Proposed Plan for Remedial Action

Tatalina Long Range Radar Site

Tatalina, Alaska
May 2012

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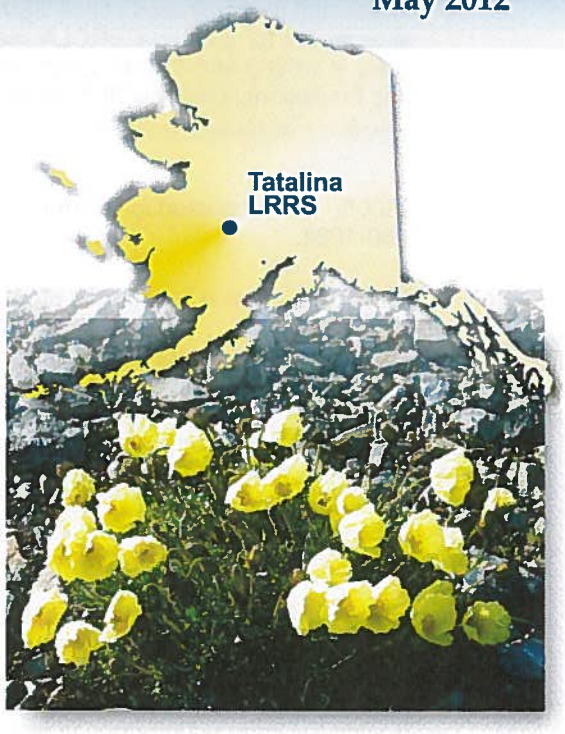


Introduction

The U.S. Air Force (Air Force) requests your comments on this **Proposed Plan** for **Environmental Restoration Program (ERP)** sites at Tatalina Long Range Radar Site (LRRS), Alaska. The ERP Sites included in this Proposed Plan (Figure 1) are:

- SS003: This was the location of a Petroleum, Oil, and Lubricant (POL) Tank Farm, which had four different spills/leaks from 1970-1982.

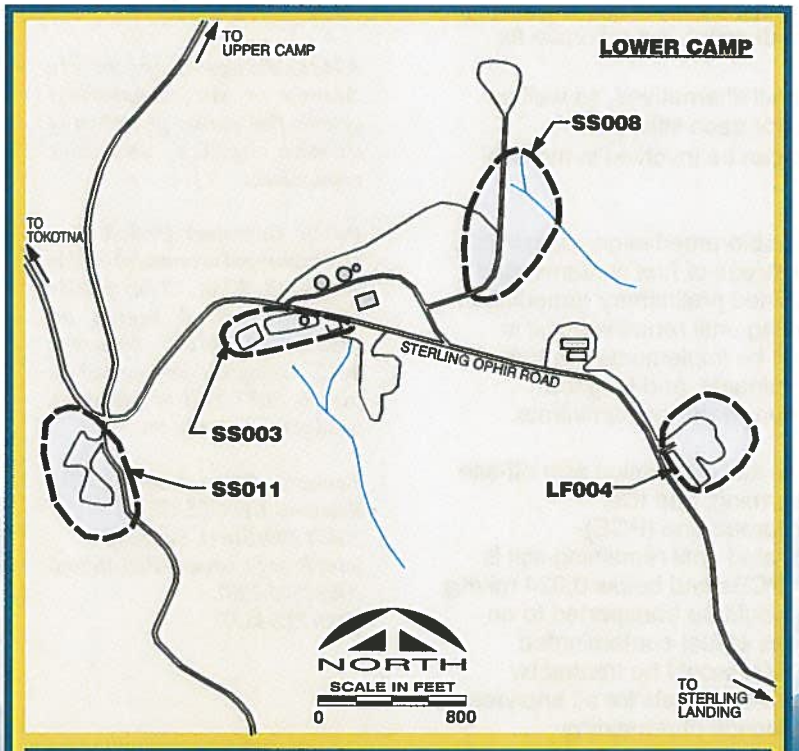


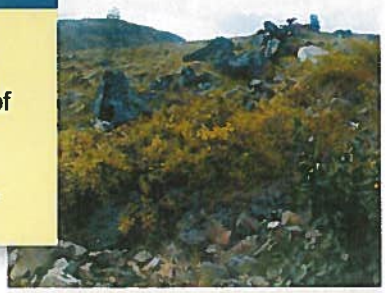
Figure 1 Site Location Map

Regulatory Basis

This Proposed Plan is issued in accordance with and satisfies the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, at 42 USC § 9601 et. seq.), as further implicated by the National Contingency Plan (NCP, at 40 CFR Part 300). The Environmental Restoration Program is the program the Air Force uses to take CERCLA response actions and satisfy its CERCLA lead agency functions as delegated by Executive Order 12580. This Proposed Plan also meets requirements of Alaska State law and regulations including, but not limited to, Title 46 of the Alaska Statutes and the regulations promulgated thereunder. This Proposed Plan is a document that the Air Force is required to issue to fulfill the requirements of CERCLA § 117(a) and NCP § 300.430 (f)(2).

Summary of Preferred Remedial Alternatives

The preferred remedial alternatives for the CERCLA sites discussed in this Proposed Plan are Offsite Disposal of PCB/PCE contaminated soil and Long-term groundwater monitoring at SS008 and Offsite Disposal of debris and contaminated soil at SS011. The preferred remedial alternatives for the non-CERCLA sites are Bioremediation of Surface Soils at SS003 and SS008, Long-term Monitoring at SS003 and LF004, and Institutional Controls (ICs) at all sites.



- SS008: This was used for storage of waste oil drums from 1950-1984.
- SS011: This was a liquid drum storage area from the 1950s.
- LF004: This was a landfill used to bury wastes from the mid-1960s to around 2000.

This Proposed Plan discusses the environmental investigations and the cleanup actions that were performed at ERP Sites SS003, SS008, SS011, and LF004, and describes the preferred **alternatives** for each site. The preferred alternatives can change in response to public comment or new information. More detailed information about each site can be found in reports located in the Administrative Record at Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska, and at the website listed at the end of this Proposed Plan. The purpose of this Proposed Plan is to:

- Provide background information and describe environmental conditions at the sites.
- Describe alternatives that were considered for the sites, present the preferred alternative for each site, and describe the rationale for selecting the preferred alternative.
- Request comments from the public on all alternatives, as well as rationale for the preferred alternatives for each site.
- Provide information on how the public can be involved in the final decision.

The preferred alternative for SS003 includes bioremediation using in-situ landfarming and institutional controls (ICs). Areas of fuel contaminated surface soils and **sediments** exceeding defined preliminary remediation goals (PRGs) would be treated by landfarming until remaining soil is below PRG levels for all analytes. ICs would be implemented to prevent disturbance of remaining subsurface contaminants, and long term monitoring would be conducted to track groundwater contaminants.

The preferred alternative for SS008 includes soil excavation with off-site disposal, bioremediation using in-situ landfarming, and ICs. Polychlorinated biphenyl (PCB) and tetrachloroethene (PCE)-contaminated soil at SS008 would be excavated until remaining soil is below 1 milligram per kilogram (mg/Kg) for PCBs and below 0.024 mk/Kg for PCE. The PCB/PCE-contaminated soil would be transported to an appropriate disposal facility. Remaining areas of fuel-contaminated surface soil and sediment exceeding the PRGs would be treated by landfarming until the remaining soil is below PRG levels for all analytes. ICs would be implemented to prevent disturbance of remaining subsurface contaminants. Long term monitoring would be conducted to

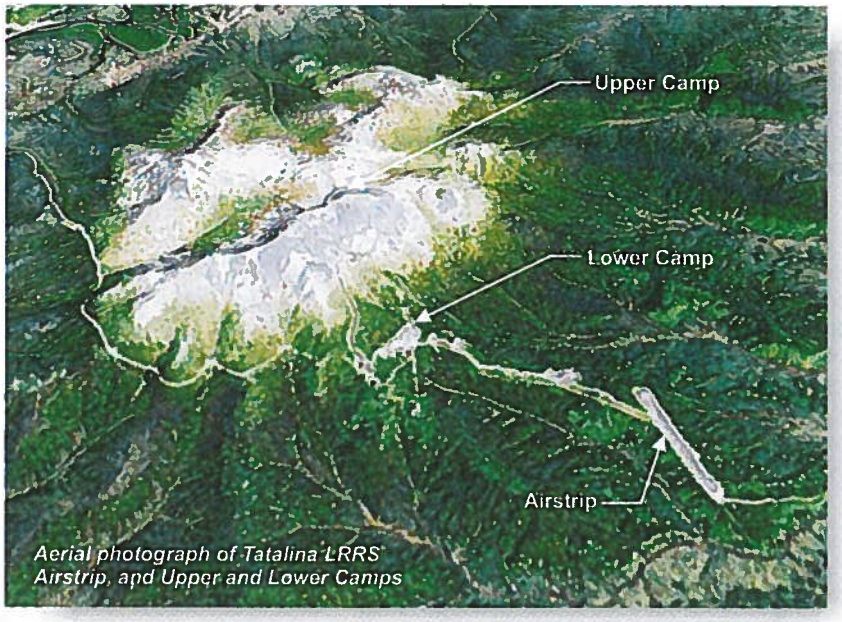
Proposed Plan: *a document required by Section 117(a) of CERCLA that informs Alaska Tribes, community leaders, and the public about contaminated sites, alternatives that were considered for cleaning up the sites, and which alternatives were identified as the preferred alternatives.*

Environmental Restoration Program (ERP): *a federal program initiated in the early 1980s to investigate and clean up old military facilities. The Air Force's CERCLA program. This program was formerly called the Installation Restoration Program (IRP).*

Alternatives: *appropriate cleanup or site management options that ensure protection of human health and the environment.*

Public Comment Period: *You are encouraged to comment on this Proposed Plan. The public comment period begins on May 7, 2012, and ends on June 6, 2012. Comments postmarked by June 6, 2012, will be addressed. Send your comments to:*

Tommie Baker, Community Relations, 611 CES/CEAR
10471 20th Street, Suite 340
Joint Base Elmendorf-Richardson, AK 99506-2201
(800) 222-4137



Aerial photograph of Tatalina LRRS Airstrip, and Upper and Lower Camps

track groundwater contaminants including free product encountered in well BH37/MW. Ground water monitoring will include samples collected from new well to be installed near the sediment sample that was found to contain PCE.

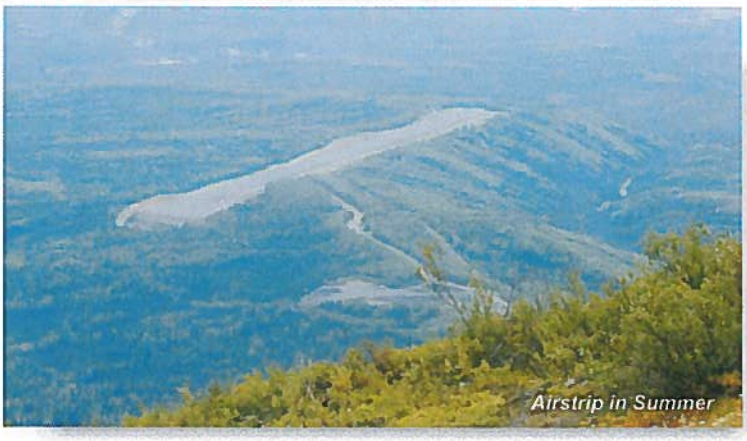
The preferred alternative for SS011 includes removal to the maximum extent possible of exposed drum debris and contaminated soil for off-site disposal. ICs would be implemented to prevent disturbance of remaining subsurface contaminants.

The preferred alternative for LF004 is ICs with Long-term Monitoring. ICs would be implemented to prevent disturbance of the landfill cover and buried wastes. Long-term Monitoring would consist of landfill cover inspections and downgradient groundwater and surface water sampling.

The Air Force has issued this Proposed Plan to solicit review and comments from the public participants on all alternatives and on the rationale for the preferred alternatives proposed for each of the four sites. The final decision on the preferred alternative would not be made until comments submitted by the end of the **public comment period** have been reviewed and considered. Changes to the preferred alternative may be made if public comments or additional data indicate that such changes would result in a more appropriate solution. Following public comment, a **Record of Decision** (ROD) will be issued that selects the final cleanup remedy. Public comments and responses to those comments will be included in the Record of Decision.

