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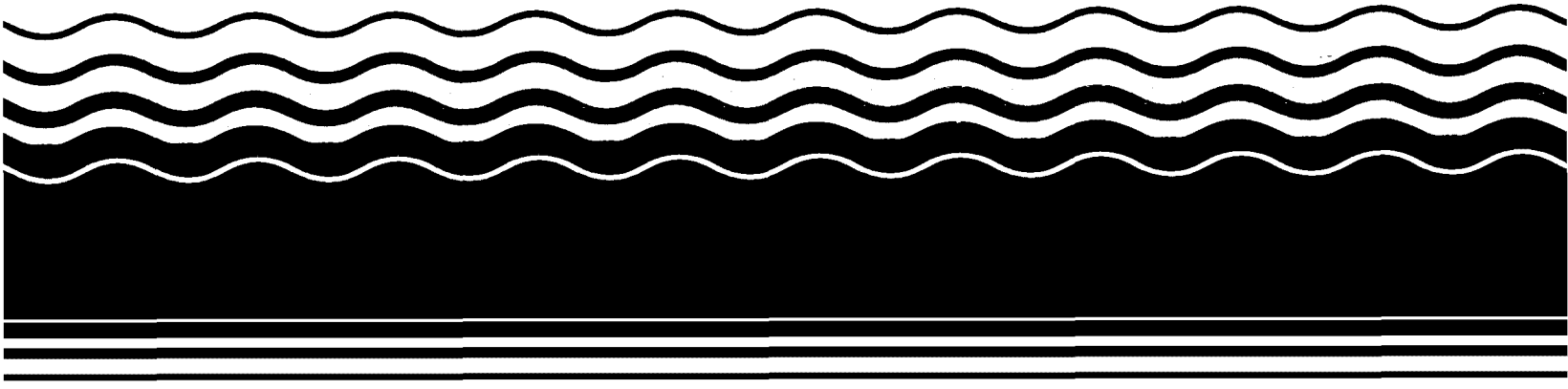
EPA

Superfund Record of Decision:

Eielson Air Force Base, AK



NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

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REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R10-92/050	2.	3. Recipient's Accession No.
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15. Supplementary Notes

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16. Abstract (Limit: 200 words)

The 19,700-acre Eielson Air Force Base (EAFB) site, located 26 miles southeast of Fairbanks, Alaska, is primarily a tactical air support installation. The 2-acre Blair Lakes Target Range facility, approximately 25 miles southwest of the main base, has been included in the EAFB site because of its geographical proximity. Land in the surrounding area is used principally for military training associated with Fort Wainwright, and there are few scattered residential and commercial activities close to the base. The communities of Moose Creek, North Pole, and Salcha all lie within a 20-mile radius of the base. The aquifer beneath EAFB, which supplies drinking water to private wells in Moose Creek and North Pole, has been designated a sole-source aquifer. In addition, 70 percent of EAFB and virtually all of the Blair Lakes Target Range are wetlands. Constructed in 1944, EAFB was originally a satellite installation of Fort Wainwright. Used jointly by the Army and Air Force, the site was designated Eielson AFB in 1948. Many industrial operations were conducted at the base, which generated waste oils, contaminated fuels and sludge, and spent solvents and cleansers. During the mid-1980's, the Air Force Installation Restoration Program (IRP) identified

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Eielson Air Force Base, AK
First Remedial Action - Interim
Contaminated Media: soil, gw
Key Contaminants: VOCs (benzene, toluene, xylenes), oils

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 54
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

EPA/ROD/R10-92/050
Eielson Air Force Base, AK
First Remedial Action - Interim

Abstract (Continued)

64 potential areas of contamination that were divided into six OUs. This ROD addresses an interim remedy for OU1B to prevent further degradation of the ground water quality by significantly reducing the volume of petroleum product in site soil and free product floating on top of the ground water. OU1B contains four areas: ST20 Refueling Loop E-7 Complex, ST20 Refueling Loop E-9 Complex, ST48 Powerplant Fuel Spill Area, and ST49 Building 1300/ SS50-53 Blair Lakes Target Range. A future ROD will address additional source control and final ground water response actions. The primary contaminants of concern affecting the soil and ground water are VOCs, including benzene, toluene, and xylenes; and oils.

The selected remedial action for this site includes in situ bioventing of BTEX contaminated soil in the vadose zone, with monitoring of soil gases; collecting floating petroleum hydrocarbons from the ground water through wells, culverts, or trenches; incinerating recovered product onsite or transporting this offsite for recycling or disposal; treating extracted ground water, as needed, using air stripping, oil-water separation, or carbon filtration, as determined during the remedial design stage; and discharging the residual water onsite; monitoring petroleum product levels; collecting BTEX-LNAPLS using vacuum extraction wells, with carbon adsorption, followed by offsite disposal of carbon residuals; treating collected liquids using an oil and water separator, air stripper, or carbon adsorption; destroying air emissions using tip flare incineration; and monitoring ground water. The estimated capital cost for this remedial action is $3,867, with an annual O&M cost of $3,375 for 5 years.

PERFORMANCE STANDARDS OR GOALS:

No chemical-specific soil and ground water clean-up goals are provided for this interim remedy. Final performance goals will be established in the final remedy for site soil and ground water remediation. All air emissions and effluent discharges generated by this interim remedy will comply with the applicable federal and state environmental regulations.

RECORD OF DECISION
for the
UNITED STATES AIR FORCE
EIELSON AIR FORCE BASE, ALASKA

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Responsiveness Summary

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Eielson Air Force Base
North Star Borough, Alaska

Operable Unit 1B
Source Areas: ST20 Refueling Loop
ST48 Powerplant Fuel Spill Area
ST49 Building 1300
SS50 - SS53 Blair Lakes Target Range

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the removal of floating petroleum product at sites within the Operable Unit 1B. This action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the May 21 1991 Eielson Air Force Base Federal Facility Agreement (FFA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for Operable Unit 1B.

The State of Alaska concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare or the environment.

Description of the Selected Remedy

The interim action for the OU1B sites is intended to prevent further degradation of the groundwater quality by significantly reducing the volume of petroleum product floating on the groundwater. To the extent practicable, the interim action will be consistent with the final response action for OU1 scheduled to be determined in 1994. The OU1 Record of Decision will address additional source control and

groundwater response actions, as appropriate.

The major components of the selected remedy for each site are described below:

ST20 Refueling Loop E-7 Complex: Bioventing

- Install vents to inject oxygen into subsurface soils to enhance microbial biodegradation of fuel hydrocarbons in the vadose zone;

- Add nutrients and/or moisture and/or heat, as necessary, to increase biodegradation rates; and

- Monitor: (1) soil gas monitoring probes to determine local oxygen concentrations and degree of biodegradation; (2) surface gas emissions, if any, (3) and floating petroleum product.

ST20 Refueling Complex E-9 Complex: Free Product Extraction

- Extract floating petroleum hydrocarbons from the groundwater through wells, culverts, or trenches using skimmer or dual pump systems;

- Recycle or dispose of recovered floating petroleum product; and

- Treat extracted groundwater, as needed , through physical/chemical processes and discharge appropriately.

- Monitor floating petroleum product levels.

ST48 Powerplant Fuel Spill Area: Vacuum Extraction

- Install small diameter tubes to extract floating petroleum product and to enhance aerobic degradation of fuel hydrocarbons in the vadose zone;

- Treat offgas through an air emissions control system prior to release to the atmosphere;

- Recycle or dispose of recovered floating petroleum product;

- Treat extracted groundwater, as necessary, through physical/chemical processes and discharge appropriately; and

- Monitor: (1) soil gas monitoring probes to determine degree of biodegradation; and (2) floating petroleum product.

ST49 Building 1300 and SS50-53 Blair Lakes Target Range: Free Product Extraction

- Extract floating petroleum hydrocarbons from on top of the groundwater through wells, culverts, or trenches using skimmer or dual pump systems;

- Recycle or dispose of recovered floating petroleum product;

- Treat extracted groundwater, as needed , through physical/chemical processes and discharge appropriately; and

- Monitor floating petroleum product.

STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action utilizes treatment and thus is in furtherance of that statutory mandate.

Because this action does not constitute the final remedy for the Eielson AFB Operable Unit 1 site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action.

Subsequent actions are planned to address fully the threats posed by the conditions at Operable Unit 1. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be continuing during development of final remedial alternatives for Operable Unit 1.

Signature sheet for the foregoing Eielson Air Force Base Record of Decision between the United States Air Force and the U.S. Environmental Protection Agency, with concurrence by the Alaska Department of Environmental Conservation.

THOMAS O. FLEMING, JR., Colonel, USAF
Commander, 343rd Wing
Eielson Air Force Base, Alaska

24 Sep 92
Date

Signature sheet for the foregoing Eielson Air Force Base Record of Decision between the United States Air Force and the U.S. Environmental Protection Agency, with concurrence by the Alaska Department of Environmental Conservation.

Dana A Rasmussen

DANA A. RASMUSSEN
Regional Administrator
Region 10
U.S. Environmental Protection Agency

9/29/92
Date

Signature sheet for the foregoing Eielson Air Force Base Record of Decision between the United States Air Force and the U.S. Environmental Protection Agency, with concurrence by the Alaska Department of Environmental Conservation.

WILLIAM D. McGEE
Regional Administrator
Northen Regional Office
Alaska Department of Environmental Conservation

9/17/92
Date

DECISION SUMMARY

Introduction

The Air Force has identified a number of potential contaminant source areas at Eielson AFB. These potential source areas were grouped into six operable units (OUs), based upon similar contaminant and environmental characteristics. This Record of Decision addresses a group of sites called OU1B which include areas where surface and subsurface petroleum spills have resulted in floating petroleum products on the groundwater.

I Site Name, Location, and Description

Eielson Air Force Base is located approximately 26 miles southeast of Fairbanks, Alaska, and is primarily a tactical air support installation. Typical activities at the base include flight operation, aircraft maintenance, and support functions. Since 1943, the major sources of hazardous materials include industrial operations, fire suppression training, and fuel management.

The main base, located along the Richardson Highway, is approximately 19,700 acres in size. The Blair Lakes Target Range Facility which is located approximately 25 miles southwest of the main base, is approximately 2 acres in size. Because of its geographical proximity to Eielson AFB, the Air Force is including the Blair Lakes Facility in the scope of the investigation.

This Record of Decision establishes the selected remedy for four sites at the base: (1) ST20, the Refueling Loop; (2) ST48, the Powerplant Fuel Spill Area; (3) ST49, Building 1300; and (4) SS50 through SS53, Blair Lakes Target Range. The location of the four sites are shown in Figure 1a and b.

