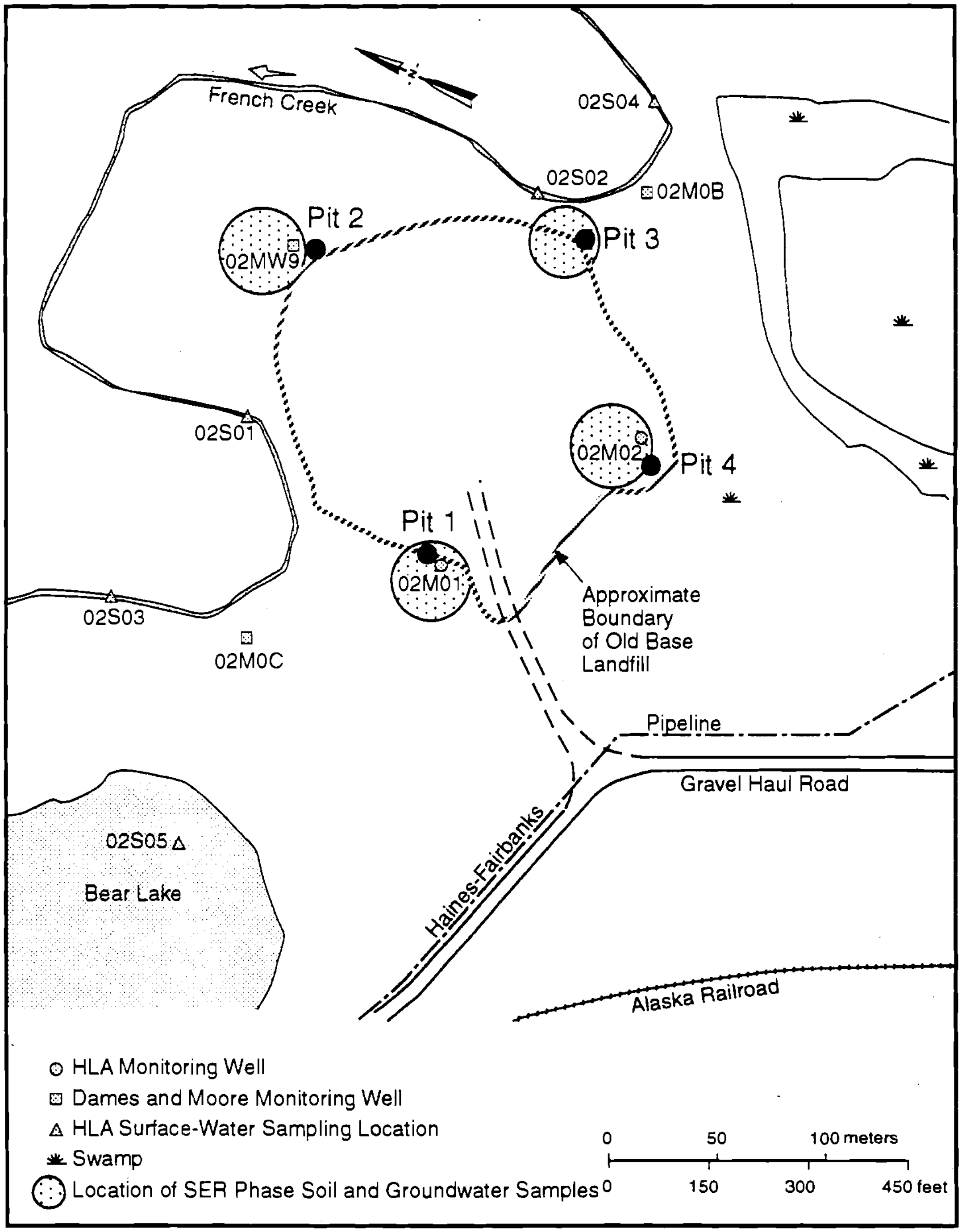
7.6.3 Surface Water. Anglers and recreational users of French Creek are exposed to potential surface water pathways. Riparian wildlife of French Creek, primarily beaver and waterfowl, are abundant. Direct mixing between contaminated groundwater and surface water along French Creek or surface ponds and sumps would be a potential contaminant pathway.

Groundwater was not a closed pathway for any contaminants other than arsenic, iron, and manganese; therefore, ground-to-surface-water interaction is an unlikely potential general risk to human or ecological receptors. A dilution effect would further limit the risks of this scenario. Overland flow from LF02 to any surface water system is also not a closed pathway; the surface soil is not contaminated. Surface water and sediment data have not exceeded regulatory or risk-based criteria for any parameter except TPH. The data were not duplicated in replicate samples, and TPH in groundwater (Table 7.3) at LF02 has been well below Alaska water quality standards. The past TPH levels are unlikely to represent French Creek or the result of LF02 releases. As explained above in Section 7.5, the elevated zinc concentration in Well 02M01 exceeds ambient water quality criteria for aquatic life; however, this concentration does not appear to remain high following melting of the waste snow cover. In any event, it is likely given the discussion of Section 7.5 that this concentration is not representative of the groundwater entering French Creek.

7.6.4 Air. With no contaminated surface soils, suspension of soil is not a potential pathway. Volatile compounds are assumed to have evaporated in the 27 years since the site was last used. Therefore, the air pathway is not considered a complete pathway.

7.7 CONCLUSIONS AND RECOMMENDATIONS

Because of fluctuating groundwater values for the contaminants of concern, the risk to human and ecological health from LF02 is unclear. It is recommended that this site be included with the remedial investigation/feasibility study of OU 5. The revised schedule for OU 5 is compatible with this action. Continued sampling of the four monitoring wells, 02M01, 02M02, 02MOB, and 02MW9 should take place with analysis of RCRA Subtitle D landfill parameters.



S9306040.3

FIGURE 7.1. Map of LF02 with Phase 2 Sampling Stations

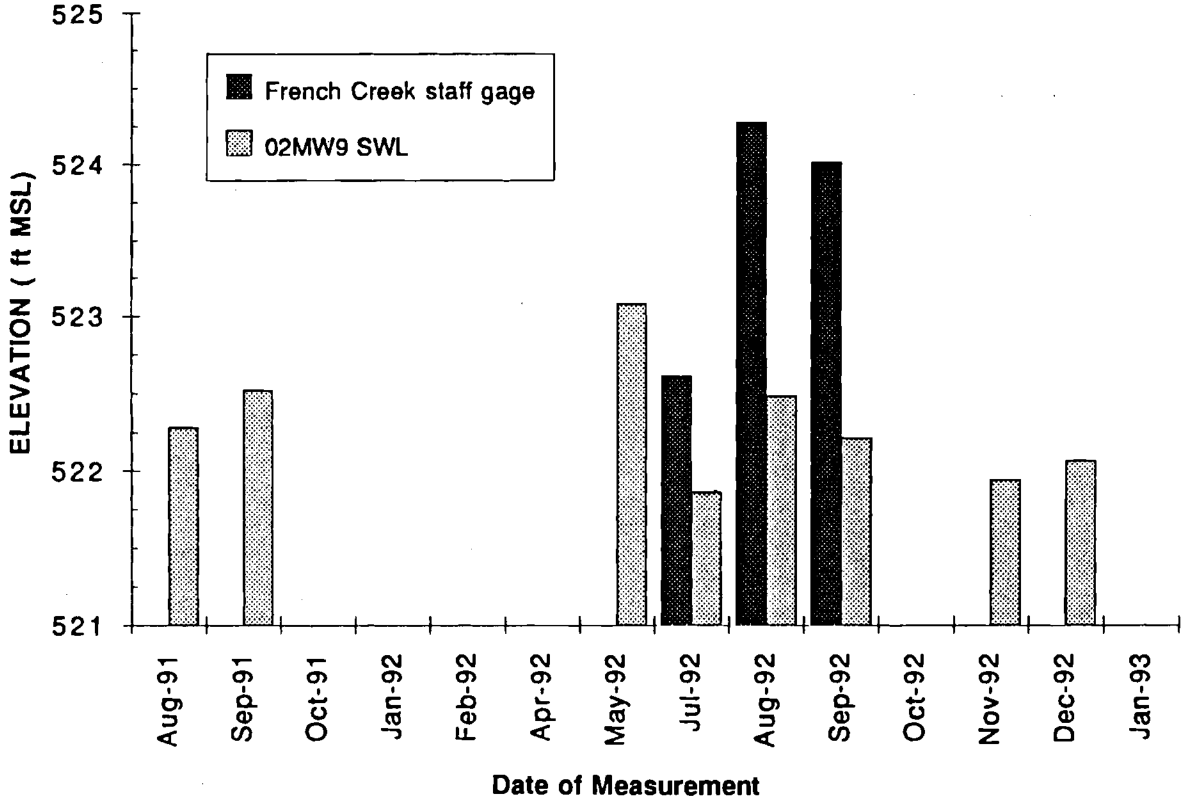


FIGURE 7.2. Seasonal Fluctuation of Groundwater at Well 02MW09

TABLE 7.1. Monitor Well Construction Details and Survey Data, LF02

LF02 Monitor Well Construction Details and Survey Data												
Well No. (Old No.)	Year Constr.	Depth (ft)	Screened Int. (ft)	Years Sampled	Water Table Elevation (ft)							
					Jun-84	Dec-84	08/14/86	Sep-86	1987	10/20/88	10/29/88	09/06/90
W-8	1984	21.0	1 - 21	1984, 86, 87	521.4	521.3	- -	521.0	N/A	- -	- -	- -
02MW9 (W-9)	1984	26.0	1 - 21	1984, 86, 87, 88, 90	522.5	521.2	- -	521.22	N/A	521.19	521.24	522.79
02M0B (GW-2B)	1986	15.0	4.5 - 14.5	1986, 87, 88, 90			521.2	521.49	N/A	521.39	521.47	523.39
02M0C (GW-2C)	1986	16.5	5.5 - 15.5	1986, 87, 88, 90			522.0	520.28	N/A	520.39	520.47	521.35
02M01	1990	14.0	3.5 - 10.0	1990								521.99
02M02	1990	15.3	4.8 - 10.0	1990								522.48

No Entry Well not constructed.
- - Water table elevation not measured
N/A Data not available.

TABLE 7.2. Soil Sample Data From Previous Investigations, LF02

LF02 Sediment Sample Data From Previous Investigations

Parameter Analyzed	Units	Det. Limit	02M01	02M02		W-8	02MW9	Conc. Range	Location of Max.
			1990	1990	1990-Dup	1984	1984		
Oil and Grease	mg/g	0.008				0.014	0.016	.014-.016	02MW9
PCBs	µg/g	0.05				ND	ND		
Phenol	µg/g	5				ND	ND		
Moisture	%		8.2	8.5	3.4	15	21	3.4-21	02MW9
Lead	µg/g	6				ND	ND		
<u>Pesticides</u>						ND	ND		
<u>Petroleum Hydrocarbons</u>	mg/kg	14	4290	210	ND			210-4290	02M01
<u>Volatile Organics</u>									
4-Methyl Phenol	mg/kg	0.03	ND	0.07	ND			0.07	02M02
<u>Semi-Volatile Organics</u>			ND	ND	ND				

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 7.3. Groundwater Sample Data From Previous Investigations, LF02

LF02 Ground Water Sample Data From Previous Investigations - sheet 1 of 2

		Det.	02M01		02M02	W-8			02MW9					02M0B				02M0C				Conc.	Location
Parameter Analyzed	Units	Limit	1990	1990-Dup	1990	1984	1986	1987	1984	1986	1987	1988	1990	1986	1987	1988	1990	1986	1987	1988	1990	Range	of Max.
Oil and Grease	μg/L	500				1200			1800														
PCBs	μg/L	0.5				ND			ND														
Pesticides	μg/L	.002-.02																					
Phenols	μg/L	10				ND			ND														
TDS	μg/L	1000				- -	200000	Unknown	168000	240000	Unknown	148000		170000	Unknown	124000		180000	Unknown	144000		14400-240000	02MW9
TOC	μg/L	1000				6000			6000													6000	W-8/02MW9
TOX	μg/L	10				100			110													100-110	02MW9
pH (field)						7.05	Unknown		7.15	Unknown				Unknown				Unknown				7.05-7.15	02MW9
Spec. Cond. @ 25°C	μmhos/cm					236	Unknown		195	Unknown				Unknown				Unknown				195-236	W-8
<u>Petroleum Hydrocarbons</u>							ND			1800		ND		1600		ND		1600		ND			
<u>Purgeable Halocarbons</u>																							
1,2-Dichloroethane	μg/L	0.2	ND	ND	ND		ND			ND		ND	ND	ND		ND	ND	ND		0.466	ND	0.466	02M0C
Trans-1,2-Dichloroethene	μg/L	0.38	0.99	0.93	ND		ND			ND		ND	ND	ND		ND	ND	ND		ND	ND	.93-.99	02M01
Methylene Chloride	μg/L	1.31	ND	ND	ND		ND			ND		ND	ND	ND		ND	ND	ND		2.45	ND	2.45	02M0C
1,1,2,2-Tetrachloroethane	μg/L	0.2	ND	ND	ND		ND			ND		ND	ND	ND		ND	ND	ND		0.791	ND	0.791	02M0C
Trichloroethene	μg/L	0.52	0.85	ND	ND		ND			ND		ND	ND	ND		ND	ND	ND		ND	ND		
Trichlorfluoromethane	μg/L	0.44	ND	ND	ND		5.6			3.4		ND	ND	1.2		ND	ND	5.4		ND	ND	1.2-5.6	W-8
<u>Purgeable Aromatics</u>																							
Benzene	μg/L	0.15	ND	ND	ND		ND			ND		ND	ND	ND		ND	0.29	ND		ND	ND	0.29	02M0B
Toluene	μg/L	0.25	ND	ND	95.1		ND			ND		ND	ND	ND		ND	ND	ND		ND	ND	95.1	02M02
<u>Semi-Volatile Organics</u>												ND				ND				ND			
<u>Arsenic</u>																							
Arsenic, total	μg/L	1.8					24000			9000		72.7		8000		415		5000		72.2		72.2-24000	W-8
Arsenic, dissolved	μg/L	1.8										30				20				20		20-30	02MW9
<u>Cadmium</u>	μg/L	4					ND			4000				ND				9000				4000-9000	02M0C
<u>Chromium</u>	μg/L	7					ND			ND				ND				ND					
<u>Lead</u>																							
Lead, total	μg/L	1.4				60	ND		30	ND		72.7		ND		65.1		ND		40.2		30-72.7	02MW9
Lead, dissolved	μg/L	1.4										ND				ND				ND			
<u>Mercury</u>																							
Mercury, total	μg/L	0.2					ND			ND		ND		ND		ND		ND		ND			
Mercury, dissolved	μg/L	0.2										ND				ND				ND			
<u>Silver</u>	μg/L	7					ND			ND				ND				ND					

TABLE 7.3. (Contd)

LF02 Ground Water Sample Data From Previous Investigations - sheet 2 of 2

Parameter Analyzed	Units	Det. Limit	02M01 1990	02M01 1990-Dup	02M02 1990	W-8 1984	W-8 1986	W-8 1987	02MW9 1984	02MW9 1986	02MW9 1987	02MW9 1988	02MW9 1990	02M0B 1986	02M0B 1987	02M0B 1988	02M0B 1990	02M0C 1986	02M0C 1987	02M0C 1988	02M0C 1990	Conc. Range	Location of Max.
ICP Metals Scan																							
Aluminum, total	µg/L	30										41100				521000				38000		38000-521000	02M0B
Antimony, total	µg/L	30										ND				81.9				ND		81.9	02M0B
Arsenic, total	µg/L	40										ND				2100				60		60-2100	02M0B
Barium, total	µg/L	1										605				7620				487		487-7620	02M0B
Barium, dissolved	µg/L	1										200				100				100		100-200	02MW9
Beryllium, total	µg/L	1.8										ND				29.9				ND		29.9	02M0B
Cadmium, total	µg/L	3										ND				39.6				ND		39.6	02M0B
Calcium, total	µg/L	1.3										57100				222000				47600		47600-222000	02M0B
Calcium, dissolved	µg/L	1.3										38200				29300				33600		29300-38200	02MW9
Chromium, total	µg/L	6										78.4				1120				63.2		63.2-1120	02M0B
Cobalt, total	µg/L	6										38.3				465				32.1		32.1-465	02M0B
Copper, total	µg/L	3										168				1600				178		168-1600	02M0B
Copper, dissolved	µg/L	3										ND				ND				5		5	02M0C
Iron, total	µg/L	20										83000				972000				75100		75100-972000	02M0B
Iron, dissolved	µg/L	20										8500				3700				800		800-8500	02MW9
Lead, total	µg/L	30										70				800				70		70-800	02M0B
Magnesium, total	µg/L	44										26800				300000				25600		25600-300000	02M0B
Magnesium, dissolved	µg/L	44										9210				6890				8030		6890-9210	02MW9
Manganese, total	µg/L	1.4										2510				15100				1820		1820-15100	02M0B
Manganese, dissolved	µg/L	1.4										1600				900				900		900-1600	02MW9
Molybdenum, total	µg/L	10										ND				36.2				ND		36.2	02M0B
Nickel, total	µg/L	20										84.3				1060				69		69-1060	02M0B
Potassium, total	µg/L	408										6790				42400				5590		5590-42400	02M0B
Potassium, dissolved	µg/L	408										1730				1250				1800		1250-1800	02M0C
Sodium, total	µg/L	82										9450				28900				9490		9450-28900	02M0B
Sodium, dissolved	µg/L	82										48500				4200				6000		4200-48500	02MW9
Thallium, total	µg/L	100										ND				2400				ND		2400	02M0B
Vanadium, total	µg/L	10										108				1620				106		106-1620	02M0B
Zinc, total	µg/L	2										162				2780				183		162-2780	02M0B
Zinc, dissolved	µg/L	2										30				40				40		30-40	02M0B/0C
Common Anions																							
Chloride	µg/L	200										1172				1190				4402		1172-4402	02M0C
Sulfate	µg/L	500										3698				3074				42730		3074-42730	02M0C
Nitrogen	µg/L	10										ND				ND				ND			

No Entry Parameter not analyzed for.
-- Parameter in suite of analyses for well, but not analyzed.
ND Parameter not detected.
Unknown Reference unavailable for this value.

TABLE 7.4. Soil Gas Vapor Sample Data From Previous Investigations, LF02

LF02 1988 Soil Gas Survey Data						
		Sample Point No.			Conc.	Location
Parameter Analyzed	Units	1	10	12	Range	of Max.
Toluene	ppm	ND	ND	0.17	0.17	pt-12
m-Xylene	ppm	ND	ND	0.08	0.08	pt-12
Total BTEX	ppm	ND	ND	0.26	0.26	pt-12
1,1-DCE	ppm	0.02	0.28	ND	.02-.28	pt-10

ND Parameter not detected.

TABLE 7.5. Surface Water Sample Data From Previous Investigations, LF02

LF02 Surface Water Sample Data From Previous Investigations

Parameter Analyzed	Units	Det. Limit	02S01 1988	02S01 1990	02S02 1990	02S03 1990	02S04 1990	02S05 1990	Conc. Range	Location of Max.
Oil and Grease	µg/L	500								
PCBs	µg/L	0.5								
Pesticides	µg/L	.002-.02								
Phenols	µg/L	10								
TDS	µg/L	1000	130000						130000	02S01
TOC	µg/L	1000								
TOX	µg/L	10								
pH (field)										
Spec. Cond. @ 25°C	µmhos/cm									
Petroleum Hydrocarbons			ND							
Purgeable Halocarbons										
1,2-Dichloroethane	µg/L	0.2	0.26	ND	ND	ND	ND	ND	0.26	02S01
1,1,2,2-Tetrachloroethane	µg/L	0.2	0.226	ND	ND	ND	ND	ND	0.226	02S01
Purgeable Aromatics			ND	ND	ND	ND	ND	ND		
Semi-VOC			ND							
Arsenic										
Arsenic, total	µg/L	1.8	3						3	02S01
Arsenic, dissolved	µg/L	1.8	4						4	02S01
Lead										
Lead, total	µg/L	0.2	ND							
Lead, dissolved	µg/L	0.2	ND							
Mercury										
Mercury, total	µg/L	0.2	ND							
Mercury, dissolved	µg/L	0.2	ND							
ICP Metals Scan										
Aluminum, total	µg/L	30	316						316	02S01
Barium, total	µg/L	1	84.4						84.4	02S01
Barium, dissolved	µg/L	1	70						70	02S01
Calcium, total	µg/L	1.3	33600						33600	02S01
Calcium, dissolved	µg/L	1.3	30700						30700	02S01
Iron, total	µg/L	20	30700						30700	02S01
Iron, dissolved	µg/L	20	1100						1100	02S01
Magnesium, total	µg/L	44	8430						8430	02S01
Magnesium, dissolved	µg/L	44	7720						7720	02S01
Manganese, total	µg/L	1.4	720						720	02S01
Manganese, dissolved	µg/L	1.4	600						600	02S01
Potassium, total	µg/L	408	1820						1820	02S01
Potassium, dissolved	µg/L	408	1590						1590	02S01
Sodium, total	µg/L	82	4580						4580	02S01
Sodium, dissolved	µg/L	82	4140						4140	02S01
Zinc, total	µg/L	2	6.4						6.4	02S01
Zinc, dissolved	µg/L	2	30						30	02S01
Common Anions										
Chloride	µg/L	200	903						903	02S01
Sulfate	µg/L	500	6198						6198	02S01
Nitrogen	µg/L	10	ND							

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 7.6. Volatile Organic Compounds and Metals Analyzed for and Detected in Soil, LF02

LF02 SOIL	Method	Units	MDL	Pit 1 (02M01) Aug-93	Pit 4 (02MO2) Aug-93	Pit 2 (02MW9) Aug-93	Pit 3 (02MOB) Aug-93	Range of Values	Location / Date of Maximum	Background Metals
Benzene	8020	µg/kg	0.174	ND	ND	ND	(a)	ND	N/A	
Carbon Tetrachloride	8010	µg/kg	0.302	ND	ND	ND		ND	N/A	
Chloroform	8010	µg/kg	0.086	ND	ND	ND		ND	N/A	
p-Dichlorobenzene	8010/8020	µg/kg	0.093	ND	ND	ND		ND	N/A	
1,1-Dichloroethane	8010	µg/kg	0.303	ND	ND	ND		ND	N/A	
1,2-Dichloroethane	8010	µg/kg	0.296	ND	ND	ND		ND	N/A	
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	0.26	ND	ND		ND - 0.26	Pit 1 Aug-93	
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	ND	ND	ND		ND	N/A	
Ethylbenzene	8020	µg/kg	0.157	ND	ND	ND		ND	N/A	
Methylene Chloride	8010	µg/kg	3.360	ND	ND	ND		ND	N/A	
Tetrachloroethylene	8010	µg/kg	0.154	ND	ND	ND		ND	N/A	
Toluene	8020	µg/kg	0.151	ND	ND	ND		ND	N/A	
1,1,1-Trichloroethane	8010	µg/kg	0.119	ND	ND	ND		ND	N/A	
1,1,2-Trichloroethane	8010	µg/kg	0.075	ND	ND	ND		ND	N/A	
Trichloroethylene	8010	µg/kg	0.088	ND	ND	ND		ND	N/A	
Vinyl Chloride	8010	µg/kg	0.130	ND	ND	ND		ND	N/A	
Xylene	8020	µg/kg	0.611	ND	ND	ND		ND	N/A	
Aluminum	6010	µg/kg	3220	11000000	8200000	5300000	6400000	5300000 - 11000000	Pit 1 Aug-93	
Antimony	6010	µg/kg	4270	ND	ND	ND	ND	ND	N/A	
Barium	6010	µg/kg	115	86000	90000	43000	58000	43000 - 90000	Pit 4 Aug-93	141200
Beryllium	6010	µg/kg	96.7	ND	ND	ND	ND	ND	N/A	
Cadmium	6010	µg/kg	330.0	ND	ND	ND	410	ND - 410	Pit 3 Aug-93	
Calcium	6010	µg/kg	1520	6900000	4600000	2700000	4200000	2700000 - 6900000	Pit 1 Aug-93	
Chromium	6010	µg/kg	766	18000	13000	9000	12000	9000 - 18000	Pit 1 Aug-93	26000
Cobalt	6010	µg/kg	653	7400	5000	3500	5900	3500 - 7400	Pit 1 Aug-93	
Copper	6010	µg/kg	1080	26000	16000	8600	22000	8600 - 26000	Pit 1 Aug-93	44800
Iron	6010	µg/kg	1723	16000000	11000000	8100000	9600000	8100000 - 16000000	Pit 1 Aug-93	26823000
Magnesium	6010	µg/kg	768.0	5200000	4200000	2900000	3100000	2900000 - 5200000	Pit 1 Aug-93	
Manganese	6010	µg/kg	139	300000	150000	110000	180000	110000 - 300000	Pit 1 Aug-93	409000
Nickel	6010	µg/kg	2340	17000	12000	9600	12000	9600 - 17000	Pit 1 Aug-93	31900
Potassium	6010	µg/kg	45990	820000	670000	360000	640000	360000 - 820000	Pit 1 Aug-93	
Silver	6010	µg/kg	326	ND	ND	ND	ND	ND	N/A	
Sodium	6010	µg/kg	15400	790000	450000	230000	380000	230000 - 790000	Pit 1 Aug-93	
Tin	6010	µg/kg	5120	5300	ND	ND	ND	ND - 5300	Pit 1 Aug-93	
Vanadium	6010	µg/kg	547	35000	26000	20000	20000	20000 - 35000	Pit 1 Aug-93	
Zinc	6010	µg/kg	451	55000	56000	20000	27000	20000 - 56000	Pit 4 Aug-93	69000
Lead	7421	µg/kg	300	6200	3600	2600	9100	2600 - 9100	Pit 3 Aug-93	10600
Arsenic	7060	µg/kg	200	7200	3500	3100	9000	3100 - 9000	Pit 3 Aug-93	13900

ND = Not Detected

(a) VOA lost in lab. Container broken.

TABLE 7.6. (Contd)

LF02 GROUND-WATER	Method	Units	MDL	02M01 May-93	02M01 Aug-93	02M02 May-93	02M02 Aug-93	02MW9 May-93	02MW9 Aug-93	02M0B May-93	02M0B Aug-93	Range of Values	Location / Date of Maximum
Benzene	8020	µg/L	0.105	0.13	0.11	ND	ND	0.16	ND	ND	ND	ND - 0.16	02MW9 May-93
Carbon Tetrachloride	8010	µg/L	0.121	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Chloroform	8010	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
p-Dichlorobenzene	8010/8020	µg/L	0.107	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
1,1-Dichloroethane	8010	µg/L	0.337	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
1,2-Dichloroethane	8010	µg/L	0.139	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
cis-1,2 Dichloroethylene	8010	µg/L	0.127	7.6	4.3	ND	ND	ND	ND	ND	ND	ND - 7.6	02M01 May-93
trans-1,2 Dichloroethylene	8010	µg/L	0.149	1.9	1.4	ND	ND	0.17	ND	ND	ND	ND - 1.9	02M01 May-93
Ethylbenzene	8020	µg/L	0.046	0.048	0.066	0.049	ND	0.13	ND	ND	ND	ND - 0.13	02MW9 May-93
Methylene Chloride	8010	µg/L	0.056	0.12	0.11	ND	0.085	0.094	0.084	0.069	ND	ND - 0.12	02M01 May-93
Tetrachloroethylene	8010	µg/L	0.049	0.078	0.074	ND	ND	0.10	ND	ND	ND	ND - 0.1	02MW9 May-93
Toluene	8020	µg/L	0.056	ND	ND	1.0	ND	0.14	ND	ND	ND	ND - 1.0	02M02 May-93
1,1,1-Trichloroethane	8010	µg/L	0.072	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
1,1,2-Trichloroethane	8010	µg/L	0.043	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Trichloroethylene	8010	µg/L	0.065	6.5	4.5	ND	ND	ND	ND	ND	ND	ND - 6.5	02M01 May-93
Vinyl Chloride	8010	µg/L	0.266	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Xylene	8020	µg/L	0.202	ND	ND	0.24	ND	ND	ND	ND	ND	ND - 0.24	02M02 May-93
Aluminum	6010	µg/L	32.5	21000	2900	1000	350	4500	1900	5100	640	350 - 21000	02M01 May-93
Antimony	6010	µg/L	69.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Barium	6010	µg/L	0.001	510	270	57	35	270	240	220	110	35 - 510	02M01 May-93
Beryllium	6010	µg/L	0.814	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Cadmium	6010	µg/L	4.7	ND	4.8	ND	4.9	ND	ND	ND	5.0	ND - 5.0	02M02 Aug-93
Calcium	6010	µg/L	20.9	79000	58000	51000	34000	54000	50000	32000	46000	34000 - 79000	02M01 May-93
Chromium	6010	µg/L	5.42	32	9.3	ND	ND	ND	8.0	ND	ND	ND - 32	02M01 May-93
Cobalt	6010	µg/L	4.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Copper	6010	µg/L	2.65	61	9.7	ND	ND	ND	6.5	ND	4.4	ND - 61	02M01 May-93
Iron	6010	µg/L	10.3	49000	18000	20000	9900	27000	22000	36000	19000	9900 - 49000	02M01 May-93
Magnesium	6010	µg/L	26.0	32000	22000	18000	7700	14000	12000	8200	8600	7700 - 32000	02M01 May-93
Manganese	6010	µg/L	1.35	1400	890	830	740	1300	1300	1500	1300	740 - 1500	02M0B May-93
Nickel	6010	µg/L	17.9	32	ND	ND	ND	ND	ND	ND	ND	ND - 32	02M01 May-93
Potassium	6010	µg/L	662	11000	9300	7300	2700	5000	4700	2000	2600	2000 - 11000	02M01 May-93
Silver	6010	µg/L	2.87	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Sodium	6010	µg/L	40.9	25000	22000	10000	4200	5800	5700	4000	4300	4000 - 25000	02M01 May-93
Tin	6010	µg/L	51.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Vanadium	6010	µg/L	3.84	48	12	ND	ND	ND	8.8	ND	8.7	ND - 48	02M01 May-93
Zinc	6010	µg/L	3.44	100	20	21	9.3	37	18	28	9.8	9.3 - 100	02M01 May-93
Lead	7421	µg/L	0.6	18	4.3	2.3	2.5	6.2	1.5	8.2	1.2	1.2 - 18	02M01 May-93
Arsenic	7060	µg/L	2	81	43	63	61	62	83	140	53	43 - 140	02M0B May-93

ND = Not Detected

TABLE 7.7. Decision Criteria for Sampling Recommendations, LF02

GROUND WATER					
CONTAMINANT	HIGHEST DETECT µg/L	SDWA MCL µg/L	CARCINOGENS µg/L	SYSTEMIC TOXICANTS µg/L	CRITERIA RESULTS
arsenic	**24000**	**50**	**0.042**		**above†**
iron	**970000**	**300**			**above†**
manganese	**15000**	**50**		**3700**	**above†**
barium	**7620**	**1000**		**1800**	**above†**
beryllium	**29.9**		**0.02**		**above†**
cadmium	**9000**	**5**		**18**	**above†**
chromium	**1100**	**50**			**above†**
lead	**800**	**50**			**above†**
nickel	**1060**			**730**	**above†**
trihalomethanes, total	5.4	100			below
1,2-dichloroethane	**0.47**	**5**	**0.2**		**above**
1,1-dichloroethylene	**0.99**	**0.08**		**360**	**above**
1,1,2,2-tetrachloroethane	**0.8**		**0.087**		**above**
trichloroethylene	0.85	5	3		below
toluene	95	1000		3000	below
benzene	0.29	5	0.6		below

†May be background

SOIL					
CONTAMINANT	HIGHEST DETECT mg/kg	ALASKA SOIL CLEAN UP mg/kg	CARCINOGENS mg/kg	SYSTEMIC TOXICANTS mg/kg	CRITERIA RESULTS
BTEX	0.26	10	1.9		below
TPH	**4290**	**100**			**above**
ethylbenzene	0.01			27000	below
toluene	0.17			55000	below
xylenes	0.08			550000	below
1,1-dichloroethylene	0.28		1.1		below
4-methylphenol	0.07			14000	below

8.0 Source Areas WP32 and WP33

8.0 WP32 AND WP33, WASTEWATER PLANT SPILL PONDS AND EFFLUENT INFILTRATION POND

8.1 LOCATION

WP32 (Wastewater Plant Spill Ponds) and WP33 (Effluent Infiltration Pond) are separated in the Federal Facility Agreement (EPA et al. 1990), and each will be addressed separately in any regulatory action; however, this limited field investigation addresses them together because of their operational and environmental interaction.

These source evaluation report sites are a major portion of the existing Eielson Air Force Base (AFB) wastewater treatment plant (Figure 8.1). The plant is on a separate access road from Central Avenue, about 0.5 km northeast of the main gate. Additional access is gained from a gravel road that intersects the east side of Transmitter Road, about 0.5 km from Central Avenue. The plant is about 100 m west of Garrison Slough. WP33, the effluent infiltration pond, is a 120 m^2 unlined surface water body used for holding the treated effluent released by the plant. WP32, the spill ponds, is located a few meters north of the plant.

8.2 HISTORICAL USE

The wastewater treatment plant, built in 1953, treats most of the base domestic and operations wastewater. Thirty distributed oil-water separators pretreat some operations waste streams. The average daily flow through the plant in 1982 was 3400 m^3/day (900,000 gal/day) (CH2M Hill 1982). Before 1973, primary treatment was effected through three clarifiers and two sludge digesters. The plant was expanded in 1973 to include secondary treatment at two aeration lagoons and a chlorination system. Until 1979, effluent was directly discharged to Garrison Slough under a National Pollution Discharge Elimination System permit (No. AK-002089-3). This permit requires routine monitoring of discharge waters for sanitary sewer parameters, chemical oxygen demand, oil, and grease. These parameters were frequently above normal, indicating unauthorized petroleum, oil, and lubricant disposal or releases.

Wastewater entering the plant may have included wastes generated by spent solvents, deicers, and degreasers from shops and other repair facilities disposed of into storm drains; accidental discharges of these and other industrial chemicals; photography shop and laboratory waste reagents from sinks and floor drains; contaminated wash-down waters from runways, driveways, and roads; fire training pit discharges; dust suppression oils; excess herbicides and pesticides; polychlorinated biphenyl (PCB); wood preservative containing solutions and spillage; and a variety of household and office supplies discharged through sanitary sewer outflows.

In 1979, effluent was diverted to WP33. WP33 is still in use. Effluent leaves the aeration lagoons and enters the chlorine contact station. From the station, the effluent is conveyed around the northwest end of the aeration lagoons in an open, partially lined ditch to the north end of WP33. Effluent can also be discharged directly to WP33 from the aeration lagoons through a gate valve and underground culvert.

From 1953 to 1973, digested sludge was removed to several unlined pits located 15 m north of the main building. Since 1973, sludge has been dried in a natural depression between the digesters and the aeration lagoons. The drying beds contained no leachate recovery system. Sludge was eventually transported to three different locations. Contaminated sludge was stored on site for treatability studies. Petroleum, oil, and lubricant-contaminated sludge is land farmed on base and uncontaminated sludge is applied directly on site, both treatments are under State permit.

WP32 is directly adjacent to the sludge drying beds. WP32 has been used since 1970 to accommodate emergencies, such as pretreatment of contaminated influent to avoid plant upset. WP32 has been used 10 times between 1970 and 1980, with a one-time disposal of about 19,000 L of silver nitrate. In 1975, an "unknown industrial chemical or solvent" spill was diverted to WP32 (CH2M Hill 1982). Discharge from WP32 is controlled by a gate valve and is conveyed by corrugated metal culvert to Garrison Slough.

8.3 HISTORICAL DATA AND ASSUMPTIONS

8.3.1 Site Observations. During the June 1993 site survey, the wastewater treatment plant was being upgraded and construction activity was ubiquitous throughout the area (see photographs in Appendix B). Standing water covered the floor of the spill ponds to a 0.5 m depth. The water was turbid and fetid but no obvious signs of contamination were observed. Vegetation was vigorous in patches in and around the ponds. The effluent pond was similarly unremarkable. No oily sheen or discoloration were seen in the spill ponds or effluent pond.

8.3.2 Previous Investigations. Six previous investigations were done at the wastewater treatment plant (CH2M Hill 1982; Dames & Moore 1985, 1986; HLA 1989, 1991; COE 1991). Sampling and monitoring stations are shown in Figures 8.1 and 8.2.

During the 1982 Installation Restoration Program investigation (CH2M Hill 1982), a records search was done that uncovered the uncontrolled discharges and persistent petroleum, oil, and lubricant contamination reported in Section 8.2. During the 1985 Installation Restoration Program investigation (Dames & Moore 1985), monitoring Well 32M07 was constructed (Table 8.1) up gradient of the drying beds (WP32) and 3- and 5-m deep soil samples were taken. Groundwater was analyzed (Table 8.2) for total organic compounds, total organic halides, lead, phenol, and oil and grease; soil was analyzed (Table 8.3) for PCB, and oil and grease.

In 1986, Dames & Moore (1986) installed six more wells, 32M0A (southeast of the plant), 32M0B (northwest of the spill ponds), 32M0C (north corner of the aeration lagoons), 32M0D (on the back access road), 32M0E (about 183 m northwest of 32M0D), and 32M0F (along the front access road) (Table 8.1). Each of the six wells, plus Well 32M07, was sampled and analyzed (Table 8.2) for purgable halocarbon compounds, purgable aromatic compounds, total petroleum hydrocarbon (TPH), total organic compounds, phosphate, nitrate/nitrite, and lead.

In 1988, Harding Lawson Associates (1989) conducted an investigation and drilled (Table 8.1) Wells 32M01 and 32M02 down gradient from WP33. Four soil samples were taken and analyzed (Table 8.3) for volatile and semivolatile organic compounds, TPH, mercury, and total metals. The seven previous wells were resampled plus the two new wells and the plant water supply well. The water samples plus two grab samples from Garrison Slough and WP33 were analyzed (Tables 8.2 and 8.4) for purgable halocarbon compounds, purgable aromatic compounds, semivolatile organic compounds, TPH, total and dissolved arsenic, total and dissolved lead, total and dissolved mercury, and total metals. Slug tests were performed on Wells 32M01 and 32M02 to determine hydraulic conductivity.

In the 1990 Installation Restoration Program investigation (HLA 1991), monitoring Well 32M03 was installed (Table 8.1). This well, three previously constructed Harding Lawson Associates wells, and two locations along Garrison Slough were sampled and analyzed (Table 8.2) for purgable halocarbons and nitrogen. Groundwater sampling probes were installed around the aeration lagoons and screened for purgable halocarbons and purgable aromatic compounds.

In 1990 in preparation for the plant update, the U.S. Army Corps of Engineers initiated an investigation (COE 1991). Six new monitoring wells were installed (Table 8.1), AP-4900 and AP-4901 (at the southeast end of the aeration lagoons); AP-4903, AP-4904, and AP-4905 (in and around the spill ponds); and AP-4912 (at the east corner of the facility). Soil was sampled at various locations around the facility and in the drying beds (AP-4909). Surface soils were analyzed (Table 8.3) for volatile organic compounds, pesticides, PCB, and metals; a toxic characteristic leach performance test was performed; subsurface samples were analyzed for volatile organic compounds. Groundwater was analyzed (Table 8.2) for volatile and semivolatile organic compounds, inorganic compounds, and fuel.

The results of these investigations are compiled in Tables 8.2 through 8.4, and the important conclusions summarized below.

In the 1984 study (Dames & Moore 1985), groundwater samples did not indicate any detectable contaminants. In 1986 groundwater samples, 1,1-dichloroethane (2 μg/L), trichlorofluoromethane (21 μg/L), and 1,2-dichloroethylene (2.4 μg/L) were detected. In 1988, benzene (0.25 μg/L), trichloroethylene (0.523 μg/L), and toluene (16.4 μg/L) were also found. Methylene chloride, butylbenzylphthalate, and bis(2-ethylhexyl)phthalate were reported as probable laboratory contaminants. Many analytes were not found in the same well in both studies. Total and/or dissolved concentrations of aluminum, arsenic, barium, beryllium, copper, iron, lead, manganese, mercury, and zinc were found above maximum contaminant levels.

In 1989, many of the volatile organic species were analyzed but not detected from the earlier wells; however, detectable chloroform (0.23 μg/L) was found at the new well (32M03). The U.S. Army Corps of Engineers well samples showed reportable concentrations of toluene (73 μg/L); 1,2-dichloroethylene (6 μg/L), mercury (4.56 μg/L), arsenic (24 μg/L), and lead (9.4 μg/L) were also found.

Soil samples from the site have also shown varied contamination. In 1984 and 1990, PCB was analyzed and not found. Pesticides found included dieldrin, chlordane, 4,4'-DDD, and 4,4'-DDT, all within 0.3 m of the surface. Volatile and semivolatile organic compounds found included benzene, toluene, ethylbenzene, and xylene; methylene chloride; acetone; di-n-butylphthalate; bis(2-ethylhexyl)phthalate; chlorobenzene; dichlorobenzene; naphthalene; and elevated levels of arsenic, barium, chromium, lead, cadmium, mercury, and selenium. In addition, at 32M02SA, near the intersection of Transmitter Road and the rear access road, detectable amounts of polycyclic aromatic hydrocarbons (PAHs) [benzo(B)fluoranthene, benzo(A)pyrene, phenanthrene, and pyrene] were found (0.16 to 0.23 mg/kg). At AP-4904 (the spill pond), PAHs were also found at unreported levels [benzo(A)anthracene, benzo(A)pyrene, benzo(K)fluoranthene, chrysene, fluoranthene, pyrene, and phenanthrene]. Both detectable levels were reported from the top 0.3 m of soil.

