PACIFIC AIR FORCES
REGIONAL SUPPORT CENTER

CAPE ROMANZOF LRRS, ALASKA

FEASIBILITY STUDY FOR SR018

CAPE ROMANZOF LONG-RANGE RADAR SITE, ALASKA

FINAL
FEBRUARY 2015

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ADEC	Alaska Department of Environmental Conservation
AFCEC	Air Force Civil Engineer Center
ARAR	applicable or relevant and appropriate requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
CSE	Comprehensive Site Evaluation
cy	cubic yard
Eco-SSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
FRTR	Federal Remediation Technologies Roundtable
FS	feasibility study
HHE	human health and the environment
HHRA	human health risk assessment
IRP	Installation Restoration Program
Jacobs	Jacobs Engineering Group Inc.
LRRS	Long-Range Radar Site
LTM	long-term monitoring
LUC	land-use control
MAR	Minimally Attended Radar
mg/kg	milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
S/S	solidification/stabilization
SARA	Superfund Amendments and Reauthorization Act
TBC	to be considered
TI	technical impracticability
TSDF	treatment, storage, and disposal facility
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	United States Code
WACS	White Alice Communications System

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EXECUTIVE SUMMARY

This Feasibility Study (FS) evaluates potential remedial technologies to address metals contamination in soil at SR018 Former Recreational Small Arms Use Area located at Cape Romanzof Long-Range Radar Site (LRRS), Alaska. The remedial technologies presented in this FS were screened based on site-specific effectiveness, implementability, and cost. The following alternatives were developed for addressing soil contamination:

- **Alternative 1:** No Action
- **Alternative 2:** Land-Use Controls (LUC) and Long-Term Monitoring (LTM)
- **Alternative 3:** Capping, LUCs, and LTM
- **Alternative 4:** Debris Removal, In Situ Soil Treatment, Capping, and LUCs
- **Alternative 5:** Removal and Offsite Disposal

As required by the Code of Federal Regulations, Title 40, Part 300.430(e)(6), the No Action alternative was retained as a baseline for which the other alternatives could be compared. Other remediation technologies were considered but failed to meet the threshold or balancing criteria established under the Comprehensive Environmental Response, Compensation, and Liability Act (Code of Federal Regulations, Title 40, Chapter 300). Only the five alternatives listed above were retained for detailed analysis.

Table ES-1 presents the proposed alternatives and estimated costs for comparison purposes.

Table ES-1
SR018 at Cape Romanzof LRRS Alternatives Summary

Alternative	Description	Cost Estimate
Alternative 1	No Action	$0
Alternative 2	LUCs and LTM	$320,804
Alternative 3	Capping, LUCs, and LTM	$886,257
Alternative 4	Debris Removal, In Situ Soil Treatment, Capping, and LUCs	$1,075,127
Alternative 5	Removal and Offsite disposal	$917,871

Following final approval of this FS, the U.S. Air Force will issue a Proposed Plan for SR018 at Cape Romanzof LRRS. Comments on the Proposed Plan will be solicited from the community and state. Following receipt of comments, the alternatives will be further evaluated based on the modifying criteria (state acceptance and community acceptance), and a remedy will be selected for the site. The selected remedy will be documented in the Record of Decision.

1.0 INTRODUCTION

This Feasibility Study (FS) presents and evaluates remedial alternatives for the SR018 Former Recreational Small Arms Use Area at the Cape Romanzof Long-Range Radar Site (LRRS), Alaska. This study is part of continuing efforts by the U.S. Air Force (USAF) Air Force Civil Engineer Center (AFCEC) to address contamination at the facility. AFCEC's overall goal for SR018 at Cape Romanzof LRRS is to meet remedial action objectives (RAO), as described in Section 2.1. Jacobs Engineering Group Inc. (Jacobs) prepared this FS on behalf of AFCEC under Contract Number FA8903-08-D-8773, Task Order 166.

This FS is necessary to address soil contamination delineated during a 2011 investigation conducted to find evidence of munitions use. Sampling activities during the 2011 Comprehensive Site Evaluation (CSE) Phase I/II focused on collecting soil samples at SR018 and analyzing them for lead and antimony (U.S. Army Corps of Engineers [USACE] 2013). No surface water, sediment, or groundwater data were collected. Results of the CSE concluded that, although both lead and antimony are present in the soil at SR018, only lead is present at concentrations above the cleanup level. Lead is classified as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (U.S. Code [USC] Title 42, Part 9601 et. seq.).

1.1 PURPOSE AND ORGANIZATION OF REPORT

As outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [Code of Federal Regulations (CFR) Title 40, Part 300.430(e)], the objective of this FS is to develop and evaluate remedial alternatives for contamination at SR018. The specific goals of this document are the following:

- Formulate site-specific RAOs (Section 2.1);
- Identify applicable remedial technologies based on the chemicals, contaminant distribution and concentration, and local site conditions (Section 2.4.1);
- Screen the identified technologies based on effectiveness, implementability, and cost (Section 2.4.2);
- Use technologies that pass the screening process to develop alternatives that eliminate, control, and/or reduce risk to human health and the environment (HHE) at the site (Section 3.1);

