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Record of Decision:

ELMENDORF AIR FORCE BASE
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DECLARATION OF THE RECORD OF DECISION
DECISION SUMMARY
RESPONSIVENESS SUMMARY

FOR

INTERIM REMEDIAL ACTION
OPERABLE UNIT 2
SOURCE AREA ST41
ELMENDORF AIR FORCE BASE
ANCHORAGE, ALASKA
JULY 1992

DECLARATION STATEMENT
for
RECORD OF DECISION
ELMENDORF AIR FORCE BASE
ANCHORAGE, ALASKA
OPERABLE UNIT 2, SOURCE AREA ST41 - INTERIM REMEDIAL ACTION
SEPTEMBER 1992

SITE NAME AND LOCATION

Elmendorf Air Force Base
Operable Unit 2, Source Area ST41, Interim Remedial Action
Anchorage, Alaska

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for Operable Unit 2, Source Area ST41 (Four-Million Gallon Hill) at Elmendorf Air Force Base, a National Priorities List site located in Anchorage, Alaska. The interim remedy was chosen 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 Federal Facility Agreement entered into by the United States Environmental Protection Agency (USEPA), the United States Air Force (USAF), and the State of Alaska on November 14, 1991, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site and is summarized in the attached Decision Summary.

The USAF is the lead agency for this decision. The USEPA approves of this decision and, along with the Alaska Department of Environmental Conservation (ADEC), has participated in the scoping of site investigations and evaluation of interim remedial action alternatives. The State of Alaska concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from Operable Unit 2, Source Area ST41, if not addressed by implementing the interim 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

This interim remedial action addresses contamination at one of seven operable units at Elmendorf Air Force Base. ST41 is one of two source areas in Operable Unit 2. The purpose of this interim remedial action is to initiate recovery of product floating on the groundwater surface, which poses the principal threat to human health and the environment. This action will also reduce further movement of contaminated groundwater through containment of seeps, thus eliminating a pathway of contamination to humans, wildlife, and plants from surface water and groundwater. The interim remedy is expected to be consistent with the final remedy that will be selected for Operable Unit 2 following completion of the remedial investigation/feasibility study.

The major components of the selected remedy include:

- Extraction of fuel product from the groundwater surface in the shallow aquifer to minimize further migration;

- Containment of seeps using collection systems and subsequent product aquifer to minimize further migration;

- Treatment of water collected from seeps and wells by an air stripping process to meet federal, state, and local regulations;

- Treatment of the emissions from the air stripping process to meet process to meet federal, state, and local regulations;

- Disposal of the treated groundwater in accordance with federal, state, and local regulations by discharge to the municipal wastewater system; and treatment process to provide design information for the final remedy.

DECLARATION

The selected remedy is protective of human-health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. Although this interim remedial action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim remedial action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the operable unit, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as the principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions may be necessary to fully address the risks posed by the conditions at this operable unit.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that this action continues to reduce the threat to human health and the environment. Review of this interim action will be conducted under the remedial investigation/feasibility study being performed for this operable unit.

Signature sheet for the foregoing Operable Unit 2, Source AreaST 41, Elmendorf Air Force Base Interim Remedial Action, Record of Decision between the United States Air Force and the United States Environmental Protection Agency, Region 10, with concurrence by the Alaska Department of Environmental Conservation.

South Central Regional Administrator
Alaska Department of Environmental Conservation

Signature sheet for the foregoing Operable Unit 2, Source Area ST41, Elmendorf Air Force Base Interim Remedial Action, Record of Decision between the United States Air Force and the United States Environmental Protection Agency, Region 10, with concurrence by the Alaska Department of Environmental Conservation.

Regional Administrator, Region 10
United States Environmental Protection Agency

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RECORD OF DECISION
ELMENDORF AIR FORCE BASE
ANCHORAGE, ALASKA
OPERABLE UNIT 2, SOURCE AREA ST41 - INTERIM REMEDIAL ACTION
JULY 1992

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Elmendorf Air Force Base (AFB), a National Priorities List (NPL) site, is located within the northern border of the Municipality of Anchorage, Alaska. The base is bordered on the east by the U.S. Army's Fort Richardson, on the south by the city of Anchorage, and on the north and west by the Knik Arm of Cook Inlet (Figure 1). The base encompasses approximately 13,130 acres, of which 7,077 acres are essentially undeveloped. Wetlands, lakes, and ponds cover approximately 1,416 acres. The approximately 6,053 acres remaining have been developed for airfield operations, base support operations, personnel housing, and recreational facilities. The base population is approximately 8,600 military personnel and dependents. Approximately 6,100 military personnel and 1,600 civilians work on base.

The interim remedial action for Operable Unit 2 (OU2) will occur at Source Area ST41 (ST41), also known as Four-Million Gallon Hill. ST41 is approximately 20 acres in size and is located near the western edge of the base, north of Loop Road, west of Brown Road, and approximately 2,200 feet east of the Knik Arm of Cook Inlet (Figure 2).

ST41 includes four one-million gallon, underground JP-4 and aviation gasoline storage tanks and ancillary piping constructed in the early 1940s. Reports indicate that the tanks are steel and may have an outer concrete lining. ST41 also includes an area of approximately one acre located west of the tanks which is described as a tank sludge burial area. The sludge burial area will be investigated in the ongoing remedial investigation/feasibility study (RI/FS) for OU2.

