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Eielson Air Force Base
Operable Unit Two and Other Areas

Declaration of the Amended Record of Decision

Site Name and Location
Operable Unit 2
Eielson Air Force Base, Alaska

Statement and Basis of Purpose
This decision document presents the amended remedial action for Operable Unit 2 (OU2) at Eielson Air Force Base (AFB), Alaska, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the May 1991 Federal Facilities Agreement entered into by the Air Force, the U.S. Environmental Protection Agency (EPA), and the State of Alaska, and to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record for OU2, updated in July 1998, to include new information generated since the original Record of Decision was signed on 27 September 1994. This amendment applies to OU2 sites ST13, E-4 Diesel Fuel Spill, and DP26, E-10 Fuel Tank Sludge Burial Site.

The State of Alaska concurs with the amended remedy.

Assessment of the Sites
Actual or threatened releases of hazardous substances from sites ST13 and DP26 within OU2, if not addressed by implementing the response action selected in this amended Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy
ST13 and DP26 were treated jointly in the feasibility study because of their physical proximity and commingled groundwater contamination. The subsurface soils and groundwater at ST13 and DP26 are contaminated with petroleum products, including benzene, toluene, ethylbenzene, and xylene (BTEX). The 1994 ROD included the installation of a bioventing system to address the source of petroleum contamination to the groundwater. The portion of the original selected remedy addressing the organic subsurface contamination remains unchanged except for the substitution of passive removal for active removal.

In addition to hydrocarbon contaminants, the OU2 ROD specified lead as a chemical of concern for the groundwater at Source Areas ST13 and DP26. Total and dissolved lead concentrations in the groundwater were found to exceed the action level of 15 micrograms per liter (ug/L) established under the Safe Drinking Water Act. The 1994 ROD specified pump and treat technology for remediation of the groundwater lead contamination and also specified that the technology effectiveness be evaluated prior to implementation. The resultant evaluation and

monitoring results concluded that the lead is largely immobile in the subsurface, the contaminant plume is stable and is not expanding, and that removal of lead contamination is not technically feasible. This ROD Amendment is necessary because this new information has led to a fundamental change in the recommended remedial action for Source Areas ST13 and DP26.

Institutional controls prohibiting use of groundwater within the contaminated area will remain in place for as long as the contaminant concentrations in groundwater exceed action levels or MCLs. Groundwater monitoring will be conducted to confirm contaminant containment and compliance with final remediation goals.

The major components of the amended selected remedy for ST13 and DP26 include:

- Install a passive skimming system to remove fuel floating atop the groundwater at ST13 and DP26 where the product is sufficiently mobile to be recoverable. Completed 1995.
- Install a bioventing and soil vapor extraction (SVE) system to remediate soil contamination that poses a threat to groundwater through leaching. Completed 1995.
- Monitor groundwater at ST13 and DP26 to evaluate contaminant levels and migration until remediation levels are achieved.
- Implement and enforce institutional controls to prevent exposure to contaminated groundwater. In the event of base closure, contaminated sites will be further addressed in accordance with CERCLA Section 120.

Statutory Determination

The amended selected remedies are protective of human health and the environment and are cost effective. The amended selected remedies comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action with the exception of the action level for lead established under the Safe Drinking Water Act (40 CFR 141.80). A waiver of the lead action level is justified because compliance with the requirement is technically impracticable from an engineering perspective. The remedies utilize permanent solutions and alternate treatment (or resource recovery) technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because these remedies will result in hazardous substances remaining onsite above health-based levels, reviews will be conducted at sites ST13 and DP26 within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature and Support Agency Acceptance of the Amended Remedy for Operable Unit 2, Eielson Air Force Base.

JENNIFER ROBERTS, Section Manager
Contaminated Sites Remediation Program
Alaska Department of Environmental Conservation

March 28 2001
Date

Signature and Support Agency Acceptance of the Amended Remedy for Operable Unit 2 and Other Areas, Eielson Air Force Base

_____ _____

KURT FREDERIKSSON Date
Director of the Division of Spill Prevention and Response
Alaska Department of Environmental Conservation

Signature and Support Agency Acceptance of the Amended Remedy for Operable Unit 2 and Other Areas, Eielson Air Force Base

CHARLES R. HEFLEBOWER, Lt Gen, USAF
Vice Commander

27 May 99
Date

Signature and Support Agency Acceptance of the Amended Remedy for Operable Unit 2 and Other Areas, Eielson Air Force Base

Chuck Clarke

9/29/98
Date

Chuck Clarke
Regional Administrator
Region 10
U.S. Environmental Protection Agency

AMENDMENT OUTLINE
OPERABLE UNIT 2 RECORD OF DECISION
EIELSON AIR FORCE BASE
SOURCE AREAS ST13 AND DP26

TABLES

FIGURES

AMENDMENT
OPERABLE UNIT 2 RECORD OF DECISION
EIELSON AIR FORCE BASE
SOURCE AREAS ST13 AND DP26

1.0 Introduction

Site name and location: Operable Unit 2, Source Areas ST13, E-4 Diesel Fuel Spill, and DP26, E-10 Fuel Tank Sludge Burial Site, Eielson Air Force Base, Alaska.

Lead agency: Eielson Air Force Base (AFB), U.S. Air Force.

Support agencies: State of Alaska Department of Environmental Conservation (ADEC).
Region 10, U.S. Environmental Protection Agency (EPA).

Eielson AFB is located within the Fairbanks North Star Borough approximately 21 miles southeast of Fairbanks and 10 miles southeast of the city of North Pole Alaska, along the Richardson Highway. Operable Unit 2 (OU2) consists of seven source areas combined because of commonality in contamination caused by leaks and spills of fuels. Source Areas ST13 and DP26 are two of the seven source areas and have fuel and lead contamination.

The Record of Decision (ROD) for OU2 was developed in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), Section 117, as amended by the *Superfund Amendments and Reauthorization Act* (SARA), and the May 1991 Federal Facility Agreement (FFA) entered into by the Air Force, EPA and ADEC (US Air Force 1994). The ROD was signed on 27 September 1994.

2.0 Reasons for Issuing the ROD Amendment

In addition to the hydrocarbon contaminants, the OU2 ROD specified lead as a chemical of concern for the groundwater at Source Areas ST13 and DP26. Total and dissolved lead concentrations in the groundwater were found to exceed the action level of 15 micrograms per liter (ug/L) established under the Safe Drinking Water Act. The ROD specified pump and treat technology for remediation of the groundwater lead contamination and also specified that the technology effectiveness be evaluated prior to implementation. Based on the evaluation, the Air Force and agencies determined that the lead is largely immobile in the subsurface and that the lead contamination cannot be readily removed using pump and treat technology (US Air Force 1996). This ROD Amendment is necessary because this new information has led to a fundamental change in the recommended remedial action for Source Areas ST13 and DP26.

3.0 Need for Technical Impracticability Waiver

Because the groundwater will not be restored within a reasonable time frame, a waiver based on technical impracticability (TI) is necessary. This ROD Amendment provides the justification for the TI waiver for the lead action level.

