Proposed Plan for Remedial Action at

OPERABLE UNIT A AND OPERABLE UNIT B

Fort Richardson, Alaska

January 1997

This Proposed Plan presents cleanup strategies for Operable Unit ***(OU-)*** A and cleanup alternatives for OU-B at Fort Richardson near Anchorage, Alaska. These alternatives are being considered by the United States Army, the Alaska Department of Environmental Conservation ***(ADEC)***, and the United States Environmental Protection Agency ***(EPA)***. The Army, ADEC, and EPA are soliciting comments on the information and proposed ***remedial actions*** discussed in this document. A glossary of terms is provided on each page for quick reference to the words and abbreviations in bold italics found throughout this document.

This plan fulfills the requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act ***(CERCLA)***, also known as Superfund, by providing a discussion about the remedial action plans for OU-A and OU-B. The Army, ADEC, and EPA have determined that the sites included within OU-A will be addressed under the conditions of the State-Fort Richardson Environmental Restoration Agreement ***(Two-Party Agreement)*** between the Army and ADEC. The agencies have selected a preferred remedial alternative for OU-B based on criteria found in the National Oil and Hazardous Substances Pollution Contingency Plan ***(NCP)***.

The preferred alternative for OU-B is Alternative 6: active remediation of the ***chlorinated solvent-contaminated hotspot, institutional controls*** and ***long-term monitoring*** of the contaminated ***groundwater*** outside of the hotspot. A hotspot is defined as the area containing the highest levels of contamination. Remediation of the hotspot will consist of soil vapor extraction ***(SVE)*** to treat soil and ***air stripping*** to treat groundwater. The groundwater contamination outside the hotspot will be regularly monitored to ensure the effectiveness of the remediation. Although this Proposed Plan identifies a preferred remedial alternative, a final decision will not be made until the public comment period ends and all comments are reviewed and considered. Therefore, the public is encouraged to review and comment on all of the alternatives presented in the Proposed Plan.

How You Can Participate

The public is encouraged to participate in the decision-making process regarding OU-A and OU-B. You can comment on the proposed actions presented in this plan in three ways: attend the Open House public meeting at 7 p.m. on January 29, 1997, at Russian Jack Springs Chalet in Anchorage; leave a recorded telephone message at 1-888-343-9460; or write to the following address before the public comment period ends:

Kevin Gardner
Fort Richardson Project Manager
US Army Alaska
Attn: APVR-RPW-EV
730 Quartermaster Road
Fort Richardson, Alaska 99505-6500

Operable Unit (OU)
An operable unit is a unit in which sources have been grouped together based on similarities of contaminant types, source locations, or anticipated cleanup actions.

ADEC
Alaska Department of Environmental Conservation.

EPA
United States Environmental Protection Agency

Remedial action
Involves the construction and operation of the systems chosen to clean up a contaminated site.

CERCLA
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund. CERCLA established a nationwide process for cleaning up hazardous waste sites that potentially endanger public health and the environment.

Two-Party Agreement
Defines the process by which the Army agrees to investigate and cleanup petroleum-contaminated areas under Alaska laws and regulations.

NCP
National Contingency Plan. Serves as the foundation for implementing all CERCLA provisions. All EPA decisions and actions must be consistent with the NCP.

Chlorinated solvents
Organic compounds that evaporate readily at room temperature.

Hotspot
The areas containing the highest levels of contamination.

Long Term Monitoring
Collection of groundwater samples over a 30-year period to measure the performance of clean-up systems.

Institutional Controls
Land use restrictions imposed to decrease human contact with contamination.

Groundwater
Water lying below the earth's surface.

SVE
Soil vapor extraction. In-place process that removes solvents from soils.

Air Stripping
Process that removes solvents by transferring them from contaminated water to air.

Administrative Record
Contains all files, records, and documents associated with the cleanup process for each OU.

Responsiveness Summary
A summary of oral and/or written public comments received during a comment period and the responses to those comments.

ROD
Record of Decision. Documentation of the selected remedy for a site and the rationale for its selection.

NPL
National Priorities List. EPA's list of the most serious or abandoned hazardous waste sites identified for possible long-term remedial response. The list is based primarily on the score a site receives on the Hazard Ranking System. EPA is required to update the NPL at least once a year.

FFA
Federal Facilities Agreement. A legal document which details the involvement and interaction between the Army, EPA, and ADEC regarding cleanup activities at Fort Richardson.

All public comments, whether provided at the public meeting, submitted in writing, or recorded on the toll-free telephone line during the public comment period, will be considered equally by the Army, ADEC, and EPA when reaching a final decision for remedial action. In addition to this plan, other documents can be found at either of the information repositories. The ***Administrative Record*** is available for the public to view at the Public Works Environmental Resource Office, 724 Quartermaster Road, Fort Richardson. The information repositories listed on page 16 have photocopying capability.

The Army, ADEC, and EPA will present their response to all comments received during the public comment period in a document called a ***Responsiveness Summary***. The decision on remedial action for OU-B will be presented in a Record of Decision ***(ROD)***. The Responsiveness Summary will be part of the ROD and will be available for review at the information repositories and in the Administrative Record. Depending on public comments, the actual remedies selected may be the preferred alternatives, a modification to the alternatives, a combination of alternatives, or a different alternative.

Site Background and Summary of Contamination

Fort Richardson, established in 1940 as a military staging and supply center during World War II, originally occupied 162,000 acres north of Anchorage. In 1950, the fort was divided between the Army and the Air Force. The fort now occupies approximately 56,000 acres bounded to the west by Elmendorf Air Force Base, to the east by Chugach State Park, and to the north and south by the Municipality of Anchorage (see Figure 1). Fort Richardson's current mission is to conduct operations necessary to support the rapid deployment of Army forces from Alaska to the Pacific Theater.

Fort Richardson was added to EPA's ***National Priorities List*** in June 1994. On December 5, 1994, the Army, ADEC, and EPA signed a Federal Facilities Agreement ***(FFA)*** that outlines the procedures and schedules required for a thorough investigation of suspected historical hazardous-substance sources at Fort Richardson. The FFA ensures that appropriate actions protect public health and the environment in accordance with state and federal laws. To facilitate an investigation