ST41 is situated on the glacially deposited Elmendorf Moraine. Elevations range from 225 to 275 feet above mean sea level on the northeastsouthwest trending moraine. Groundwater levels range from approximately 34 feet below ground surface on top of the moraine, to less than one foot below ground surface north and south of the moraine. Groundwater seeps are evident along the south side of the moraine. A similar seep is located on the north side of the moraine, where shallow groundwater is discharging to a wetlands area.

ST41 is located about 1,000 feet from the west end of the base airfield. Land in the vicinity of ST41 is basically undeveloped except for an abandoned underground tank complex to the east. Residences and residential support services occupy much of the southwest corner of the base about one-half mile south of ST41. Approximately one and one-half miles south of ST41, and just beyond the Government Hill Gate at the southwest corner of the base, is an Anchorage residential area commonly referred to as Government Hill. Industrial land uses beyond the southwest boundary of the base include railroad yards, a fuel storage tank farm, and marine facilities.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 History of Operations

Since installation in the early 1940s, the four tanks at ST41 reportedly have been subject to numerous leaks and above-ground spills estimated to total several hundred thousand gallons.

In the 1970s, an oil/water separator was installed in response to fuel seeping out of the south side of the Elmendorf moraine, north of Loop Road. During an inspection in May 1983, an additional fuel seep on the south side was discovered. In 1989, a concrete dam was

installed in an effort to recover fuel from the south seeps. During RI/FS work in 1991, a fuel seep was discovered on the north side of the Elmendorf moraine, discharging into a wetlands area.

Fuel product has been observed floating on the groundwater in monitoring wells located downgradient of the tanks. Leak tests conducted in late 1990 indicated that all four tanks and piping were leaking. In January 1991, the tanks and piping were pumped dry and taken out of service.

Fuel-related contaminants, including benzene, have been detected in the groundwater and the surface water seeps downgradient of the tanks at levels above the maximum contaminant levels (MCLs) established by the Safe Drinking Water Act and the Alaska Water Quality Standards (Table 1).

2.2 History of Site Investigations

In 1983, the USAF began studies of Elmendorf AFB through its installation Restoration Program (IRP). Source Area ST41 was identified through a records search conducted in 1983 which indicated that numerous leaks and above-ground fuel spills had occurred since the tanks were installed in the 1940s. Two groundwater monitoring wells were installed downgradient of the seeps in 1984. Analytical results of groundwater samples indicated no water quality problems downgradient of the seeps.

Remedial investigation activities performed in 1988 and 1989 included the drilling of twenty-six borings, seventeen of which were completed as monitoring wells. Two test trenches were dug on the south side of the moraine, a terrain conductivity survey was conducted in the tank sludge burial area, and soil-gas samples were collected. Results of the investigation indicated that the soil and water samples collected at the site were contaminated with fuel and with the soluble components of fuel.

In August 1990 and May 1991, additional investigative activities were conducted including collection of surface water (seep) samples, subsurface soil samples, groundwater probe samples, and product probe samples; installation of nine monitoring wells; and sampling of monitoring wells. Evaluation of the data from these sampling efforts serves as the basis for this interim action.

Groundwater data indicate that groundwater within an approximate 500-foot radius around ST41 is contaminated and floating product exists downgradient of both the north and south tanks. In addition, soil and surface water contamination exist at ST41.

2.3 History of Enforcement Actions

In 1989, Elmendorf AFB was proposed for placement on the NPL. The facility was placed on the NPL in August 1990. A Federal Facilities Agreement (FFA) for Elmendorf AFB was signed on November 14, 1991 by the USAF, USEPA, and ADEC. The FFA documents and facilitates cooperation and information exchange between the USAF, USEPA and ADEC during development, implementation, and monitoring of appropriate response actions at the base. These actions must be in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The FFA also establishes requirements for the performance of remedial investigations and interim remedial actions at the base, including ST41.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Prior to conducting community relations activities for ST41, a public workshop was held to discuss the various environmental cleanup programs underway at Elmendorf AFB. On January 28, 1992, the date and location of the workshop were advertised in the Anchorage Daily News and Anchorage Times. On January 29, 1992, the USAF issued a press release announcing the public workshop which was held on February 5, 1992 at the Government Hill Elementary School. Approximately 75 individuals attended the workshop.

The Proposed Plan for ST41 was released to the public for comment on February 17, 1992. The document was mailed to approximately 240 individuals on the Elmendorf AFB mailing list. This document was also made available to the public in the administrative record maintained in Anchorage at the Bureau of Land Management's Alaska Resources Library in the Federal Building and at the Consortium Library of the University of Alaska at Anchorage. A notice of the public comment period and the availability of this document was published in the Elmendorf AFB newspaper, the Sourdough Sentinel, on February 13, 1992, and in the Anchorage Times and the Anchorage Daily News on February 16, 1992. A public comment period on the Proposed Plan was held from February 17, 1992 to March 17, 1992.

A public meeting was held on February 27, 1992 at the Wilda Marston Theater at the Z.J. Loussac Library in Anchorage to present the Proposed Plan. Approximately 30 individuals attended the public meeting. At this meeting, USAF, USEPA, and ADEC representatives discussed the project, answered questions, and received public comments. A verbatim transcript of the meeting was prepared by a court reporter. Written comment forms were distributed at the public meeting.

Seven sets of written comments were received during the public comment period. Responses to the comments received during the public comment period and at the public meeting are included in the Responsiveness Summary, Attachment A to this Record of Decision (ROD).