Three communities (Moose Creek, North Pole, and Salcha) lie within a twenty-mile radius of the base. The land surrounding Eielson AFB is primarily used for military training associated with Fort Wainwright. All lands north and east of Eielson AFB belong to the Department of the Army. Lands northwest, west, and south of the base are predominantly Tanana River and Chena River flatlands which are composed of river bottomlands, woods and scrub lands. Besides the community of Moose Creek (northwest of the base) there are few scattered residential and commercial activities close to the base.

Drinking water for Moose Creek and North Pole is supplied primarily by private wells. Eielson AFB receives its drinking water primarily from a water treatment plant which is supplied by on-base deep water wells. The aquifer beneath Eielson AFB has been designated as a sole-source aquifer.

The surface water bodies nearest to the seven source areas are Garrison Slough, French Creek, Moose Creek, Pile Driver Slough and the Tanana River Approximately 70% of Eielson Air Force Base and virtually all of the Blair Lakes Target Range are wetlands. However, all of the proposed actions will take place on previously filled land and will have no adverse environmental impacts on wetlands.

II Site History and Enforcement Activities

Eielson AFB was originally a satellite installation of Fort Wainwright (previously Ladd Field) called Mile 26. Mile 26 was initially constructed between 1943 and 1944. The field was deactivated at the end of World War II, but was reopened again in 1947 as a future strategic base. Many of the base facilities were built during a major construction program from 1947 to 1954. The base was used jointly by the Army and the Air Force during the 1950s. Mile 26 was officially redesignated Eielson AFB in February 1948.

Eielson's primary mission was tactical air support for the Alaskan Air Command but is currently included in the Pacific Air Forces. Currently, the host unit at Eielson AFB is the 343rd Wing. Airborne missions of the 343rd Wing include emergency war order and contingency planning, tactical air forces training for close air support and battle field interdiction, and air refueling operations.

The majority of industrial operation at Eielson AFB have been in existence since the early 1950s. Industrial operations and related wastes were insignificant prior to 1950. Major industrial operations at the base include propulsion shops, pneumatic/hydraulics shops, aerospace ground equipment, maintenance shops, nondestructive inspection labs, and vehicle maintenance shops. Industrial wastes have generally been grouped into three categories: waste oils, contaminated fuels and sludges, and spent solvents and cleansers. For the period from 1950 to 1982, the total quantity of industrial wastes is estimated to range from 25,000 to 40,000 gallons per year.

Previous investigations regarding environmental contamination at Eielson AFB were conducted under the Air Force Installation Restoration Program (IRP). The four-phase IRP was initiated in 1982 with a Phase 1 record search to identify past disposal sites containing contaminants that may pose a hazard to human health or the environment. Under the IRP, the Air Force identified 64 potential areas of contamination at Eielson AFB. Potential source areas include old landfills, storage and disposal areas, fueling system leaks, and spill areas.

Eielson AFB was placed on the National Priorities List in November 1989. In May 1991, the Air Force, EPA, and the State of Alaska entered into a Federal Facility Agreement (FFA) which established the procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions. Under the FFA, the 64 potential source areas were placed in one of six operable units, based on similar contaminant and environmental characteristics, or were included for evaluation under a Source Evaluation Report.

III Community Relations

In October, 1991, the Air Force held a public meeting to describe the cleanup efforts being planned to address soil and groundwater contamination at OU1. Announcements for the meeting were published in the local newspaper. The Community Relations Plan was made available in October 1991. The Administrative Record was placed in the Rasmuson Library at the University of Alaska, Fairbanks in March, 1992.

In accordance with sections 117 and 113(k)(2)(b), the public was encouraged to participate in the remedy selection process. The proposed plan for OU1B was mailed to over 130 interested parties and distributed to libraries at the University of Alaska Fairbanks, North Pole and the Noel Wein Library in Fairbanks in May 1992. The proposed plan summarized the alternatives evaluated and presented the preferred alternative. Approximately 15 people attended a public meeting held on June 9, 1992 at the North Pole Middle School. The public meeting was announced by six advertisements in the local newspaper and the base cable TV network. A news release was provided to the local news media explaining the proposed plan. This resulted in a front page article about the cleanup efforts in the Fairbanks Daily News Miner. A 30-day comment period was held from May 15 to June 15, 1992. No requests for extensions were received during the comment period. Responses to comments received at the public meeting and written comments are included in the attached Responsiveness Summary.

IV Scope and Role of Response Action within Site Strategy

The Air Force is currently conducting a comprehensive investigation of groundwater and soil contamination for all sites in this Operable Unit. During this investigation, floating petroleum products were found at several locations. Under the Superfund program, early actions, or interim actions, are used to expedite the completion of total site cleanup. It is expected that this interim action will accelerate the overall cleanup process for OU1.

The selected remedy for this interim action is intended to begin the process of cleaning up four sites containing floating petroleum products in OU1. The purpose of this interim action is to expedite the cleanup by eliminating the primary source of the contamination and by reducing the volume of the floating product on the water table. It is anticipated that activities under this interim action will continue for approximately five years or until the practical limit is reached for floating petroleum product recovery, whichever is sooner. To the extent practicable, this interim action will be consistent with the comprehensive investigation scheduled to be completed in 1993.

This interim action focuses on removing floating petroleum product to prevent migration of contaminants and allow for collection of sufficient information about the system response to allow for a final remedy selection. The petroleum product floating on the water table should be removed in its concentrated form, before harmful constituents such as benzene, toluene, and xylene dissolve into the groundwater. Once the contaminants are in the groundwater pathway, they can begin to migrate, thereby increasing the volume of contaminated material and the potential risk to human health and the environment.

This interim action is consistent with future actions that may be undertaken to address contaminated soil and groundwater in OU1.

V SUMMARY OF SITE CHARACTERISTICS

Subsurface Conditions

Eielson Air Force Base is located in the Tanana Valley and is underlain by approximately 200 feet of unconsolidated fluvial and glaciofluvial sediments. These sediments consist of predominantly interbedded layers of well-graded sand and gravel and are underlain by metamorphic and intrusive bedrock materials. Permafrost conditions occur in undeveloped locations within the valley; however, in areas of surface development, only localized pockets of permafrost remain. Permafrost conditions are reported at the Blair Lakes Target Range, but are not expected beneath most Eielson AFB locations. It is anticipated that seasonal frost zones may extend into the shallow water table at the Base during winter; however, site-specific winter data on the groundwater conditions have not been collected to date.

Groundwater Conditions

The upper unconfined aquifer extends from the ground surface to a depth of about 200 feet. Groundwater at the Eielson and Blair Lakes sites typically occurs at depths of less than 10 feet below ground surface and flows regionally toward the north-northwest (HLA, 1989). Horizontal groundwater gradients are reported to be 4 to 6 feet per mile at the Base, resulting in relatively slow groundwater movement. The hydraulic properties of the aquifer are not well characterized at this time; however, hydraulic conductivities are typically high (approximately 200 feet per day) for sand and gravel sediments. Groundwater within the sedimentary aquifer occurs under unconfined to semi-confined conditions. Vertical gradient data for the study area are not currently available but will be evaluated as needed for individual source areas. No distinct aquitard horizons have been identified in the unconsolidated deposits.

Shallow groundwater beneath the sites is classified as a sole-source aquifer and provides the base with drinking water as well as domestic, irrigation, and industrial water supplies.

A brief summary of selected information on facility operations and subsurface environmental conditions for source areas of concern is presented below. A summary of floating petroleum product thickness measurements is given in Table 1. Approximate areas and extent of floating product for each site are shown in Figures 2 through 7. A summary of analytical results for groundwater sampling are presented in Tables 2 through 8.

ST20 Refueling Loop

Source Area ST20 is an active aircraft refueling loop and includes three refueling complexes, E-7, E-8, and E-9 (see Figures 2 through 4). The complexes contain underground fuel tanks, piping, and associated pump houses. The refueling loop is generally flat, consisting of asphalt-covered taxiway and refueling pads with adjacent unpaved areas of gravel and grass. Site data indicate a range in depths to shallow groundwater of between 3 and 9 feet below ground surface and a northwesterly direction of flow. Sediments at ST20 generally include sand and gravel deposits.

The sources of petroleum, oil, and/or lubricants (POL) contamination at ST20 include historic surface spills and leaky underground pipes. Considerable subsurface investigation has been performed at the source area since 1982, including borehole soil sampling, soil vapor sampling, groundwater probe sampling, monitor and extraction well installations, and surface water sampling. A summary of analytical results of the groundwater investigations is presented in Tables 2 and 3.

Floating petroleum product has been measured above the shallow groundwater at each of the three refueling complexes. Results are summarized in Table 1. The approximate extent of each of the pools of floating petroleum product at complexes E-7, E-8, and E-9 was investigated using temporary groundwater probes (HLA, 1990). Floating petroleum product was observed at the E-8 complex in 1989, but not in more recent monitoring.

ST48 Powerplant Fuel Spill Area

Source Area ST48 shown in Figure 5, is located in the east-central portion of Eielson AFB, near the intersection of Division Street and Industrial Drive. The site is adjacent to a coal-generated powerplant, an ash storage house, active railroad lines, two cooling water supply wells and one drinking water supply well, and abandoned below-grade fuel lines.

The abandoned gasoline and diesel pipelines reportedly served as delivery lines from bulk storage tanks to an old military service station located at the intersection of Division Street and Industrial Drive. It is not known if the fuel pipelines were drained and purged when they were taken out of service.

Previous findings from a soil vapor survey, product level measurements, and analytical soil and groundwater data indicate that the greatest amount of fuel contamination lies along the abandoned fuel pipelines passing beneath Industrial Drive. A summary of analytical results for groundwater are presented in Tables 4 and 5. Floating petroleum product has been found at a number of locations near the abandoned fuel pipelines where they cross beneath Industrial Drive. A summary of floating product measurements is presented in Table 1. Floating petroleum product sampled from Well 48M01 may be arctic diesel, based on hydrocarbon fingerprint analytic results (HLA, 1990). The extent of floating petroleum product is estimated to be approximately 100 feet by 100 feet. The maximum observed floating product thickness was over 1.51 feet.

Based on available data, the direction of groundwater flow at ST48 varies from east to northeast, and is probably influenced by pumping from water supply wells located approximately 500 feet east (Wells 1 and 2 -- powerplant cooling water wells) and 500 feet north (Well D) of the floating product pool. Permafrost conditions were not encountered during field investigations near ST48, nor were permafrost conditions reported for Wells 1 and 2.

Floating petroleum product was also detected at the newly constructed Ash Storage House, approximately 225 feet north of Well 48M01. Dewatering activities during construction of the Ash Storage House may have induced migration of the floating petroleum product from the vicinity of 48M01 toward the Ash Storage House. No potential source areas near the Ash Storage House are known.