No organic compounds were found in Garrison Slough in the 1988 and 1990 investigations. Arsenic (44.9 μg/L total and 20 μg/L dissolved) and mercury (0.3 μg/L total and 0.4 μg/L dissolved) were both elevated in the 1988 samples. Soil had reportable concentrations of methylene chloride (2.30 μg/kg), toluene (1.50 μg/kg), 4-methylphenol (0.40 μg/kg), TPH (5,390 mg/kg), arsenic (15.4 mg/kg), cadmium (1.13 mg/kg), and chromium (23.7 mg/kg). In WP33, chloroform (0.846 μg/L), 1,2-dichloroethane (0.242 μg/L), methylene chloride (12.5 μg/L), tetrachloroethylene (9.81 μg/L), arsenic (4.6 μg/L total and 5 μg/L dissolved), and lead (7.2 μg/L total) were all found.

Geophysical surveys (electromagnetic) were run during the 1986 (Dames & Moore 1986) and 1988 (HLA 1989) field seasons. No unknown buried features were identified.

In summary, a consistent pattern of contaminant concentrations, sources, and transport mechanisms has not emerged. Although organic compounds and trace metals appear to have entered into the system, the fate of these pollutants is not obvious from previous investigations. Likewise, which of these contaminants is attributable to past practices and which may have resulted from current operations is not clear.

Concentrations of 1,2-DCA, 1,1-dichloroethane, arsenic, cadmium, chromium, mercury, and lead were found in groundwater at levels above maximum contaminant levels or risk-based criteria. Surface water values in Garrison Slough were above water quality criteria for arsenic, mercury, and lead. Soil samples were found with concentrations of arsenic, lead, PAH, and TPH at levels above risk-based criteria or state of Alaska cleanup levels.

8.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

8.4.1 Potential Contaminants of Concern. The wastewater treatment plant could receive any sort of liquid or solid suspension waste from base operations or domestic use. Many of the potential waste components are represented by the contaminants already found including solvents, degreasers, paints, thinners, deicer/antifreeze solutions, pesticides and herbicides, PCB-contaminated oils, waste oils, diesel, gasoline, hydraulic fluids, photographic solutions, and paint. Silver nitrate was already reported by base personnel as a likely waste material along with the undetermined solvent (see Section 8.2).

Because of this diversity of waste streams and products, almost no commonly found contaminant can be ruled out. These potential contaminants are

arsenic	1,1-dichloroethylene	PAH
cadmium	1,2-dichloroethylene	PCB
chromium	1,1,1-trichloroethane	tetrachloroethylene
lead	1,1,2,2-tetrachloroethane	tetraethyl lead
mercury	acetone	tetramethyl lead
nickel	benzene	toluene
silver	DDT, DDD, DDE	trichloroethylene
1,1-dichloroethane	ethylbenzene	trichlorofluoromethane
1,2-dichloroethane	naphthalene	xylene.

Similar to other Eielson AFB areas, the wastewater treatment plant has indicated high levels of heavy metals. The potential influence of background soil composition on this observation has not been determined.

8.4.2 Conceptual Model. The numerous investigations and data collected from the wastewater treatment plant present a scattered picture of the hydrology and geology. Borings have revealed sand and silty sand to a depth of 1.8 to 2.4 m underlain by sandy gravel. These textures are consistent with fluvial channel and overbank deposits associated with Garrison Slough and its tributaries.

Water levels in the wells vary between 1.2 and 2.7 m (below casing) and are seasonally correlated. The effluent pond affects groundwater contours throughout the wastewater treatment plant. Groundwater monitoring data suggest that the groundwater gradient at WP32 and WP33 is dynamic and may be greatly different from the base-wide northerly gradient. Past measurements (HLA 1989, 1990) suggest that the gradient varies between 0.9 and 1.7 m/km and that the hydraulic conductivity is high.

These observations suggest that contaminants could move from the eluent or spill ponds downward to the water table and be transported as dissolved or in light nonaqueous phases with local groundwater flow. The seasonal and dynamic aspect to the regional groundwater regime could impede or exacerbate this migration. Surficial transport could only occur if the ponds were breached or over topped in the direction of the topographic slope, toward Garrison Slough.

8.4.3 Sampling Objective and Strategy. WP32 and WP33 are difficult to evaluate because the wastewater treatment plant is still operating. Separating contamination resulting from past activities and from recent releases is difficult. Also, ongoing construction at the wastewater treatment plant has introduced the potential for additional uncontrolled releases of contaminants, although no modification at the effluent pond is planned. Past investigations have not demonstrated a clear understanding of the wastewater treatment plant and have generated a wealth of data that may not be relevant to the specific needs of either CERCLA or the source evaluation report process.

Although considerable ambiguity exists for all of the sources at the wastewater treatment plant, the source of greatest uncertainty is WP33. Because WP33 is still in constant use and infiltration from the pond has a strong hydrological effect on its surroundings, separating past contamination from current is difficult. During past investigations, only arsenic was noted in the sediment of WP33 at levels higher than regulatory and risk-based criteria (U.S. Air Force 1993c), and methylene chloride, a common laboratory contaminant, was the only organic contaminant found in both the pond and the soil. This suggested that grab samples of the pond surface water or soil would produce ambiguous data.

The sludge drying beds received material from 1953 to 1973. WP32 (the spill ponds) is designed to receive contaminated raw sewage and is not a standard part of the ongoing or upgrade operations. These ponds and beds have concentrated solid and semi- to nonvolatile components entering the system and unlikely to be affected by the current operation. For this reason, sampling occurred only at the sludge drying beds and WP32.

The compounds chosen for analysis in the source evaluation reports Phase 2 limited field investigation are discussed in the sampling and analysis plan (U.S. Air Force 1993c) and correspond to those analytes that required further quantification and site characterization. Certain data, for example, pesticides and volatile organic compound levels at the sludge drying beds and metals and pesticides data at Well 32M02, were analyzed but not found in the numerous past investigations.

In summary, the following sampling strategy was used at WP32 and WP33.

Objective: To evaluate contamination at WP32 and WP33 that is unambiguously the result of past practices.

Action: Sample the sludge drying beds as a representative of pre-1973 contaminants of concern entering the effluent pond, WP33.

Sample the spill ponds, WP32, as a representative of plant upset conditions, hazardous waste discharges, and routine contaminant releases, primarily between 1970 and 1980.

Sample Well 32M02 to confirm PAH levels, metals, and nitrate from past investigations.

Activity: Soil samples taken at regular intervals between the surface and water table at the drying beds and spill ponds.

Grab sample of unfiltered pit water from soil sampling pits.

Groundwater sample taken from Well 32M02.

8.4.4 Limited Field Investigation Field Work. Two sampling stations were placed in WP32, one at the culvert outfall (Figure 8.1) of the south pond and one at the deepest part of the north pond. Two sampling stations will be placed in the sludge drying beds, one per bed. Well 32M02 was sampled to better characterize the PAH found at that location and to determine nitrate.

Surface soil samples were a composite of the material from the ground surface to the depth of the first backhoe cut, generally about 0.5 m. Pits were excavated at each sampling station to the water table (Appendix B). The side walls and bottom of the pit were sampled and a grab sample of the pit water was taken. These water samples were unfiltered and were not representative of groundwater at the locations. Strata in WP32 included a 0.3-m-thick layer of wet plant material and dark silt underlain by about 1 m of dark-bluish-grey, fetid, organic-rich sandy silt with gravel. Groundwater was encountered in the south pond at 1 m below the surface. Standing surface water in the north pond precluded a water sample. Although three samples were called for in the work plan (U.S. Air Force 1993c), only two were possible because of the high water table.

Soil at the drying bed consisted of about 0.1 m of residual sludge underlain by about 1 to 1.5 m of light brown gravelly to silt sand with cobbles. These units were underlain by at least 0.75 m of dark-bluish-grey, fetid, organic-rich, silty sand with gravel. Groundwater was found at approximately 2.5 m below the surface.

Parameters analyzed (Tables 8.5 and 8.6) in the sludge drying beds were semivolatile organic compounds and metals. Parameters analyzed in the spill ponds were volatile and semivolatile organic compounds, pesticides, and metals (Tables 8.5 through 8.9). At Well 32M02, samples were analyzed for nitrates and semivolatile organic compounds (Tables 8.7 and 8.10).

8.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

The Phase 2 limited field investigation data have been compared to regulatory, risk-based, and background criteria (Table 8.11). Historical data have suggested that elevated concentrations of 1,2-DCA, 1,1-dichloroethane, arsenic, cadmium, chromium, lead, and mercury exist in groundwater, relative to regulatory and risk-based criteria. High levels of tetrachloroethylene, arsenic, and lead may be occurring in surface water. Soil has been found to have elevated arsenic, lead, PAH, and TPH.

No semivolatile organic compounds were found in the groundwater at WP33 or the sludge drying beds. Soils at the spill pond 2 (WP33) contained levels of bis(2-ethylhexyl)phthalate (a plasticizer) (350 μg/L) and p-chloroanaline (1000 μg/kg) above method detection limits. Spill pond 1 soil samples also revealed levels of bis(2-ethylhexyl)phthalate (350 μg/kg) above detection limits. Both analytes are well below regulatory and risk-based criteria.

Pesticides and herbicides were not found (Tables 8.8 and 8.9) in spill pond 1 in levels greater than the method detection level. At spill pond 2, lindane (4.1 μg/kg), DDD (270 μg/kg), DDE (85 μg/kg), and dieldrin (110 μg/kg) were found in soil, all at levels below regulatory and risk-based criteria. Chlordane was also found at very high but analytically indeterminate levels (Appendix C). However, a sample less than 1 m above this depth was below method detection limits. Groundwater at spill pond 2 showed levels of delta-BHC, 4,4-DDD, and 4,4-DDE above method detection levels but below risk-based criteria. Chlordane, at 3.7 mg/L, is above the hazard index and carcinogenic hazard criteria.

Groundwater from Well 32M02, directly down gradient of the effluent pond, did not exceed detection limits for any volatile organic compounds (Table 8.7). This result agrees with historical data (Table 8.1) that reveals no volatile organic compound or dissolved metal at levels greater than regulatory or risk-based criteria for any of the wells down gradient of WP32. Although Well 32M0D did exceed (0.611 μg/L) the 10^{-6} carcinogenic health criteria (0.2 μg/L) for 1,2-dichloroethane, a duplicate analysis of the sample did not confirm this. Similarly, TPH at several wells exceeded (300 to 400 μg/L) the Alaska water quality standards (15 μg/L, chronic, aquatic life) in 1986 but this was not replicated in subsequent samples. Nitrate levels did not exceed regulatory action level (Table 8.10). Because of standing surface water, only spill pond 2 was sampled for volatile organic compounds. Detectable levels of p-dichlorobenzene (0.34 μg/L), ethylbenzene (0.12 μg/L), toluene (0.28 μg/L), and trichloroethylene (0.017 μg/L) were all below regulatory and risk-based criteria. Soils from spill pond 2, 0.5 m below the surface, gave detectable levels of p-dichlorobenzene (0.16 μg/kg), ethylbenzene (0.19 μg/kg), toluene (0.16 μg/kg), and trichloroethylene (0.94 μg/kg), but all of the amounts are below regulatory and risk-based criteria for soils.

The lead and arsenic metal values for all soil samples are elevated (Table 8.6) with respect to regulatory and risk-based criteria. Lead in pond 2 soil exceeds background concentrations, but arsenic is not above this criteria. The beryllium metal values are elevated at spill pond 2 and both sludge beds. Pond 2 is particularly high in metal values but only exceeds background levels and all criteria for lead. Grab samples of pit water were unfiltered and reflect the adjacent soil values in all cases. As expected, almost all exceed background water values.

Spill pond 2 may confirm the anecdotal information on silver nitrate releases. Silver is elevated in the soil (0.5 m deep) relative to all other samples at 32,000 μg/kg. Curiously, the sludge pit grab sample gave the highest silver concentration.

One of the objectives of this study was to use WP33 and the sludge drying bed to estimate the kinds of contaminants that may have entered WP32 from past practices. The elevated PAH and volatile organic compounds reported in previous investigations were not confirmed by this investigation. This suggests that if such contaminants are in the effluent pond, they were released because of current operations. The high levels of metals were confirmed and suggest that metals, including silver, were delivered to WP32. Despite this, the level of silver in WP33 water and soil is below criteria and/or background values and has not accumulated in the subsurface. This suggests that even if silver has gone through the wastewater system the pond is not contaminated.

8.6 RISK CHARACTERIZATION

8.6.1 Soil. The soils at WP32 contain levels of arsenic, lead, and chlordane in excess of regulatory, risk-based, and background criteria and are contaminated.

The contaminant level of sediments associated with WP33 is unknown but the results of the limited field investigation have confirmed that silver, arsenic, lead, and several other metals have accumulated in the wastewater treatment system, at levels exceeding regulatory and risk-based criteria and background levels. This suggests that sediments in the pond need to be sampled and analyzed for metals and pesticides before the risk associated with the soil pathway can be evaluated at WP33.

8.6.2 Groundwater. No historical data on the groundwater at WP32 was available for organic compounds. Chlordane was found at levels above criteria. No representative water samples were collected other than grab samples. Given the high concentrations of metals in soil at WP32, the results of previous studies are probably correct and groundwater at WP32 is contaminated.

Groundwater at Well 32M02 was not contaminated. Specifically, PAHs were not detected. Historical data from that well supports this result. This suggests that the groundwater at WP32 is not contaminated.

8.6.3 Surface Water. Because of surface soils and groundwater, WP32 is contaminated. Further investigation will be necessary to determine risk to exposed populations from the surface water pathway.

No physical connection exists between WP33 and any surface drainage, and overland flow is unlikely. Historical data demonstrated that none of the metals were elevated in the pond and that tetrachloroethylene was the only contaminant. Tetrachloroethylene has not been found in the sludge beds or spill ponds at action levels. This suggests that the surface water at the pond is not contaminated and this pathway is not complete.

8.6.4 Air. No volatile organic compounds were present above risk-based or regulatory criteria and there is little chance of direct inhalation of organic contaminants at either WP32 or WP33.

Elevated concentrations of lead in soil at WP32 could provide a source to an air pathway through suspension of contaminated fines. Vegetation in the ponds limits this potential source term to disturbed contaminated soil.

At WP33, it is unlikely that any contaminated soil would be exposed unless the pond is drained. Because these sediments have not been sampled, it is unknown if levels of metals exceed regulatory and risk-based criteria.

8.7 CONCLUSIONS AND RECOMMENDATIONS

The risk to human and ecological health from WP32 and WP33 is unclear. It is recommended that this site be included with the remedial investigation/feasibility study for OU 4. The revised schedule for OU 4 is compatible with this action. Additional work should consist of downgradient sampling of groundwater wells 32MOD, 32M01, 32MOE, and 32M02. Continued sampling of the spill ponds should be conducted in concert with their planned reconstruction.

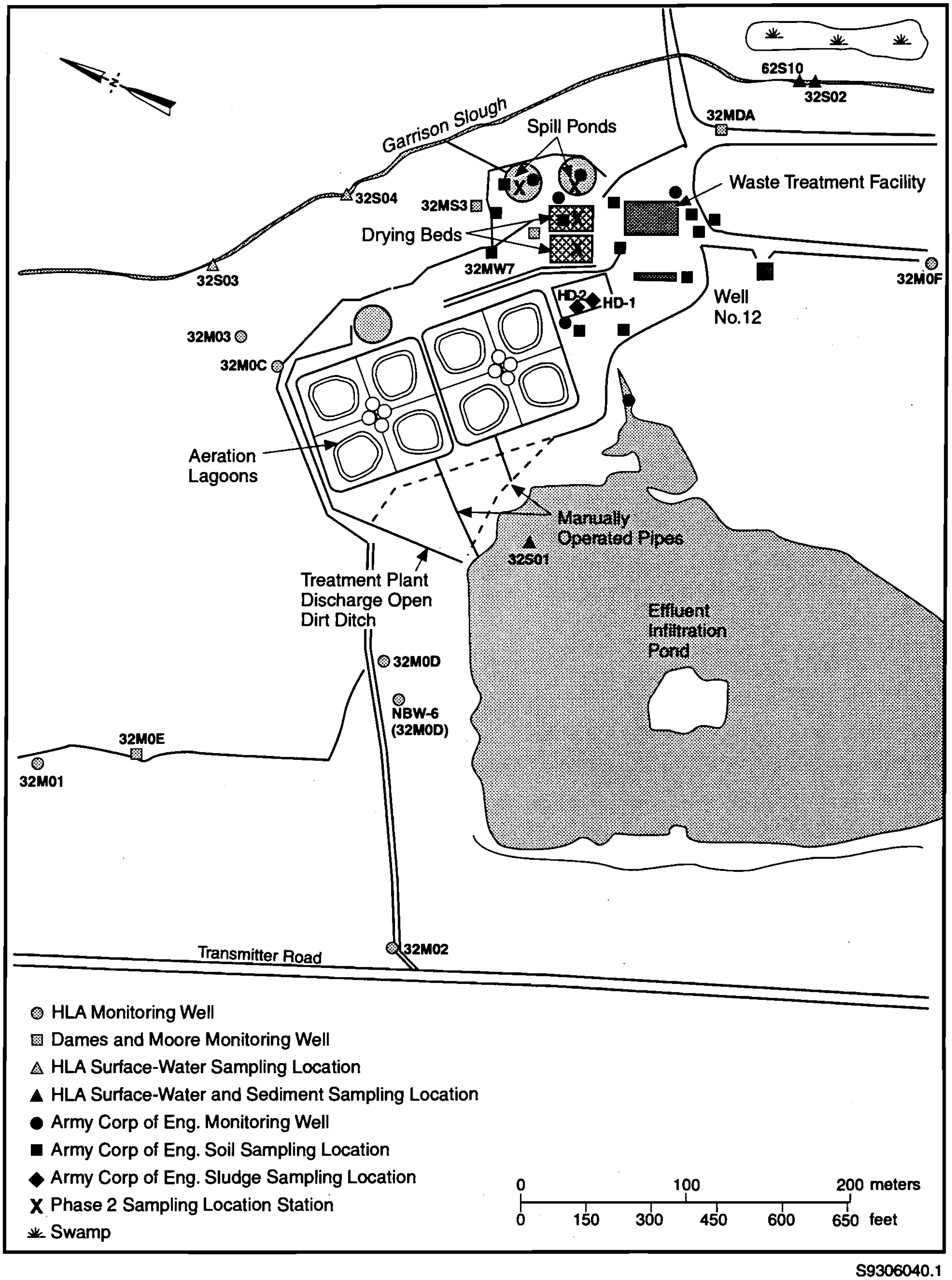
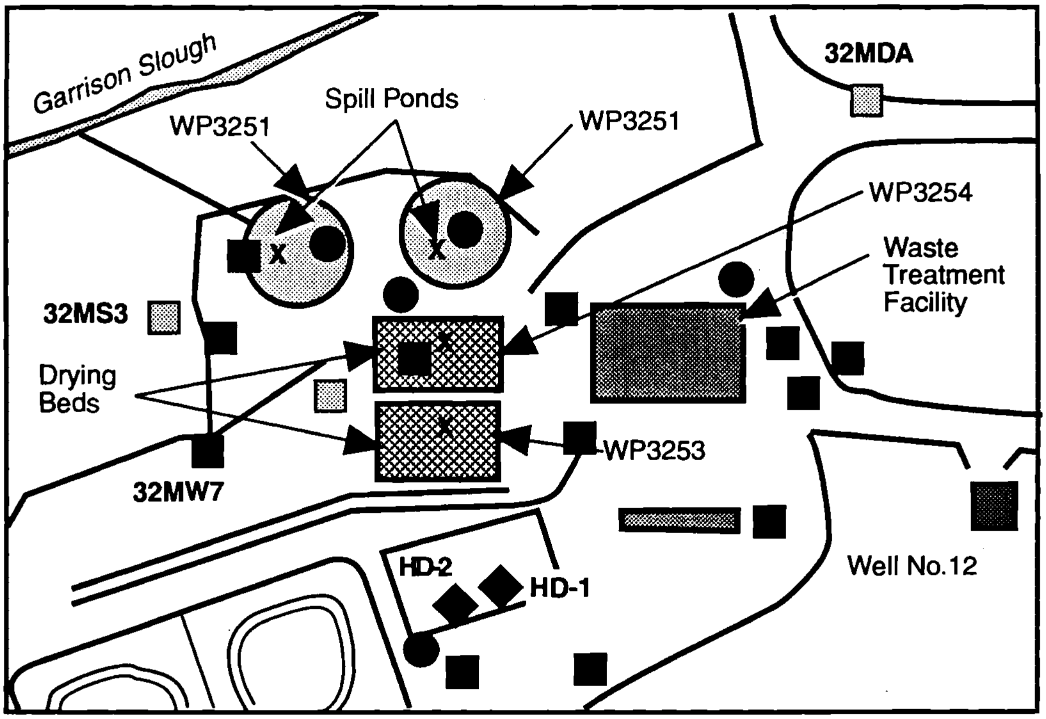


FIGURE 8.1. Map of WP32 and WP33 with Phase 2 Sampling Stations



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- HLA Monitoring Well
- Dames and Moore Monitoring Well
- HLA Surface-Water Sampling Location
- Army Corp of Eng. Monitoring Well
- Army Corp of Eng. Soil Sampling Location
- Army Corp of Eng. Sludge Sampling Location
- X Phase 2 Sampling Location Station

FIGURE 8.2. WP32 and WP33 Spill Ponds and Drying Beds

TABLE 8.1. Monitor Well Construction Details and Survey Data, WP32 and WP33

WP32 Monitor Well Construction Details and Survey Data

Well No. (Old No.)	Year Constr.	Depth (ft)	Screened Int. (ft)	Year(s) Sampled	Water Table Elevation (ft)											
					Jun-84	Dec-84	08/15/86	08/16/86	Sep-86	1987	10/21/88	10/23/88	10/26/88	10/29/88	09/06/90	Sep-90
32MW7 (W-7)	1984	24.0	4 - 24	1984, 86, 87, 88	516.4	519.6	- -	- -	519.58	N/A	- -	519.22	- -	- -	520.0	- -
32M0A (GW32-A)	1986	13.0	3 - 13	1986, 87, 88			520.9	- -	519.85	N/A	- -	- -	519.69	- -	520.3	- -
32M0B (GW32-B)	1986	16.5	5 - 15	1986, 87, 88			517.5	- -	519.47	N/A	- -	- -	519.12	- -	519.8	- -
32M0C (GW32-C)	1986	16.5	5 - 15	1986, 87, 88, 90			520.0	- -	519.11	N/A	519.08	- -	- -	- -	520.1	- -
32M0D (GW32-D)	1986	16.5	5 - 15	1986, 87, 88, 90				521.3	519.6	N/A	- -	519.45	- -	- -	520.3	- -
32M0E (GW32-E)	1986	16.0	5 - 15	1986, 87, 88				520.7	518.96	N/A	- -	518.77	- -	- -	519.5	- -
32M0F (GW32-F)	1986	16.0	4.5 - 14.5	1986, 87, 88				522.4	521.53	N/A	- -	521.27	- -	- -	- -	- -
32M01	1988	16.5	4 - 10	1988										517.58	518.5	- -
32M02	1988	16.5	4 - 10	1988, 90										519.46	520.3	- -
32M03	1990	15.0	2 - 10	1990											520.0	- -
AP-4900	1990	N/A	N/A	1990												N/A
AP-4901	1990	N/A	N/A	1990												N/A
AP-4903	1990	N/A	N/A	1990												N/A
AP-4904	1990	N/A	N/A	1990												N/A
AP-4905	1990	N/A	N/A	1990												N/A
AP-4912	1990	N/A	N/A	1990												N/A

No Entry Well not constructed.
- - Water table elevation not measured
N/A Data not available.

TABLE 8.2. Groundwater Sample Data From Previous Investigations, WP32 and WP33

WP32 Ground Water Sample Data From Previous Investigations - sheet 1 of 8

Parameter	Units	Det. Limit	32M01	32M02		32M03	32MW7				32M0A		
			1988	1988	1990	1990	1984	1986	1987	1988	1986	1987	1988
Oil and Grease	µg/L	500					3100						
PCBs	µg/L	0.5					ND						
Pesticides	µg/L	.002-.02											
Phenol	µg/L	10					ND						
TDS	µg/L	1000	358000	346000			- -	330000		500000	210000	Unknown	250000
TOC	µg/L	1000					11000	7000			33000		
TOX	µg/L	10					180000						
Total Phosphate	µg/L	100						300			8100		
pH (field)							7.05						
Spec. Cond. @ 25°C	µmhos/cm						519						
<u>Petroleum Hydrocarbons</u>			ND	ND				ND	Unknown	ND	ND	Unknown	ND
<u>Purgeable Halocarbons</u>													
Chloroform	µg/L	0.2	ND	ND	ND	0.23		ND		ND	ND		ND
Chloromethane	µg/L	0.4	1.36	1.01	ND	ND		ND		ND	ND		1.03
1,1-Dichloroethane	µg/L	0.49	ND	ND	ND	ND		ND		ND	ND		ND
1,2-Dichloroethane	µg/L	0.2	0.281	0.238	ND	ND		ND		0.271	ND		0.493
1,2-Dichloroethylene	µg/L		ND	ND	ND	ND		ND		ND	ND		ND
Trans-1,2-Dichloroethene	µg/L	0.42	ND	ND	ND	ND		ND		ND	ND		ND
Methylene Chloride	µg/L	1.31	ND	ND	ND	ND		ND		15.2	ND		ND
Trichloroethene	µg/L	0.52	ND	ND	ND	ND		ND		ND	ND		ND
Trichlorfluoromethane	µg/L	0.44	ND	ND	ND	ND		8.7		ND	21		ND
<u>Purgeable Aromatics</u>													
Benzene	µg/L	0.15	ND	ND				ND		0.19	ND		ND
Toluene	µg/L	0.25	ND	ND				ND		16.4	ND		ND
Xylenes, total	µg/L	0.85	ND	ND				ND		ND	ND		ND
<u>Semi-Volatile Organics</u>													
Butylbezylphthalate	µg/L	1.5	ND	ND						440			140
Bis(2-Ethylhexyl)phthalate	µg/L	2	ND	ND						590			210
<u>Arsenic</u>													
Arsenic, total	µg/L	1.8	97.6	ND						74.9			67
Arsenic, dissolved	µg/L	1.8	4	ND						50			10
<u>Lead</u>													
Lead, total	µg/L	1.4	49.1	14.3			ND	ND		9.3	6		27.7
Lead, dissolved	µg/L	1.4	5	4						ND			ND
<u>Mercury</u>													
Mercury, total	µg/L	0.2	ND	ND						ND			0.3
Mercury, dissolved	µg/L	0.2	ND	ND						ND			ND

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 2 of 8													
		Det.	32M0B			32M0C					32M0D		
Parameter	Units	Limit	1986	1987	1988	1986	1987	1988	1990	1990-Dup	1986	1987	1988
Oil and Grease	µg/L	500											
PCBs	µg/L	0.5											
Pesticides	µg/L	.002-.02											
Phenol	µg/L	10											
TDS	µg/L	1000	200000	Unknown	316000	460000	Unknown	470000			290000	Unknown	268000
TOC	µg/L	1000	110000			57000					26000		
TOX	µg/L	10											
Total Phosphate	µg/L	100	5500			4500					3600		
pH (field)													
Spec. Cond. @ 25°C	µmhos/cm												
Petroleum Hydrocarbons			400	Unknown	ND	300	Unknown	ND			300	Unknown	ND
Purgeable Halocarbons													
Chloroform	µg/L	0.2	ND		ND	ND		ND	ND	ND	ND		ND
Chloromethane	µg/L	0.4	ND		ND	ND		ND	ND	ND	ND		2.69
1,1-Dichloroethane	µg/L	0.49	ND		0.639	2		ND	ND	ND	0.74		ND
1,2-Dichloroethane	µg/L	0.2	ND		ND	ND		ND	ND	ND	ND		ND
1,2-Dichloroethylene	µg/L		ND		ND	ND		ND	ND	ND	ND		ND
Trans-1,2-Dichloroethene	µg/L	0.42	ND		ND	2.4		ND	ND	ND	ND		ND
Methylene Chloride	µg/L	1.31	ND		8.62	ND		ND	ND	ND	ND		ND
Trichloroethene	µg/L	0.52	ND		ND	ND		0.523	ND	ND	ND		ND
Trichlorfluoromethane	µg/L	0.44	2.9		ND	9		0.481	ND	ND	6.1		ND
Purgeable Aromatics													
Benzene	µg/L	0.15	ND		ND	ND		0.25			ND		ND
Toluene	µg/L	0.25	ND		ND	ND		ND			ND		ND
Xylenes, total	µg/L	0.85	ND		ND	ND		ND			ND		ND
Semi-Volatile Organics													
Butylbezylphthalate	µg/L	1.5			ND			ND					ND
Bis(2-Ethylhexyl)phthalate	µg/L	2			ND			ND					ND
Arsenic													
Arsenic, total	µg/L	1.8			53			17.3					50
Arsenic, dissolved	µg/L	1.8			40			8					40
Lead													
Lead, total	µg/L	1.4	ND		21.3	ND		28			ND		11.5
Lead, dissolved	µg/L	1.4			ND			ND					ND
Mercury													
Mercury, total	µg/L	0.2			ND			0.4					ND
Mercury, dissolved	µg/L	0.2			ND			ND					ND

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 3 of 8

Parameter	Units	Det. Limit	32M0D (cont.) 1988-Dup	32M0D (cont.) 1990	32M0E 1986	32M0E 1987	32M0E 1988	32M0F 1986	32M0F 1987	32M0F 1988	AP-4900 1990	AP-4901 1990	AP-4903 1990
Oil and Grease	µg/L	500											
PCBs	µg/L	0.5											
Pesticides	µg/L	.002-.02											
Phenol	µg/L	10											
TDS	µg/L	1000	266000		320000	Unknown	310000	240000	Unknown	252000			
TOC	µg/L	1000			34000			19000					
TOX	µg/L	10											
Total Phosphate	µg/L	100			4300			4700					
pH (field)													
Spec. Cond. @ 25°C	µmhos/cm												
<u>Petroleum Hydrocarbons</u>			ND		ND	Unknown	ND	ND	Unknown	ND			
<u>Purgeable Halocarbons</u>													
Chloroform	µg/L	0.2	ND	ND	ND		ND	ND		ND	ND	ND	ND
Chloromethane	µg/L	0.4	ND	ND	ND		ND	ND		ND	ND	ND	ND
1,1-Dichloroethane	µg/L	0.49	ND	ND	0.65		ND	ND		ND	ND	ND	ND
1,2-Dichloroethane	µg/L	0.2	0.611	ND	ND		ND	ND		ND	ND	ND	ND
1,2-Dichloroethylene	µg/L		ND	ND	ND		ND	ND		ND	ND	ND	ND
Trans-1,2-Dichloroethene	µg/L	0.42	ND	ND	ND		ND	ND		ND	ND	ND	ND
Methylene Chloride	µg/L	1.31	ND	ND	ND		1.5			2.37	ND	ND	ND
Trichloroethene	µg/L	0.52	ND	ND	ND		ND	ND		ND	ND	ND	ND
Trichlorfluoromethane	µg/L	0.44	ND	ND	4.6		ND	11		ND	ND	ND	ND
<u>Purgeable Aromatics</u>													
Benzene	µg/L	0.15	ND		ND		0.19	ND		ND	ND	ND	ND
Toluene	µg/L	0.25	ND		ND		ND	ND		ND	ND	ND	73
Xylenes, total	µg/L	0.85	1.15		ND		ND	ND		ND	ND	ND	ND
<u>Semi-Volatile Organics</u>													
Butylbezylphthalate	µg/L	1.5	ND				ND			ND	ND	ND	ND
Bis(2-Ethylhexyl)phthalate	µg/L	2	ND				ND			ND	ND	ND	ND
<u>Arsenic</u>													
Arsenic, total	µg/L	1.8	51.1				46.8			26	6.8	8.4	23
Arsenic, dissolved	µg/L	1.8	40				30			5	ND	ND	ND
<u>Lead</u>													
Lead, total	µg/L	1.4	12		ND		38.1	ND		39.7	ND	ND	ND
Lead, dissolved	µg/L	1.4	ND				ND			ND	ND	ND	73
<u>Mercury</u>													
Mercury, total	µg/L	0.2	ND				ND			ND	4.56	ND	ND
Mercury, dissolved	µg/L	0.2	ND				ND			ND	ND	ND	ND

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 4 of 8

Parameter	Units	Det. Limit	AP-4904 1990	AP-4905 1990	AP-4912 1990	Conc. Range	Location of Max.
Oil and Grease	µg/L	500					
PCBs	µg/L	0.5					
Pesticides	µg/L	.002-.02					
Phenol	µg/L	10					
TDS	µg/L	1000				200000 - 500000	32MW7
TOC	µg/L	1000				7000 - 110000	32M0B
TOX	µg/L	10				180000	32MW7
Total Phosphate	µg/L	100				300 - 8100	32M0A
pH (field)						7.05	32MW7
Spec. Cond. @ 25°C	µmhos/cm					519	32MW7
<u>Petroleum Hydrocarbons</u>						300 - 400	32M0B
<u>Purgeable Halocarbons</u>							
Chloroform	µg/L	0.2	ND	ND	ND	0.23	32M03
Chloromethane	µg/L	0.4	ND	ND	ND	1.01 - 2.69	32M0D
1,1-Dichloroethane	µg/L	0.49	ND	ND	ND	0.639 - 2	32M0C
1,2-Dichloroethane	µg/L	0.2	ND	ND	ND	0.238 - 0.611	32M0D
1,2-Dichloroethylene	µg/L		6	ND	ND	6	AP-4904
Trans-1,2-Dichloroethene	µg/L	0.42	ND	ND	ND	2.4	32M0C
Methylene Chloride	µg/L	1.31	ND	ND	ND	1.5 - 15.2	32MW7
Trichloroethene	µg/L	0.52	ND	ND	ND	0.523	32M0C
Trichlorfluoromethane	µg/L	0.44	ND	ND	ND	0.481 - 21	32M0A
<u>Purgeable Aromatics</u>							
Benzene	µg/L	0.15	ND	ND	ND	0.19 - 0.25	32M0C
Toluene	µg/L	0.25	ND	ND	ND	16.4 - 73	AP-4903
Xylenes, total	µg/L	0.85	ND	ND	ND	1.15	32M0D
<u>Semi-Volatile Organics</u>							
Butylbezylphthalate	µg/L	1.5	ND	ND	ND	140 - 440	32MW7
Bis(2-Ethylhexyl)phthalate	µg/L	2	ND	ND	ND	210 - 590	32MW7
<u>Arsenic</u>							
Arsenic, total	µg/L	1.8	ND	18	24	6.8 - 97.6	32M01
Arsenic, dissolved	µg/L	1.8	ND	ND	ND	4 - 50	32MW7
<u>Lead</u>							
Lead, total	µg/L	1.4	ND	ND	9.4	6 - 49.1	32M01
Lead, dissolved	µg/L	1.4	ND	ND	ND	4 - 73	AP-4903
<u>Mercury</u>							
Mercury, total	µg/L	0.2	ND	ND	ND	0.3 - 4.56	AP-4900
Mercury, dissolved	µg/L	0.2	ND	ND	ND		

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 5 of 8

Parameter	Units	Det. Limit	32M01	32M02		32M03	32MW7				32M0A		
			1988	1988	1990	1990	1984	1986	1987	1988	1986	1987	1988
__ICP Metals Scan__													
Aluminum, total	µg/L	30	33100	5580						2110			23200
Arsenic, total	µg/L	40	ND	ND						90			80
Arsenic, dissolved	µg/L	40	ND	ND						ND			ND
Barium, total	µg/L	1.8	982	189						289			588
Barium, dissolved	µg/L	1.8	300	200						200			200
Beryllium, total	µg/L	1.8	ND	ND						2.6			ND
Beryllium, dissolved	µg/L	1.8	ND	2.3						ND			ND
Cadmium, total	µg/L	3	ND	ND						ND			ND
Calcium, total	µg/L	1.3	74400	61						129000			60100
Calcium, dissolved	µg/L	1.3	60600	60200						120000			49400
Chromium, total	µg/L	6	61.4	8.8						ND			35
Cobalt, total	µg/L	6	32.1	ND						ND			17.8
Copper, total	µg/L	3	145	30.6						15.2			5306
Iron, total	µg/L	20	61200	7890						11100			36800
Iron, dissolved	µg/L	20	80	ND						2000			600
Lead, total	µg/L	30	40	ND						ND			ND
Magnesium, total	µg/L	44	25800	13900						20100			19500
Magnesium, dissolved	µg/L	44	13700	11600						18400			11700
Manganese, total	µg/L	1.4	8170	3360						4330			2320
Manganese, dissolved	µg/L	1.4	4000	2900						4000			1700
Nickel, total	µg/L	20	73	20.3						ND			26.2
Potassium, total	µg/L	408	11400	9410						6890			8500
Potassium, dissolved	µg/L	408	6000	8450						5990			2850
Sodium, total	µg/L	82	29800	35000						10600			8870
Sodium, dissolved	µg/L	82	23100	23900						9710			4940
Vanadium, total	µg/L	10	104	13.7						ND			61.6
Zinc, total	µg/L	2	198	32.5						14.7			85.2
Zinc, dissolved	µg/L	2	30	30						30			50
__Common Anions__													
Chloride	µg/L	200	22850	27720						5360			2955
Flouride, dissolved	µg/L	500	ND	ND						ND			ND
Sulfate	µg/L	500	4004	3964						30410			15790
__Nitrogen__	µg/L	10	30	12	133			24000		ND	160		ND

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 6 of 8

Parameter	Units	Det. Limit	32M0B 1986	32M0B 1987	32M0B 1988	32M0C 1986	32M0C 1987	32M0C 1988	32M0C 1990	32M0C 1990-Dup	32M0D 1986	32M0D 1987	32M0D 1988
ICP Metals Scan													
Aluminum, total	µg/L	30			1200			19600					2290
Arsenic, total	µg/L	40			ND			ND					ND
Arsenic, dissolved	µg/L	40			50			ND					50
Barium, total	µg/L	1.8			374			652					471
Barium, dissolved	µg/L	1.8			200			300					300
Beryllium, total	µg/L	1.8			ND			ND					ND
Beryllium, dissolved	µg/L	1.8			ND			ND					ND
Cadmium, total	µg/L	3			ND			ND					ND
Calcium, total	µg/L	1.3			72800			105000					34600
Calcium, dissolved	µg/L	1.3			63600			89000					30400
Chromium, total	µg/L	6			16.9			33.6					ND
Cobalt, total	µg/L	6			15			23.2					10.9
Copper, total	µg/L	3			66.4			124					35.2
Iron, total	µg/L	20			21100			24600					8160
Iron, dissolved	µg/L	20			1600			300					200
Lead, total	µg/L	30			ND			ND					ND
Magnesium, total	µg/L	44			18200			22900					8920
Magnesium, dissolved	µg/L	44			13400			15200					7260
Manganese, total	µg/L	1.4			2520			10500					6950
Manganese, dissolved	µg/L	1.4			2100			8900					6000
Nickel, total	µg/L	20			ND			32.8					ND
Potassium, total	µg/L	408			8190			15400					11400
Potassium, dissolved	µg/L	408			5440			11400					9900
Sodium, total	µg/L	82			16700			38000					39000
Sodium, dissolved	µg/L	82			14200			32100					35200
Vanadium, total	µg/L	10			32.6			48.3					ND
Zinc, total	µg/L	2			79.8			100					18.5
Zinc, dissolved	µg/L	2			30			20					50
Common Anions													
Chloride	µg/L	200			6379			25800					31260
Flouride, dissolved	µg/L	500			ND			ND					578
Sulfate	µg/L	500			34610			19540					563
Nitrogen	µg/L	10	150		ND	220		ND	62	64	120		ND

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 7 of 8

Parameter	Units	Det. Limit	32M0D (cont.) 1988-Dup	32M0D (cont.) 1990	32M0E 1986	32M0E 1987	32M0E 1988	32M0F 1986	32M0F 1987	32M0F 1988	AP-4900 1990	AP-4901 1990	AP-4903 1990
ICP Metals Scan													
Aluminum, total	µg/L	30	3540				18900			28200			
Arsenic, total	µg/L	40	ND				ND			ND			
Arsenic, dissolved	µg/L	40	60				ND			ND			
Barium, total	µg/L	1.8	444				581			567			
Barium, dissolved	µg/L	1.8	300				300			200			
Beryllium, total	µg/L	1.8	ND				ND			ND			
Beryllium, dissolved	µg/L	1.8	ND				ND			ND			
Cadmium, total	µg/L	3	ND				ND			5.6			
Calcium, total	µg/L	1.3	35300				55600			74100			
Calcium, dissolved	µg/L	1.3	30700				44400			58800			
Chromium, total	µg/L	6	ND				33.4			45.2			
Cobalt, total	µg/L	6	8.2				21.9			27.3			
Copper, total	µg/L	3	45.8				148			220			
Iron, total	µg/L	20	8700				32900			40800			
Iron, dissolved	µg/L	20	100				100			60			
Lead, total	µg/L	30	ND				60			ND			
Magnesium, total	µg/L	44	9470				17600			22900			
Magnesium, dissolved	µg/L	44	7350				9190			12300			
Manganese, total	µg/L	1.4	7060				5810			2850			
Manganese, dissolved	µg/L	1.4	6100				4500			1800			
Nickel, total	µg/L	20	ND				54.3			45.8			
Potassium, total	µg/L	408	11800				16100			7560			
Potassium, dissolved	µg/L	408	9470				12200			3030			
Sodium, total	µg/L	82	39400				40900			9560			
Sodium, dissolved	µg/L	82	35300				36000			5070			
Vanadium, total	µg/L	10	ND				57.6			64.4			
Zinc, total	µg/L	2	19.3				105			120			
Zinc, dissolved	µg/L	2	20				40			40			
Common Anions													
Chloride	µg/L	200	30670				30780			2298			
Flouride, dissolved	µg/L	500	551				508			ND			
Sulfate	µg/L	500	500				658			11460			
Nitrogen	µg/L	10	ND		130		ND	110		ND			

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.2. (Contd)

WP32 Ground Water Sample Data From Previous Investigations - sheet 8 of 8

Parameter	Units	Det. Limit	AP-4904 1990	AP-4905 1990	AP-4912 1990	Conc. Range	Location of Max.
ICP Metals Scan							
Aluminum, total	µg/L	30				1200 - 33100	32M01
Arsenic, total	µg/L	40				80 - 90	32MW7
Arsenic, dissolved	µg/L	40				50 - 60	32M0D
Barium, total	µg/L	1.8				189 - 982	32M01
Barium, dissolved	µg/L	1.8				200 - 300	32M01/0C/0D/0E
Beryllium, total	µg/L	1.8				2.6	32MW7
Beryllium, dissolved	µg/L	1.8				2.3	32M02
Cadmium, total	µg/L	3				5.6	32M0F
Calcium, total	µg/L	1.3				61 - 129000	32MW7
Calcium, dissolved	µg/L	1.3				30400 - 120000	32MW7
Chromium, total	µg/L	6				8.8 - 61.4	32M01
Cobalt, total	µg/L	6				8.2 - 32.1	32M01
Copper, total	µg/L	3				15.2 - 5306	32M0A
Iron, total	µg/L	20				7890 - 61200	32M01
Iron, dissolved	µg/L	20				60 - 2000	32MW7
Lead, total	µg/L	30				40 - 60	32M0E
Magnesium, total	µg/L	44				8920 - 25800	32M01
Magnesium, dissolved	µg/L	44				7260 - 18400	32MW7
Manganese, total	µg/L	1.4				2320 - 10500	32M0C
Manganese, dissolved	µg/L	1.4				1700 - 8900	32M0C
Nickel, total	µg/L	20				20.3 - 73	32M01
Potassium, total	µg/L	408				6890 - 16100	32M0E
Potassium, dissolved	µg/L	408				2850 - 12200	32M0E
Sodium, total	µg/L	82				8870 - 40900	32M0E
Sodium, dissolved	µg/L	82				4940 - 36000	32M0E
Vanadium, total	µg/L	10				13.7 - 104	32M01
Zinc, total	µg/L	2				14.7 - 198	32M01
Zinc, dissolved	µg/L	2				20 - 50	32M0A/0D
Common Anions							
Chloride	µg/L	200				2298 - 31260	32M0D
Flouride, dissolved	µg/L	500				508 - 578	32M0D
Sulfate	µg/L	500				500 - 34610	32M0B
Nitrogen	µg/L	10				12 - 24000	32MW7

No Entry Parameter not analyzed for. ND Parameter not detected.