In February 1992, the first issue of Environmental Update, a quarterly newsletter aimed at keeping the public informed of the status of environmental cleanup programs at Elmendorf AFB, was distributed to workshop attendees and individuals on the mailing list. The second issue of Environmental Update was distributed in May 1992 to individuals on the mailing list.

4.0 SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Operable Unit 2, which contains ST41, is one of seven operable units comprised of 32 known and/or suspected hazardous waste sites located at Elmendorf AFB. Existing site characterization data indicated OU2 source areas presented substantial threats to human health and the environment. This ROD for OU2 addresses the first interim remedial action at Elmendorf AFB.

The interim remedial action is needed to reduce the further spread of fuel constituents, and thereby reduce the potential risk of impact to existing and future groundwater users located downgradient of the site, and initiate a strategy expected to be consistent with the final remedy. This action is limited to addressing floating product and seep contamination, whereas the final remedy will also consider groundwater and soil cleanup. The selected interim action includes product extraction, containment of seeps, treatment of collected water, and disposal. These elements will likely become major components of the final remediation at the site.

Remedial investigation field work is currently underway at OU2. Prior to completion of the RI report, data collected will be used to prepare a baseline risk assessment. Under the Federal Facilities Agreement, the draft RI/FS is to be submitted to USEPA by January 15, 1994. The draft ROD for OU2 is scheduled to be submitted to USEPA by July 15, 1994.

5.0 SUMMARY OF SOURCE AREA CHARACTERISTICS

5.1 Geology and Hydrology

Geologic units of concern at and near ST41 include the Elmendorf Moraine, the Anchorage Plain alluvium, the Bootlegger Cove Formation, and unnamed sediments that underlie the Bootlegger Cove Formation.

ST41 is situated on the glacially deposited Elmendorf Moraine. The moraine consists of laterally and vertically discontinuous, unconsolidated, glacial till with poorly sorted boulders, gravel, sand, silt, and clay. The Bootlegger Cove Formation, a low permeability

clay layer, is believed to underlie ST41, although the borings to date have not been drilled deep enough to confirm this.

The Anchorage Plain alluvium, often called the outwash plain, is present approximately one-quarter mile south of the Elmendorf Moraine. The deposits of this unit are characterized by gravel and sand with minor amounts of silt. In general, the outwash plain deposits mantle the base from Ship Creek to the Elmendorf Moraine. These deposits are underlain at variable depth by the Bootlegger Cove Formation, which in turn is underlain by unnamed sediments similar to the outwash plain sediments. The stratigraphic relationship of the sediments of the outwash plain to the Elmendorf Moraine at ST41 is currently unknown.

Groundwater is present in all four of the geologic units described above. However, significant quantities of water are only obtainable from the outwash plain deposits and the deposits which underlie the Bootlegger Cove Formation. The shallow water table aquifer of the outwash plain is believed to be separated from a deeper confined aquifer in the unnamed sediments by the Bootlegger Cove Formation. This clay layer is expected to act as a barrier that significantly retards movement of groundwater and contaminants between these aquifers.

At ST41, groundwater is found in the sediments of the Elmendorf Moraine. Because of the lateral and vertical heterogeneity of these deposits, groundwater is typically found in perched systems and is in greatest abundance in sand and gravel lenses within the moraine. Evidence of perched groundwater is indicated by the presence of groundwater seeps along the south and north sides of the moraine.

Groundwater level measurements in existing monitoring wells at ST41 indicate that a groundwater divide is present at the crestline of the moraine. In general, groundwater on the north side of ST41 flows northwest and groundwater on the south side of the moraine flows southeast. Water levels at ST41 are highly variable, ranging from 34 feet below ground surface on top of the moraine to approximately one foot below ground surface south of the moraine.

The hydraulic interaction between groundwater found in the Elmendorf Moraine sediments at ST41, the shallow water table aquifer, and the deeper confined aquifer is not fully understood. Numerous borings and monitoring wells have been drilled on and around ST41. However, the depth of these borings was insufficient to determine and characterize the hydrogeologic environment below ST41.

As part of ongoing RI activities, borings will be drilled at and near ST41 to more fully characterize the geologic and hydrogeologic environment. This effort will provide information useful in understanding and defining the potential for contaminant migration to the shallow water table aquifer and the deeper confined aquifer.

No Elmendorf AFB supply wells in the immediate vicinity of ST41 obtain water from the shallow groundwater aquifer. In general, the deeper confined aquifer at Elmendorf AFB serves currently only as a stand-by water supply when surface water supplies cannot meet demand. The area surrounding Elmendorf AFB uses surface water for various services, including industrial, commercial, domestic, and public supply. The nearest wells using the shallow aquifer are private water wells located in the Government Hill residential area south of and adjacent to the base. These wells are located over one and onehalf miles away and not directly downgradient of the site; thus, the wells are not expected to be in danger of contamination from ST41.

5.2 Sources and Types of Contaminants

The source of contamination at ST41 was periodic surface spills and subsurface leaks in the tanks. Leaking valves and pipes may also have contributed. The volume of fuel released is estimated to have been several hundred thousand gallons. The spills and subsurface leaks have resulted in fuel product floating on the groundwater and seeping

from locations on the north and south sides of the hill. Dissolved constituents of the fuel product have also contaminated the groundwater.

The primary contaminant at ST41 is the fuel product JP-4, although other types of fuel products may also have been stored in the tanks. The main compounds of concern in JP-4 are benzene, toluene, ethylbenzene, and xylenes (BTEX). Benzene, a known human carcinogen, is the most toxic and mobile of the BTEX compounds.