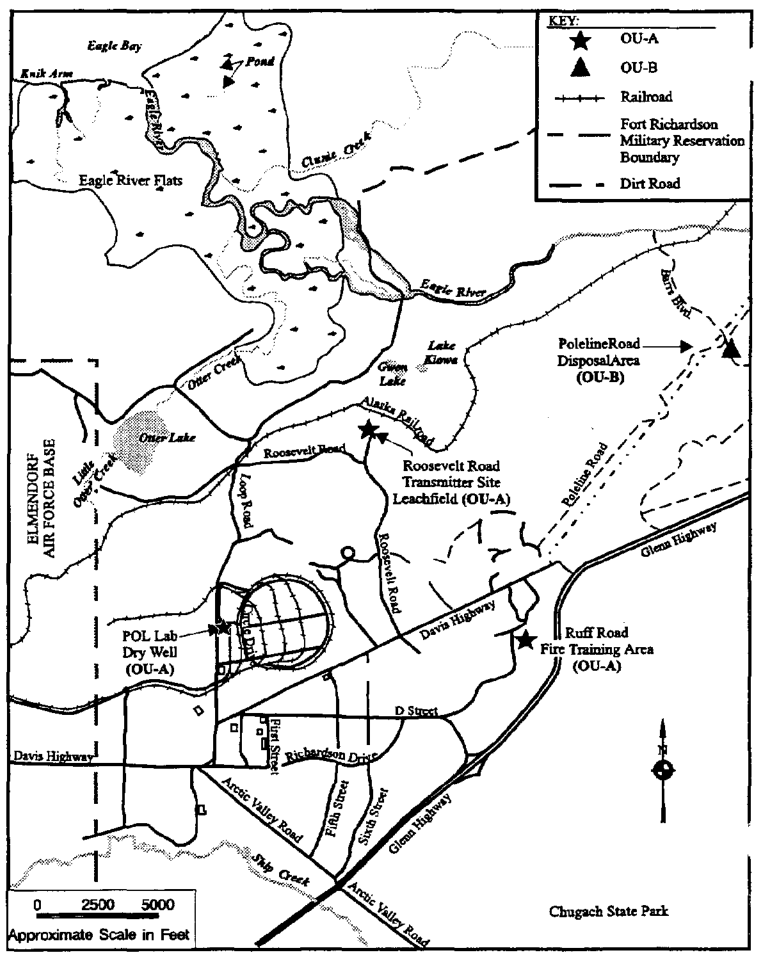


Figure 1 OPERABLE UNIT LOCATION MAP

of such a large installation, the FFA divided Fort Richardson's potential hazardous-substance source areas into four OUs: OU-A, OU-B, OU-C, and OU-D. The potential source areas were grouped into the OUs based on the amount of existing information, the similarity of potential hazardous-substance contamination, and the level of effort required to complete a Remedial Investigation ***(RI)***. Only OU-A and OU-B are addressed in this Proposed Plan. OU-C and OU-D will be addressed in future Proposed Plans. OU-A is contaminated with petroleum, and OU-B is contaminated with chlorinated solvents.

RI
Remedial Investigation. An investigation conducted to determine sufficient information on the nature and extent of contamination at a site necessary to identify cleanup alternatives.

FS
Feasibility Study. A study of the results of the remedial investigation to establish criteria for the cleanup and to identify and evaluate cleanup alternatives for a site or operable unit.

During an RI, information is gathered through field investigations to determine the nature and extent of contamination and the potential human health and ecological risks associated with that contamination. Following completion of the RI, a Feasibility Study ***(FS)*** is performed to evaluate various site cleanup alternatives based on information collected during the RI. All cleanup alternatives developed during the FS then are reviewed by the agencies and evaluated against nine criteria established by the NCP (See Page 12). A Proposed Plan, such as this document, summarizes the cleanup options and methods presented in the FS report.

An additional method through which the Army intends to clean up sites at Fort Richardson is remedial action at petroleum-contaminated sites conducted under terms of a Two-Party Agreement between the Army and the State of Alaska. Contamination consisting of petroleum substances usually is addressed by such agreements. This agreement, signed in 1994, defines the process by which the Army agrees to investigate and clean up petroleum-contaminated areas at Fort Richardson under Alaska laws and regulations. These areas generally are associated with underground storage tanks that have leaked, other miscellaneous sources of underground petroleum contamination, or surface spills of petroleum products.

OU-A History and Extent of Contamination

OU-A comprises three sites: the Roosevelt Road Transmitter Site Leachfield (Transmitter Site); the Ruff Road Fire Training Area (Fire Training Area); and the Building 986 Petroleum, Oil, and Lubricant (POL) Laboratory Dry Well (Dry Well).

PCBs
Polychlorinated biphenyls. A group of at least 50 widely used compounds containing chlorine. PCB oil was formerly used in electrical transformers.

Residential Exposure Scenario
A method of evaluating site risks assuming people will be living on the site.

The Transmitter Site is located north of the main fort area one mile southeast of Otter Lake (see Figure 1). The site includes an underground communications bunker used during the 1950s and 1960s. The sanitary facilities within the bunker are connected to a septic leachfield that was the subject of the OU-A RI. Previous investigations at the site indicated possible petroleum, heavy metals, and polychlorinated biphenyl ***(PCB)*** contamination in soils surrounding the leachfield. Between 1988 and 1992, approximately 750 tons of PCB-contaminated soil was removed. The results of the 1995 RI indicate that soils in isolated locations within the leachfield have been impacted by petroleum contamination. Low levels of heavy metals and PCBs were encountered. The levels of heavy metals and PCBs do not pose an unacceptable risk to human health or the environment based on ***residential exposure scenarios***. Groundwater has not been impacted by contamination at the site. A more detailed explanation of risk is presented under "Summary of Site Risks" on page 6 of this Proposed Plan.

The Fire Training Area is located east of Bryant Airfield near the Glenn Highway (see Figure 1). The site consists of an area used for fire-fighting exercises from the 1940s to 1980. The exercises involved applying fuels and other waste combustible liquids to an unlined earthen pit, igniting the fuels, and extinguishing the resulting fires with water. Previous site investigations documented the presence of petroleum products, chlorinated solvents, and dioxins in surface and subsurface soil. However, the low levels of solvents and dioxins encountered do not pose an unacceptable risk to human health or the environment. The results of the OU-A RI indicate that approximately 6,200 cubic yards of petroleum-contaminated surface and subsurface soil exists at the site. Groundwater and surface water/sediments in a pond near the site have not been impacted by the petroleum-contaminated soil.

The Dry Well is located at Building 986 within the main cantonment area of Fort Richardson, near Loop Road and Warehouse Street (see Figure 1). The Dry Well is approximately 15 feet deep, and was used for disposal of drain and sink water from the adjacent POL laboratory Numerous chemicals were used at the POL laboratory in performing quality testing of fuels used at Fort Richardson. Previous investigations of the Dry Well indicated a potential for petroleum products, solvents, and heavy metals in the sludge at the bottom of the Dry Well. The results of the RI indicate that this sludge is contaminated with petroleum products and that approximately 230 cubic yards of petroleum-contaminated subsurface soil is present beneath and around the bottom of the Dry Well. The heavy metals chromium and mercury also were detected in subsurface soil at the site, however, these contaminants do not pose a risk to human health and the environment because of their subsurface location and relatively low concentrations. Chlorinated solvents at this site do not pose an unacceptable risk to human health or the environment. Groundwater has not been impacted by petroleum-contaminated sludge and subsurface soil at the site. Although chloroform, methylene chloride, and manganese were detected in groundwater samples, these analytes are not considered site-related. Chloroform and methylene chloride are laboratory contaminants associated with the sample analysis performed for this site; moreover, neither chloroform nor methylene chloride was detected in sludge or subsurface soil samples collected at the Dry Well, which makes it unlikely that chloroform and methylene chloride are contaminating groundwater. Based on results of previous investigations, the presence of manganese in the groundwater samples is likely attributable to naturally occurring minerals in groundwater at the site.