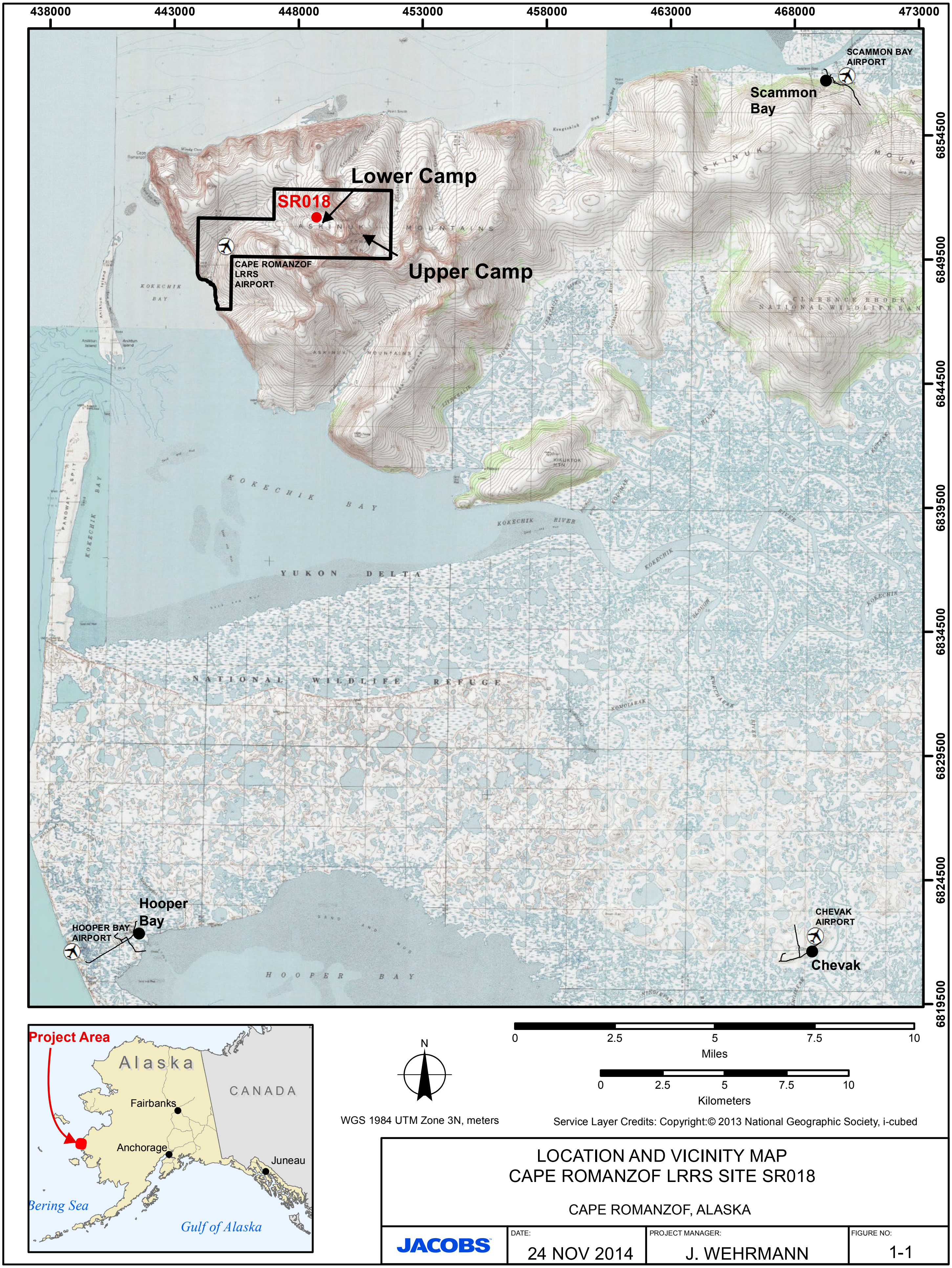
- Evaluate each alternative that passes screening against the following seven NCP threshold and balancing criteria (Section 4.2):
  - Protection of HHE
  - Compliance with applicable or relevant and appropriate requirements (ARAR)
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost;
- Present a comparative analysis to determine the relative performance of the alternatives (Section 4.4).

This report has been organized into five sections based on the outline provided in *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (U.S. Environmental Protection Agency [EPA] 1988):

- **Section 1.0 Introduction** outlines report preparation and provides relevant historical and background information.
- **Section 2.0 Identification and Screening of Technologies** introduces the technical approach and provides a description of potentially applicable remedial technologies.
- **Section 3.0 Development and Screening of Alternatives** formulates remedial technologies into alternatives based on their applicability to SR018.
- **Section 4.0 Detailed Analysis of Alternatives** evaluates and compares remedial alternatives established in Section 3.0.
- **Section 5.0 References** provides a list of documents used in the preparation of this FS.

1.2 BACKGROUND INFORMATION

The Cape Romanzof LRRS was established in 1953. It is located in coastal western Alaska, in the Yukon-Kuskokwim Coastal Lowland region at the western end of the Askinuk Mountains and on a small peninsula that extends into the Bering Sea. The site is approximately 560 miles west of Anchorage, 165 miles northwest of Bethel, and 170 miles southeast of Nome (Figure 1-1). The USAF property at the installation encompasses about 4,900 acres situated within the boundaries of the Yukon-Kuskokwim Delta National Wildlife Refuge, a federally protected habitat area. The nearest local communities are Scammon Bay and Hooper Bay, which are located approximately 15 miles east and south of the installation, respectively.



LOCATION AND VICINITY MAP
CAPE ROMANZOF LRRS SITE SR018

CAPE ROMANZOF, ALASKA

JACOBS	DATE: 24 NOV 2014	PROJECT MANAGER: J. WEHRMANN	FIGURE NO: 1-1

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Although the communities are not connected to Cape Romanzof by road, the community members use off-road vehicles, boats, snow machines, and walking to travel all around the Cape Romanzof area. Sections 1.2.1 through 1.2.5 provide an overview of the environmental conditions at SR018.

1.2.1 Site Description

The Cape Romanzof installation is comprised of two main areas: the Lower Camp where the main camp facilities (i.e., housing, power plant, and bulk fuel storage area) are located; and the Upper Camp where the long-range radar equipment is located (Figure 1-2). The Upper Camp is situated at the top of Towak Mountain (elevation 2,250 feet above mean sea level), with the two areas connected by a gravel road and former tramway service. A 1-mile-long gravel runway serving the installation is located near the beach at Kokechik Bay, approximately 4 miles southwest of the Lower Camp by road. Fowler (Nilumat) Creek and its tributaries run through Cape Romanzof LRRS to Kokechik Bay. There is one small lake, which was formed by a small dam at the head of the valley at the Lower Camp (USACE 2013).