Although the ongoing RI/FS will determine the full extent of contamination at ST41, the following information has been obtained from previous investigations. Subsurface soil samples contain elevated levels of BTEX, lead, and total petroleum hydrocarbons. Free product was observed floating on top of the groundwater in two monitoring wells downgradient of the tanks. In one well 125 feet south of the tanks, 0.30 feet of product was encountered at 14.5 feet below ground surface. In a well 25 feet north of the tanks, 1.62 feet of product was encountered at 18.21 feet below ground surface.

Benzene concentrations in groundwater range from 10 micrograms per liter (ug/L) to 15,000 ug/L south of the tanks and were measured at 1,600 ug/L at one location north of the tanks. TPH contamination exhibits a similar distribution, ranging from 0.3 milligrams per liter (mg/L) to 730 mg/L south of the tanks, and 120 milligrams per liter (mg/L) north of the tanks. Trichloroethene (TCE) was detected at 12 ug/L in groundwater from one monitoring well located northeast of the tanks, and will be addressed in the ongoing RI/FS.

A surface water (seep) sample was collected on the north side of the moraine in the wetlands approximately 200 feet northwest of the tanks. The sample contained BTEX concentrations of 1,670 ug/L with benzene at 400 ug/L. Total arsenic was also slightly elevated at 0.07 mg/L; the MCL is 0.05 mg/L. Visible petroleum contamination was observed at the two seeps approximately 200 feet south of the tanks on the south side of the moraine.

Antimony, arsenic, cadmium, chromium, lead, nickel, selenium, and thallium have been detected above MCLs in groundwater from monitoring wells located near the tanks and the tank sludge disposal area. The highest metals contamination was evident in groundwater collected from a monitoring well located north and hydrogeologically downgradient of the sludge disposal area west of the tanks. Future RI activities will attempt to determine if the metal concentrations can be attributed to Elmendorf AFB operations or if the observed concentrations are representative of natural background conditions.

6.0 SUMMARY OF SOURCE AREA RISKS

The continued release of contaminants into groundwater currently poses the most significant human health risk at ST41. This contamination could potentially affect base standby water supplies. The north surface seep discharges into an adjacent wetlands, posing an ecological risk at ST41. The south seeps discharge into a drainage ditch adjacent to the road, posing risks to human and ecological receptors.

Before a clear understanding of the risks posed by ST41 can be determined, more information must be collected and a quantitative risk assessment must be performed. The risk assessment will be conducted during the ongoing RI/FS.

Contaminants have consistently been observed beneath ST41 in the shallow aquifer. Data collected from monitoring wells indicate that contaminants, including benzene, toluene, ethylbenzene, TCE, and metals are present at levels above MCLs. A surface water sample from the north seep indicates that benzene is present above the Alaska Water Quality Standards. Table 1 summarizes this information.

Existing data indicate that benzene is present in the groundwater as far as 400 feet to the south and 250 feet to the north of ST41, although the actual boundary of the contamination is uncertain.

7.0 DESCRIPTION OF ALTERNATIVES

The USAF, USEPA, and ADEC initially screened a range of alternatives that would achieve significant risk reduction while the final remedy for ST41 is being developed. The list was narrowed to the following three alternatives for evaluation in the Proposed Plan:

- Alternative 1 - No Action;
- Alternative 2 - Product Removal Using Existing Storage Tanks and Seep Containment; and
- Alternative 3 - Product Removal Using Recovery Wells and Seep Containment

The no-action alternative was evaluated consistent with the requirements of the NCP and serves primarily as a point of comparison for other alternatives. The other two alternatives were selected for more detailed evaluation because they could be readily implemented using commonly available technologies and equipment. If effective, the two alternatives would reduce risk by controlling further migration of contaminants from the seep(s) and by initiating removal of a source of contamination through extraction of the fuel product floating on the groundwater.

A description of the three alternatives follows.

7.1 Alternative 1 - No Action

Under this alternative, no interim remedial actions would be implemented at ST41. The condition of the buried tanks would be unchanged with groundwater or surface water possibly entering the tanks until an equilibrium of inflow and outflow was reached. The floating product would remain on the shallow groundwater surface and continue to dissolve in the groundwater and migrate away from the tanks. The discharge at the seep areas would continue and the amount and extent of floating product would remain undefined until the RI/FS was completed and a final remedy selected. No costs are associated with the no action alternative other than monitoring, which is part of the remedial investigative costs under all alternatives.

7.2 Alternative 2 - Product Removal Using Existing Storage Tanks And Seep Containment

Under this alternative, the four existing storage tanks would be utilized for product collection. The tanks would be cleaned to remove any existing product, water, and/or sludge. Floating product would be removed and recycled. Water in the tanks would be pumped and sent to the collection sumps. Sludge would be removed, treated with an emulsion-breaking chemical, and piped to the collection sumps. The tank walls would be perforated, as necessary, to allow larger quantities of fuel product and groundwater to flow back into the tanks for collection. A metered float control system would be used to pump the fluid from the tanks. The fuel/water mixture collected from the tanks would be processed through collection sumps to separate the fuel product from the contaminated water, thus allowing the fuel to be recovered and recycled. Waste water from the collection sumps would be sent to an air stripper for treatment. When the system was no longer effectively extracting fuel, all remaining liquids and sludge would be removed from the tanks. Final tank closure would be addressed in the final remedy for ST41.

The elements described below, seep containment, air stripping, and groundwater monitoring, are common to both Alternative 2 and Alternative 3.