ST49 Building 1300

ST49 is located just south of the main runway, in the southern portion of the base as shown in Figure 6. The source area is approximately 8 acres in size and includes Building 1300 and the adjacent taxiway, which together comprise an active combat alert hangar complex (CAC). The site is relatively flat with elevated taxiway and hangar construction.

A utility room is located on the east side of the hangar and contains a 550-gallon above-ground diesel fuel tank for the CAC generator. The above-ground tank is supplied on an approximately daily basis by two 10,000-gallon below-grade fuel tanks located at the southern end of the hangar. There is a floor drain in the utility room that has received diesel overspill. It is not known whether the floor drain line is connected to the CAC septic system and drain field. Floor

drains are also located within the hangar and are reportedly connected to the septic system and drain field located just south of the hangar.

Six monitoring wells and one product recovery well are located at the source area. Water level data from these wells indicate that depth to groundwater ranges from 7 to 10.5 feet below ground surface and flows toward the north. Permafrost conditions were reported at depths of approximately 25 feet in 1988 in HLA well logs for wells 49M04 and 53M05 located just north of the complex.

ST49 was investigated during the HLA 1988 (Phase II, Stage 3) and 1989 (Phase II, Stage 4) field investigations, which included borehole soil sampling, soil vapor sampling, groundwater sampling from probes and monitoring wells. A summary of analytical results of these groundwater investigations are presented in Tables 6 and 7.

Floating petroleum product was detected above the shallow water table at the north end of the hangar in 1988 and 1989 (wells 49M02 and 49M06), and just north of the utility room (well 49GMW). Product probes were installed to further delineate the lateral extent of floating product in the area; however, access restrictions prevented product delineation beneath the hangar and surrounding paved areas. Floating product thickness measurements are presented in Table 1. The estimated extent of floating product is approximately 200 feet by 75 feet with a maximum reported thickness of 2.15 feet in 49M02 in 1988. Product recovery was implemented for a time beginning in 1988 at Well 49GMW and occasional product removal was conducted in Well 49M02. Hydrocarbon identification analyses were performed on product samples collected from Wells 49M02 and 49GWM, and indicated the product is predominantly C9-C19 diesel fuel.

SS50 through SS53 Blair Lakes Target Range

The Blair Lakes Target Range shown in Figure 7 is located approximately 24 miles southwest of Eielson AFB and can be reached in summer by helicopter or in winter by way of an ice bridge across the Tanana River. The site includes a vehicle maintenance shop, above-ground diesel and gasoline tank farm (and associated product delivery lines), generators, and storage outbuildings on a central gravel pad area. Aircraft target ranges and drum disposal areas are located outside the gravel pad area.

Groundwater flows toward the north at Blair Lakes and occurs at depths of approximately 9 feet below ground surface. Permafrost was encountered at a depth of 7 feet in an HLA boring adjacent to the tank farm area and is expected to be present beneath portions of the gravel pad that are not subject to thawing effects from adjacent heated buildings. Permafrost was not encountered during HLA's drilling activities in the areas outside the gravel pad.

Potential source areas at the Blair Lakes facility were investigated by HLA in 1988 (Phase II, Stage 3) and 1989 (Phase II, Stage 4) and included borehole soil sampling, soil vapor sampling, groundwater sampling from probes and monitoring wells. A summary of analytical results of the groundwater investigations is presented in Tables 8 and 9.

HLA investigations indicated several potential sources for fuel-related contamination at Blair Lakes. A diesel spill from an above-ground diesel day tank is believed to be the primary source of fuel contamination detected in the base water supply well, located in the eastern corner of the vehicle maintenance shop. Monitoring Well 50M01 was installed in 1988 approximately 35 feet southeast of the supply well and 0.7 feet of floating petroleum product was measured. Product probes were installed in the vicinity in 1989 to investigate floating product; however, no product measurements were made at that time. Floating product thickness measurements made at the Blair Lakes facility in 1991 are listed in Table 1.

The tank farm and vicinity are potential sources, based on elevated total petroleum hydrocarbon (TPH) concentrations in soil samples near the tanks. Other nearby potential sources include spills at the fuel pump island approximately 30 feet west of the tank farm, or leaks in the associated underground piping. An additional area of concern is a former underground fuel line construction ditch located between the vehicle maintenance shop and the tank farm. The ditch was excavated in 1986, floating product was observed above the water table, and the ditch was backfilled. The specific source of the product is not known.

TABLE 1. Floating Petroleum Product Measurements

Sheet 1 of 3

Site	Well Number	Date Sampled	Product Thickness (ft)	Comment
ST20 E-7 Complex	20M04	9-5-89 8-21-91	1.7 0.85	Product JP-4
	20PP08	9-17-89 8/21/91	0.01 0.00	
	20PP09	9-17-89 8/21/91	0.78 0.00	
	20PP12	9-17-89 8/21/91	0.37 0.00	
	20PP14	9-17-89 8/21/91	1.14 0.00	
	20PP15	9-17-89 8/21/91	0.50 0.00	
	20PP16	9-17-89 8/21/91	0.39 0.00	
	20PP17	9-17-89 8/21/91	0.01 0.00	
	20PP35	9-17-89 8/21/91	0.01 NM	
	20PP36	9-17-89 8/21/91	0.83 NM	
ST20 E-8 Complex	20M06	9-6-89 10-8-89 8-21-91	0.58 0.50 0.0	
	20PP51	10-8-89 10-27-89 8-21-91	0.01 0.01 NM	
	20PP52	10-27-89 8-21-91	0.01 NM	
	20PP79	10-27-89 8-21-91	0.01 NM	
	20PP80	10-27-89 8-21-91	0.01 NM	
ST20 E-9 Complex	20M01	9-4-89 10-10-89 8-21-91	0.14 0.30 0.0	
	20M07	9-1-89 10-10-89 8-21-91	1.70 1.60 0.94	Light yellow product (JP-4)
	20M25	10-18-89 8-21-91	1.41 0.14	Dark brown product (unknown)
	20PP57	10-10-89 8-21-91	0.29 NM	
	20PP60	10-10-89 8-21-91	0.21 NM	
	20PP71	10-10-89	0.58	
	20PP72	10-10-89	1.13	
	20PP73	10-10-89	1.26	
	20PP76	10-10-89	1.13	
ST20 General	M N P S T	8-22-91 8-22-91 8-22-91 8-22-91 8-22-91	0.69 0.42 0.63 0.81 0.87	

TABLE 1. Floating Petroleum Product Measurements

Site	Well Number	Date Sampled	Product Thickness (ft)	Comment
ST48	48MO1	9-23-88 8-20-91 8-28-91 10-9-89 8-22-91	0 0.11 0.80 0.63 0.12	
	48PP01	9-23-88	0.09	
	48PP06	9-23-888 9-17-89 10-22-89	0.42 0.28 0.27	
	48PP08	9-23-8 11-1-88 9-17-89 10-22-89 8-20-91 10-10-91	0.62 0.70 0.71 0.79 0.76 0.72	
	48PP09	9-23-88 11-1-88 9-17-89 10-22-89 8-20-91	0.68 0.75 1.32 1.27 1.51 +	
	48PP11	11-1-88 9-17-89 10-22-89	0.11 0.54 0.57	
	48PP28	9-23-88 10-31-88 9-17-89 11-22-89	0.11 0.29 0.61 0.12	
	10-1	8-28-91	0.19	
	10-8	8-28-91	1.32	
	48PP64	11-22-89	0.02	
	48PP68	11-22-89	0.11	
ST49	49M02	9-23-88 10-28-88 9-18-89 8-20-91	1.28 2.15 0.61 0.62	
	49GMW	9-23-88 10-28-88 8-20-91	1.89 1.42 NM	Headspace reading: 0.00 ppm OVM
	49PP24	9-23-88 10-28-88 89	1.13 1.17 NM	Product probe destroyed
	49M06	9-22-89 8-20-91	0.08 0.00	
	49PP47	9-22-89	0.28	

TABLE 1. Floating Petroleum Product Measurements

Site	Well Number	Date Sampled	Product Thickness (ft)	Comment
SS50-53 and DP54 Blair Lake	50MO1	9-30-88 8-26-91	0.70 0.40	Well casing heaved
	50PP81 50PP85	8-26-91 10-10-91 8-26-91 10-10-91	0.75 0.70 0.32 0.30	

NM = not measured.
OVM = organic vapor monitor.