SR018 is located approximately 300 feet south of the access road between the Lower Camp and the airstrip, between the access road and one of the branches of Fowler (Nilumat) Creek. The site consists of a manmade clearing covered with native grasses. The north end of the clearing nearest the road is the firing point and the south end of the clearing has a large berm/impact area. Features present at the site include a wooden firing pad, an old pistol range, wooden target frames and miscellaneous debris, and the earthen berm. Figures 1-2 and 1-3 present the location of SR018.

1.2.2 Site History

Cape Romanzof was one of the original 12 Aircraft Control and Warning sites built in the 1950s in Alaska as part of an air defense communications system (USACE 2013). In 1958, a White Alice Communications System (WACS) was activated and operated until 1979. The Cape Romanzof WACS was deactivated and replaced by an Alascom-owned satellite earth terminal in 1979 (USACE 2013). In 1982 and 1983, the remaining military personnel were inactivated and replaced by contractor personnel to maintain the Joint Surveillance System equipment. Personnel numbers were further reduced in 1985 when the Minimally Attended Radar (MAR) was activated. All unnecessary facilities were demolished by 1988. The Cape Romanzof LRRS currently serves as a MAR site and is part of the Alaska Radar System managed by the 611th Air Support Group.

Cape Romanzof LRRS stored small quantities of hazardous materials but not at SR018. Seventeen Installation Restoration Program (IRP) sites are located at the installation, three of which remain open/active (USACE 2013). There were no IRP sites within SR018 (USACE 2013).

A historical aerial photograph of Cape Romanzof from 1963, used during the CSE Phase I, did not show any evidence of SR018 (USACE 2013). Through records review, field reconnaissance, and visual surveys during the CSE Phase I/II, it was concluded that SR018 is a recreational small arms use area and not eligible for investigation under the USAF Military Munitions Response Program. SR018 instead falls under the Environmental Restoration Program.

1.2.3 Nature and Extent of Contamination

Site-specific contaminant data can be found in the *Cape Romanzof Long Range Radar Site Comprehensive Site Evaluation Phase I/II* (USACE 2013). A combined CSE Phase I/II was performed at the Cape Romanzof LRRS in 2011. The CSE Phase I included a historical records review, visual reconnaissance, and interviews; the CSE Phase II included a visual survey and environmental sampling.

SR018 is a former recreational small arms use area. The primary chemicals of concern (COC) at this site at the Cape Romanzof LRRS are metals associated with small caliber ammunition (lead and antimony). During the CSE Phase I/II, soil was sampled for lead and antimony. Analytical results indicated that these metals are present in surface and subsurface soil associated with activities conducted at SR018. Samples detected lead in concentrations that exceeded the soil cleanup level for residential areas (400 milligrams per kilogram [mg/kg]) in three samples at one location in the berm/impact area (Figure 1-3). All results for antimony were less than the most stringent cleanup criterion. Although antimony was identified as a chemical of potential concern in the CSE Phase I/II and evaluated as a potential contributor to overall risk, site concentrations are well below both state and federal cleanup levels; the antimony results were collocated with lead.

There was no evidence of historical use of explosives, and no munitions or explosives of concern were observed during the CSE Phase I/II; only “small arms debris” was observed during the visual survey (USACE 2013).

The primary COC at SR018 at Cape Romanzof LRRS is lead. At this site, lead-contaminated soil is located at the firing range berm/impact area. This area measures approximately 10 feet by 15 feet and extends an estimated 18 inches below ground surface (bgs); it is estimated that approximately 8.3 cubic yards (cy) of soil are contaminated with lead. The affected volume of soil was estimated based on the Alaska Department of Environmental Conservation (ADEC) Method Two cleanup criterion of 400 mg/kg for lead in residential areas (ADEC 2014).

No surface water, sediment, and groundwater data were collected during the Phase I/II CSE; therefore these are considered potential exposure pathways. Depth to groundwater at the Lower Camp ranges from 1 foot to 60 feet bgs (USAF 2011, as cited by USACE 2013). Groundwater is used as the drinking water source for the Cape Romanzof LRRS (USACE 2013).