TABLE 8.3. Soil Sample Data From Previous Investigations, WP32 and WP33

WP32 Sediment Sample Data From Previous Investigations

Parameter Analyzed	Units	Det. Limit	32M01 1988	32M02 1988	32MW7 1984	32S01 1988	32S02 1988	Conc. Range	Location of Max.
Oil and Grease	mg/g	0.008			0.01			0.01	32MW7
PCBs	µg/g	0.05			ND				
Phenol	µg/g	5			ND				
Moisture	%		19.6	13.2	13	21.6	38.4	13-38.4	32S02
Lead	µg/g	6			ND				
Pesticides					ND				
Petroleum Hydrocarbons	mg/kg	10.2	33.2	34.1		55.6	5390	33.2-5390	32S02
Volatile Organics									
Chloroform	mg/kg	0.02	ND	0.17		ND	ND	0.17	32M02
Diethyl Ether	mg/kg	0.2	ND	0.1		ND	ND	0.1	32M02
Methylene Chloride	mg/kg	0.15	1.1	2.6		5	2.3	1.1-5	32M02
Toluene	mg/kg	ND	ND	ND		1.5	ND	1.5	32S01
Semi-Volatile Organics									
Benzo(B) Fluoranthene	mg/kg	0.03	ND	0.23		ND	ND	0.23	32M02
Benzo(A) Pyrene	mg/kg	0.009	ND	0.16		ND	ND	0.16	32M02
Bis(2-Ethylhexyl) Phthalate	mg/kg	0.1	2.9	0.88		ND	ND	.88-2.9	32M01
4-Methylphenol	mg/kg	0.03	ND	ND		0.4	ND	0.4	32S01
Phenanthrene	mg/kg	0.02	ND	0.21		ND	ND	0.21	32M02
Pyrene	mg/kg	0.06	ND	0.2		ND	ND	0.2	32M02
Mercury	mg/kg		ND	ND		ND	ND		-
ICP Metals Scan									
Aluminum	mg/kg	14.7	7020	9150		7300	12500	7020-12500	32S02
Antimony	mg/kg	4.5	ND	6.5		ND	ND	6.5	32M02
Arsenic	mg/kg	6.39	18.6	ND		15.4	ND	15.4-18.6	32M01
Barium	mg/kg	0.33	90.2	95.3		68.1	169	68.1-169	32S02
Beryllium	mg/kg	0.32	2.68	0.683		2.8	0.734	.683-2.8	32S01
Cadmium	mg/kg	0.455	ND	1		0.707	1.13	.707-1.13	32S02
Calcium	mg/kg	5.4	3270	4380		3300	6720	3270-6720	32S02
Chromium	mg/kg	0.72	11.9	15.8		12.6	23.7	11.9-23.7	32S02
Cobalt	mg/kg	0.77	6.66	9.76		6.69	12.1	6.66-12.1	32S02
Copper	mg/kg	2.1	14.5	19.6		18.1	36.8	14.5-36.8	32S02
Iron	mg/kg	8.1	13200	17100		12300	24300	12300-24300	32S02
Lead	mg/kg	4.56	ND	7.75		ND	23.6	7.75-23.6	32S02
Magnesium	mg/kg	4.4	4150	5180		4200	6600	4150-6600	32S02
Manganese	mg/kg	0.26	231	319		134	395	134-395	32S02
Nickel	mg/kg	2	13.9	18.7		17	24.6	13.9-24.6	32S02
Potassium	mg/kg	77.6	624	946		538	1140	538-1140	32S02
Sodium	mg/kg	21.9	332	384		339	589	332-589	32S02
Vanadium	mg/kg	1.7	26.4	32.2		24.8	46.3	24.8-46.3	32S02
Zinc, total	mg/kg	0.61	36.3	42.7		36.5	121	36.3-121	32S02

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 8.4. Surface Water Sample Data From Previous Investigations, WP32

WP32 Surface Water Sample Data From Previous Investigations								
Parameter	Units	Det. Limit	32S01 1988	32S02 1988	32S03 1990	32S04 1990	Conc. Range	Location of Max.
Oil and Grease	µg/L	500						
PCBs	µg/L	0.5						
Pesticides	µg/L	.002-.02						
Phenol	µg/L	10						
TDS	µg/L	1000	244000	230000			230000-244000	32S01
TOC	µg/L	1000						
TOX	µg/L	10						
Total Phosphate	µg/L	100						
pH (field)								
Spec. Cond. @ 25°C	µmhos/cm							
<u>Petroleum Hydrocarbons</u>			ND	ND				
<u>Purgeable Halocarbons</u>								
Chloroform	µg/L	0.2	0.846	ND	ND	ND	0.846	32S01
Chloromethane	µg/L	0.4	ND	10.9	ND	ND	10.9	32S02
1,2-Dichloroethane	µg/L	0.2	0.242	0.271	ND	ND	0.242-0.271	32S02
Methylene Chloride	µg/L	1.31	12.5	ND	ND	ND	12.5	32S01
Tetrachloroethene	µg/L	0.2	9.81	ND	ND	ND	9.81	32S01
<u>Purgeable Aromatics</u>			ND	ND				
<u>Semi-Volatile Organics</u>			ND	ND				
<u>Arsenic</u>								
Arsenic, total	µg/L	1.8	4.6	44.9			4.6-44.9	32S02
Arsenic, dissolved	µg/L	1.8	5	20			5-20	32S02
<u>Lead</u>								
Lead, total	µg/L	1.4	7.2	ND			7.2	32S02
Lead, dissolved	µg/L	1.4	ND	ND				
<u>Mercury</u>								
Mercury, total	µg/L	0.2	ND	0.3			0.3	32S02
Mercury, dissolved	µg/L	0.2	ND	0.4			0.4	32S02
<u>ICP Metals Scan</u>								
Aluminum, total	µg/L	30	46.4	372			46.4-372	32S02
Barium, total	µg/L	1.8	66.8	172			66.8-172	32S02
Barium, dissolved	µg/L	1.8	100	200			100-200	32S02
Calcium, total	µg/L	1.3	31300	52000			31300-52000	32S02
Calcium, dissolved	µg/L	1.3	29100	48200			29100-48200	32S02
Copper, total	µg/L	3	5.7	ND			5.7	32S02
Copper, dissolved	µg/L	3	7	ND			7	32S02
Iron, total	µg/L	20	411	26500			411-26500	32S02
Iron, dissolved	µg/L	20	90	17200			90-17200	32S02
Magnesium, total	µg/L	44	9200	11700			9200-11700	32S02
Magnesium, dissolved	µg/L	44	8670	11100			8670-11100	32S02
Manganese, total	µg/L	1.4	270	2570			270-2570	32S02
Manganese, dissolved	µg/L	1.4	200	2400			200-2400	32S02
Potassium, total	µg/L	408	9320	3560			3560-9320	32S01
Potassium, dissolved	µg/L	408	8070	2810			2810-8070	32S01
Sodium, total	µg/L	82	35000	5740			5740-35000	32S01
Sodium, dissolved	µg/L	82	33400	5840			5740-33400	32S01
Zinc, total	µg/L	2	19.2	10.3			10.3-19.2	32S01
Zinc, dissolved	µg/L	2	50	30			30-50	32S01
<u>Common Anions</u>								
Chloride	µg/L	200	29710	3422			3422-29710	32S01
Flouride, dissolved	µg/L	500	615	ND			615	32S01
Sulfate	µg/L	500	20970	2093			2093-20970	32S01
<u>Nitrogen</u>	µg/L	10	ND	ND	35	31	31-35	32S03

No Entry Parameter not analyzed for.
ND Parameter not detected.

TABLE 8.5. Semivolatile Organic Compounds Analyzed for and Detected in Soil, WP32

WP32						Pit 1 - Soil		Pit 2 - Soil		Pit 2 - Water	Pit 3 - Soil			Pit 3 - Water
		Soil		Water		WP32_S1_1	WP32_S1_2	WP32_S2_1	WP32_S2_2	WP32_W2_1	WP32_S3_1	WP32_S3_2	WP32_S3_3	WP32_W3_1
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	3.0-ft Aug-93	0.9-ft Aug-93	1.4-ft Aug-93	0.9-ft Aug-93	1.9-ft Aug-93	3.9-ft Aug-93	6.5-ft Aug-93	6.5-ft Aug-93
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	350	ND	ND	720	ND	ND	ND	ND	ND
2,4-Dichlotophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	1000	ND	ND	ND	ND	ND
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronepthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	140	ND	ND	ND	ND	ND	ND	ND	ND
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-(Dimethylamine)Azobenzene	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32						Pit 1 - Soil		Pit 2 - Soil		Pit 2 - Water	Pit 3 - Soil			Pit 3 - Water
		Soil		Water		WP32_S1_1	WP32_S1_2	WP32_S2_1	WP32_S2_2	WP32_W2_1	WP32_S3_1	WP32_S3_2	WP32_S3_3	WP32_W3_1
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	3.0-ft Aug-93	0.9-ft Aug-93	1.4-ft Aug-93	0.9-ft Aug-93	1.9-ft Aug-93	3.9-ft Aug-93	6.5-ft Aug-93	6.5-ft Aug-93
7,12-Dimethylbenz[A]Anthracene	8270	µg/Kg	227	µg/L	1.82	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyridine	8270	µg/Kg	205	µg/L	4.57	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	µg/L	10.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
A,A-Dimethylphenethylamine	8270	µg/Kg	358	µg/L	37.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	8270	µg/Kg	357	µg/L	5.88	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylphthalate	8270	µg/Kg	57.0	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Dinitrobenzene	8270	µg/Kg	74.5	µg/L	9.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	µg/L	5.55	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	8270	µg/Kg	157	µg/L	4.46	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	8270	µg/Kg	169	µg/L	2.59	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	8270	µg/Kg	168	µg/L	2.85	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octylphthalate	8270	µg/Kg	225	µg/L	2.98	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diphenylamine	8270	µg/Kg	497	µg/L	2.86	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Methane Sulfonate	8270	µg/Kg	118	µg/L	2.07	ND	ND	ND	ND	ND	ND	ND	ND	ND
Famphur	8270	µg/Kg	317	µg/L	12.80	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	8270	µg/Kg	212	µg/L	4.62	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	8270	µg/Kg	166	µg/L	2.56	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	8270	µg/Kg	241	µg/L	2.38	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	8270	µg/Kg	182	µg/L	4.29	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	8270	µg/Kg	168	µg/L	2.62	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	8270	µg/Kg	146	µg/L	4.73	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorophene	8270	µg/Kg	1190	µg/L	19.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloropropene	8270	µg/Kg	135	µg/L	3.68	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	µg/L	3.21	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	8270	µg/Kg	94	µg/L	1.44	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	8270	µg/Kg	163	µg/L	3.29	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isosafrole	8270	µg/Kg	155	µg/L	2.25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Kepone	8270	µg/Kg	1404	µg/L	9.59	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methapyriline	8270	µg/Kg	120	µg/L	8.45	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Methylcholanthrene	8270	µg/Kg	170	µg/L	2.63	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Methane Sulfonate	8270	µg/Kg	132	µg/L	1.61	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	8270	µg/Kg	30.6	µg/L	2.76	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Naphthoquinone	8270	µg/Kg	263	µg/L	10.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-Naphthylamine	8270	µg/Kg	119	µg/L	25.30	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Naphthylamine	8270	µg/Kg	720	µg/L	15.60	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Nitroaniline	8270	µg/Kg	121	µg/L	7.82	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Nitroaniline	8270	µg/Kg	253	µg/L	9.52	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitroaniline	8270	µg/Kg	1119	µg/L	21.40	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	8270	µg/Kg	161	µg/L	3.16	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Nitrophenol	8270	µg/Kg	195	µg/L	1.52	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	µg/L	6.00	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiethylamine	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	8270	µg/Kg	178	µg/L	3.81	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	8270	µg/Kg	143	µg/L	2.11	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodipropylamine	8270	µg/Kg	164	µg/L	3.67	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosomethylethylamine	8270	µg/Kg	124	µg/L	2.83	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-nitrosomorpholine	8270	µg/Kg	135	µg/L	3.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopiperidine	8270	µg/Kg	27.9	µg/L	4.35	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosopyrolidine	8270	µg/Kg	171	µg/L	2.78	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-Nitro-o-Toluidine	8270	µg/Kg	186	µg/L	5.25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Parathion	8270	µg/Kg	257	µg/L	3.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorobenzene	8270	µg/Kg	186	µg/L	3.99	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32						Pit 1 - Soil		Pit 2 - Soil		Pit 2 - Water	Pit 3 - Soil			Pit 3 - Water
		Soil		Water		WP32_S1_1	WP32_S1_2	WP32_S2_1	WP32_S2_2	WP32_W2_1	WP32_S3_1	WP32_S3_2	WP32_S3_3	WP32_W3_1
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	3.0-ft Aug-93	0.9-ft Aug-93	1.4-ft Aug-93	0.9-ft Aug-93	1.9-ft Aug-93	3.9-ft Aug-93	6.5-ft Aug-93	6.5-ft Aug-93
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	ND	ND	ND	ND	ND
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	ND	ND	ND	ND	ND
sym-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32						Pit 4 - Soil				Pit 4 - Water
		Soil		Water		WP32_S4_1	S4_1 Dup	WP32_S4_2	WP32_S4_3	WP32_W4_3
SOIL	Method	Units	MDL	Units	MDL	2.3-ft Aug-93	2.3-ft Aug-93	5.5-ft Aug-93	8.6-ft Aug-93	8.7-ft Aug-93
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	ND	ND	ND	ND
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	ND	ND	ND	ND
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	ND	ND	ND	ND
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	ND	ND	ND	ND
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	ND	ND	ND	ND
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	ND	ND	ND	ND
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	ND	ND	ND	ND
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	ND	ND	ND	ND
Tris-2-Chloroethyl Phospha	8270	µg/Kg	94.7	µg/L	2.88	ND	ND	ND	ND	ND
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND	ND	ND	ND	ND
2,4-Dichlotophenol	8270	µg/Kg	160	µg/L	2.80	ND	ND	ND	ND	ND
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	ND	ND	ND	ND
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	ND	ND	ND	ND
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	ND	ND	ND	ND
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	ND	ND	ND	ND
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	ND	ND	ND	ND
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	ND	ND	ND	ND
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	ND	ND	ND	ND
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	ND	ND	ND	ND
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	ND	ND	ND	ND
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	ND	ND	ND	ND
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	ND	ND	ND	ND
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	ND	ND	ND	ND
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	ND	ND	ND	ND
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	ND	ND	ND	ND
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	ND	ND	ND	ND
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	ND	ND	ND	ND
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	ND	ND	ND	ND
Bis(2-Chloroethoxy)Methan	8270	µg/Kg	36.2	µg/L	7.13	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND
Bis(2-Chloro-1-Methylethyl)E	8270	µg/Kg	83.5	µg/L	3.35	ND	ND	ND	ND	ND
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	µg/L	2.34	ND	ND	ND	ND	ND
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	ND	ND	ND	ND
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND	ND	ND	ND	ND
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	ND	ND	ND	ND
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	ND	ND	ND	ND
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	ND	ND	ND	ND
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ethe	8270	µg/Kg	32.2	µg/L	3.04	ND	ND	ND	ND	ND
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	ND	ND	ND	ND
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	ND	ND	ND	ND
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	ND	ND	ND	ND
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	ND	ND	ND	ND
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	ND	ND	ND	ND
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	ND	ND	ND	ND
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	ND	ND	ND	ND
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	ND	ND	ND	ND
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND	ND	ND	ND	ND
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	ND	ND	ND	ND
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	ND	ND	ND	ND
p-(Dimethylamino)Azobenz	8270	µg/Kg	66.0	µg/L	3.36	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32						Pit 4 - Soil				Pit 4 - Water
		Soil		Water		WP32_S4_1	S4_1 Dup	WP32_S4_2	WP32_S4_3	WP32_W4_3
SOIL	Method	Units	MDL	Units	MDL	2.3-ft Aug-93	2.3-ft Aug-93	5.5-ft Aug-93	8.6-ft Aug-93	8.7-ft Aug-93
7,12-Dimethylbenz(A)Anth	8270	µg/Kg	227	µg/L	1.82	ND	ND	ND	ND	ND
Pyridine	8270	µg/Kg	205	µg/L	4.57	ND	ND	ND	ND	ND
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	µg/L	10.4	ND	ND	ND	ND	ND
A,A-Dimethylphenethylami	8270	µg/Kg	358	µg/L	37.80	ND	ND	ND	ND	ND
2,4-Dimethylphenol	8270	µg/Kg	357	µg/L	5.88	ND	ND	ND	ND	ND
Dimethylphthalate	8270	µg/Kg	57.0	µg/L	5.55	ND	ND	ND	ND	ND
m-Dinitrobenzene	8270	µg/Kg	74.5	µg/L	9.35	ND	ND	ND	ND	ND
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	µg/L	5.55	ND	ND	ND	ND	ND
2,4-Dinitrophenol	8270	µg/Kg	157	µg/L	4.46	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	8270	µg/Kg	169	µg/L	2.59	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	8270	µg/Kg	168	µg/L	2.85	ND	ND	ND	ND	ND
Di-N-Octylphthalate	8270	µg/Kg	225	µg/L	2.98	ND	ND	ND	ND	ND
Diphenylamine	8270	µg/Kg	497	µg/L	2.86	ND	ND	ND	ND	ND
Ethyl Methane Sulfonate	8270	µg/Kg	118	µg/L	2.07	ND	ND	ND	ND	ND
Famphur	8270	µg/Kg	317	µg/L	12.80	ND	ND	ND	ND	ND
Fluoranthene	8270	µg/Kg	212	µg/L	4.62	ND	ND	ND	ND	ND
Fluorene	8270	µg/Kg	166	µg/L	2.56	ND	ND	ND	ND	ND
Hexachlorobenzene	8270	µg/Kg	241	µg/L	2.38	ND	ND	ND	ND	ND
Hexachlorobutadiene	8270	µg/Kg	182	µg/L	4.29	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	8270	µg/Kg	168	µg/L	2.62	ND	ND	ND	ND	ND
Hexachloroethane	8270	µg/Kg	146	µg/L	4.73	ND	ND	ND	ND	ND
Hexachlorophene	8270	µg/Kg	1190	µg/L	19.60	ND	ND	ND	ND	ND
Hexachloropropene	8270	µg/Kg	135	µg/L	3.68	ND	ND	ND	ND	ND
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	µg/L	3.21	ND	ND	ND	ND	ND
Isodrin	8270	µg/Kg	94	µg/L	1.44	ND	ND	ND	ND	ND
Isophorone	8270	µg/Kg	163	µg/L	3.29	ND	ND	ND	ND	ND
Isosafrole	8270	µg/Kg	155	µg/L	2.25	ND	ND	ND	ND	ND
Kepone	8270	µg/Kg	1404	µg/L	9.59	ND	ND	ND	ND	ND
Methapyraline	8270	µg/Kg	120	µg/L	8.45	ND	ND	ND	ND	ND
3-Methylcholanthrene	8270	µg/Kg	170	µg/L	2.63	ND	ND	ND	ND	ND
Methyl Methane Sulfonate	8270	µg/Kg	132	µg/L	1.61	ND	ND	ND	ND	ND
2-Methylnaphthalene	8270	µg/Kg	30.6	µg/L	2.76	ND	ND	ND	ND	ND
1,4-Naphthoquinone	8270	µg/Kg	263	µg/L	10.0	ND	ND	ND	ND	ND
1-Naphthylamine	8270	µg/Kg	119	µg/L	25.30	ND	ND	ND	ND	ND
2-Naphthylamine	8270	µg/Kg	720	µg/L	15.60	ND	ND	ND	ND	ND
o-Nitroaniline	8270	µg/Kg	121	µg/L	7.82	ND	ND	ND	ND	ND
m-Nitroaniline	8270	µg/Kg	253	µg/L	9.52	ND	ND	ND	ND	ND
p-Nitroaniline	8270	µg/Kg	1119	µg/L	21.40	ND	ND	ND	ND	ND
Nitrobenzene	8270	µg/Kg	161	µg/L	3.16	ND	ND	ND	ND	ND
p-Nitrophenol	8270	µg/Kg	195	µg/L	1.52	ND	ND	ND	ND	ND
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	µg/L	6.00	ND	ND	ND	ND	ND
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	µg/L	3.22	ND	ND	ND	ND	ND
N-Nitrosodiethylamine	8270	µg/Kg	134	µg/L	2.90	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	8270	µg/Kg	178	µg/L	3.81	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	8270	µg/Kg	143	µg/L	2.11	ND	ND	ND	ND	ND
N-Nitrosodipropylamine	8270	µg/Kg	164	µg/L	3.67	ND	ND	ND	ND	ND
N-Nitrosomethylethylamine	8270	µg/Kg	124	µg/L	2.83	ND	ND	ND	ND	ND
N-nitrosomorpholine	8270	µg/Kg	135	µg/L	3.27	ND	ND	ND	ND	ND
N-Nitrosopiperidine	8270	µg/Kg	27.9	µg/L	4.35	ND	ND	ND	ND	ND
N-Nitrosopyrolidine	8270	µg/Kg	171	µg/L	2.78	ND	ND	ND	ND	ND
5-Nitro-o-Toluidine	8270	µg/Kg	186	µg/L	5.25	ND	ND	ND	ND	ND
Parathion	8270	µg/Kg	257	µg/L	3.90	ND	ND	ND	ND	ND
Pentachlorobenzene	8270	µg/Kg	186	µg/L	3.99	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32						Pit 4 - Soil				Pit 4 - Water
		Soil		Water		WP32_S4_1	S4_1 Dup	WP32_S4_2	WP32_S4_3	WP32_W4_3
SOIL	Method	Units	MDL	Units	MDL	2.3-ft Aug-93	2.3-ft Aug-93	5.5-ft Aug-93	8.6-ft Aug-93	8.7-ft Aug-93
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	ND	ND	ND	ND
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	ND	ND	ND	ND
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	ND	ND	ND	ND
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	ND	ND	ND	ND
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	ND	ND	ND	ND
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	ND	ND	ND	ND
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	ND	ND	ND	ND
Tetraethyl Dithiopyrophospl	8270	µg/Kg	149	µg/L	2.81	ND	ND	ND	ND	ND
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	ND	ND	ND	ND
0,0,0-Triethylphosphorothio	8270	µg/Kg	156	µg/L	5.19	ND	ND	ND	ND	ND
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	ND	ND	ND	ND

TABLE 8.5. (Contd)

WP32		Soil		Water		Soil Summary		Water Summary	
SOIL	Method	Units	MDL	Units	MDL	Range of Soil Values	Location / Date of Maximum	Range of Water Values	Location / Date of Maximum
o-Cresol	8270	µg/Kg	94.8	µg/L	1.80	ND	N/A	ND	N/A
m-Cresol	8270	µg/Kg	92.1	µg/L	1.44	ND	N/A	ND	N/A
p-Cresol	8270	µg/Kg	188	µg/L	3.54	ND	N/A	ND	N/A
Kerosene	8270	µg/Kg	46.8	µg/L	1.03	ND	N/A	ND	N/A
Naphthanlene	8270	µg/Kg	168	µg/L	6.50	ND	N/A	ND	N/A
Pentachlorophenol	8270	µg/Kg	254	µg/L	8.07	ND	N/A	ND	N/A
Phenol	8270	µg/Kg	127	µg/L	0.833	ND	N/A	ND	N/A
Tributyl Phosphate	8270	µg/Kg	223	µg/L	4.42	ND	N/A	ND	N/A
Tris-2-Chloroethyl Phospha	8270	µg/Kg	94.7	µg/L	2.88	ND	N/A	ND	N/A
Benzothiazole	8270	µg/Kg	144	µg/L	2.55	ND	N/A	ND	N/A
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	µg/L	4.07	ND - 720	Pit 2/1.4-ft Aug-93	ND	N/A
2,4-Dichlorophenol	8270	µg/Kg	160	µg/L	2.80	ND	N/A	ND	N/A
2-Nitrophenol	8270	µg/Kg	195	µg/L	3.96	ND	N/A	ND	N/A
p-Dichlorobenzene	8270	µg/Kg	161	µg/L	4.64	ND	N/A	ND	N/A
2-Methyl Pyridine	8270	µg/Kg	339	µg/L	5.83	ND	N/A	ND	N/A
Acenaphthene	8270	µg/Kg	168	µg/L	2.88	ND	N/A	ND	N/A
Acenaphthylene	8270	µg/Kg	157	µg/L	3.96	ND	N/A	ND	N/A
Acetophenone	8270	µg/Kg	169	µg/L	2.38	ND	N/A	ND	N/A
2-Acetylaminofluorine	8270	µg/Kg	203	µg/L	2.83	ND	N/A	ND	N/A
2-Aminobiphenyl	8270	µg/Kg	430	µg/L	3.83	ND	N/A	ND	N/A
Aniline	8270	µg/Kg	202	µg/L	3.53	ND	N/A	ND	N/A
Anthracene	8270	µg/Kg	177	µg/L	2.95	ND	N/A	ND	N/A
Aramite	8270	µg/Kg	267	µg/L	8.60	ND	N/A	ND	N/A
Benzo(A)Anthracene	8270	µg/Kg	170	µg/L	2.34	ND	N/A	ND	N/A
Benzo(B)Fluorathene	8270	µg/Kg	176	µg/L	4.41	ND	N/A	ND	N/A
Benzo(K)Fluorathene	8270	µg/Kg	248	µg/L	2.21	ND	N/A	ND	N/A
Benzo(G,H,I)Perylene	8270	µg/Kg	216	µg/L	3.65	ND	N/A	ND	N/A
Benzo(A)Pyrene	8270	µg/Kg	164	µg/L	1.70	ND	N/A	ND	N/A
Benzyl Alcohol	8270	µg/Kg	226	µg/L	5.16	ND	N/A	ND	N/A
Bis(2-Chloroethoxy)Methan	8270	µg/Kg	36.2	µg/L	7.13	ND	N/A	ND	N/A
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	µg/L	2.90	ND	N/A	ND	N/A
Bis(2-Chloro-1-Methylethyl)E	8270	µg/Kg	83.5	µg/L	3.35	ND	N/A	ND	N/A
4-Bromophenyl-Phenylethe	8270	µg/Kg	45.4	µg/L	2.34	ND	N/A	ND	N/A
Butylbenzylphthalate	8270	µg/Kg	107	µg/L	5.94	ND	N/A	ND	N/A
p-Chloroanaline	8270	µg/Kg	112	µg/L	13.2	ND - 1000	Pit 2/1.4-ft Aug-93	ND	N/A
Chlorobenzilate	8270	µg/Kg	244	µg/L	8.69	ND	N/A	ND	N/A
p-Chloro-m-Cresol	8270	µg/Kg	159	µg/L	7.41	ND	N/A	ND	N/A
2-Chloronaphthanlene	8270	µg/Kg	170	µg/L	3.02	ND	N/A	ND	N/A
2-Chlorophenol	8270	µg/Kg	144	µg/L	1.91	ND	N/A	ND	N/A
4-Chlorophenyl Phenyl Eth	8270	µg/Kg	32.2	µg/L	3.04	ND	N/A	ND	N/A
Chrysene	8270	µg/Kg	184	µg/L	1.70	ND	N/A	ND	N/A
Diallate	8270	µg/Kg	143	µg/L	3.15	ND	N/A	ND	N/A
Dibenz(A,H)Anthracene	8270	µg/Kg	190	µg/L	1.92	ND	N/A	ND	N/A
Dibenzofuran	8270	µg/Kg	39.5	µg/L	2.54	ND	N/A	ND	N/A
Di-N-Butylphthalate	8270	µg/Kg	97.8	µg/L	4.34	ND	N/A	ND	N/A
o-Dichlorobenzene	8270	µg/Kg	140	µg/L	3.77	ND	N/A	ND	N/A
m-Dichlorobenzene	8270	µg/Kg	156	µg/L	7.85	ND	N/A	ND	N/A
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	µg/L	3.88	ND	N/A	ND	N/A
2,6-Dichlorophenol	8270	µg/Kg	145	µg/L	3.47	ND	N/A	ND	N/A
Diethylphthalate	8270	µg/Kg	133	µg/L	8.94	ND - 140	Pit/0.9-ft Aug-93	ND	N/A
Thionazin	8270	µg/Kg	180	µg/L	3.04	ND	N/A	ND	N/A
Dimethoate	8270	µg/Kg	184	µg/L	10.0	ND	N/A	ND	N/A
p-(Dimethylamino)Azobenz	8270	µg/Kg	66.0	µg/L	3.36	ND	N/A	ND	N/A

TABLE 8.5. (Contd)

WP32						Soil Summary		Water Summary	
		Soil		Water					
SOIL	Method	Units	MDL	Units	MDL	Range of Soil Values	Location / Date of Maximum	Range of Water Values	Location / Date of Maximum
7,12-Dimethylbenz[A]Anth	8270	µg/Kg	227	µg/L	1.82	ND	N/A	ND	N/A
Pyridine	8270	µg/Kg	205	µg/L	4.57	ND	N/A	ND	N/A
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	µg/L	10.4	ND	N/A	ND	N/A
A,A-Dimethylphenethylami	8270	µg/Kg	358	µg/L	37.80	ND	N/A	ND	N/A
2,4-Dimethylphenol	8270	µg/Kg	357	µg/L	5.88	ND	N/A	ND	N/A
Dimethylphthalate	8270	µg/Kg	57.0	µg/L	5.55	ND	N/A	ND	N/A
m-Dinitrobenzene	8270	µg/Kg	74.5	µg/L	9.35	ND	N/A	ND	N/A
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	µg/L	5.55	ND	N/A	ND	N/A
2,4-Dinitrophenol	8270	µg/Kg	157	µg/L	4.46	ND	N/A	ND	N/A
2,4-Dinitrotoluene	8270	µg/Kg	169	µg/L	2.59	ND	N/A	ND	N/A
2,6-Dinitrotoluene	8270	µg/Kg	168	µg/L	2.85	ND	N/A	ND	N/A
Di-N-Octylphthalate	8270	µg/Kg	225	µg/L	2.98	ND	N/A	ND	N/A
Diphenylamine	8270	µg/Kg	497	µg/L	2.86	ND	N/A	ND	N/A
Ethyl Methane Sulfonate	8270	µg/Kg	118	µg/L	2.07	ND	N/A	ND	N/A
Famphur	8270	µg/Kg	317	µg/L	12.80	ND	N/A	ND	N/A
Fluoranthene	8270	µg/Kg	212	µg/L	4.62	ND	N/A	ND	N/A
Fluorene	8270	µg/Kg	166	µg/L	2.56	ND	N/A	ND	N/A
Hexachlorobenzene	8270	µg/Kg	241	µg/L	2.38	ND	N/A	ND	N/A
Hexachlorobutadiene	8270	µg/Kg	182	µg/L	4.29	ND	N/A	ND	N/A
Hexachlorocyclopentadiene	8270	µg/Kg	168	µg/L	2.62	ND	N/A	ND	N/A
Hexachloroethane	8270	µg/Kg	146	µg/L	4.73	ND	N/A	ND	N/A
Hexachlorophene	8270	µg/Kg	1190	µg/L	19.60	ND	N/A	ND	N/A
Hexachloropropene	8270	µg/Kg	135	µg/L	3.68	ND	N/A	ND	N/A
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	µg/L	3.21	ND	N/A	ND	N/A
Isodrin	8270	µg/Kg	94	µg/L	1.44	ND	N/A	ND	N/A
Isophorone	8270	µg/Kg	163	µg/L	3.29	ND	N/A	ND	N/A
Isosafrole	8270	µg/Kg	155	µg/L	2.25	ND	N/A	ND	N/A
Kepone	8270	µg/Kg	1404	µg/L	9.59	ND	N/A	ND	N/A
Methapyraline	8270	µg/Kg	120	µg/L	8.45	ND	N/A	ND	N/A
3-Methylcholanthrene	8270	µg/Kg	170	µg/L	2.63	ND	N/A	ND	N/A
Methyl Methane Sulfonate	8270	µg/Kg	132	µg/L	1.61	ND	N/A	ND	N/A
2-Methylnaphthalene	8270	µg/Kg	30.6	µg/L	2.76	ND	N/A	ND	N/A
1,4-Naphthoquinone	8270	µg/Kg	263	µg/L	10.0	ND	N/A	ND	N/A
1-Naphthylamine	8270	µg/Kg	119	µg/L	25.30	ND	N/A	ND	N/A
2-Naphthylamine	8270	µg/Kg	720	µg/L	15.60	ND	N/A	ND	N/A
o-Nitroaniline	8270	µg/Kg	121	µg/L	7.82	ND	N/A	ND	N/A
m-Nitroaniline	8270	µg/Kg	253	µg/L	9.52	ND	N/A	ND	N/A
p-Nitroaniline	8270	µg/Kg	1119	µg/L	21.40	ND	N/A	ND	N/A
Nitrobenzene	8270	µg/Kg	161	µg/L	3.16	ND	N/A	ND	N/A
p-Nitrophenol	8270	µg/Kg	195	µg/L	1.52	ND	N/A	ND	N/A
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	µg/L	6.00	ND	N/A	ND	N/A
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	µg/L	3.22	ND	N/A	ND	N/A
N-Nitrosodiethylamine	8270	µg/Kg	134	µg/L	2.90	ND	N/A	ND	N/A
N-Nitrosodimethylamine	8270	µg/Kg	178	µg/L	3.81	ND	N/A	ND	N/A
N-Nitrosodiphenylamine	8270	µg/Kg	143	µg/L	2.11	ND	N/A	ND	N/A
N-Nitrosodipropylamine	8270	µg/Kg	164	µg/L	3.67	ND	N/A	ND	N/A
N-Nitrosomethylethylamine	8270	µg/Kg	124	µg/L	2.83	ND	N/A	ND	N/A
N-nitrosomorpholine	8270	µg/Kg	135	µg/L	3.27	ND	N/A	ND	N/A
N-Nitrosopiperidine	8270	µg/Kg	27.9	µg/L	4.35	ND	N/A	ND	N/A
N-Nitrosopyrolidine	8270	µg/Kg	171	µg/L	2.78	ND	N/A	ND	N/A
5-Nitro-o-Toluidine	8270	µg/Kg	186	µg/L	5.25	ND	N/A	ND	N/A
Parathion	8270	µg/Kg	257	µg/L	3.90	ND	N/A	ND	N/A
Pentachlorobenzene	8270	µg/Kg	186	µg/L	3.99	ND	N/A	ND	N/A

TABLE 8.5. (Contd)

WP32						Soil Summary		Water Summary	
		Soil		Water					
SOIL	Method	Units	MDL	Units	MDL	Range of Soil Values	Location / Date of Maximum	Range of Water Values	Location / Date of Maximum
Pentachloronitrobenzene	8270	µg/Kg	211	µg/L	2.49	ND	N/A	ND	N/A
Pentacetin	8270	µg/Kg	200	µg/L	4.78	ND	N/A	ND	N/A
Phenanthrene	8270	µg/Kg	185	µg/L	5.27	ND	N/A	ND	N/A
p-Phenylenediamine	8270	µg/Kg	311	µg/L	3.09	ND	N/A	ND	N/A
Pronamide	8270	µg/Kg	209	µg/L	3.42	ND	N/A	ND	N/A
Pyrene	8270	µg/Kg	177	µg/L	3.69	ND	N/A	ND	N/A
Safrole	8270	µg/Kg	165	µg/L	3.22	ND	N/A	ND	N/A
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	µg/L	4.39	ND	N/A	ND	N/A
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	µg/L	4.77	ND	N/A	ND	N/A
Tetraethyl Dithiopyrophospl	8270	µg/Kg	149	µg/L	2.81	ND	N/A	ND	N/A
o-Toluidine	8270	µg/Kg	169	µg/L	2.27	ND	N/A	ND	N/A
1,2,4-Trichlorobenzene	8270	µg/Kg	179	µg/L	4.14	ND	N/A	ND	N/A
2,4,5-Trichlorophenol	8270	µg/Kg	176	µg/L	4.01	ND	N/A	ND	N/A
2,4,6-Trichlorophenol	8270	µg/Kg	138	µg/L	2.54	ND	N/A	ND	N/A
0,0,0-Triethylphosphorothio	8270	µg/Kg	156	µg/L	5.19	ND	N/A	ND	N/A
syn-Trinitrobenzene	8270	µg/Kg	152	µg/L	3.74	ND	N/A	ND	N/A

TABLE 8.6. Volatile Organic Compounds and Metals Data Analyzed for and Detected in Soil, WP32

WP32						Pit 1 - Soil		Pit 2 - Soil		Pit 2 - Water	Pit 3 - Soil			Pit 3 - Water
		Soil		Water		WP32_S1_1	WP32_S1_2	WP32_S2_1	WP32_S2_2	WP32_W2_1	WP32_S3_1	WP32_S3_2	WP32_S3_3	WP32_W3_1
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	3.0-ft Aug-93	0.9-ft Aug-93	1.4-ft Aug-93	0.9-ft Aug-93	1.9-ft Aug-93	3.9-ft Aug-93	6.5-ft Aug-93	6.5-ft Aug-93
Benzene	8020	μg/kg	0.174	μg/L	0.105	ND	ND	ND	ND	ND				
Carbon Tetrachloride	8010	μg/kg	0.302	μg/L	0.121	ND	ND	ND	ND	ND				
Chloroform	8010	μg/kg	0.086	μg/L	0.043	ND	ND	ND	ND	ND				
p-Dichlorobenzene	8010/8020	μg/kg	0.093	μg/L	0.107	ND	ND	ND	0.16	0.34				
1,1-Dichloroethane	8010	μg/kg	0.303	μg/L	0.337	ND	ND	ND	ND	ND				
1,2-Dichloroethane	8010	μg/kg	0.296	μg/L	0.139	ND	ND	ND	ND	ND				
cis-1,2 Dichloroethylene	8010	μg/kg	0.196	μg/L	0.127	ND	ND	ND	ND	ND				
trans-1,2 Dichloroethylene	8010	μg/kg	0.169	μg/L	0.149	ND	ND	ND	ND	ND		Not sampled for VOCs		
Ethylbenzene	8020	μg/kg	0.157	μg/L	0.046	ND	ND	ND	0.19	0.12				
Methylene Chloride	8010	μg/kg	3.360	μg/L	0.056	ND	ND	ND	ND	ND				
Tetrachloroethylene	8010	μg/kg	0.154	μg/L	0.049	ND	ND	ND	ND	ND				
Toluene	8020	μg/kg	0.151	μg/L	0.056	ND	ND	ND	0.16	0.28				
1,1,1-Trichloroethane	8010	μg/kg	0.119	μg/L	0.072	ND	ND	ND	ND	ND				
1,1,2-Trichloroethane	8010	μg/kg	0.075	μg/L	0.043	ND	ND	ND	ND	ND				
Trichloroethylene	8010	μg/kg	0.088	μg/L	0.065	ND	ND	ND	0.94	0.072				
Vinyl Chloride	8010	μg/kg	0.130	μg/L	0.266	ND	ND	ND	ND	ND				
Xylene	8020	μg/kg	0.611	μg/L	0.202	ND	ND	ND	ND	0.55				
Aluminum	6010	μg/kg	3220	μg/L	32.5	4700000	5000000	5100000	3300000	14000	6700000	6900000	8800000	200000
Antimony	6010	μg/kg	4270	μg/L	69.4	7000	ND	ND	10000	ND	ND	5500	ND	ND
Barium	6010	μg/kg	115	μg/L	0.001	60000	53000	62000	620000	400	62000	72000	67000	3000
Beryllium	6010	μg/kg	96.7	μg/L	0.814	ND	150	ND	ND	2.0	140	130	120	6.2
Cadmium	6010	μg/kg	330.0	μg/L	4.7	ND	ND	ND	9200	8.6	ND	ND	ND	5.5
Calcium	6010	μg/kg	1520	μg/L	20.9	2400000	2600000	2700000	11000000	57000	3400000	3600000	4300000	150000
Chromium	6010	μg/kg	766	μg/L	5.42	18000	12000	8800	120000	81	12000	12000	17000	390
Cobalt	6010	μg/kg	653	μg/L	4.05	2600	3800	3700	2400	35	4500	4000	7700	210
Copper	6010	μg/kg	1080	μg/L	2.65	8800	11000	10000	140000	320	16000	12000	20000	840
Iron	6010	μg/kg	1723	μg/L	10.3	7400000	9500000	7700000	6900000	100000	12000000	11000000	19000000	390000
Magnesium	6010	μg/kg	768.0	μg/L	26.0	2500000	2900000	2500000	1200000	16000	3500000	3400000	4500000	110000
Manganese	6010	μg/kg	139	μg/L	1.35	85000	130000	120000	520000	6000	140000	240000	360000	14000
Nickel	6010	μg/kg	2340	μg/L	17.9	7300	12000	7700	13000	78	14000	12000	19000	500
Potassium	6010	μg/kg	45990	μg/L	662	220000	270000	520000	170000	6200	580000	500000	620000	21000
Silver	6010	μg/kg	326	μg/L	2.87	ND	ND	ND	32000	33	400	ND	ND	37
Sodium	6010	μg/kg	15400	μg/L	40.9	190000	180000	280000	160000	18000	280000	370000	360000	17000
Tin	6010	μg/kg	5120	μg/L	51.1	ND	ND	ND	96000	ND	ND	ND	ND	ND
Vanadium	6010	μg/kg	547	μg/L	3.84	17000	21000	16000	7800	64	23000	24000	27000	600
Zinc	6010	μg/kg	451	μg/L	3.44	29000	27000	22000	790000	660	44000	31000	43000	1500
Lead	7421	μg/kg	300	μg/L	0.6	5500	2500	5300	550000	240	4400	4400	6300	330
Arsenic	7060	μg/kg	200	μg/L	2	2500	2900	2100	2400	66	4200	4800	8900	190