Regulatory Process

The ERP is the Air Force's program modeled after the U.S. Environmental Protection Agency's (EPA's) environmental cleanup program. Typically, the EPA is involved with cleanup activities to ensure compliance with applicable laws and regulations. Pursuant to the Department of Defense ERP, the Air


Airstrip in Summer

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): *a federal law established in 1980, modified in 1986, also known as "Superfund." CERCLA established a nationwide process for cleaning up hazardous waste sites that potentially endanger public health and the environment.*

Record of Decision: *as required by CERCLA Section 117(b), a document of the final cleanup decision under the site cleanup rules. The Record of Decision documents the rationale for selection of the final remedy.*

Responsiveness Summary: *a summary of oral and written public comments received during the comment period and the responses to those comments. The responsiveness summary is part of the Record of Decision.*

Sediment: *loose particles of sand or mud that are transported from their place of origin by moving water and deposited in unconsolidated layers.*

Force provides copies of site investigation documents to the EPA for their review and to keep them informed on site activities. In the past, the EPA has not provided comments on documents for Tatalina LRRS sites, generally deferring regulatory oversight to Alaska Department of Environmental Conservation (ADEC). Copies of the remedial investigation/feasibility study (RI/FS) reports for the four sites in this Proposed Plan were provided to the EPA and no comments were received; therefore, ADEC is the principle regulatory agency involved in the environmental restoration of these sites.

CERCLA

Preparation of this Proposed Plan and the associated public comment period are required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These federal laws regulate the cleanup of hazardous waste sites that contain substances covered under CERCLA. Although the sites described in this Proposed Plan are not Superfund sites, the Air Force cleanup program follows CERCLA procedures when CERCLA hazardous substances are present at any of the sites at an installation. The steps involved in evaluation and cleanup of Air Force ERP sites are shown on Figure 2 and summarized below.

Preliminary Assessment.

In this first phase of the ERP process, investigators review records and interview former site workers. The investigators look for information about waste handling and fuels management to identify areas that might have been contaminated. Additional

Institutional Controls (ICs): ICs are non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy.

Polychlorinated Biphenyls (PCBs): a group of toxic, persistent chemicals used in transformers.

Metals: elements that occur naturally in the environment and are used in numerous products (i.e., sheet metal, drums, paint, batteries, etc.)

Cleanup Levels: concentrations or amounts of chemicals prescribed by state and federal regulations that have been determined to be protective of human health and the environment.

Background Levels: levels of naturally-occurring substances, such as metals, that are commonly found in the soil, sediment, or water of a region.

PAHs: a group of chemicals produced as byproducts of burning fuel.

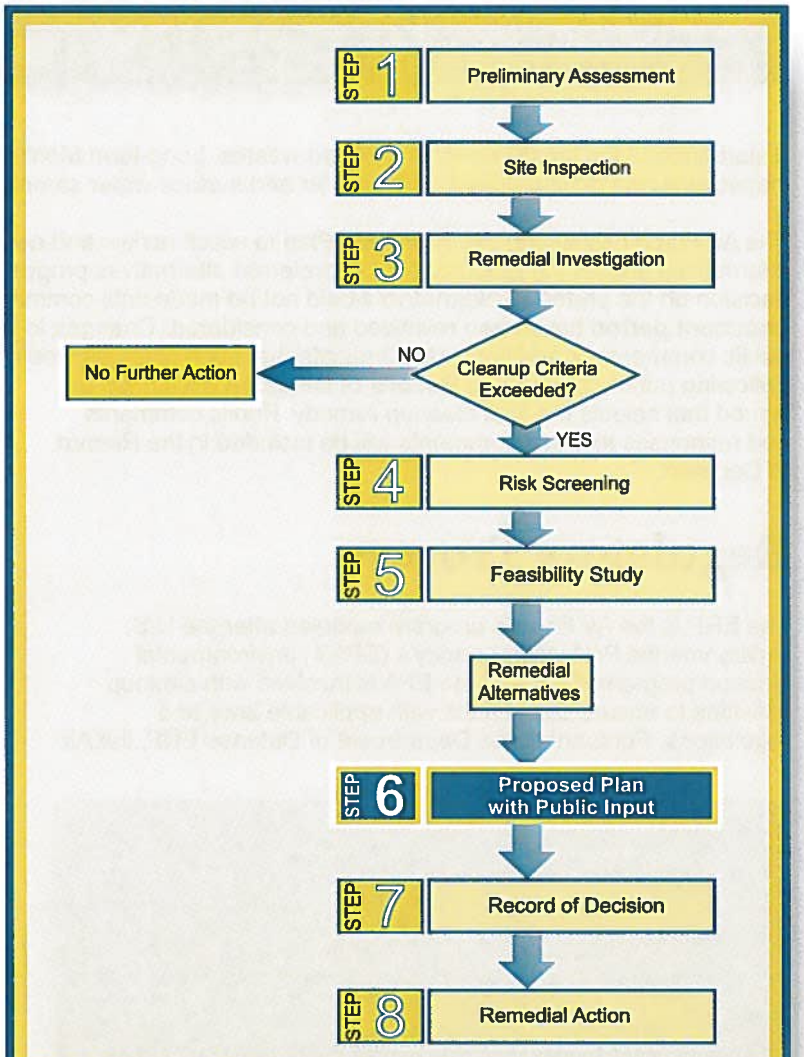
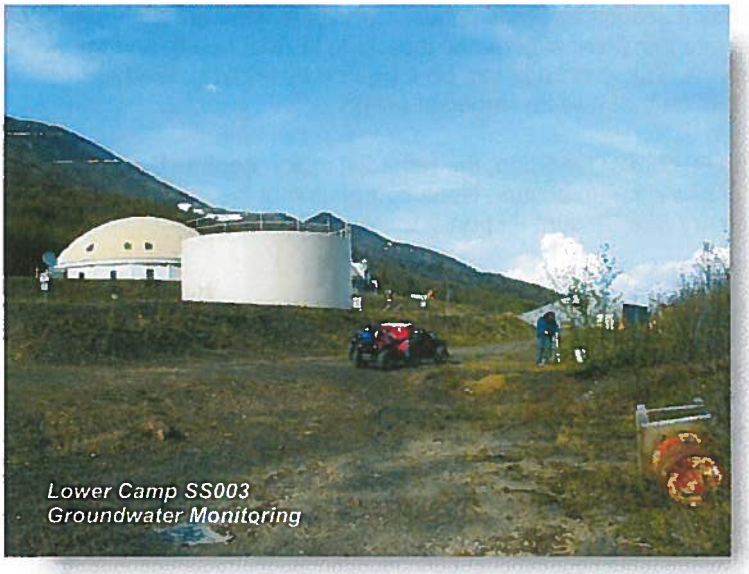


Figure 2
CERCLA Process for Investigation and Remediation of Potentially Contaminated Sites


Lower Camp SS003
Groundwater Monitoring

assessments may be conducted when new information is found, or new sites are identified.

Site Inspection. To follow up on findings from the preliminary assessment, investigators inspect potentially-contaminated sites and collect environmental samples. The purpose of the site inspection is to determine if contamination exists and if further investigations are warranted.

Remedial Investigation (RI). Based on the results of the site inspection, a more comprehensive investigation may be required. This investigation is called a RI. During the RI, environmental field crews collect samples of potentially contaminated media such as soil, sediment, groundwater, and surface water. The purpose of a RI is to determine the presence and/or extent of contamination, and to add to the knowledge gained in the site inspection to create a more complete picture of environmental conditions at a site. Additional samples may be collected and analyzed to determine naturally-occurring background concentrations in the different sample media.

Risk Screening. After the RI, a preliminary risk evaluation is conducted to evaluate potential risks to human health or the environment at each site. The goal of risk screening is to identify chemical contaminants that have a potential to cause risk to human health or the environment. Risk screening is performed for each media of concern (soil, sediment, water, air, and biota [plants and animals]). Two primary factors considered in risk screening are:

1. Whether significant levels of contaminants are present at a site, determined by comparing sample results with appropriate cleanup levels.
2. The likelihood of an exposure occurring, determined by the proximity of receptors to a site, the persistence of contaminants, and whether the toxicity thresholds for any chemical were exceeded.

In addition, results of the risk screening can be used to establish levels of chemicals in site media that may remain at a site and still be protective of human health and the environment.

Feasibility Study (FS). The purpose of a FS is to evaluate various remedial alternatives to address contamination in media identified at a site. The FS for ERP Sites SS003, SS008, and SS011 evaluated the feasibility of various remedial alternatives.

Proposed Plan. The preferred alternative for a site is presented to the public in a Proposed Plan. The Proposed Plan briefly summarizes the alternatives studied in the detailed analysis of the RI/FS, highlighting the key factors that led to identifying the preferred alternative.

Record of Decision. The ROD documents the remedial action plan for a site and serves the following three basic functions:

- Certifies that the remedy selection process was carried out in accordance with CERCLA and, to the extent practicable, with the NCP.
- Describes the technical parameters of the remedy, specifying the methods selected to protect human health and the environment, including; treatment, engineering, and IC components, as well as cleanup levels.
- Provides the public with a consolidated summary of information about the site and the chosen remedy, including the rationale behind the selection.

Interim Removal Actions. Interim removal actions and time critical removal actions are generally short-term response actions taken to abate or mitigate imminent substantial threats to human health and the environment and are generally surface cleanups. These actions can be triggered by burning, leaking, explosion, or other hazardous occurrences that cannot wait for remedial action.

Remedial Action. After completion of the Record of Decision, the remedial action begins. During the remedial action, the implementation phase of site cleanup occurs. Upon completion of the remedial action for a site, a Remedial Action Report and Preliminary Site Closure Report are prepared that document NCP site construction completion.

Following consideration of public comments received on this Proposed Plan, the Air Force will prepare a Record of Decision to document the final selected remedies for these four sites. The Record of Decision contains a summary of responses to public comments **(Responsiveness Summary)**.

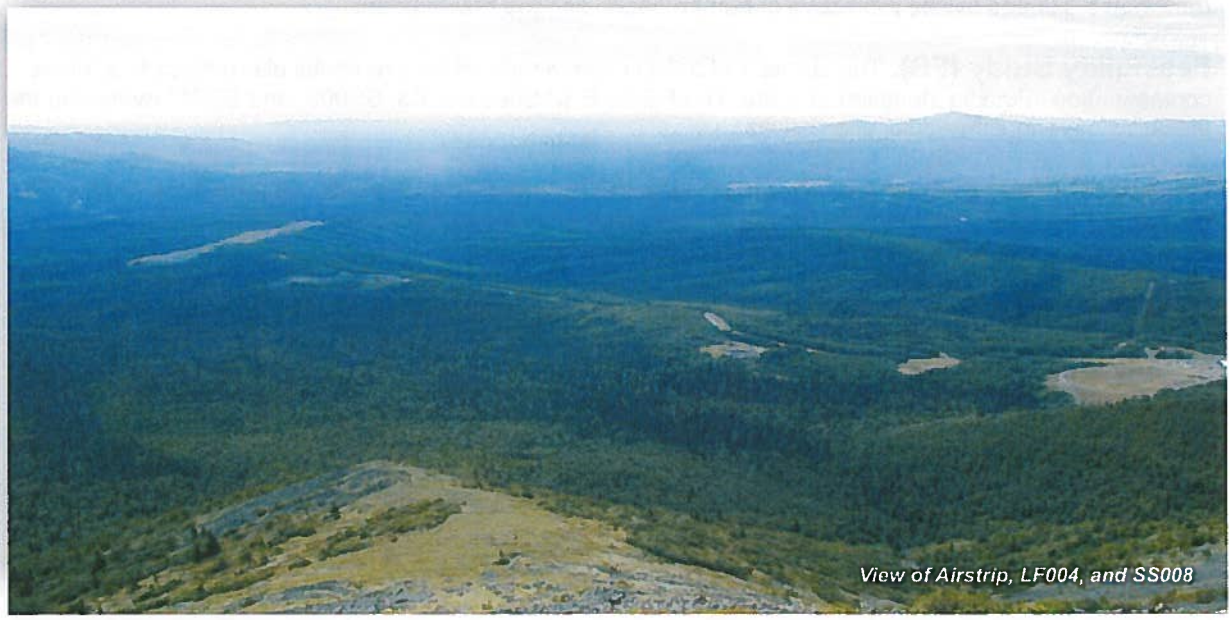
CERCLA Petroleum Exclusion

CERCLA Section 101(14) excludes certain substances from the definition of hazardous substance, thus exempting them from CERCLA. These substances include petroleum, meaning "crude oil or any fraction thereof." The EPA interprets this to include hazardous substances that are normally mixed with or added to crude oil or crude oil fractions during the refining process. Contamination resulting from spills of heating oil, diesel fuel, jet fuel, and gasoline are exempt from CERCLA. However, in Alaska, sites that are contaminated with releases of petroleum products or other hazardous substances are addressed by ADEC under the contaminated sites regulations (18 Alaska Administrative Code [AAC] 75, Article 3, Discharge Reporting Cleanup and Disposal of Oil and Other Hazardous Substances).

Contamination at ERP Sites SS003, SS008, and SS011 is almost entirely from spills of petroleum products and the investigations and cleanup fall under State of Alaska regulations and not CERCLA. The exception is at site SS011 and the area of PCB and PCE soil contamination at SS008 to which CERCLA applies. LF004 is a former landfill that received municipal solid waste from Tatalina LRRS, but since no CERCLA hazardous substances have been detected, the landfill will be managed under 18 AAC 75.