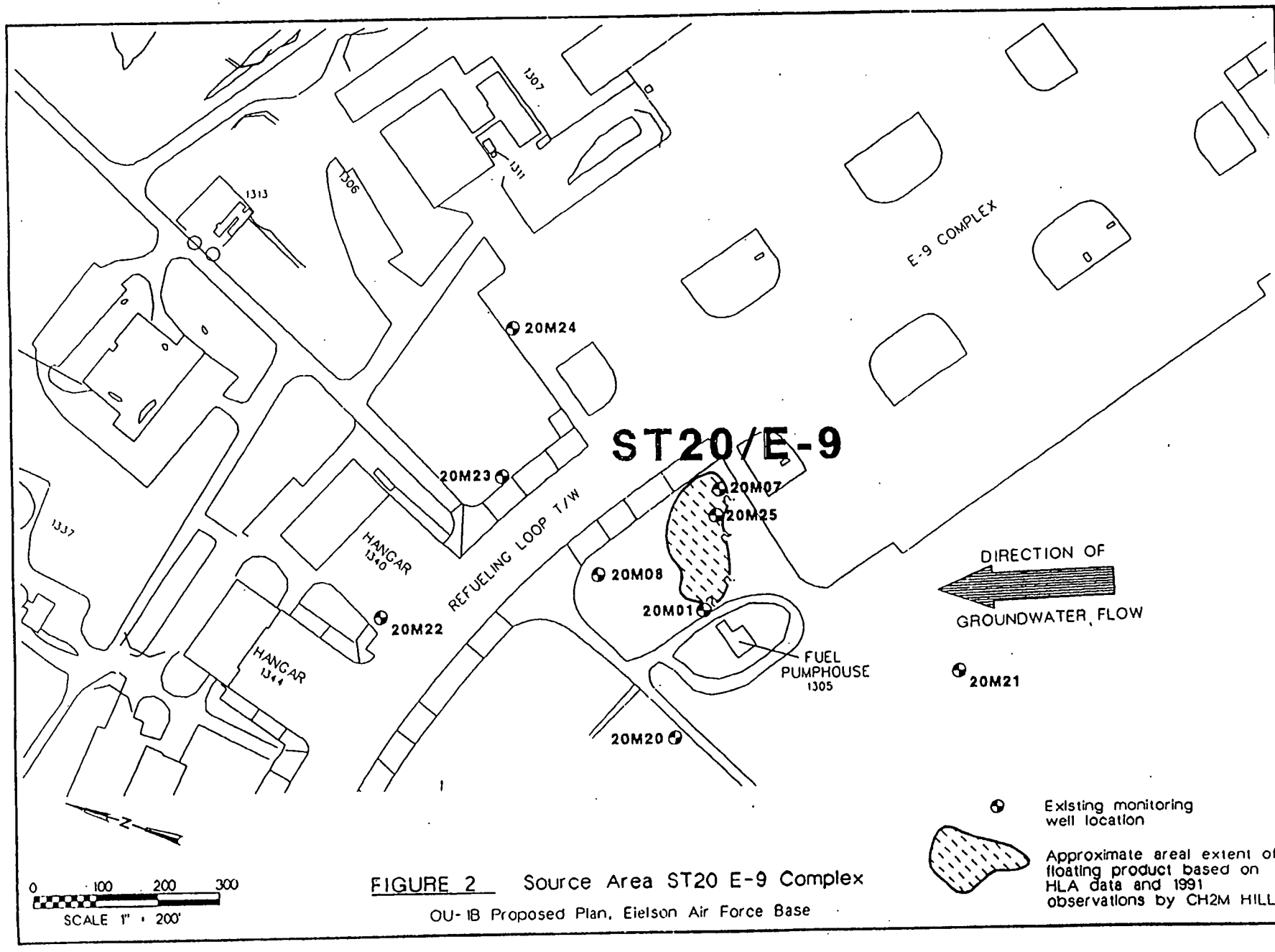

FIGURE 2 Source Area ST20 E-9 Complex

OU-1B Proposed Plan, Eielson Air Force Base

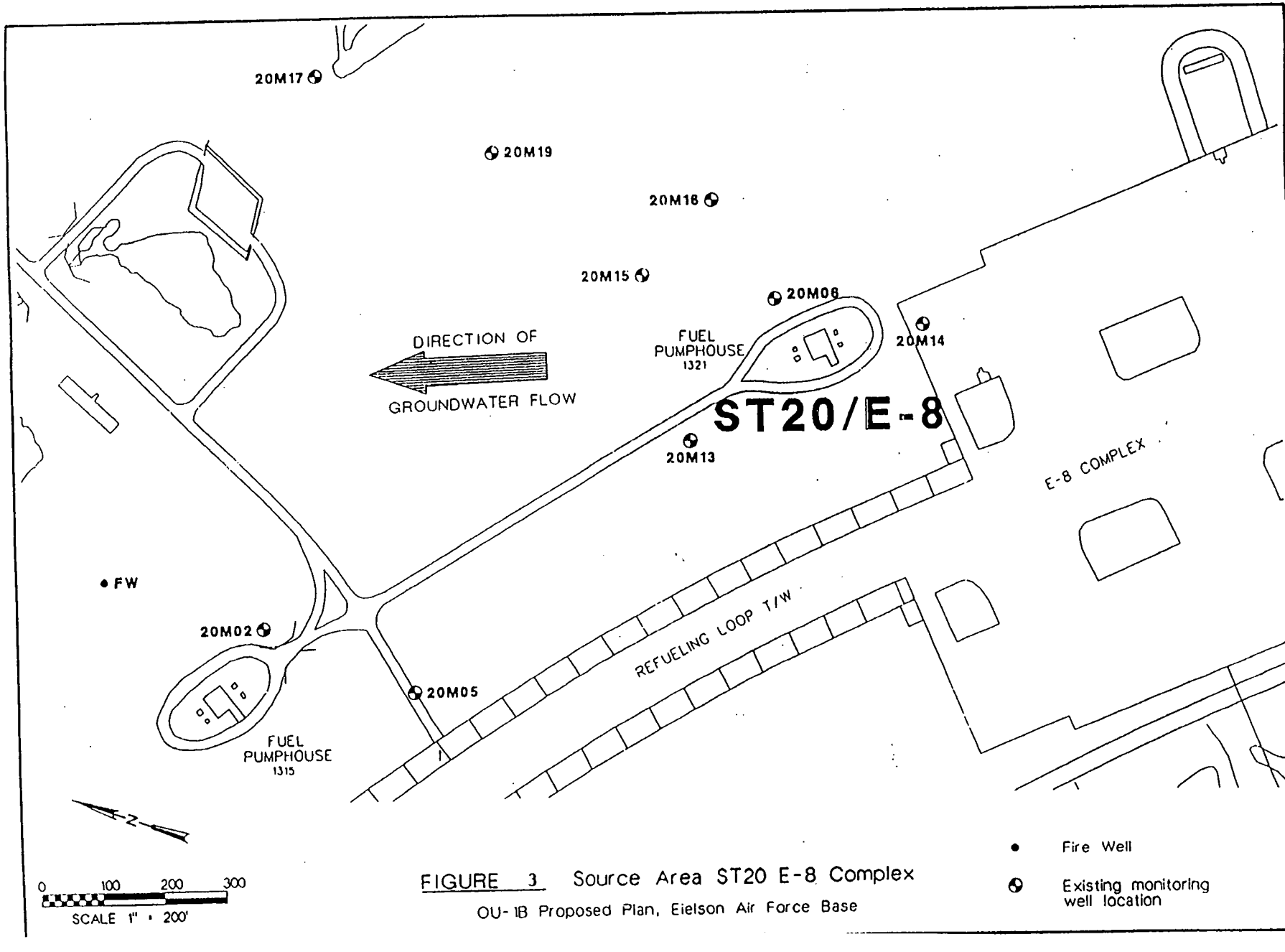

FIGURE 3 Source Area ST20 E-8 Complex

OU-1B Proposed Plan, Eielson Air Force Base

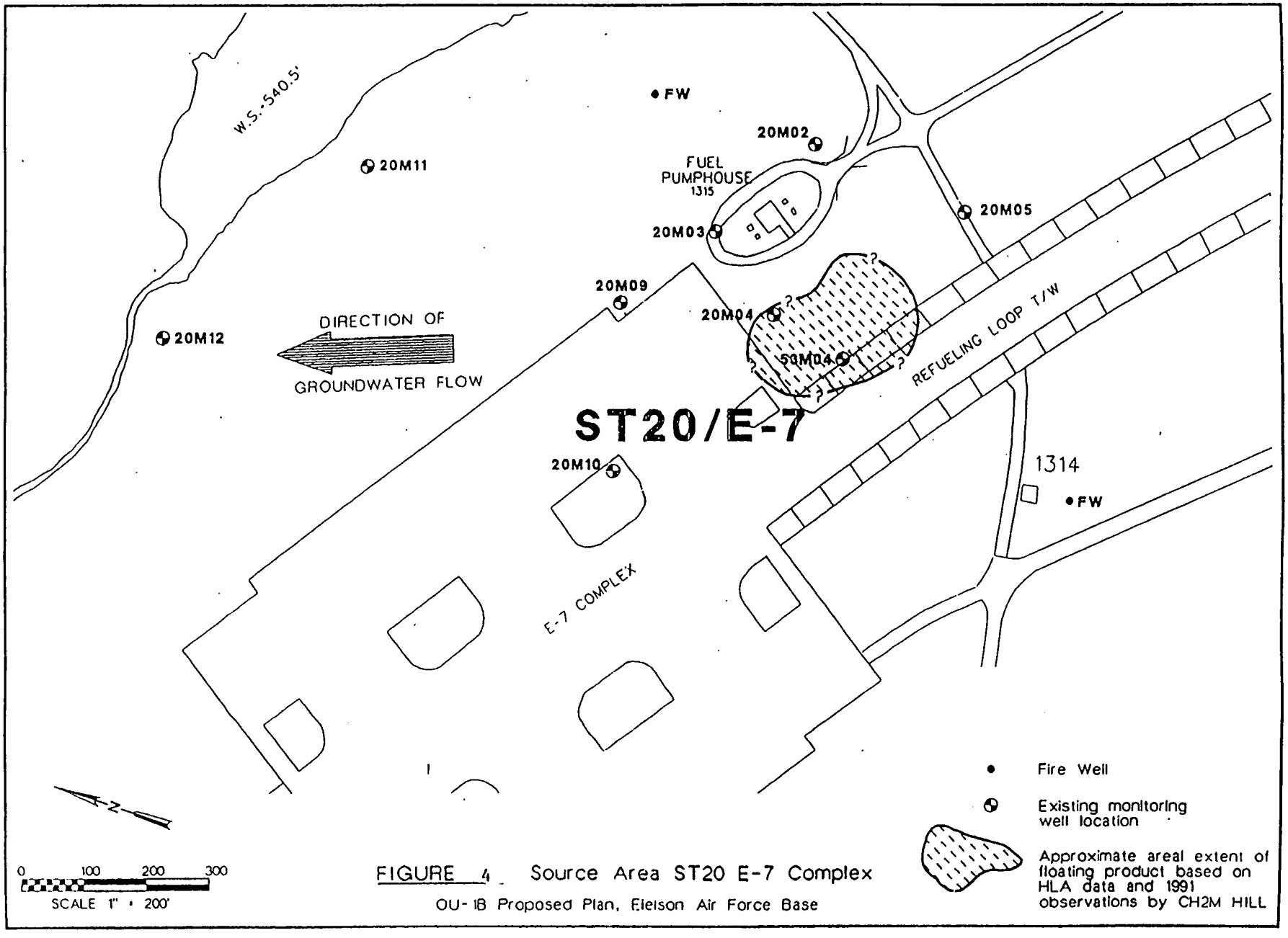

FIGURE 4 Source Area ST20 E-7 Complex

OU-1B Proposed Plan, Eielson Air Force Base

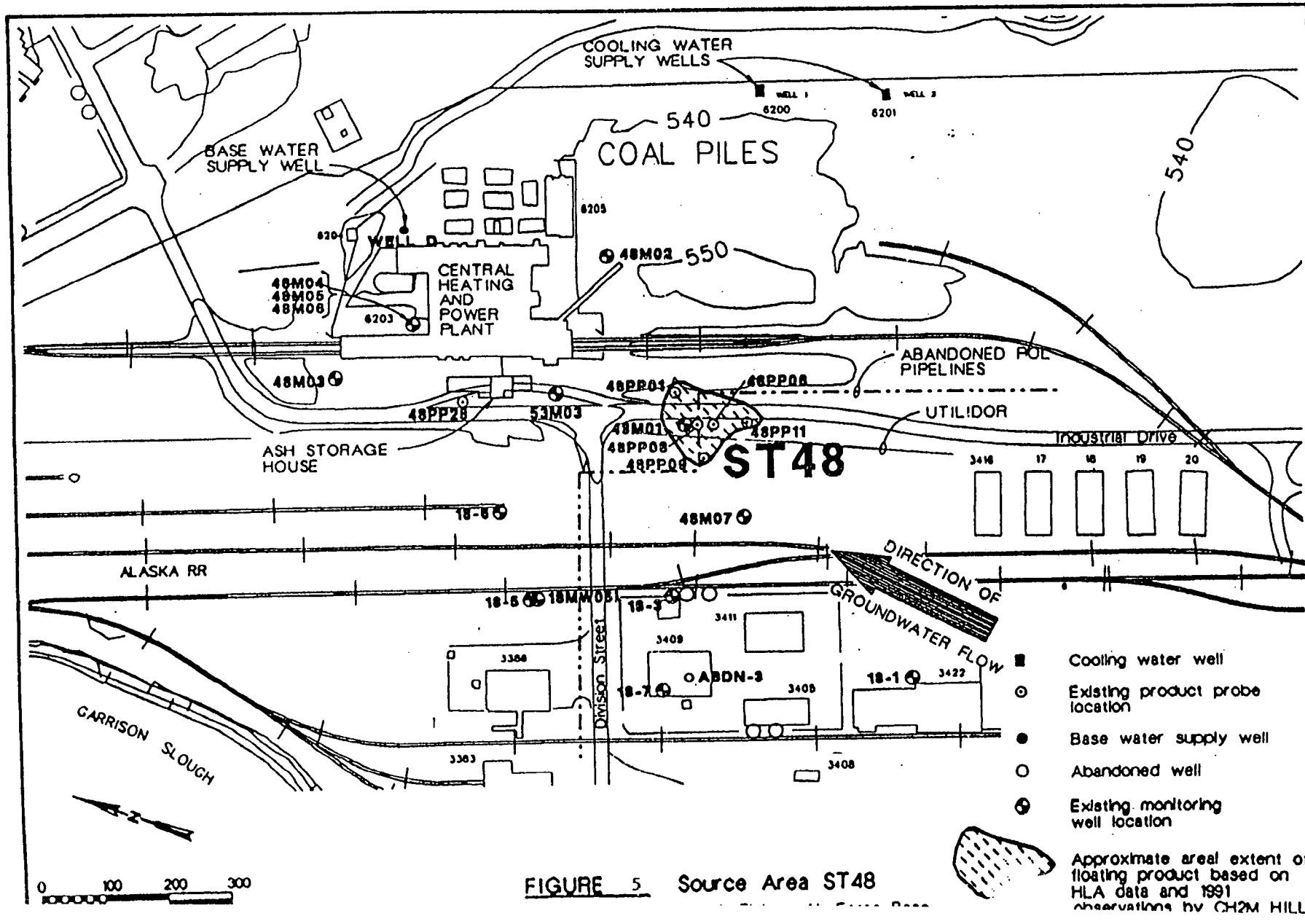

FIGURE 5 Source Area ST48

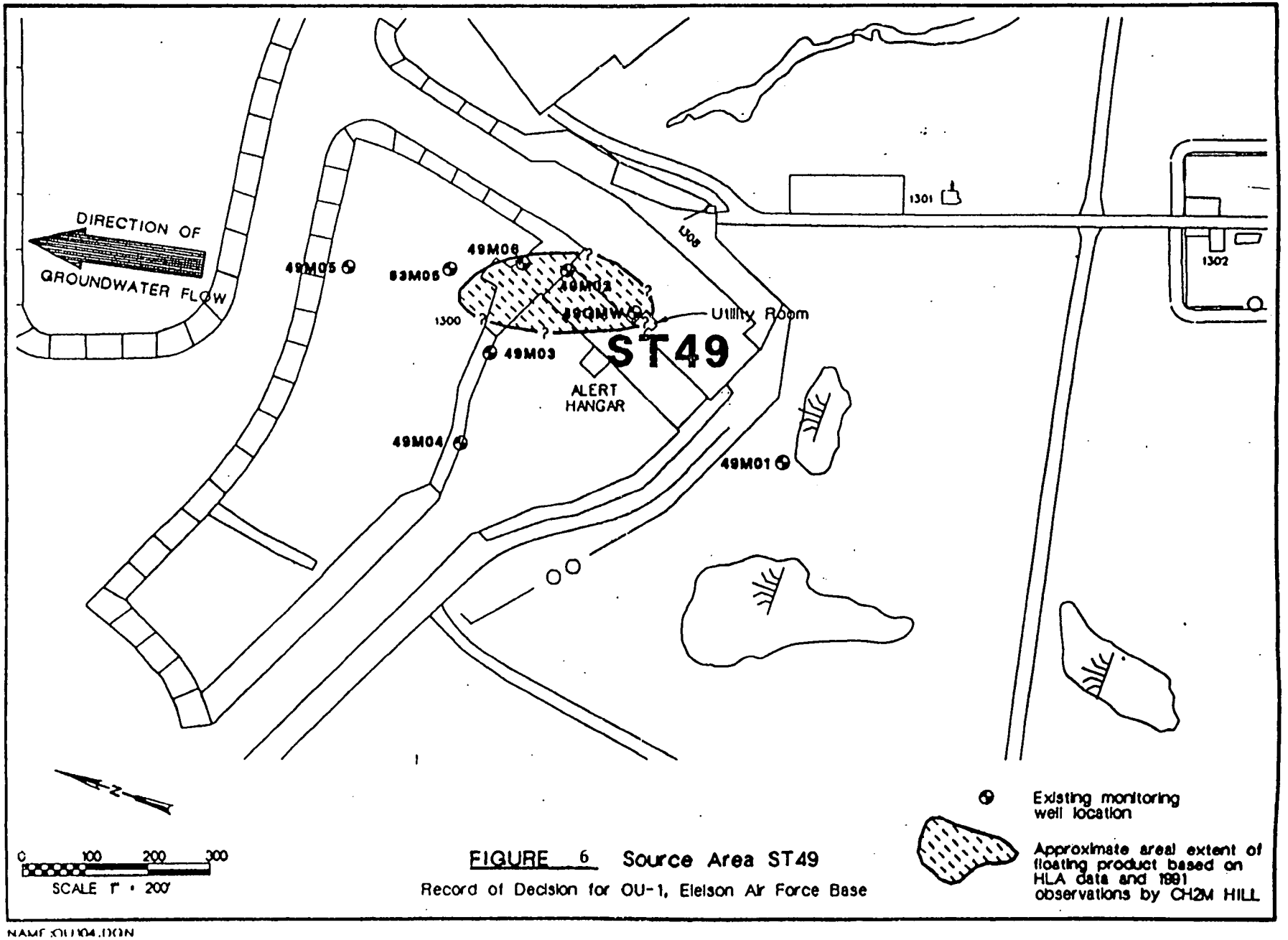

FIGURE 6 Source Area ST49

Record of Decision for OU-1, Eielson Air Force Base

NAME:OU104.DGN

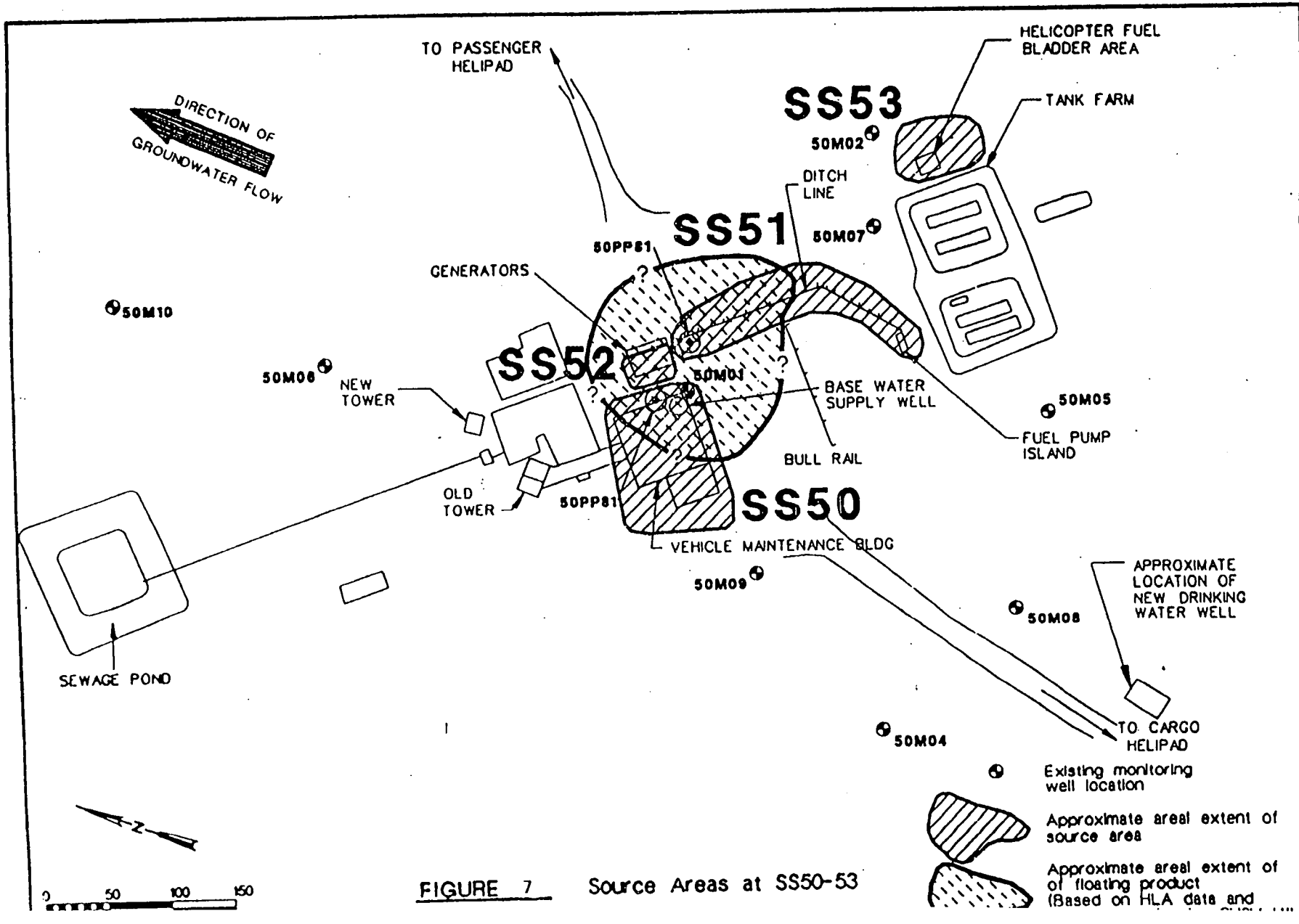

FIGURE 7 Source Areas at SS50-53

Table 2 Summary of Groundwater Results for Site 20 (Groundwater Probes)				
Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
E-7 Complex				
Benzene	1	18/31	1-330	20FW18
Toluene	1	8/31	1-3	20FW56
Ethylbenzene	1	2/31	1	20FW61
m,p-Xylene	1	3/31	1-2	20FW74
o-Xylene	1	2/31	1-2	20FW75
Methylene Chloride	1	3/25	4-5	20FW55
1,1-Dichloro-ethylene	5	4/25	6-32	20FW56
E-8 Complex				
Benzene	1	8/49	1-830	20FW70
Toluene	1	24/49	1-1,400	20FW70
Ethylbenzene	1	3/49	3-470	20FW02
m,p-Xylene	1	21/49	1-640	20FW02
o-Xylene	1	13/49	1-380	20FW70
E-9 Complex				
Benzene	1	12/31	2-25,000	20FW42
Toluene	1	14/31	2-21,000	20FW42
Ethylbenzene	1	9/31	1-1,600	20FW46
m,p-Xylene	1	16/31	1-4,700	20FW39
o-Xylene	1	14/31	1-1,400	20FW42