OU-B History and Extent of Contamination

OU-B consists of one site: the Poleline Road Disposal Area (Poleline Road). Poleline Road is located in the north portion of Fort Richardson, approximately 1 mile south of Eagle River and 0.6 mile north of the Anchorage Regional Landfill (see Figure 2). The site is situated in a low-lying wooded area at Poleline Road and Barrs Boulevard. This site was used as a disposal area for chemical agent identification sets *(CAIS)* and associated debris from 1950 to 1972. During this time, CAIS were burned and disposed of in trenches. The CAIS were doused with a mixture of bleach or lime and chlorinated solvents before burial.

CAIS
Chemical agent identification sets.

The site was further divided into four disposal areas: Areas A-1, A-2, A-3, and A-4. Areas A-3 and A-4 showed the greatest evidence of buried waste and trenching. Historical information describes how relatively shallow (eight to ten feet in depth) trenches were dug and used for the disposal of a wide variety of debris, to include chemical agent training kits. The material was

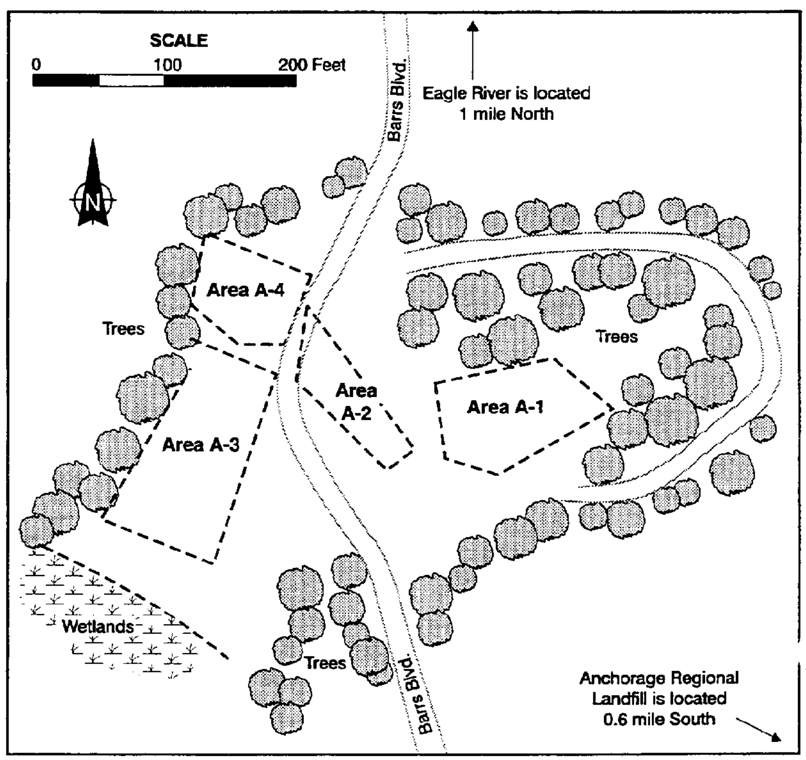


Figure 2 OU-B, POLELINE ROAD DISPOSAL AREA SITE MAP

placed in the trenches, doused with fuel and burned. Following the burning, a mixture of either bleach or lime combined with chlorinated solvents was poured over the material.

In 1993 and 1994, contaminated debris and soil were removed from Areas A-3 and A-4. Sampling indicated the presence of chlorinated solvents, including trichloroethene *(TCE)*; tetrachloroethene *(PCE)*; and 1,1,2,2-tetrachloroethene, in soils and groundwater. Soils were excavated to a maximum depth of 14 feet and a ***geophysical survey*** confirmed that the buried material had been removed.

Review of known information on the Poleline Road Disposal Area indicated that Areas A-1 and A-2 may potentially contain buried unexploded ordnance. Investigation of soils and groundwater surrounding Areas A-1 and A-2 detected only low level contaminant concentrations. No chemical agent or ***breakdown products*** were detected in the soil or groundwater, therefore it is unlikely that chemical warfare materials were disposed in these areas. It does not appear that contaminants were released from Areas A-1 and A-2. The groundwater flow pattern of the Poleline Road Disposal Area suggests that the low-level contaminants detected near Areas A-1 and A-2 migrated from Areas A-3 and A-4.

According to the RI, after the contaminated debris and soil were removed from Areas A-3 and A-4 in 1993 and 1994, maximum concentrations of 2,000 milligrams per kilogram ***(mg/kg)*** of 1,1,2,2-tetrachloroethene remained in soil at depths greater than 15 feet below ground surface. The small area where high contaminant concentrations remain in the soil is referred to as a "hot spot". The hot spot at Areas A-3 and A-4 cover an area of approximately 75 feet by 200 feet with concentrations greater than 1,000 mg/kg of 1,1,2,2-tetrachloroethene. The risk based concentration ***(RBC)*** is 3.2 mg/kg for this contaminant.

Four water bearing zones (groundwater) have been identified at OU-B: ***perched, shallow,*** and ***intermediate*** zones and a ***deep aquifer***. (See Figure 3) The RI results indicate that there is interconnection between the four zones, which allows the contaminants to migrate vertically. Chlorinated solvent contamination, including TCE and 1,1,2,2-tetrachloroethene, was detected in all four groundwater zones. The perched zone in Area A-3 had the highest concentration of 1,1,2,2-tetrachloroethene detected; a maximum concentration of 1,900 milligrams per liter ***(mg/L)***. Groundwater studies performed at the site indicated that the contaminated groundwater is flowing north toward the Eagle River. These studies estimate that contaminants at or above the Maximum Contaminant Levels ***(MCLs)*** allowed by federal and state regulations in the groundwater may reach the river within 120 years.

Use of groundwater from the shallow or deep zone at Poleline Road as a drinking water source would pose an unacceptable risk of cancer and noncancer health effects. Primary contributors to lifetime excess cancer risk in groundwater are 1,1,2,2-tetrachloroethane and TCE because they exceed MCLs for residential exposure to groundwater.