Site Background

Tatalina LRRS is a remote site, accessible only by air and water, located 10 miles southeast of Takotna by road, and 240 miles northwest of Anchorage. The site was constructed as an Aircraft Control and Warning facility in 1952, and became operational in the same year. A White Alice Communications System (WACS)



View of Airstrip, LF004, and SS008

was built at the site and activated in 1957. A Minimally Attended Radar (MAR) was installed in 1985 and remains active to date. The site was converted to Long Range Radar in 1983. Four contractor personnel currently are assigned to operate and maintain the facilities for the Air Force. Site operations are planned to continue indefinitely.

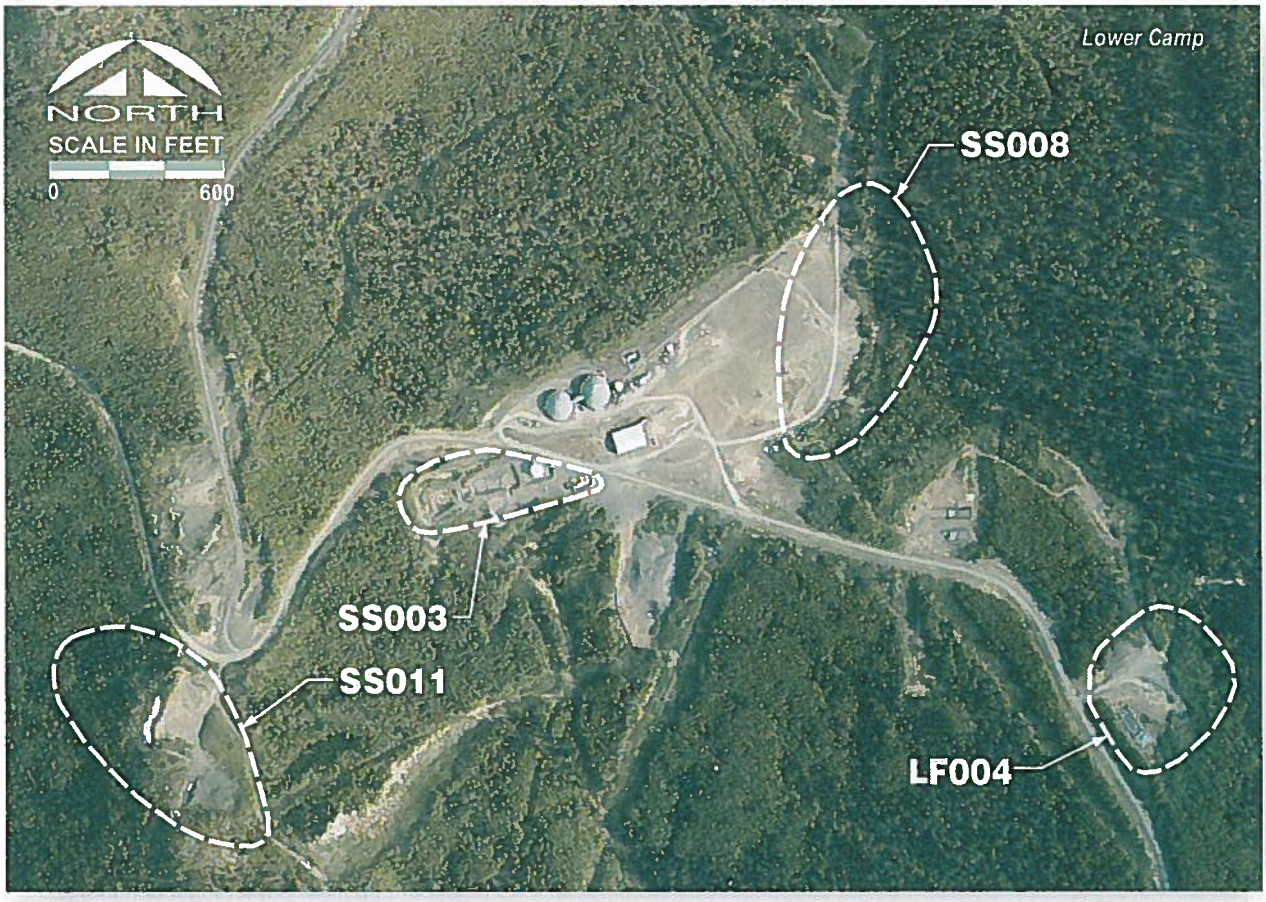
Tatalina LRRS consists of 4,968 acres located in the upper Kuskokwim River area. The installation consists of four areas: Upper Camp on Takotna Mountain, where radar facilities are located; Lower Camp, where residential and support facilities are located; the Airstrip; and the Sterling Landing (a barge landing) site along the Kuskokwim River.

Upper Camp is located at the summit of Takotna Mountain. The LRRS radar facilities and a small structure to house the MAR are located at Upper Camp.

Lower Camp is located on the southern flank of Takotna Mountain, at an elevation of approximately 1,250 feet. A living dome, an industrial dome, several aboveground storage tanks used for fueling vehicles and equipment, as well as ERP Sites SS003, SS008, SS011, and LF004, are located at Lower Camp. The Airstrip is about 2 miles southeast of Lower Camp, at an elevation of about 890 feet. The sources of contaminants of concern at SS003, SS008, SS011, and LF004 are POL tanks, waste accumulation areas, and landfill area.

Site Characteristics

The following sections provide physical descriptions and investigative histories for ERP Sites SS003, SS008, SS011, and LF004.



SS003 POL Tank Farm

The primary area of SS003 consists of the former POL Tank Farm and the area of targeted remediation is approximately 20,000 square feet. This site is located at Lower Camp (Figure 3).

Records indicate that a liner was installed in the bermed POL Tank Farm area in 1983. Three bulk diesel storage tanks and two bulk motor vehicle gasoline (MOGAS) storage tanks were removed in 1993.

Between 1997 and 2004, four Remedial Investigations (RIs) were conducted at SS003. Notable observations include a 1997 finding that fuel leaks/spills infiltrated vertically in the POL Tank Farm area until reaching the groundwater interface, and then spread horizontally. The 2002 investigation confirmed that shallow soil concentrations within the bermed areas contained the greatest hydrocarbon concentrations; while soil located a short distance downgradient contained moderate concentrations. The 2003 investigation confirmed the contaminated soil in the POL Tank Farm was a continuing source of contamination of groundwater downgradient of the tank farm. Depth to groundwater at this site ranged from 12.85 feet below ground surface (bgs) to 7.70 feet bgs in 2003. In addition, after the removal of the liner in 2004, POL contaminants were still present in the soil immediately below the tank pits and the downgradient soil and groundwater.

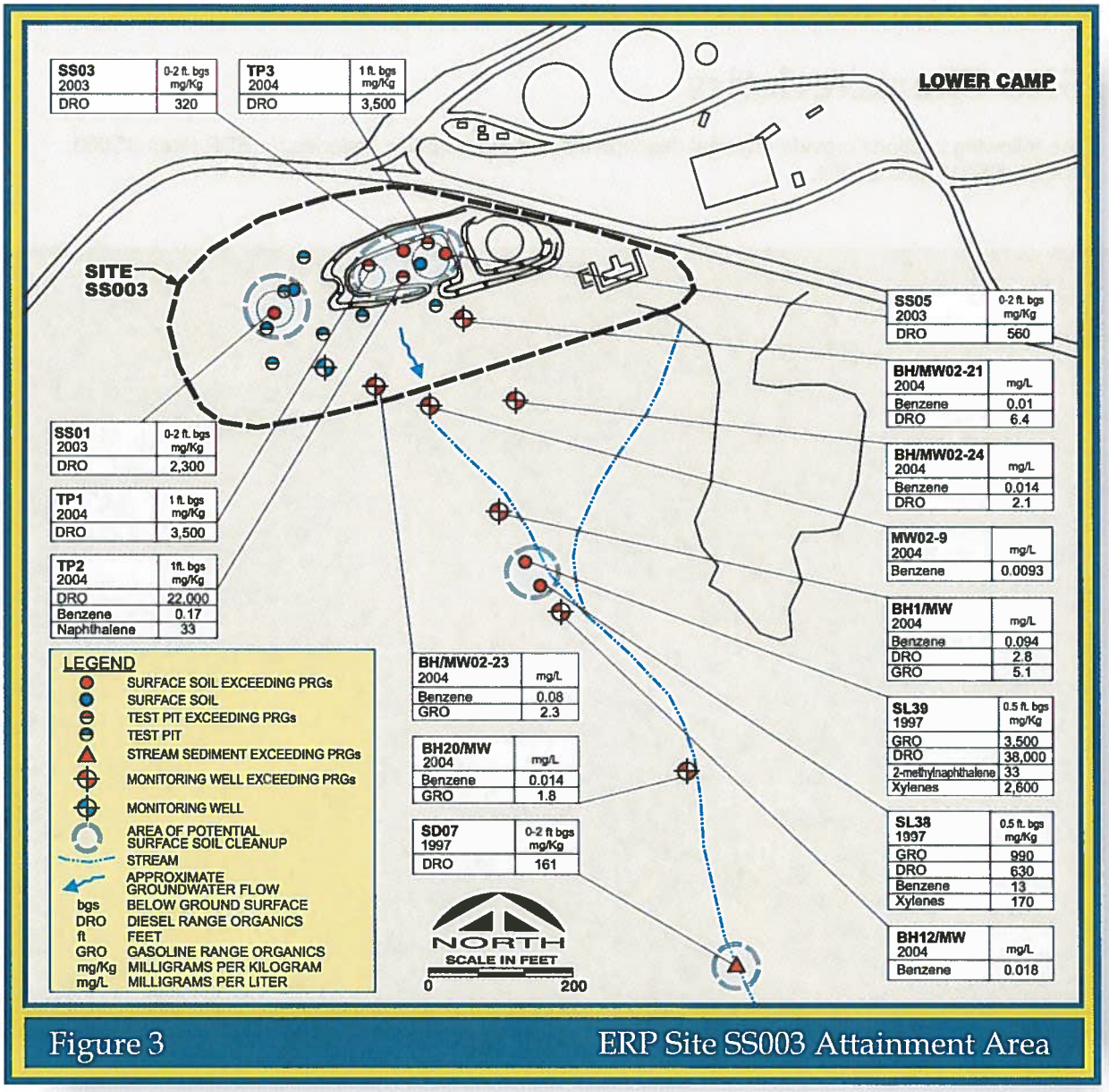


Figure 3 ERP Site SS003 Attainment Area

Diesel range organics (DRO) concentrations in the soil samples ranged from not detected to 38,000 mg/Kg. The source of this DRO contamination was described in the 1997 RI report to be an isolated incident, with a separate, non-pervasive spill source. The subsurface soil pathway is incomplete and will not be considered further. Petroleum is the only contaminant of concern at SS003, which is not included in CERCLA's definition of hazardous substances and, is therefore, not subject to CERCLA reporting, response, or liability requirements; therefore, no action for petroleum is proposed under CERCLA. Action under State of Alaska regulations is required for the petroleum contamination.

SS008 Waste Accumulation Area Number 4

The primary area of SS008 consists of Waste Accumulation Area Number 4 and the area of targeted remediation is approximately 10,000 square feet. This site is located at Lower Camp (Figure 4). Eleven boreholes were completed in 1997 and 1999. Only two had PCB contamination. These are likely isolated incidents, because one borehole location is in a separate small clearing, and the other had nearby