Seep containment would occur through the installation of a perforated pipe or an infiltration trench to collect the floating fuel and contaminated groundwater discharging at the two seeps on the south side of the moraine and one seep on the north side. The collected fuel/water mixture would be gravity fed to a collection sump, which would allow the lighter fuel to separate to the top of the water. A collection sump would be placed near the seep containment system on the north side and another between the two seep

containment systems on the south side of ST41. If geological conditions are found to be favorable during construction of the groundwater collection system, the system might be expanded laterally to collect more free product and contaminated water. Gravity collection systems would be used, where possible, to limit pumping requirements and to minimize mixing of the fuel with the water. If it was determined that the collection sumps were not providing adequate separation, an oil/water separator would be placed in the collection sumps. Fuel from the collection sumps would be recycled or recovered for its heating value. Contaminated soils removed during installation of seep containment systems and collection sumps would be stored on base with other fuel-contaminated soil. The contaminated soil would be addressed in the final remedial action for ST41.

Water from the collection sumps would be pumped to an air stripper for treatment. This air stripper would be located in the immediate vicinity of ST41. Air stripping is the best demonstrated available technology (BDAT) for removing volatile organics, such as BTEX compounds, from contaminated groundwater. In the air stripping process, volatile organics would be transferred from the water phase to the air phase. Iron/biological pretreatment would be included because of the high iron content of the groundwater. This treatment could be expanded to include some other metals, as necessary. Design of the pretreatment unit would take into account other parameters, such as temperature, and suspended and dissolved solids, which could affect the efficiency of the air stripper. Air emissions from the air stripper would be treated by carbon adsorption to remove any volatile organics such as benzene, toluene, ethylbenzene, and xylene. Carbon adsorption units would be placed on the air stripper to provide maximum control and minimum release of the volatile organics back into the environment. Discharge air from the carbon adsorption unit would be periodically sampled to ensure that no organics were being emitted in excess of allowable standards. If the air did not meet discharge requirements, enhancements to the carbon adsorption unit or other treatment systems would be evaluated. The spent carbon filters from the air stripping process would be disposed of in accordance with federal and state regulations. Effluent water from the air stripping process would be discharged to the Anchorage municipal wastewater system through the Elmendorf AFB collection system. Sampling and analysis would be performed to ensure that effluent meets the requirements for discharge into the system. Effluent water would be sampled for BTEX and other organic compounds, and for heavy metals. If air stripping treatment did not meet the effluent requirements for discharge of water into the base sewer system, other water treatment systems would be evaluated.

Groundwater monitoring during the remedial activities would be used to evaluate performance and success of the interim remedial action and aid in the selection of the ultimate remedy for the source area. Monitoring points would be located downgradient, within, and at the edges of the plume as determined by the soil gas survey conducted as part of the OU2 RI/FS field program. Existing monitoring wells, and possibly additional monitoring wells or piezometers, would be used. Monitoring would occur at least three times annually, in early spring, late summer, and late fall, as part of the RI/FS activities. Climatic conditions make winter sampling events unfeasible. The groundwater would be monitored for BTEX, other volatile organic compounds, and heavy metals. Gradients and product thickness would be measured to determine the movement of product and the effectiveness of the action.

The success of this alternative in terms of the quantity of product and groundwater which could be recovered and treated is directly related to the position of the water table with respect to the tanks. It is unclear whether any or all of the tanks are in contact with groundwater, whether the groundwater gradient could be reversed, and whether any of the fuel product is at a higher elevation than the leaking portions of the tanks.

Engineering design of Alternative 2 would take approximately 6 months. Actual construction would take approximately 30 days but would not occur during winter months. The amount of time required for product to flow back into the tanks is highly uncertain as is the amount of product and water which would be recovered.

The estimated capital cost of Alternative 2 is $300,800, and estimated operation and

maintenance (O&M) costs are $27,500 per year. The total present worth of Alternative 2 is estimated to be $438,300 assuming a 5-year period of operation and a 10 percent interest rate.

7.3 Alternative 3 - Product Removal Using Recovery Wells and Seep Containment

In this alternative, a minimum of four 10-inch diameter extraction wells would be installed to a depth of approximately 40 feet to remove floating product from the groundwater surface on both the north and south sides of the moraine. Two recovery wells would be installed at both the north and south side of ST41 near each of the two monitoring wells in which product has been found. The wells would be pumped to draw down the water table and enhance the collection of the product. The collected fuel/water mixture would be separated and handled as described previously in the Alternative 2 description. The collected water would be treated by air stripping.

The lateral extent of the floating product would be assessed using product probes or soil gas measurements downgradient of the tanks and in wells with known floating product. If the fuel product extends a long distance from the tanks, additional wells might need to be added to increase product recovery. Information gathered from the performance of these wells would be used to determine the need for additional wells or the need to evaluate other product extraction technologies.

Seep control, air stripping, and groundwater monitoring would be as described previously in the Alternative 2 description.

Engineering design of Alternative 3 would take approximately 6months. Actual construction would take approximately 30 days but would not occur during winter months. The actual flow rate and quantities of fuel and groundwater expected to be recovered are uncertain. This is because the extent of the product plume is not well defined, and hydrogeologic characteristics of the soil are highly variable.