ND = Not Detected

TABLE 8.6. (Contd)

WP32						Pit 4 - Soil				Pit 4 - Water
		Soil		Water		WP32_S4_1	S4_1 Dup	WP32_S4_2	WP32_S4_3	WP32_W4_3
SOIL	Method	Units	MDL	Units	MDL	2.3-ft Aug-93	2.3-ft Aug-93	5.5-ft Aug-93	8.6-ft Aug-93	8.7-ft Aug-93
Benzene	8020	µg/kg	0.174	µg/L	0.105					
Carbon Tetrachloride	8010	µg/kg	0.302	µg/L	0.121					
Chloroform	8010	µg/kg	0.086	µg/L	0.043					
p-Dichlorobenzene	8010/8020	µg/kg	0.093	µg/L	0.107					
1,1-Dichloroethane	8010	µg/kg	0.303	µg/L	0.337					
1,2-Dichloroethane	8010	µg/kg	0.296	µg/L	0.139					
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	µg/L	0.127					
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	µg/L	0.149			Not sampled for VOCs		
Ethylbenzene	8020	µg/kg	0.157	µg/L	0.046					
Methylene Chloride	8010	µg/kg	3.360	µg/L	0.056					
Tetrachloroethylene	8010	µg/kg	0.154	µg/L	0.049					
Toluene	8020	µg/kg	0.151	µg/L	0.056					
1,1,1-Trichloroethane	8010	µg/kg	0.119	µg/L	0.072					
1,1,2-Trichloroethane	8010	µg/kg	0.075	µg/L	0.043					
Trichloroethylene	8010	µg/kg	0.088	µg/L	0.065					
Vinyl Chloride	8010	µg/kg	0.130	µg/L	0.266					
Xylene	8020	µg/kg	0.611	µg/L	0.202					
Aluminum	6010	µg/kg	3220	µg/L	32.5	9200000	8200000	11000000	7800000	300000
Antimony	6010	µg/kg	4270	µg/L	69.4	ND	ND	ND	4800	120
Barium	6010	µg/kg	115	µg/L	0.001	78000	85000	74000	65000	6200
Beryllium	6010	µg/kg	96.7	µg/L	0.814	270	220	210	160	8.9
Cadmium	6010	µg/kg	330.0	µg/L	4.7	ND	ND	ND	ND	11
Calcium	6010	µg/kg	1520	µg/L	20.9	4800000	4100000	6200000	4600000	230000
Chromium	6010	µg/kg	766	µg/L	5.42	17000	15000	19000	14000	590
Cobalt	6010	µg/kg	653	µg/L	4.05	5000	5600	8300	5300	320
Copper	6010	µg/kg	1080	µg/L	2.65	16000	15000	22000	15000	1500
Iron	6010	µg/kg	1723	µg/L	10.3	14000000	14000000	18000000	13000000	550000
Magnesium	6010	µg/kg	768.0	µg/L	26.0	4100000	4100000	5400000	3800000	160000
Manganese	6010	µg/kg	139	µg/L	1.35	180000	160000	670000	240000	25000
Nickel	6010	µg/kg	2340	µg/L	17.9	14000	16000	21000	15000	760
Potassium	6010	µg/kg	45990	µg/L	662	700000	590000	860000	620000	36000
Silver	6010	µg/kg	326	µg/L	2.87	480	430	ND	470	72
Sodium	6010	µg/kg	15400	µg/L	40.9	500000	420000	560000	440000	26000
Tin	6010	µg/kg	5120	µg/L	51.1	ND	ND	ND	ND	ND
Vanadium	6010	µg/kg	547	µg/L	3.84	34000	31000	35000	30000	930
Zinc	6010	µg/kg	451	µg/L	3.44	39000	37000	47000	37000	2300
Lead	7421	µg/kg	300	µg/L	0.6	3000	3500	6100	4700	550
Arsenic	7060	µg/kg	200	µg/L	2	4400	5000	8900	5200	280

ND = Not Detected

TABLE 8.6. (Contd)

WP32						Soil Summary		Water Summary	
		Soil		Water		Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	Soil Values	of Maximum	Water Values	of Maximum
Benzene	8020	µg/kg	0.174	µg/L	0.105	ND	N/A	ND	N/A
Carbon Tetrachloride	8010	µg/kg	0.302	µg/L	0.121	ND	N/A	ND	N/A
Chloroform	8010	µg/kg	0.086	µg/L	0.043	ND	N/A	ND	N/A
p-Dichlorobenzene	8010/8020	µg/kg	0.093	µg/L	0.107	ND - 0.16	Pit 2/1.4-ft Aug-93	ND - 0.34	Pit 2/1.4-ft Aug-93
1,1-Dichloroethane	8010	µg/kg	0.303	µg/L	0.337	ND	N/A	ND	N/A
1,2-Dichloroethane	8010	µg/kg	0.296	µg/L	0.139	ND	N/A	ND	N/A
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	µg/L	0.127	ND	N/A	ND	N/A
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	µg/L	0.149	ND	N/A	ND	N/A
Ethylbenzene	8020	µg/kg	0.157	µg/L	0.046	ND - 0.19	Pit 2/1.4-ft Aug-93	ND - 0.12	Pit 2/1.4-ft Aug-93
Methylene Chloride	8010	µg/kg	3.360	µg/L	0.056	ND	N/A	ND	N/A
Tetrachloroethylene	8010	µg/kg	0.154	µg/L	0.049	ND	N/A	ND	N/A
Toluene	8020	µg/kg	0.151	µg/L	0.056	ND - 0.16	Pit 2/1.4-ft Aug-93	ND - 0.28	Pit 2/1.4-ft Aug-93
1,1,1-Trichloroethane	8010	µg/kg	0.119	µg/L	0.072	ND	N/A	ND	N/A
1,1,2-Trichloroethane	8010	µg/kg	0.075	µg/L	0.043	ND	N/A	ND	N/A
Trichloroethylene	8010	µg/kg	0.088	µg/L	0.065	ND - 0.94	Pit 2/1.4-ft Aug-93	ND - 0.072	Pit 2/1.4-ft Aug-93
Vinyl Chloride	8010	µg/kg	0.130	µg/L	0.266	ND	N/A	ND	N/A
Xylene	8020	µg/kg	0.611	µg/L	0.202	ND	N/A	ND - 0.55	Pit 2/1.4-ft Aug-93
Aluminum	6010	µg/kg	3220	µg/L	32.5	3300000 - 11000000	Pit 4/5.5-ft Aug-93	14000 - 300000	Pit 4/8.7-ft Aug-93
Antimony	6010	µg/kg	4270	µg/L	69.4	ND - 10000	Pit 2/1.4-ft Aug-93	ND - 120	Pit 4/8.7-ft Aug-93
Barium	6010	µg/kg	115	µg/L	0.001	53000 - 620000	Pit 2/1.4-ft Aug-93	400 - 6200	Pit 4/8.7-ft Aug-93
Beryllium	6010	µg/kg	96.7	µg/L	0.814	ND - 270	Pit 4/2.3-ft Aug-93	2 - 8.9	Pit 4/8.7-ft Aug-93
Cadmium	6010	µg/kg	330.0	µg/L	4.7	ND - 9200	Pit 2/1.4-ft Aug-93	5.5 - 11	Pit 4/8.7-ft Aug-93
Calcium	6010	µg/kg	1520	µg/L	20.9	2400000 - 11000000	Pit 2/1.4-ft Aug-93	57000 - 230000	Pit 4/8.7-ft Aug-93
Chromium	6010	µg/kg	766	µg/L	5.42	8800 - 120000	Pit 2/1.4-ft Aug-93	81 - 590	Pit 4/8.7-ft Aug-93
Cobalt	6010	µg/kg	653	µg/L	4.05	2400 - 8300	Pit 4/5.5-ft Aug-93	35 - 320	Pit 4/8.7-ft Aug-93
Copper	6010	µg/kg	1080	µg/L	2.65	8800 - 140000	Pit 2/1.4-ft Aug-93	320 - 1500	Pit 4/8.7-ft Aug-93
Iron	6010	µg/kg	1723	µg/L	10.3	6900000 - 19000000	Pit 3/6.5-ft Aug-93	100000 - 550000	Pit 4/8.7-ft Aug-93
Magnesium	6010	µg/kg	768.0	µg/L	26.0	1200000 - 5400000	Pit 4/5.5-ft Aug-93	16000 - 160000	Pit 4/8.7-ft Aug-93
Manganese	6010	µg/kg	139	µg/L	1.35	85000 - 670000	Pit 4/5.5-ft Aug-93	6000 - 25000	Pit 4/8.7-ft Aug-93
Nickel	6010	µg/kg	2340	µg/L	17.9	7300 - 21000	Pit 4/5.5-ft Aug-93	78 - 760	Pit 4/8.7-ft Aug-93
Potassium	6010	µg/kg	45990	µg/L	662	170000 - 860000	Pit 4/5.5-ft Aug-93	6200 - 36000	Pit 4/8.7-ft Aug-93
Silver	6010	µg/kg	326	µg/L	2.87	ND - 32000	Pit 2/1.4-ft Aug-93	33 - 72	Pit 4/8.7-ft Aug-93
Sodium	6010	µg/kg	15400	µg/L	40.9	160000 - 560000	Pit 4/5.5-ft Aug-93	17000 - 26000	Pit 4/8.7-ft Aug-93
Tin	6010	µg/kg	5120	µg/L	51.1	ND - 96000	Pit 2/1.4-ft Aug-93	ND	N/A
Vanadium	6010	µg/kg	547	µg/L	3.84	7800 - 35000	Pit 4/5.5-ft Aug-93	64 - 930	Pit 4/8.7-ft Aug-93
Zinc	6010	µg/kg	451	µg/L	3.44	22000 - 790000	Pit 2/1.4-ft Aug-93	660 - 2300	Pit 4/8.7-ft Aug-93
Lead	7421	µg/kg	300	µg/L	0.6	2500 - 550000	Pit 2/1.4-ft Aug-93	240 - 550	Pit 4/8.7-ft Aug-93
Arsenic	7060	µg/kg	200	µg/L	2	2100 - 8900	Pit 4/5.5-ft Aug-93	66 - 280	Pit 4/8.7-ft Aug-93

ND = Not Detected

TABLE 8.7. Volatile Organic Compounds and Metals Analyzed for and Detected in Groundwater, WP32

WP32				Well 32M02		
GROUND-WATER	Method	Units	MDL	WP32_W5 Aug-93	Range of Values	Location / Date of Maximum
Benzene	8020	µg/L	0.105	ND	ND	N/A
Carbon Tetrachloride	8010	µg/L	0.121	ND	ND	N/A
Chloroform	8010	µg/L	0.043	ND	ND	N/A
p-Dichlorobenzene	8010/8020	µg/L	0.107	ND	ND	N/A
1,1-Dichloroethane	8010	µg/L	0.337	ND	ND	N/A
1,2-Dichloroethane	8010	µg/L	0.139	ND	ND	N/A
cis-1,2 Dichloroethylene	8010	µg/L	0.127	ND	ND	N/A
trans-1,2 Dichloroethylene	8010	µg/L	0.149	ND	ND	N/A
Ethylbenzene	8020	µg/L	0.046	ND	ND	N/A
Methylene Chloride	8010	µg/L	0.056	ND	ND	N/A
Tetrachloroethylene	8010	µg/L	0.049	ND	ND	N/A
Toluene	8020	µg/L	0.056	ND	ND	N/A
1,1,1-Trichloroethane	8010	µg/L	0.072	ND	ND	N/A
1,1,2-Trichloroethane	8010	µg/L	0.043	ND	ND	N/A
Trichloroethylene	8010	µg/L	0.065	ND	ND	N/A
Vinyl Chloride	8010	µg/L	0.266	ND	ND	N/A
Xylene	8020	µg/L	0.202	ND	ND	N/A
Aluminum	6010	µg/L	32.5	Not sampled for Metals	N/A	N/A
Antimony	6010	µg/L	69.4		N/A	N/A
Barium	6010	µg/L	0.001		N/A	N/A
Beryllium	6010	µg/L	0.814		N/A	N/A
Cadmium	6010	µg/L	4.7		N/A	N/A
Calcium	6010	µg/L	20.9		N/A	N/A
Chromium	6010	µg/L	5.42		N/A	N/A
Cobalt	6010	µg/L	4.05		N/A	N/A
Copper	6010	µg/L	2.65		N/A	N/A
Iron	6010	µg/L	10.3		N/A	N/A
Magnesium	6010	µg/L	26.0		N/A	N/A
Manganese	6010	µg/L	1.35		N/A	N/A
Nickel	6010	µg/L	17.9		N/A	N/A
Potassium	6010	µg/L	662		N/A	N/A
Silver	6010	µg/L	2.87		N/A	N/A
Sodium	6010	µg/L	40.9		N/A	N/A
Tin	6010	µg/L	51.1		N/A	N/A
Vanadium	6010	µg/L	3.84		N/A	N/A
Zinc	6010	µg/L	3.44		N/A	N/A
Lead	7421	µg/L	0.6		N/A	N/A
Arsenic	7060	µg/L	2		N/A	N/A

ND = Not Detected

TABLE 8.7. (Contd)

WP32				32M02
GROUND-WATER	Method	Units	MDL	WP32_W5 Aug-93
Benzene	8020	µg/L	0.105	ND
Carbon Tetrachloride	8010	µg/L	0.121	ND
Chloroform	8010	µg/L	0.043	ND
p-Dichlorobenzene	8010/8020	µg/L	0.107	ND
1,1-Dichloroethane	8010	µg/L	0.337	ND
1,2-Dichloroethane	8010	µg/L	0.139	ND
cis-1,2 Dichloroethylene	8010	µg/L	0.127	ND
trans-1,2 Dichloroethylene	8010	µg/L	0.149	ND
Ethylbenzene	8020	µg/L	0.046	ND
Methylene Chloride	8010	µg/L	0.056	ND
Tetrachloroethylene	8010	µg/L	0.049	ND
Toluene	8020	µg/L	0.056	ND
1,1,1-Trichloroethane	8010	µg/L	0.072	ND
1,1,2-Trichloroethane	8010	µg/L	0.043	ND
Trichloroethylene	8010	µg/L	0.065	ND
Vinyl Chloride	8010	µg/L	0.266	ND
Xylene	8020	µg/L	0.202	ND
Aluminum	6010	µg/L	32.5	Not sampled for Metals
Antimony	6010	µg/L	69.4	
Barium	6010	µg/L	0.001	
Beryllium	6010	µg/L	0.814	
Cadmium	6010	µg/L	4.7	
Calcium	6010	µg/L	20.9	
Chromium	6010	µg/L	5.42	
Cobalt	6010	µg/L	4.05	
Copper	6010	µg/L	2.65	
Iron	6010	µg/L	10.3	
Magnesium	6010	µg/L	26.0	
Manganese	6010	µg/L	1.35	
Nickel	6010	µg/L	17.9	
Potassium	6010	µg/L	662	
Silver	6010	µg/L	2.87	
Sodium	6010	µg/L	40.9	
Tin	6010	µg/L	51.1	
Vanadium	6010	µg/L	3.84	
Zinc	6010	µg/L	3.44	
Lead	7421	µg/L	0.6	
Arsenic	7060	µg/L	2	

ND = Not Detected

TABLE 8.8. Pesticides Analyzed for and Detected in Soil, WP32

WP32						Pit 1 - Soil		Pit 2 - Soil		Pit 2 - Water	Pit 3 - Soil			Pit 3 - Water
		Soil		Water		WP32_S1_1	WP32_S1_2	WP32_S2_1	WP32_S2_2	WP32_W2_1	WP32_S3_1	WP32_S3_2	WP32_S3_3	WP32_W3_1
SOIL	Method	Units	MDL	Units	MDL	0.9-ft Aug-93	3.0-ft Aug-93	0.9-ft Aug-93	1.4-ft Aug-93	0.9-ft Aug-93	1.9-ft Aug-93	3.9-ft Aug-93	6.5-ft Aug-93	6.5-ft Aug-93
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	ND	ND	ND	ND				
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	ND	ND	ND	ND				
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	ND	ND	ND	ND				
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	ND	ND	ND	0.0076				
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND	ND	ND	4.1	ND				
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND	ND	ND	(a)	3.7				
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	ND	ND	26	270	0.028				
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND	ND	ND	85	0.0094		Not sampled for Pesticides		
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	ND	ND	ND	ND	ND				
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND	ND	ND	110	ND				
Endosulfin I	8080	µg/kg	4.30	µg/L	0.0029	ND	ND	ND	ND	ND				
Endosulfin II	8080	µg/kg	0.28	µg/L	0.004	ND	ND	ND	ND	ND				
Endosulfansulfate	8080	µg/kg	1.70	µg/L	0.0072	ND	ND	ND	ND	ND				
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	ND	ND	ND	ND				
Endrin aldehyde	8080	µg/kg	2.50	µg/L	0.011	ND	ND	ND	ND	ND				
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	ND	ND	ND	ND				
Heptachlorepoxide	8080	µg/kg	5.70	µg/L	0.0008	ND	ND	ND	ND	ND				
Methoxychlor	8080	µg/kg	13.0	µg/L	0.1	ND	ND	ND	ND	ND				
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	ND	ND	ND	ND				

ND = Not Detected

(a) Concentration greater than upper limit of analysis range.

TABLE 8.8. (Contd)

WP32						Pit 4 - Soil				Pit 4 - Water
		Soil		Water		WP32_S4_1	S4_1 Dup	WP32_S4_2	WP32_S4_3	WP32_W4_3
SOIL	Method	Units	MDL	Units	MDL	2.3-ft Aug-93	2.3-ft Aug-93	5.5-ft Aug-93	8.6-ft Aug-93	8.7-ft Aug-93
Aldrin	8080	µg/kg	0.63	µg/L	0.05					
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012					
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026					
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014					
Lindane	8080	µg/kg	0.41	µg/L	0.0021					
Chlordane	8080	µg/kg	7.40	µg/L	0.0057					
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005					
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009			Not sampled for Pesticides		
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011					
Dieldrin	8080	µg/kg	5.10	µg/L	0.019					
Endosulfin I	8080	µg/kg	4.30	µg/L	0.0029					
Endosulfin II	8080	µg/kg	0.28	µg/L	0.004					
Endosulfansulfate	8080	µg/kg	1.70	µg/L	0.0072					
Endrin	8080	µg/kg	0.51	µg/L	0.008					
Endrin aldehyde	8080	µg/kg	2.50	µg/L	0.011					
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019					
Heptachlorepoxide	8080	µg/kg	5.70	µg/L	0.0008					
Methoxychlor	8080	µg/kg	13.0	µg/L	0.1					
Toxaphene	8080	µg/kg	26.0	µg/L	0.89					

ND = Not Detected

TABLE 8.8. (Contd)

WP32						Soil Summary		Water Summary	
		Soil		Water		Range of	Location / Date	Range of	Location / Date
SOIL	Method	Units	MDL	Units	MDL	Soil Values	of Maximum	Water Values	of Maximum
Aldrin	8080	µg/kg	0.63	µg/L	0.05	ND	N/A	ND	N/A
alpha-BHC	8080	µg/kg	0.26	µg/L	0.012	ND	N/A	ND	N/A
beta-BHC	8080	µg/kg	0.44	µg/L	0.0026	ND	N/A	ND	N/A
delta-BHC	8080	µg/kg	0.39	µg/L	0.0014	ND	N/A	ND - 0.0076	Pit 2/0.9-ft Aug-93
Lindane	8080	µg/kg	0.41	µg/L	0.0021	ND - 4.1	Pit 2/1.4-ft Aug-93	ND	N/A
Chlordane	8080	µg/kg	7.40	µg/L	0.0057	ND - (a)	Pit 2/1.4-ft Aug-93	N - 3.7	Pit 2/0.9-ft Aug-93
4,4-DDD	8080	µg/kg	0.65	µg/L	0.0005	ND - 270	Pit 2/1.4-ft Aug-93	ND - 0.028	Pit 2/0.9-ft Aug-93
4,4-DDE	8080	µg/kg	6.70	µg/L	0.0009	ND - 85	Pit 2/1.4-ft Aug-93	ND - 0.0094	Pit 2/0.9-ft Aug-93
4,4-DDT	8080	µg/kg	1.20	µg/L	0.011	ND	N/A	ND	N/A
Dieldrin	8080	µg/kg	5.10	µg/L	0.019	ND - 110	Pit 2/1.4-ft Aug-93	ND	N/A
Endosulfin I	8080	µg/kg	4.30	µg/L	0.0029	ND	N/A	ND	N/A
Endosulfin II	8080	µg/kg	0.28	µg/L	0.004	ND	N/A	ND	N/A
Endosulfansulfate	8080	µg/kg	1.70	µg/L	0.0072	ND	N/A	ND	N/A
Endrin	8080	µg/kg	0.51	µg/L	0.008	ND	N/A	ND	N/A
Endrin aldehyde	8080	µg/kg	2.50	µg/L	0.011	ND	N/A	ND	N/A
Heptachlor	8080	µg/kg	0.40	µg/L	0.0019	ND	N/A	ND	N/A
Heptachlorepoxide	8080	µg/kg	5.70	µg/L	0.0008	ND	N/A	ND	N/A
Methoxychlor	8080	µg/kg	13.0	µg/L	0.1	ND	N/A	ND	N/A
Toxaphene	8080	µg/kg	26.0	µg/L	0.89	ND	N/A	ND	N/A

ND = Not Detected

(a) Concentration greater than upper limit of analysis range.

TABLE 8.9. Pesticides Analyzed for and Detected in Groundwater, WP32

WP32				32M02
GROUND-WATER	Method	Units	MDL	WP32_W5 Aug-93
Aldrin	8080	µg/L	0.05	Not sampled for Pesticides
alpha-BHC	8080	µg/L	0.012	
beta-BHC	8080	µg/L	0.0026	
delta-BHC	8080	µg/L	0.0014	
Lindane	8080	µg/L	0.0021	
Chlordane	8080	µg/L	0.0057	
4,4-DDD	8080	µg/L	0.0005	
4,4-DDE	8080	µg/L	0.0009	
4,4-DDT	8080	µg/L	0.011	
Dieldrin	8080	µg/L	0.019	
Endosulfin I	8080	µg/L	0.0029	
Endosulfin II	8080	µg/L	0.004	
Endosulfansulfate	8080	µg/L	0.0072	
Endrin	8080	µg/L	0.008	
Endrin aldehyde	8080	µg/L	0.011	
Heptachlor	8080	µg/L	0.0019	
Heptachlorepoxide	8080	µg/L	0.0008	
Methoxychlor	8080	µg/L	0.1	
Toxaphene	8080	µg/L	0.89	

TABLE 8.10. Anions Analyzed for and Detected in Groundwater, WP32

WP32				32M02
GROUND-WATER	Method	Units	MDL	WP32_W5 Aug-93
Bromide	300.0	µg/L	52.8	80
Chloride	300.0	µg/L	82.5	22000
Flouride	300.0	µg/L	13.9	600
Nitrate	300.0	µg/L	44.4	7700
Nitrite	300.0	µg/L	38.3	300
Phosphate Ion	300.0	µg/L	147	ND
Sulfate	300.0	µg/L	49.9	11000

ND = Not Detected

TABLE 8.11. Decision Criteria for Sampling Recommendations at Wastewater Treatment Plant

GROUND WATER

CONTAMINANT	HIGHEST DETECT µg/l	SDWA MCL µg/l	CARCINOGENS µg/l	SYSTEMIC TOXICANTS µg/l	CRITERIA RESULTS
arsenic	**97.6**	**50**	**0.042**		**above††**
cadmium	**5.6**	**5**		**18**	**above††**
chromium	**61.4**	**50**			**above††**
lead	**60**	**15**			**above††**
mercury	**4.56**	**2**		**11**	**above††**
1,1-dichloroethane	2			800	below
1,2-dichloroethane	**0.493**	**5**	**0.2**		**above**
1,1-dichloroethylene	**8**	**0.08**		**360**	**above**
trihalomethanes, total	21	100			below
trichloroethylene	0.523	5	3		below
toluene	73	1000		3000	below
benzene	0.25	5	0.6		below

†† May be background

TABLE 8.11. (Contd)

SURFACE WATER					
CONTAMINANT	HIGHEST DETECT µg/l	WQC-HUMAN FOOD CHAIN† µg/l	WQC-AQUATIC ACUTE µg/l	WQC-AQUATIC CHRONIC µg/l	CRITERIA RESULTS
arsenic	**44.9**	**0.018**			**above††**
lead	**7.2**		**34**	**1.3**	**above††**
mercury	**0.3**	**0.146**	**2.4**	**0.012**	**above††**
chloroform	0.846	15.7	28900	1240	below
1,2-dichloroethane	0.242	99	118000	20000	below
trihalomethanes, total	10.9	15.7	11000		below
tetrachloroethylene	**9.81**	**8.85**	**5280**	**840**	**above**

† fish ingestion

SOIL					
CONTAMINANT	HIGHEST DETECT µg/l	ALASKA SOIL CLEAN UP µg/l	CARCINOGENS µg/l	SYSTEMIC TOXICANTS µg/l	CRITERIA RESULTS
arsenic	18.6		0.32		**above††**
lead	16.3			200	**above††**
PAH	0.23		0.055		**above**
TPH	**4290**	**100**			**above**
pyrene	0.2			8200	below

9.0 Source Area SS56

9.0 SS56 ENGINEER HILL SPILL SITE

9.1 LOCATION

SS56 (Engineer Hill Spill Site) is a spill site at an active munitions storage and maintenance area about 6.5 km north-northeast of the main part of Eielson Air Force Base (AFB) (Figure 9.1). The storage and maintenance area is on an isolated hill and is accessed along a controlled gravel road that joins Transmitter Road about 1 km east of the wastewater treatment plant. The storage and maintenance area is a secured area with a fence and guard house. Except for the access corridor, the area is contained within Fort Wainwright (U.S. Army) property. Lily Lake, an unimproved recreational area, is about 200 m south of SS56, outside of the security perimeter. The nearest residences (in the community of Moose Creek) are about 5.5 km southwest of SS56.

9.2 HISTORICAL USE

The munitions storage and maintenance area was built in the early 1950s and used by the U.S. Army Corps of Engineers. The primary mission was and continues to be the storage and maintenance of munitions. In this capacity, ammunition and light artillery shells are received by the facility and stored or repaired as needed. Support for these activities is supplied by eight small buildings on a paved road that follows the 200-m contour line of Engineer Hill (Figure 9.1). A ninth building (6122) is at the base of the hill.

Before 1990, sporadic light vehicle and trailer maintenance were done in Building 6161. All maintenance is now done at the main base shops. Buildings 6161, 6162, and 6163 stored munitions. Site vehicles are kept in Building 6154. Building 6158 houses a diesel generator for power and a boiler plant for heating. Buildings 6152 and 6159 are administrative offices. Building 6122 is the maintenance building.

Building 6122 has a floor drain in the bathroom. Floor drains were also found in Buildings 6158 and 6161. These structures connect to the septic system or independent dry wells or drain fields. Roof drains and storm drains are routed to corrugated metal culverts that discharge down slope of the road.

Seven below-ground and three above-ground storage tanks have supplied fuel oil, gasoline, and diesel. In Building 6158, a 75.7-m^3 (20,000-gal) above-ground tank and 3.8-m^3 (1000-gal) below-ground tank (both installed in 1954), and a 0.4-m^3 (100-gal) above-ground tank supply diesel to the power plant and boilers. In 1986, 1.9-m^3 (500-gal) underground fuel oil tanks were installed and connected to Buildings 6128, 6132, 6134, and 6136. A 1.9-m^3 (500-gal) gasoline below-ground tank is at Building 6155. A tank of Stoddard solvent was kept in Building 6161 for trailer maintenance but has been removed. No evidence of leaking tanks or pipeline has been observed. A 60-L release of arctic diesel occurred in January 1989, but all product was reported recovered and properly disposed. In 1992, a diesel tank was removed from Building 6158 under the base tank testing and removal program. A second tank was removed from Building 6128 and revealed stained soil. A site inspection report (Shannon & Wilson 1993) was filed with the State of Alaska. Samples were retrieved from the excavated material and from the material below the tank and piping excavation. Samples were analyzed for TPH (418.1), diesel-range TPH (8100M), gasoline-range TPH (8015M), BTEX (8020), volatile organic compounds (8240), and PCB (8080). PCB concentrations were below detection limits. Small amounts of carbon tetrachloride (0.4 ppb), chloroform (0.4 ppb), and 1,2-dichloropropane (0.3 ppb) were detected. Stained soil generally exceeded State of Alaska criteria for DR-TPH but not BTEX (e.g., benzene at 0.15 mg/kg). Soil below the tank and piping ranged between 1100 and 2100 mg/kg in

DR-TPH, below the State criteria of 2000 mg/kg in one case. The site has been submitted for no further action. All below-ground tanks and piping were tested in 1993 and all passed. Tanks on the office side of the complex were not tested.

The activities at these nine buildings involved potential contaminants of concern. Trailer repair may have involved small amounts of fuel, lubricants, and degreasers. According to the unit commander, munitions maintenance consists of disassembly of light artillery ammunition and rockets and involves only minor amounts of solvents or degreasers. For reasons of safety, explosives, propellants, and other dangerous compounds contained by these weapons are strictly controlled within the buildings and have never been released to the environment. Repairs to the diesel generator may have used small quantities of fuel, lubricants, and solvents. Boiler maintenance involved blow-down wastes that included phosphate compounds and any contaminants present in the groundwater. In the past, blow-down water was discharged to floor drains; however, it is now removed and disposed as hazardous waste.

SS56 has been supplied with water, brought to the site in tanks, since about 1991. Two wells formerly supplied water to SS56. The first well was drilled in 1976 to a depth of 139 m. Contamination of this well was discovered in 1986 (see Section 9.3.2). A new well was drilled in 1990. Both wells are connected to a 60,000-gal tank. The wells are considered contaminated and were disconnected from the drinking water supply in 1991. Drinking water at the munitions storage and maintenance area is supplied with bottled water.

Wastewater is conducted through a utilidor to a drain pipe and septic tank at the bottom of the hill. From there, effluent is discharged to a leach field. A wooden crib at the bottom of the hill (Figure 9.1), on the road to Lily Lake, regularly discharges water to the surface in a seep and is a part of the leach field.

9.3 HISTORICAL DATA AND ASSUMPTIONS

9.3.1 Site Observations. Site inspection during June 1993 revealed no evidence for large use or release of solvents or petroleum products (see photographs in Appendix B). No stressed vegetation, oily sheens, unusual odors, refuse, drums, or stained soil were observed at SS56. At the leach field, a large pool of standing water has accumulated directly adjacent to the wooden crib, in a low spot on the road. The water is clearly flowing, at low discharge, into the road. The water has no distinctive odor or color. The area has been blocked off, and the dirt road to Lily Lake has been realigned.

9.3.2 Previous Investigations. There has been no Installation Restoration Program or CERCLA investigations at SS56. Jacobs Engineering prepared a sampling and analysis plan that included SS56 but was never implemented. Analytical data requested (Table 9.1) is limited to drinking water parameters for operation of the water supply well.

Groundwater samples were collected on a quarterly basis from the water wells at SS56 starting in 1986 (Table 9.1). From 1986 on, a variety of organic compounds have been found. The most consistently detected analyte in the well has been tetrachloroethylene, with benzene, toluene, ethylbenzene, and xylene (BTEX); trichloroethylene; 1,1-dichloroethylene; 1,1,2,2-tetrachloroethane; 1,1,1-trichloroethane; naphthalene; chlorobenzene; and a variety of non-BTEX alkylbenzenes found sporadically. Arsenic, copper, iron, manganese, zinc, chloride, nitrate, and sulfate were also above maximum contaminant levels. In 1988, a carbon filter was installed and the tetrachloroethylene concentration declined markedly (15 μg/L). In April 1989, the value spiked again and remained high (41 to 59 μg/L), leading Eielson AFB personnel to suspect that tetrachloroethylene had saturated the filter. The filter was replaced but elevated tetrachloroethylene and other organic species remained unacceptably high. In 1990, a new well was brought on line and was similarly contaminated. Testing was discontinued following the shut down of the well. In March 1994 (while this report was in review), Eielson AFB Bioenvironmental Engineering Services sampled the well and analyzed it for volatile organic compounds (EPA 503.1, MDL = 0.2 μg/L). TCE was found at 0.6 μg/L and tetrachloroethylene at 25.1 μg/L suggesting that the well is still contaminated.

No sampling has occurred in the seep at the wooden crib.

9.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

9.4.1 Potential Contaminants of Concern. The past activities at SS56 do not suggest large-scale use of solvents, paints, degreasers, or trichloroethylene-based chemicals. Despite this, quantities of all of these materials were probably stored at SS56 and a tank of Stoddard solvent was maintained until after 1990. Large quantities of fuel were maintained on site with at least one release in 1989 (see Section 9.2). Waste oils and hydraulic fluid could also have been stored and/or spilled during routine use. Small amounts of these materials were likely released to the environment through the floor drains and leach fields.

Based on the expected components of these materials, the potential contaminants of concern are

arsenic	1,2-dichloroethylene	PAH
cadmium	1,1,1-trichloroethane	PCB
chromium	1,1,2,2-tetrachloroethane	tetrachloroethylene
lead	acetone	tetraethyl lead
nickel	benzene	tetramethyl lead
1,1-dichloroethane	DDT, DDD, DDE	toluene
1,2-dichloroethane	ethylbenzene	trichloroethylene
1,1-dichloroethylene	naphthalene	xylene.

9.4.2 Conceptual Model. Very little geological or hydrological information is known about SS56. No historical record of water levels exists for the two water supply wells. Engineer Hill is composed of Precambrian quartz-mica schists collectively referred to as the Birch Creek Schist (Pewe 1982). Drilling at Ski Hill (WP38) (HLA 1991) records the geology of an area generally similar to SS56 and reveals the site-specific complexity to be expected at SS56. Regional mapping (Weber et al. 1978) indicates that Precambrian schist is exposed at both localities. During the limited field investigation, a geological reconnaissance of the two sites was performed.

At Ski Hill (WP38), the schist is a deeply weathered, yellow-brown to red-brown, foliated and fractured quartz-biotite schist with intermittent graphite-rich, talc-rich, and quartzose layering. Shear zones and mineralized or oxidized planar zones are common. The upland associated with the Ski Lodge is mantled with loess that grades at the base of the slope into silty soils of probable eolian origin. Alluvium, some frozen, appears to lap out against the Birch Creek Schist although the contact is not clear. At Engineer Hill, a similar schist is exposed in outcrops at the base of the hill, behind the maintenance building (Figure 9.1). This sequence contains some quartzite and appears to be more oxidized but is grossly similar in degree of fracturing and structural orientation.

If these same conditions hold at SS56, the contamination reported from the well and the seeps at the wooden crib may be hydrologically linked. If this is the case, a persistent source within the fractured rock aquifer may be present at SS56. If fuel and solvent were routinely washed into the shop drains, this material would have been released into the leach field and could have migrated into the fractured rock aquifer where it became drawn up into the well. Numerous cycles of contaminated flow between the leach field and the well could have pervasively contaminated the aquifer. Transport can be very complex in fractured rock aquifers. Heterogeneous aquifer properties are the norm (Gale 1982), and contaminants can persist in these systems over large time scales. This suggests that the variability of the groundwater data is a direct result of the aquifer properties.

9.4.3 Sampling Objective and Strategy. The conceptual model suggests that the contaminants derived from past practices are preserved in the supply well and within the leach field outfall. The supply well is clearly contaminated. The model suggests that contaminants might have been recycled through the water supply wells and the wooden crib seeps. The samples at the leach field would determine if a current pathway is complete for humans and ecological receptors.

In summary, the following sampling strategy was used at SS56.

Objective: To evaluate contamination at SS56 that is the result of discharges at the waste water leach field.

Action: Sample the soil that is in contact with leach field effluent.

Sample the leach field effluent.

Install monitoring Well 56M03 to represent shallow groundwater at the base of the hill.

Activity: A brief geological inspection was made of SS56 and similar bedrock outcrops at Ski Hill.

Soil samples were taken at regular intervals between the surface and water table during installation of the monitoring well. The soil samples were analyzed for volatile organic compounds, semivolatile organic compounds, inductively coupled plasma metals, lead, and arsenic.

A groundwater sample was taken from Well 56M03 and analyzed for volatile organic compounds, semivolatile organic compounds, inductively coupled plasma metals, lead, and arsenic.

9.4.4 Limited Field Investigation Field Work. A soil boring and monitoring well were installed immediately adjacent to the wooden crib. The leach field is underlain by dark brown, micaceous, clay-like silt with gravel to about 6 m (20 ft) (Appendix B). No permafrost was found. The first boring encountered a perched aquifer at about 3.8 m (12.5 ft). The hole was abandoned in unsaturated silt at 6.2 m (20.3 ft) below the surface. Water was cascading into the hole. The augers were pulled, and the boring was sealed and reclaimed. The hole was restarted about 2 m adjacent to about 5 m below the surface. The stratigraphic sequence was identical. Casing was set and the well developed with the screened interval at 1.5 to 5 m to sample the perched zone. Static water level the next day was 2.3 m (7.6 ft).

Tables 9.2 through 9.5 summarize the analytical data obtained for SS56. Two soil samples were retrieved during well construction, from the shallow near-surface and from the unsaturated silt below the perched zone. A split-spoon sampler was used for the lower sample to limit contamination with perched fluid. Soil samples were analyzed for volatile organic compounds and total metals, and semivolatile organic compounds (Tables 9.2 and 9.4). Groundwater samples were analyzed for the same parameters (Tables 9.3 and 9.5).

9.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

Regulatory, risk-based, and background criteria have been used to evaluate the risk indicated by the Phase 2 limited field investigation data for SS56 (Table 9.6). Past data suggested that arsenic, manganese, 1,1-dichloroethylene, 1,1,2,2-tetrachloroethane, tetrachloroethylene, trichloroethylene, and benzene might be a problem in the wastewater disposal system. Semivolatile or organic compounds were not detected (Tables 9.2 through 9.5) in any soil or water samples above the method detection limits. Volatile organic compounds were also not detected in all soil samples.

Groundwater samples produced (Table 9.3) detectable levels of benzene (0.13 μg/L), p-dichlorobenzene (0.11 μg/L), ethylbenzene (0.15 mg/L), methylene chloride (0.11 μg/L), tetrachloroethylene (0.11 μg/L), xylene (1.1 μg/L), and toluene (1.0 μg/L). All of these are well below maximum contaminant levels or risk-based criteria. The decrease in concentration between the well and the crib likely occurs through volatilization of these organic compounds. Trichloroethylene was detected at 6.5 μg/L and is greater than the maximum contaminant level and the 10^{-6} carcinogenic health risk.

Metals are within criteria and background levels in groundwater with the exception of lead (18 μg/L) and arsenic (81 μg/L) (Table 9.3). Soil metal values are all at background levels and, for the most part, do not vary with depth. Both lead and arsenic are highest (< two times) in the shallow sample. Recall also that the water used at SS56 is extracted from a bedrock aquifer. Water from crystalline metamorphic rock is commonly greatly elevated in trace metals (such as arsenic and lead) relative to fluvial formation aquifers (Runnels et al. 1992). The water and bedrock of the Eielson AFB crystalline formations have not been characterized.

In summary, the only water quality parameters that have remained above criteria from the water supply well to the crib well are for trichloroethylene; arsenic and lead have also been found at elevated levels. Most of the contaminants found in the well water appear to not be in the wastewater crib, as represented by the groundwater data, at the same high levels.

9.6 RISK CHARACTERIZATION

9.6.1 Soil. No volatile or semivolatile organic compounds were detected in the soil at the crib. All metal concentrations were below risk-based criteria or background levels.