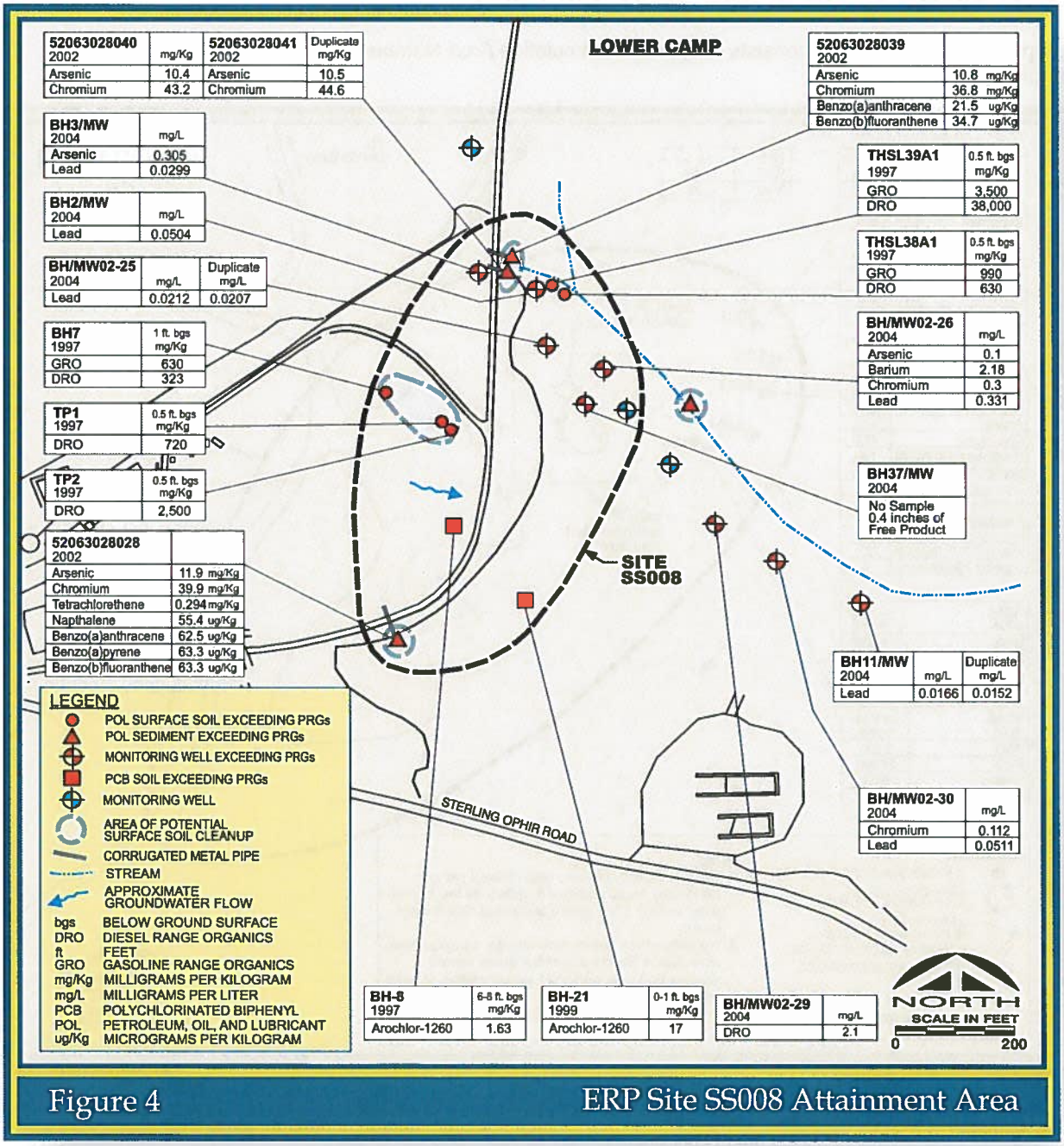


Figure 4 ERP Site SS008 Attainment Area

boreholes without PCB detections. PCBs were detected above ADEC cleanup levels in the surface soil of Boring BH-21 and subsurface soil of Boring BH-8. PCE was detected in one sediment sample, but not in neighboring boreholes or monitoring wells. Most notably, one monitoring well had free product during the 2002, 2003, and 2004 investigations. The 2002 and 2003 reports concluded that the free product was limited, and confined to the base or toe of the slope of the hill. In 2004, DRO was detected in a monitoring well downgradient from the well with free product, most likely representing migration of contaminants. DRO results ranged from not detected to 2.1 milligrams per liter (mg/L). Breakdown products from pesticides were detected above ADEC cleanup levels at SS008. These pesticides were applied to the entire installation and therefore, will not be considered for remediation. The subsurface soil pathways is incomplete and will not be considered further. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability requirements; therefore, no action is proposed under CERCLA for petroleum. Treatment of PCB and PCE contaminated soils are subject to CERCLA requirements. Action under State of Alaska regulations is required for the petroleum contamination.

SS011 Waste Accumulation Area Number 1

The primary area of SS011 consists of Waste Accumulation Area Number 1 and is located at Lower Camp (Figure 5).

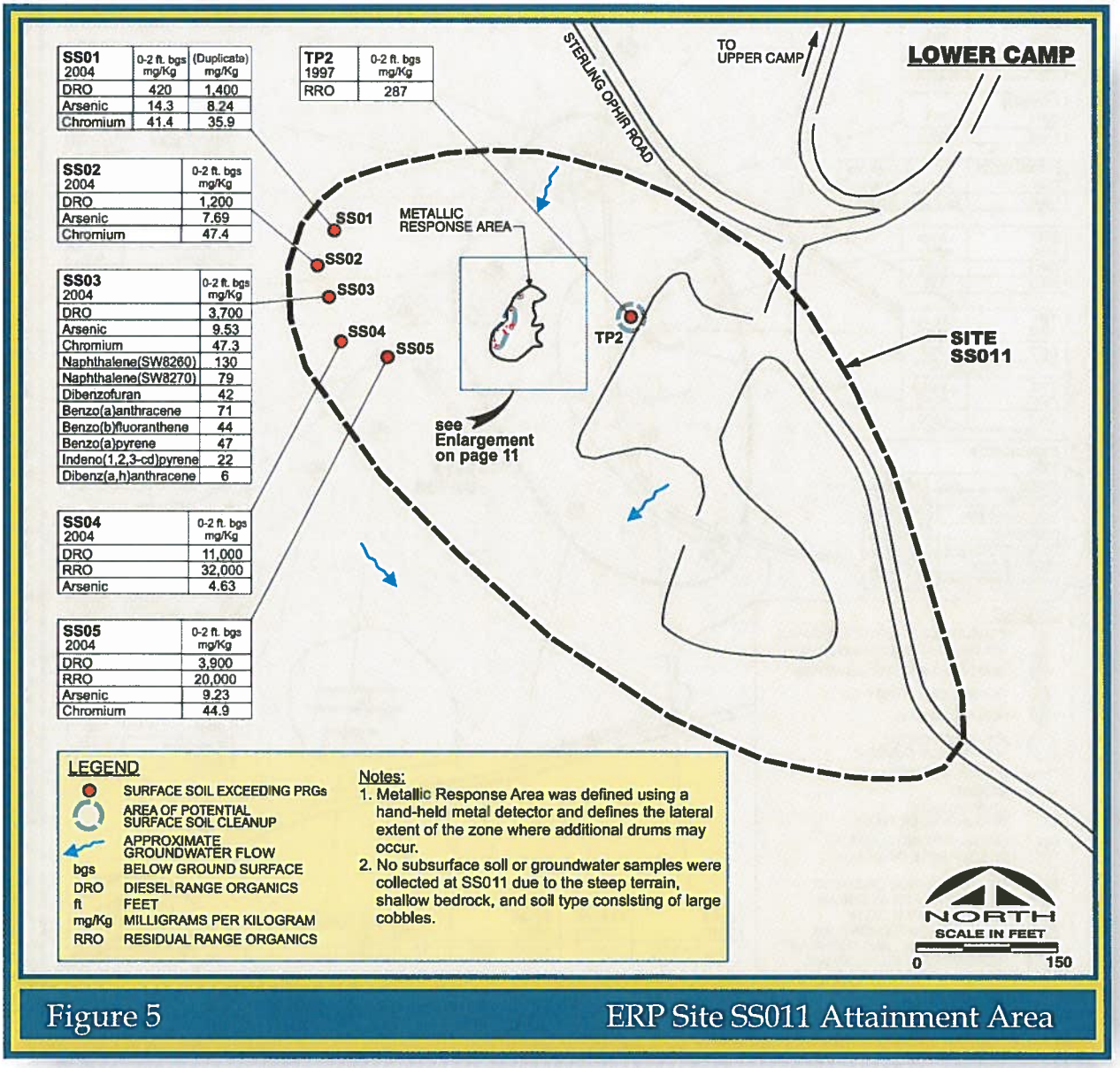


Figure 5 ERP Site SS011 Attainment Area

Between 1997 and 2007, five RIs were conducted at SS011. There were multiple removal actions to remove the stored waste drums. The 1997 report indicated neither PCBs nor petroleum hydrocarbons (PHCs) were present above ADEC Method Two cleanup levels. The 2003 report indicated there was no evidence of petroleum product contamination in surface water or sediment downgradient from the buried waste drums. In 2004, surface samples downgradient of the slope where waste drums were exposed and removed had residual range organics (RRO) results ranging from 2,300 to 32,000 mg/Kg; and DRO results ranged from 420 to 11,000 mg/Kg. One sample had polynuclear aromatic hydrocarbons (PAHs) detected at higher concentrations than the other samples, representing a hotspot.

Ten partially-exposed drums were documented in 2007 and remain on site, and a magnetometer coupled with a high accuracy global positioning system (GPS) was used to determine the potential extent of possible buried drums. The extent of potentially-buried debris registering a magnetic signal was approximately 2,500 square feet. Surface soils collected from the stained area beneath the 10 drums had results for DRO ranging from 240 to 200,000 mg/Kg, while RRO results ranged from 700 to 160,000 mg/Kg. No subsurface soil or groundwater samples were collected at SS011 due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability; therefore, no action is proposed under CERCLA for petroleum.

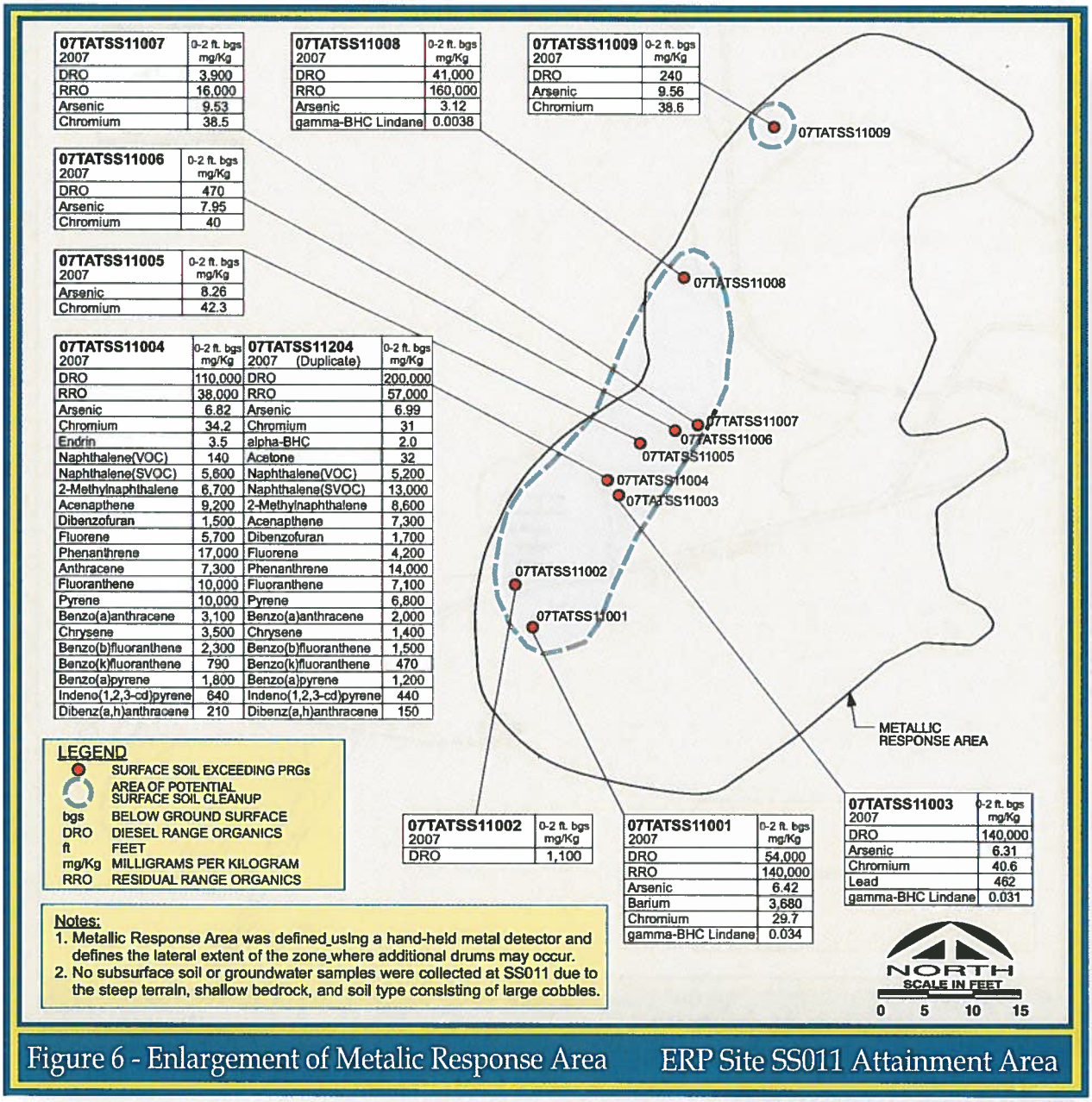


Figure 6 - Enlargement of Metalic Response Area ERP Site SS011 Attainment Area

LF004 Landfill Number 2

The primary area of LF004 consists of Lower Landfill Number 2 and is approximately 4 acres in size. This site is located at Lower Camp (Figure 7).

Between 1992 and 1999, three RIs were conducted at LF004. No contaminants of concern were detected above ADEC cleanup levels for surface soil, subsurface soil, groundwater, or downgradient surface water and sediment samples. The 1997 RI did not investigate the active portions of the landfill. One soil boring was drilled and converted to a monitoring well, and then sampled for subsurface soil, and groundwater. In 1999, test holes were excavated into the cover of the landfill to verify that it was at least 2 feet thick.