The estimated capital cost of Alternative 3 is $329,800, and estimated O&M costs are $27,500 per year. The total present worth of Alternative 3 is estimated to be $467,300 assuming a 5-year period of operation and a 10 percent interest rate.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The National Contingency Plan identifies nine criteria to be used to evaluate remedial alternatives. These criteria are described below as they apply to an interim action. The first two listed criteria represent threshold criteria that must be met by the interim action alternatives. The criterion for long-term effectiveness and permanence was not considered relevant, because an "interim" action is, by definition, a short-term remedy. The three interim action alternatives were evaluated against the other eight criteria to select a remedy.

8.1 Criterion 1: Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled.

Based on the preliminary findings, floating product and fuel contaminated groundwater appear to be restricted to the shallow aquifer, which is not presently used as an on-base drinking water supply. However, future risks to possible downgradient groundwater users might occur if groundwater contaminants continue to migrate away from ST41 and eventually, off base. For this reason, protection of human health and the environment was assessed relative to the ability of each alternative to remove floating product and contain contaminated groundwater coming to the surface at the seeps.

Alternatives 2 and 3 are both protective of human health and the environment. Both would

remove floating fuel product, the primary source of contamination, and are protective of future groundwater uses. The proven extraction technology of Alternative 3 may be more reliable than Alternative 2 in collecting floating product. The effectiveness of Alternative 2 involves some measure of uncertainty with changing the groundwater gradient to induce flow of product and contaminated groundwater back into the perforated tanks. Both Alternatives 2 and 3 involve final off-site treatment or disposal of the spent carbon from the air stripper. Under Alternative 1 (no action), the migration and spread of floating product and contaminated groundwater discharging at the seeps would continue until the final remedy was implemented.

8.2 Criterion 2: Compliance with Applicable or Relevant and Appropriate Requirements

The purpose of the interim remedial action is to remove floating product, a known source of contamination from the groundwater surface, and to contain contaminated groundwater where it comes to the surface at the seeps 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. The USAF, USEPA, and ADEC expect that such ARARs will be met 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.

Alternatives 2 and 3 involve the discharge of processed wastewater to the Anchorage municipal wastewater system through the Elmendorf AFB collection system in accordance with Anchorage Water and Wastewater Utility (AWWU) requirements of 100 parts per billion (ppb) for BTEX and 10 mg/l for TPH. State and federal air emission standards would be met through the use of carbon adsorption units on the air stripper. The used air stripper carbon would be disposed of in accordance with federal and state regulations. All work in nearby wetlands would be conducted in accordance with the substantive requirements of the Clean Water Act, Section 404. No chemical-specific ARARs exist for the limited scope of this interim remedial action. No ARARs are identified for Alternative 1 since no action is involved.

8.3 Criterion 3: Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once clean-up goals have been met.

For this interim action, this criterion was not considered due to the limited scope of the interim remedial action. The final remedy at ST41 is expected to provide both long-term effectiveness and permanence. However, all contaminants extracted would be permanently removed as a source of groundwater contamination.

8.4 Criterion 4: Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the preference for a remedy that uses treatment to reduce health hazards, contaminant migration, or the quantity of contaminants at the site.

Alternatives 2 and 3 would reduce the toxicity, mobility, and volume of groundwater contaminants through the extraction and treatment of fuel product and small amounts of contaminated groundwater. Both Alternatives 2 and 3 would reduce toxicity through treatment of extracted groundwater and seep water. Alternative 3 would actively remove floating product and therefore reduce mobility and volume sooner than Alternative 2. Alternative 2 may be less effective due to the unproven extraction technology and unknown length of time required to draw product back into the perforated tanks. Under Alternatives 2 and 3, spent carbon filters would be disposed of off-site for further

treatment. Alternative 1 (no action) would not achieve any of these goals.

8.5 Criterion 5: Short-Term Effectiveness

Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.

Alternatives 2 and 3 can be designed and installed in less than one year with minimal impact to human health. Floating product containment can be effected within a short period of time following initiation of pumping. Construction may involve some temporary adverse impacts due to disturbance of adjacent wetlands. However, actions will be taken to minimize and mitigate adverse impacts. Construction is not expected to increase the current site risk to on-site workers, base personnel, or the surrounding communities. During construction, no noise impact to base residential communities or surrounding communities is anticipated given the large distance (approximately 1.8 miles) to the nearest off-base community and the nature of the construction involved in implementing either of these alternatives. Air emissions and water and solid residual disposal will be regulated by ARARs. Alternative 1 has no short-term effectiveness.

8.6 Criterion 6: Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. It also includes coordination of federal, state, and local governments to clean up the site.

Implementation of Alternatives 2 or 3 would be relatively straightforward with few administrative requirements that would cause delays. Both alternatives could be expanded and used as part of the final remedial action. Alternative 2 would utilize existing tanks, possibly making it easier to initiate. Alternative 3 would require more time for the installation of new recovery wells. For either alternative, steep grades and the freeze/thaw cycle will be taken into account during design of the system. The system will not be designed for winter operation when temperatures are consistently below 32 degree Fahrenheit. For either alternative, contractor and equipment requirements would be easily obtainable locally.

8.7 Criterion 7: Cost

This criterion examines the estimated costs for each remedial alternative. For comparison, capital and annual O&M costs are used to calculate a present worth cost for each alternative.

Alternative 1 does not meet threshold criteria. Alternative 2 has a slightly lower estimated capital cost ($300,800) than Alternative 3 ($329,800). The higher cost of Alternative 3 is associated with mobilizing a drilling crew for recovery well installation. Estimated O&M costs ($27,500 yearly) for Alternatives 2 and 3 are the same. Estimated present worth is $438,300 for Alternative 2 and $467,300 for Alternative 3, assuming a 5-year period of operation and a 10 percent interest rate for each alternative.