4.0 National Contingency Plan (NPL) Citation

This ROD amendment is presented in accordance with the National Contingency Plan (NCP), Section 300.435(c)(2)(ii) and will become a part of the OU2 Administrative Record File in accordance with the NCP, Section 300.825(a)(2). The Administrative Record File is available for public review at:

Elmer E. Rasmuson Library (Archives Section)
Alaska and Polar Regions Department
University of Alaska Fairbanks
Fairbanks, Alaska 99775
(907) 474-6594

5.0 Summary of Site History and Contamination Problems

At the time the remedial investigation (RI) report was prepared, the ST13 area included a fuel pump house, 11 underground storage tanks (UST's), five fuel outlets, and an area historically used for filling and storing fuel bladders (US Air Force 1993). The DP26 area included a 420,000 gallon above ground storage tank (tank 300) and ancillary piping and shallow trenches used for burial of sludge from fuel tank cleaning operations. Upgrade work at these sites conducted in 1994 included removal and close-out of the 11 UST's, installation of a new tank near tank 300, and removal of an existing utilidor and installation of 4,000 feet of new utilidor.

Spills at ST13 have occurred as a result of ruptured, leaking, and overfilled bladders used to transport diesel and some motor gasoline by helicopter to remote areas. Groundwater contamination at DP26 was apparently due to spills/leaks of leaded fuels used from the 1950s to the 1970s prior to reconditioning of Tank 300 and associated underground piping in 1987. This conclusion is based on the detection of tetraethyl lead, a fuel additive, in floating product and in groundwater at DP26 (US Air Force 1996).

Table 2.1 is reproduced from the OU2 ROD and lists the concentrations of TPH, BTEX, and lead detected in subsurface soil samples at ST13 and DP26.

Table 2.1 ST13 and DP26 Subsurface Soil Concentrations of TPH, BTEX, and Lead

Constituent	Detection Limit (mg/kg)	Detected/ Analyzed	Concentration Range Detected (mg/kg)	Location of Max. Concentration
TPH	1.9 - 50	41/55	6.7 - 31,400	13SBC-12.7
Benzene	0.005 - 0.65	6/36	0.02 - 20	13SBC-12.7
Toluene	0.005 - 0.65	10/36	0.02 - 220	13SBC-12.7
Lead	1	3/3	14.5 - 60.4	13SBC-07.5

Contaminants of concern in groundwater are benzene, ethylbenzene, toluene, xylenes, napthalene, and lead. Table 2.2 is also reproduced from the OU2 ROD and lists concentrations of TPH, BTEX, and total lead for groundwater collected from ST13 and DP26 monitoring wells. Figure 1, ST13 and DP26 Location Map, shows the location of monitoring wells and boreholes having the maximum contaminant concentrations.

Table 2.2 ST13 and DP26 Groundwater Concentrations of TPH, BTEX, and Total Lead

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Max. Concentration
TPH	50	3/5	100 -101,000	13MW02
Benzene	5	18/22	1J - 1,400	26MW08
Ethylbenzene	5	13/22	1J - 1,100	26MW01
Toluene	5	13/22	2J - 4,200	26MW08
Total Lead	1	15/20	1.3B - 795	26MW08

B - Reported value is less than the Contract Required Quantitation Limit but greater than the Instrument Detection Limit.
J - Estimate value less than Contract Required Quantitation Limit.

As reported in the RI, ST13 maximum groundwater contaminant concentrations in ug/L were; benzene - 170, toluene - 720, ethylbenzene - 320, xylene - 2,100, and lead - 41.4. Maximum soil concentrations of TPH and lead were respectively: surface soil - 814 and 88.3 mg/kg and subsurface soil - 31,400 and 60.4 mg/kg. Floating fuel of 0.01 feet thickness was found in one well at ST13.

At DP26, maximum groundwater contaminant concentrations in ug/L were: benzene - 1,400, toluene - 3,000, ethylbenzene - 1,100, xylene - 6,300, and lead - 795. The maximum apparent thickness of floating fuel at DP26 was measured at 1.13 feet.

Floating product thickness appears to have decreased over the years. In 1995, 14 of 20 wells sampled at ST13 and DP26 had no floating product and the maximum apparent floating product thickness measured was 0.7 feet (US Air Force 1996).

6.0 Description of the Original Selected Remedy

The original selected remedy included a combination of bioventing, SVE, and possibly air sparging to enhance volatilization and degradation of volatile organic compounds from the vadose zone, smear zone, and floating fuel layer in areas where the layer is thin. This remedy also included installation of a product and groundwater extraction well near Tank 300. The groundwater extracted during the implementation of this alternative would be treated by precipitation to remove the lead and air stripping to remove the volatile organic compounds.

This original selected remedy was intended to address groundwater contamination by source reduction and by extraction and treatment of contaminated groundwater.

Institutional controls prohibiting domestic use of groundwater within the contaminated area would remain in place for as long as the contaminant concentrations in groundwater exceed action levels or MCLs. Groundwater monitoring would be conducted to evaluate contaminant migration and compliance with final remediation goals.

The original specific selected remedies for ST13 and DP26 were as follows:

- Install an active skimming system to remove fuel floating atop the groundwater at ST13 and DP26 where the product is sufficiently mobile to be recoverable.
- Install a bioventing and soil vapor extraction (SVE) system to remediate soil contamination that poses a threat to groundwater through leaching.
- Install groundwater extraction and treatment facilities in areas of highest groundwater lead concentrations at ST13 and DP26. The physical/chemical treatment of the groundwater includes precipitation of metals and air stripping of volatile organic compounds
- Monitor groundwater at ST13 and DP26 to evaluate contaminant levels and migration until remediation levels are achieved.
- Monitor the distal end of the contaminant plume at ST13 and DP26 to evaluate if the plume is expanding. Monitoring will continue for 5 years, at which time the need for further monitoring will be reevaluated. Hydraulically contain the groundwater plume at ST13 and DP26 by extracting groundwater from near the plume's distal end, if the plume is expanding. The groundwater extracted from the hydraulic containment well will be treated in the physical/chemical system.
- Implement institutional controls to prevent exposure to contaminated groundwater. In the event of base closure, any remaining contaminated sites will be addressed in accordance with CERCLA Section 120.

The remediation was to be implemented with a phased approach, where ongoing monitoring would evaluate the performance of each technology before proceeding to the next phase of cleanup. This phased approach would allow the U.S. Air Force to use field data collected during cleanup to get the best mix of technologies to meet cleanup objectives

7.0 Status of OU2 Remedial Action

Because of the need to comply with the terms of the FFA, an accelerated remedial design (RD) schedule was developed utilizing some of the fast tracking work elements provided for in EPA guidance (EPA 1990) and the Observational Method (Brown et al 1989). The accelerated RD schedule addressed hydrocarbon (non-lead) contaminants. Based on discussions with experts in the field and EPA and ADEC representatives, the RD incorporated bioventing with injection of air five feet below the watertable and passive floating fuel recovery (Eielson AFB, 1995a and 1995b). Additional data collected during RD/RA indicated that the weathered floating product at the OU2 source areas is not sufficiently mobile for use of active floating product removal. Successful operation of the new bioventing system began on 15 October 1995.