A new landfill was constructed in 2002, covering approximately 80 percent of the former landfill. The remaining 20 percent is being visually inspected by the Tatalina LRRS Base Operations Contractor on a regular basis. In 2003, a small area of exposed debris was covered.

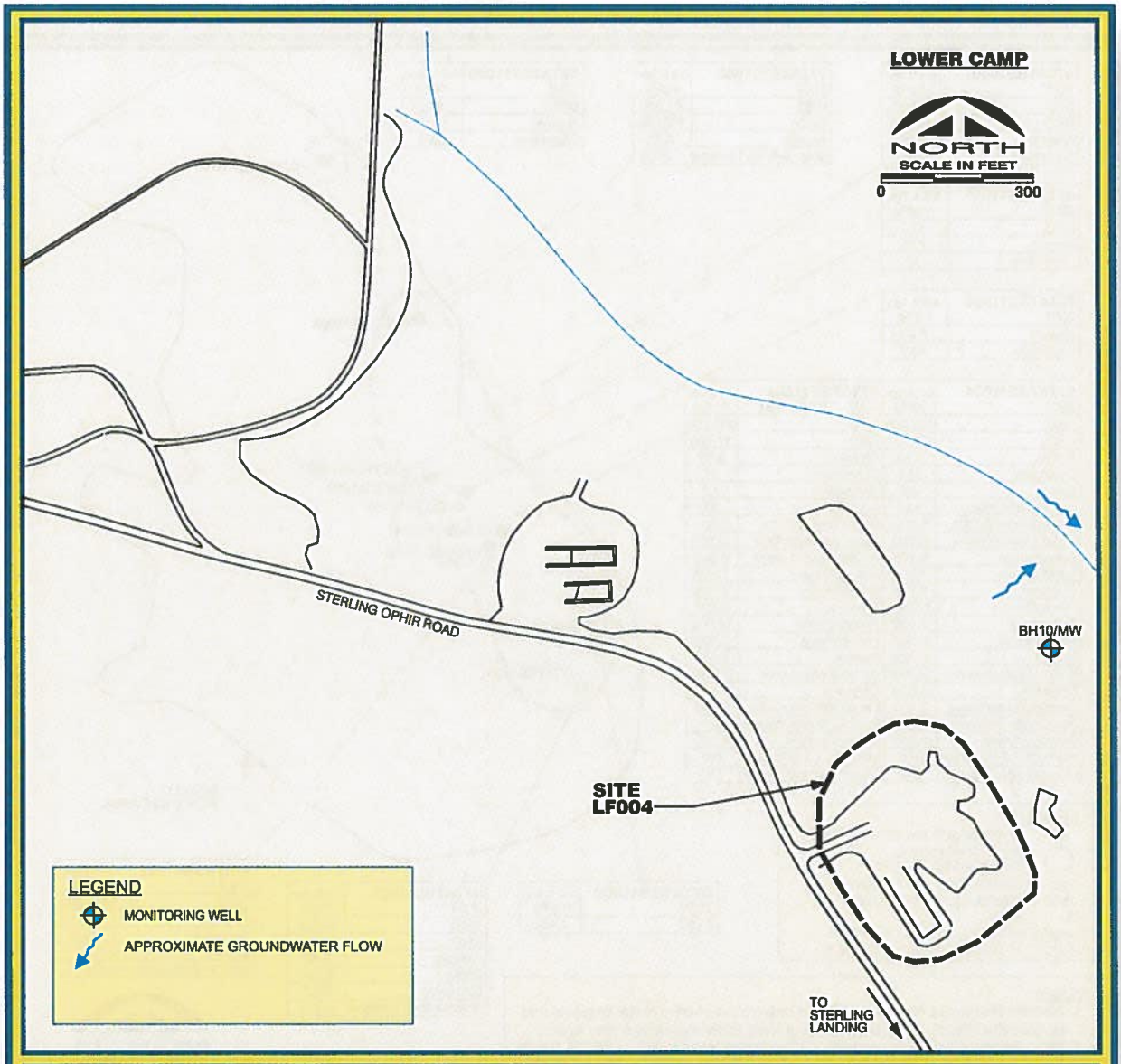
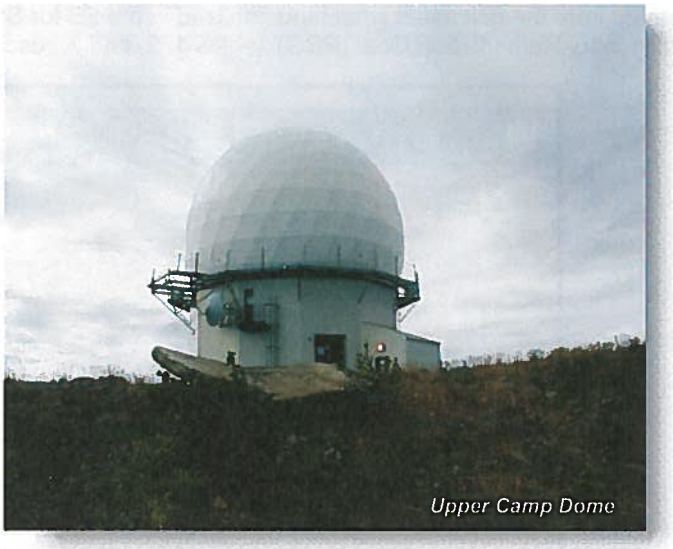


Figure 7 ERP Site LF004 Attainment Area

A risk assessment completed in 1997 for LF004 indicated contaminant concentrations were below human health risk-based levels. Ecological risk drivers were determined to be 4,4'- dichlorodiphenyldichloroethane (DDD), 4,4'- dichlorodiphenyldichloroethylene (DDE), and 4,4' - dichlorodiphenyltrichloroethylene (DDT). These analytes are breakdown products from pesticides that were legally applied to the entire installation, were detected below ADEC Method Two soil cleanup levels, and, therefore, will not be considered for further remediation. No analytes included in CERCLA's definition of hazardous substances have been detected at this site; therefore, LF004 is not subject to CERCLA reporting, response, or liability requirements; and no action is proposed under CERCLA.


Upper Camp Dome

Summary of Site Risk

As part of the RI, a baseline risk assessment was conducted in 2009 based on data from the four RIs conducted between 1997 and 2004 to estimate the potential current and future effects of contaminants on human health and the environmental at ERP Sites SS003, SS008, and SS011.

Tatalina LRRS has one nearby community connected by road, but access to the site is limited to Air Force-approved activities. The four ERP sites contain no occupied structures and the Air Force uses the lands at SS003 for storage and dispensing diesel and MOGAS. Part of LF004 is currently used as an active landfill. There are no current plans for future development at any of the sites. The current land use is expected to remain the same over the foreseeable future.

Receptors: living organisms that may be affected by site contamination. Human receptors may include site workers, subsistence users, and site visitors. Potential ecological receptors consist of terrestrial and aquatic wildlife and plant species.

Toxicity Threshold: a criterion used in risk screening to evaluate how toxic a potential exposure to a contaminant could be. The toxicity threshold is exceeded when:

The duration or frequency of exposure is sufficient to cause adverse health or environmental effects, AND

One of the following is met:

-The measured concentration of at least one contaminant exceeded the ADEC cleanup level or other appropriate criteria, OR

-One or more contaminants exhibit high toxicity to ecological receptors.

It is the Air Force's current judgment that the preferred alternative identified for each ERP Site in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health, welfare, or the environment from actual or threatened releases of **hazardous substances** at the sites into the environment.

Human Health Risk

Using the data collected from 1997 to 2004 at SS003, SS008, and SS011, an updated human health risk assessment was conducted in 2009. Source areas were first evaluated to determine where human receptors might be exposed to site contaminants. Possible exposure pathways were evaluated to see which routes of exposure were complete. A complete exposure route is one in which site contaminants can get from the contaminated media, such as soil or groundwater, to humans. Inhalation of contaminated dust, incidental ingestion of soil or water, or dermal exposure to contaminated soil or water are exposure routes evaluated at Tatalina LRRS. Based on this evaluation, it was determined that potentially significant complete exposure pathways between site workers and soil chemicals of potential concern (COPCs) include incidental oral, dermal, and inhalation contact with soil, soil particulates, sediments, surface water, or subsurface water. Human health risks were calculated for carcinogenic (cancer causing) and non-carcinogenic contaminants. The results of those calculations were compared against conservative risk management standards set by ADEC. The selected values

derived from the risk assessmentand finalized in the FS for SS003, SS008, and SS011 are summarized in Preliminary Remediation Goal (PRG) Tables 1, 2, and 3, respectively.

Table 1 SS003 - Preliminary Remediation Goals

Media	Parameter	PRG	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	Naphthalene	81	160	51
	1,2,4-Trimethylbenzene	116	1,400	431
	1,3,5-Trimethylbenzene	82	510	81
Groundwater [2]	Benzene	0.005	0.35	0.12
	Ethylbenzene	0.7	0.41	0.14
	3,3'-Dichlorobenzidine	0.0019	0.005	0.0050
	Bis(2-chloroethyl) Ether	0.00077	0.0005	0.00050
	Hexachlorobutadiene	0.0073	0.003	0.0030
	DRO	1.5	6.4	3.5
	GRO	2.2	7.5	3.4
	RRO	1.1	1.00	3.4
Ecological Receptors				
Surface Soil [1]	Total Xylenes	2,029	2,600	2,600
	DRO	1,000 [3]	38,000	14,251
	GRO	347	3,500	629
	RRO	11,000 [4]	1,260	605
Sediment [1]	Bis(2-ethylhexyl)phthalate	0.19	0.9	0.90

Key:
1. Concentrations reported in milligrams per kilogram (mg/Kg).
2. Concentrations reported in milligrams per liter (mg/L), ADEC Table C cleanup levels were used to establish PRGs for these parameters.
3. This value represents a remedial target for land farming that was mutually agreed upon by the Air Force and ADEC on April 10, 2012.
4. The ADEC Method Two cleanup level for the migration groundwater pathway, for under 40 inches of precipitation, was used to establish the PRG for this parameter.

ADEC - Alaska Department of Environmental Conservation
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
GRO - Gasoline Range Organics
PRG - Preliminary Remediation Goal, based on the risk-based cleanup level.
RRO - Residual Range Organics

The risk assessment found that exposure pathways were complete for both current and future site workers, trench workers, and recreational hunters for surface soil (SS003, SS008, and SS011) and groundwater (SS003 and SS008). The exposure pathways for subsurface soil were also complete; however, these results were below the conservative ADEC risk management standards at SS003 and SS008. Results of the ADEC-approved human health risk assessment indicate there is a risk to site workers from naphthalene (SS003 and SS011), PCBs (SS008), DRO (SS011), RRO (SS011), and various PAHs (SS011). The risk assessment also indicated there is a risk to site workers from arsenic at SS003; however, these levels have been determined to be within the areas background levels. In 1997, no COPCs were identified as human health risks for ERP Site LF004.

Ecological Risks

The updated ecological risk assessment concluded that there are complete exposure pathways between ecological **receptors** at Tatalina LRRS for terrestrial birds and mammals in surface soil, subsurface soil, sediment, and surface water media for direct contact pathways, including incidental ingestion, dermal contact,

Table 2 SS008 - Preliminary Remediation Goals

Media	Parameter	PRG	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	PCB (Aroclor 1260)	1[3]	17	11.50
Groundwater [2]	1,2-Dibromomethane	0.00005	0.001[5]	0.0010
	2-Methylnaphthalene	0.15	0.464	0.46
	DRO - Aliphatic	1.5	152	36
	DRO - Aromatic	1.5	76	36
	Lead	0.015	0.331	0.087
Ecological Receptors				
Surface Soil [1]	PCB (Aroclor 1260)	1	17	12
	DRO	1,000 [6]	2,500	2,159
	GRO	323	630	630
	RRO	11,000[4]	529	529
Sediment [1]	DRO	265	2,740	2,506
	RRO	22	1,190	871
	PCE	0.024[4]	0.294	NC

Key:
1. Concentrations reported in milligrams per kilogram (mg/Kg).
2. Concentrations reported in milligrams per liter (mg/L), ADEC Table C cleanup levels were used to establish PRGs for these parameters.
3. Method 2 default clean-up level based upon the Federal TSCA regulations.
4. The ADEC Method Two cleanup level for the migration-to groundwater pathway, for under 40 inches of precipitation, was used to establish the PRG for this parameter.
5. With the exception of two samples from 1997 with reported concentrations, the analyte was not detected in all samples. However, the Method Reporting Limit (MRL) is greater than the PRG for all nine samples indicated to have concentrations above PRG.
6. This value represents a remedial target for land farming that was mutually agreed upon by the Air Force and ADEC on April 10, 2012.