8.8 Criterion 8: State Acceptance

The State of Alaska Department of Environmental Conservation has been involved in the selection of the interim remedial action and concurs with the selection of the remedy as described in Section 9.0.

8.9 Criterion 9: Community Acceptance

Based on comments received during the public comment period and at the public meeting, the public generally supports the selected remedy. Comments received are described in the

attached Responsiveness Summary. The major concern of the community in relation to the interim remedial action was that contamination in all media at ST41 be fully addressed in the final remedy.

9.0 SELECTED REMEDY

The selected interim remedial action for this Operable Unit is Alternative 3, Product Removal Using Recovery Wells and Seep Containment. This remedy calls for the design and implementation of an interim remedial action to protect human health and the environment. The goal of this remedial action is to initiate removal of floating product from the shallow groundwater surface, reduce further movement of contaminated groundwater, and eliminate a pathway of contamination to humans, wildlife, and plants from surface water and groundwater. The ultimate level of remediation to be attained for this source area will be determined in the final remedy for ST41.

Alternative 3 includes the following key elements:

- Product extraction from the groundwater surface in the shallow aquifer to minimize further migration of floating fuel;
- Seep containment using collection systems and subsequent product to minimize further migration of floating fuel;
- Treating the water collected from seeps and wells by an air stripping process to meet federal, state, and local regulations;
- Treating the emissions from the air stripping process to meet state process to meet federal, state, and local regulations;
- Disposing of the treated groundwater in accordance with federal, state, and local regulations by discharge to the municipal wastewater system; and
- Monitoring of the effectiveness of the groundwater containment and treatment process to provide design information for the final remedy.

9.1 Recovery System Approach

The selected remedy includes the installation of four extraction wells to remove floating product from the shallow groundwater surface. Two extraction wells will be located in proximity of each monitoring well in which floating fuel product had been observed during past sampling events. The wells will be pumped to draw down the water table and enhance the collection of the product. Additional recovery wells may be installed to increase product recovery, as necessary. Seeps on the north and south sides of the moraine will be controlled through the installation of perforated pipes or infiltration trenches to collect the fuel/water mixture.

The extent of the fuel plume is not well defined, and hydrogeological characteristics of the soil are highly variable. Thus, the actual flow rate and quantities of fuel and groundwater expected to be recovered are uncertain. An initial engineering estimate has been made that the contaminated groundwater flow at the recovery wells will be 1.0 gallons per minute (gpm) and the flow rate at each seep will average 2.0 gpm. Some changes may be made to the recovery system as a result of the detailed design and construction processes. Such changes, in general, reflect modifications resulting from the engineering design process.

9.2 Effectiveness of Treatment Technology

Air stripping is the selected treatment process. It is a proven technology for the extraction of organic contaminants from groundwater. Prior to air stripping, the fuel/water mixture recovered from the groundwater and seeps will be processed through

collection sumps. Fuel from the sumps will be recycled or recovered for its heating value. Contaminated water will be pumped from the sumps to the air stripper for treatment. A pretreatment system will be included, as necessary, to reduce dissolved and suspended solids and microorganisms that might inhibit the operation of the air stripper. Filters and/or residual materials from the pretreatment system will be disposed of in accordance with the federal off-site disposal policy (OSWER 9834.11) and state regulations.

It is expected that the air stripper will remove 99.5% to 99.9% of the organics in the contaminated groundwater. An initial estimate of JP-4 solubility in water is 60.88 mg/l. Benzene, the primary contaminant of concern, makes up approximately 3% by weight of JP-4. Thus the maximum benzene concentration in the contaminated water is expected to be 1800 ppb. Based on these calculations and assumptions, the air stripper should provide removal of benzene to a concentration of 1.8 ppb in the effluent water which is below the 5.0 ppb MCL for benzene.

Emissions from the air stripper will contain the volatile organic compounds removed from the contaminated groundwater. Prior to discharge to the atmosphere, the air emissions will be treated by carbon adsorption to remove the volatile organics. The spent carbon will be disposed of in accordance with the federal off-site disposal policy (OSWER 9834.11) and state regulations. Preliminary risk calculations based on an estimated benzene concentration in the discharge air of 0.0005 parts per million (ppm) indicate that a risk of 10[-5] at the point of discharge exists. This risk is expected to be further reduced in the breathing zone, is considered acceptable, and represents an overall reduction of risk at ST41. This estimate assumes maximum expected concentrations of benzene in the groundwater, maximum groundwater flow, minimum air flows, complete volatilization of benzene, and a 95 percent removal of benzene by carbon adsorption. The actual expected discharge values will be determined during design of the interim remedial action treatment system. During the design phase, ADEC will review and establish air monitoring criteria.

9.3 Treated Water Disposal

The selected discharge method for the treated water is to discharge to the Anchorage municipal wastewater system through the Elmendorf AFB collection system. Organics concentrations would be well below the AWWU allowable standard for BTEX of 100 ppb and for TPH of 10.0 mg/l.

9.4 Cost

The estimated present worth for the selected remedy is $467,300 assuming a 5-year period of operation and a 10 percent interest rate (Table 2). The estimated total capital cost is $329,800. Annual O&M costs are estimated to be $27,500.