8. Description of the new selected remedy

The selected remedy for sites ST13 and DP26 has been modified as follows.

- Groundwater extraction and treatment facilities will not be installed to address groundwater lead concentrations.
- Instead of active skimming, passive skimming systems will be utilized to remove fuel floating atop the groundwater where the fuel is sufficiently mobile to be recoverable.
- The lead action level for groundwater is waived due to technical impracticability. The amended remedy will comply with all other Applicable or Relevant and Appropriate Requirements (ARARs).
- As presented in the original alternative, groundwater monitoring will continue and institutional controls will remain in place to prevent exposure to contaminated groundwater. Monitoring for potential lead movement at ST13 and DP26 will be incorporated into the Eielson AFB Sitewide Monitoring Program.

As part of the institutional controls for contaminated soil and groundwater, the Air Force will develop a written, installation-wide plan ("Institutional Control Plan" or "IC Plan") that sets out procedures to assure that institutional controls for soil and groundwater are developed, maintained, monitored, and remain effective. The IC Plan will be completed within six months of the signature of the ROD amendment and will apply to all areas on the base requiring institutional controls for soil and groundwater as part of the remedy. The IC Plan will be reviewed and approved by EPA and the State of Alaska and is enforceable jointly or severally by them.

The IC Plan shall specify the following:

1.) Eielson AFB will undertake, at a minimum, the following:
   a. identify all areas under restriction or control;
   b. identify the objectives that must be met by the restrictions and controls;

c. identify the current and future land users, including, at a minimum, but not limited to, lessees, contractors, employees, agents, assigns, invitees, and licensees. In areas where the installation is aware of routine trespassing, the Air Force will also consider trespassers.

2.) Eielson AFB will establish an Institutional Control ("IC") process to develop Standard Operating Procedures (SOPs), incorporated into the Base General Plan (or equivalent document) to ensure IC development, implementation, and enforceability for each area which has an IC as a component of the selected remedy.

a. Eielson AFB shall consider, and demonstrate to EPA and the State, that the IC process will cover all entities and persons necessary, including, but not limited to, lessees, contractors, employees, agents, licensees, trespassers, and invitees.

b. Eielson AFB shall consider and demonstrate to EPA and the State that the IC process will cover all activities, including, but not limited to any and all, routine and non-routine utility work, soil disturbance, groundwater withdrawals, well placement, drilling, paving, troop training exercises, recreation uses, building, renovation work on structures or other activities.

c. Eielson AFB shall specify (e.g., through the SOPs) the particular restrictions, controls and mechanisms which will be used to achieve the identified objectives.

d. Eielson AFB shall include a data base and master installation map that identifies all land areas under restriction or control, the objectives to be met by the restrictions or controls, and the particular restrictions, controls and mechanisms which will be used to achieve the identified objectives.

e. Eielson AFB shall develop a process to ensure that both EPA and State approval, as appropriate, are obtained prior to any change in identified land use designation, restrictions, land users or specific activity for any IC required.

3.) The IC Plan will specify that all current or future land users, whether government or private entities, will be legally required to abide by the decision document and the IC contained therein, and specify the enforcement mechanism or tool that will legally bind the land user (e.g. leases, licenses, contracts, command directives, etc.).

4.) Eielson AFB shall identify the "point of contact" person or organization designated as being responsible for implementing, monitoring, maintaining and enforcing the IC process.

5.) Eielson AFB shall identify the source of funding for activities required by the IC process at the installation.

6.) Eielson AFB will monitor compliance with all aspects of the IC process on an annual basis throughout the period of time necessary to implement and maintain the applicable IC, unless another monitoring frequency is agreed to by EPA and the State.

7.) Eielson AFB shall conduct field inspections, at least annually, to assess the condition of all areas at the installation subject to IC. These inspections will be used in determining the effectiveness and protectiveness of all IC and designated land uses, and will be used in ascertaining whether the current land and groundwater uses in the areas are consistent with the IC for all remediation objectives outlined in the decision document governing that area. The results of any field inspections shall be documented in a field inspection report, which shall be sent to EPA and the State within 60 days of the completion of the field inspection. The designated official responsible for the facility operations shall certify the accuracy of the field inspections and the continued compliance with all IC requirements. Eielson AFB shall provide notice of any change in the designated official to EPA and the State.

8.) Eielson AFB shall notify EPA and the State immediately upon discovery of any unauthorized change in an IC, in land use designation(s), or in any activity which is inconsistent with the identified IC. Eielson AFB will allow EPA and the State upon notification to work with the installation to determine a plan of action to resolve the unauthorized change/activity. Where the Air Force believes the unauthorized change creates an emergency situation, the Air Force can respond to the emergency upon notification to EPA and the State and need not await EPA or State input to determine a plan of action. Eielson AFB will develop a "feedback loop" to identify what went wrong with the IC process, identify how to correct the process to avoid future problems and requires the correction to be implemented.

9.) Eielson AFB shall notify EPA and the State at least six (6) months prior to, when possible, but no later than thirty (30) days prior to, any transfer, sale or lease of any property interest at the installation and define in the notification the process to be utilized to ensure IC remain in place, remain effective and remain enforceable.

10.) The IC Plan, and in particular, the IC process developed and implemented under that Plan, shall be reviewed as a part of the CERCLA five year review process.

11.) The removal of IC, completion of IC, or no further need for IC must be a coordinated decision with approval by EPA and the State. In the event of a disagreement, the parties will resolve the dispute in accordance with Part XXI, Resolution of Dispute, of the Eielson Air Force Base Federal Facility Agreement.

9. Relationship Between ARARs and the Original Selected Alternative

The ARARs remain unchanged from the original selected remedy. The ARAR for the lead action level established under the Safe Drinking Water Act (40 CFR 141.80) is waived due to technical impracticability.

10. Basis for the new selected remedy

In accordance with the ROD provision that remediation be implemented with a phased approach, where ongoing monitoring will evaluate the performance of each technology before proceeding to the next phase of cleanup, the Air Force evaluated the lead contamination at ST13 and DP26 and the feasibility of utilizing pump and treat technology for remediation of lead contamination at the sites. A field investigation was conducted during the 1995 summer season. The resultant Treatability Study Informal Technical Information Report (ITIR) concludes that active remediation of the aquifer for lead is not indicated at this time (US Air Force 1996).

The study determined that the organic lead originally contained in the fuel has degraded to an immobile, stable inorganic lead that strongly adheres to the soils within the groundwater and consequently, the groundwater contamination is contained within an area approximately 500 feet long. Monitoring data collected during the investigations confirm that the contamination is not expanding. Any remaining source of more mobile organic lead will be degraded to the immobile inorganic lead through treatment and removal of the petroleum products. It would be extremely difficult or technically impracticable to clean up the groundwater lead contamination by pumping the groundwater because the lead is so strongly adhered to the soils within the groundwater.