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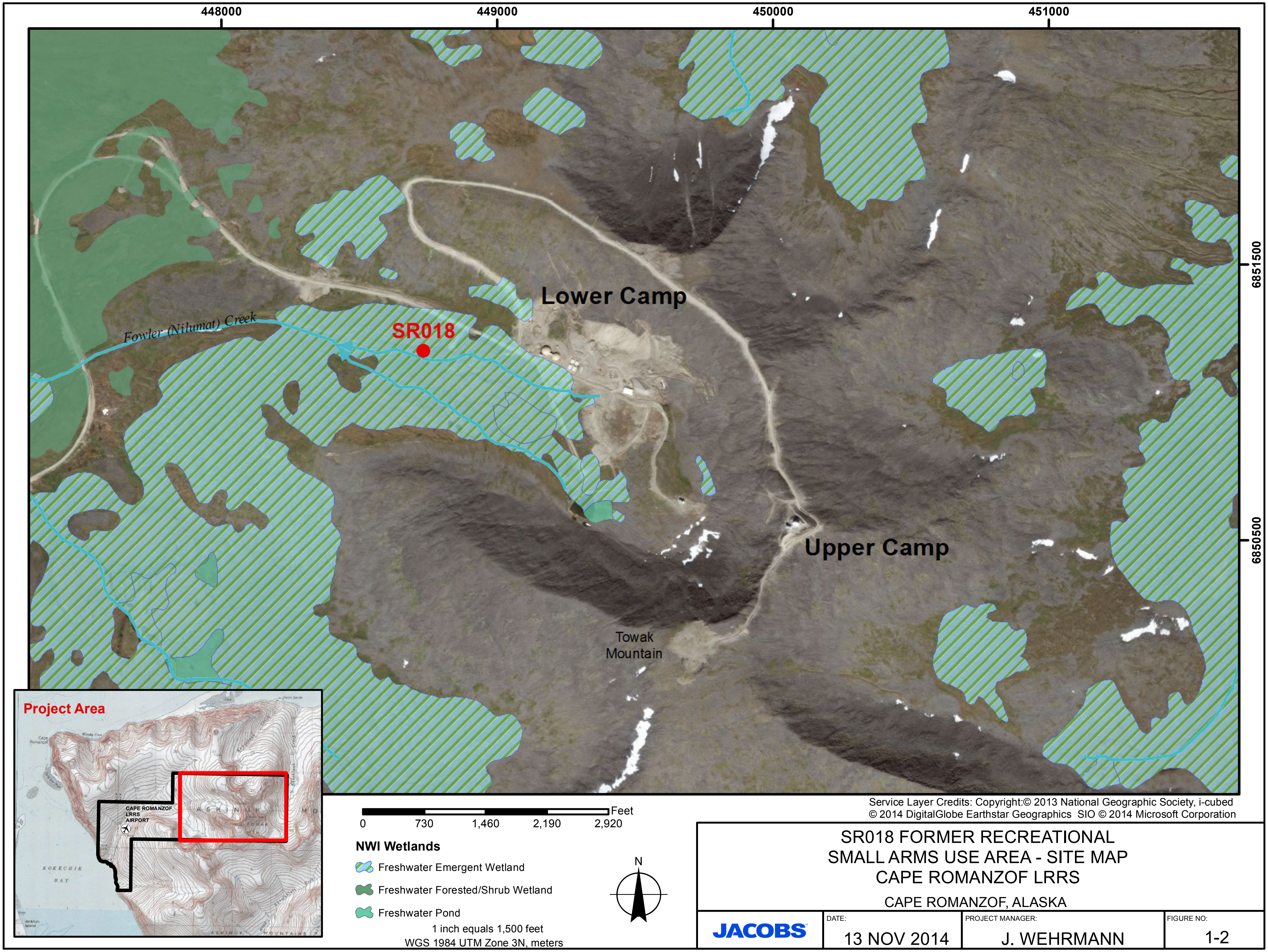