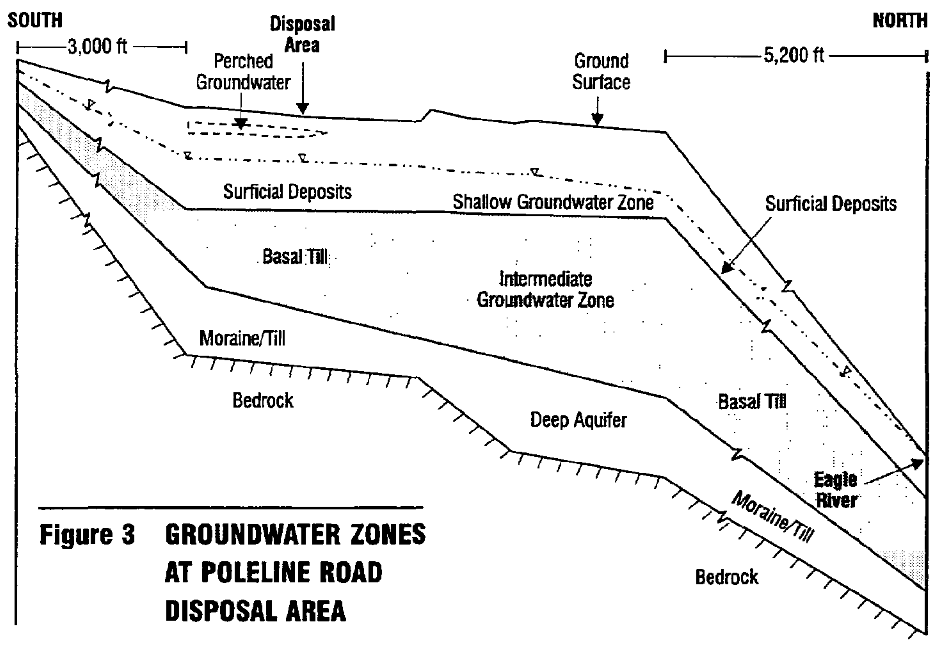


Figure 3 GROUNDWATER ZONES AT POLELINE ROAD DISPOSAL AREA

PCE Tetrachlorethene. A chlorinated solvent used for drycleaning and vapor-degreasing.

TCE Trichloroethene. A chlorinated solvent used as a metal degreaser.

Geophysical Survey
Survey that explores the shallow subsurface. Determines the extent and nature of the geologic materials beneath the surface, and can identify the location and shape of buried metal objects.

Breakdown Products
Some contaminants chemically react to form other contaminants.

mg/kg Milligrams per kilogram. Concentration unit for conatminants in soil.

RBC Risk based concentration. Concentration at which no cancer risk to human health is expected based on conservative exposure assumptions.

Perched zone
Water zone formed above the main water table on a layer of low-permeability materials such as clay.

Shallow Zone
Ten foot thick water bearing layer above the intermediate zone.

Intermediate Zone
Water bearing zone up to 90 feet thick with variable amounts of groundwater.

Deep aquifer
Geologic unit that can store and transmit water at rates fast enough to supply reasonable amounts to wells.

mg/L Milligrams per liter. Concentration unit for contaminants in water.

MCL Maximum Contaminant Level defined by federal regulations for contaminant concentrations in drinking water.

Summary of Site Risks

Human Health Risk Assessment (HHRA)

A baseline Risk Assessment was conducted to evaluate the estimated human health effects tha could result if contamination at the OU-A and OU-B sites is not cleaned up (i.e., if no remedial action is performed). The detailed reports discussing this evaluation are *Risk Assessment Report, Operable Unit A*, and *Risk Assessment Report, Operable Unit B*. The evaluation was based on the location and amount of contamination, toxicity of each contaminant, current and potential future use of each site, and pathways by which people could be exposed to contaminants. The evaluation results were used to support decisions concerning the extent of remediation and to aid in the selection of remedial technologies.

HHRA
Human Health Risk Assessment. An analysis used to evaluate the estimated human health effects that could result if no remedial action is performed.

Acceptable Risk Range
Excess lifetime cancer risks ranging from 1 in 10,000 to 1 in 1 million. This means that an individual could face up a 1 in 10,000 to 1 in 1 million chance of developing cancer because of exposure to chemicals at a site, beyond those cancers expected from other causes.

Hazard Index
The estimated intake level of a contaminant at which no adverse health effects are expected to occur.

The estimated risks from each pathway are added to determine total risk. Risks are evaluated for carcinogenic (cancer-causing) and noncarcinogenic (toxic) effects. The NCP defines the ***acceptable risk range*** for Superfund sites as excess lifetime cancer risks ranging from 1 in 10,000 (1×10^{-4}) to 1 in 1 million (1×10^{-6}). This means that an individual could face up to a 1 in 10,000 to 1 in 1 million chance of developing cancer because of exposure to chemicals at a site, beyond those cancers expected from other causes. Noncarcinogenic effects are evaluated by calculating the ratio between the estimated intake of a contaminant and its corresponding reference dose; i.e., the intake level at which no adverse health effects are expected to occur. This ratio is a summation of all site contaminants. If this ratio, called a ***hazard index***, is less than 1, then noncarcinogenic health effects are not expected at the site.

OU-A The estimated risks associated with the contaminants at OU-A are presented in Table 1. The risks presented are conservative because they are based on future residential land use, which is not likely at this site, thereby overestimating risk for site-specific exposure scenarios.

The conclusion of the baseline HHRA for OU-A is that contaminant levels at the OU-A sites do not represent unacceptable risks to human health, based on EPA criteria. However, the levels of petroleum contamination in the soil do exceed the ADEC soil cleanup criteria. The Army, ADEC, and EPA have elected to pursue further cleanup efforts at these sites under the Two-Party Agreement. Under the agreement, the Army and ADEC will clean up contaminated materials at each site in accordance with applicable State of Alaska regulations. While the specific cleanup actions and the time required to remediate the sites have yet to be determined, the Army and State of Alaska will jointly consider all available information before selecting appropriate OU-A site cleanup activities. Decisions regarding OU-A site cleanup will be documented in accordance with stipulations of the Two-Party Agreement. Because the OU-A sites will be addressed through the Two-Party Agreement, they are not discussed further in this Proposed Plan.

Table 1 Estimated Human Health Risks Operable Unit A

Site	Contaminants of Concern	Potential Excess Cancer Risk to Future Residents if Cleanup Does Not Occur
Roosevelt Road Transmitter Site Leachfield	Petroleum Hydrocarbons PCBs Petroleum, Oil, and Lubricant	2 in 10 million
Laboratory Dry Well	Petroleum Hydrocarbons	1 in 10 million
Ruff Road Fire Training Area	Petroleum Hydrocarbons	3 in 1 million

OU-B The baseline HHRA for OU-B evaluated the potential risks for on-site workers, visitors, and residents, including adults and children. The Risk Assessment identified ways that people working or living on or near the sites could be exposed: touching and ingesting soil, inhaling vapors and dust released from soil, and using groundwater for drinking and showering. On-site workers and visitors are the most likely individuals to be exposed under current exposure conditions. Future land use conditions could result in exposure of on-site workers, visitors, residents, or downgradient groundwater users. The most likely future scenario is temporary occupational or recreational use of the site (on-site workers, military training, or trespassers).