Under the federal Superfund law, when groundwater restoration is technically impracticable, further action should focus on: (1) containment to prevent contaminant migration; (2) source removal to prevent further contamination of the groundwater; and (3) prevention of exposures. For ST13 and DP26, the Air Force, EPA, and ADEC have determined that groundwater restoration for this limited area is technically impracticable; and therefore, the original remedy of groundwater extraction/treatment is proposed to be changed to:

- Continued monitoring to confirm that the contamination is not migrating and is remaining within the currently established containment area. Regulatory requirements would be waived for lead in groundwater within this limited containment area:
- Degradation of the organic lead to immobile inorganic lead through the existing soil treatment system that treats and removes the petroleum contamination; and
- Implementation of institutional controls to prevent use of the contaminated groundwater in this area to ensure protection of human health and the environment.

11.0 Summary of the Comparative Analysis of Alternatives

The following is a brief discussion evaluating the original selected remedy and the new selected remedy based on the nine criteria presented in the National Contingency Plan (NCP).

11.1 Overall Protection of Human Health and the Environment

Both of the alternatives satisfy this criteria. Both of the alternatives would use institutional controls to prevent exposure to contaminated groundwater and would employ long term monitoring. Both alternatives also employ bioventing (air injection five feet below the water table) and floating product removal for remediation of POL contamination. The pump and treat portion of the original selected alternative will not provide a significantly greater protection of human health and the environment or a significantly greater degree of cleanup by treating lead contaminated groundwater since both alternatives will require decades to achieve lead remediation goals.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Both alternatives are expected to achieve groundwater maximum contaminant goals for all contaminants except lead. The action level for lead is waived due to technical impracticability from an engineering perspective.

11.3 Long-term Effectiveness and Permanence

Both alternatives aggressively treat the subsurface soils for hydrocarbon petroleum contamination, including the smear zone soils, through air injection (bioventing) five feet below the water table. This process is expected to increase both the rate of organic lead degradation and the rate the inorganic lead is immobilized. Under both alternatives, the inorganic lead is currently or will become fixed on soil particles. The Air Force will effectively maintain institutional controls for contaminated soil and groundwater in this area in accordance with the Institutional Control Plan while contaminant levels exceed regulatory levels.

11.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Both alternatives result in a reduction in toxicity, mobility, and volume of contamination by treating petroleum contamination in the soil and in the groundwater. The groundwater pump and treat system presented in the original alternative may reduce the amount of organic lead contamination remaining in the soil and the dissolved lead plume in the groundwater at a somewhat faster rate, however, the time required would not be significantly reduced and would still be measured in decades.

11.5 Short-Term Effectiveness

Neither of the alternatives pose an unacceptable risk to residents or workers during implementation. All potential impacts from construction and system operation will be controlled using standard engineering controls and practices. The new selected remedy will present relatively less risk since construction and operation of a pump and treat system will not be required.

The lead contamination in the groundwater is expected to persist for decades.

11.6 Implementability

The original alternative using pump and treat technology is feasible to construct but is not anticipated to significantly reduce lead levels in the groundwater. The new alternative is more readily implementable because it requires no additional action other than monitoring, institutional controls and operation of the bioventing and free product recovery systems.

11.7 Cost

The time required to achieve lead groundwater contamination levels below 15 ug/L at the lead source would be expected to be decades using pump and treat technology. Because of the uncertainty associated with cost projections of long duration, the following costs for the pump and treat system are based on a 40-year life cycle.

	Original Alternative	New Alternative
Estimated Capital Cost:	$1,150,000	$470,000
Operation and Maintenance/year:	$235,000	$70,00
Estimated Present Worth Total Cost:	$9,860,000	$1,190,000

The estimated costs reflect the additional costs associated with the pump and treat system proposed in the original alternative. Not included are long term monitoring costs which are assumed to be the same for both alternatives.

11.8 State Acceptance

The State of Alaska Department of Environmental Conservation (ADEC) concurs with the modified selected remedy proposed in this ROD Amendment.

11.9 Community Acceptance

No public comments were received in response to the Proposed Plan. Community participation is discussed in Section 14, Public Participation Activities.

12.0 Technical Impracticability (TI) of Groundwater Restoration

12.1 Specific ARARs

The specific ARAR or media cleanup standards for which the TI waiver applies are as follows:

- MCLs and maximum contaminant level goals (MCLs, non-zero maximum contaminant limit goals [MCLGs], and action levels) established under the *Safe Drinking Water Act* for groundwater that may be used for drinking water supply (40 CFR 141 and 18 AAC 80).

The TI waiver will apply only to lead in the groundwater and specifically to the EPA established action level of 15 ug/L for lead in drinking water.

12.2 Spatial Extent of TI Waiver

The TI waiver will apply to the area having the following boundaries (see figure 2).

- Flightline Avenue on the west
- Outer Loop Road on the north
- A line running north and south along the east boundary fence of the HAZMAT yard
- A line running east and west along the north boundary fence for Tank 300

The vertical extent of the TI waiver will range from the water table to 30 feet below the average annual water table depth.

12.3 Conceptual Model

12.3.1 Site Conditions

The site lithology is generally homogeneous and is predominantly sand and gravel with very thin discontinuous layers of silt encountered in less than ten percent of site lithological samples (U.S. Air Force 1996 page 5-1). The depositional environment consists of fluvial and glacial fluvial deposits. Most of the sediments were deposited in the principal stream beds during higher energy deposition. The thickness of the alluvial fan deposits are in the hundreds of feet.

The water bearing zone is characterized by a low hydraulic gradient and highly transmissive aquifer materials. The mean hydraulic gradient is 0.002 with the highest (0.05) occurring during a four week period in May and the lowest (0.0013) occurring over a seven month period from September to March (U.S. Air Force 1996 page 5.2). A hydraulic conductivity value of 380 feet/day was estimated from an August 1995 pumping test (U.S. Air Force 1996 page 5.1). The aquifer has a slow vertical rate of mixing which serves to confine groundwater contaminants near the water table (U.S. Air Force 1993b, page 4.1).

12.3.2 Fate and Transport Investigation

The investigation indicates that the major source of lead contamination is from the floating product plume as shown in Figure 2. The lead plume is confined to a small area north of the above ground storage tanks at DP26 and appears to coincide with the historic

extent of the floating product plume. During the investigation, tetraethyl lead (TEL), the organic lead fuel additive, was detected in a floating product sample at a level of 319,000 ug/L and at low levels in the groundwater, i.e., 6 ug/L (page ES-3). The groundwater TEL plume was coincident to that of inorganic lead. The investigation also established that the lead contamination is confined to depths between 5 and 30 feet below ground surface (page 5-3).

A RANDOM WALK model predicted that the lead could migrate 50 feet in 500 years (page 5-9). The report qualified this prediction, however, stating that, because of the uncertainty associated with predicting lead transport, conservative input parameters (Retardation Factor $R_f = 166$, page 5-6) were used which demonstrate that the plume will not move appreciably in 100 years and that the concentrations will have diminished substantially at the core (page 5-23). The report also points out that the lead plume has not migrated over the time period for which lead in groundwater data are available (1988 through 1995) (page ES-3). Associated lead transport modeling indicated that aquifer restoration would require approximately 100 years. This prediction is also very uncertain for the reasons Stated above.