Table 3 Summary of Groundwater Results for Site 20 (Monitoring Wells)

Constituent	Detection Limit (µg/l)	Detected/ Analyzed	Concentration Range Detected (µg/l)	Location of Maximum (complex)
VOLATILES				
Benzene	0.2	17/30	0.32-7170	20M04 (E-7)
Ethylbenzene	0.5	10/30	1.21-1120	53M04 (E-7)
Toluene	0.3	16/30	0.56-15900	53M04 (E-7)
Xylenes, Total	0.4	11/30	1.21-3820	20M04 (E-7)
SEMIVOLATILES				
Anthracene	1.0	1/19	1.7	20M01 (E-9)
Bis(2-ethylhexyl)phthalate	2.0	11/19	6.4-2900	20M06 (E-8)
Fluoranthene	1.0	1/19	6.3	20M01 (E-9)
2-Methylnaphthalene	1.0	3/19	39-260	20M07 (E-9)
Naphthalene	1.0	3/19	12-160	20M07 (E-9)
Phenanthrene	1.0	1/19	6.6	20M01 (E-9)
Pyrene	1.0	1/19	5.5	20M01 (E-9)
Petroleum Hydrocarbons (mg/l)	0.2	4/29	1.4-6.3	20M01 (E-9)

Notes:
Samples from E-7 Complex wells were not analyzed for semivolatiles.

Table 4 Summary of Groundwater Results for Site 48 (Groundwater Probes)				
Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Benzene	1	6/24	80-7,100	48FW11
Toluene	1	7/24	40-6,600	48FW11
Ethylbenzene	1	9/24	3-950	48FW12
m,p-Xylene	1	9/24	5-3,300	48FW12
o-Xylene	1	8/24	5-1,300	48FW12
t-Dichloro-ethylene	5	2/24	17-490	48FW12

Table 5 Summary of Groundwater Results for Site 48 (Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
1988 RESULTS				
VOLATILES				
Benzene	0.15	5/10	0.34-1330	48M01
Ethylbenzene	0.46	2/10	89.2-160	48M01
Toluene	0.25	2/10	53.2-88.0	48M01
Xylenes, Total	0.85	3/10	1.62-929	48M01
SEMIVOLATILES				
Butylbenzylphthalate	1.5	1/10	520	48P01W1
Bis(2-ethylhexyl)phthalate	2.0	1/10	700	48P01W1
2,4-Dimethylphenol	0.28	1/10	5.1	48M01
2-Methylnaphthalene	0.9	2/10	130-251	53M03[b]
Naphthalene	0.26	2/10	230-440	53M03
Petroleum Hydrocarbons[a] (mg/L)	0.1	2/10	3.4-44.0	48M01
1989 RESULTS				
VOLATILES				
Benzene	0.20	4/10	3.01-1,390	48M01
Ethylbenzene	0.50	1/10	143	48M01
Toluene	0.30	2/10	48.8-230	48M01
Total Xylenes	0.40	2/10	1550-1990	48M01
SEMIVOLATILES				
Bis(2-ethylhexyl)phthalate	2.0	2/10	44-52	48M07
2-Methylnaphthalene	1.0	4/10	24-140	48M01

Table 5 Summary of Groundwater Results for Site 48
(Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Naphthalene	1.0	4/10	24-270	48M01
Petroleum Hydrocarbons (mg/L)	0.2	5/10	0.3-10.6	48M01

Notes:
[a]Hydrocarbon fingerprint analysis for wells 48M01 and 48M02 indicated 4.2 mg/L Arctic Diesel and 13 mg/L of a C8-C20 hydrocarbon, respectively.
[b]Well 53M03 also has been analyzed for major cations, major anions and selected metals.

Table 6 Summary of Groundwater Results for Site 49 (Groundwater Probes)				
Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Benzene	1	12/24	1-6	49FW08
Toluene	1	0/24	--	--
Ethylbenzene	1	4/24	1-8	49FW03
m,p-Xylene	1	6/24	3-37	49FW03
o-Xylene	1	3/24	2-24	49FW03
Trichloroethylene	1	10/24	1-4	49FW10 49FW15
t-Dichloro-ethylene	1	1/24	2	49FW12

Table 7 Summary of Groundwater Results for Site 49
(Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
1988 RESULTS				
VOLATILES				
1,1-Dichloroethane	0.46	1/8	1.57	53M05[b]
Trans-1,2-Dichloroethene	0.38	1/8	0.40	53M05
1,1,1-Trichloroethane	0.2	2/8	0.447-4.77	53M05
Trichloroethene	0.52	2/8	3.14-14.0	53M05
Trichlorofluoromethane	0.32	1/8	0.788	49M01
Benzene	0.15	4/8	0.35-4.71	49M03
Chlorobenzene	0.34	1/8	0.432	49M02
1,2-Dichlorobenzene	0.2	1/8	0.21	49M03
Ethylbenzene	0.46	3/8	0.55-5.37	49M02
Toluene	0.25	2/8	0.31-0.49	49M02
Xylenes, Total	0.85	2/8	3.99-18.1	49M02
SEMIVOLATILES				
Dibenzofuran	0.01	1/8	0.620	49M02
2-Methylnaphthalene	0.9	2/8	117	49M02
Naphthalene	0.26	2/8	6.2-62	49M02
Petroleum Hydrocarbons (mg/L)	0.01	1/8	28.4	49M02
1989 RESULTS				
VOLATILES				
1,1-Dichloroethane	0.400	2/8	0.457-1.01	49M05

Table 7 Summary of Groundwater Results for Site 49
(Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
1,1,1-Trichloroethane	0.200	5/8	0.333-1.50	49M06
Trichloroethene	0.600	5/8	0.963-6.93	49M05
Benzene	0.20	7/8	0.33-4.35	49M03
1,4-Dichlorobenzene	1.00	1/8	4.53	49M03
Ethylbenzene	0.50	5/8	0.63-3.26	49M06
Toluene	0.30	3/8	0.72-1.04	49M06
Total Xylenes	0.40	2/8	0.94-5.95	49M02
SEMIVOLATILES				
Acenaphthene	1.12	4/8	1.19-12.8	49M02
Acenaphthylene	0.655	5/8	1.30-6.43	49M02
Anthracene	0.019	2/8	0.031-0.034	49M04
Benzo(A)Anthracene	0.0004	8/8	0.0006-0.026	49M02
Benzo(B)Fluoranthene	0.0003	8/8	0.0003-0.012	49M02
Benzo(K)Fluoranthene	0.0001	7/8	0.0004-0.008	49M02
Benzo(G,H,I)Perylene	0.001	5/8	0.001-0.023	49M03
Benzo(A)Pyrene	0.0003	7/8	0.0004-0.015	49M02
Chrysene	0.008	4/8	0.01-0.03	49M04
Dibenz(A,H)Anthracene	0.0009	5/8	0.0009-0.005	49M02
Fluoranthene	0.0003	8/8	0.003-0.356	49M02
Fluorene	0.125	6/8	0.142-10.8	49M02
Indeno(1,2,3-cd)Pyrene	0.0008	4/8	0.001-0.009	49M02
Naphthalene	0.470	7/8	0.878-49.9	49M02

Table 7 Summary of Groundwater Results for Site 49 (Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Phenanthrene	0.02	7/8	0.02-21	49M02
Pyrene	0.011	7/8	0.015-0.850	49M02
Petroleum Hydrocarbons[a] (mg/L)	0.2	3/8	1.6-32.3	49M05

Notes:
[a] Hydrocarbon fingerprint analysis for well 49M02 indicated 5.4 mg/L of a C9-C19 hydrocarbon, based on an Arctic JP-7 reference.
[b] Well 53M05 also has been analyzed for major cations, major anions and selected metals.

Table 8 Summary of Groundwater Results for Site 50 (Groundwater Probes)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Toluene	1	3/21	1	50FW01 50FW04 50FW06

Note:
Samples from the groundwater probes were analyzed by the HLA field laboratory.

Table 9 Summary of Groundwater Results for Site 50 (Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
1988 RESULTS				
VOLATILES				
Chloromethane	0.4	4/7	0.58-1.32	50M03
Benzene	0.15	3/7	3.0-65.2	50M01
Chlorobenzene	0.34	1/7	1.73	50M05
Ethylbenzene	0.46	2/7	136-332	50M01
Toluene	0.25	2/7	52.5-261	50M01
Xylenes, Total	0.85	2/7	602-1860	50M01
SEMIVOLATILES				
Butylbenzylphthalate	1.5	3/7	3.7-12	50M05
Diethylphthalate	1	1/7	6.6	50M05
2,4-Dimethylphenol	0.28	1/7	4.7	50M05
2-Methylnaphthalene	0.9	1/7	454	50M01
Naphthalene	0.26	1/7	540	50M01
Phenol	1	1/7	6.8	50M05
Petroleum Hydrocarbons[a] (mg/L)	0.1	1/7	119	50M01
1989 RESULTS				
VOLATILES				
Chloroform[b]	0.2	1/12	1.01	50M08
Benzene	0.20	4/12	3.08-335	50M01
Ethylbenzene	0.50	3/12	0.99-2,210	50M01

Table 9 Summary of Groundwater Results for Site 50 (Monitoring Wells)

Constituent	Detection Limit (ug/L)	Detected/ Analyzed	Concentration Range Detected (ug/L)	Location of Maximum
Toluene	0.30	3/12	2.69-2,080	50M01
Total Xylenes	0.40	3/12	11.3-6,940	50M01
SEMIVOLATILES				
Bis(2-ethylhexyl)Phthalate	2.0	1/12	4.1	50M02
2,4-Dimethylphenol	2.0	1/12	12	50M05
2-Methylnaphthalene	1.0	3/12	1.3-12,000	50M01
Naphthalene	1.0	2/12	32-5700	50M01
Petroleum Hydrocarbons (mg/L)	0.2	2/12	0.3-1,980	50M01

Notes:
[a]Hydrocarbon fingerprint analysis for well 50M01 indicated 7.6 mg/L of "weathered product", based on an Arctic JP-7 reference.
[b]Chloroform not detected in resample.
[c] 1988 sampling round also included analysis for major cations, major anions and selected trace metals.