Based on analytical results from surface and subsurface soil surrounding Areas A-1 and A-2, the risk of cancer and noncancer health effects from exposure to low concentrations of solvents in soil was negligible. The lifetime excess cancer risk was 1 in 100,000 and the noncarcinogenic hazard index was less than 1 for residential exposure to soils at depths of 0 feet to 15 feet BGS in Areas A-3 and A-4. Generally, remediation is not warranted for protection of public health if the total lifetime excess cancer risk does not exceed 1 in 10,000 and if noncarcinogenic effects have a hazard index of less than 1. However, although these contaminants do not pose a threat to human health, they will serve as a continuing source of contamination to groundwater.

Excess lifetime cancer risks for soil in the hotspot area beneath Areas A-3 and A-4 were not within the acceptable risk range for the current-worker exposure scenario. However, these soils are 14 feet BGS; therefore, the likelihood of direct exposure to humans is unlikely.

The NCP and state regulations require protection and restoration of water resources. Contamination of OU-B groundwater, if used as a drinking water source, presents an unacceptable risk to human health. This area represents a continuing source of contamination to the groundwater at the site. Table 2 summarizes the risks associated with contaminated soils and groundwater at Poleline Road. The table presents the maximum possible human risks associated with the various locations at the site and the risks to humans if groundwater from different depths at the site is ingested.

The overall conclusion of the HHRA is that exposure scenarios associated with soil do not exceed EPA's acceptable excess cancer risk/hazard indices. Although excess lifetime cancer risks and hazard indices for soil at the hotspot area beneath Area A-3 exceed EPA's acceptable risk ranges, the contaminants are found at 14 feet BGS and therefore do not pose a hazard for direct human contact. While soil contamination does not pose a threat to human health, the contamination level is high enough to pose an ongoing threat to groundwater. Groundwater contamination in the shallow and deep zones exceeds EPA's acceptable risk range and federal drinking water MCLs for human consumption. Therefore, groundwater and the hotspot source at Poleline Road ultimately will require treatment.

Table 2 Summary of Site Risks Operable Unit B

Media	Potential Cancer Risk if Cleanup Does Not Occur	Potential Hazard Index if Cleanup Does Not Occur[1]
Hotspot soils	8 in 1,000	0.8
Hotspot groundwater: shallow zone	1 in 1	2,800
Hotspot groundwater: deep aquifer	9 in 100	47
Downgradient soils	8 in 1 million	0.005
Downgradient groundwater: shallow zone	2 in 100	18
Downgradient groundwater: deep aquifer	2 in 1,000	0.9

(1) Hazard index values greater than 1.0 are consedered by EPA to represent conditons potentially requiring remedial action.

Ecological Risk Assessment

The Ecological Risk Assessment *(ERA)* addresses the current and future impacts and potential risks posed by source-related contaminants to the plants and animals of OU-A and OU-B in the absence of remedial action. Unlike the HHRA, the ERA focuses on the effects to populations or communities of plants and animals, not individuals. If identified during the ERA, potential risks to individuals of a species are evaluated within a larger context to determine ecological significance.

ERA
Ecological Risk Assessment. An analysis used to determine the potential risks to plants and wildlife from contaminants at a source area in the absence of remedial action.

COECs
Contaminants of Ecological Concern.

The northern red-backed vole and muskrat were selected as representative terrestrial site receptors for OU-B based on site-specific exposure pathways and ecological considerations. The potential for adverse effects from contaminants of ecological concern *(COECs)* on plant communities and aquatic invertebrates also was evaluated.

Based on the risk analysis, COEC concentrations at OU-B result in a negligible risk to small-mammal populations, aquatic invertebrates, emergent wetland vegetation, and upland plant vegetation. The overall potential for valued environmental resources at this site to be adversely affected is considered negligible.

Purpose and Scope of Remedial Action

The OU-B RI identified soil and groundwater contamination requiring remedial action. The need for remedial action was determined based on the results of the HHRA and because contaminant levels in groundwater exceed state and federal drinking water standards. The objectives of remedial action at OU-B are to:

- Reduce contaminant levels in the groundwater to comply with drinking water standards;
- Prevent the soil from continuing to act as a source of groundwater contamination;
- Prevent the contaminated groundwater from adversely affecting the Eagle River surface water and sediments; and
- Minimize degradation of the State of Alaska's groundwater resources at the site as a result of past disposal practices.

Summary of Alternatives

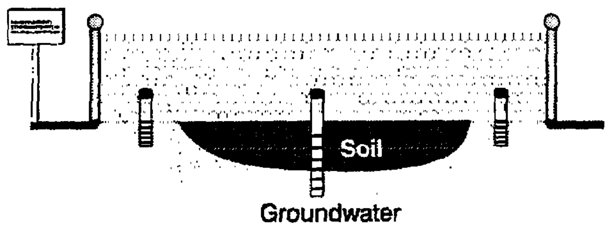
Many technologies were considered to clean up the contaminated soil and groundwater at OU-B that is contaminated with TCE and 1,1,2,2-tetrachloroethene. The most promising options, known as *alternatives*, were selected based on their effectiveness, implementability, and relative cost. Most of the chosen alternatives consist of a combination of more than one technology. The proposed alternatives and the technologies used in these alternatives are discussed below. For additional details about these alternatives, see the OU-B FS report at the information repository.

Alternative 1: No Action

CERCLA requires evaluation of a no-action alternative as a baseline reflecting current conditions without any cleanup effort. This alternative is used for comparison to each of the other alternatives and does not include monitoring or institutional controls. No costs would be associated with this alternative.

Alternative 2: Natural Attenuation

Natural attenuation, or breakdown of contaminants without artificial stimuli, includes ***institutional controls*** and groundwater monitoring to determine whether the contaminants in the groundwater are degrading naturally. Natural attenuation can occur because of degradation processes such as biological breakdown, chemical and physical processes, and volatilization. Even under ideal conditions, entire breakdown of the contaminants is rarely complete. Groundwater monitoring measures contaminant levels in groundwater. Two additional wells would be added to the 15 existing wells. Groundwater would be sampled and analyzed periodically for contaminants. Institutional controls would be used to decrease or minimize human or wildlife exposure to contaminants and could include deed restrictions, restrictions on groundwater well installations, site access restrictions, and fencing. Periodic inspections and maintenance of the institutional controls would be required. The estimated ***present-worth cost*** for 30 years of this alternative is approximately $1,300,000 (see Table 4 on page15).