12.3.3 EPA Technical Review

In a technical review of the report, EPA indicates that the following report conclusions are valid (see Appendix E, US Air Force 1996 page ES-1).

- The source of the lead is the leaded fuel leaked from the USTs and the associated fuel hydrant system as well as unknown buried fuel tank sludge.
- Lead was transported with the fuel product in the vadose zone and on the water table.
- Organic lead in the fuel product has degraded to inorganic lead which is strongly adsorbed to the vadose zone and aquifer matrix.
- The groundwater lead plume has not migrated over the time period for which lead in groundwater analytical data are available.

The reviewers, however, did not agree with the use of the RANDOM WALK model presented in the report. The model significantly overStated the mobility of lead in groundwater and the model uncertainties are so high that the model results cannot be used to make risk management and remediation decisions (page 5).

A conceptual model, based on empirical data, is represented in figures 3 and 4. In the model, advection refers to the transport and dispersion of lead contamination by the groundwater. As the petroleum hydrocarbons with TEL and inorganic lead are dissolved in the groundwater, the TEL is degraded to inorganic lead relatively quickly through physical, chemical and biological processes. The report indicates that TEL has a half life of 2 to 8 weeks (page 4-10). When the conversion occurs, the inorganic lead has a very strong tendency to sorb onto organic matter and the soil matrix. At this point the inorganic lead is nearly immobilized.

Initially, because migration of the lead is retarded, the BTEX plume may expand beyond the limits of the lead contamination plume. After the fuel source is removed and biodegradation continues to act on the fuel, the size of the fuel plume will decrease with time. As the TEL is transformed to inorganic lead, it is fixed in place. The size of the area contaminated by lead will not decrease and the lead will not move with the groundwater.

In fact, the BTEX plume at ST13 and DP26 has expanded beyond the extent of the lead plume by a significant amount and has begun to decrease in size (U.S. Air Force 1996 page 2-7). The air injection system operation which began in October 1995 is intended to remove the BTEX contaminant source and is expected to accelerate reduction of the BTEX plume. This activity will also accelerate the organic lead degradation rate and the resultant sorption of inorganic lead.

12.4 Evaluation of Restoration Potential

12.4.1 Source Control Measures

Replacement of the original tank 300 in 1988 and removal of eleven USTs and upgrading of the associated fuel hydrant system in 1994 have removed the source of lead contamination. The USTs were used in the 1950s and 1960s to store leaded aviation gasoline, and, based on observations made during the 1994 construction effort, the USTs and fuel hydrant system leaked extensively (U.S. Air Force 1996 page 1-1). No fuels with lead additives were stored or used at the site after the early 1970s (page 5-3).

Efforts to remove the fuel contaminants include passive recovery of floating product and operation of a bioventing system in which air is injected five feet below the water table (U.S. Air Force 1995a, 1995b). Air is injected below the water table to promote volatilization and remediation of contaminants in the smear zone as well as in the vadose zone. Operation of the remediation system began in the fall of 1995.

Restoration of the site is constrained by the mobility of the lead. Modeling efforts predict that a pump and treat system will require greater than 100 years to remove the lead contamination. The report concludes that lead is largely immobile in the subsurface at ST13/DP26 and that lead contamination cannot be cleaned up using pump and treat technology.

No cleanup technology is available that will significantly reduce the time required to restore the aquifer. Soil excavation is not practical because the majority of the contamination is within the saturated zone (U.S. Air Force 1994). Because the source area is adjacent to active taxiways, fuel outlets, fuel storage tanks, buried pipelines, buildings and other facilities, soil excavation would disrupt base activities.

Regarding floating fuel recovery, recent information indicates that active skimming for product recovery at Eielson AFB is not practical at sites which involve weathered product associated with historical fuel spills. Field observation of recovery into wells indicates that free product is generally not "mobile" and thus is not recoverable in large quantities (see OU1 Remedial Design, US Air Force 1995c). EA Figure 1.2 provides a conceptual model of distribution of free product at Eielson AFB. This concept is supported by other individuals knowledgable in the field (Christianson 1995b. Memorandum 19 April). Based on this information, the Air Force, EPA and ADEC have agreed that the main remediation efforts should include bioventing (or air injection) and only simple, cost effective free product removal methods (such as passive skimming) (Christianson. 1995a. Memorandum 3 March).

12.4.2 Restoration Timeframe

As outlined in Section 12.3, Conceptual Model, the modeling effort predicted that restoration of the site using pump and treat technology could require 100 years or more and suggested that this estimate is conservative and the time required could be significantly longer. The EPA review Stated that the model uncertainties are so high that the model results cannot be used to make remediation decisions. The EPA review also Stated that the lead is relatively immobile and cannot be cleaned up using pump and treat technology.

12.4.3 Other Applicable Technologies

The ROD evaluated two remedial technologies as having potential for lead remediation at Source Area ST13/DP26: excavation of known subsurface soil hot spots or groundwater extraction with physical/chemical treatment. The ROD selected groundwater extraction with physical/chemical treatment as potentially the most practical approach with the provision that remediation should be implemented with a phased approach so that each technology could be evaluated before moving to the next step (U.S. Air Force 1994 page iii). Excavation was not selected as an alternative because it would be poor in effectiveness and implementability since it is not possible to excavate large volumes of contaminated soil near pipelines, tanks, and operating systems, nor in the smear-zone soil (page 53).

13.0 Affirmation of Statutory Determinations

The amended selected remedies are protective of human health and the environment and are cost effective. The amended selected remedies comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action with the exception of the action level for lead established under the Safe Drinking Water Act (40 CFR 141.80). A waiver of the lead action level is justified because compliance with the requirement is technically impractical from an engineering perspective. The remedies utilize permanent solutions and alternate treatment (or resource recovery) technologies to the maximum extent practicable and satisfy the statutory preference for

remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because these remedies will result in hazardous substances remaining onsite above health-based levels, reviews will be conducted at sites ST13 and DP26 within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

14.0 Public Participation Activities

The proposed ROD amendments and TI waiver considered by the U.S. Air Force, ADEC, and EPA were presented to the public in the Proposed Plan for Operable Unit 2 and Operable Units 3, 4, 5. The Proposed Plan was released to the public in May 1996 and discussed in a public meeting on 23 May 1996. The Proposed Plan outlined proposed changes to the selected remedies for addressing soil and groundwater contamination in the Records of Decision for OU 2 and OUs 3, 4, and 5. The public comment period for the Proposed Plan was from May 13 to June 12, 1996. There were no formal comments received during the public meeting or during the public comment period.

The original OU2 Proposed Plan was presented to the Technical Review Committee (TRC) on November 16, 1993. The TRC was established in 1992 and included three representatives from the community (selected by local officials and the University of Alaska Chancellor), industry representatives, and environmental representatives. The TRC was converted to a Restoration Advisory Board (RAB) in the Spring of 1995. Three community representatives were selected as RAB co-chairpersons, one each from the communities of Salcha, Moose Creek, and North Pole, Alaska. The RAB met during the public comment period on May 23, 1996 to review the Proposed Plan for the amended remedy.