448000
449000
450000
451000
6851500
6850500
Lower Camp
SR018
Fowler (Nilumat) Creek
Upper Camp
Towak Mountain
Project Area
CAPE ROMANZOF LRRS AIRPORT
KOKECHIK BAY
Feet
0
730
1,460
2,190
2,920
NWI Wetlands
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
1 inch equals 1,500 feet
WGS 1984 UTM Zone 3N, meters
N
Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
© 2014 DigitalGlobe Earthstar Geographics SIO © 2014 Microsoft Corporation
SR018 FORMER RECREATIONAL
SMALL ARMS USE AREA - SITE MAP
CAPE ROMANZOF LRRS
CAPE ROMANZOF, ALASKA
JACOBS
DATE:
13 NOV 2014
PROJECT MANAGER:
J. WEHRMANN
FIGURE NO:
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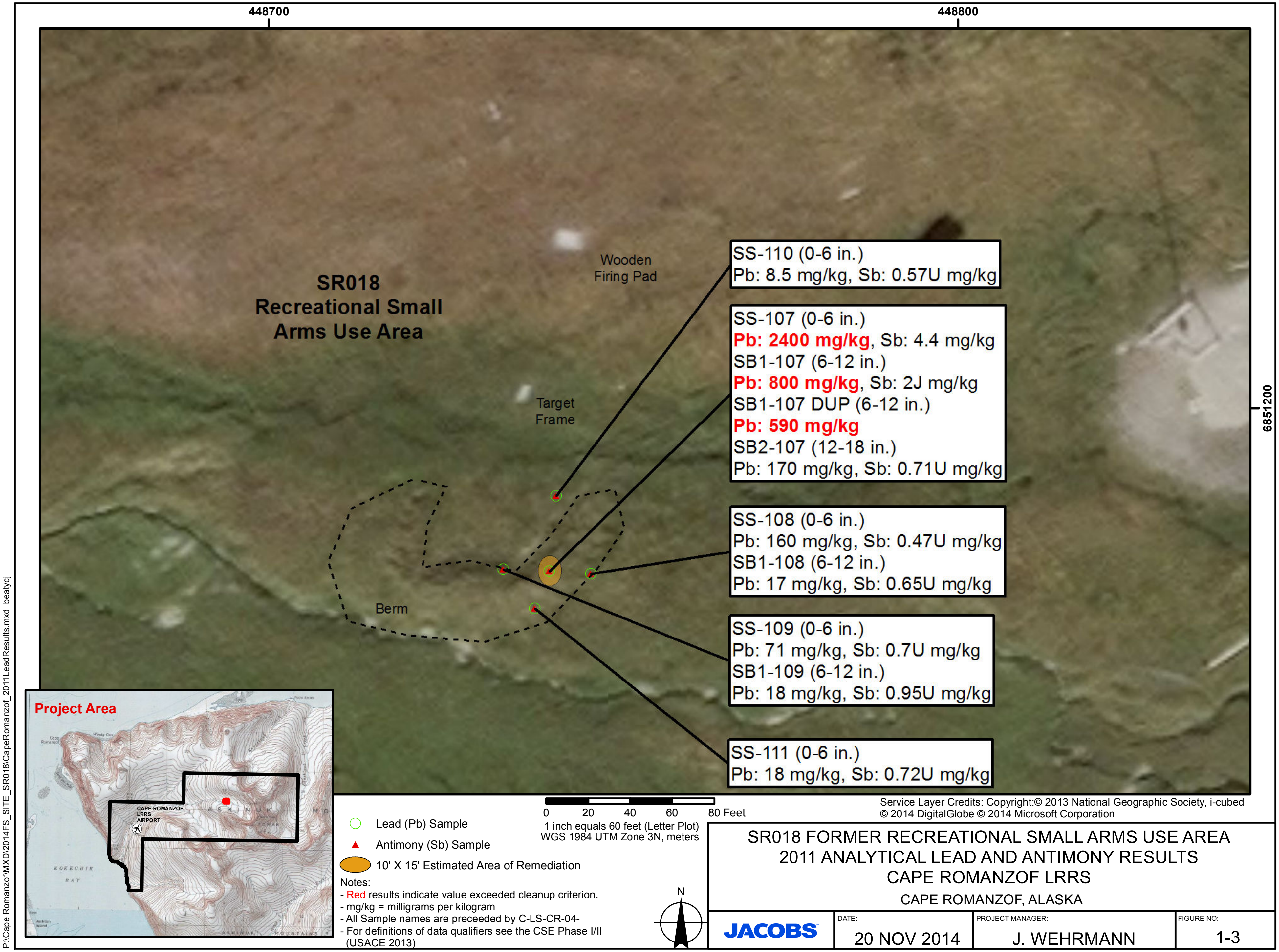
448700
448800
6851200
SR018
Recreational Small
Arms Use Area
Wooden
Firing Pad
Target
Frame
Berm
SS-110 (0-6 in.)
Pb: 8.5 mg/kg, Sb: 0.57U mg/kg
SS-107 (0-6 in.)
Pb: 2400 mg/kg, Sb: 4.4 mg/kg
SB1-107 (6-12 in.)
Pb: 800 mg/kg, Sb: 2J mg/kg
SB1-107 DUP (6-12 in.)
Pb: 590 mg/kg
SB2-107 (12-18 in.)
Pb: 170 mg/kg, Sb: 0.71U mg/kg
SS-108 (0-6 in.)
Pb: 160 mg/kg, Sb: 0.47U mg/kg
SB1-108 (6-12 in.)
Pb: 17 mg/kg, Sb: 0.65U mg/kg
SS-109 (0-6 in.)
Pb: 71 mg/kg, Sb: 0.7U mg/kg
SB1-109 (6-12 in.)
Pb: 18 mg/kg, Sb: 0.95U mg/kg
SS-111 (0-6 in.)
Pb: 18 mg/kg, Sb: 0.72U mg/kg
Project Area
CAPE ROMANZOF LRRS AIRPORT
KOKECHIK BAY
0 20 40 60 80 Feet
1 inch equals 60 feet (Letter Plot)
WGS 1984 UTM Zone 3N, meters
Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed © 2014 DigitalGlobe © 2014 Microsoft Corporation
Lead (Pb) Sample
Antimony (Sb) Sample
10' X 15' Estimated Area of Remediation
Notes:
- Red results indicate value exceeded cleanup criterion.
- mg/kg = milligrams per kilogram
- All Sample names are preceeded by C-LS-CR-04-
- For definitions of data qualifiers see the CSE Phase I/II (USACE 2013)
N
SR018 FORMER RECREATIONAL SMALL ARMS USE AREA
2011 ANALYTICAL LEAD AND ANTIMONY RESULTS
CAPE ROMANZOF LRRS
CAPE ROMANZOF, ALASKA
JACOBS
DATE: 20 NOV 2014
PROJECT MANAGER: J. WEHRMANN
FIGURE NO: 1-3
P:\Cape Romanzof\MXD\2014FS_SITE_SR018\CapeRomanzof_2011LeadResults.mxd beatycj

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1.2.4 Contaminant Fate and Transport

Lead and antimony adsorb to soil and are not considered highly mobile in the environment. When lead is deposited in soil from anthropogenic sources, it does not biodegrade or decay and is not rapidly absorbed by plants; therefore, it remains in the soil at elevated levels (EPA 2001). Most lead is retained strongly in soil, and very little is transported through runoff to surface water or leaching to groundwater, except under acidic conditions (EPA 1986; National Science Foundation 1977, as cited by the Agency for Toxic Substances and Disease Registry [ATSDR] 2007). Small amounts of lead may enter water bodies when soil particles containing lead are moved by rainwater. Movement of lead from soil also depends on the type of lead salt or compound, as well as on the physical and chemical characteristics of the soil. Plants and animals may bioconcentrate lead through direct contact with the source, but biomagnification to upper levels of the food chain is not expected (ATSDR 2007). The bioavailability of lead in soil to plants is limited because of the strong adsorption of lead to soil organic matter; however, the bioavailability increases as the pH and the organic matter content of soil are reduced (ATSDR 2007). Uptake of lead in animals may occur as a result of inhalation or ingestion.

The binding of antimony to soil is determined by the nature of the soil and the form of antimony deposited on the soil. Some studies suggest that antimony is fairly mobile under diverse environmental conditions (Rai and Zachara 1984, as cited by ATSDR 1992), while others suggest that it is strongly adsorbed in soil (Ainsworth 1988, Foster 1989, and King 1988, as cited by ATSDR 1992). Antimony does not appear to biomagnify from lower to higher trophic levels in the food chain (ATSDR 1992).

1.2.5 Baseline Risk Assessment

Screening level human health and ecological risk assessments were performed as part of the CSE Phase I/II investigation. Lead and antimony were identified as chemicals of potential concern. The human health and ecological risk assessments were limited to the soil sample data collected in 2011.