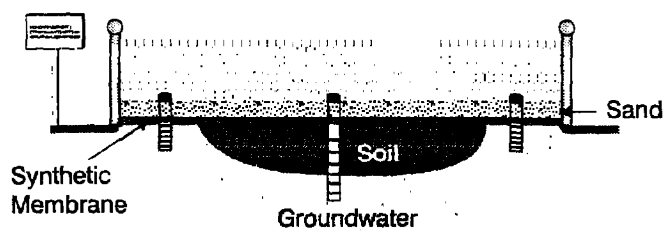


Institutional Controls
Various ways to restrict site access or use of groundwater or land.

Present Worth Cost
The total project cost expressed as U.S. dollars in 1996.

Alternative 3: Containment

The objective of containment is to minimize water flow into or out of contaminated areas, thus minimizing migration of contamination into lower water zones. This alternative consists of a cap and vertical barrier to reduce the mobility of the contaminants, monitoring, and institutional controls. See Alternative 2 for a description of monitoring and institutional controls. Site soils would be covered with a blanket of sand overlying an impermeable membrane to minimize the amount of surface water and rainwater that could flow through the contaminated soils. Covering the soils would protect humans and animals from contacting contaminated soils. ***Bentonite slurry walls*** would be installed to inhibit the flow of water from the wetlands into the site. Without this flow, the mobility of the contaminants in the soil would be reduced. Natural attenuation would be relied on to clean up contaminants to acceptable levels, as explained in Alternative 2. The estimated present-worth cost for 30 years of this alternative is approximately $2,500,000 (see Table 4 on page 15).



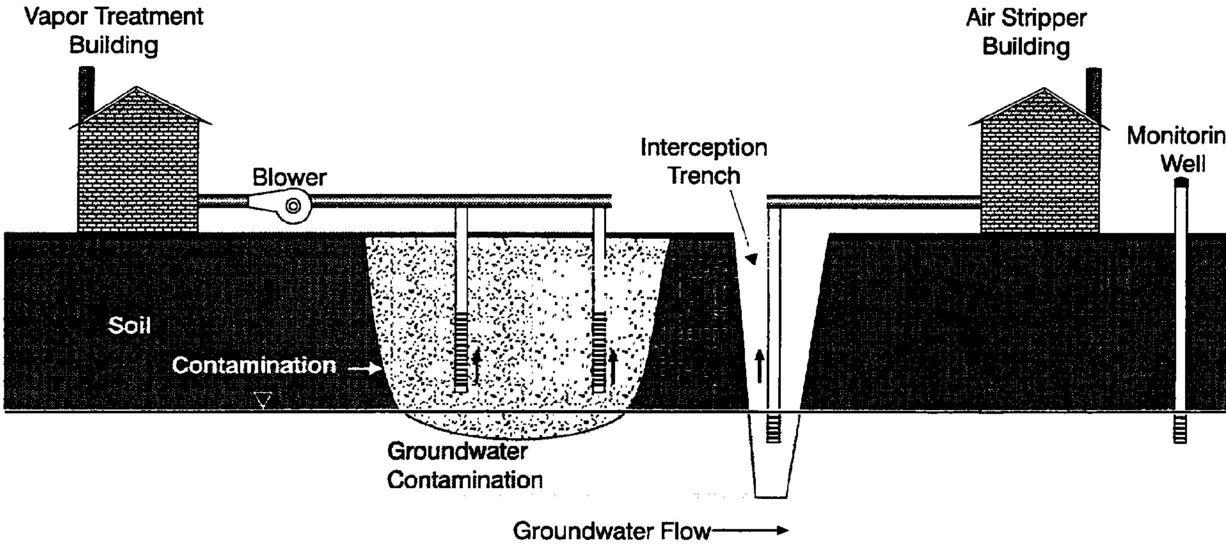
Bentonite
A porous clay that absorbs water and swells greatly as a result.

Slurry Wall
A veritical barrier in the subsurface which impedes or redirects groundwater flow.

Alternative 4: Interception Trench, Air Stripping, and Soil Vapor Extraction

Air Stripping
Process that removes solvents by transferring them from contaminated water to air.

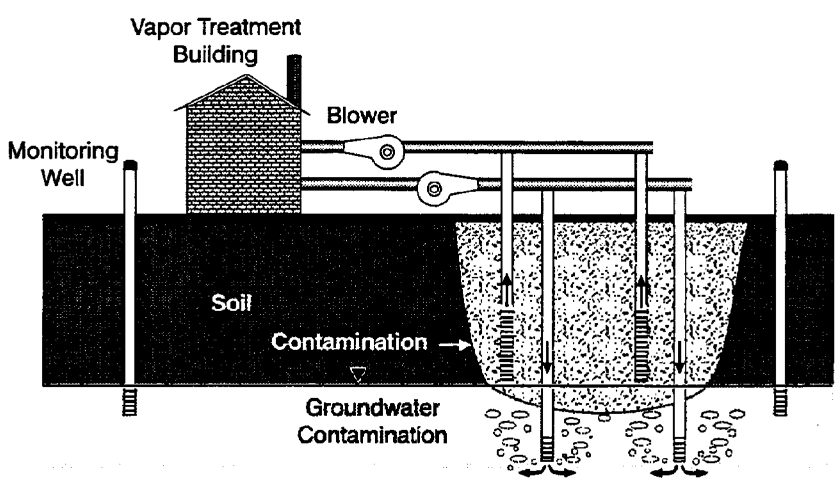
The objective of this alternative is to remove contamination from the soil and groundwater within areas A-1 through A-4. Trenches will be dug for collection of groundwater, which will be pumped to an air stripper for treatment. ***Air stripping*** is a process that removes solvents by transferring them from contaminated water to air. Vapors from the air stripper would be treated as required by state and federal regulations before being discharged to the atmosphere. Soil vapor extraction is an in-place process for removal of solvents from unsaturated soils. The system consists of a series of vapor extraction wells, commonly called vapor extraction points (VEPs); monitoring wells; and air blowers to draw air into the VEPs. Soil vapor extraction includes piping to collect the extracted air and systems to remove contaminants from the extracted air, as required by state and federal regulations, before being discharged. The estimated present-worth cost for 30 years of this alternative is approximately $7,500,000 (see Table 4 on page 15).



Alternative 5: Air Sparging and Soil Vapor Extraction of the Hotspot and Natural Attenuation

Plume
Extent of contamination in groundwater.