The public comment period, public meeting, and Proposed Plan for the amendment changes for OUs 2, 3, 4, and 5 were advertised twice in two local newspapers. The advertisement appeared in the *Fairbanks Daily News-Miner* on May 12, 1996 and in the Goldpanner on May 17, 1996. Proposed Plans were mailed to more than 150 people on the clean up mailing list on May 13. In addition, members of the RAB and 354 CES/CEVR created a short informational commercial which was aired as a public service announcement thirteen times prior to the public meeting on local television channels 2, 4, and 11. The Administrative Record is available for public review as identified in Section 1.5.

15.0 References

Brown, S.M., Lincoln, D.R. & Wallace, A.W. 1989. *Application of the Observational Method to Remediation of Hazardous Waste Sites.* CH2M Hill, Bellevue, Washington.

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Christianson, C. 1995. 354 CES/CEVR, Eielson Air Force Base, Alaska. Memorandum. 19 April.

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U.S. Air Force. 1996. *Eielson Air Force Base Operable Unit 2, Source Areas ST13/DP26, Treatablility Study Informal Technical Information Report.* Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas.

Utah Water Research Center. 1997. *Intrinsic Remediation Engineering Evaluation/Cost Analysis for Site 13/26, Eielson Air Force Base, Alaska.* Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas.

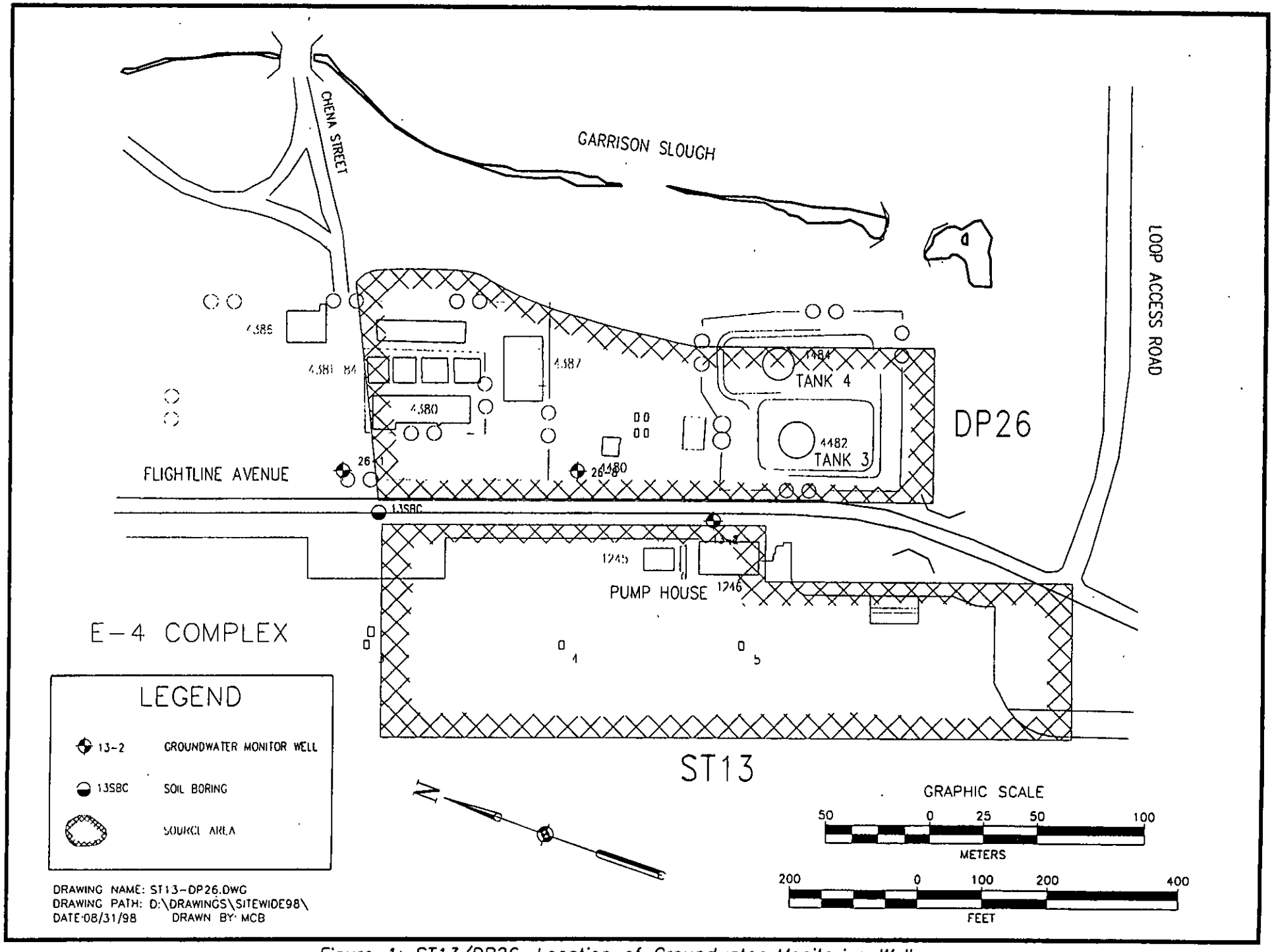

Figure 1: ST13/DP26, Location of Groundwater Monitoring Wells and Soil Borings, Eielson Air Force Base, AK.