For the human health risk assessment (HHRA), lead was retained as a COC. Antimony was not retained as a COC due to the low concentrations in soil, which did not exceed the EPA regional screening level of 31 mg/kg. The HHRA concluded that lead in soil at SR018 may result in risk to human receptors, as all three exceedances (2,400, 800, and 590 mg/kg) resulted in screening hazard quotients of 6, 2, and 1.5, respectively (USACE 2013). These exceed the target hazard quotient of less than 1. The lateral and vertical extent of contaminated soil around the highest result appears well defined.

For the ecological risk assessment, both lead and antimony in soils may result in unacceptable risks to ecological receptors at SR018 (USACE 2013). All of the lead sample results exceeded the EPA ecological soil screening level (Eco-SSL) value for lead (11 mg/kg). Three of the values (17, 18, and 18 mg/kg) were within the range of U.S. background soils for lead (5 to 39 mg/kg) (EPA 2005, as cited in USACE 2013). Three out of ten of the antimony sample results exceeded the EPA Eco-SSL value for antimony (0.27 mg/kg). The remaining values were not detected; however, the laboratory method detection limit exceeded the EPA Eco-SSL. These screening concentrations for lead and antimony are less than background concentrations for many states; however, the levels indicate the contamination present is potentially harmful to terrestrial plants and animals (USACE 2013).

Although antimony was identified as a chemical of potential concern in the CSE Phase I/II and evaluated as a potential contributor to overall risk, site concentrations are well below both state and federal cleanup levels. Because antimony is collocated with lead, most treatments addressing lead will also address antimony.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

In order to provide a clear understanding of remedial options available for SR018 at Cape Romanzof LRRS, this FS followed the process outlined in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). This process entails the following steps:

- Develop RAOs and general response actions
- Identify and screen remedial technologies capable of obtaining the RAOs
- Develop remedial alternatives
- Screen remedial alternatives
- Perform detailed analysis of remedial alternatives

Each step is discussed in detail in this section, and the implementation of each step is discussed in Sections 3.0 and 4.0 of this document. RAOs were developed based on contaminant concentration standards established under various chemical-specific ARARs. RAOs for soil contamination were set at the concentrations established under Method Two in the Alaska Administrative Code Title 18, Chapter 75 (ADEC 2014). General response actions are broad categories of action that can be undertaken to satisfy RAOs (Section 2.2).

2.1 REMEDIAL ACTION OBJECTIVES

RAOs consist of site-specific goals for protecting HHE. In accordance with EPA Guidance, the objectives are as specific as possible but not so specific that the range of alternatives that can be developed is unduly limited (EPA 1988). RAOs specify the following:

- COCs
- Media (e.g., soil or groundwater)
- Exposure routes and receptors
- Acceptable contaminant concentrations, commonly referred to as preliminary remediation goals

The following RAOs were identified for SR018:

- Minimize or eliminate direct worker exposure to COCs.
- Prevent direct contact of humans to soil containing lead in excess of 400 mg/kg.
- Minimize or eliminate direct ecological exposure to COCs.
- Reduce the potential for COCs to migrate from site soil to any groundwater, surface water, and/or sediments where human receptors could be exposed.
- Reduce the potential for COCs to migrate in surface water from the site.

The cleanup levels selected for this site are chemical-specific ARARs for lead, based on the ADEC Method Two soil cleanup level (400 mg/kg for direct contact/ingestion). Achievement of these RAOs will be necessary to be protective of HHE, allowing continued use of the site for the USAF mission at the Cape Romanzof LRRS.

2.2 GENERAL RESPONSE ACTIONS

General response actions are broad categories of actions that can be undertaken to satisfy RAOs. An evaluation of general actions that may be effective in meeting RAOs has led to the selection of the following potential general response actions:

- No Action
- Disposal
- Containment
- In situ treatment
- Ex situ treatment
- Land-use controls (LUC)

These general response actions (Sections 2.2.1 to 2.2.6) can be combined to form an effective remedy. Table 2-1 summarizes the general response actions and potentially applicable technologies for contamination.

Table 2-1
General Response Actions and Potentially Applicable Technologies for Lead-Contaminated Soil

General Response Actions	Technology Category	Potentially Applicable Technologies
No Action	None	None
Disposal	Physical	Onsite Disposal
		Offsite Disposal
Containment	Physical	Permeable Cap
		Impermeable Cap
In Situ Treatment	Physical/Chemical Treatment	Solidification/Stabilization
		Vitrification
		Electrokinetics
Ex Situ Treatment	Physical/Chemical Treatment	Extraction
		Solidification/Stabilization
		Onsite/Offsite Vitrification
	Thermal Treatment	Flame Reactor Process
LUCs	Physical or Regulatory	Site Controls
		Institutional Controls

2.2.1 No Action

The No Action general response action serves as a baseline for comparison with other general response actions.

2.2.2 Disposal

Contaminated media can be removed and disposed of onsite or offsite at a location in compliance with the Resource Conservation and Recovery Act (RCRA), such as an approved treatment, storage, and disposal facility (TSDF).

2.2.3 Containment

Containment actions reduce risks to human health and environmental receptors by limiting possible exposure to contaminants. Containment can prevent either direct exposure (ingestion or inhalation) or indirect exposure (migration to groundwater). Containment technologies do not reduce the toxicity or volume of contaminants but may reduce contaminant mobility. For example, placing an impermeable cap over a landfill may be used to protect the underlying groundwater.

2.2.4 In Situ Treatment

In situ treatment reduces long-term risks to HHE by destroying or immobilizing contaminants in place through a variety of physical, chemical, biological, or thermal processes. Generally, contaminants are not brought above the ground surface, thereby minimizing short-term risks to humans and the environment. However, limited access to the contaminated media can reduce the effectiveness of in situ treatment options. Chemical stabilizers can be placed on soil in situ to increase stabilization and prevent leaching of lead.