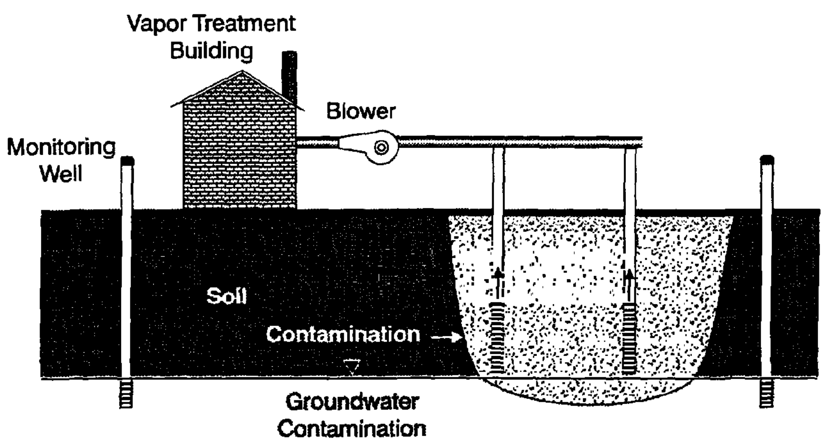
The objective of this alternative is to remove contamination from the hotspot and to rely on natural attenuation to restore the remainder of the contaminated groundwater ***plume***. This alternative focuses active treatment in the area of highest soil contamination. Air sparging is the injection of pressurized air into the shallow aquifer, which results in volatilization of solvents and enhanced biodegradation of contaminants susceptible to aerobic



microbial degradation. Soil vapor extraction is commonly used in combination with air sparging. See Alternative 4 for a description of soil vapor extraction. The estimated present-worth cost for 30 years of this alternative is approximately $5,500,000 (see Table 4 on page 15).

Alternative 6: High Vacuum Soil Vapor Extraction of the Hot Spot and Site-wide Institutional Controls with Long Term Groundwater Monitoring.

The objective of this alternative is also to remove the contamination from the source area (hot spot) and to monitor the remainder of the contaminated plume in the groundwater. This ensures that by controlling the source, the contamination in ground water is not increasing. Also, monitoring will track the plume to determine if contamination from this site is approaching the Eagle River. This alternative also includes enforcement of land use restrictions designed to prohibit extraction and use of the groundwater and annual groundwater monitoring to track the progress of contaminant breakdown and movement, as well as provide an early indication of unforeseen environmental or human health risk. The high vacuum extraction process uses a strong vacuum applied to the source area through a series of wells. This vacuum will draw both soil gas vapors from the hot spot as well as some contaminated groundwater. As this air and water mixture is drawn to the surface some of the contaminants in the water will transfer to the air. An air stripping system or similar performing technology will be used to treat the extracted groundwater to meet State of Alaska and Federal water quality standards prior to being reinjected down-gradient from the site. Soil vapors extracted from the hot spot soil will be treated as necessary to meet State and federal air quality standards prior to release to the atmosphere. The estimated present-worth cost for 30 years of this alternative is approximately $4,000,000 (See Table 4 on page 15).



Evaluation of Alternatives and Preferred Alternative

This section presents the preferred alternative for OU-B; compares the preferred alternative to the other alternatives; and emphasizes the reasons why the Army, EPA, and ADEC selected the preferred alternative. The comparison of alternatives is based on an evaluation using nine criteria established by Superfund (see Table 3). The criterion of community acceptance will not be evaluated until after public comments are received.

Table 3 Criteria for Evaluation of Alternatives

THRESHOLD CRITERIA: Must be met by all alternatives.

1. **Overall protection of human health and the environment.** How well does the alternative protect human health and the environment, both during and after construction?

2. **Compliance with requirements.** Does the alternative meet all applicable or relevant and appropriate state and federal laws?

BALANCING CRITERIA: Used to compare alternatives.

3. **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?

4. **Reduction of toxicity, mobility, and volume through treatment.** Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, and volume of the hazardous substances?

5. **Short-term effectiveness.** Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative?

6. **Implementability.** Is the alternative both technically and administratively feasible? Has the technology been used successfully at similar areas?

7. **Cost.** What are the relative costs of the alternative?

MODIFYING CRITERIA: Evaluated as a result of public comments.

8. **State 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?

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

Table 4 (on page 15) shows the cost comparison for the proposed cleanup alternatives.

The selection of the preferred alternative is preliminary. Based on new information or comments received from the public, the Army, ADEC, and EPA later may modify the preferred alternative presented in this Proposed Plan or choose a different alternative. Therefore, the public is encouraged to review and comment on all the alternatives identified in this Proposed Plan during the public comment period. The OU-B FS report contains detailed information about each alternative and the comparison of all the alternatives. The Fort Richardson Administrative Record and both informational repositories contain copies of the OU-B FS report for review.

The evaluation of alternatives for OU-B follows. Figure 4 illustrates the comparison of alternatives and how they meet the threshold and balancing evaluation criteria listed in Table 3.

OU-B

Alternatives are ranked by comparing them to each other.

Cleanup Alternatives: 1	2	3	4	5	6	
						THRESHOLD CRITERIA
○	⊙	◓	●	◓	●	**Overall protection of human health and the environment**
○	○	⊙	◓	◓	◓	**Compliance with applicable or relevant and appropriate requirements**
						BALANCING CRITERIA
○	⊙	◓	●	◓	●	**Long-term effectiveness and permanence**
○	○	⊙	●	◓	●	**Reduction of toxicity, mobility, or volume through treatment**
NA	●	⊙	◓	◓	◓	**Short-term effectiveness**
NA	●	◓	◓	◓	◓	**Implementability**
NA	●	◓	⊙	⊙	◓	**Cost (see Table 4)**

Cleanup Alternatives:

1 No Action
2 Natural Attenuation
3 Containment
4 Interception Trench, Air Stripping, and Soil Vapor Extraction
5 Air Sparging and Soil Vapor Extraction of the Hotspot and Natural Attenuation
6 High Vacuum Extraction of the Hot Spot and Site-wide Institutional Controls with Long Term Groundwater Monitoring

Key:
● = best ◓ = good
⊙ = poor ○ = worst
NA = Not Applicable

Figure 4 COMPARISON OF CLEANUP ALTERNATIVES FOR OU-B USING THE THRESHOLD AND BALANCING CRITERIA

Overall Protection of Human Health and the Environment

Alternatives 4, 5 and 6 would provide the most protection to human health and the environment by actively treating solvent-contaminated soil and groundwater. While Alternative 5 would treat the solvent contaminated vapors in the soil, a treatability study found that air sparing would not be effective treating the groundwater. Alternative 3 would protect human health and the environment by reducing the possibility of human contact with contaminants and minimizing future infiltration of contaminants from soil to groundwater. Alternative 2 would rely on natural processes to slowly decrease contaminant concentrations in the soil and groundwater. Alternative 2 would provide some protection of human health and the environment through institutional controls, which would reduce contact with contamination. Alternative 1 (no action) would be the least-protective alternative.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Significant ARARs that apply to the OU-B site include the Federal Safe Drinking Water Act, Alaska Drinking Water Regulations, Alaska State Water Quality Standards, and the Clean Water Act. Alternatives 4, 5 and 6 are expected to meet all state and federal ARARs. These alternatives include active soil and groundwater treatment and would be expected to achieve state and federal standards more rapidly than Alternatives 1, 2, and 3. However, under Alternative 1, no monitoring would be conducted to determine compliance with the ARARs. Alaska State Water Quality Standards would be achieved through natural processes under all of the alternatives.