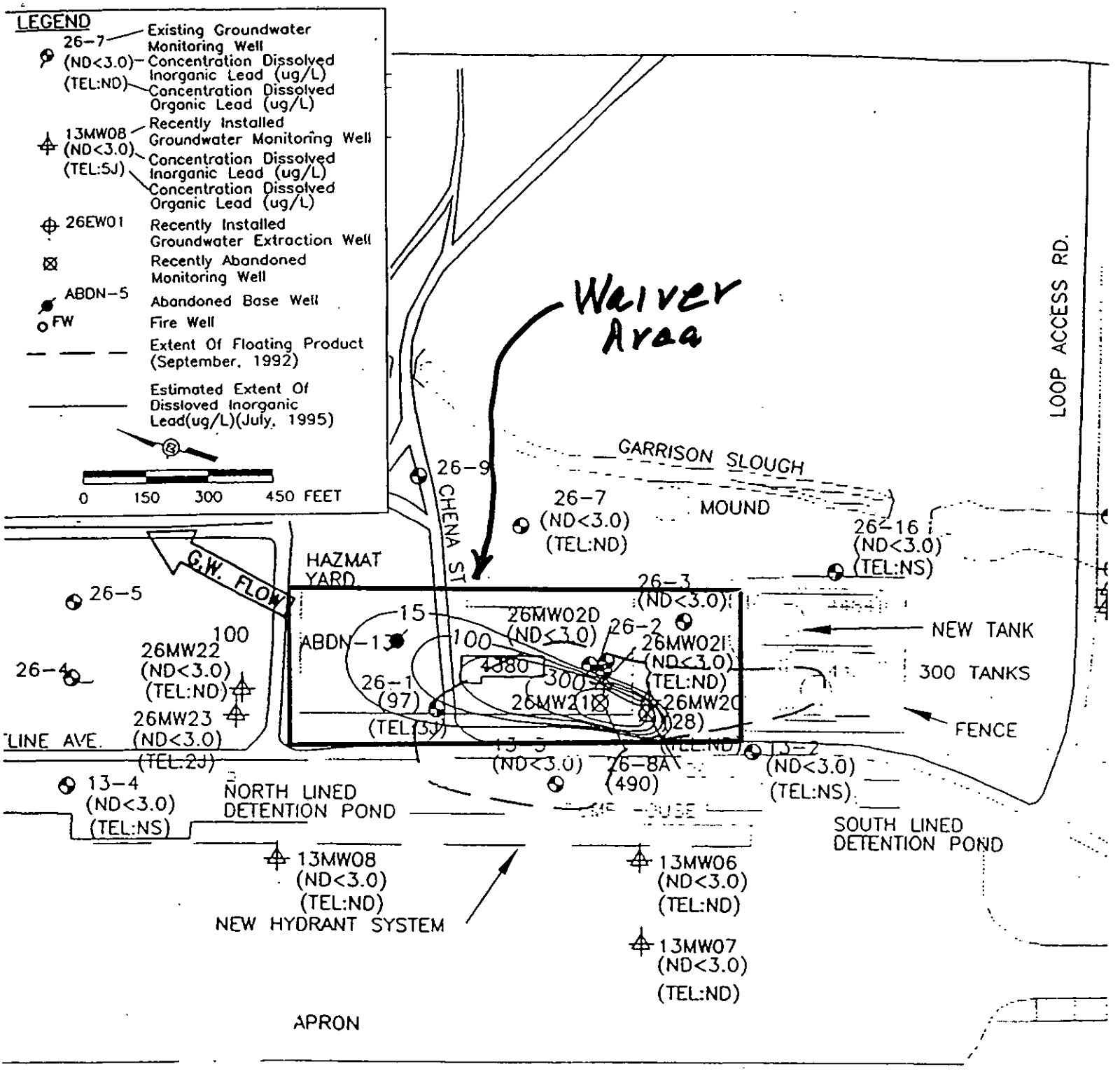

FIGURE 2

Source Area ST13/DP26

Extent Of Dissolved Lead In Groundwater (July, 1995) And Floating Fuel Product (Sept., 1992)