9.6.2 Groundwater. Contamination of the water supply well is not in question. The potential of contamination by the supply well of proximal receptor points remains unaddressed. Despite this, samples from Lily Lake (U.S. Air Force 1994b) do not indicate levels of the contaminants of concern for SS56 that exceed method detection limits. The well has repeatedly revealed levels of regulated contaminants at levels exceeding regulatory and risk-based contaminants. The extent of the contamination is unknown. Secondary contamination of water at the crib and in the shallow perched aquifer appears to be limited to arsenic, lead, and trichloroethylene. Currently, water from these aquifers is not used and the closest drinking water well and residences are at Moose Creek, about 5.5 km away. This indicates that a groundwater pathway for current human health is not complete. An ecological pathway to vegetation and burrowing animals may be complete.

9.6.3 Surface Water. Because surface soil is not contaminated, surface water is not likely to be contaminated by overland flow. However, shallow and deep groundwater at SS56 is contaminated and a ground to surface water pathway currently exists.

9.6.4 Air. Surface soil is uncontaminated and re-suspension/inhalation is not a complete pathway. Volatile species are present in the shallow groundwater system and, presumably, the surface water but at very low levels. Volatilization of organic compounds is presumed to occur throughout the buried piping system. The air pathway is not complete to any receptors.

9.7 CONCLUSIONS AND RECOMMENDATIONS

The risk to human and ecological health from SS56 is unclear. It is recommended that this site be included with the remedial investigation/feasibility study for OU 3. The revised schedule for OU 3 is compatible with this action. Future work should consist of a limited aquifer test and hydrogeologic investigation of bedrock at Engineer Hill. In addition, two wells should be drilled adjacent to the hill to the top of the first aquifer. Samples from these aquifers should be analyzed for metals and volatile organic compounds.

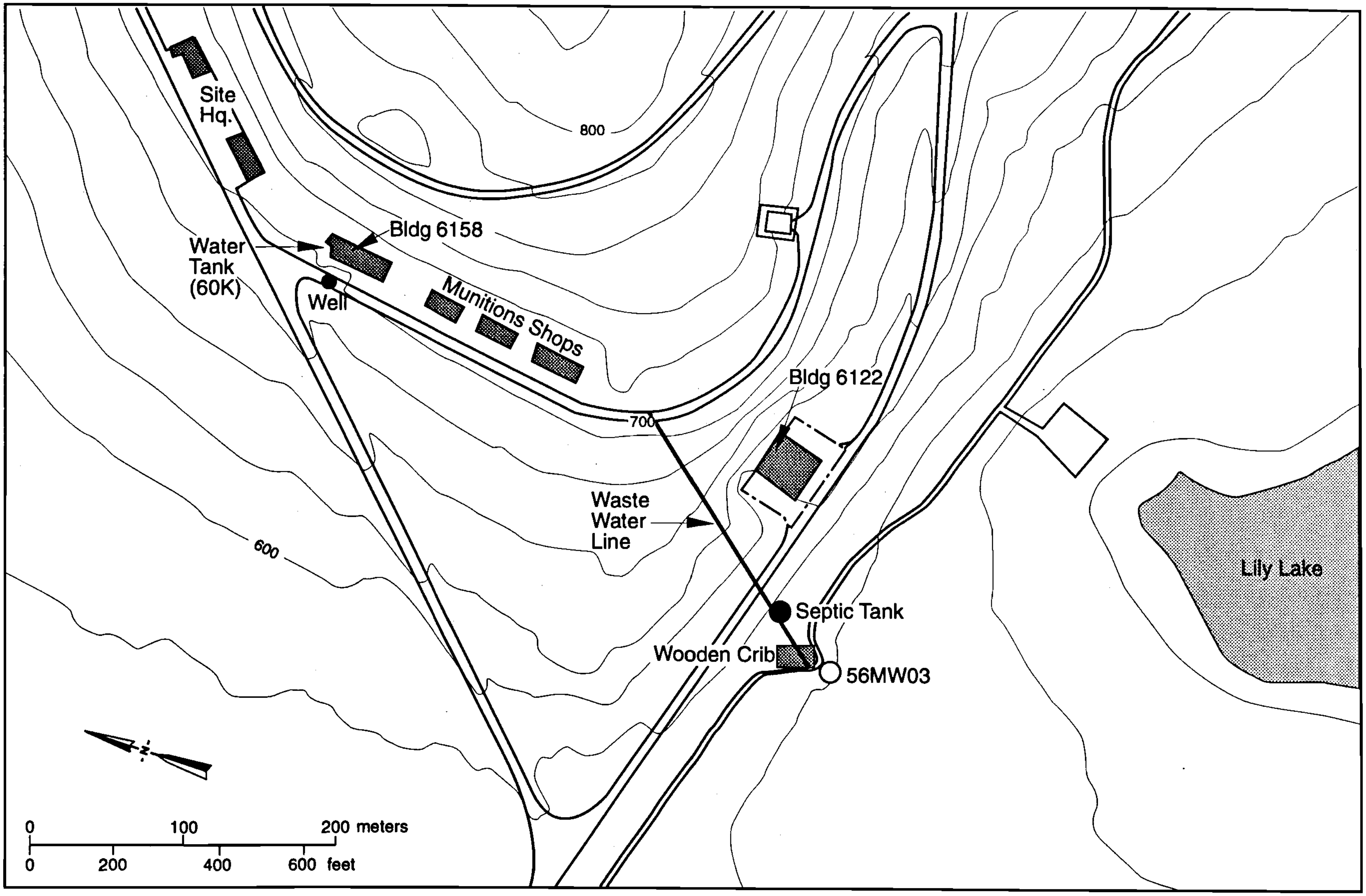

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FIGURE 9.1. Map of SS56

TABLE 9.1. Analytical Data from the Engineer Hill Water Supply Well. Data from 1986 are from older well. 1990 and 1991 data are from new well.

SS 56-Engineer Hill	1986	1987				1988					1989						1990		1991	
Ground Water Data	Dec	Sept	Dec	Jan	Mar	Apr	Jul	Jan	Apr	May	June	July	Aug	Oct	Jan	Apr	July	Oct	Jan	April
Volatile Organic																				
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	ND	ND	ND	ND
n-Butylbenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	NA	ND	0.522	ND	ND	ND	ND	0.4	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	0.41	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
Ethylbenzene	ND	0.028	ND	ND	ND	ND	ND	ND	ND	ND	27	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.2	ND	ND	ND	ND	ND	0.9	ND	ND	ND
n-Propylbenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	48	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
Tetrachloroethylene	48	24.6	40	15	12	23	14	ND	41	59	ND	48	ND	5.2	4.4	ND	4.1	ND	7.7	6.3
Toluene	19.6	0.05	ND	ND	ND	ND	ND	ND	ND	ND	220	ND	ND	ND	ND	ND	0.4	ND	ND	ND
1,1,1-Trichloroethane	0.04	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	NA	NA
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	1.4	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,5-Trimethylbenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	38	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	NA	0.17	ND	ND	ND	ND	ND	ND	ND	ND	199	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals																				
Arsenic	4	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21	NA	NA	NA	NA
Copper	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	107	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	271	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	385	NA	NA	NA	NA
Zinc	700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	746	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA
Nitrate	NA	0.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA	NA	NA

TABLE 9.2. Volatile Organic Compounds and Metals Analyzed for and Detected in Soil, SS56

SS56				56M03				
SOIL	Method	Units	MDL	SS56_S1_1 5.6-ft Aug-93	SS56_S1_1 15-ft Aug-93	Range of Values	Location / Date of Maximum	Background Metals
Benzene	8020	µg/kg	0.174	ND	ND	ND	N/A	
Carbon Tetrachloride	8010	µg/kg	0.302	ND	ND	ND	N/A	
Chloroform	8010	µg/kg	0.086	ND	ND	ND	N/A	
p-Dichlorobenzene	8010/8020	µg/kg	0.093	ND	ND	ND	N/A	
1,1-Dichloroethane	8010	µg/kg	0.303	ND	ND	ND	N/A	
1,2-Dichloroethane	8010	µg/kg	0.296	ND	ND	ND	N/A	
cis-1,2 Dichloroethylene	8010	µg/kg	0.196	ND	ND	ND	N/A	
trans-1,2 Dichloroethylene	8010	µg/kg	0.169	ND	ND	ND	N/A	
Ethylbenzene	8020	µg/kg	0.157	ND	ND	ND	N/A	
Methylene Chloride	8010	µg/kg	3.360	ND	ND	ND	N/A	
Tetrachloroethylene	8010	µg/kg	0.154	ND	ND	ND	N/A	
Toluene	8020	µg/kg	0.151	ND	ND	ND	N/A	
1,1,1-Trichloroethane	8010	µg/kg	0.119	ND	ND	ND	N/A	
1,1,2-Trichloroethane	8010	µg/kg	0.075	ND	ND	ND	N/A	
Trichloroethylene	8010	µg/kg	0.088	ND	ND	ND	N/A	
Vinyl Chloride	8010	µg/kg	0.130	ND	ND	ND	N/A	
Xylene	8020	µg/kg	0.611	ND	ND	ND	N/A	
Aluminum	6010	µg/kg	3220	13000000	13000000	13000000	5.6/15-ft Aug-93	
Antimony	6010	µg/kg	4270	ND	5900	ND - 5900	15-ft Aug-93	
Barium	6010	µg/kg	115	140000	150000	140000 - 150000	15-ft Aug-93	141200
Beryllium	6010	µg/kg	96.7	ND	ND	ND	N/A	
Cadmium	6010	µg/kg	330.0	ND	ND	ND	N/A	
Calcium	6010	µg/kg	1520	5200000	12000000	5200000 - 12000000	15-ft Aug-93	
Chromium	6010	µg/kg	766	25000	24000	24000 - 25000	5.6-ft Aug-93	26000
Cobalt	6010	µg/kg	653	9400	8400	8400 - 9400	5.6-ft Aug-93	
Copper	6010	µg/kg	1080	25000	27000	25000 - 27000	15-ft Aug-93	44800
Iron	6010	µg/kg	1723	20000000	20000000	20000000	5.6-ft Aug-93	26823000
Magnesium	6010	µg/kg	768.0	5200000	6000000	5200000 - 6000000	15-ft Aug-93	
Manganese	6010	µg/kg	139	360000	340000	340000 - 360000	5.6-ft Aug-93	409000
Nickel	6010	µg/kg	2340	24000	21000	21000 - 24000	5.6-ft Aug-93	31900
Potassium	6010	µg/kg	45990	1100000	1400000	1100000 - 1400000	15-ft Aug-93	
Silver	6010	µg/kg	326	ND	ND	ND	N/A	
Sodium	6010	µg/kg	15400	330000	430000	330000 - 430000	15-ft Aug-93	
Tin	6010	µg/kg	5120	ND	ND	ND	N/A	
Vanadium	6010	µg/kg	547	41000	40000	40000 - 41000	5.6-ft Aug-93	
Zinc	6010	µg/kg	451	48000	55000	48000 - 55000	15-ft Aug-93	69000
Lead	7421	µg/kg	300	7500	7900	7500 - 7900	15-ft Aug-93	10600
Arsenic	7060	µg/kg	200	8300	12000	8300 - 12000	15-ft Aug-93	13900

ND = Not Detected

TABLE 9.3. Volatile Organic Compounds and Metals Analyzed for and Detected in Groundwater, SS56

SS56				56M03
GROUND-WATER	Method	Units	MDL	SS56_W1 Aug-93
Benzene	8020	µg/L	0.105	0.17
Carbon Tetrachloride	8010	µg/L	0.121	ND
Chloroform	8010	µg/L	0.043	ND
p-Dichlorobenzene	8010/8020	µg/L	0.107	0.11
1,1-Dichloroethane	8010	µg/L	0.337	ND
1,2-Dichloroethane	8010	µg/L	0.139	ND
cis-1,2 Dichloroethylene	8010	µg/L	0.127	ND
trans-1,2 Dichloroethylene	8010	µg/L	0.149	ND
Ethylbenzene	8020	µg/L	0.046	0.15
Methylene Chloride	8010	µg/L	0.056	0.11
Tetrachloroethylene	8010	µg/L	0.049	0.11
Toluene	8020	µg/L	0.056	1.0
1,1,1-Trichloroethane	8010	µg/L	0.072	ND
1,1,2-Trichloroethane	8010	µg/L	0.043	ND
Trichloroethylene	8010	µg/L	0.065	ND
Vinyl Chloride	8010	µg/L	0.266	ND
Xylene	8020	µg/L	0.202	1.1
Aluminum	6010	µg/L	32.5	38000
Antimony	6010	µg/L	69.4	ND
Barium	6010	µg/L	0.001	570
Beryllium	6010	µg/L	0.814	2.4
Cadmium	6010	µg/L	4.7	ND
Calcium	6010	µg/L	20.9	61000
Chromium	6010	µg/L	5.42	64
Cobalt	6010	µg/L	4.05	27
Copper	6010	µg/L	2.65	90
Iron	6010	µg/L	10.3	59000
Magnesium	6010	µg/L	26.0	26000
Manganese	6010	µg/L	1.35	1900
Nickel	6010	µg/L	17.9	69
Potassium	6010	µg/L	662	8100
Silver	6010	µg/L	2.87	4.2
Sodium	6010	µg/L	40.9	29000
Tin	6010	µg/L	51.1	ND
Vanadium	6010	µg/L	3.84	110
Zinc	6010	µg/L	3.44	320
Lead	7421	µg/L	0.6	29
Arsenic	7060	µg/L	2	27

ND = Not Detected

TABLE 9.4. Semivolatile Organic Compounds Analyzed for and Detected in Soil, SS56

SS56				56M03		Summary	
		Soil		SS56_S1_1	SS56_S1_2	Range of	Location / Date
SOIL	Method	Units	MDL	5.7-ft Aug-93	15-ft Aug-93	Soil Values	of Maximum
o-Cresol	8270	µg/Kg	94.8	ND	ND	ND	N/A
m-Cresol	8270	µg/Kg	92.1	ND	ND	ND	N/A
p-Cresol	8270	µg/Kg	188	ND	ND	ND	N/A
Kerosene	8270	µg/Kg	46.8	ND	ND	ND	N/A
Naphthanlene	8270	µg/Kg	168	ND	ND	ND	N/A
Pentachlorophenol	8270	µg/Kg	254	ND	ND	ND	N/A
Phenol	8270	µg/Kg	127	ND	ND	ND	N/A
Tributyl Phosphate	8270	µg/Kg	223	ND	ND	ND	N/A
Tris-2-Chloroethyl Phosphate	8270	µg/Kg	94.7	ND	ND	ND	N/A
Benzothiazole	8270	µg/Kg	144	ND	ND	ND	N/A
Bis(2-Ethylhexyl)Phthalate	8270	µg/Kg	68.9	ND	ND	ND	N/A
2,4-Dichlotophenol	8270	µg/Kg	160	ND	ND	ND	N/A
2-Nitrophenol	8270	µg/Kg	195	ND	ND	ND	N/A
p-Dichlorobenzene	8270	µg/Kg	161	ND	ND	ND	N/A
2-Methyl Pyridine	8270	µg/Kg	339	ND	ND	ND	N/A
Acenaphthene	8270	µg/Kg	168	ND	ND	ND	N/A
Acenaphthylene	8270	µg/Kg	157	ND	ND	ND	N/A
Acetophenone	8270	µg/Kg	169	ND	ND	ND	N/A
2-Acetylaminofluorine	8270	µg/Kg	203	ND	ND	ND	N/A
2-Aminobiphenyl	8270	µg/Kg	430	ND	ND	ND	N/A
Aniline	8270	µg/Kg	202	ND	ND	ND	N/A
Anthracene	8270	µg/Kg	177	ND	ND	ND	N/A
Aramite	8270	µg/Kg	267	ND	ND	ND	N/A
Benzo(A)Anthracene	8270	µg/Kg	170	ND	ND	ND	N/A
Benzo(B)Fluorathene	8270	µg/Kg	176	ND	ND	ND	N/A
Benzo(K)Fluorathene	8270	µg/Kg	248	ND	ND	ND	N/A
Benzo(G,H,I)Perylene	8270	µg/Kg	216	ND	ND	ND	N/A
Benzo(A)Pyrene	8270	µg/Kg	164	ND	ND	ND	N/A
Benzyl Alcohol	8270	µg/Kg	226	ND	ND	ND	N/A
Bis(2-Chloroethoxy)Methane	8270	µg/Kg	36.2	ND	ND	ND	N/A
Bis(2-Chloroethyl)Ether	8270	µg/Kg	134	ND	ND	ND	N/A
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/Kg	83.5	ND	ND	ND	N/A
4-Bromophenyl-Phenylether	8270	µg/Kg	45.4	ND	ND	ND	N/A
Butylbenzylphthalate	8270	µg/Kg	107	ND	ND	ND	N/A
p-Chloroanaline	8270	µg/Kg	112	ND	ND	ND	N/A
Chlorobenzilate	8270	µg/Kg	244	ND	ND	ND	N/A
p-Chloro-m-Cresol	8270	µg/Kg	159	ND	ND	ND	N/A
2-Chloronaphthanlene	8270	µg/Kg	170	ND	ND	ND	N/A
2-Chlorophenol	8270	µg/Kg	144	ND	ND	ND	N/A
4-Chlorophenyl Phenyl Ether	8270	µg/Kg	32.2	ND	ND	ND	N/A
Chrysene	8270	µg/Kg	184	ND	ND	ND	N/A
Diallate	8270	µg/Kg	143	ND	ND	ND	N/A
Dibenz(A,H)Anthracene	8270	µg/Kg	190	ND	ND	ND	N/A
Dibenzofuran	8270	µg/Kg	39.5	ND	ND	ND	N/A
Di-N-Butylphthalate	8270	µg/Kg	97.8	ND	ND	ND	N/A
o-Dichlorobenzene	8270	µg/Kg	140	ND	ND	ND	N/A
m-Dichlorobenzene	8270	µg/Kg	156	ND	ND	ND	N/A
3,3'-Dichlorobenzidine	8270	µg/Kg	45.4	ND	ND	ND	N/A
2,6-Dichlorophenol	8270	µg/Kg	145	ND	ND	ND	N/A
Diethylphthalate	8270	µg/Kg	133	ND	ND	ND	N/A
Thionazin	8270	µg/Kg	180	ND	ND	ND	N/A
Dimethoate	8270	µg/Kg	184	ND	ND	ND	N/A
p-(Dimethylamino)Azobenzene	8270	µg/Kg	66.0	ND	ND	ND	N/A

TABLE 9.4. (Contd)

SS56				56M03		Summary	
		Soil		SS56_S1_1	SS56_S1_2	Range of	Location / Date
SOIL	Method	Units	MDL	5.7-ft Aug-93	15-ft Aug-93	Soil Values	of Maximum
7,12-Dimethylbenz[A]Anthracene	8270	µg/Kg	227	ND	ND	ND	N/A
Pyridine	8270	µg/Kg	205	ND	ND	ND	N/A
3,3'-Dimethylbenzidine	8270	µg/Kg	10.4	ND	ND	ND	N/A
A,A-Dimethylphenethylamine	8270	µg/Kg	358	ND	ND	ND	N/A
2,4-Dimethylphenol	8270	µg/Kg	357	ND	ND	ND	N/A
Dimethylphthalate	8270	µg/Kg	57.0	ND	ND	ND	N/A
m-Dinitrobenzene	8270	µg/Kg	74.5	ND	ND	ND	N/A
4,6-Dinitro-o-c-Cresol	8270	µg/Kg	201	ND	ND	ND	N/A
2,4-Dinitrophenol	8270	µg/Kg	157	ND	ND	ND	N/A
2,4-Dinitrotoluene	8270	µg/Kg	169	ND	ND	ND	N/A
2,6-Dinitrotoluene	8270	µg/Kg	168	ND	ND	ND	N/A
Di-N-Octylphthalate	8270	µg/Kg	225	ND	ND	ND	N/A
Diphenylamine	8270	µg/Kg	497	ND	ND	ND	N/A
Ethyl Methane Sulfonate	8270	µg/Kg	118	ND	ND	ND	N/A
Famphur	8270	µg/Kg	317	ND	ND	ND	N/A
Fluoranthene	8270	µg/Kg	212	ND	ND	ND	N/A
Fluorene	8270	µg/Kg	166	ND	ND	ND	N/A
Hexachlorobenzene	8270	µg/Kg	241	ND	ND	ND	N/A
Hexachlorobutadiene	8270	µg/Kg	182	ND	ND	ND	N/A
Hexachlorocyclopentadiene	8270	µg/Kg	168	ND	ND	ND	N/A
Hexachloroethane	8270	µg/Kg	146	ND	ND	ND	N/A
Hexachlorophene	8270	µg/Kg	1190	ND	ND	ND	N/A
Hexachloropropene	8270	µg/Kg	135	ND	ND	ND	N/A
Indeno(1,2,3-Cd)Pyrene	8270	µg/Kg	152	ND	ND	ND	N/A
Isodrin	8270	µg/Kg	94	ND	ND	ND	N/A
Isophorone	8270	µg/Kg	163	ND	ND	ND	N/A
Isosafrole	8270	µg/Kg	155	ND	ND	ND	N/A
Kepone	8270	µg/Kg	1404	ND	ND	ND	N/A
Methapyraline	8270	µg/Kg	120	ND	ND	ND	N/A
3-Methylcholanthrene	8270	µg/Kg	170	ND	ND	ND	N/A
Methyl Methane Sulfonate	8270	µg/Kg	132	ND	ND	ND	N/A
2-Methylnaphthalene	8270	µg/Kg	30.6	ND	ND	ND	N/A
1,4-Naphthoquinone	8270	µg/Kg	263	ND	ND	ND	N/A
1-Naphthylamine	8270	µg/Kg	119	ND	ND	ND	N/A
2-Naphthylamine	8270	µg/Kg	720	ND	ND	ND	N/A
o-Nitroaniline	8270	µg/Kg	121	ND	ND	ND	N/A
m-Nitroaniline	8270	µg/Kg	253	ND	ND	ND	N/A
p-Nitroaniline	8270	µg/Kg	1119	ND	ND	ND	N/A
Nitrobenzene	8270	µg/Kg	161	ND	ND	ND	N/A
p-Nitrophenol	8270	µg/Kg	195	ND	ND	ND	N/A
4-Nitroquinoline-1-Oxide	8270	µg/Kg	362	ND	ND	ND	N/A
N-Nitrosodi-n-Butylamine	8270	µg/Kg	82.0	ND	ND	ND	N/A
N-Nitrosodiethylamine	8270	µg/Kg	134	ND	ND	ND	N/A
N-Nitrosodimethylamine	8270	µg/Kg	178	ND	ND	ND	N/A
N-Nitrosodiphenylamine	8270	µg/Kg	143	ND	ND	ND	N/A
N-Nitrosodipropylamine	8270	µg/Kg	164	ND	ND	ND	N/A
N-Nitrosomethylethylamine	8270	µg/Kg	124	ND	ND	ND	N/A
N-nitrosomorpholine	8270	µg/Kg	135	ND	ND	ND	N/A
N-Nitrosopiperidine	8270	µg/Kg	27.9	ND	ND	ND	N/A
N-Nitrosopyrolidine	8270	µg/Kg	171	ND	ND	ND	N/A
5-Nitro-o-Toluidine	8270	µg/Kg	186	ND	ND	ND	N/A
Parathion	8270	µg/Kg	257	ND	ND	ND	N/A
Pentachlorobenzene	8270	µg/Kg	186	ND	ND	ND	N/A

TABLE 9.4. (Contd)

SS56				56M03		Summary	
		Soil		SS56_S1_1	SS56_S1_2	Range of	Location / Date
SOIL	Method	Units	MDL	5.7-ft Aug-93	15-ft Aug-93	Soil Values	of Maximum
Pentachloronitrobenzene	8270	µg/Kg	211	ND	ND	ND	N/A
Pentacetin	8270	µg/Kg	200	ND	ND	ND	N/A
Phenanthrene	8270	µg/Kg	185	ND	ND	ND	N/A
p-Phenylenediamine	8270	µg/Kg	311	ND	ND	ND	N/A
Pronamide	8270	µg/Kg	209	ND	ND	ND	N/A
Pyrene	8270	µg/Kg	177	ND	ND	ND	N/A
Safrole	8270	µg/Kg	165	ND	ND	ND	N/A
2,3,4,6-Tetrachlorophenol	8270	µg/Kg	190	ND	ND	ND	N/A
1,2,4,5-Tetrachlorobenzene	8270	µg/Kg	173	ND	ND	ND	N/A
Tetraethyl Dithiopyrophosphate	8270	µg/Kg	149	ND	ND	ND	N/A
o-Toluidine	8270	µg/Kg	169	ND	ND	ND	N/A
1,2,4-Trichlorobenzene	8270	µg/Kg	179	ND	ND	ND	N/A
2,4,5-Trichlorophenol	8270	µg/Kg	176	ND	ND	ND	N/A
2,4,6-Trichlorophenol	8270	µg/Kg	138	ND	ND	ND	N/A
0,0,0-Triethylphosphorothioate	8270	µg/Kg	156	ND	ND	ND	N/A
syn-Trinitrobenzene	8270	µg/Kg	152	ND	ND	ND	N/A

TABLE 9.5. Semivolatile Organic Compounds Analyzed for and Detected in Groundwater, SS56

SS56				56M03
GROUND-WATER	Method	Units	MDL	SS56_W1 Aug-93
o-Cresol	8270	µg/L	1.80	ND
m-Cresol	8270	µg/L	1.44	ND
p-Cresol	8270	µg/L	3.54	ND
Kerosene	8270	µg/L	1.03	ND
Naphthanlene	8270	µg/L	6.50	ND
Pentachlorophenol	8270	µg/L	8.07	ND
Phenol	8270	µg/L	0.833	ND
Tributyl Phosphate	8270	µg/L	4.42	ND
Tris-2-Chloroethyl Phosphate	8270	µg/L	2.88	ND
Benzothiazole	8270	µg/L	2.55	ND
Bis(2-Ethylhexyl)Phthalate	8270	µg/L	4.07	ND
2,4-Dichlotophenol	8270	µg/L	2.80	ND
2-Nitrophenol	8270	µg/L	3.96	ND
p-Dichlorobenzene	8270	µg/L	4.64	ND
2-Methyl Pyridine	8270	µg/L	5.83	ND
Acenaphthene	8270	µg/L	2.88	ND
Acenaphthylene	8270	µg/L	3.96	ND
Acetophenone	8270	µg/L	2.38	ND
2-Acetylaminofluorine	8270	µg/L	2.83	ND
2-Aminobiphenyl	8270	µg/L	3.83	ND
Aniline	8270	µg/L	3.53	ND
Anthracene	8270	µg/L	2.95	ND
Aramite	8270	µg/L	8.60	ND
Benzo(A)Anthracene	8270	µg/L	2.34	ND
Benzo(B)Fluorathene	8270	µg/L	4.41	ND
Benzo(K)Fluorathene	8270	µg/L	2.21	ND
Benzo(G,H,I)Perylene	8270	µg/L	3.65	ND
Benzo(A)Pyrene	8270	µg/L	1.70	ND
Benzyl Alcohol	8270	µg/L	5.16	ND
Bis(2-Chloroethoxy)Methane	8270	µg/L	7.13	ND
Bis(2-Chloroethyl)Ether	8270	µg/L	2.90	ND
Bis(2-Chloro-1-Methylethyl)Ether	8270	µg/L	3.35	ND
4-Bromophenyl-Phenylether	8270	µg/L	2.34	ND
Butylbenzylphthalate	8270	µg/L	5.94	ND
p-Chloroanaline	8270	µg/L	13.2	ND
Chlorobenzilate	8270	µg/L	8.69	ND
p-Chloro-m-Cresol	8270	µg/L	7.41	ND
2-Chloronaphthanlene	8270	µg/L	3.02	ND
2-Chlorophenol	8270	µg/L	1.91	ND
4-Chlorophenyl Phenyl Ether	8270	µg/L	3.04	ND
Chrysene	8270	µg/L	1.70	ND
Diallate	8270	µg/L	3.15	ND
Dibenz(A,H)Anthracene	8270	µg/L	1.92	ND
Dibenzofuran	8270	µg/L	2.54	ND
Di-N-Butylphthalate	8270	µg/L	4.34	ND
o-Dichlorobenzene	8270	µg/L	3.77	ND
m-Dichlorobenzene	8270	µg/L	7.85	ND
3,3'-Dichlorobenzidine	8270	µg/L	3.88	ND
2,6-Dichlorophenol	8270	µg/L	3.47	ND
Diethylphthalate	8270	µg/L	8.94	ND
Thionazin	8270	µg/L	3.04	ND
Dimethoate	8270	µg/L	10.0	ND
p-(Dimethylamino)Azobenzene	8270	µg/L	3.36	ND
7,12-Dimethylbenz[A]Anthracene	8270	µg/L	1.82	ND
Pyridine	8270	µg/L	4.57	ND
3,3'-Dimethylbenzidine	8270	µg/L	10.4	ND
A,A-Dimethylphenethylamine	8270	µg/L	37.80	ND
2,4-Dimethylphenol	8270	µg/L	5.88	ND
Dimethylphthalate	8270	µg/L	5.55	ND
m-Dinitrobenzene	8270	µg/L	9.35	ND
4,6-Dinitro-o-c-Cresol	8270	µg/L	5.55	ND
2,4-Dinitrophenol	8270	µg/L	4.46	ND
2,4-Dinitrotoluene	8270	µg/L	2.59	ND
2,6-Dinitrotoluene	8270	µg/L	2.85	ND
Di-N-Octylphthalate	8270	µg/L	2.98	ND
Diphenylamine	8270	µg/L	2.86	ND

TABLE 9.5. (Contd)

SS56				56M03
				SS56_W1
GROUND-WATER	Method	Units	MDL	Aug-93
Ethyl Methane Sulfonate	8270	µg/L	2.07	ND
Fluoranthene	8270	µg/L	4.62	ND
Fluorene	8270	µg/L	2.56	ND
Hexachlorobenzene	8270	µg/L	2.38	ND
Hexachlorobutadiene	8270	µg/L	4.29	ND
Hexachlorocyclopentadiene	8270	µg/L	2.62	ND
Hexachloroethane	8270	µg/L	4.73	ND
Hexachlorophene	8270	µg/L	19.60	ND
Hexachloropropene	8270	µg/L	3.68	ND
Indeno(1,2,3-Cd)Pyrene	8270	µg/L	3.21	ND
Isodrin	8270	µg/L	1.44	ND
Isophorone	8270	µg/L	3.29	ND
Isosafrole	8270	µg/L	2.25	ND
Kepone	8270	µg/L	9.59	ND
Methapyraline	8270	µg/L	8.45	ND
3-Methylcholanthrene	8270	µg/L	2.63	ND
Methyl Methane Sulfonate	8270	µg/L	1.61	ND
2-Methylnaphthalene	8270	µg/L	2.76	ND
1,4-Naphthoquinone	8270	µg/L	10.0	ND
1-Naphthylamine	8270	µg/L	25.30	ND
2-Naphthylamine	8270	µg/L	15.60	ND
o-Nitroaniline	8270	µg/L	7.82	ND
m-Nitroaniline	8270	µg/L	9.52	ND
p-Nitroaniline	8270	µg/L	21.40	ND
Nitrobenzene	8270	µg/L	3.16	ND
p-Nitrophenol	8270	µg/L	1.52	ND
4-Nitroquinoline-1-Oxide	8270	µg/L	6.00	ND
N-Nitrosodi-n-Butylamine	8270	µg/L	3.22	ND
N-Nitrosodiethylamine	8270	µg/L	2.90	ND
N-Nitrosodimethylamine	8270	µg/L	3.81	ND
N-Nitrosodiphenylamine	8270	µg/L	2.11	ND
N-Nitrosodipropylamine	8270	µg/L	3.67	ND
N-Nitrosomethylethylamine	8270	µg/L	2.83	ND
N-nitrosomorpholine	8270	µg/L	3.27	ND
N-Nitrosopiperidine	8270	µg/L	4.35	ND
N-Nitrosopyrolidine	8270	µg/L	2.78	ND
5-Nitro-o-Toluidine	8270	µg/L	5.25	ND
Parathion	8270	µg/L	3.90	ND
Pentachlorobenzene	8270	µg/L	3.99	ND
Pentachloronitrobenzene	8270	µg/L	2.49	ND
Pentacetin	8270	µg/L	4.78	ND
Phenanthrene	8270	µg/L	5.27	ND
p-Phenylenediamine	8270	µg/L	3.09	ND
Pronamide	8270	µg/L	3.42	ND
Pyrene	8270	µg/L	3.69	ND
Safrole	8270	µg/L	3.22	ND
2,3,4,6-Tetrachlorophenol	8270	µg/L	4.39	ND
1,2,4,5-Tetrachlorobenzene	8270	µg/L	4.77	ND
Tetraethyl Dithiopyrophosphate	8270	µg/L	2.81	ND
o-Toluidine	8270	µg/L	2.27	ND
1,2,4-Trichlorobenzene	8270	µg/L	4.14	ND
2,4,5-Trichlorophenol	8270	µg/L	4.01	ND
2,4,6-Trichlorophenol	8270	µg/L	2.54	ND
0,0,0-Triethylphosphorothioate	8270	µg/L	5.19	ND
syn-Trinitrobenzene	8270	µg/L	3.74	ND

ND = Not Detected

TABLE 9.6. Decision Criteria for Sampling Recommendations, SS56

GROUND WATER

CONTAMINANT	HIGHEST DETECT µg/L	SDWA MCL µg/L	CARCINOGENS µg/L	SYSTEMIC TOXICANTS µg/L	CRITERIA RESULTS
arsenic	**21**	**50**	**0.042**		**above††**
zinc	700	5000			below
copper	107	1300†		1400	below
iron	271	300			below
manganese	**385**	**50**		**3700**	**above††**
1,1-dichloroethylene	**0.41**	**7**	**0.07**		**above**
monochlorobenzene	0.7	100			below
naphthalene	8.2			150	below
1,1,1-trichloroethane	0.04	200		2000	below
1,1,2,2-tetrachloroethane	**48**		**0.087**		**above**
tetrachloroethylene	**59**	**5**	**1**		**above**
trichloroethylene	**30**	**5**	**3**		**above**
ethylbenzene	27	700		2000	below
toluene	220	1000		3000	below
benzene	**42**	**5**	**0.6**		**above**
xylenes	199	10000		800	below

† MCLG
†† May be background

10.0 Source Area DP55

10.0 DP55 BIRCH LAKE RECREATION AREA

10.1 LOCATION

DP55 is a refuse pile directly adjacent to the maintenance yard at the U.S. Air Force recreation site at Birch Lake administered by the Eielson Air Force Base (AFB). DP55 is located off of Richardson Highway (AK2) and adjacent to Birch Lake (Figure 10.1). Birch Lake is accessed by a dirt road that leaves Richardson Highway about 64 km south of the Eielson AFB main gate. Besides the U.S. Air Force recreational facilities, numerous private seasonal residents use the area. The closest residence is less than 0.8 km from DP55.

10.2 HISTORICAL USE

The refuse area has been used in the past to dispose of material associated with the maintenance and operation of the Birch Lake recreation area. The recreation area encompasses a boat dock, lodge, campground, and several cabins used by Eielson AFB personnel.

The maintenance yard is several hundred yards to the east of the recreation area. The yard now contains several piles of construction material, various equipment, and an above-ground storage tank. A below-ground storage tank was located away from the yard, adjacent to the recreation facilities and was replaced in 1989 with a double-walled, steel tank. Inspection of the site during installation revealed stained soil; however, no samples were taken and no site report was filed. The excavation was backfilled with the stained soil. Limited surface staining of soil around the removal site indicates that fuel spills may have occurred in the past.

About 90 m further east, a series of debris piles are found scattered about in the underbrush. The piles are poorly covered with no obvious design cap or cover. Debris in the piles is primarily wood and scrap lumber with occasional metal scraps, bottles, cans, and other domestic refuse. Several empty and crushed barrels are scattered about, most appear to be abandoned trash receptacles.

Records indicate that DP55 has always been used to support the Birch Lake recreational mission but no records were kept on the length of use for the maintenance yard or refuse pits. No indication exists that large quantities of hazardous materials were brought to DP55. Minor amounts of fuel and vehicle maintenance supplies may have been stored or disposed of at the yard or in the surrounding undeveloped areas.

Based upon the historical site use, materials used at the site might be small volumes (<0.02 m^3 [<5 gal]) of insecticides used for mosquito control; solvents and degreasers used for small motor maintenance and repair; paint, varnish, and wood preservatives and small-volume household refuse associated with the campground and picnic area.

10.3 HISTORICAL DATA AND ASSUMPTIONS

10.3.1 Site Observations. The maintenance area was inspected twice during the source evaluation report Phase 2 limited field investigation. The maintenance yard is still in active use and contains routine material and equipment used in recreational site maintenance (see photographs in Appendix B). The yard is ringed by piles of woody plant material, other refuse, sand and gravel, construction material, lumber, and scrap metals. An elevated tank is in use for dispensing petroleum products.

The wooded area directly east of the yard contains several mounds of soil and other indications of surface disturbance. Most of these disturbed areas appear to be berms, apparently constructed as part of the maintenance yard for access control or surface water diversion. These berms appear to be unrelated to the maintenance yard. Some of the mounds contain buried refuse, including boards, plant debris and clippings, household trash, and several crushed drums. No liquids were observed associated with the drums and one drum was labeled "Fort Richardson." No stressed vegetation was observed at any of the disturbed sites.

10.3.2 Previous Investigations. There has been no Installation Restoration Program, CERCLA, or any other environmental investigations at DP55. However, samples collected by Eielson AFB Bioenvironmental Engineering have turned up levels of arsenic similar to other Eielson AFB sites and background measurements (highest, 10 μg/L). Eielson AFB sampled the supply well on a monthly basis between August 1989 and 1990. Samples were analyzed for volatile organic compounds (EPA 504, MDL = 0.2 μg/L) and pesticides (EPA 505, MDL = 0.03 μg/L). In August 1992, detectable levels of BTEX (1.6 μg/L of ethylbenzene, 8 μg/L of chlorobenzene, 9.5 μg/L of xylene, and 0.3 μg/L of toluene) were found. These values are far below regulatory and risk-based criteria (Table 10.1) and no other measured parameter has ever been found above detection limits.

10.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

10.4.1 Potential Contaminants of Concern. No indication exists that large quantities of hazardous wastes were generated at or transported to Birch Lake. Small quantities of solvents, paints, degreasers, or other chemicals may have been stored or used on DP55 for repair and maintenance of the facilities. Tanks of fuel were and are present, and some fuel may have spilled at the pump station. Small amounts of these materials may have been discharged to the surface.

Based on the expected components of these materials, the potential contaminants of concern are

1,1-dichloroethylene	acetone	tetraethyl lead
1,2-dichloroethane	benzene	tetramethyl lead
1,2-dichloroethylene	ethylbenzene	trichloroethylene
1,1,1-trichloroethane	pesticides	toluene
1,1,2,2-tetrachloroethane	tetrachloroethylene	xylene.

10.4.2 Conceptual Model. No direct geological or hydrological information exists on the Birch Lake area. The main channel of the Tanana River is about 2.4 km west of DP55. The area is underlain by fluvial and lacustrine sediments associated with the Tanana River floodplain and was formed by aggradation of Tanana River sediments against the crystalline bedrock. Bedrock is exposed to the southeast and north of the lake and resembles quartz-mica schists of the Birch Creek Schist (Pewe 1982).

Depth to groundwater or other hydrologic data for Birch Lake is not available. The presence of Birch Lake and the proximity of the Tanana River suggest a shallow groundwater system. Surface drainages at DP55 are topographically directed to the lake and any contaminants directed to the ground could be transported by overland flow to the lake. In other parts of the Eielson AFB, confined groundwater is extracted from the fractured Birch Creek Schist. Without other geological data, the type of aquifer tapped by the supply well is unknown.

10.4.3 Sampling Objective and Strategy. Other than the one sample, there has never been any indication of a contamination problem at DP55. No samples were taken at the site and the investigation was confined to the two visual inspections. No additional evidence for contamination was observed.

Phase 2 limited field investigation field work consisted of the two site inspections described in Section 10.3.1. In general, the inspection followed EPA/600/4-84/075 (EPA 1985) in scope and methods. Before the visit, available U.S. Air Force personnel were queried on the current activities and site history. A literature search was conducted on regional and site-specific geological and hydrological information. Topographic maps were consulted to determine likely surface depressions and drainages. Very minor amounts (0.02 m^3 [<5 gal]) of pesticides, fuel, solvents, oils, and other hazardous substances were reported to be stored at the site and field sampling was assumed to be unnecessary.

During the site inspection, a complete traverse of the maintenance yard (Appendix B, Figure B.7) was made. The yard is approximately 20 km^2 (5 acre) in extent. All structures were examined. Drums and other containers were examined with no leaks observed. Vegetation and soils were examined and evaluated. Piles of plant cuttings and woody debris were collected in several piles. Piles of sand and gravel were also present. The elevated petroleum product tank was visually inspected and no evidence was found of past or current leaks or releases. It was confirmed that no large amounts of hazardous substances were stored and no evidence of releases was found. The surface drainage is to the west of Birch Lake.

The 3-acre area behind the yard was also examined and debris piles were found containing scrap lumber, metal, wire, two empty drums, and household refuse. This material was entirely compatible with wastes that would have been collected during operation and maintenance of the recreational area. Refuse mounds (Appendix B, Figure B.8) were 2 to 3 m high, 5 to 6 m wide, and about 20 m long. Again, soils and vegetation were examined and no evidence for releases were observed. Vegetation was vigorous and diverse. The surface drainage is to the northwest and Birch Lake. Other than the lake, no wetlands or perennial streams were found at the site.

Inspection of the recreation facilities revealed rustic cabins and marina facilities that are used by summer U.S. Air Force visitors. No other water supply was apparent other than the supply well. During the late August visit, less than 25 individuals were observed. The distance from the maintenance yard to the recreation facilities is about 0.3 km.