2.2.5 Ex Situ Treatment

This general response action entails the removal and treatment of contaminated media. Treatment mechanisms may be physical, chemical, biological, or thermal processes. Removal of contaminated media can reduce long-term risks to HHE but requires extra care to minimize short-term risks associated with handling the contaminated media.

2.2.6 Land-Use Controls

LUCs include institutional controls and site controls. Institutional controls are legal or administrative measures taken to limit human exposure to contaminants by restricting access to and use of an area. Site controls include actions such as fencing and physically blocking access to the site. Institutional controls and site controls are commonly used as temporary measures to ensure the protection of human health until remedial actions or natural attenuation are complete. When undertaken without other general response actions, LUCs attempt to protect HHE without reducing the volume or toxicity of contaminants present.

2.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

There are three types of ARARs: chemical-specific; location-specific; and action-specific. Chemical-specific ARARs establish health- or risk-based contaminant concentration limits for various media. Chemical-specific ARARs may set cleanup levels for specific chemicals or discharge limits. Action-specific ARARs establish controls or restrictions on the remedial activities. Action-specific ARARs are triggered by the specific remedial activity rather than the contaminants present. Location-specific ARARs set limitations on remedial activities as a result of the location or characteristics.

In addition, EPA guidance documents identify items to be considered (TBC). TBCs are not considered legally enforceable but are evaluated along with ARARs as part of the risk assessment to set protective cleanup level targets. TBCs should be used in the absence of ARARs, when ARARs are not sufficiently protective to develop cleanup goals, or when multiple contaminants may be posing a cumulative risk (EPA 1987).

ARARs can be identified only on a source-specific basis and ARARs depend on the specific hazardous substances, pollutants, and contaminants at a source, the particular actions proposed as a remedy, and the characteristics of a source. ARAR identification is necessarily an iterative process and the potential ARARs must be re-examined throughout the CERCLA process.

2.3.1 Chemical-Specific ARARs

Chemical-specific ARARs set contaminant cleanup levels that are considered protective of HHE. The levels are media-specific. Chemical-specific ARARs may also set acceptable levels for the contaminants in discharged media if discharge occurs as part of a remedial activity. A state requirement is an ARAR only if it is more stringent than the corresponding federal requirement.

If necessary, EPA may waive attainment of ARARs. CERCLA [Section 121(d)(4)] specifies six reasons for waiving ARARs, including technical impracticability (TI) from an engineering perspective (a TI waiver). TI waivers usually apply to ARARs that set cleanup standards or levels. These standards are usually chemical-specific ARARs.

2.3.2 Action-Specific ARARs

Action-specific requirements control or restrict the activities that are selected to accomplish the remedy, not a specific contaminant. Action-specific ARARs may establish performance levels, actions, or technologies as well as specific levels for discharged or residual contaminants.

2.3.3 Location-Specific ARARs

Location-specific ARARs set restrictions on contaminant concentrations or on remedial activities because the contaminants or activities are in—or affect—specific locations, such as wetlands, flood plains, historical places, or sensitive habitats.

2.4 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGY TYPES AND PROCESS OPTIONS

This section presents the technology identification and screening process. Remedial technologies were selected in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). These technologies were screened based on effectiveness, implementability, and cost. For the technologies evaluated, the Treatment Technologies Screening Matrix (Federal Remediation Technologies Roundtable [FRTR] 2008) was used to obtain information on the effectiveness, implementability, and costs of process options implemented in similar projects in remote Alaska.

Effectiveness is the ability of the alternative to protect HHE. It includes both short-term effectiveness, such as protection of workers during remedial actions, and long-term effectiveness, such as the magnitude of residual risk. Effectiveness also includes the ability of the alternative to reduce the toxicity, mobility, and volume of contamination and the ability to meet RAOs and related ARARs. To evaluate effectiveness, each technology was screened against the following:

- Proven ability to achieve cleanup goals
- Potential impacts on HHE
- Reliability with respect to site contaminants

Implementability is the technical and administrative feasibility of the alternative, as well as the availability of the various resources that would be required. This criterion evaluates the technical and administrative feasibility of implementing the technology considering the site-specific conditions. Technical feasibility generally refers to the ability to construct and reliably operate the process until the remedial goal is achieved. This criterion accounts especially for the logistics of performing the technology relative to the remoteness and seasonal weather conditions of the site location. Administrative feasibility includes the approval of any needed permits and the availability of required facilities, specialists, and equipment.

Cost assesses the capital and operating costs of implementing the technology, evaluating them as low, moderate, or high. The cost also includes the logistical expense of working at a remote Alaska site where all personnel, machinery, materials, and waste are transported in and out by air. Rough order-of-magnitude costs for each alternative were provided for comparative purposes during screening. Remedial technologies were not eliminated from further consideration purely based on cost factors because these are only rough estimates at this stage of the FS process.

2.4.1 Identification and Screening of Technologies

This section describes the identification and screening of remedial technologies to address metals contamination at SR018. Potentially applicable remedial technologies were identified based on previous experience addressing lead contamination at remote sites in Alaska, professional judgment, emerging technologies, technical reports, papers, and reference guides.

Remedial alternatives were developed based on the results of the technology screening. In accordance with CERCLA guidance, the range of alternatives include the No Action alternative, alternatives that focus on reducing risk by preventing exposure, and (to the extent practicable) alternatives that focus on treatment of contaminated media. Alternatives considered were generally limited by the feasibility due to the remote site location. All of the alternatives developed for SR018 were retained for detailed analysis.

For each general response action except No Action, all remedial technologies and associated technologies considered potentially appropriate for the site were identified (Sections 3.1.1 to 3.1.5).