Long-Term Effectiveness and Permanence

Alternatives 4, 5 and 6 would involve permanent and active reduction of soil and groundwater contamination and would achieve long-term effectiveness. Alternative 5 fails to adequately address the contamination found in the groundwater. None of the contaminants would be addressed by Alternatives 1, 2, or 3, except through natural processes. Therefore, Alternatives 1, 2, and 3 would provide the least-effective long-term permanence.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternatives 4, 5 and 6 would involve treatment technologies that reduce the toxicity and mobility of solvent-contaminated soil and groundwater. Alternative 5 fails to reduce the toxicity, mobility, and volume of contamination in the groundwater. The other alternatives do not include treatment technologies to reduce site risks. Alternative 3 would reduce contaminant mobility by restricting future infiltration of rainfall and snowmelt through contaminated soils to groundwater. Alternatives 1 and 2 would slowly decrease the toxicity and volume of contaminated media through natural attenuation. Because Alternative 2 includes monitoring, the rate and degree of contaminant reduction would be known.

Short-Term Effectiveness

Alternatives 3, 4, 5 and 6 would pose some short-term potential risks to on-site workers and visitors/members of the community during the time required for construction and installation of containment and treatment systems. These potential risks could be minimized by engineering and institutional controls. These alternatives are expected to achieve state and federal standards more rapidly than alternatives 1 and 2.

Risks associated with groundwater contamination are equal for Alternatives 4, 5 and 6. Because these alternatives actively treat groundwater contamination, contaminant levels would be expected to decrease during the same treatment period. While Alternative 4 treats groundwater more aggressively than Alternatives 5 and 6, the uncertainty associated with this technology's long term effectiveness suggests this alternative would not clean the site quicker than Alternatives 5 and 6. Alternatives 1, 2, and 3 do not actively treat soil or groundwater contamination; therefore, risks would not change over time except through natural processes. Under Alternative 1, no monitoring would be conducted to determine the remediation time frame. However, the time frame for remediation is expected to be similar to Alternative 2.

Implementability

All alternatives would use readily available technologies and would be feasible to construct. Alternatives 1 and 2 would be readily implementable because they would require no additional action other than monitoring and institutional controls. A pilot-scale test or field test would be conducted before full-scale implementation of Alternatives 4, 5 and 6.

Table 4 Cost Comparison Table

Alternative	Capital Cost	Annual O&M Cost	Annual Monitoring Cost	Total Present-Worth Cost
1-No Action	$0	$0	$0	$0
2-Natural Attenuation	$80,000	$29,070	$29,070	$1,300,000
3-Containment	$993,325	$9,600	$20,620	$2,500,000
4-Trench, Air Strip, SVE	$2,042,000	$29,070	$73,333	$7,500,000
5-Air Sparge, SVE, Natural Attenuation	$1,600,000	$2,200,000	$29,070	$5,500,000
6- SVE and Long-Term Groundwater Monitoring	$801,841	$64,878	$29,070	$4,000,000

<u>TABLE 4 ERRATA:</u>

The Alternative 4 annual O&M cost should be $142,880, and annual monitoring cost should be $20,620. The Alternative 5 annual O&M cost should be $72,736.

O&M
Operations and Maintenance Costs over the life of a system.

Costs

The estimated costs for each alternative evaluated for OU-B are in Table 4 and are based on the information available at the time the alternatives were developed.

State Acceptance

ADEC has been involved with the development of remedial alternatives for OU-B and concurs with the preferred alternative.

Community Acceptance

Community acceptance of the preferred alternative and the other alternatives will be evaluated after the public comment period is conducted and all comments are considered.

Summary

After evaluation of the potential risks and the appropriate cleanup standards, the preferred alternative for OU-B is Alternative 6: high vacuum soil vapor extraction of the source area, and site-wide institutional controls, and long-term monitoring of groundwater downgradient from the hotspot.

Alternative 6, the preferred alternative, is expected to achieve overall protection of human health and the environment and to meet ARARs. Additionally, this alternative is a cost-effective and permanent solution to contamination at OU-B.

Rationale for Selection of the Preferred Alternatives

Alternative 6 is the preferred alternative for soil and groundwater treatment at OU-B. A thorough assessment of alternatives considered groundwater risks, cleanup times, and costs. It was determined that protection of human health and the environment and compliance with ARARs would best be attained by cleanup of soil and groundwater in the source area and long-term monitoring of the groundwater plume. Although only the hotspot is proposed for active remediation for this alternative, if it is successful, it would produce a significant reduction in risk because the source area would be remediated. This alternative ensures protection of the groundwater and provides the best balance of criteria among the alternatives evaluated.

Although Alternative 4 possibly would remediate a larger portion of the contaminated area, the Army, EPA, and ADEC believe that the most prudent action at this time would be to monitor the plume until the success of the preferred alternative could be judged. Alternative 5, like the preferred alternative, actively treats only the hot spot soil with soil vapor extraction but also includes air sparging to treat groundwater at the hot spot and natural attenuation for downgradient groundwater. However, preliminary results from an on-site test during late 1996 indicates that air sparging and natural attenuation will most likely be ineffective in treating groundwater to attain state and federal water quality standards. If the preferred alternative is selected, information gathered from that action would be used to assess the need for additional remedial action such as for the remainder of the plume. This assessment would be performed in conjunction with the periodic monitoring of the site.

The preferred alternative is subject to public comment and participation, and no alternative will be selected until the public comment period ends and all comments are addressed.

Public Involvement

A public meeting is scheduled from 7 p.m. to 9 p.m. on January 29, 1997, at the Russian Jack Chalet in Anchorage. Representatives from the Army, ADEC, and EPA will discuss the Proposed Plan and answer questions.

The public meeting also will provide an opportunity for interested parties to submit written or verbal comments on the Proposed Plan. A 30-day comment period is scheduled from January 20 to February 18, 1997.

The Army, ADEC, and EPA will respond to all comments on the Proposed Plan in the Responsiveness Summary. After consideration of all public comments, a final cleanup decision will be made for OU-B. The document that will detail the decisions made during the CERCLA cleanup process is the ROD, which will include the Responsiveness Summary and will be added to the information repositories.

For More Information

Copies of site documents, fact sheets and other supporting reports are available for public review at the following locations:

University of Alaska Anchorage
Consortium Library
3211 Providence Drive
Anchorage, Alaska 99508-8176
(907) 786-1845

Alaska Resources Library
222 West 7th Avenue
Anchorage, Alaska 99513
(907) 271-5025

Fort Richardson Post Library
Building 636, B Street
Fort Richardson, Alaska 99503
(907) 384-1648

Directorate of Public Works
Building 724
Fort Richardson, Alaska 99503
(907) 384-3175

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U.S. Army Alaska
Attn: APVR-RPW-EV
730 Quartermaster Road
Fort Richardson, Alaska 99505-6500