In summary, the following sampling strategy was used at DP55.

Objective: To evaluate contamination at DP55 that is the result of debris piles in the maintenance yard and surroundings.

Action: Review historical data to determine hazardous wastes stored and released at DP55.

Conduct a site inspection of the maintenance area, the recreational facilities, and surrounding debris piles.

Activity: A site visual inspection was conducted, and the area was photographed during two field visits.

In-person and telephone interviews were conducted with base personnel.

10.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

Table 10.1 collates the existing data on DP55 and compares these results to various specific regulatory or risk-based criteria, as described in Section 3.0.

These data suggest that regulatory and risk-based criteria are exceeded at the water supply wells for arsenic, manganese, and iron. These levels do not exceed background values of these elements (Appendix A). The human health and ecological risk is less than similar undisturbed areas at Birch Lake.

10.6 RISK CHARACTERIZATION

10.6.1 Soil. Historical data do not suggest any contamination of soil, and no evidence was observed that contaminated soil or uncontrolled waste is present. The soil pathway is not complete at DP55.

10.6.2 Groundwater. Well water samples at DP55 suggest that groundwater is below risk-based, regulatory, or background levels in hazardous constituents. Soil is not contaminated. The groundwater pathway is not complete at DP55.

10.6.3 Surface Water. With an incomplete groundwater and soil pathway and no surface sources, no potential exists for contamination of Birch Lake or any local water bodies. The surface water pathway is not complete at DP55.

10.6.4 Air. Because all volatile organic compounds detected in the well are below regulated levels in groundwater, the risk through inhalation of these contaminants is very low. Soil is not contaminated and suspension of soil is not a hazard. For these reasons, the air pathway is not complete at DP55.

10.7 CONCLUSIONS AND RECOMMENDATIONS

Based upon the data of the Phase 2 source evaluation investigation, no evidence exists that DP55 is a source of contamination to human or ecological receptors. DP55 is recommended for inclusion in the remedial investigation/feasibility study of OU 4. The revised schedule for OU 4 is compatible with this action.

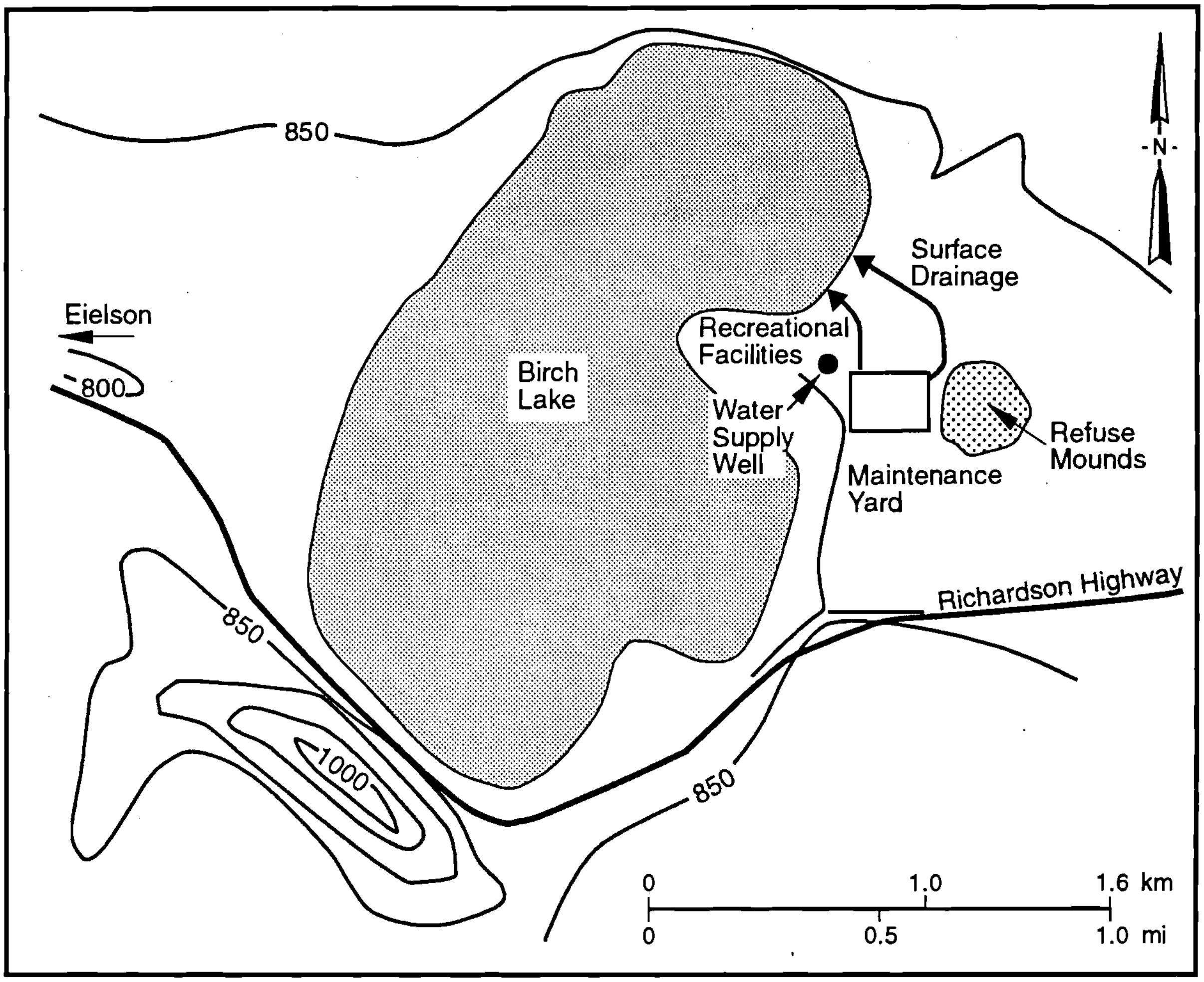

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FIGURE 10.1. Map of DP55

TABLE 10.1. Decision Criteria for Sampling Recommendations, DP55

GROUNDWATER					
CONTAMINANT	HIGHEST DETECT (μg/L)	SDWA MCL (μg/L)	CARCINOGENS (μg/L)	SYSTEMIC TOXICANTS (μg/L)	CRITERIA RESULTS
arsenic	10	50	0.042		above[a]
iron	486	300			above[a]
manganese	1235	50		3700	above[a]
fluoride	300	4000		1800	below
monochlorobenzene	8			100	below
ethylbenzene	1.6	700		2000	below
xylenes	9.5	10000		800	below
toluene	0.3	1000		3000	below
benzene	0.1	5	0.6		below

(a) May be background

11.0 Source Area ST58

11.0 ST58 OLD QUARTERMASTER SERVICE STATION

11.1 LOCATION

ST58 is the site of the old Quartermaster service station. ST58 is on the northwest corner at the intersection of Division Street and Wabash Avenue (Figure 11.1). The service station covered approximately 4 km^2 (1 acre), which is 41 by 91 m (135 by 300 ft). ST58 is currently a flat, grassy field (Liikala and Evans 1994).

11.2 HISTORICAL USE

The Quartermaster service station (ST58) was operated from 1970 to 1988. The service station was a source of petroleum products for private vehicles operated by Eielson Air Force Base (AFB) personnel and their dependents until 1975 and Eielson AFB vehicles only after 1975.

The service station used four 95-m^3 (25,000-gal) above-ground storage tanks, containing leaded and unleaded motor gasoline (MOGAS) and diesel. Two barrels of motor oil were stored at the service station for customer use. The above-ground storage tanks and above-ground piping were removed in August 1988. Underground piping was left in place. During removal, evidence for product releases was observed. No samples were taken, and no analytical work was performed. ST58 was reportedly covered with approximately 0.9 to 1 m (3 to 4 ft) of fill after the above-ground storage tanks and above-ground piping were removed (Liikala and Evans 1994).

11.3 HISTORICAL DATA AND ASSUMPTIONS

11.3.1 Site Observations. No known spills have occurred at ST58. The pipeline that supplied fuel to ST58 was suspected of leaking at the intersection of Industrial Drive and Division Street, east of ST58[a].

11.3.2 Previous Investigations. Two previous investigations have been conducted at ST58. The results are briefly summarized below.

Sixteen borings were drilled in October 1991 approximately 100 m northwest, down gradient, of ST58. Soil samples from each of the borings were tested for geotechnical properties by Shannon & Wilson (1991). Ten of the borings were completed as monitoring wells. Ground-water samples from these wells were collected in October 1991 and analyzed (Table 11.1) for a limited number of analytes. No contaminants were found with concentrations over established maximum contaminant levels for drinking water. Detected contaminants included sulfate, dissolved residue, and trace chromium.

Eight borings were drilled in January 1992 adjacent to and down gradient of ST58. Soil samples from each of the borings were tested for geotechnical properties by Shannon & Wilson (1992). No chemical analyses were performed on the soils. The samples from above the water table were used by Shannon & Wilson for headspace screening of total volatile organic compound content. The measured headspace gas concentration was 1 ppm for all samples.

(a) Written communication, 1993, A. E. Schumacher, Deputy Chief of Operations, Eielson Air Force Base, Fairbanks, Alaska.

All of the borings were completed as monitoring wells. Groundwater samples from these wells were collected in January 1992 and analyzed (Table 11.1) for a limited number of contaminants. Concentrations of benzene above the maximum contaminant level of 5 $\mu g/L$ were detected in Wells 58MW03 (5.4 $\mu g/L$), 58MW04 (72.0 $\mu g/L$), 58MW05 (85.0 $\mu g/L$), and 58MW08 (145.0 $\mu g/L$). Benzene was not detected in the remaining wells. Ethylbenzene was detected in Wells 58MW04, 58MW05, and 58MW08. Toluene was detected in Well 58MW06. Xylenes were detected in Well 58MW08. Detectable levels of total dissolved solids, sulfate, and trace levels of chromium and mercury (total and dissolved) were found in selected samples. Other organic and inorganic constituents were not detected.

11.4 PHASE 2 LIMITED FIELD INVESTIGATION ACTIVITY AND DATA

11.4.1 Potential Contaminants of Concern. The potential contaminants of concern are those petroleum, oil, and lubricants, and derived compounds generated as waste and released to the surface and subsurface. These include

1,1-dichloroethane	1,1,2,2-tetrachloroethane	tetraethyl lead
1,2-dichloroethane	acetone	tetramethyl lead
1,1-dichloroethylene	benzene	toluene
1,2-dichloroethylene	ethylbenzene	trichloroethylene
1,1,1-trichloroethane	tetrachloroethylene	xylene.

11.4.2 Conceptual Model. ST58 is in a relatively flat, open field. ST58 is covered with grass and showed no sign of stressed vegetation during 1993. Garrison Slough is approximately 206 m (675 ft) southeast of ST58. ST58 is underlain by soil consisting of sandy gravel with silt, silty gravel, silty sand, and sand that ranges from 0.6- to 5-m (2- to 16-ft)-thick. The depth to groundwater at the vehicle maintenance building has been measured at 3.7 to 1.5 m (12 to 5 ft) below ground surface. Groundwater travels in a north-northwest direction, although it may be affected locally by Garrison Slough. The velocity has been estimated at 0.046 to 0.36 m/day (0.15 to 1.2 ft/day). Potential contaminant migration over 30 years could be as much as 0.5 to 4 km (0.3 to 2.5 mi).

MOGAS and diesel stored and used at ST58 appears to have been spilled or leaked from the piping and diesel tanks. Some of the volatile components of petroleum products released at the surface may have evaporated. The less volatile components probably seeped into the soil. The less volatile contaminants may have adsorbed to the soils or been dissolved in surface infiltration and carried to the groundwater. Fuel from large spills, if any occurred, may have moved through the vadose zone and formed a floating layer on the water table. Because the primary potential source of contamination (fuel storage tanks) has been removed, the potential source is now any residual contamination in the soil that could be released to the groundwater. Additional volatilization could occur if the area is excavated.

11.4.3 Sampling Objective and Strategy. The purposes of this work were to 1) determine the contaminant types, concentrations, and distributions in the soil and groundwater resulting from ST58, 2) excavate approximately 382 m (500 yd^3) of the most contaminated soil for the Pacific Northwest Laboratory soil composting demonstration, and 3) reclaim the excavation.

The following sampling strategy was used at ST58.

Objective: To evaluate contamination at ST58 that is the result of releases of fuels and lubricants from underground and above-ground fuel storage and dispensing facilities.

Action: Conduct geophysical surveys of ST58 to determine the extent of underground piping and associated structures.

Sample the soil in contact with product, facilities, or contaminated water.

Sample the shallow groundwater at ST58.

Activity: A records search was conducted to determine the extent of the facility.

EM inductive and radio-detection methods were used to outline piping.

Four new monitoring wells were constructed.

Soil-gas and PETREX screening of soils were conducted to focus sampling.

Soil was sampled and analyzed for volatile organic compounds, gasoline-range TPH, diesel-range TPH, and lead.

Groundwater was sampled in the four wells and analyzed for volatile organic compounds, gasoline-range TPH, diesel-range TPH, and lead.

11.4.4 Limited Field Investigation Field Work. Two separate field efforts were conducted (Liikala and Evans 1994) for the Phase 2 limited field investigation. In April 1993, four new wells (58MW09, 58MW10, 58MW11, and 58MW12) were drilled and completed at ST58. Groundwater samples were collected by Pacific Northwest Laboratory from Wells 58MW01 through 58MW12 in April 1993. The samples were analyzed for volatile organic compounds, total petroleum hydrocarbons (TPHs) (TPH-G, TPH-D), gasoline and diesel fractions, and lead (Table 11.1).

A search was conducted to locate service station as-built drawings, maintenance records, observations during above-ground storage tank removal, and/or closure files for ST58. No records were available to help identify the location of the above-ground storage tank piping, leaks, and/or spills; therefore, a grid encompassing the all of ST58 was used throughout the field investigation. A 46- by 91-m (150- by 300-ft) grid, with 87-m (25-ft) nodes, was set up using a transit and steel tape, with the 46-m (150-ft) axis parallel to Wabash Avenue (Figure 11.1). The nodes were surveyed to the Eielson AFB coordinate system for horizontal and vertical control. Horizontal coordinates were taken to the nearest 0.006 m (0.02 ft) and elevations to the nearest 0.03 m (0.1 ft). Land surface elevations range from approximately 164 to 165 m (538 to 542 ft) above mean sea level.

Electromagnetic induction and radiodetection unit surveys were performed and results compared with the unscaled blueprints to help identify the location of the above-ground storage tank piping. These surveys were useful in locating buried objects. Results of the electromagnetic induction survey corresponded very well to the above-ground storage tank piping indicated on the unscaled drawings and radiodetection unit survey. Survey results also indicated a significant amount of other buried metallic debris. Railroad rails, culvert pipe, cables, and rebar were also found during sampling and excavation.

The radiodetection survey was able to delineate the two main feeder pipes entering ST58. In general, the radio signal attenuated and became difficult to detect with increased distance and branching from the transmitter. Discontinuities and/or breaks in the above-ground storage tank piping probably hindered transmission of the signal, making pipe detection impossible. Details of the geophysical survey are in Liikala and Evans (1994).

Two soil-gas survey methods were performed during June of 1993 to identify heavily contaminated soil for use in an ex situ remediation demonstration. An active survey method employed sample probes inserted into the soil to a depth of 1 m (4 ft). Gas samples drawn through the probe were analyzed in the field by either a handheld detector or by a gas chromatograph. The PETREX method (Liikala and Evans 1994), a second method, was used for comparison.

Soil samples were collected from 17 test pits using a backhoe. Test pit soil samples were collected from below the suspected above-ground storage tank locations and pump islands. Samples were collected below each 8-m (25-ft) length of above-ground storage tank piping with emphasis on joints and elbows. Samples were also collected outside the perimeter and below the bottom of the plume(s) to confirm the horizontal and vertical extent of contamination. Eight test pits (58TP01 through 58TP08) were selected based on the grid nodes with the highest contamination; five (58TP09 through 58TP13) were chosen from nodes with moderate contamination; and four (58TP14 through 58TP17) were peripheral to the areas of high and moderate contamination. Three soil samples, A, B, and C, were collected from each test pit, approximately 0.1, 1 to 1.7, and 2.7 to 3 m (0.5, 4 to 5.5, and 9 to 10 ft) below land surface, respectively. The samples were analyzed for volatile organic compounds, TPH-G, TPH-D, and lead.

11.5 DISCUSSION OF LIMITED FIELD INVESTIGATION DATA

Regulatory, risk-based, and background criteria have been used to evaluate the risk indicated by the Phase 2 limited field investigation data for SS56. Past data suggested that lead and benzene, toluene, ethylbenzene, and xylene (BTEX) might be a problem.

During the April 1993 well sampling effort, benzene was detected (Figure 11.2) in Wells 58MW04 (98 μg/L), 58MW05 (29 μg/L), 58MW08 (180 μg/L), 58MW09 (24 μg/L), and 58MW10 (450 μg/L); all were well above risk-based and regulatory criteria. Benzene was also detected in Wells 58MW02 (0.9 μg/L), 58MW03 (3.7 μg/L), and 58MW11 (1.3 μg/L). No benzene was detected in the remaining wells. Ethylbenzene was detected in Well 58MW08 (110 μg/L). Samples from other wells were not analyzed for ethylbenzene. Toluene was detected in Wells 58MW09 (2.8 μg/L), 58MW10 (140 μg/L), and 58MW11 (1.1 μg/L). Total xylenes were detected in Wells 58MW08 (29 μg/L), 58MW09 (45 μg/L), and 58MW10 (830 μg/L). The concentrations of ethylbenzene, toluene, and xylenes were all significantly below maximum contaminant levels. The presence of benzene at and down gradient from ST58 with little or no toluene, ethylbenzene, and xylene is indicative of the higher mobility of benzene in water and suggests the contamination occurred relatively recently (Liikala and Evans 1994). Methylene chloride was reported for samples from all wells but may have been introduced as a laboratory contaminant.

TPH-G was detected in Well 58MW09 (260 mg/L). No TPH-G was detected in the other wells. TPH-D was detected in Wells 58MW01 (0.2 mg/L), 58MW04 (0.3 mg/L), 58MW05 (0.1 mg/L), 58MW07 (0.1 mg/L), 58MW08 (0.8 mg/L), 58MW09 (99 mg/L), 58MW10 (7.0 mg/L), 58MW11 (0.1 mg/L), and 58MW12 (0.3 mg/L). Well 58MW09, having the highest TPH-D concentration, is near the former diesel above-ground storage tank. No TPH-D was detected in samples from Wells 58MW02, 58MW03, and 58MW06. All of these values are well below the Alaska water quality standard of 15 g/L.

Lead was found (Figure 11.3) above the criteria (15 μg/L) in all 12 of the ST58 wells. Concentrations ranged from 35 μg/L to 180 μg/L, with the highest contamination in Wells 58MW09 (130 μg/L), 58MW11 (170 μg/L), and 58MW12 (180 μg/L).

Gas chromatography and field PID results (Table 11.2) for the June soil-gas measurements indicate two locations containing high (maxima: benzene 5954 μg/L; toluene 6764 μg/L; ethylbenzene 317 µg/L; and total xylenes 4199 µg/L) subsurface concentrations of gasoline centered near grid points 7E and 11F. Passive (PETREX) soil-gas measurements (Table 11.3), expressed as total ion counts, were consistent with gasoline contamination (Liikala and Evans 1994). The PETREX survey proved very valuable in producing high quality remote mapping of subsurface contamination with relatively limited in-field expenditure of effort.

The test pit soil sample results generally confirmed (Table 11.4) the contaminant distributions interpreted from the soil-gas surveys. The most contaminated soils were found in the central part of ST58 at the 1- to 1.7- and 2.7- to 3-m (4- to 5.5- and 9- to 10-ft) sampling intervals. Benzene concentrations ranged from <10 to >90,137 µg/kg. High concentrations of toluene (>12,000 µg/kg), ethylbenzene (>106,000 µg/kg), and total xylenes (>250,000 µg/kg) were also found. Significantly lower BTEX concentrations were found in the 0.1-m (0.5-ft) samples (for example, benzene, 52 µg/kg to detection limit). No chlorinated hydrocarbons were detected in any of the samples.

TPH-G concentrations ranged from below detection (method detection limit = 30 mg/kg) near the surface to 19,916 mg/kg at the 1- to 1.7-m (4- to 5.5-ft) depth. TPH-D concentrations were below the 50 mg/L detection limit in all test pits at both the 0.1- and 1- to 1.7-m (0.5- and 4- to 5.5-ft) sample intervals. All but three of the 2.7- to 3- m (9- to 10-ft) samples were below detection. The highest TPH-D concentration was 1750 mg/kg. Lead concentrations ranged from below detection to 3.69 mg/L.

High ranges of these results well exceed risk-based and regulatory criteria (Table 11.5) for BTEX and TPH. Further discussion of results can be found in Liikala and Evans (1994).

11.6 RISK CHARACTERIZATION

11.6.1 Soil. Soil is clearly contaminated well above regulatory and risk-based criteria with BTEX and TPH. This indicates a complete soil pathway of unknown risk to human and ecological receptors.

11.6.2 Groundwater. Groundwater is also contaminated with benzene, although it appears that other parameters are not above criteria. Nevertheless, a complete groundwater pathway exists of unspecified risk to human and ecological receptors.

11.6.3 Surface Water. No surface water to groundwater interaction appears to exist, and surface soils are not contaminated. This suggests that the surface water pathway is not complete.

11.6.4 Air. With no contamination of surface water or soil, there is little chance of an air pathway to current receptors. Future receptors that used groundwater may be exposed through inhalation to the highly volatile components found in the deep subsurface. A future resident air pathway exists of unknown risk. In addition, an occupational risk exists to workers exposed during removal of soil for the soil composting technical demonstration (U.S. Air Force 1993c). This exposure will be temporary and be conducted under an approved health and safety plan, presumably limiting inhalation exposure to an acceptable level.

11.7 CONCLUSIONS AND RECOMMENDATIONS

Based on the data of the Phase 2 source evaluation investigation, ST58 is a source of contamination of unknown risk to human and ecological receptors. ST58 is recommended for inclusion in an appropriate base operable unit and remedial investigation/feasibility study under the *Site Management Plan, Eielson Air Force Base* (U.S. Air Force 1993c).

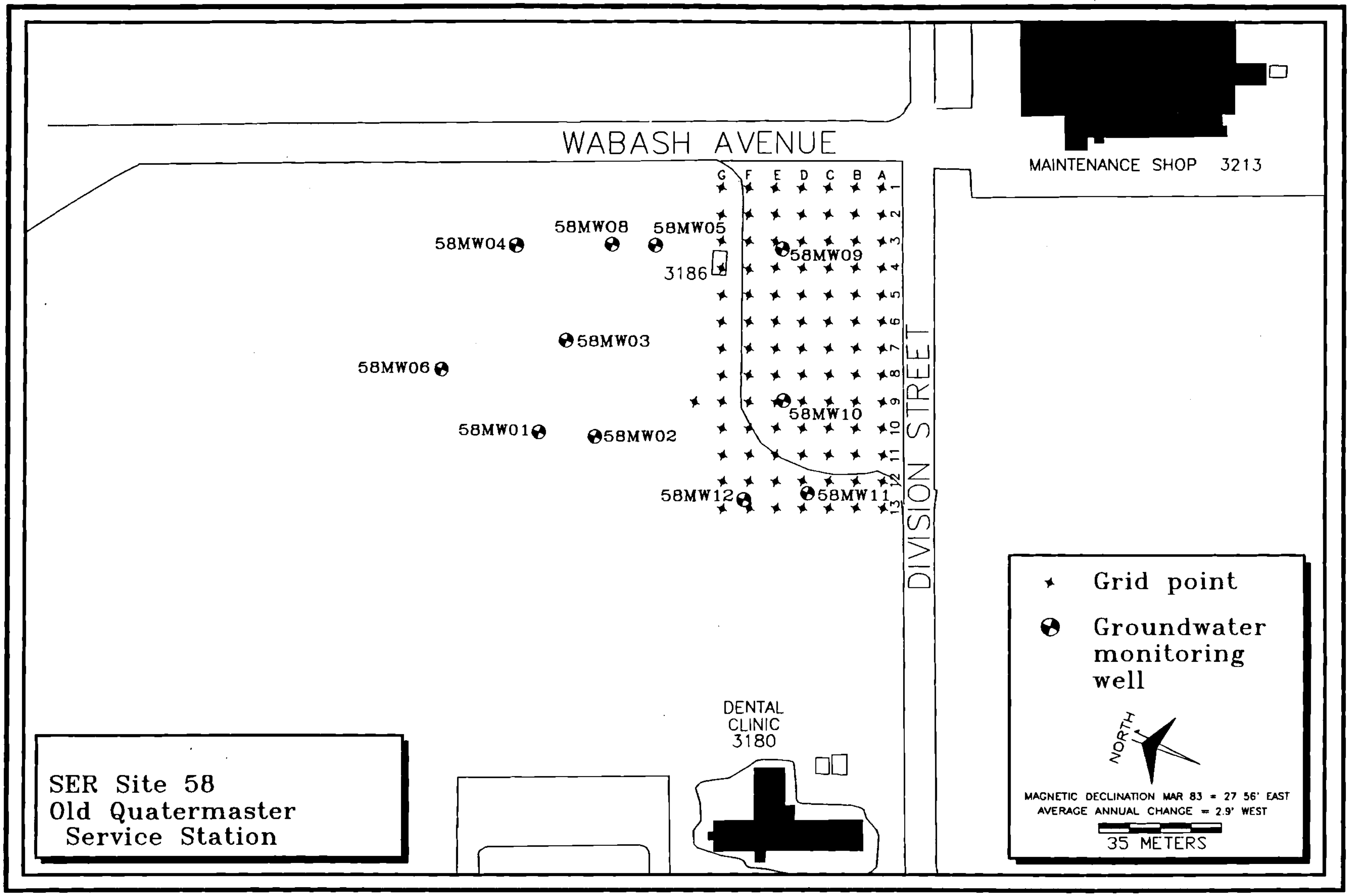

FIGURE 11.1. Map of ST58

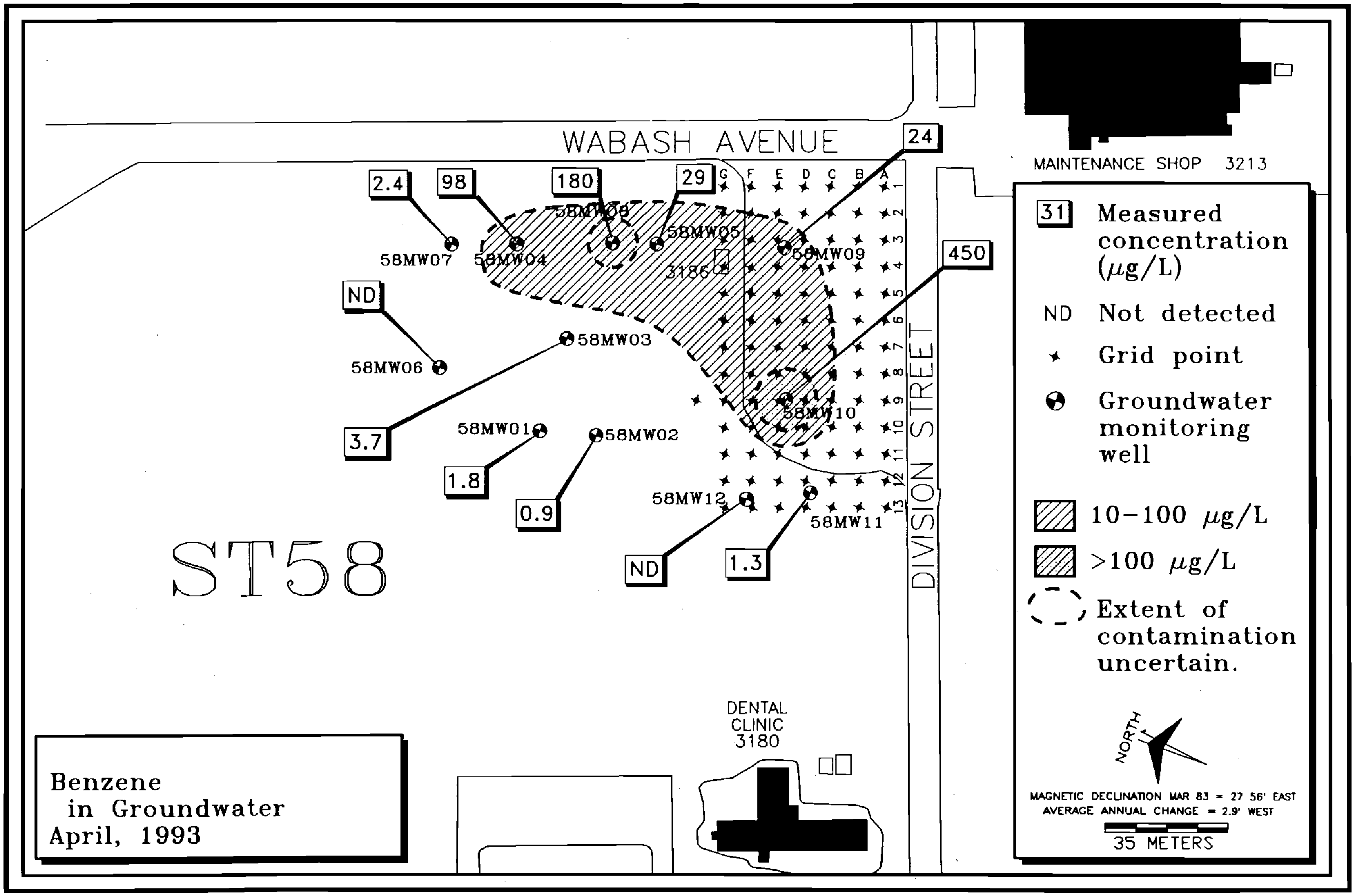

FIGURE 11.2. Benzene in Groundwater, ST58

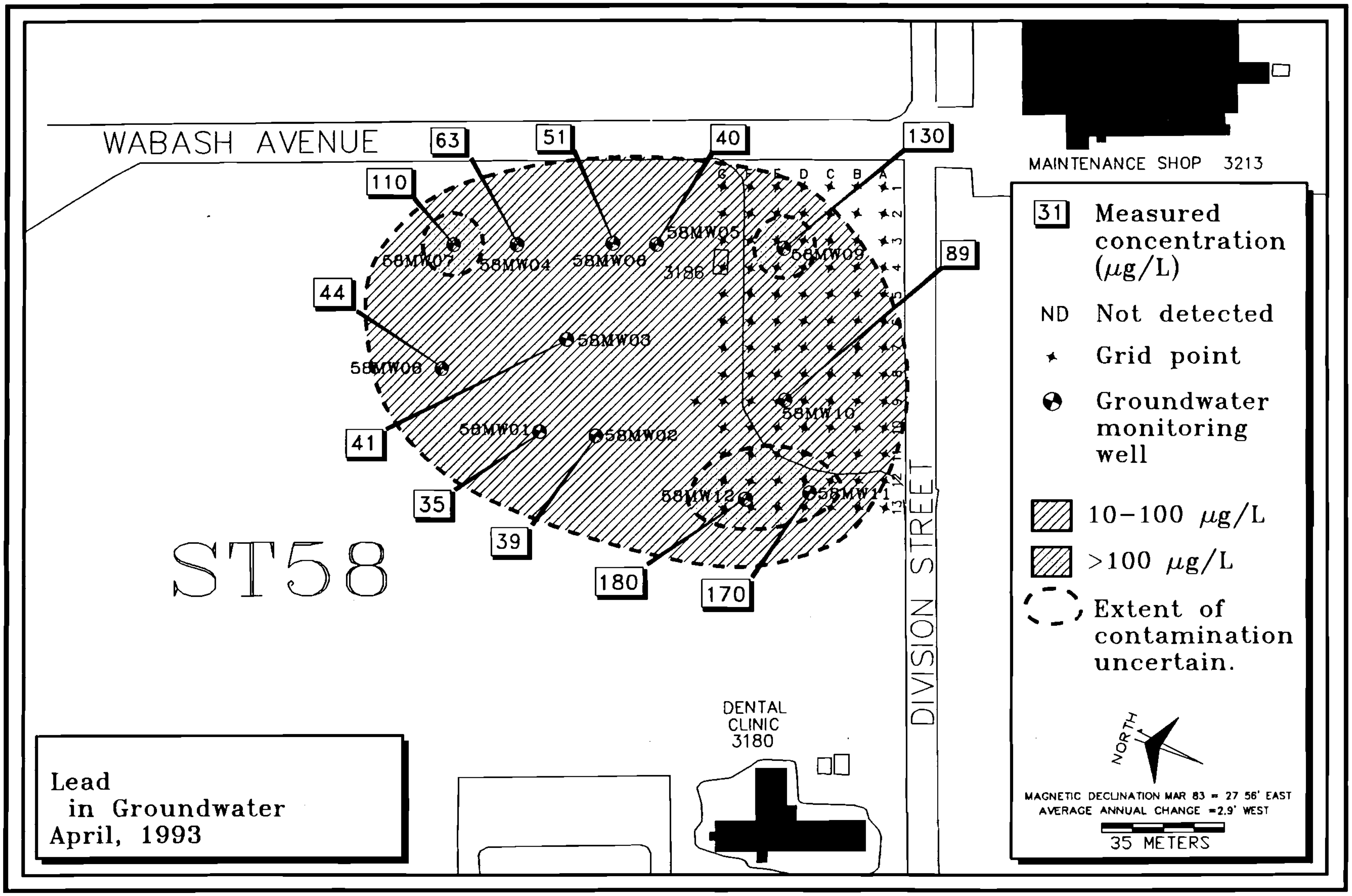

FIGURE 11.3. Lead in Groundwater, ST58

TABLE 11.1. Previous Investigation Summary: Groundwater Samples, ST58

ST58	Method		MDL	58MW01		58MW02		58MW03		58MW04		58MW05		58MW06	
Ground-water	1992/1993	Units	1992/1993	Jan-92	Apr-93	Jan-92	Apr-93	Jan-92	Apr-93	Jan-92	Apr-93	Jan-92	Apr-93	Jan-92	Apr-93
Benzene	602/8240	µg/L	0.2/0.65	ND	ND	ND	0.9	5.4	3.7	72.0	98	85.0	29	ND	ND
Ethylbenzene	602/8240	µg/L	1.0/0.49	ND		ND		ND		1.4		14.0		ND	
Methylene Chloride	601/8240	µg/L	1.0/1.6	ND	1.8	ND	1.8	ND	2.3	ND	2.3	ND	2.3	ND	2.3
Toluene	602/8240	µg/L	1.5/0.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND
Xylenes	602/8240	µg/L	3.0/1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium, dissolved	200.7/NA	mg/L	0.007/NA	ND		ND		ND		ND		ND		ND	
Dissolved Residue	160.1/NA	mg/L	1/NA	211		129		123		179		175		181	
Lead	NA/7421	µg/L	NA/5.0		35		39		41		63		40		44
Mercury, total	245.1/NA	mg/L	0.0002/NA	0.0002		0.0002		0.0004		ND		0.0002		ND	
Mercury, dissolved	245.1 F/NA	mg/L	0.0002/NA	0.0002		0.0018		0.0002		0.0002		ND		ND	
Sulfate	300.0/NA	mg/L	2.0/NA	23.5		13.6		12.3		4.1		6.7		21.3	
TPH	418.1	mg/L	0.4	ND		ND		ND		ND		ND		ND	
TPH-D	8015 mod	mg/L	0.1		0.2		ND		ND		0.3		0.1		ND
TPH-G	8015 mod	mg/L	2.0		ND		ND		ND		ND		ND		ND

ST58	Method		MDL	58MW07		58MW08			58MW09	58MW10	58MW11	58MW12	Range of	Location / Date	
Ground-water	1992/1993	Units	1992/1993	Jan-92	Apr-93	Jan-92	Apr-93	Apr-93 Dup	Apr-93	Apr-93	Apr-93	Apr-93	Values	of Maximum	
Benzene	602/8240	µg/L	0.2/0.65	ND	ND	145.0	180	180	24	450	1.3	ND	0.9 - 450	58MW10	Apr-93
Ethylbenzene	602/8240	µg/L	1.0/0.49	ND		43.0	110	100					1.4 - 110	58MW08	Apr-93
Methylene Chloride	601/8240	µg/L	1.0/1.6	ND	2.4	ND	2.2	2.0	2.3	9.0	2.0	2.0	1.8 - 9.0	58MW10	Apr-93
Toluene	602/8240	µg/L	1.5/0.73	ND	ND	ND	ND	ND	2.8	140	1.1	ND	1.1 - 140	58MW10	Apr-93
Xylenes	602/8240	µg/L	3.0/1.7	ND	ND	14.0	29	28	45	830	ND	ND	ND - 830	58MW10	Apr-93
Chromium, dissolved	200.7/NA	mg/L	0.007/NA	ND		ND							ND	N/A	
Dissolved Residue	160.1/NA	mg/L	1/NA	171		191							123 - 211	58MW01	Jan-92
Lead	NA/7421	µg/L	NA/5.0		110		51	48	130	89	170	180	35 - 180	58MW12	Apr-93
Mercury, total	245.1/NA	mg/L	0.0002/NA	ND		0.0003							ND - 0.0004	58MW03	Jan-92
Mercury, dissolved	245.1 F/NA	mg/L	0.0002/NA	0.0002		ND							ND - 0.0018	58MW02	Jan-92
Sulfate	300.0/NA	mg/L	2.0/NA	13.9		5.7							4.1 - 23.5	58MW01	Jan-92
TPH	418.1	mg/L	0.4	ND		ND							ND	N/A	
TPH-D	8015 mod	mg/L	0.1		0.1		0.7	0.8	99	7.0	0.1	0.3	ND - 99	58MW09	Apr-93
TPH-G	8015 mod	mg/L	2.0		ND		ND	ND	260	ND	ND	ND	ND - 260	58MW09	Apr-93

No Value = not analyzed
NA = not analyzed
ND = not detected

mg/L = milligram/Liter
µg/L = microgram/Liter
MDL = method detection limit

TABLE 11.2. Active Soil Gas Results, ST58

Grid Point	PID (ppm)	Benzene (μg/L)	Toluene (μg/L)	Ethyl Benzene (μg/L)	Xylene (μg/L)
1A	0	0	0	0	0
1C	0	0	0	0	0
1E	0	0	0	0	0
1G	0	0	0	0	0
3A	0	0	0	0	0
3C	0	0	0	0	0
3E	0	0	0	0	0
3G	0	0	0	0	0
4A	0	0	0	0	0
4C	0	0	0	0	0
4E	0	0	0	0	0
4G	0	0	0	0	0
5A	0	0	0	0	0
5C	0	0.06	0.83	0.37	3.9
5E	0	0	0	0	0
5G	0	0	0	0	0
6C	1.4	0	0	0	0
6D	35	0	0	0	0
6E	1335	479	4247	147	4199
6F	12	0.69	0	0	0
7A	0	0	0	0	0
7B	0	0	0	0	0
7C	1050	97	46	19	388
7D	2170	995	1326	29	1097
7E	680	5954	6764	317	2005
7F	0	0	0	0	0
7G	0	0	0	0	0
8C	2.5	0	0	0	0
8D	22	0	0	0	0
8E	1115	337	2483	116	1375
8F	8	0	0	0	0
8G	8	0	0	0	0
9A	0	0	0	0	0
9C	0	0	0	0	0
9E	0	0.7	0	0	0
9F	125	65	0	2.8	7.2
9G	420	5	4.3	24	15.6
9H	146	0	0.85	4.6	1.85
10F	70	40	0	1.7	19.5
10G	45	2.4	0.69	0	0
11A	0	0	0	0	0
11C	0	0	0	0	0
11E	0	30	0	0	0
11F	2090	0	5.2	2.1	1887
11G	0	0	0	0	0
13A	0	0	0	0	0
13C	0	0	0	0	0
13E	0	0	0	0	0
13G	0	0	0	0	0

PID = Photoionization Detector

TABLE 11.3. Passive (PETREX) Soil Gas Survey Results, ST58

Grid Point	BTEX (a)	Cycloalkanes (b)
1A	31,593	22,411
1B	5,225	241
1C	21,809	1,450
1D	2,116,420	100,400
1F	22,815	707
1G	51,147	47,350
2A	37,596	254
2B	114,340	6,451
2C	289,761	35,162
2D	12,718	3,125
2E	10,715	278
2F	65,339	1,615
3A	56,270	1,973
3B	149,643	14,092
3C	14,432	370
3D	99,090	1,723
3E	32,331	3,807
3F	71,610	12,117
3G	99,050	2,571
4A	48,837	851
4B	32,814	374
4C	232,840	4,291
4D	77,540	5,280
4E	55,766	2,533
4F	54,760	3,294
4G	159,750	3,920
5A	116,120	3,046
5B	459,195	23,925
5C	46,969	2,974
5D	26,010	710
5E	65,394	14,798
5G	47,390	858
6B	14,361	76
6C	29,284	1,653
6A	49,500	1,589
6D	133,604	32,801
6E	16,618,500	1,426,040
6F	15,132	803
6G	11,810	158
7A	47,070	567
7B	16,582	101
7C	42,872	1,335
7D	82,900	3,378
7E	18,227,400	663,530
7F	37,191	1,326
7G	29,132	397
8A	51,180	1,864
8B	67,460	946
8C	42,849	1,501
8D	332,010	74,940
8E	2,271,200	2,387,600
8F	47,695	1,855
8G	18,638	427
9A	106,000	4,932
9B	34,180	427
9C	135,620	10,429
9D	12,182	293
9E	104,350	2,134
9F	126,512	20,389
9G	21,205	4,303
10A	376,850	79,648
10B	31,924	1,481
10C	24,793	981
10D	48,876	62,590
10E	77,140	1,464
10F	30,560	902
10G	989,090	58,940
11A	120,350	2,985
11B	16,243	7,809
11C	15,847	119
11D	40,110	3,424
11E	179,500	5,218
11F	14,912,900	912,170
11G	2,537,500	35,270
12A	118,925	16,009
12B	605,370	41,122
12C	217,050	166,140
12D	47,020	8,592
12E	27,071	162
12F	58,532	828
12G	165,000	3,715
13A	104,239	2,628
13B	38,512	265
13C	290,080	8,463
13D	71,820	1,396
13E	59,400	2,116
13F	103,400	4,687
13G	144,810	2,381

(a) Total ion counts at masses 78, 92, and 106.
(b) Total ion counts at masses 84, 98, 112, and 126.