ADEC - Alaska Department of Environmental Conservation
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
GRO - Gasoline Range Organics
NC - Not calculated
PCE - Tetrachloroethene
PRG - Preliminary Remediation Goal, based on RBCL (Risk-Based Cleanup Level)
RRO - Residual Range Organics
TSCA - Toxic Substances Control Act

and inhalation of dust. The pathways for subsurface soil were incomplete for ecological receptors. Concentrations of metals were similar to concentrations measured in background samples and are not considered for evaluation. Primary ecological risk-drivers include: PCBs (SS008), chlorinated pesticides (SS011), various PAHs (SS011), gasoline range organics (GRO) (SS003), DRO (SS003, SS008, and SS011), and RRO (SS003, SS008, and SS011). Although three chemicals of potential ecological concern (COPECs) were identified during an ecological risk assessment at LF004 in 1997, they were breakdown products of pesticides that were legally applied, therefore, will not be considered for further remediation.

Remedial Action Objectives

Remedial action objectives (RAOs) are the short- and long-term goals established for each of the four ERP sites. Based on the findings of the investigations and risk assessments conducted at each site, the RAOs for these sites are to protect against oral ingestion, dermal contact, or inhalation of contaminated soil and groundwater.

Table 3 SS011 - Preliminary Remediation Goals

Media	Parameter	PRG[4]	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	Benzo(a)anthracene	24	3,100	950
	Benzo(a)pyrene	2.4	1,800	286
	Benzo(b)fluoranthene	24	2,300	705
	Benzo(k)fluoranthene	239	790	166
	Chrysene	2,389	3,500	1,066
	Dibenz(a,h)anthracene	2.4	210	34
	Indeno(1,2,3-cd)pyrene	24	640	103
	Naphthalene	81	13,000	3,555
	Alpha-BHC	3	2	0.70
	2-Methylnaphthalene	2,492	8,600	3,697
	Naphthalene[2]	287	13,000	3,555
	DRO	12,500[3]	200,000	79,575
	RRO	22,000[3]	160,000	60,057
Ecological Receptors				
Surface Soil [1]	2-Methylnaphthalene	3.356	8,600	3,697
	Acenaphthene	9.898	9,200	2,800
	Anthracene	6.065	7,300	2,230
	Benzo(a)anthracene	7.241	3,100	950
	Benzo(a)pyrene	10.915	1,800	286
	Benzo(b)fluoranthene	5.650	2,300	705
	Benzo(g,h,i)perylene	5.004	740	229
	Benzo(k)fluoranthene	0.791	790	166
	Chrysene	6.404	3,500	1,066
	Dibenz(a,h)anthracene	2.476	210	34
	Fluoranthene	4.841	10,000	3,063
	Fluorene	1.549	5,700	1,744
	Indeno(1,2,3-cd)pyrene	5.142	640	103
	Naphthalene	3.356	13,000	3,555
	Phenanthrene	8.487	17,000	5,177
	Pyrene	8.344	10,000	3,029
	Endrin	0.119	3.5	0.61
	Endrin aldehyde	0.119	2.9	0.94
	Endrin ketone	0.119	2.2	0.75
	DRO	12,500[3]	200,000	79,575
	RRO	22,000[3]	160,000	60,057
Sediment [1]	RRO	36	342	342

Key:
1 Concentrations reported in milligrams per kilogram (mg/Kg).
2 Non-cancer Hazard Index.
3 The Alaska Department of Environmental Conservation Method Two Cleanup level for inhalation, for under 40 inches of precipitation, was used to establish the PRG for this parameter.
4. The more conservative value between Human Health and Ecological Receptors will be used as the clean-up goal.
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
PRG - Preliminary Remediation Goal, based on RBCL (Risk-Based Cleanup Level).
RRO - Residual Range Organics

Based on the risk assessment results, RAOs for SS003 are:

- Prevent human, mammalian, and avian species exposure to soil impacted by historical fuel spills inside and south of the bermed areas where fuel tanks once stood.
- Prevent future human exposure to petroleum-contaminated groundwater downgradient of the old POL Tank Farm.

Based on the risk assessment results, RAOs for SS008 are:

- Prevent current and future human and ecological receptor exposure to petroleum and PCB contaminated surface soil on the eastern side of the pad where the old Lower Camp once stood.
- Prevent future human exposure to petroleum-contaminated groundwater and avian species exposure to petroleum-contaminated sediment downgradient of the old Lower Camp pad.

Based on the risk assessment results, RAOs for SS011 are:

- Prevent current and future human exposure to petroleum and pesticide contaminated surface soil on the slope immediately west of the Waste Accumulation Area No. 1.
- Prevent exposure of mammalian and avian species to petroleum and pesticide contaminated surface soil at SS011.

Summary of Alternatives

Remedial alternatives for ERP Sites SS003, SS008, SS011, and LF004 will be selected and implemented after final input is received from interested parties or stakeholders. Each alternative was evaluated against nine criteria established under CERCLA (Table 4).

Table 4 Nine Remedial Alternative Evaluation Criteria Under CERCLA

Evaluation Criteria	Definition
Overall Protection of Human Health and the Environment	Does the alternative protect human health and the environment through elimination, reduction, or control of contaminated areas?
Compliance with Applicable or Relevant and Appropriate Requirements	Does the alternative meet cleanup standards and comply with applicable government laws and regulations?
Long-term Effectiveness and Permanence	How well does the alternative protect human health and the environment after cleanup, and are there any risks remaining at the site?
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?
Short-term Effectiveness	Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative and how effective is the remedial alternative in the short-term?
Implementability	Is the alternative both technically and administratively feasible?
Cost	What are the capital and operating and maintenance costs of the alternative?
State Acceptance	Is the alternative acceptable to the state (ADEC)?
Community Acceptance	Does the community accept the Air Force's preferred alternatives?

The remedial alternatives considered in the FS to address contaminated media at these four ERP sites is provided in Table 5 and discussed below.

CERCLA Hazardous Substance:
a chemical that presents an imminent and substantial danger to the public health or welfare if it is released to the atmosphere, surface water, groundwater, or land surface. Regulatory definitions can be found in CERCLA 101(14) and 102 and the NCP 40 CFR 300.5.

No Action

CERCLA requires that the "No Action" alternative be evaluated to establish a baseline for comparison. Under this alternative, the Air Force would take no action at the site to prevent exposure to the soil and groundwater contamination. The No Action alternative assumes that the site would be left "as is" i.e., in its current condition. No Action is a response action selected when no additional remedial actions are necessary to protect human health and the environment. No Action status should be noted in Air Force and ADEC records.

Institutional Controls Only

This alternative consists of notices being placed in Land Records and the Base Master Plan. These notices will document the contamination and restrict use of the site to prevent disturbance of surface/subsurface soil and surface/groundwater. This would eliminate the exposure pathway that the unacceptable human risk determination is based on. However, this option would not prevent potential migration of contaminants from wind or water erosion and would not reduce leaching or runoff, nor would it reduce potential ecological risks.

Soil Cover with Institutional Controls

This alternative consists of using local material to construct a cover for the areas of SS003 and SS008 that contain contaminants above the PRG level to eliminate exposure to contaminated surface soil. Soil covers would be graded to promote drainage. The covers would require periodic monitoring to ensure they remain effective and might require maintenance if the integrity of the cover becomes diminished. ICs, in the form of a Notice in the Base Master Plan, and other notices in the land records would be implemented and excavation in the affected areas would be prohibited.

Natural Attenuation

This alternative consists of allowing native biological, physical, and chemical processes to reduce contaminant concentrations. The rate at which natural processes operate is highly variable, depending on the media, specific process, and site conditions. A key component of this approach is to consider and monitor multiple processes, as well as track the individual processes, in order to estimate the overall rate and extent of attenuation.

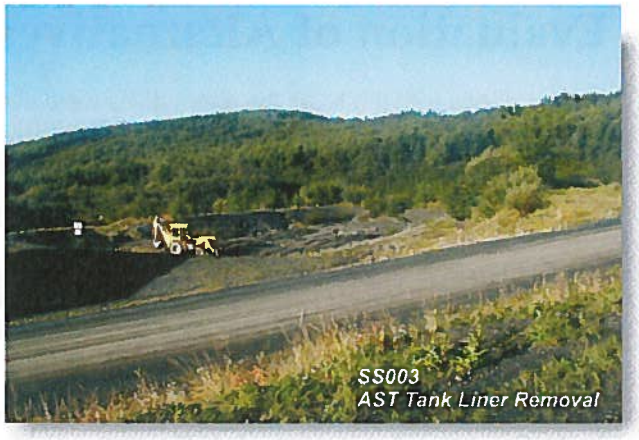
Table 5 Summary Alternatives

Remedial Alternative	POL Soil Remediation Alternative	POL Groundwater Remediation Alternative	CERCLA-PCB and PCE Remediation Alternative
No Action	✓	✓	✓
Institutional Controls	✓	✓	✓
Soil Cover with Institutional Controls	✓		✓
Natural Attenuation	✓	✓	
Chemical Oxidation	✓		
Thermal Treatment	✓		
Excavation and Off-site Landfilling	✓		✓ At TSCA Facility
Bioremediation (In-situ Landfarming)	✓		
Enhanced Bioremediation		✓	
Active Pumping with Air Stripping		✓	
Active Pumping with Filtration using Granular Activated Carbon		✓	

Key: CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
PCB - Polychlorinated biphenyl
POL - Petroleum , Oil, and Lubricant
TSCA - Toxic Substances Control Act
✓ Matrix of Application of Remedial Alternative

Chemical Oxidation

A strong oxidizing agent can be added to the surface and subsurface soils to break chemical bonds in organic contaminants of concern. This is a chemical reaction that requires an oxidizing chemical (peroxide, permanganate, persulfate, or ozone) to come in contact with the contaminant. The chemical reaction occurs relatively quickly to destroy the contaminant. The breakdown products are carbon dioxide, water, and other harmless compounds - depending on the contaminant. The oxidant can be applied by mixing a reagent directly into the soil, thus eliminating low in-situ soil temperature as a limiting factor.


SS003
AST Tank Liner Removal

Thermal Treatment

This remediation alternative consists of excavating soil with contaminant concentrations exceeding PRGs and subsequent disposal by combustion. The soil is heated in a sealed combustion chamber to remove or desorb contaminants. PHCs are the contaminant most commonly remediated using this technology. Temperatures and residence times used in thermal desorption units volatilize the contaminants, which are then emitted to the atmosphere.

Excavation and Off-site Landfilling

This remediation alternative consists of excavating soil with contaminant concentrations exceeding PRGs, and transporting the excavated soil to an off-site landfill or soil recycling and disposal facility. Most of the contaminants at the sites are PHCs, which could be landfilled at a number of permitted facilities. Soil containing CERCLA hazardous substances will be landfilled at a facility permitted to accept Toxic Substances Control Act (TSCA) wastes.

Bioremediation (In-situ Landfarming)

This remediation alternative involves landfarming of soils where contaminant concentrations exceed the PRGs, which includes stimulation of aerobic microbial activity through aeration and/or application of minerals, nutrients, and moisture. This would result in a reduction of contaminant concentrations through volatilization and enhanced microbial metabolization of hydrocarbons adsorbed to soil. For surface soil contamination, this can be accomplished in situ without the need to excavate or relocate the soil.

Enhanced Bioremediation

Adding oxygen to a groundwater source area can enhance bacterial metabolizing of PHCs and other non-halogenated organic compounds. To increase the dissolved oxygen concentration in groundwater, compounds are added that interact with water and slowly release oxygen into the water. The oxygen-releasing compounds (ORCs) are placed in the saturated zone and allowed to react with water over an extended period. Increased dissolved oxygen concentrations would enhance bacterial growth in the saturated zone directly downgradient of the point where the ORCs are placed.

Active Pumping with Air Stripping

Air injected into an aquifer via sparge points induces contaminant volatilization in groundwater and enhances biodegradation in the vadose zone. Air sparging is often applied in tandem with a soil vapor extraction system in the **vadose zone**. In general, air emerging from the sparge point creates a conical-shaped zone of aeration that expands above the screen at approximately 45 degrees relative to the casing.

Active Pumping with Filtration using Granular Activated Carbon (GAC)

This remediation technology treats hydrocarbons and volatile contaminants dissolved in water. The approach involves pumping groundwater from an area where contaminant concentrations exceed PRGs, and conveying that water to a filter filled with GAC filter. The charcoal is sieved so that the particle size is uniform. The charcoal removes organic molecules dissolved in the water through adsorption. Periodic regeneration or replacement of the GAC filter is required.

Evaluation of Alternatives

In accordance with the NCP, the alternatives were evaluated using the nine criteria described in CERCLA Section 121(b) and the NCP Section 300.430(f)(5)(I)(see Table 4) . The nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. ADEC has reviewed the plan and agrees that if properly implemented, the preferred remedial alternatives identified in this Proposed Plan will meet state regulatory requirements.

The first two of the nine criteria, protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs), are "threshold" factors. The selected alternative must satisfy both of these criteria. The next five criteria are "primary balancing" criteria, and are used to make comparisons and to identify major trade-offs between remedial alternatives.