9.5 Summary

The selected alternative calls for the design and implementation of an interim remedial action to protect human health and the environment. The goal of this interim remedial action is to initiate removal of floating fuel product from the shallow groundwater surface, reduce further movement of contaminated groundwater, and eliminate a pathway of contamination to humans, wildlife, and plants from surface water and groundwater. The ultimate level of remediation to be attained at ST41 will be determined in a final remedial action for this source area. This interim remedial action will be monitored carefully to determine the feasibility of achieving aquifer restoration with this method and to ensure that hydraulic control of the contaminated plume is maintained. After the period of time necessary to complete the RI/FS and arrive at a final decision for ST41, a final ROD for OU2 will be prepared that will specify the ultimate goal, remedy, and anticipated time-frame. Upon completion of this RI/FS, the interim system may be incorporated into the design of the remedy specified in the final remedial action ROD.

10.0 STATUTORY DETERMINATIONS

The USAF's and USEPA's primary responsibility under their legal CERCLA authority is to select interim remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, as amended by SARA, provides several statutory requirements and preferences. The selected remedy must be cost-effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that permanently or significantly reduce the volume, toxicity, or mobility of hazardous substances through treatment. CERCLA also requires that the selected remedial action for the site must comply with ARARs established under federal and state environmental laws, unless a waiver is granted.

The selected alternative for this interim remedial action is protective of human health and the environment. It meets ARARs within the limited scope of the action and is cost effective. The preferred alternative is consistent with the statutory mandate for treatment to the maximum extent practicable. It represents the best balance of trade-offs among the alternatives with respect to pertinent criteria given the limited scope of the action. Because this is an interim action, review of this remedy will be ongoing as the USAF continues to develop final remedial alternatives for the site.

10.1 Protection of Human Health and the Environment

The selected interim remedial action will protect human health and the environment by initiating removal of the source of contamination through extraction of the product floating on the shallow groundwater, and also by reducing the further migration of fuel constituents in groundwater discharging at the seeps. The selected remedy thus reduces the threat to future potential drinking water supplies located beyond the current site boundaries.

The treatment of contaminated water will be to a level that meets ARARs and is protective of human health and the environment. The contaminants will be permanently removed from the groundwater through the treatment process which includes air stripping. As necessary, pre-treatment and post-treatment processing will be employed to ensure the disposed water and treatment residues do not constitute an unacceptable risk to human health or the environment.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all applicable or relevant and appropriate action- and location-specific requirements (ARARs). No chemical-specific ARARs exist for the limited scope of this interim remedial action. In addition, USEPA, the State, and USAF have agreed to consider USEPA guidance governing the control of air emissions from air strippers (OSWER Directive 9355.0-28, Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites, issued June 15, 1989).

10.2.1 Action-Specific ARARs

- To the extent hazardous waste, as defined by the Resource Conservation and Recovery Act, 42 U.S.C. SS 6901 et. seq., is extracted from the groundwater, air emissions resulting from operations of an air stripper shall comply with the requirements of 40 CFR 264 Subparts AA and Recovery Act, 42 U.S.C. SS 6901 et. seq., is extracted from the groundwater, air emissions resulting from operations of an air stripper shall comply with the requirements of 40 CFR 264 Subparts AA & BB. Spent carbon from the carbon adsorption unit and filters and/or residual materials from the pretreatment system will be stored and disposed of or recycled at a RCRA-approved facility in accordance with the USEPA policy on offsite disposal of CERCLA waste.

- Processed wastewater will be discharged into the Anchorage municipal wastewater system through the Elmendorf AFB collection system in accordance with 40 CFR 403.5

and the Anchorage Water and Wastewater Utility requirements of 100 ppb for BTEX and 10 mg/l for TPH. requirements of 40 CFR Part 125 and the Alaska Wastewater Disposal regulations set forth in 18AAC62.

- 40 CFR Part 230 sets forth guidelines pursuant to Section 404 of the Federal Water Pollution Control Act, 33 U.S.C. S 1344, to control discharges of dredged or fill material into the waters of the United States, including special aquatic sites such as wetlands.

- State of Alaska Air Quality Control regulations (18AAC50) establish criteria for ambient air quality from sources such as air strippers.

10.2.2 Location-Specific ARARs

- 40 CFR Part 6, Appendix A, requires that federal agencies conduct activities to avoid, to the extent possible, the long and short-term adverse impacts associated with the destruction or modification of wetlands.

10.3 Cost Effectiveness

The selected interim remedial action is cost-effective, because it protects human health and the environment, attains ARARs, and meets the objectives established for the interim action in a way that is proportional to its cost. The cost of the selected remedy is slightly higher than Alternative 2; however, there are concerns about the effectiveness of Alternative 2 for the purposes of this interim action. Alternative 1 is the least expensive, but does not achieve the objectives of the interim action.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

Although the selected interim remedial action has certain features of a permanent solution because of its use of a treatment technology, this is a limited scope action and is not intended to provide a final remedy for this site. Product extraction and treatment of collected water will minimize further significant contaminant spread in the groundwater and will permanently reduce the toxicity, volume, and mobility of contaminants by collection on activated carbon for off-site recycling or destruction. The treatment process for the extracted groundwater and collected surface water will be designed to meet or exceed state and federal standards for the protection of human health and the environment prior to discharge.

10.5 Preference for Treatment as a Principal Element

This action is being undertaken primarily to remove the source of contamination and limit the spread of contaminants in the groundwater in the shallow aquifer beneath ST41. While this interim action does employ treatment, the statutory preference for remedies employing treatments that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants as a principal element will be more fully addressed in the final decision document for this operable unit.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The selected interim remedial action is the preferred alternative presented in the Proposed Plan and during the public meeting. No changes to the components of the preferred alternative have been made.