TABLE 11.4. Volatile Organic Compounds and Total Petroleum Hydrocarbons Analyzed for and Detected in Soil Test Pit, ST58

ST58				4E			5D			6E			6F			7B		
SOIL	Method	Units	MDL	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93
Benzene	PNL	µg/Kg	10	ND	>390	22	ND	ND	36	18	105	407	NM	NM	NM	ND	ND	ND
Ethylbenzene	PNL	µg/Kg	10	ND	131	ND	ND	ND	46	ND	95	3231	NM	NM	NM	ND	10	ND
Toluene	PNL	µg/Kg	10	ND	44	ND	15	ND	38	97	606	3231	NM	NM	ND	ND	ND	ND
Xylene	PNL	µg/Kg	20	ND	259	ND	ND	ND	193	104	>5500	>13000	NM	NM	NM	ND	63	ND
TPH - Diesel	PNL	µg/Kg	30000	NM	ND	ND	ND	ND	1750000	ND	ND	102000	ND	ND	ND	ND	ND	ND
TPH - Gasoline	PNL	µg/Kg	50000	NM	ND	ND	ND	ND	ND	66000	686000	ND	ND	ND	ND	ND	NM	ND

ND = Not Detected NM = Not Measured

ST58				7C			7D			7E			7F					
SOIL	Method	Units	MDL	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	Dup	0.5-ft Apr-93	Dup	10-ft Apr-93	Dup
Benzene	PNL	µg/Kg	10	ND	16	ND	55	158	10100	45	>60000	596	ND	ND	>580	>580	257	205
Ethylbenzene	PNL	µg/Kg	10	15	ND	ND	ND	39	32542	137	>66000	393	ND	ND	45	37	18	15
Toluene	PNL	µg/Kg	10	ND	65	25	98	573	>68000	68	>78000	1798	20	20	ND	ND	ND	ND
Xylene	PNL	µg/Kg	20	91	152	211	ND	2516	>150000	>900	>150000	3303	ND	ND	ND	ND	ND	ND
TPH - Diesel	PNL	µg/Kg	30000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH - Gasoline	PNL	µg/Kg	50000	ND	ND	ND	ND	ND	1953000	ND	19916000	51000	ND	ND	ND	ND	ND	ND

ND = Not Detected NM = Not Measured

ST58				8E			9E			9F			9G			10F		
SOIL	Method	Units	MDL	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93
Benzene	PNL	µg/Kg	10	52	>90000	3143	ND	132	23	ND	ND	ND	ND	ND	ND	ND	22	12
Ethylbenzene	PNL	µg/Kg	10	10	>106000	1102	ND	24	ND	ND	14	14	ND	38	26	ND	ND	ND
Toluene	PNL	µg/Kg	10	148	>12000	4862	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	PNL	µg/Kg	20	195	>250000	5649	ND	ND	ND	34	55	ND	ND	ND	26	ND	ND	ND
TPH - Diesel	PNL	µg/Kg	30000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH - Gasoline	PNL	µg/Kg	50000	ND	19902000	179000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected NM = Not Measured

ST58				10G			11F			12F			Summary	
SOIL	Method	Units	MDL	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	0.5-ft Apr-93	5-ft Apr-93	10-ft Apr-93	Range of Soil Values	Location of Maximum
Benzene	PNL	µg/Kg	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND - >90000	8E 5-ft
Ethylbenzene	PNL	µg/Kg	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND - >106000	8E 5-ft
Toluene	PNL	µg/Kg	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND - >78000	7E 5-ft
Xylene	PNL	µg/Kg	20	195	ND	ND	57	ND	ND	ND	ND	ND	ND - >250000	8E 5-ft
TPH - Diesel	PNL	µg/Kg	30000	NM	ND	ND	ND	ND	ND	NM	ND	ND	ND - 1750000	5D 10-ft
TPH - Gasoline	PNL	µg/Kg	50000	NM	ND	ND	ND	ND	ND	NM	ND	ND	ND - 19916000	7E 5-ft

ND = Not Detected NM = Not Measured

TABLE 11.4. (Contd)

Lead in Soil From Test Pits at SER Site ST58

ST58 Soil - LEAD	Method	Units	MDL	Test Pit 01	02	03	04	05
0.5 ft	PNL-ALO-211.2	mg/Kg	0.8	4.7	9.1	8.8 / 9.4	24.6	6.3
4.0 - 5.5 ft	PNL-ALO-211.2	mg/Kg	0.8	9.9	7.7	8.5	3.5	3.4
9.0 - 10.0 ft	PNL-ALO-211.2	mg/Kg	0.8	2.5	4.4	14.5	1.9	2.7

ST58 Soil - LEAD	Method	Units	MDL	Test Pit 06	07	08	09
0.5 ft	PNL-ALO-211.2	mg/Kg	0.8	11.3	4.6 / 4.3	8.4	24.7 / 18.4
4.0 - 5.5 ft	PNL-ALO-211.2	mg/Kg	0.8	2.9	2.9	3.1	6.2
9.0 - 10.0 ft	PNL-ALO-211.2	mg/Kg	0.8	2.6	2.3	2.0	2.3

ST58 Soil - LEAD	Method	Units	MDL	Test Pit 10	11	12	13
0.5 ft	PNL-ALO-211.2	mg/Kg	0.8	9.8	3.5	6.5	298.8 / 251.2
4.0 - 5.5 ft	PNL-ALO-211.2	mg/Kg	0.8	2.7	2.4	3.4	3.9
9.0 - 10.0 ft	PNL-ALO-211.2	mg/Kg	0.8	1.5	1.6	2.9	2.4

ST58 Soil - LEAD	Method	Units	MDL	Test Pit 14	15	16	17
0.5 ft	PNL-ALO-211.2	mg/Kg	0.8	3.6	ND / 1.4	296.4	3.8
4.0 - 5.5 ft	PNL-ALO-211.2	mg/Kg	0.8	8.2	3.5 / 3.1	2.9 / 2.1	5.2
9.0 - 10.0 ft	PNL-ALO-211.2	mg/Kg	0.8	3.2	1.7 / 1.7	1.4	1.7 / 1.6

TABLE 11.5. Decision Criteria for Sampling Recommendations, ST58

GROUND WATER					
CONTAMINANT	HIGHEST DETECT µg/l	SDWA MCL µg/l	CARCINOGENS µg/l	SYSTEMIC TOXICANTS µg/l	CRITERIA RESULTS
Benzene	450	5			above
Toluene	140	1000		3000	below
Ethylbenzene	110	700		2000	below
Xylenes	830	10000		800	above
Lead	180	15			above
TPH-D	99000	15			above
TPH-G	260000	15			above

SOIL					
CONTAMINANT	HIGHEST DETECT mg/kg	ALASKA SOIL CLEAN UP mg/kg	CARCINOGENS mg/kg	SYSTEMIC TOXICANTS mg/kg	CRITERIA RESULTS
Benzene	>90	10			above
Toluene	>78			55000	below
Ethylbenzene	>106			27000	below
Xylenes	>250			550000	below
Lead	299			200	above
TPH-D	1750	100			above
TPH-G	19916	100			above

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Appendix A

APPENDIX A - BACKGROUND SOIL AND GROUNDWATER CONCENTRATIONS

APPENDIX A - BACKGROUND SOIL AND GROUNDWATER CONCENTRATIONS

TABLE A.1. Background Concentrations of Constituents in Soil Eielson Air Force Base, Alaska

	Number of samples	t-value	Arsenic (mg/kg)	Barium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Manganese (1) (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	TPH (mg/kg)
FILL	21	1.725										
Mean			3.3	57.9	9.5	13.2	9014	3.6	195	12.6	22.7	2.9
Standard Deviation			1.7	13.0	1.7	2.4	1069	0.6	151	2.3	4.3	3.4
Upper Confidence Limit			3.9	62.8	10.1	14.1	9710	3.8	252	13.4	24.4	4.2
FLUVIAL SOIL	60	1.671 (2)										
Mean			13.9	141.2	26.0	44.8	26823	10.6	409	31.9	69.2	2.9
Standard Deviation			7.6	55.6	10.0	20.6	10604	4.8	196	12.5	27.6	5.6
Upper Confidence Limit			15.5	153.2	28.3	49.3	29111	11.6	451	34.6	75.2	4.1
LOESS	9	1.860										
Mean			14.1	184.4	35.2	37.8	25822	8.5	339	32.7	59.4	< 1.8
Standard Deviation			4.3	17.6	4.2	5.2	2961	0.9	52	4.2	6.1	NA
Upper Confidence Limit			16.7	195.4	37.8	41.0	27658	9.0	372	35.3	63.1	< 1.8

(1) 10 fill, 43 fluvial, and 9 loess values biased high due to high matrix spike recoveries
(2) t-value for 60 degrees of freedom
(NA) Not applicable
Upper Confidence Limit on sample mean calculated as follows: UCL = Mean + $[t(Std/\sqrt{n})]$
If constituent was not detected, a value of one-half the detection limit was used to calculate the mean and standard deviation.

TABLE A.2. Major Cation and Anion Results for Ground-Water Samples

	Well Number	Sample Number	Calcium	Magnesium	Sodium	Potassium	Iron	Bicarbonate	Sulfate	Chloride	Fluoride	Nitrate	CHARGE BALANCE	
Atomic weight			40.08	24.31	23.0	39.1	55.85	61.0	96.0	35.5	19.0	62.0		
Valence			2	2	1	1	2	1	2	1	1	1		
Background Wells														
	01M01	1-1												
mg/L			49	9	5.8	2.5	0.009	159	32	1.3	0.1	1.8	TOTAL CATIONS	3.50
Molarity			1.22	0.37	0.25	0.06	0.00	2.61	0.33	0.04	0.01	0.03	TOTAL ANIONS	3.34
meq/L			2.45	0.74	0.25	0.06	0.00	2.61	0.67	0.04	0.01	0.03	% DIFFERENCE	4.7
	01M02	1-2												
mg/L			40	7.4	3.4	2.2	0.01	134	26	1.1	0.1	0.5	TOTAL CATIONS	2.81
Molarity			1.00	0.30	0.15	0.06	0.00	2.20	0.27	0.03	0.01	0.01	TOTAL ANIONS	2.76
meq/L			2.00	0.61	0.15	0.06	0.00	2.20	0.54	0.03	0.01	0.01	% DIFFERENCE	0.9
	05M03	5-3												
mg/L			68	16	4.7	3.1	0.2	268	23	1.1	0.5	0.3	TOTAL CATIONS	5.00
Molarity			1.70	0.66	0.20	0.08	0.00	4.40	0.24	0.03	0.03	0.00	TOTAL ANIONS	4.94
meq/L			3.39	1.32	0.20	0.08	0.01	4.40	0.48	0.03	0.03	0.00	% DIFFERENCE	1.2
	17-2	17-2												
mg/L			49	11	3.6	3.2	0.17	195	15	1.3	0.1	0.3	TOTAL CATIONS	3.59
Molarity			1.22	0.45	0.16	0.08	0.00	3.20	0.16	0.04	0.01	0.00	TOTAL ANIONS	3.56
meq/L			2.45	0.90	0.16	0.08	0.01	3.20	0.31	0.04	0.01	0.00	% DIFFERENCE	1.1
	20-18	20-18												
mg/L			7.9	1.4	1.2	4.9	0.16	30	1.9	0	0	0.9	TOTAL CATIONS	0.69
Molarity			0.20	0.06	0.05	0.13	0.00	0.49	0.02	0.00	0.00	0.01	TOTAL ANIONS	0.55
meq/L			0.39	0.12	0.05	0.13	0.01	0.49	0.04	0.00	0.00	0.01	% DIFFERENCE	23.8
	20M17	20-17												
mg/L			41	11	2.3	4.3	15	183	0.25	0.9	0.1	0.1	TOTAL CATIONS	3.70
Molarity			1.02	0.45	0.10	0.11	0.27	3.00	0.00	0.03	0.01	0.00	TOTAL ANIONS	3.04
meq/L			2.05	0.90	0.10	0.11	0.54	3.00	0.01	0.03	0.01	0.00	% DIFFERENCE	19.6
	20M18	20-18												
mg/L			29	6	9	3.3	0.51	122	14	0.5	0.1	0.1	TOTAL CATIONS	2.43
Molarity			0.72	0.25	0.39	0.08	0.01	2.00	0.15	0.01	0.01	0.00	TOTAL ANIONS	2.31
meq/L			1.45	0.49	0.39	0.08	0.02	2.00	0.29	0.01	0.01	0.00	% DIFFERENCE	5.2
	20M21	20-21												
mg/L			42	9.4	4.4	3	0.35	171	9.9	1.1	0.2	0.1	TOTAL CATIONS	3.15
Molarity			1.05	0.39	0.19	0.08	0.01	2.80	0.10	0.03	0.01	0.00	TOTAL ANIONS	3.05
meq/L			2.10	0.77	0.19	0.08	0.01	2.80	0.21	0.03	0.01	0.00	% DIFFERENCE	3.3

Methods: Metals: 6010, Alkalinity: ASTM 1067A&B, Major anions: 300.0
Cations are dissolved concentrations
If analyte was undetected, one-half of the detection limit was used in calculations
Percent difference = (Cations - Anions)/((Cations + Anions)/2) * 100

TABLE A.2. (Contd)

	Well Number	Sample Number	Calcium	Magnesium	Sodium	Potassium	Iron	Bicarbonate	Sulfate	Chloride	Fluoride	Nitrate	CHARGE BALANCE	
Atomic weight			40.08	24.31	23.0	39.1	55.85	61.0	96.0	35.5	19.0	62.0		
Valence			2	2	1	1	2	1	2	1	1	1		
	27-1	27-1												
mg/L			39	8.3	4.3	2.9	0.71	159	9	1.1	0.2	0.3	TOTAL CATIONS	2.92
Molarity			0.97	0.34	0.19	0.07	0.01	2.60	0.09	0.03	0.01	0.00	TOTAL ANIONS	2.83
meq/L			1.95	0.68	0.19	0.07	0.03	2.60	0.19	0.03	0.01	0.00	% DIFFERENCE	2.9
	38M03	38-3												
mg/L			31	8.9	6.3	2.2	0.065	85	45	0.6	0.2	11	TOTAL CATIONS	2.61
Molarity			0.77	0.37	0.27	0.06	0.00	1.39	0.47	0.02	0.01	0.18	TOTAL ANIONS	2.54
meq/L			1.55	0.73	0.27	0.06	0.00	1.39	0.94	0.02	0.01	0.18	% DIFFERENCE	2.7
	46M01	46-1												
mg/L			66	14	5.2	3.8	0.33	256	18	3.7	0.2	0.1	TOTAL CATIONS	4.78
Molarity			1.65	0.58	0.23	0.10	0.01	4.19	0.19	0.10	0.01	0.00	TOTAL ANIONS	4.69
meq/L			3.29	1.15	0.23	0.10	0.01	4.19	0.38	0.10	0.01	0.00	% DIFFERENCE	2.0
	46M03	46-3												
mg/L			60	13	5	3.4	0.15	232	20	3.7	0.1	0.1	TOTAL CATIONS	4.37
Molarity			1.50	0.53	0.22	0.09	0.00	3.80	0.21	0.10	0.01	0.00	TOTAL ANIONS	4.33
meq/L			2.99	1.07	0.22	0.09	0.01	3.80	0.42	0.10	0.01	0.00	% DIFFERENCE	1.1
	53M02	53-2												
mg/L			72	14	4.2	3.9	0.71	281	22	1.4	0.4	0.2	TOTAL CATIONS	5.05
Molarity			1.80	0.58	0.18	0.10	0.01	4.61	0.23	0.04	0.02	0.00	TOTAL ANIONS	5.13
meq/L			3.59	1.15	0.18	0.10	0.03	4.61	0.46	0.04	0.02	0.00	% DIFFERENCE	-1.5
	54M02	54-2												
mg/L			41	8.9	3.5	2.2	0.41	159	13	0.9	0.1	1.7	TOTAL CATIONS	2.99
Molarity			1.02	0.36	0.15	0.06	0.01	2.60	0.14	0.03	0.01	0.03	TOTAL ANIONS	2.93
meq/L			2.05	0.72	0.15	0.06	0.01	2.00	0.27	0.03	0.01	0.03	% DIFFERENCE	2.2
	54M04	54-4												
mg/L			41	8.8	3.6	2.2	0.46	159	14	1	0.1	0.1	TOTAL CATIONS	3.00
Molarity			1.02	0.36	0.16	0.06	0.01	2.60	0.15	0.03	0.01	0.00	TOTAL ANIONS	2.93
meq/L			2.05	0.72	0.16	0.06	0.02	2.60	0.29	0.03	0.01	0.00	% DIFFERENCE	2.5
	54M05	54-5												
mg/L			65	14	5.4	3	2.5	256	21	3.6	0.2	0.1	TOTAL CATIONS	4.80
Molarity			1.62	0.58	0.23	0.08	0.04	4.20	0.22	0.10	0.01	0.00	TOTAL ANIONS	4.75
meq/L			3.24	1.15	0.23	0.08	0.09	4.20	0.44	0.10	0.01	0.00	% DIFFERENCE	1.0
	54M08	54-8												
mg/L			66	14	5.5	3.1	2.2	256	20	3.6	0.1	0.1	TOTAL CATIONS	4.84
Molarity			1.65	0.58	0.24	0.08	0.04	4.20	0.21	0.10	0.01	0.00	TOTAL ANIONS	4.72
meq/L			3.29	1.15	0.24	0.08	0.08	4.20	0.42	0.10	0.01	0.00	% DIFFERENCE	2.5

Methods: Metals: 6010, Alkalinity: ASTM 1067A&B, Major anions: 300.0
Cations are dissolved concentrations
If analyte was undetected, one-half of the detection limit was used in calculations
Percent difference = [Cations - Anions]/[(Cations + Anions)/2] * 100

TABLE A.2. (Contd)

	Well Number	Sample Number	Calcium	Magnesium	Sodium	Potassium	Iron	Bicarbonate	Sulfate	Chloride	Fluoride	Nitrate	CHARGE BALANCE	
Atomic weight			40.08	24.31	23.0	39.1	55.85	61.0	96.0	35.5	19.0	62.0		
Valence			2	2	1	1	2	1	2	1	1	1		
Nested Wells, Source Area ST48														
	48M04	48-4												
mg/L			100	13	13	8.5	0 020	256	90	4	0.8	23	TOTAL CATIONS	6.84
Molarity			2.50	0.53	0.57	0.22	0.00	4.20	0.94	0.11	0.04	0.37	TOTAL ANIONS	6.60
meq/L			4.99	1.07	0.57	0.22	0.00	4.20	1.88	0.11	0.04	0.37	% DIFFERENCE	3.6
	48M05	48-5												
mg/L			65	14	7.2	4.3	7.4	256	12	5.5	0.2	0.1	TOTAL CATIONS	5.08
Molarity			1.62	0.58	0.31	0.11	0.13	4.20	0.13	0.15	0.01	0.00	TOTAL ANIONS	4.62
meq/L			3.24	1.15	0.31	0.11	0.26	4.20	0.25	0.15	0.01	0.00	% DIFFERENCE	9.6
	48M06	48-6												
mg/L			44	10	4.8	2.8	5	183	12	1.8	0.1	0.1	TOTAL CATIONS	3.48
Molarity			1.10	0.41	0.21	0.07	0.09	3.00	0.13	0.05	0.01	0.00	TOTAL ANIONS	3.31
meq/L			2.20	0.82	0.21	0.07	0.18	3.00	0.25	0.05	0.01	0.00	% DIFFERENCE	5.1

Methods: Metals: 6010, Alkalinity: ASTM 1067A&B, Major anions: 300.0
Cations are dissolved concentrations
If analyte was undetected, one-half of the detection limit was used in calculations
Percent difference = (Cations - Anions)/[(Cations + Anions)/2] * 100

TABLE A.3. Analytical Results for Metals and Arsenic in Background Ground-Water Samples

Well Number	Sample Number	Date Sampled	Total Antimony (µg/L)	Dissolved Antimony (µg/L)	Total Arsenic (µg/L)	Total Barium (µg/L)	Dissolved Barium (µg/L)	Total Beryllium (µg/L)	Dissolved Beryllium (µg/L)	Total Cadmium (µg/L)	Dissolved Cadmium (µg/L)	Total Calcium (µg/L)	Dissolved Calcium (µg/L)	Total Chromium (µg/L)
Lowland Wells														
01M01	1-1	11-Jun-92	200 U	200 U	5 U	94	89	3 U	3 U	10 U	10 U	49000	49000	20 U
01M02	1-2	11-Jun-92	200 U	200 U	5 U	62	38	3 U	3 U	10 U	10 U	43000	40000	20 U
05M03	5-3	10-Jun-92	200 U	200 U	5 U	97	97	3 U	3 U	10 U	10 U	69000	68000	20 U
17-2	17-2	11-Jun-92	200 U	200 U	5 U	78	73	3 U	3 U	10 U	10 U	50000	49000	20 U
20-18	20-18	10-Jun-92	200 U	200 U	5 U	35	33	3 U	3 U	10 U	10 U	8000	7900	20 U
20M17	20-17	10-Jun-92	200 U	200 U	22	200	200	3 U	3 U	10 U	10 U	41000	41000	20 U
20M18	20-18	10-Jun-92	200 U	200 U	5 U	72	71	3 U	3 U	10 U	10 U	27000	29000	20 U
20M21	20-21	10-Jun-92	200 U	200 U	8.1	120	120	3 U	3 U	10 U	10 U	43000	42000	20 U
27-1	27-1	10-Jun-92	200 U	200 U	10	90	92	3 U	3 U	10 U	10 U	40000	39000	20 U
46M01	46-1	9-Jun-92	200 U	200 U	5 U	160	140	3 U	3 U	10 U	10 U	67000	66000	20 U
46M03	46-3	9-Jun-92	200 U	200 U	5 U	91	82	3 U	3 U	10 U	10 U	60000	60000	20 U
53M02	53-2	11-Jun-92	200 U	200 U	5 U	91	89	3 U	3 U	10 U	10 U	71000	72000	20 U
54M02	54-2	10-Jun-92	200 U	200 U	5 U	120	120	3 U	3 U	10 U	10 U	36000	41000	20 U
54M04	54-4	10-Jun-92	200 U	200 U	5 U	140	140	3 U	3 U	10 U	10 U	41000	41000	20 U
54M05	54-5	9-Jun-92	200 U	200 U	56	160	110	3 U	3 U	10 U	10 U	68000	65000	20 U
54M08	54-8	9-Jun-92	200 U	200 U	19	120	110	3 U	3 U	10 U	10 U	69000	66000	20 U
Upland Well														
36M03	36-3	11-Jun-92	200 U	200 U	5 U	160	160	3 U	3 U	10 U	10 U	31000	31000	20 U

Methods **Metals: 6010, Arsenic: 7060, Lead: 7421**
U **Analyte not detected at the given detection limit**

TABLE A.3. (Contd)

Sample Number	Dissolved Chromium (µg/L)	Total Cobalt (µg/L)	Dissolved Cobalt (µg/L)	Total Copper (µg/L)	Dissolved Copper (µg/L)	Total Iron (µg/L)	Dissolved Iron (µg/L)	Total Lead (µg/L)	Total Magnesium (µg/L)	Dissolved Magnesium (µg/L)	Total Manganese (µg/L)	Dissolved Manganese (µg/L)	Total Nickel (µg/L)
1-1	20 U	20 U	20 U	20 U	20 U	530	89	5.0 U	9100	9000	120	27	30 U
1-2	20 U	20 U	20 U	20 U	20 U	2100	20 U	5.0 U	8600	7400	190	10 U	30 U
5-3	20 U	20 U	20 U	20 U	20 U	280	200	8.3	16000	16000	770	860.	30 U
17-2	20 U	20 U	20 U	20 U	20 U	400	170	5.0 U	11000	10000	1100	870	30 U
20-18	20 U	20 U	20 U	20 U	20 U	100	100	5.0 U	1500	1400	32	35	30 U
20-17	20 U	20 U	20 U	20 U	20 U	15000	15000	5.0 U	11000	11000	1500	1500	30 U
20-16	20 U	20 U	20 U	20 U	20 U	770	510	5.0 U	5700	6000	420	480	30 U
20-21	20 U	20 U	20 U	20 U	20 U	3600	3500	5.0 U	9600	9400	1200	1200	30 U
27-1	20 U	20 U	20 U	20 U	20 U	1200	710	5.0 U	8400	8300	980	960	30 U
46-1	20 U	20 U	20 U	20 U	20 U	520	330	5.0 U	14000	14000	3300	3300	30 U
46-3	20 U	20 U	20 U	20 U	20 U	750	150	5.0 U	13000	13000	2900	2700	30 U
53-2	20 U	20 U	20 U	20 U	20 U	960	710	5.0 U	14000	14000	1500	1500	30 U
54-2	20 U	20 U	20 U	20 U	20 U	420	410	5.0 U	8500	8800	2100	2200	30 U
54-4	20 U	20 U	20 U	20 U	20 U	600	400	5.0 U	9000	8000	2000	2600	30 U
54-6	20 U	20 U	20 U	20 U	20 U	7100	2600	8.2	15000	14000	2200	2100	30 U
54-8	20 U	20 U	20 U	20 U	20 U	3400	2200	5.0 U	15000	14000	2400	2200	30 U
Upland Well													
38-3	20 U	20 U	20 U	20 U	20 U	20 U	85	5.0 U	9000	8900	10 U	10 U	30 U

Methods Metals: 6010, Arsenic: 7060, Lead: 7421
U Analyte not detected at the given detection limit

TABLE A.3. (Contd)

Sample Number	Dissolved Nickel (µg/L)	Total Potassium (µg/L)	Dissolved Potassium (µg/L)	Total Silver (µg/L)	Dissolved Silver (µg/L)	Total Sodium (µg/L)	Dissolved Sodium (µg/L)	Total Tin (µg/L)	Dissolved Tin (µg/L)	Total Vanadium (µg/L)	Dissolved Vanadium (µg/L)	Total Zinc (µg/L)	Dissolved Zinc (µg/L)
1-1	30 U	2500	2500	20 U	20 U	5800	5000	100 U	100 U	30 U	30 U	10 U	10 U
1-2	30 U	2400	2200	20 U	20 U	4100	3400	100 U	100 U	30 U	30 U	14	10 U
6-3	30 U	3400	3100	20 U	20 U	4700	4700	100 U	100 U	30 U	30 U	10 U	13
17-2	30 U	3200	3000	20 U	20 U	3800	3500	100 U	100 U	30 U	30 U	10 U	10 U
20-18	30 U	4600	4900	20 U	20 U	1200	1200	100 U	100 U	30 U	30 U	10 U	13
20-17	30 U	4200	4300	20 U	20 U	2400	2300	100 U	100 U	30 U	30 U	10 U	10
20-19	30 U	2900	3300	20 U	20 U	8700	8000	100 U	100 U	30 U	30 U	10 U	10 U
20-21	30 U	2800	3000	20 U	20 U	4600	4400	100 U	100 U	30 U	30 U	10 U	10 U
27-1	30 U	2800	2800	20 U	20 U	4300	4300	100 U	100 U	30 U	30 U	10 U	12
46-1	30 U	3800	3600	20 U	20 U	5100	5200	100 U	100 U	30 U	30 U	10 U	10 U
46-3	30 U	3600	3400	20 U	20 U	5200	5000	100 U	100 U	30 U	30 U	10 U	10 U
53-2	30 U	3800	3900	20 U	20 U	4100	4200	100 U	100 U	30 U	30 U	16	10 U
54-2	30 U	2300	2200	20 U	20 U	3600	3500	100 U	100 U	30 U	30 U	10 U	11
54-4	30 U	2200	2200	20 U	20 U	3800	3600	100 U	100 U	30 U	30 U	10 U	10 U
54-5	30 U	3200	3000	20 U	20 U	5800	5400	100 U	100 U	30 U	30 U	10 U	10 U
54-8	30 U	3000	3100	20 U	20 U	6000	5500	100 U	100 U	30 U	30 U	10 U	10 U
Upland Well													
38-3	30 U	2200	2200	20 U	20 U	6400	6300	100 U	100 U	30 U	30 U	10 U	10

Methods Metals: 6010, Arsenic: 7060, Lead: 7421
U Analyte not detected at the given detection limit

TABLE A.4. Analytical Results for Major Anions and Conventional Parameters

Well Number	Sample Number	Date Sampled	Chloride (µg/L)	Fluoride (µg/L)	Nitrate (µg/L)	Sulfate (µg/L)	Phosphate (µg/L)	Alkalinity (mg/L)	TOC (µg/L)	TDS (mg/L)	TPH (mg/L)
Lowland Wells.											
01M01	1-1	11-Jun-92	1300	100	1800	32000	400 U	130	1000 U	170	0.5 U
01M02	1-2	11-Jun-92	1100	100	500	26000	400 U	110	1000 U	150	0.5 U
05M03	5-3	10-Jun-92	1100	500	300	23000	400 U	220	6000 U	250	0.5 U
17-2	17-2	11-Jun-92	1300	100	300	15000	400 U	160	2000 U	190	0.5 U
20-1B	20-1B	10-Jun-92	200 U	100 U	900	1900	400 U	50 U	1000 U	20	0.5 U
20M17	20-17	10-Jun-92	900	100	200 U	500 U	400 U	150	9000 U	150	0.5 U
20M18	20-18	10-Jun-92	600	100	200 U	14000	400 U	100	2000 U	40	0.5 U
20M21	20-21	10-Jun-92	1100	200	200 U	9900	400 U	140	5000 U	190	0.5 U
27-1	27-1	10-Jun-92	1100	200	300	9000	400 U	130	5000 U	20	0.5 U
46M01	46-1	9-Jun-92	3700	200	200 U	18000	400 U	210	2000 U	250	0.5 U
46M03	46-3	9-Jun-92	3700	100	200 U	20000	400 U	190	1000 U	160	0.5 U
53M02	53-2	11-Jun-92	1400	400	200	22000	400 U	230	1000 U	250	0.5 U
54M02	54-2	10-Jun-92	900	100	1700	13000	400 U	130	3000 U	50	0.5 U
54M04	54-4	10-Jun-92	1000	100	200 U	14000	400 U	130	2000 U	50	0.5 U
54M05	54-5	9-Jun-92	3600	200	200 U	21000	400 U	210	4000 U	180	0.5 U
54M08	54-8	9-Jun-92	3600	100	200 U	20000	400 U	210	4000 U	170	0.5 U
Upland Well											
38M03	38-3	11-Jun-92	800	200	11000	45000	400 U	70	2000 U	150	0.5 U

Methods: Major anions: 300.0, Alkalinity: ASTM 1067A&B, TOC: 9060, TDS: 209B, TPH: 418.1

U: Analyte not detected at the given detection limit

TOC: Total Organic Carbon

TDS: Total Dissolved Solids

TPH: Total Petroleum Hydrocarbons

TABLE A.5. Summary of Concentrations of Constituents in Background Ground-Water Samples

	Mean Concentration	Standard Deviation	Upper 95-Percent Confidence Limit on Mean Background Concentration
Total Metals and Arsenic	(µg/L)		(µg/L)
Antimony	< 200	NA	< 200
Arsenic	8.0	14.0	15
Barium	106	28	119
Beryllium	<3	NA	<3
Cadmium	< 10	NA	< 10
Calcium	52500	14522	59373
Chromium	< 20	NA	< 20
Cobalt	< 20	NA	< 20
Copper	< 20	NA	< 20
Iron	1635	1923	2545
Lead	< 5	2	< 5
Magnesium	11207	3220	12731
Manganese	1556	1033	2045
Nickel	< 30	NA	< 30
Potassium	3000	532	3252
Silver	< 20	NA	< 20
Sodium	5021	1579	5769
Tin	< 100	NA	< 100
Vanadium	< 30	NA	< 30
Zinc	< 10	4	< 10
Anions	(µg/L)		(µg/L)
Chloride	1814	1223	2393
Fluoride	179	125	238
Nitrate	414	579	688
Sulfate	18350	6378	21369
Phosphate	NA	NA	< 400
Conventional Parameters	(mg/L)		(mg/L)
Alkalinity	164	45	186
TDS	151	80	189
Organic Compounds	(mg/L)		(mg/L)
TPH	< 0.5	NA	< 0.5

Concentrations below the detection limit were assigned a value of one-half the detection limit in the calculation of the mean and standard deviation.

Upper 95-Percent Confidence Limit was calculated as follows:
Upper Confidence Limit = Mean + $[t(Std/\sqrt{n})]$; t = 1.771; sample size = 14

NA Not Applicable
TDS Total Dissolved Solids
TPH Total Petroleum Hydrocarbons

Appendix B

APPENDIX B - DRILLING LOGS AND OTHER FIELD DATA

APPENDIX B - DRILLING LOGS AND OTHER FIELD DATA

B.1 Photographs

FIGURE B.1. Refuse Mound Associated with LF01. Location approximately 100 m northeast of monitoring Well 01M04

FIGURE B.2. Windrow of Drums Extending to the East at the LF01 Drum Storage Area. Pits 5, 6 and 7 were located directly to the right of the drums

FIGURE B.3. Snow Disposal Area at LF02. The graded surface is the cap for the landfill

FIGURE B.4. Wastewater Treatment Plant. Rectangular concrete-lined containers are the sludge drying beds. The spill ponds, WP32, are located beyond. Note that the ponds are separated by a berm and culvert seen above and left of the red truck.

FIGURE B.5. Engineer Hill Munitions Facility, SS56. Location is at the upper road showing the maintenance and operations buildings. The water supply well is located at the concrete pad immediately left of the small wooden shed (Bldg 6156)

FIGURE B.6. The Leach Field Crib at the Bottom of Engineer Hill, SS56. Road is the old access to Lily Lake. At the time of the photo (August 1993), water was seeping out of the embankment at the left and forming the standing pool. Well 56M03 is located under the safety cone, to the right of the cuttings drums.

FIGURE B.7. The Maintenance Yard at Birch Lake, DP55. Metal structures are empty storage sheds.

FIGURE B.8. Soil Mound Located About 200 m East of Figure B.7. Rectangular object is a 2-m long wooden board.

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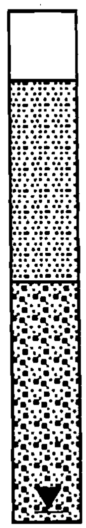
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S1
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: 0,0
Surface Elevation : 547 approx
Source of Location Data: Topo

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown loamy soil
545		LF01_01_S1 2.3' bgs		SILT, sandy, light brown
		LF01_01_S2 3.6' bgs		
540				SAND, w/gravel, dark brown, poorly sorted, medium-grained
		LF01_01_S3 8.4' bgs		
535				

Water Level (▼): 6.6 ft

Comments:

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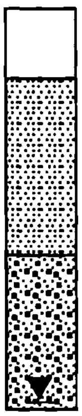
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S2
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: 0,0
Surface Elevation : 547 approx Source of Location Data: Topo

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
545		LF01_02_S1 1.8' bgs		HUMUS, dark brown loamy soil
				SILT, sandy, light brown
		LF01_02_S2 4.7' bgs		SAND, light brown, poorly sorted w/ gravel and cobbles
540		LF01_02_S3 6.6' bgs		
535				



Water Level (▼): 6.6 ft Comments:

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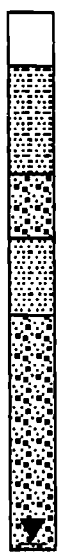
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S3
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: -199, 174
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil
545		LF01_03_S1 1.8' bgs		SILT, clayey, light brown
				GRAVEL, sandy, brown
		LF01_03_S2 4.4' bgs		SILT, sandy, light brown
540				GRAVEL, sandy, brown
		LF01_02_S3 9.0' bgs		
535				

Water Level (▼): 9.4 ft Comments:

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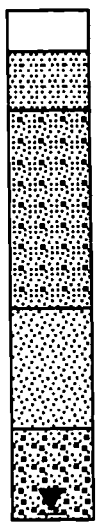
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S4
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: -199, 174
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil
				SILT, sandy w/clay, light brown
545		LF01_04_S1 2.1' bgs		SAND, gravelly, brownish grey, poorly sorted
		LF01_04_S2 4.7' bgs		SAND, medium grained, well sorted, grey
540		LF01_04_S3 7.4' bgs		GRAVEL, sandy w/cobbles, grey cobbles
535				

Water Level (▼): 7.4 ft Comments:

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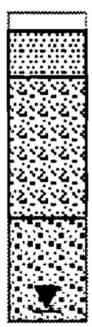
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S5
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: 243, 143
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil and grass
				SILT, sandy w/clay, orangish brown
545		LF01_05_S1 1.9' bgs		
		LF01_05_S2 2.3' bgs		ORGANIC SILT, w/sand, fetid odor, bluish grey to orangish brown,
		LF01_05_S3 3.7' bgs		GRAVEL, sandy w/silt, bluish grey
540				
535				

Water Level (▼): 5.9 ft Comments:

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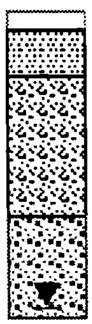
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S6
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: 242, -105
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil and grass
				SILT, sandy w/clay, orangish brown
545		LF01_05_S1 1.9' bgs		
		LF01_05_S2 2.3' bgs		ORGANIC SILT, w/sand, fetid odor, bluish grey to orangish brown,
		LF01_05_S3 3.7' bgs		GRAVEL, sandy w/silt, bluish grey
540				
535				



Water Level (▼): 5.9 ft Comments:

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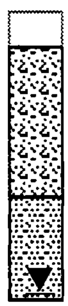
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S7
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: 240, -390
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil and duff
545		LF01_07_S1 1.5' bgs		ORGANIC SILT, w/sand, fetid odor, orange brown w/ bluish grey streaks
		LF01_07_S2 3.6' bgs		SAND silty w/organic matter, bluish grey, fetid odor
		LF01_07_S3 4.9' bgs		
540				
535				

Water Level (▼): 4.8 ft Comments:

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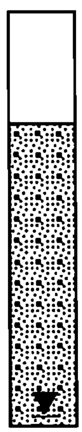
GEOLOGIC WELL LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: 01M01
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location:
Surface Elevation : 525 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
526				
		WP32_S2_S1 0.9' bgs		HUMUS, dark brown, loamy soil and plant debris
524				
				SAND, medium grain, poorly sorted w/gravel and silt bluish black, organic rich w/fetid smell
		WP32_S2_S2 3.0' bgs		
522				
520				

Water Level (▼): 2.9 ft Comments:

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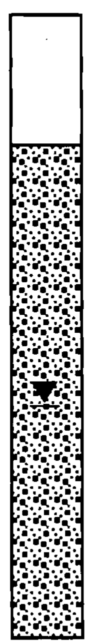
GEOLOGIC WELL LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: 01M03
Completion Date: 8/19/93
Rig Type: Mobil Drill
Method: 6″ cf auger
Core Size: n/a
Horizontal Location: 223011.76 N, 385312.16 E
Surface Elevation : 547.93 Source of Location Data: Survey

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
545				HUMUS, dark brown, loamy soil and plant debris, some gravel
540		No soil sample taken		GRAVEL, sandy, poorly sorted w/ 1 to 2 cm cobbles
535				
530				



Water Level (▼): 12.8 ft btc Comments:

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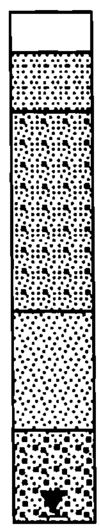
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF01S4
Completion Date: 8/21/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: -199, 174
Surface Elevation : 547 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
550				
				HUMUS, dark brown, loamy soil
				SILT, sandy w/clay, light brown
545		LF01_04_S1 2.1' bgs		SAND, gravelly, brownish grey, poorly sorted
		LF01_04_S2 4.7' bgs		SAND, medium grained, well sorted, grey
540		LF01_04_S3 7.4' bgs		GRAVEL, sandy w/cobbles, grey cobbles
535				

Water Level (▼): 7.4 ft Comments:

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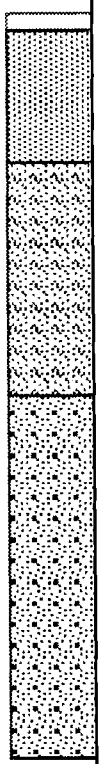
PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF02S1
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location:
Surface Elevation : Source of Location Data:

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
530				
				HUMUS, dark brown loamy soil
				SAND, silty, fine-grained, light brown, with gravel
520				SAND, organic-rich, medium -grained, bluish-grey, micaceous, fetid odor
		LF02S1 8.9' btc C of C # 76192		SAND, gravelly, coarse- grained, dark grey, well sorted
510				
500				



Water Level (▼): 8.8 ft Comments:

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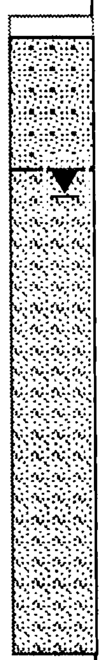
Pacific Northwest Laboratories

PIT GEOLOGIC LOG

PROJECT: Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK: # BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF02S2
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: about xx ft E of 02MW9
Surface Elevation: 530.1 Source of Data: contractor reports
Description of site: Pit is located directly adjacent to well 02MW9.