The last two criteria are "modifying" criteria and can only be fully evaluated after the public comment period for the Proposed Plan is completed. The state has reviewed this Proposed Plan, which agrees with the state acceptance criteria. The community acceptance will be evaluated after the comment period, and public comments will be addressed in the Record of Decision. The preferred alternatives may change in response to public comment or new information. The results of the evaluation are presented on a site basis in the following sections.

SS003 Surface Soil

For SS003, the preferred surface soil remedial alternative is Bioremediation through in-situ landfarming (Table 6). Bioremediation is considered high for overall protection of human health and the environment in surface soil at SS003 by reducing contaminant concentrations below ADEC cleanup levels. The work would be done in accordance with applicable laws including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative. Bioremediation actively attenuates COPC concentrations, and is considered effective in reducing contaminant toxicity, mobility, or volume.

Table 6 SS003 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	◐	○	◐	●	25K[1]
Soil Cover	Pass	Pass	◐	○	●	◐	1.6M
Natural Attenuation	Pass	Pass	●	●[3]	○	●	1.5M[1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	720K[2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	3.6M
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	2.9M
Bioremediation (in-situ landfarming)	Pass	Pass	●	●	○	◐	525K[2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 2-year operation period.
3 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

Bioremediation is considered effective in reducing or eliminating contaminant concentrations in both the short and long term; therefore, it was rated medium for long-term effectiveness and permanence. Bioremediation requires mobilizing heavy equipment to and from the site to execute; therefore, this alternative was rated medium for implementability, reflecting the more difficult constraints associated with mobilization.

The other active remedial alternatives, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Chemical Oxidation, rank similarly to Bioremediation for most of the criteria, but are more costly. A Soil Cover would not reduce toxicity, mobility, or volume through treatment and is also more expensive than Bioremediation. ICs and Natural Attenuation do not protect ecological receptors in the short term and, therefore, ranked lower overall than Bioremediation.

SS003 Groundwater

For SS003, the preferred groundwater remedial alternative is ICs with Long-term Monitoring (Table 7). ICs would serve to effectively reduce human and ecological exposure to groundwater at SS003 by preventing future development of the groundwater resources in the area; therefore, it is rated high for overall protection of human health and the environment. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative.

ICs were rated high for compliance with chemical-specific applicable requirements. ICs were rated high for long-term effectiveness and permanence by preventing future development of resource; ICs would not directly affect contaminant toxicity, mobility, or volume and are rated low for this criterion. For short-term effectiveness, ICs were rated high by reducing human exposure. Long-term Monitoring would be conducted to ensure that the ICs remain effective by tracking contaminant concentrations in the groundwater to make sure that they remain within the area controlled by the ICs. ICs with Long-term Monitoring requires that a small sampling crew with minimal equipment mobilize to the site periodically; therefore, this alternative was rated high for implementability.

The other alternatives considered, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration, do not increase the protectiveness of human health and the environment over ICs, but do provide better short-term effectiveness. However, they are more difficult to implement and not as cost-effective as ICs.

Table 7 SS003 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Groundwater

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	●	○	●	●	25K[1]
Natural Attenuation	Pass	Pass	●	◐[3]	○	●	1.5M[1]
Enhanced Bioremediation	Pass	Pass	●	●	◐	◐	468K
Active Pumping with Air Stripping	Pass	Pass	◐	◐	◐	◐	835K[2]
Active Pumping with Filtration using GAC	Pass	Pass	◐	●	◐	◐	719K

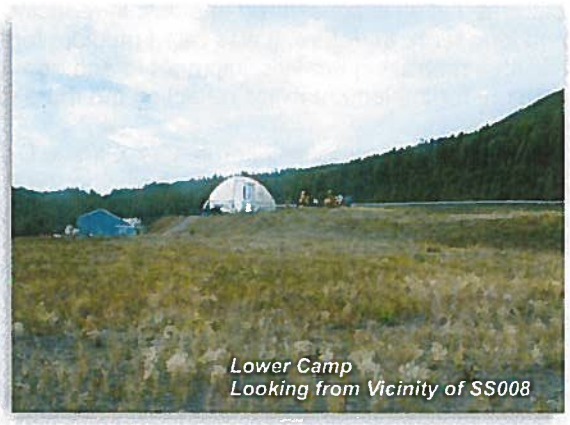
Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 5-year operation period.
3 - Passive treatment mechanisms are utilized.
GAC - granular activated carbon
K - thousand
M - million

SS008 Surface Soil

The contaminants identified in surface soil at SS008 consist of petroleum hydrocarbons (PHCs) and associated compounds, as well as PCBs and PCE at one sampling location. Given the very different nature of the two types of COPCs, separate detailed analysis of the PHC and PCB/PCE remedial technologies was performed. In keeping with that approach, separate evaluation of alternative for PHCs and PCBs/PCE are presented below.


Lower Camp
Looking from Vicinity of SS008

SS008 PHCs in Surface Soil

For SS008, the preferred surface soil remedial alternative for PHCs is Bioremediation through in-situ landfarming (Table 8). Bioremediation is considered high for overall protection of human health and the environment by reducing COPC concentrations, to below ADEC cleanup levels. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations— depending on the chosen alternative. Bioremediation actively attenuates contaminant concentrations, and is considered effective in reducing or eliminating contaminant concentrations in the long term; therefore, it was rated high for long-term effectiveness and permanence. Bioremediation is also effective in reducing contaminant toxicity, mobility, or volume. Bioremediation is effective in reducing or eliminating contaminant concentrations in the short term. Bioremediation requires mobilizing heavy equipment to and from the site to execute; therefore, this alternative was rated medium for implementability, reflecting the more difficult constraints associated with mobilization.

The other active remedial alternatives, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Chemical Oxidation, rank similarly to Bioremediation for most of the criteria, but are more costly. A Soil Cover would not reduce toxicity, mobility, or volume through treatment and is also more expensive than Bioremediation. ICs and Natural Attenuation do not protect ecological receptors in the short term and, therefore, ranked lower overall than Bioremediation.

Table 8 SS008 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Petroleum Hydrocarbons in Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Fail	Fail	◐	○	◐	●	75K
Soil Cover	Pass	Pass	●	◐	●	●	1.3M
Natural Attenuation	Pass	Pass	●	●[3]	○	●	1.4M[1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	685K[2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	3.1M
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	2.6M
Bioremediation (in-situ landfarming)	Pass	Pass	●	●	○	◐	540K[2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects a 20-year monitoring period.
2 - Cost reflects a 2-year operation period.
3 - Passive treatment mechanisms are utilized.
K - thousand
M - million

SS008 PCBs and PCE in Surface Soil

Given the limited amount of soil impacted by PCBs and PCE at SS008, the preferred surface soil remedial alternative is Excavation with Off-site Landfilling at a TSCA Facility (Table 9). Excavation is considered high for overall protection of human health and the environment by eliminating PCB and PCE concentrations at SS008. Off-site Disposal removes PCBs and PCE from the site and was ranked high for compliance with ARARs. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and transportation regulations—depending on the chosen alternative.

Excavation with Off-site Landfilling would effectively remove PCBs and PCE from the site; therefore, this alternative was rated high for long-term effectiveness and permanence. Excavation would not effectively reduce the toxicity, mobility, and volume of PCB and PCE-contaminated soil at SS008 through treatment and was, therefore, ranked low.

Excavation with Off-site Landfilling would effectively remove PCB and PCE-contaminated soil in the short-term, but involves potential risk to site workers due to exposure to PCB-contaminated soil during transportation; therefore, this alternative was ranked medium. Implementability is strongly affected by the remote location of Tatalina LRRS; excavation requires mobilizing heavy equipment to and from the site. However, the small volume of PCB and PCE-contaminated soil would require minimal equipment to execute the removal; therefore, this alternative was ranked high for implementability.

The other alternatives evaluated for PCB and PCE impacted soil, ICs and soil cover, would not remove the contaminants from the site. PCBs are extremely stable compounds and persist in the environment for very long periods of time. ICs alone would not protect environmental receptors from exposure, and the Soil Cover would need to be maintained indefinitely. Therefore, removal was determined to be the preferable alternative.

Table 9 SS008 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for PCBs and PCE in Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Fail	Fail	◐	○	◐	●	5K
Soil Cover	Pass	Pass	◐	○	●	●	100K
Off-site Disposal through Landfilling [1]	Pass	Pass	●	○	◐	●	250K

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Detailed analysis of alternatives assumes a total of 25 cubic yards of PCB-contaminated soil.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
PCB - polychlorinated biphenyl
PCE - tetrachloroethene

SS008 Groundwater

For SS008, the preferred groundwater remedial alternative is ICs with Long-term Monitoring. ICs would serve to effectively reduce human exposure to groundwater by preventing future development of the groundwater resource in the area; therefore, it is rated high for overall protection of human health and the environment. The work would be done in accordance with applicable laws including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative.

ICs were rated high for compliance with chemical-specific applicable requirements.

ICs were rated high for long-term effectiveness and permanence by preventing future development of the groundwater resource. ICs would not directly affect COPC toxicity, mobility, or volume and are rated low for this criterion.

For short-term effectiveness, ICs were rated high by reducing human exposure. Long-term Monitoring would be conducted to ensure that the ICs remain effective by tracking contaminant concentrations in the groundwater to make sure that they remain within the area controlled by the ICs. ICs with Long-term Monitoring requires that a small sampling crew with minimal equipment mobilize to the site periodically; therefore, ICs was rated high for implementability.

The other alternatives considered, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration, do not increase the protectiveness of human health and the environment over ICs, but do provide better short-term effectiveness. However, they are more difficult to implement and less cost effective.

Table 10 SS008 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for Groundwater

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	●	○	●	●	25K[1]
Natural Attenuation	Pass	Pass	●	◐[3]	○	●	1.5M[1]
Enhanced Bioremediation	Pass	Pass	●	●	◐	◐	301K[2]
Active Pumping with Air Stripping	Pass	Pass	◐	◐	◐	◐	1.5M[2]
Active Pumping with Filtration using GAC	Pass	Pass	◐	●	◐	◐	718K[2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 5-year operation period.
3 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
GAC - granular activated carbon
K - thousand
M - million

SS011 Soil

For SS011, the preferred soil remedial alternatives are Excavation with Off-site Landfilling for exposed debris and areas of stained soil, and ICs for the remainder of the site (Table 11). Excavation with Off-site Landfilling is protective of overall human health and the environment by eliminating COPC concentrations in designated areas, while ICs would serve to reduce human and ecological exposure to the remaining soil. There are no Location-Specific or Action-Specific ARARs applicable to the remedial alternatives evaluated for SS011. Excavation with Off-site Landfilling removes COPCs from the site. ICs do not address chemical-specific ARARs as well as other alternatives. ICs would prevent exposure to subsurface soil in the attainment area, but may not be effective in preventing ecological receptor exposure.

Excavation with Off-site Landfilling is considered effective in eliminating surface soil COPC concentrations in the long-term and was, therefore, rated high for long-term effectiveness and permanence. A medium rating was assigned to ICs for long-term effectiveness and permanence. Off-site Landfilling of excavated material is not considered effective in reducing COPC toxicity, mobility, or volume, while ICs are considered ineffective for this criteria.

Excavation with Off-site Landfilling was rated medium for short-term effectiveness due to complications

associated with handling contaminated soil during transport. ICs also received a medium rating for short-term effectiveness. Implementability is strongly affected by the remote location of Tatalina LRRS. ICs require little or no site work and is among the easiest alternative to implement. Excavation with Off-site Disposal through Landfilling requires mobilization of heavy equipment to and from SS011, as well as larger field crews to execute. Excavation was assigned a medium rating for implementability, reflecting the more difficult constraints associated with mobilizing heavy equipment and extra field personnel.

The other remedial alternatives, Natural Attenuation, Chemical Oxidation, Off-site Disposal through Thermal Desorption, and Bioremediation, rank high for protection of human health and environment; compliance with ARARs; and long-term effectiveness, reduction of toxicity, mobility, or volume through treatment. Natural Attenuation does not protect ecological receptors in the short term and was not selected as the preferred alternative for this reason. Given the low volume of stained soil and the difficult site access, and highly organic soil (interferes with contaminant oxidation), Chemical Oxidation was not selected as the preferred alternative. Bioremediation is similar in implementability and cost as Off-site disposal but is not effective in the short term and therefore was not selected. Off-site Thermal Desorption ranks the same as Off-site Landfilling on six of the criteria but has a higher cost.

Table 11 SS011 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	◐	○	◐	●	25K
Natural Attenuation	Pass	Pass	●	●[4]	○	●	1.4M[1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	178K[2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	629K[2]
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	560K[2]
Bioremediation (Biopile)	Pass	Pass	●	●	○	◐	426K[2,3]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technologyis worse than average.

Note:
Highlighted row Indicates preferred alternative.