VI SUMMARY OF SITE RISKS

The primary risk being addressed by this interim remedial action is exposure to groundwater contaminated with organic constituents. Because petroleum products contain toxic chemicals that dissolve into water, the first step in reducing risk at these sites is to minimize the volume of petroleum product in contact with the groundwater. Although petroleum products contain many chemicals, those of primary concern are benzene, toluene, ethylbenzene, and xylene.

Based on existing information, the areas of floating petroleum product are relatively localized and do not appear to be spreading quickly. However, if not removed, these floating petroleum products will continue to dissolve into the groundwater and may migrate, thus contaminating larger areas of groundwater in the future.

Contaminants such as benzene, ethylbenzene, toluene, and total petroleum hydrocarbons are present at levels exceeding their respective drinking water standards in the upper regions of the groundwater near the areas of floating petroleum products. One Base drinking water supply well (Well D) is located close to the Powerplant Fuel Spill Area. The upper regions of the aquifer are not presently used as a drinking water source at Eielson AFB; however, it would pose an unacceptable risk if used for domestic purposes (e.g., drinking and showering). In addition, if not addressed, the contaminants may migrate both horizontally and vertically and may contaminate the existing deeper drinking water supply wells.

VII DESCRIPTION OF ALTERNATIVES

The following alternatives for reducing floating petroleum products on top of the water table and preventing further migration of the contamination were evaluated:

Alternative 1 -- No Action

Alternative 2 -- Free Product Extraction

Alternative 3 -- Vacuum Extraction

Alternative 4 -- Soil Excavation / Free Product Removal

Alternative 5 -- Bioventing

Alternative 1: No Action

The no action alternative is presented as a baseline for comparison against other alternatives. Under this alternative, the Air Force would not take further action to remove floating petroleum product contamination. The floating petroleum product would remain on top of the water table and continue to dissolve into the groundwater and migrate away from the source.

Alternative 2: Free Product Extraction

This alternative would remove floating petroleum product from the top of the water table by pumps installed in groundwater wells, culverts, or trenches. Viable pump configurations include skimmer pumps and dual pump systems. The type and number of pumps used would be determined based on source-specific conditions to achieve optimal floating petroleum product removal. The goal of efficient pumping is to maximize removal of floating product while minimizing extraction of large volumes of groundwater.

Extracted groundwater would be monitored to determine whether it required treatment using physical/chemical processes such as air stripping, oil-water separation or carbon filtration. Depending on the volume, the treated effluent would then be discharged to the ground surface, surface water bodies or to the subsurface soils via trenches or wells. Small volumes of extracted groundwater may be discharged to the Base sewage treatment plant in accordance with state and federal regulations.

Depending on its quality, the recovered floating petroleum product would then be burned on-base at the waste oil incinerator or recycled or disposed of off-base through the Defense Reutilization and Marketing Office.

Alternative 3 Vacuum Extraction

This alternative includes the extraction of floating petroleum product using vacuum extraction wells (VEWs). The objective of vacuum extraction is to accomplish removal of the floating petroleum product. In addition, the VEWs would remediate some of the residual contamination in the soil.

Well casings will be installed to below groundwater level and smaller diameter drawdown tubes or "slurp" tubes will be inserted. The open end of the slurp tube will be placed at the interface of the floating petroleum product and the watertable. The top of the casing will be sealed and a vacuum pump connected to the slurp tube. With the tip of the slurp tube located at or slightly above the interface, the floating petroleum product will be removed but very little, if any, groundwater will be removed. The well head will be constructed so the depth of the draw-down tube can be adjusted. An operator will manually place and maintain the tip of the tube slightly above the interface between the floating petroleum product and the watertable within the well casing.

As a vacuum is applied at the end of the drawdown tube, a vacuum is created within the perforated will casing. The influence of the vacuum spreads radially from the well casing. The actual radius of influence depends on a number of site-specific soil parameters (e.g., air permeability, particle size distribution, moisture content, etc.). Ambient air will be pulled through the soil within the radius of influence generated around each vacuum well.

The floating petroleum product removal rate is dependent on the rate the product enters each perforated well casing. This system does not establish a cone of depression because very little, if any, groundwater will be extracted by the slurp tube. The product flows to the vacuum well because of a difference in hydrostatic pressure.

The two phase flow rate (i.e. air and liquid in the drawdown tube and vacuum header piping to the vacuum pump) at each well can be manually controlled at the wellhead and may be changed to achieve a desired floating petroleum product removal rate.

The air and liquid mixture from the vacuum wells will flow to a knock-out tank immediately upstream of the vacuum pump. The purpose of the knock-out tank is to separate the liquid/air streams. The liquid will be pumped from the tank to an oil water separator. Petroleum product will be removed from the tank by gravity flow. The product will either be reused, recycled or sent off base for disposal. The effluent water will either be treated using physical/chemical processes before discharge to a surface water or subsurface or discharged to the base wastewater treatment plant. The exit air from the air/water separator tank will flow to an elevated tip flare where the volatile hydrocarbons will be thermally destroyed. Propane may be added to the exit air to maintain desired combustion temperatures.

Alternative 4: Soil Excavation / Free Product Removal

Under this alternative, soils overlying floating petroleum products would be excavated and treated to remove contamination. The options for treating contaminated soils include soil washing followed by landfarming or bioremediation. Soil washing segregates the soil particles by size to separate larger soil particles from the smaller particles that contain the majority of the contamination. The reduced volume of smaller soil particles would then be treated by compost landfarming or bioremediation, both of which enhance the biological degradation of petroleum in soils.

Recovered petroleum product recycling would occur as described in Alternative 2. The excavated area would be backfilled with clean soil.

This alternative was not evaluated for the refueling loop (ST20), the powerplant area (ST48), or Building 1300 (ST49) because the presence of existing buildings or runways preclude the excavation of large areas of soils. This alternative was only evaluated for the Blair Lakes Facility (SS50 through SS53).

Alternative 5 Bioventing

Bioventing is one of the technologies proposed for site remediation at Eielson AFB. Petroleum hydrocarbons in the environment are, to some extent, broken down by native microorganisms. This is generally an aerobic process, in which the limiting substrate is oxygen. Bioventing enhances this natural biodegradation by supplementing oxygen to the native organisms in the subsurface soil.

Air is pumped through a system of manifolds by a pump. A low volume of air is pumped through each of these manifolds which can be controlled individually. These manifolds then distribute the air to the subsurface. The air injection rate is determined by two factors: there must be enough air flow to assure an adequate radius of influence across the site, yet the air flow should be as low enough to minimize surface emissions. This is accomplished by saturating the soil with air and adjusting air flow down to where the desired radius of influence is maintained. The air is injected just above the water table at approximately six feet.

Bioventing is monitored for microbial activity by measuring respiration rate. Periodic soil borings will be taken and analyzed to determine if the bioventing is significantly enhancing product degradation. Potential surface emissions are monitored by taking air samples at the surface of the site via evacuated canisters. Methods for heating bioventing sites may be utilized to extend the operating season and/or increase microbiological activity.

Although bioventing acts primarily to remediate petroleum-contaminated soils, it is also applicable to the removal of relatively thin layers of floating petroleum products, which are difficult to pump effectively. One objective of bioventing is to minimize further leaching of contaminants from subsurface soils into the groundwater. In addition, as the soil is remediated, the cleaner soils may draw the floating petroleum products up into the soil directly above the groundwater where it can undergo biological degradation.

Discussion of ARARs

The purpose of the interim remedial action is to remove floating petroleum product, a known source of contamination from the groundwater surface until the final remedy is implemented. This interim action is neither intended to restore the aquifer to drinking water conditions, nor to attain all federal and state ARARs relating to cleanup of the aquifer or the soil. The USAF, USEPA and ADEC expect that such ARARs will be addressed by the final remedy to be selected for the site.

The ARARs for this interim remedy relate to the treatment and disposal of groundwater that is collected and treated during implementation of the interim remedial action and for air emissions resulting from the treatment.

Air emissions resulting from the operations of a flare or an air stripper to the extent that they meet the criteria of a hazardous waste shall comply with the requirements of 40 CFR 265 Subparts AA & BB and the substantive requirements of State of Alaska Air Quality Control regulations (18AAC 50). (Alternatives 2,3 and 5)

Spent carbon from a carbon adsorption unit and filters and/or residual materials from the pretreatment system which meet the criteria of a characteristic waste will be stored, treated, recycled, or disposed of in accordance with the Resource Conservation and Recovery Act, 40 CFR Parts 262-264, 266, and 268. (Alternatives 2,3 and 5)

To the extent that effluent will be discharged to surface water bodies or subsurface, such discharge shall comply with the substantive requirements of Alaska Water Quality Standards set forth in 18 AAC 70 and Alaska Wastewater Disposal regulations set forth in 18 AAC 72. (Alternatives 2,3 and 5)

VIII Summary of the Comparative Analysis of Alternatives

EPA Evaluation Criteria

The alternatives presented above were evaluated based on the following nine EPA evaluation criteria. Brief definitions of criteria are summarized below:

Threshold criteria

- **overall protection of human health and the environment** -- How well does the alternative protect human health and the environment, both during and after construction?
- **compliance with regulations** -- Does the alternative meet all applicable or relevant and appropriate state and federal laws?

Primary balancing criteria

- **long term effectiveness and permanence** -- How well does the alternative protect human health and the environment after completion of cleanup? What, if any, risks will remain at the site?
- **reduction of toxicity, mobility, or volume through treatment** -- Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, and volume of the hazardous substances?
- **short term effectiveness** -- Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative? How fast does the alternative reach the cleanup goals?
- **implementability** -- Is the alternative both technically and administratively feasible? Has the technology been used successfully at similar sites?
- **cost** -- What are the relative costs of the alternative?

Modifying criteria

- **state/support agency acceptance** -- What are the state's comments or concerns about the alternatives considered and about the preferred alternative? Does the state support or oppose the preferred alternative?

- **community acceptance** -- What are the community's comments or concerns about the alternatives considered and about the preferred alternative? Does the community generally support or oppose the preferred alternative?

Evaluation of Alternatives

The following section compares the alternatives using the EPA evaluation criteria.

Overall Protection of Human Health and the Environment. Alternative 1 is not protective of human health and the environment because the floating petroleum product would continue to migrate into the groundwater increasing the area of groundwater contamination.