CONCEPTUAL SITE MODEL

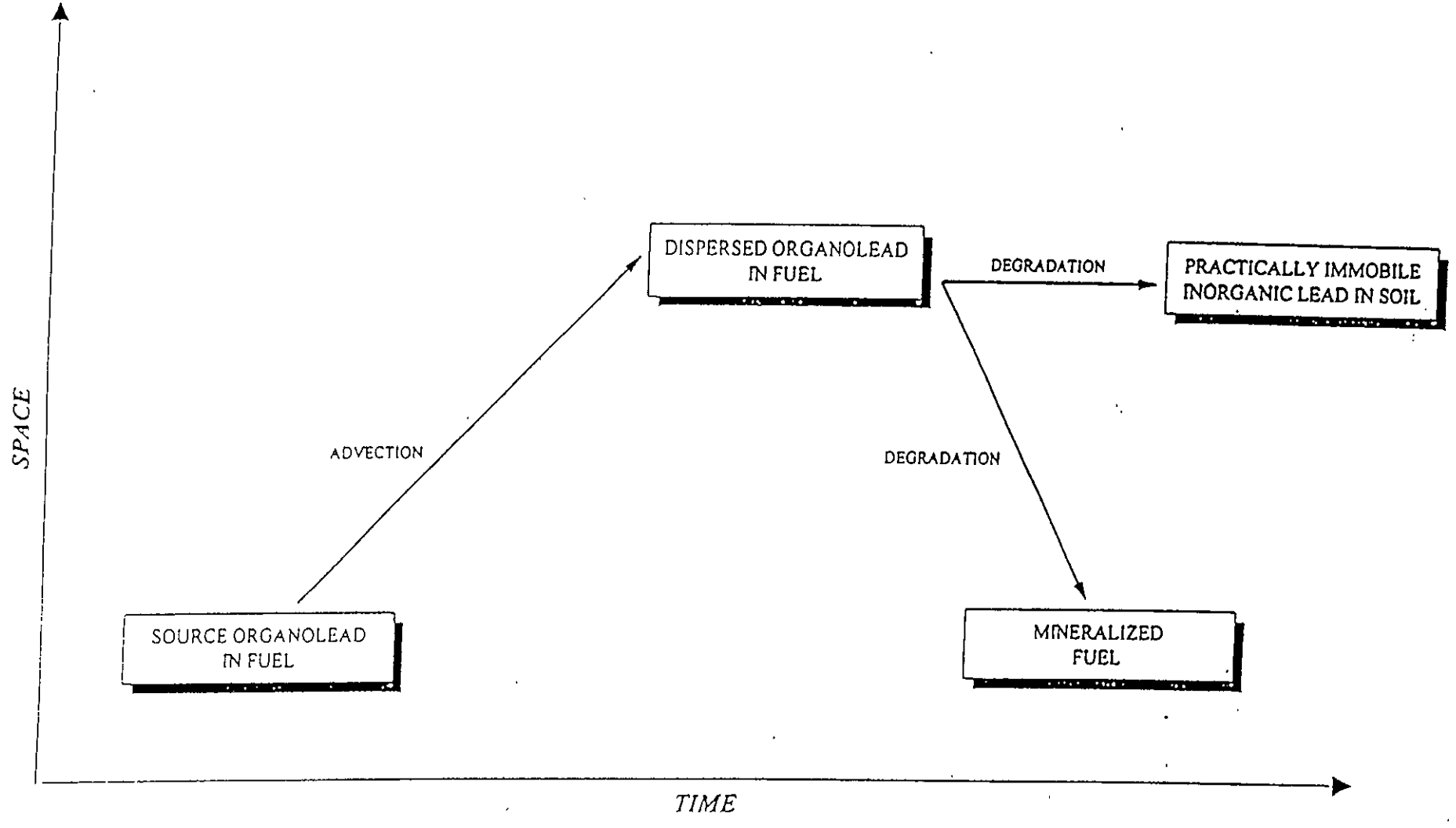

FIGURE 3
CONCEPTUAL SITE MODEL
EIELSON AIR FORCE BASE

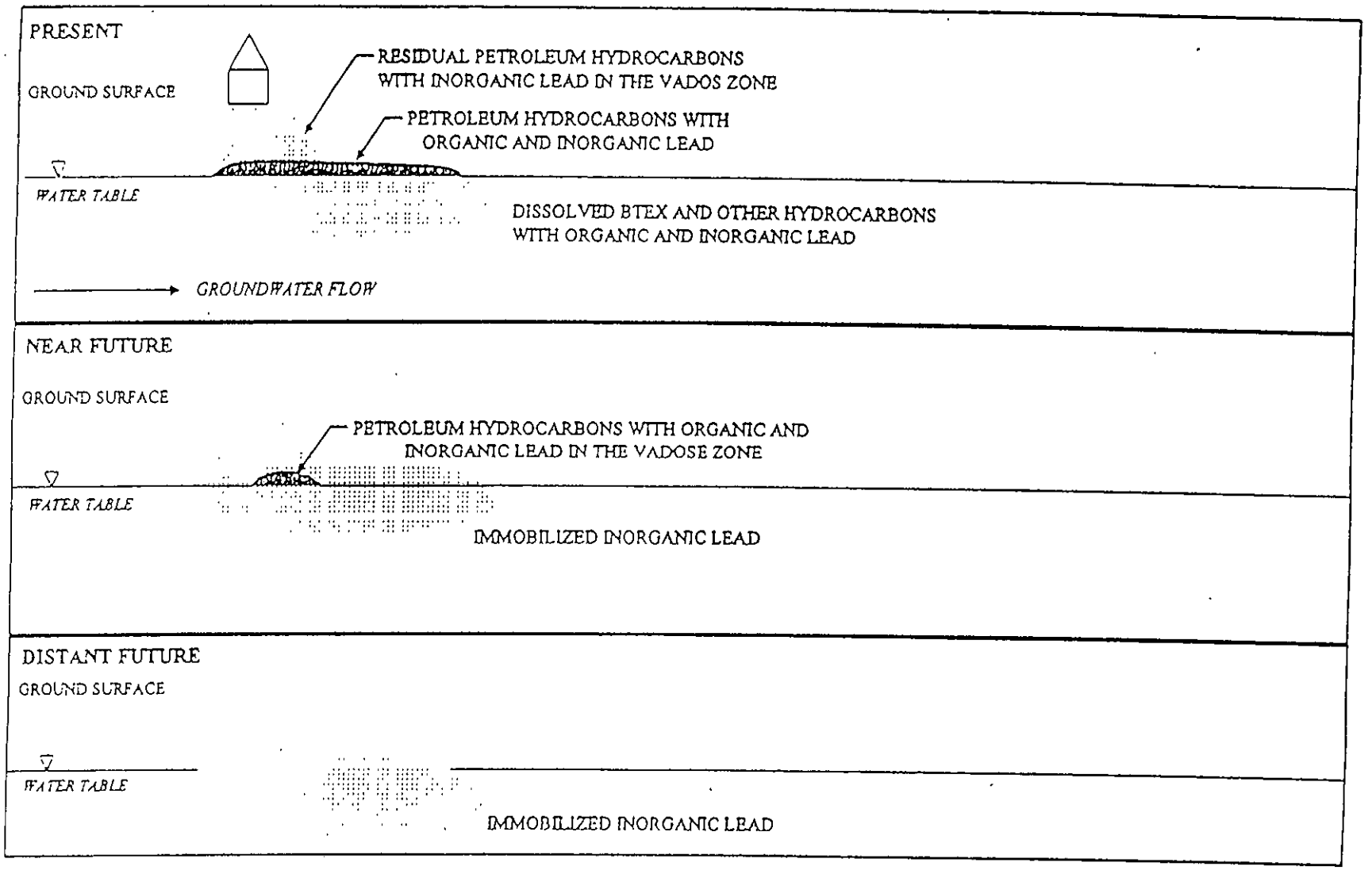

FIGURE 4
CONCEPTUAL SITE MODEL
EIELSON AIR FORCE BASE

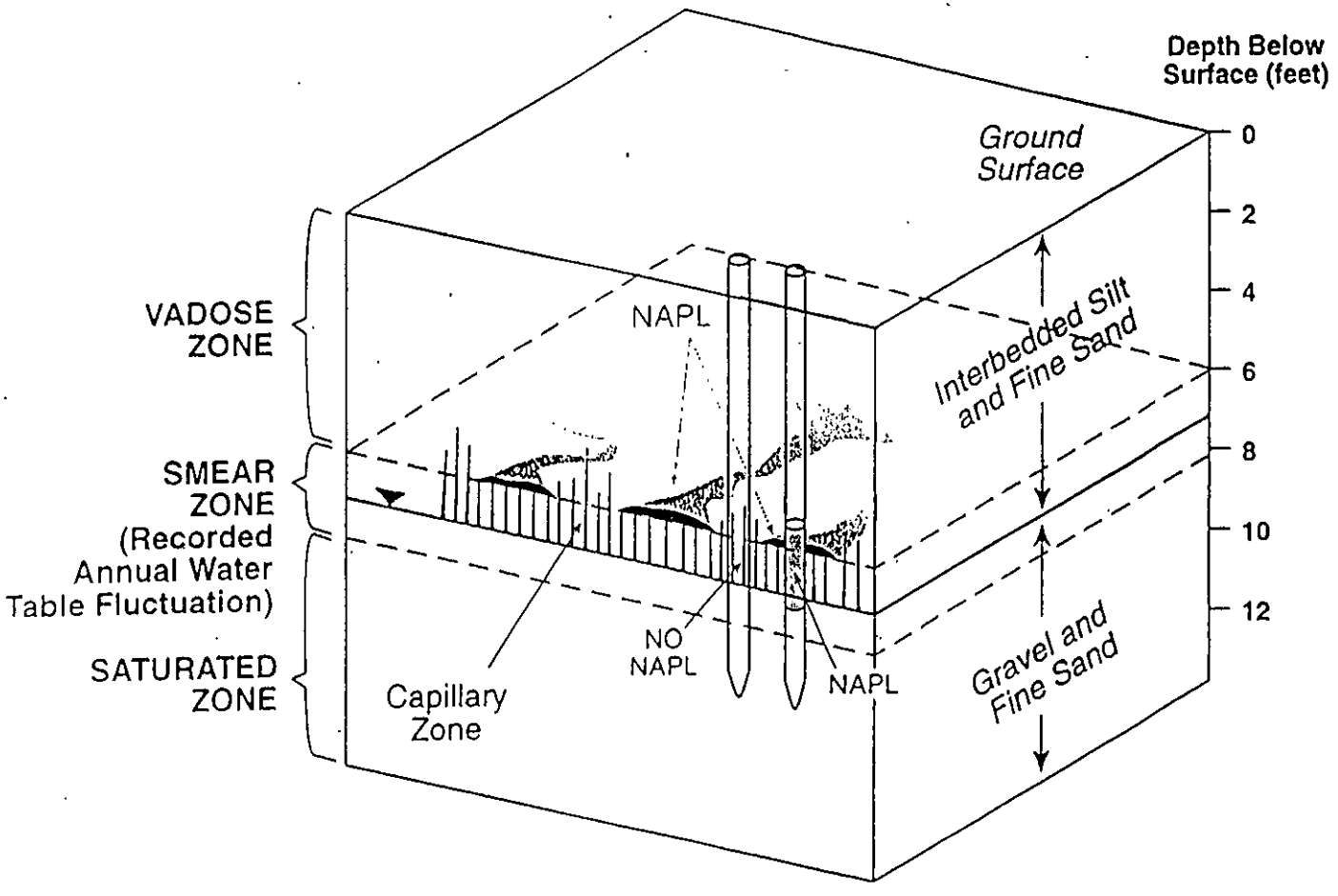

Figure 1-2. Conceptual model of distribution of NAPL in the smear zone at Eielson AFB source areas.

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