Key:
1 - Cost reflects a 20-year monitoring period.
2 - Cost does not include constructing an access road.
3 - Reflects a 5-year operational period.
4 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

LF004

The preferred remedial alternative for LF004 is ICs with Long-term Monitoring (including cover inspections). The landfill is currently capped with a soil cover to prevent human and ecological exposure to the landfill waste and to reduce precipitation infiltration and leaching. However, the landfill is not lined; therefore, ICs alone do not meet the Long-term Effectiveness criteria, because a potential leachate problem would go undetected.

ICs to prevent disturbance of the landfill wastes and Long-term Monitoring, consisting of cover inspections to ensure its integrity and downgradient groundwater and surface water sampling to detect possible contaminant migration, meet all of the criteria except reduction of toxicity, mobility, or volume through treatment. Due to the volume of waste involved and the remoteness of the site, removing the waste would be exceedingly expensive. ICs also rank only moderate on short-term effectiveness and implementability due to potential exposure risks during excavation and transportation. The Removal alternative is not the preferred alternative

since ICs with Long-term Monitoring meets the threshold criteria, is better in short-term effectiveness and implementability, and can be accomplished at substantially lower cost. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75, siting requirements in 18 AAC 60, and transportation regulations—depending on the chosen alternative.

Table 12 LF004 - Summary of Detailed Analysis of Non-CECRLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action		Fail	Fail	○	○	●	0
Institutional Controls Only		Fail	Fail	○	◐	◐	100K [1]
Long Term Monitoring and Institutional Controls		Pass	Pass	○	●	●	200K [2]
Removal		Pass	Pass	○	◐	◐	50M [2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects a 2-year operation period.
2 - Cost reflects a 5-year operation period.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

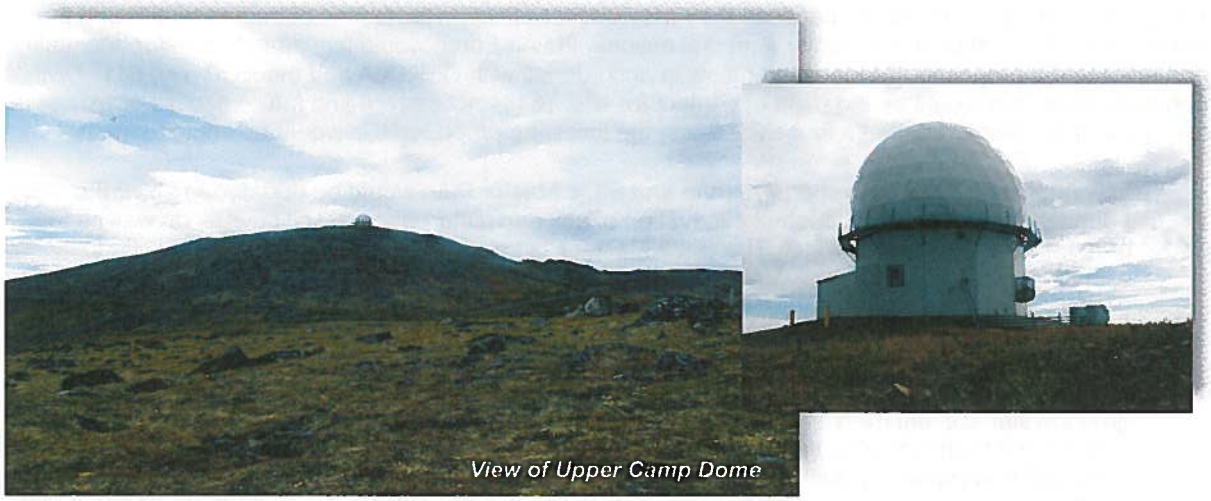
Preferred Alternative

The primary indicator of remedial action performance would be protecting human health and the environment. The successful implementation of the preferred alternative would achieve a protective and legally compliant remedy.

The preferred remedial alternative for SS003 is Bioremediation through in-situ landfarming for surface soil (down to 2 feet bgs) and preventing exposure to subsurface contaminants (below 2 feet bgs) at the site with ICs, including long-term groundwater monitoring. Contaminated soil would be treated until remaining PHC concentrations are below the site-specific PRGs. A detailed delineation will be done at the remedial design and implementation stage for the isolated occurrence of DRO downgradient of SS003. Groundwater monitoring would be conducted to track contaminant concentrations over time. Petroleum is the only contaminant of concern at SS003, which is not included in CERCLA's definition of hazardous substances and, therefore, further action is not required under CERCLA. The remedy will be implemented consistent with State regulations.

The preferred remedial alternative for SS008 includes: excavation of soil containing PCBs and PCE and off-site disposal at a TSCA landfill facility, bioremediation through in-situ landfarming for surface soil (down to 2 feet bgs), long-term groundwater monitoring, and preventing exposure to subsurface contamination (below 2 feet bgs) at the site with ICs. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability requirements. PCB-contaminated soil would be excavated until remaining concentrations are below the site-specific PRG of 1 mg/Kg. PCE-contaminated soil


Entrance to LF004


View of Upper Camp Dome

would be excavated until remaining concentrations are below the site-specific PRG of 0.024 mg/Kg. The amount of soil contaminated with PCBs and PCE is estimated at 25 cubic yards although this amount may vary. The excavated material would be placed into drums or supersacks for transport off-site. Removal of the contaminated soil would be confirmed by sampling. Clean fill (soil) from a local source would be used to backfill the excavated area. Since PCBs and PCE would be removed down to concentrations below the most stringent ADEC cleanup level, no soil cover or ICs would be required. The other alternatives were not selected as the preferred remedial action because they would not be as effective and permanent for the long term as excavation with off-site disposal. In addition, a new well will be installed near the sediment sample that contained PCE. The well will be monitored in conjunction with the planned monitoring event for PHC and lead contaminants. PCB and PCE contaminated soil is subject to the 8-step CERCLA procedure described in Figure 2.

PHC contaminants in surface soil and sediments at SS008 would be destroyed using bioremediation. This treatment is expected to reduce contaminant concentrations to below the site specific PRGs in the surface soil. ICs would be implemented to prevent exposure to contaminants in subsurface soil and groundwater. A detailed delineation will be done at the remedial design and implementation stage for the occurrence of free product in Monitoring Well BH37/MW.

The preferred remedial alternative for SS011 includes: removal of exposed debris, excavation of stained soils and sediments to be disposed of at an off-site landfill, and ICs for the entire site to prevent exposure to subsurface contaminants. The other alternatives were not selected as the preferred remedial action because they would either not reduce toxicity as effectively as excavation with off-site disposal, or the alternative would incur significant costs due to construction of an access road. Excavation with Off-site Landfilling would serve to reduce the associated risk for this site. No significant ecological risk would remain once contamination levels are below their respective PRGs for human health.

Additional Information

Additional information can be found in the Administrative Record located at Elmendorf Air Force Base, Alaska, and online at www.adminrec.com. The list of source material is provided for readers who want more detailed information than is presented in this Proposed Plan.

The preferred remedial alternative for LF004 is ICs, including biennial cover evaluations, followed by a 5-year inspection and long-term groundwater and surface water monitoring. Detections of pesticides (DDD, DDE, and DDT) are considered widespread, as these chemicals are representative of remaining residue from historical pesticide use throughout Tatalina LRRS, and are not considered for further remediation. No analytes included in CERCLA's definition of hazardous substances have been detected at this site; however, LF004 is subject to State of Alaska reporting, response, or liability requirements.

These alternatives are preferred because they provide cost-effective protection of human health and the environment. In addition to the above remedial actions, the Air Force would implement, monitor, maintain, and enforce the proposed ICs identified below in accordance with CERCLA and the NCP. The 611th Civil Engineer Squadron would be the point of contact for ICs. To restrict current and future access or exposure to soil and groundwater at these four ERP Sites, the following proposed ICs would be implemented:

- The Tatalina LRRS comprehensive map and Base Master Plan would be updated to show the boundaries of each site to restrict excavation of soil and disturbance of soil covers, as well as to prevent access to groundwater. The Base Master Plan would contain a map indicating site location, with restrictions on any invasive activities that could potentially expose potential contaminants. Dig permits issued by the Base Operating Contractor are required for any excavation at Tatalina LRRS. Excavation, disturbance, or relocation of contaminated soil and groundwater; and excavation or drilling in areas of groundwater contamination, will be restricted by the ICs. Relocation of petroleum-contaminated soil will require prior ADEC approval. Use or removal of petroleum-contaminated groundwater will require characterization and be managed by the applicable regulations. Prior to approving a permit, the Tatalina LRRS comprehensive map and Base Master Plan would be reviewed to ensure that invasive activities are not taking place within the boundary of the sites where land use has been restricted. A Notice of Environmental Contamination will be placed on State (Department of Natural Resources) land records.

- The ICs will be documented in the Air Force Real Property Records, Tatalina LRRS General Plan, and 611th IRP Records. This will include: information about current land uses and allowed uses (prohibiting future residential land use), geographic boundaries of the ICs, an inspection of the site and submittal of a performance report on ICs to ADEC at least once every 5 years after the date of the signed decision document, submittal of a long-term monitoring sampling plan and subsequent sampling reports to ADEC for approval prior to removal of ICs.

- Long-term monitoring and IC management of soil and groundwater conditions will be discontinued once the PRGs for petroleum have been met for two consecutive sampling events. ICs will remain in effect until it is demonstrated the site(s) are suitable for unrestricted use/unlimited exposure per ADEC concurrence.

- The Air Force would notify ADEC prior to making any major changes to the Base Master Plan that could affect the ICs.

- The Air Force would obtain prior concurrence from ADEC to terminate the ICs, modify current land use, or allow anticipated actions that might disrupt the protectiveness of the ICs. In the unlikely event that the property is to be transferred, the Air Force would notify ADEC prior to any transfer taking

General Vicinity View

place and would ensure any ICs are incorporated into the land transfer documents.

- 5-year reviews would be conducted to evaluate the effectiveness of the remedies.

In addition to the above ICs, the following proposed activities would be conducted:

- A land survey would be conducted at ERP Sites SS003, SS008, SS011, and LF004 to identify site boundaries. This information would be used to update land records and the Tatalina LRRS comprehensive map and Base Master Plan. Any activity that is inconsistent with IC requirements, objectives, or controls, or any action that might interfere with protectiveness of the ICs, would be addressed by the Air Force as soon as practicable after discovery. In no instance would ADEC be notified later than 10 days after the Air Force becomes aware of a deficiency.

- The ICs at each site would extend indefinitely, to ensure that human and ecological receptors are protected from potential exposures. Periodic reports of IC monitoring would be prepared at a frequency of at least once every 5 years and provided to ADEC with copies filed in the Administrative Record.

The proposed remedies outlined above are considered to best meet the site cleanup objectives and the NCP evaluation criteria. In addition, if a selected alternative allows contamination to remain above levels allowing unrestricted use of a site, reviews of the selected alternative would be conducted as long as required by applicable law. The reviews are intended to be an evaluation of site conditions, to determine if the alternative remains protective or if a modification to the selected alternative is warranted.

Selective Administrative Record References:

Additional information can be obtained from the Administrative Record located at Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska. The Administrative Record for Tatalina LRRS includes detailed investigation reports, evaluation of potential cleanup technologies, and test results from field studies. Electronic copies of the documents contained in the Administrative Record can also be viewed online at www.adminrec.com. The Administrative Record contains the documents listed below.

USAF. 1998b. Tatalina LRRS Remedial Investigation Report. Final. October.

USAF. 2000. Results of 1999 Tatalina LRRS Follow-on Remedial Investigation of Source Area SS-008/WAA No. 4. Technical Memorandum. May 22, 2000.

USAF. 2000. Results of 1999 Tatalina LRRS Follow-On Remedial Investigation and Closure Evaluation of Source Area LF004 Technical Memorandum. February 25, 2000.

USAF. 2004. 2003 Final Follow-On Remedial Investigation at SS003, SS008, and SS011 Report. Tatalina LRRS, Alaska. January.

USAF. 2005. 2004 Final Follow-On Remedial Investigation at SS003, SS008, and SS011 Report. Tatalina LRRS, Alaska. August.

USAF. 2008. Tatalina LRRS, Follow-On Remedial Investigation at SS003, SS008, and SS011. Technical Memorandum. Draft. February.

USAF. 2009. Human Health and Ecological Risk Assesssments at SS003, SS008, and SS011. Report. Final. August.

USAF. 2009. Tatalina LRRS. Focused Feasibility Study at SS003, SS008, and SS011. Report. Final. November.

COMMUNITY PARTICIPATION
HOW YOU CAN PARTICIPATE

You are encouraged to comment on this Proposed Plan. The public comment period begins on May 7, 2012, and ends on June 6, 2012.

If there is sufficient interest for a public meeting on this Proposed Plan, and a meeting is requested before the end of the 30-day comment period, an acceptable meeting date will be scheduled before June 20, 2012, and the comment period extended.

Contact for Questions

If you have any questions about the information provided in this Proposed Plan,

You can mail or email your comments to the USAF Community Involvement Coordinator at the following address:

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10471 20th Street, Suite 340
JBER, Alaska 99506-2201
1-907-552-4506, or
Toll Free: 1-800-222-4137
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