Alternatives 2, 3, 4, and 5 enhance protection of human health and the environment by minimizing further degradation of the groundwater through removal of the floating petroleum products that are acting as a continuing source of groundwater contamination. In Alternatives 3, 4, and 5 the extraction by treating petroleum products adhering to subsurface soils that may also be acting as a source of groundwater contamination further enhances protection of human health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements. Because this interim action is focused on the removal of floating petroleum product, it is not anticipated that groundwater or soil cleanup standards will be achieved. Groundwater and soil cleanup standards will be addressed as part of the final action for this operable unit. Applicable or relevant and appropriate requirements will be met for actions taken under Alternatives 2, 3, 4, and 5.

Short-Term Effectiveness. Alternatives 2, 3, and 4 would begin floating petroleum product removal in the least amount of time. Alternative 5, which uses bioremediation in the soils, would achieve floating petroleum product removal more slowly than the other alternatives.

Alternative 4 is constrained by existing underground utility infrastructure and existing roadways, and requires excavation and treatment of large volumes of soil.

Alternative 5 has been extensively described in the literature and used for remediation in warmer climates. However, the viability of bioventing in colder climates is still being tested and may impact implementation.

Cost. The relative estimated cost (minus 30% to plus 50%) for each alternative at a given source is presented in table below. The cost for Alternative 2 may increase if large volumes of groundwater require treatment. The Cost of Remedial Actions (CORA) model was used to develop the cost for Alternatives 2 and 4. Alternatives 3 and 5 are innovative technologies, thus making cost estimates more difficult. Cost estimates were developed for these alternatives using cost data from treatability studies.

State Acceptance. The ADEC has been involved with the preparation of this Record of Decision and concurs with the selected alternatives.

Community Acceptance. The community has accepted the selected remedies based on the community response to the proposed plan and public meeting as documented in the attached Responsiveness Summary.

	Alternative 2			Alternative 3	Alternative 4	Alternative 5
	Skimmer Pump	Dual Pump	Trenches	Vacuum Extraction	Excavation	Bioventing
ST20 Refueling Loop						
Capital	155	1710	290	279	NA[2]	125
O&M[1]	25	190	225	375	NA	375
Total	180	1900	515	654	NA	500
ST48 Power Plant Fuel Spill						
Capital	310	1300	2760	252	NA[2]	NA[3]
O&M[1]	25	1450	2175	325	NA	NA
Total	335	2750	4935	577	NA	NA
ST49 Building 1300						
Capital	245	990	2110	248	NA[2]	NA[3]
O&M[1]	25	1000	1400	275	NA	NA
Total	270	1990	3510	523	NA	NA
ST50-53 Blair Lakes						
Capital	155	880	1090	239	720	NA[3]
O&M[1]	55	725	1050	275	145	NA
Total	210	1605	2140	514	865	NA

1) Operating and Maintenance (O&M) costs are for a projected 5 year length of operation.
2) Alternative 4 was evaluated for Blair Lakes only because of site constraints at the other areas.
3) Alternative 5 was evaluated for the Refueling Loop only. Relatively thick layers floating petroleum products at the other areas make this alternative unfeasible.

No short-term adverse impacts to workers or the environment during construction or operation are anticipated that could not be readily addressed using standard engineering practices.

Long-term Effectiveness and Permanence. Although this interim remedial action is not intended to fully address the statutory mandate for permanence, the removal of floating petroleum product which is a primary source of groundwater contamination is in furtherance of the statutory mandate for permanence. The alternatives offer varying degrees of long-term effectiveness and permanence, depending on the success of the technology. Removal of the floating petroleum products is the critical first step toward cleanup by removing the continuing source of groundwater contamination.

Alternative 2 is intended to remove floating petroleum product only and is not designed to treat subsurface soils above the groundwater table. Alternatives 3, 4, and 5 would provide a greater degree of long-term effectiveness and permanence by addressing subsurface soil contamination that also may be acting as a continuing source of groundwater contamination.

Reduction of Toxicity, Mobility, or Volume Through Treatment The goal of Alternatives 2,3,4,and 5 is to significantly reduce the volume of floating petroleum product and to minimize further migration of contamination into the groundwater. Alternative 3, Vacuum Extraction, and Alternative 5, Bioventing, would achieve this reduction through treatment by enhancing biodegradation of the petroleum product in the vadose zone.

Implementability. Alternative 2 has been used with varying degrees of success to address similar spills in the Fairbanks area. However, this alternative may be limited if large volumes of groundwater are removed as part of the extraction process. The extracted groundwater would require treatment before disposal.

Because it is still considered an innovative technology, Alternative 3 may have difficulties that complicate full-scale implementation. However, if proven successful, this alternative should produce smaller volumes of groundwater than Alternative 2.

IX The Selected Remedy

The following alternatives were selected for the four areas in OU1:

- ST20 Refueling Loop E-7 Complex: Alternative 5 - Bioventing

  ST20 Refueling Loop E-9 Complex: Alternative 2 - Free Product Extraction

- ST48 Powerplant Fuel Spill Area: Alternative 3 - Vacuum Extraction

- ST49 Building 1300: Alternative 2 - Free Product Extraction

- ST50 - ST53 Blair Lakes Target Range: Alternative 2 - Free Product Extraction

Remediation Goals

The primary goal and minimum objective of this interim action is to remove floating petroleum product from the groundwater in an attempt to control the source of continuing contamination. The Air Force will conduct free product removal in a manner that minimizes the spread of contamination into previously uncontaminated zones by using recovery and disposal techniques appropriate to hydrogeologic conditions at the site. The Air Force will properly treat, discharge, or dispose of recovery byproducts using methods approved by and in compliance with federal, state, and local law.

Floating petroleum product will be removed to the extent technically practicable as agreed to by the USAF, the USEPA and the ADEC or until the final remedy for OU1 is in place. Performance of the selected remedy will be evaluated periodically to determine if modifications are needed. For example, if in Alternative 2, static recovery systems initially installed fail to recover sufficient product, more recovery systems will be installed, maintenance and pumping of existing systems may be monitored more frequently, or the system may be replaced with more traditional dual pump systems, bioventing or vacuum extraction. It is the intent of these projects to operate during the seasonal temperatures of winter at Eielson. Based on changing site conditions or implementability difficulties, it may be appropriate to modify the system or utilize one of the other alternatives described in this Record of Decision.

ST20 Refueling Loop E-7 Complex

Alternative 5 was selected for this site because of the relatively thin layer of floating product and the favorable subsurface geology, which allows sufficient airflow to encourage bioremediation. Alternatives 2 and 3 were eliminated because of the marginal cost effectiveness associated with removal of thin layers of floating petroleum products.

A treatability study began in the summer 1991. This study will provide additional data to allow the treatment alternative to be fully developed and evaluated and to reduce cost and performance uncertainties.

ST20 Refueling Loop E-9 Complex

Alternative 2 was selected for this area. The relatively thick layer of floating petroleum product and the large number of existing wells allow for rapid removal of significant volumes of floating petroleum product. Alternatives 3 and 5 are constrained by the access and safety concerns caused by the adjacent flightline.

ST48 Powerplant Fuel Spill

Alternative 3 was selected because this relatively small area of contamination is suitable for bioremediation. Alternative 3 is also expected to result in smaller volumes of groundwater requiring treatment than Alternative 2. Alternative 5 is not appropriate because it is not capable of removing floating petroleum product of the thickness found at this site.

A vacuum extraction treatability study is planned for the fall of 1992. This study will provide additional data to allow the treatment alternative to be fully developed and evaluated.

ST49 Building 1300

Alternative 2 was selected for this area. The relatively thick layer of floating petroleum product and the large number of existing wells allow for rapid removal of significant volumes of floating petroleum product. Alternatives 3 and 5 are constrained by the access and safety concerns caused by the adjacent flightline.

ST50 through ST53 Blair Lakes Target Range Facility

Alternative 2 was selected for this facility because of the large area affected by floating petroleum product. Alternatives 3 and 5 would require an extensive number of wells to treat an area of this size. Alternative 4 is not preferred because contamination was identified under several buildings, precluding excavation as a viable alternative.

X STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited scope action, and is cost effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action utilizes treatment and thus is in furtherance of that statutory mandate.

Because this action does not constitute the final remedy for the Eielson AFB Operable Unit 1 site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action.

Subsequent actions are planned to address fully the threats posed by the conditions at Operable Unit 1. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be continuing during development of final remedial alternatives for Operable Unit 1.

Protection of Human Health and the Environment

The selected remedy aids protection of human health and the environment by minimizing further degradation of the groundwater through removal of the floating petroleum products that are acting as a continuing source of groundwater contamination. The vacuum extraction remedy selected for ST48 and the bioventing remedy selected for ST20 will also treat residual subsurface soil contamination that may also be acting as a source of groundwater contamination.

Compliance with Applicable or Relevant and Appropriate Regulations

The purpose of the interim remedial action is to remove floating petroleum product, a known source of contamination from the groundwater surface until the final remedy is implemented. This interim action is neither intended to restore the aquifer to drinking water conditions, nor to attain all federal and state ARARs relating to cleanup of the aquifer or the soil. The USAF, USEPA and ADEC expect that such ARARs will be addressed by the final remedy to be selected for the site.

The ARARs for this interim remedy relate to the treatment and disposal of groundwater that is collected and treated during implementation of the interim remedial action and for air emissions resulting from the treatment.

Air emissions resulting from the operations of a flare or an air stripper to the extent that they meet the criteria of a hazardous waste shall comply with the requirements of 40 CFR 265 Subparts AA & BB and the substantive requirements of State of Alaska Air Quality Control regulations (18AAC 50). (Alternatives 2,3 and 5)

Spent carbon from a carbon adsorption unit and filters and/or residual materials from the pretreatment system which meet the criteria of a characteristic waste will be stored, treated, recycled, or disposed of in accordance with the Resource Conservation and Recovery Act, 40 CFR Parts 262-264, 266, and 268. (Alternatives 2,3 and 5)

To the extent that effluent will be discharged to surface water bodies or subsurface, such discharge shall comply with the substantive requirements of Alaska Water Quality Standards set forth in 18 AAC 70 and Alaska Wastewater Disposal regulations set forth in 18 AAC 72. (Alternatives 2,3 and 5)

Cost Effectiveness

The selected remedy is cost effective because it provides overall effectiveness proportionate to the cost.

Utilization of Permanent Solutions and Alternative Treatment Technologies

This interim action is not designed or expected to be the final action for OU1, but the selected remedy represents the best balance of trade-offs among the alternatives with respect to the degree of overall protection of human health and the environment, compliance with ARARs, implementablity and cost

effectiveness, given the limited scope of this action.

Preference for Treatment as a Principal Element

Because this action does not constitute the final remedy for Operable Unit 1, the statutory preference for a remedy that employs treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action.

The selected remedies will significantly reduce the volume of floating petroleum product on the top of the water table and minimize further migration of contamination. The vacuum extraction and bioventing remedies reduce toxicity through removal and treatment of contaminants from subsurface soils.