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
535				
530				HUMUS, dark brown, gravelly loam and fill
				SAND,gravelly, fine-grained, lt brown, well sorted
525				
		LF0202 7.8 btc CofC # 76193		SAND,organic-rich, medium -grained with gravel, bluish-grey, micaceous, fetid odor
520				
515				
510				
505				
500				



Water Level (▼): 7.8 ft Comments:

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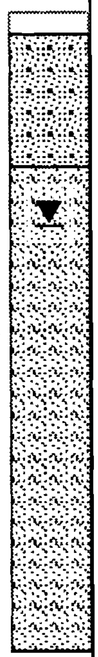
Pacific Northwest Laboratories

PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: LF02S3
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: about xx ft E of 02MW9
Surface Elevation: 528.2 Source of Data: contractor reports
Description of site: Pit is located directly adjacent to well 02MW9.

DEPTH IN FEET		BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
530					HUMUS, dark brown, loam
					SAND, silty, fine-grained, lt brown
520			LF0203 5.8 btc CofC # 76194		SAND, organic-rich, medium -grained with gravel, bluish-grey, fetid odor
510					
500					



Water Level (▼): 6.0 ft Comments: VOC sample not recovered

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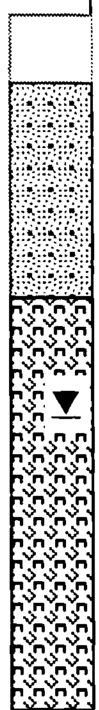
PIT GEOLOGIC LOG

PROJECT: Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 **PROJECT # :** 18119 **WELL OR PIT NUMBER:** LF02S4
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location: about xx ft E of 02M0B
Surface Elevation: 528.1 **Source of Data:** contractor reports
Description of site: Pit is adjacent to well 02M02 within the landfill perimeter road.

DEPTH IN FEET		BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
					HUMUS, dark brown, loam and refuse
525					SAND, gravelly with refuse, light brown
520			LF0204 6.1 btc CofC # 76242	▼	REFUSE, with dark-grey, fetid medium-grained s,and and gravel, strong fetid odor, LEL=0.0% CH4, PID = 0.0 ppm isobutylene
515					
510					



Water Level (▼): 6.1 ft **Comments:** Pit is within land fill.

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PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: WP32S1
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location:
Surface Elevation : 525 approx Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
526				
		WP32_S1_S1 0.9' bgs	▼	HUMUS, dark brown, saturated loamy soil and plant debris
524				
		WP32_S1_S2 1.4' bgs		GRAVEL, medium grain, poorly sorted w/sand and silt, bluish black, organic rich w/fetid smell
522				
520				

Water Level (▼): surface Comments:

Battelle
Pacific Northwest Laboratories

PIT GEOLOGIC LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: WP32S2
Completion Date: 8/23/93
Rig Type: John Deere 710 Backhoe
Method: Excavation
Core Size: N/A
Horizontal Location:
Surface Elevation : 525 approx. Source of Location Data: Topo

Description of site:

DEPTH IN FEET (Elevation)	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
526				
		WP32_S2_S1 0.9' bgs		HUMUS, dark brown, loamy soil and plant debris
524				
				SAND, medium grain, poorly sorted w/gravel and silt bluish black, organic rich w/fetid smell
		WP32_S2_S2 3.0' bgs	▼	
522				
520				

Water Level (▼): 2.9 ft Comments:

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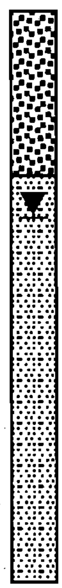
Pacific Northwest Laboratories

GEOLOGIC WELL LOG

PROJECT : Eielson Air Force Base SER Phase 2 LFI
NOTEBOOK #: BNW-55137 PROJECT #: 18119 WELL OR PIT NUMBER: 56M03
Completion Date: 8/19/93
Rig Type: Mobile Drill
Method: 6″ hollow-stem auger
Core Size: N/A
Horizontal Location: 292577.75 N, 392367.01E
Surface Elevation : 584.58 ft Source of Location Data: Survey

Description of site:

DEPTH IN FEET	BLOW COUNT	SAMPLE NUMBER	LITHOLOGY LOG	DESCRIPTION
590				
				GRAVEL, w/sand, road ballast
580		SS56_S1_1 5.7' bgs		
				SILT, w/clay, dark brown, micaceous, firm
570	22 cts/inch	SS56_S1_2 15' bgs		
560				



Water Level (▼): 7.6 ft btc Comments: Hole cascading from perched zone.

Appendix C

APPENDIX C - EPA RISK-BASED SCREENING CONCENTRATIONS

APPENDIX C - EPA RISK-BASED SCREENING CONCENTRATIONS

United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

Alaska
Idaho
Oregon
Washington

EPA

October 30, 1992

Reply to
Attn of: ES-098

MEMORANDUM

SUBJECT: Revised Cheat Sheets

FROM: Carol Sweeney, Toxicologist
Health and Environmental Assessment Section

TO: Superfund Remedial Project Managers

Enclosed is a current version the "Cheat Sheets" showing human health risk-based concentrations (RBCs) for soil and water. This replaces Appendix II of the August, 1991, Region 10 Supplemental Risk Assessment Guidance for Superfund. Appropriate uses for these tables include: compiling Preliminary Remediation Goals, evaluating detection limits, and risk-based screening of contaminants of concern.

Remember that most risk-based concentrations presented here are based on single pathways. Site specific evaluation will affect risk-based goals. Site-specific factors may include multiple pathways and contaminants, potential migration to groundwater, and ecological risk assessment. These tables are not comprehensive of the universe of possible contaminants; only Target Compound List organics and Target Analyte List inorganics are included. For contaminants that do not appear on this list, risk-based concentrations can be calculated using the same approach. (See Risk Assessment Guidance for Superfund, Part B, or Region 10 Supplemental Guidance.)

The numbers in these tables were checked carefully but it is possible that errors or typos could have occurred. Please let me know if you find any discrepancies or errors. Questions or comments about these tables should be directed to me at x6699.

I will be sending copies of the new tables to our risk mailing list, which includes the ARCS and TES contractors.

Changes from August 1991 Cheat Sheets

Format: Several people commented that the tables would be easier to use if the chemicals were in alphabetical order, so they are presented alphabetically this time, first organics, then inorganics on the last page.

MCLs: Quite a few MCLs that were proposed last year have been finalized. In some cases the final number is slightly different from the old proposed one. (Proposed MCLs are not presented on this version of the "Cheat Sheet" because there do not seem to be any proposed MCLs for the chemicals on this list right now.)

RBCs: New risk-based concentrations have been added or changed for chemicals with new or revised toxicity information. Only two chemicals have new toxicity information that had none before. About 10 chemicals have had changes in toxicity factors. For example, risk-based concentrations for carcinogenic PAHs are higher, by about a factor of two, based on the revised cancer potency factor for BaP.

Data Sources: Many toxicity numbers previously noted as HEAST are now available in IRIS.

cc: Judi Schwarz HW-117
John Sainsbury HW-114
David Bennett HW-114
Marcia Bailey HW-104
Wayne Pierre HW-124
Christine Psyk HW-124
Pat Cirone
HEAS
Risk Mailing List

Attachment

EPA Region 10
October, 1992

Appendix II. Human Health Risk-based "Preliminary Remediation Goals" for Water and Soil

Table II-1 Water Cheat Sheet: MCLs and Risk-Based Concentrations

Table II-2 Soil Cheat Sheet: Risk-Based Concentrations

REVISED VERSION
OCTOBER, 1992

Table II-1. Water Cheat Sheet: MCLs and Risk-based Concentrations

CHEMICAL	EPA REGULATED LIMITS FINAL MCLs: MCL (ug/l)	MCLG (ug/l)	Carcinogen Weight of Evidence	Risk at MCL	HQ at MCL	RISK-BASED CONCENTRATIONS Based on Ingestion, Residential: Risk =10-6 (ug/l)	Risk =10-4 (ug/l)	HI = 1 (ug/l)
Organics								
Acenaphthene				NA	NA	NA	NA	2000 (k)
Acenapthylene			D	NA	NA	NA	NA	NA
Acetone			D	NA	NA	NA	NA	4000 (k)
Aldrin			B2	NA	NA	0.005 (l)	0.5 (l)	1 (k)
Anthracene			D	NA	NA	NA	NA	10000 (k)
Benzene	5 (a)	0 (a)	A	6.0E-6 (c)	NA	0.8 (l)	80 (l)	NA
Benz(a)anthracene			B2	NA	NA	0.01 (n)	1 (n)	NA
Benzo(b)fluoranthene			B2	NA	NA	0.01 (n)	1 (n)	NA
Benzo(g,h,i)perylene			D	NA	NA	NA	NA	NA
Benzo(k)fluoranthene			B2	NA	NA	0.01 (n)	1 (n)	NA
Benzo(a)pyrene (BaP)	0.2 (b)	0 (b)	B2	2.0E-5 (d)	NA	0.01 (l)	1 (l)	NA
Benzoic acid			D	NA	NA	NA	NA	100000 (k)
Benzyl alcohol				NA	NA	NA	NA	10000 (k)
Bis(2-chloroethoxy)methane			D	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl) ether			C	NA	NA	0.5 (l)	50 (l)	1000 (k)
Bis(2-ethylhexyl)phthalate (BEHP)	6 (b)	0 (b)	B2	1.0E-6 (d)	0.008 (l)	6 (l)	600 (l)	700 (k)
Bis(chloroethyl)ether (BCEE)			B2	NA	NA	0.02 (l)	2 (l)	NA
Bromodichloromethane	100 (a)THM		B2	2.0E-4 (d)	0.1 (l)	0.6 (l)	60 (l)	700 (k)
Bromoform	100 (a)THM		B2	8.0E-8 (d)	0.1 (l)	10 (l)	1000 (l)	700 (k)
Bromomethane			D	NA	NA	NA	NA	10 (l)
Bromophenyl-phenyl ether				NA	NA	NA	NA	NA
2-Butanone (methyl ethyl ketone)			D	NA	NA	NA	NA	1000 (l)
Butyl benzyl phthalate			C	NA	NA	NA	NA	7000 (k)
Carbon disulfide				NA	NA	NA	NA	30 (l)
Carbon tetrachloride	5 (a)	0 (a)	B2	2.0E-5 (c)	0.2 (l)	0.3 (l)	30 (l)	30 (k)
Chlordane	2 (a)	0 (a)	B2	3.0E-5 (d)	0.9 (l)	0.06 (l)	6 (l)	2 (k)
p-Chloroaniline				NA	NA	NA	NA	100 (k)
Chlorobenzene	100 (a)	100 (a)	D	NA	2	NA	NA	60 (l)
Chloroethane (ethyl chloride)				NA	NA	NA	NA	30000 (m)
Chloroform	100 (a)THM		B2	4.0E-4 (e)	0.3 (g)	0.4 (l)	40 (l)	400 (l)
Chloromethane			C	NA	NA	3 (l)	300 (l)	NA
4-Chloro-3-methyl phenol				NA	NA	NA	NA	NA
2-Chloronaphthalene				NA	NA	NA	NA	3000 (k)
2-Chlorophenol				NA	NA	NA	NA	200 (k)

EPA Region 10, 10/30/92

Table II-1. Water Cheat Sheet: MCLs and Risk-based Concentrations

CHEMICAL	EPA REGULATED LIMITS FINAL MCLs MCL (ug/l)	MCLG (ug/l)	Carcinogen Weight of Evidence	Risk at MCL	HQ at MCL	RISK-BASED CONCENTRATIONS Based on Ingestion, Residential Risk =10-6 (ug/l)	Risk =10-4 (ug/l)	HI = 1 (ug/l)
4-Chlorophenyl-phenyl ether				NA	NA	NA	NA	NA
Chrysene			B2	NA	NA	0.01 (n)	1 (n)	NA
Di-n-butylphthalate				NA	NA	NA	NA	4000 (k)
Di-n-octylphthalate				NA	NA	NA	NA	700 (k)
Dibenz(a,h)anthracene			B2	NA	NA	0.01 (n)	1 (n)	NA
Dibenzofuran			D	NA	NA	NA	NA	40 (k)
Dibromochloromethane			C	NA	NA	1 (l)	100 (l)	700 (k)
1,2-Dichlorobenzene	600 (a)	600 (a)	D	NA	1 (g)	NA	NA	600 (l)
1,3-Dichlorobenzene			D	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75 (a)	75 (a)	C	2.0E-5 (d)	0.04 (h)	3 (l)	300 (l)	2000 (m)
3,3-dichlorobenzidine			B2	NA	NA	0.2 (l)	20 (l)	NA
p,p'-Dichlorodiphenyl dichloroethane (DDD)			B2	NA	NA	0.3 (l)	30 (l)	NA
p,p'-Dichlorodiphenyldichloroethylene (DDE)			B2	NA	NA	0.2 (l)	20 (l)	NA
p,p'-Dichlorodiphenyltrichloroethane (DDT)			B2	NA	NA	0.2 (l)	20 (l)	20 (k)
1,1-Dichloroethane			C	NA	NA	NA	NA	1000 (l)
1,2-Dichloroethane	5 (a)	0 (a)	B2	3.0E-5 (e)	NA	0.3 (l)	30 (l)	NA
1,1-Dichloroethylene	7 (a)	7 (a)	C	1.0E-4 (e)	0.02 (l)	0.06 (l)	6 (l)	300 (k)
cis-1,2-Dichloroethylene	70 (a)	70 (a)	D	NA	0.2 (l)	NA	NA	400 (k)
trans-1,2-Dichloroethylene	100 (a)	100 (a)		NA	0.1	NA	NA	700 (k)
Dichloromethane (methylene chloride)	5 (b)	0 (b)	B2	6.0E-7 (e)	0.003 (g)	7 (l)	700 (l)	2000 (l)
2,4-Dichlorophenol				NA	NA	NA	NA	100 (k)
1,2-Dichloropropane	5 (a)	0 (a)	B2	4.0E-6 (d)	0.04 (h)	1 (l)	100 (l)	100 (m)
1,3-Dichloropropene			B2	NA	NA	0.2 (l)	20 (l)	9 (l)
Dieldrin			B2	NA	NA	0.005 (l)	0.5 (l)	2 (k)
Diethyl phthalate			D	NA	NA	NA	NA	30000 (k)
2,4-Dimethylphenol				NA	NA	NA	NA	700 (k)
Dimethyl phthalate			D	NA	NA	NA	NA	400000 (k)
4,6-Dinitro-2-methylphenol				NA	NA	NA	NA	NA
2,4-Dinitrophenol				NA	NA	NA	NA	70 (k)
2,4-Dinitrotoluene			B2	NA	NA	0.1 (l)	10 (l)	70 (k)
2,6-Dinitrotoluene			B2	NA	NA	0.1 (l)	10 (l)	40 (k)
Endosulfan				NA	NA	NA	NA	2 (k)
Endosulfan sulfate				NA	NA	NA	NA	NA
Endrin	2 (b)	2 (b)	D	NA	0.2 (l)	NA	NA	10 (k)
Endrin ketone				NA	NA	NA	NA	NA

Table II-1. Water Cheat Sheet: MCLs and Risk-based Concentrations

CHEMICAL	EPA REGULATED LIMITS FINAL MCLs MCL (ug/l)	MCLG (ug/l)	Carcinogen Weight of Evidence	Risk at MCL	HQ at MCL	RISK-BASED CONCENTRATIONS Based on Ingestion, Residential Risk $=10^{-6}$ (ug/l)	Risk $=10^{-4}$ (ug/l)	HI = 1 (ug/l)
Ethylbenzene	700 (a)	700 (a)	D	NA	0.4 (g)	NA	NA	2000 (l)
Fluoranthene			D	NA	NA	NA	NA	1000 (k)
Fluorene			D	NA	NA	NA	NA	1000 (k)
Heptachlor	0.4 (a)	0 (a)	B2	2.0E-5 (d)	0.02 (l)	0.02 (l)	2 (l)	20 (k)
Heptachlor epoxide	0.2 (a)	0 (a)	B2	2.0E-5 (d)	0.4 (l)	0.009 (l)	0.9 (l)	0.5 (k)
Hexachlorobenzene	1 (b)	0 (b)	B2	2.0E-5 (d)	0.03 (l)	0.05 (l)	5 (l)	30 (k)
Hexachlorobutadiene			C	NA	NA	1 (l)	100 (l)	70 (k)
alpha-Hexachlorocyclohexane (alpha-HCH)			B2	NA	NA	0.01 (l)	1 (l)	NA
beta-Hexachlorocyclohexane (beta-HCH)			C	NA	NA	0.05 (l)	5 (l)	NA
delta-Hexachlorocyclohexane (delta-HCH)			D	NA	NA	NA	NA	NA
epsilon-Hexachlorocyclohexane (epsilon-HC)			D	NA	NA	NA	NA	NA
gamma-Hexachlorocyclohexane (lindane)(gamma-I	0.2 (a)	0.2 (a)	B2-C	3.0E-6 (d)	0.02 (l)	0.06 (l)	6 (l)	10 (k)
technical Hexachlorocyclohexane (t-HCH)			B2	NA	NA	0.05 (l)	5 (l)	NA
Hexachlorocyclopentadiene (HCCPD)	50 (b)	50 (b)	D	NA	0.2 (l)	NA	NA	300 (k)
Hexachloroethane			C	NA	NA	6 (l)	600 (l)	40 (k)
Hexanone				NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene			B2	NA	NA	0.01	1	NA
Isophorone			C	NA	NA	90 (l)	9000 (l)	7000 (k)
Methoxychlor	40 (a)	40 (a)	D	NA	0.2 (l)	NA	NA	200 (k)
Methyl-2-pentanone				NA	NA	NA	NA	NA
2-Methylnaphthalene				NA	NA	NA	NA	NA
2-Methylphenol (o-cresol)			C	NA	NA	NA	NA	2000 (k)
4-Methylphenol (p-cresol)			C	NA	NA	NA	NA	2000 (k)
Naphthalene			D	NA	NA	NA	NA	1000 (k)
2-Nitroaniline				NA	NA	NA	NA	2 (k)
3-Nitroaniline				NA	NA	NA	NA	NA
4-Nitroaniline				NA	NA	NA	NA	NA
Nitrobenzene			D	NA	NA	NA	NA	20 (k)
2-Nitrophenol				NA	NA	NA	NA	NA
4-Nitrophenol				NA	NA	NA	NA	NA
N-Nitrosodi-N-propylamine			B2	NA	NA	0.01 (l)	1 (l)	NA
N-Nitrosodiphenylamine			B2	NA	NA	20 (l)	2000 (l)	NA
Pentachlorophenol	1 (a)	0 (a)	B2	1.0E-6 (d)	9E-04 (l)	0.7 (l)	70 (l)	1000 (k)
Phenanthrene			D	NA	NA	NA	NA	NA
Phenol			D	NA	NA	NA	NA	20000 (k)

EPA Region 10, 10/30/92

Table II-1. Water Cheat Sheet: MCLs and Risk-based Concentrations

CHEMICAL	EPA REGULATED LIMITS FINAL MCLs: MCL (ug/l)	MCLG (ug/l)	Carcinogen Weight of Evidence	Risk at MCL	IQ at MCL	RISK-BASED CONCENTRATIONS Based on Ingestion, Residential: Risk =10-6 (ug/l)	Risk =10-4 (ug/l)	HI = 1 (ug/l)
Polychlorinated biphenyls (PCBs)	0.5 (a)	0 (a)	B2	5.0E-5 (d)	NA	0.01 (i)	1 (i)	NA
Pyrene			D	NA	NA	NA	NA	1000 (k)
Styrene	100 (a)	100 (a)	B2 (c)	4.0E-5 (e)	0.01 (i)	2 (i)	200 (i)	7000 (k)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.00003 (b)	0 (b)	B2	5.0E-5 (d)	NA	0.0000006 (i)	0.00006 (i)	NA
1,1,2,2-Tetrachloroethane			C	NA	NA	0.1 (i)	10 (i)	1000 (k)
Tetrachloroethylene	5 (a)	0 (a)	B2 (c)	3.0E-6 (e)	0.01 (i)	2 (i)	200 (i)	400 (k)
Toluene	1000 (a)	1000 (a)	D	NA	1 (g)	NA	NA	1000 (l)
Toxaphene	3 (a)	0 (a)	B2	4.0E-5 (d)	NA	0.08 (i)	8 (i)	NA
1,2,4-Trichlorobenzene	70 (b)	70 (b)	D	NA	3 (g)	NA	NA	20 (l)
1,1,1-Trichloroethane	200 (a)	200 (a)	D	NA	0.1 (g)	NA	NA	2000 (l)
1,1,2-Trichloroethane	5 (b)	3 (b)	C	2.0E-5 (e)	0.03 (i)	0.4 (i)	40 (i)	100 (k)
Trichloroethylene	5 (a)	0 (a)	B2 (c)	2.0E-6 (e)	0.02 (i)	3 (i)	300 (i)	200 (k)
2,4,5-Trichlorophenol				NA	NA	NA	NA	4000 (k)
2,4,6-Trichlorophenol			B2	NA	NA	2 (i)	200 (i)	NA
Vinyl acetate				NA	NA	NA	NA	40000 (k)
Vinyl chloride	2 (a)	0 (a)	A	7.0E-5 (e)	NA	0.03 (i)	3 (i)	NA
Xylenes	10000 (a)	10000 (a)	D	NA	10 (g)	NA	NA	800 (l)

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Table II-1. Water Cheat Sheet: MCLs and Risk-based Concentrations

CHEMICAL	EPA REGULATED LIMITS FINAL MCLs MCL (ug/l)	MCLG (ug/l)	Carcinogen Weight of Evidence	Risk at MCL	HQ at MCL	RISK-BASED CONCENTRATIONS Based on Ingestion, Residential Risk =10-6 (ug/l)	Risk =10-4 (ug/l)	HI = 1 (ug/l)
Inorganics								
Antimony	6 (b)	6 (b)		NA	0.4 (l)	NA	NA	10 (k)
Arsenic, inorganic	50 (a)		A	1.0E-3 (d)	5 (l)	0.05 (l)	5 (l)	10 (k)
Barium	2000 (a)	2000 (a)		NA	0.8 (l)	NA	NA	3000 (k)
Beryllium	4 (b)	4 (b)	B2	2.0E-4 (d)	0.02 (l)	0.02 (l)	2 (l)	200 (k)
Cadmium	5 (a)	5 (a)	B1	NA	0.3 (l)	NA	NA	20 (k)
Chromium(III)	100 (a)totC	100 (a)		NA	0.003 (l)	NA	NA	40000 (k)
Chromium(VI)	100 (a)totC	100 (a)	A	NA	0.5 (l)	NA	NA	200 (k)
Copper		1300 (a)	D	NA	NA	NA	NA	1000 (k)
Cyanide, free	200 (b)	200 (b)		NA	0.3 (l)	NA	NA	700 (k)
Lead and compounds (inorganic)		0 (a)	B2	NA	NA	NA	NA	NA
Manganese			D	NA	NA	NA	NA	1000 (o)
Mercury (inorganic)	2 (a)	2 (a)	D	NA	0.2 (l)	NA	NA	10 (k)
Nickel, soluble salts	100 (b)	100 (b)	no data	NA	0.1 (l)	NA	NA	700 (k)
Selenium	50 (a)	50 (a)	D	NA	0.3 (l)	NA	NA	200 (k)
Silver			D	NA	NA (l)	NA	NA	200 (k)
Thallium (soluble salts)	2 (b)	0.5 (b)	D	NA	0.8 (l)	NA	NA	3 (k)
Vanadium				NA	NA	NA	NA	300 (k)
Zinc				NA	NA	NA	NA	10000 (k)

Table II-1. Footnotes

NA = Toxicity value and/or MCL not available, so risk-based concentration and/or risk at MCL can not be calculated.

(a) 40 CFR 141, subparts A, B, F, G, and I.

(b) 57 FR 31777, July 17, 1992.

(c) Weight-of-Evidence classifications for carcinogenicity for trichloroethylene, tetrachloroethylene, and styrene are under review to determine status as "C" or "B2". Carcinogenicity characterizations have been withdrawn from IRIS and HEAST pending resolution of the issue. Until the new characterizations are available, Superfund risk assessments should use the quantitative evaluations for TCE and PCE presented in the 1991 HEAST.

(d) Risk at MCL was calculated considering residential exposure through ingestion of water, using equation (5) from Appendix I. Appendix I is consistent with Risk Assessment Guidance for Superfund, Part B (EPA/540/R-92/003). Exposure factors were taken from "Standard Default Exposure Factors", OSWER Directive No. 9285.6-03. Cancer potency (slope) factors for each chemical were taken from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). Specific reference for toxicity information for each chemical is provided in Table II-2, Sources of Toxicity Data.

(e) Risk at MCL was calculated considering residential exposure through ingestion of water and inhalation of volatiles from household use of water. The equation used was:

$$\text{RISK} = \text{Conc. (ug/l)} \times \left(\left(.001\ \text{mg/ug} \times \frac{2\ \text{l/day} \times 350\ \text{day/yr} \times 30\ \text{yr}}{70\ \text{kg} \times 70\ \text{yr} \times 365\ \text{day/yr}} \times \text{SFo}\right) + \left(\frac{0.5\ \text{l/m}^3 \times 30\ \text{yr} \times 15\ \text{m}^3\text{/day} \times 350\ \text{day/yr}}{70\ \text{yr} \times 20\ \text{m}^3\text{/day} \times 365\ \text{day/yr}} \times \text{Unit Risk (Inhal.)(ug/m}^3)^{-1}\right)\right)$$

This is identical in practice to equation (7) from Appendix I, except that is uses the unit risk term directly rather than back-calculating an inhalation slope factor (avoiding potential rounding error). Sources of exposure factors and cancer potency (slope) factors are as in footnote (d) above.

(f) HQ at MCL was calculated considering residential exposure through ingestion of water, using equation (9) from Appendix I. Sources of exposure factors and reference doses are as in footnote (d) above.

(g) HQ at MCL was calculated considering residential exposure through ingestion of water and inhalation of volatiles from household use of water. The equation used was:

$$\text{HQ} = \text{Conc. (ug/l)} \times .001\ \text{mg/ug} \times \left(\left(\frac{2\ \text{l/day} \times 350\ \text{day/yr}}{70\ \text{kg} \times 365\ \text{day/yr}} / \text{RfDo}\right) + \left(\frac{0.5\ \text{l/m}^3 \times 15\ \text{m}^3\text{/day} \times 350\ \text{day/yr}}{20\ \text{m}^3\text{/day} \times 365\ \text{day/yr}} \times \text{RfC (mg/m}^3)\right)\right)$$

This is identical in practice to equation (11) from Appendix I, except that is uses the reference concentration directly rather than back-calculating an inhalation reference dose (avoiding potential rounding error). Sources of exposure factors, reference doses and reference concentrations are as in footnote (d) above.

(h) For volatile chemicals that have an RfC but no RfD, HQ at MCL was calculated using the right half of the equation in (g) above.

(i) Risk-based concentration was calculated using equation (6) from Appendix I, considering ingestion of drinking water. Exposure factors and sources of toxicity data are the same as in footnote (d) above.

(j) Risk-based concentration was calculated using the equation in footnote (e) above, rearranged. Exposure pathways considered were ingestion of drinking water and inhalation of volatiles. Exposure factors and toxicity data sources are the same as in footnote (d) above.

(k) HQ = 1 concentration was calculated using equation (10) from Appendix I, considering ingestion of drinking water. Exposure factors and sources of toxicity data are the same as in footnote (d) above.

(l) HQ = 1 concentration was calculated using the equation in footnote (g) above, rearranged. Exposure pathways considered were ingestion of drinking water and inhalation of volatiles. Exposure factors and toxicity data sources are the same as in footnote (d) above.

(m) For volatile chemicals that have an RfC but no RfD, HQ =1 concentration was calculated using the right half of the equation in (g) above.

(n) For the purposes of this table and preliminary remediation goals, risk-based concentrations for all carcinogenic (B2) PAHs were calculated using the BaP potency factor. Toxic equivalency factor (TEF) approaches are being reviewed for applicability in Superfund risk assessments. This issue has not been resolved.

(o) The manganese RfD is based on exposure in the diet. For drinking water, absorption is expected to be greater, so an absorption factor of 3 is included in calculation of HQ.

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Table II-2. Soil Cheat Sheet

CHEMICAL	RISK-BASED CONCENTRATIONS Based on Soil Ingestion, Residential			SOURCES OF TOXICITY DATA				
	Risk = 10-6 (mg/kg) (a)	Risk = 10-4 (mg/kg) (a)	HQ = 1 (mg/kg) (b)	Reference Dose Data Source: Oral RfD	Reference Dose Data Source: Inhal. RfC	Carcinogen Weight of Evidence	Slope Factor Data Source: Oral SF	Slope Factor Data Source: Inhal. Unit Risk
Organics								
Acenaphthene	NA	NA	20000	IRIS				
Acenaothylene	NA	NA	NA			D	IRIS	
Acetone	NA	NA	30000	IRIS		D	IRIS	
Aldrin	0.04	4	8	IRIS		B2	IRIS	IRIS
Anthracene	NA	NA	80000	IRIS		D	IRIS	
Benzene	20	2000	NA			A	IRIS	IRIS
Benz(a)anthracene	0.09	9	NA			B2	IRIS	
Benzo(b)fluoranthene	0.09	9	NA			B2	IRIS	
Benzo(g,h,i)perylene	NA	NA	NA			D	IRIS	
Benzo(k)fluoranthene	0.09	9	NA			B2	IRIS	
Benzo(a)pyrene (BaP)	0.09	9	NA			B2	IRIS	HEAST 92
Benzoic acid	NA	NA	1000000	IRIS		D	IRIS	
Benzyl alcohol	NA	NA	80000	HEAST 92				
Bis(2-chloroethoxy)methane	NA	NA	NA			D	IRIS	
Bis(2-chloroisopropyl) ether	9	900	10000	IRIS		C	HEAST 92	HEAST 92
Bis(2-ethylhexyl)phthalate (BEHP)	50	5000	5000	IRIS		B2	IRIS	
Bis(chloroethyl)ether (BCEE)	0.6	60	NA			B2	IRIS	IRIS
Bromodichloromethane	5	500	5000	IRIS		B2	IRIS	
Bromoform	80	8000	5000	IRIS		B2	IRIS	IRIS
Bromomethane	NA	NA	400	IRIS	IRIS	D	IRIS	
Bromophenyl-phenyl ether	NA	NA	NA					
2-Butanone (methyl ethyl ketone)	NA	NA	10000	HEAST 92	IRIS	D	IRIS	
Butyl benzyl phthalate	NA	NA	50000	IRIS		C	IRIS	
Carbon disulfide	NA	NA	30000	IRIS	HEAST 92			
Carbon tetrachloride	5	500	200	IRIS		B2	IRIS	IRIS
Chlordane	0.5	50	20	IRIS		B2	IRIS	IRIS
p-Chloroaniline	NA	NA	1000	IRIS				
Chlorobenzene	NA	NA	5000	IRIS	HEAST 92	D	IRIS	
Chloroethane (ethyl chloride)	NA	NA	NA		IRIS			
Chloroform	100	10000	3000	IRIS		B2	IRIS	IRIS
Chloromethane	50	5000	NA			C	HEAST 92	HEAST 92
4-Chloro-3-methyl phenol	NA	NA	NA					
2-Chloronaphthalene	NA	NA	20000	memo 5/90				
2-Chlorophenol	NA	NA	1000	IRIS				
4-Chlorophenyl-phenyl ether	NA	NA	NA					
Chrysene	0.09	9	NA			B2	IRIS	
Di-n-butylphthalate	NA	NA	30000	IRIS	IRIS			
Di-n-octylphthalate	NA	NA	5000	HEAST 92				
Dibenz(a,h)anthracene	0.09	9	NA	IRIS		B2	IRIS	
Dibenzofuran	NA	NA	300	memo 5/91		D	IRIS	
Dibromochloromethane	8	800	5000	IRIS		C	IRIS	
1,2-Dichlorobenzene	NA	NA	20000	IRIS	HEAST 92	D	IRIS	
1,3-Dichlorobenzene	NA	NA	NA	IRIS		D	IRIS	
1,4-Dichlorobenzene	30	3000	NA		HEAST 92	C	HEAST 92	
3,3-dichlorobenzidine	1	100	NA			B2	IRIS	
p,p'-Dichlorodiphenyl dichloroethane	3	300	NA			B2	IRIS	
p,p'-Dichlorodiphenyldichloroethylene	2	200	NA			B2	IRIS	
p,p'-Dichlorodiphenyltrichloroethane	2	200	100	IRIS		B2	IRIS	IRIS
1,1-Dichloroethane	NA	NA	30000	HEAST 92	HEAST 92	C	IRIS	
1,2-Dichloroethane	7	700	NA			B2	IRIS	IRIS

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Table II-2. Soil Cheat Sheet

CHEMICAL	RISK-BASED CONCENTRATIONS Based on Soil Ingestion, Residential			SOURCES OF TOXICITY DATA				
	Risk = 10-6 (mg/kg) (a)	Risk = 10-4 (mg/kg) (a)	HQ = 1 (mg/kg) (b)	Reference Dose Data Source Oral RfD	Reference Dose Data Source Inhal. RfC	Carcinogen Weight of Evidence	Slope Factor Data Source Oral SF	Slope Factor Data Source Inhal. Unit Risk
1,1-Dichloroethylene	1	100	2000	IRIS		C	IRIS	IRIS
cis-1,2-Dichloroethylene	NA	NA	3000	HEAST 92		D	IRIS	
trans-1,2-Dichloroethylene	NA	NA	5000	IRIS				
Dichloromethane (methylene chlori	90	9000	20000	IRIS	HEAST 92	B2	IRIS	IRIS
2,4-Dichlorophenol	NA	NA	800	IRIS				
1,2-Dichloropropane	9	900	NA		IRIS	B2	HEAST 92	
1,3-Dichloropropene	4	400	80	IRIS	IRIS	B2	HEAST 92	HEAST 92
Dieldrin	0.04	4	10	IRIS		B2	IRIS	HEAST 92
Diethyl phthalate	NA	NA	200000	IRIS		D	IRIS	
2,4-Dimethylphenol	NA	NA	5000	IRIS				
Dimethyl phthalate	NA	NA	3000000	HEAST 92		D	IRIS	
4,6-Dinitro-2-methylphenol	NA	NA	NA					
2,4-Dinitrophenol	NA	NA	500	IRIS				
2,4-Dinitrotoluene	0.9	90	500	IRIS	IRIS	B2	IRIS	
2,6-Dinitrotoluene	0.9	90	300	memo 11/91		B2	IRIS	
Endosulfan	NA	NA	10	IRIS				
Endosulfan sulfate	NA	NA	NA					
Endrin	NA	NA	60	IRIS		D	IRIS	
Endrin ketone	NA	NA	NA					
Ethylbenzene	NA	NA	30000	IRIS	IRIS	D	IRIS	
Fluoranthene	NA	NA	10000	IRIS		D	IRIS	
Fluorene	NA	NA	10000	IRIS		D	IRIS	
Heptachlor	0.1	10	100	IRIS		B2	IRIS	IRIS
Heptachlor epoxide	0.07	7	4	IRIS		B2	IRIS	IRIS
Hexachlorobenzene	0.4	40	200	IRIS	IRIS	B2	IRIS	IRIS
Hexachlorobutadiene	8	800	500	IRIS		C	IRIS	IRIS
alpha-Hexachlorocyclohexane (alpha	0.1	10	NA			B2	IRIS	IRIS
beta-Hexachlorocyclohexane (beta-H	0.4	40	NA			C	IRIS	IRIS
delta-Hexachlorocyclohexane (delta-	NA	NA	NA			D	IRIS	
epsilon-Hexachlorocyclohexane (eps	NA	NA	NA			D	IRIS	
gamma-Hexachlorocyclohexane (linc	0.5	50	80			B2-C	HEAST 92	
technical Hexachlorocyclohexane (t-	0.4	40	NA			B2	IRIS	IRIS
Hexachlorocyclopentadiene (HCCPD	NA	NA	2000	IRIS	HEAST 92	D	IRIS	
Hexachloroethane	50	5000	300	IRIS		C	IRIS	IRIS
Hexanone	NA	NA	NA					
Indeno(1,2,3-cd)pyrene	0.09	9	NA			B2	IRIS	
Isophorone	700	70000	50000	IRIS		C	IRIS	
Methoxychlor	NA	NA	1000	IRIS	IRIS	D	IRIS	
Methyl-2-pentanone	NA	NA	NA					
2-Methylnaphthalene	NA	NA	NA					
2-Methylphenol (o-cresol)	NA	NA	10000	IRIS	IRIS	C	IRIS	
4-Methylphenol (p-cresol)	NA	NA	10000	HEAST 92	IRIS	C	IRIS	
Naphthalene	NA	NA	10000	HEAST 92		D	IRIS	
2-Nitroaniline	NA	NA	20	HEAST 92	HEAST 92			
3-Nitroaniline	NA	NA	NA					
4-Nitroaniline	NA	NA	NA					
Nitrobenzene	NA	NA	100	IRIS	HEAST 92	D	IRIS	
2-Nitrophenol	NA	NA	NA					
4-Nitrophenol	NA	NA	NA		IRIS			
N-Nitrosodi-N-propylamine	0.09	9	NA	IRIS		B2	IRIS	
N-Nitrosodiphenylamine	100	10000	NA	IRIS		B2	IRIS	

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Table II-2. Soil Cheat Sheet

CHEMICAL	RISK-BASED CONCENTRATIONS Based on Soil Ingestion, Residential: Risk = 10-6 (mg/kg) (a)	Risk = 10-4 (mg/kg) (a)	HQ = 1 (mg/kg) (b)	SOURCES OF TOXICITY DATA — Reference Dose Data Source: Oral RfD	Inhal. RfC	Carcinogen Weight of Evidence	Slope Factor Data Source: Oral SF	Inhal. Unit Risk
Pentachlorophenol	5	500	8000	IRIS		B2	IRIS	
Phenanthrene	NA	NA	NA			D	IRIS	
Phenol	NA	NA	200000	IRIS		D	IRIS	
Polychlorinated biphenyls (PCBs)	0.08	8	NA			B2	IRIS	
Pyrene	NA	NA	8000	IRIS		D	memo 5/90	
Styrene	20	2000	50000	IRIS		B2	HEAST 90	HEAST 91
2,3,7,8-Tetrachlorodibenzo-p-dioxi	4E-06	0.0004	NA			B2	HEAST 91	HEAST 91
1,1,2,2-Tetrachloroethane	3	300	8000	IRIS		C	IRIS	IRIS
Tetrachloroethylene	10	1000	3000	IRIS		B2	HEAST 89	HEAST 91
Toluene	NA	NA	50000	IRIS	IRIS	D	IRIS	
Toxaphene	0.6	60	NA			B2	IRIS	IRIS
1,2,4-Trichlorobenzene	NA	NA	3000	IRIS	HEAST 92	D	IRIS	
1,1,1-Trichloroethane	NA	NA	20000	HEAST 92	HEAST 92	D	IRIS	
1,1,2-Trichloroethane	10	1000	1000	IRIS		C	IRIS	IRIS
Trichloroethylene	60	6000	2000	memo 4/92		B2	HEAST 89	HEAST 91
2,4,5-Trichlorophenol	NA	NA	30000	IRIS				
2,4,6-Trichlorophenol	60	6000	NA			B2	IRIS	IRIS
Vinyl acetate	NA	NA	300000	HEAST 92	IRIS			
Vinyl chloride	0.3	30	NA			A	HEAST 92	HEAST 02
Xylenes	NA	NA	500000	IRIS	HEAST 91	D	IRIS	
Inorganics								
Antimony	NA	NA	100	IRIS				
Arsenic, inorganic	0.4	40	80	IRIS		A	HEAST 90	IRIS
Barium	NA	NA	20000	IRIS	HEAST92			
Beryllium	0.1	10	1000	IRIS		B2	IRIS	IRIS
Cadmium	NA	NA	100	IRIS		B1		IRIS
Chromium(III)	NA	NA	(c)	IRIS	HEAST 91			
Chromium(VI)	NA	NA	(c)	IRIS	HEAST 91	A		IRIS
Copper	NA	NA	10000	HEAST 92		D	IRIS	
Cyanide, free	NA	NA	5000	IRIS				
Lead and compounds (inorganic)	NA	NA	NA			B2	IRIS	
Manganese	NA	NA	30000	IRIS	IRIS	D	IRIS	
Mercury (inorganic)	NA	NA	(c)	HEAST 92	HEAST 92	D	IRIS	
Nickel, soluble salts	NA	NA	5000	IRIS		no data		
Selenium	NA	NA	1000	IRIS		D	IRIS	
Silver	NA	NA	1000	IRIS		D	IRIS	
Thallium (soluble salts)	NA	NA	20	HEAST 91		D	IRIS	
Vanadium	NA	NA	2000	HEAST 92				
Zinc	NA	NA	80000	IRIS				

Table II-2. Footnotes

NA = Toxicity value not available, so risk-based concentration can not be calculated.

(a) Risk-based concentration was calculated using equation (14) from Appendix I. This calculation assumes residential exposure through soil ingestion. Appendix I is consistent with Risk Assessment Guidance for Superfund, Part B (EPA/540/R-92/003). Exposure factors were taken from "Standard Default Exposure Factors", OSWER Directive No. 9285.6-03. Cancer potency (slope) factors for each chemical were taken from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). Specific reference for toxicity information for each chemical is provided in at right under Sources of Toxicity Data.

(b) HQ = 1 concentration was calculated using equation (16) from Appendix I. This calculation assumes residential exposure through soil ingestion. Appendix I is consistent with Risk Assessment Guidance for Superfund, Part B (EPA/540/R-92/003). Exposure factors were taken from "Standard Default Exposure Factors", OSWER Directive No. 9285.6-03. Reference Doses (RfDs) for each chemical were taken from EPA's Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). Specific reference for toxicity information for each chemical is provided in at right under Sources of Toxicity Data

(c) Risk-based concentrations calculated based on the soil ingestion pathway may not be appropriate for chromiu, cadmium, elemental mercury, or carcinogenic forms of nickel. This is due to the issue of their inhalation toxicity being potentially of more concern than ingestion.