Onsite/Offsite Disposal

Alaska does not have a Subtitle C or D landfill; therefore, this technology requires either the development of an appropriately permitted lead landfill onsite or the excavation and offsite shipment of contaminated soil to a TSDF in the contiguous United States. The cost and logistical difficulty of transportation to a TSDF would be high, as would the short-term exposure risks during remedy implementation and the potential harm to the environment due to increased fossil fuels and greenhouse gas emissions. The permitting process for an onsite facility could prove difficult depending on the concentrations of residual contamination.

Containment

Capping is a method of containment that minimizes the potential for exposure to contaminants by physically isolating and securing contaminated soil in place using barrier materials. Caps may be permeable or impermeable. Caps do not result in the destruction or removal of contaminants and are widely used to contain low levels of contamination, including lead. The ideal area for an in situ capping is a stable, sheltered area not exposed to high erosive forces or upwelling from groundwater. Caps may be temporary or permanent and can be installed before permanent site closure to minimize contaminant migration until a better remedy is selected. Cap maintenance and inspections must occur regularly to ensure the integrity and continued protectiveness of the remedy.

Permeable Cap

A permeable cap, which could be constructed using native soil suitable for re-vegetation, effectively prevents contaminant exposure due to direct contact; however, a permeable cap will not prevent exposure due to migration of contaminants to groundwater. Low or high permeability soil can be used to control the amount of water passing through the cap to the contained contamination. Disadvantages of a permeable cap include the following:

- The cap could be damaged by burrowing animals, which could also be exposed to, and spread, contaminants.
- Fill material would need to be tested to ensure that no additional contamination is introduced to the site.
- Contamination would remain onsite, and potentially be re-exposed due to natural weathering and erosion.
- The cap would require long-term inspections, upkeep, and maintenance.

Impermeable Cap

Impermeable caps can minimize direct contact with contaminants and migration of soluble soil contaminants to groundwater. An impermeable cap can be constructed using bentonite, asphalt, concrete, or a synthetic liner. These cap materials prevent water from draining into the subsurface. Disadvantages of an impermeable cap include the following:

- A site-specific design would be required.
- Contamination would remain onsite and pose a potential future risk should the cap be compromised.
- The cap would require long-term inspections, upkeep, and maintenance.

Due to the remote location of SR018 and depth to groundwater, a permeable cap is believed to be sufficient at the site.

In Situ Treatment

In situ treatment technologies avoid or reduce the need to excavate soil. By treating soil in place, in situ treatment technologies minimize costs and worker exposure to contaminated soil. However, because soil is left in place, uniform treatment can be more difficult to achieve, particularly in areas with heterogeneous subsurface lithology and/or contaminant distribution. In situ treatment technologies have been divided into three groups: physical/chemical; biological; and thermal treatment processes. Physical/chemical treatment options for metals-contaminated soil are listed below and in Table 2-1; in situ thermal and biological processes are not ideal for metals-contaminated soil and were not considered further (FRTR 2008).

Physical/Chemical: In Situ Solidification/Stabilization

Solidification/stabilization (S/S) is a physical/chemical treatment that refers to two closely related treatment processes that blend treatment reagents, such as cement or phosphate, to impart physical and/or chemical changes to minimize the potential for contaminants to leach from the matrix and often to minimize the bioavailability of contaminants. Solidification, or encapsulation, is a physical and/or chemical process that changes the characteristics of the matrix to decrease the surface area exposed to leaching and/or coating the contaminated material with low-permeability material. This entraps the contaminated material within a granular or monolithic matrix. S/S is effective for treating many inorganic contaminants and some organic contaminants. This process can also be used over a range of soil moisture contents. However, the contaminants are not destroyed or removed, so long-term stewardship may be required. In addition, there are uncertainties associated with long-term behavior of the waste form, so toxicity characteristic leaching procedure or synthetic precipitation leaching procedure or other leaching tests are necessary. In situ treatment can be performed by auger mixing (using a bucket auger and overlapping borings), shallow in-place mixing with heavy equipment, or possibly by high-pressure injection through borings. Because the long-term stability of the S/S treatment is uncertain and depends on many factors, including site-specific factors, treatability studies and/or pilot studies are often performed to optimize the process.

Physical/Chemical: In Situ Vitrification

In situ vitrification is a chemical/physical treatment that uses an electric current to melt soil or other earthen materials at or above 1,600 degrees Celsius (°C), thereby immobilizing most inorganics into a glass-like material and destroying organic pollutants by pyrolysis. This process is initiated through a path of conducting material (typically graphite) originating from the soil surface, extending into the boring. The conducting material allows the soil to get hot enough to reach its melting point and become conductive itself. The melting temperature of soil at the Cape Romanzof LRRS will vary depending on its content of alkali metal oxides. Water vapor and organic pyrolysis combustion products are captured in a vacuum-pressurized hood and drawn into an off-gas treatment system that cools and scrubs particulates and other pollutants from the gas before discharge (EPA 2005). The vitrification product is a chemically stable, leach-resistant, glass and crystalline material similar to obsidian or basalt rock. Wastes containing heavy metals are amenable to treatment by the vitrification process because they will either fuse or vaporize. Some metals are volatilized and escape from the soil surface and may be collected by a vacuum system (EPA 1991), whereas other metals are immobilized in the solidified glass or metal slag (EPA 1992). Depth of contamination in the soil requires additional logistics when using the technology in situ versus ex situ; because the contamination at the Cape Romanzof LRRS is estimated to be 18 inches deep, this should not be an issue.

Advantages to in situ vitrification include the following:

- There is no removal of contaminated material, which in turn reduces the short-term exposure risks during remedy implementation.
- If implemented properly, long-term exposure and contaminant migration risks are minimized or eliminated.
- Waste streams are reduced and disposal costs are significantly reduced accordingly.

Disadvantages of in situ vitrification include the following:

- Because in situ vitrification operates at a temperature greater than ex situ vitrification (EPA 1992), this technology would require extensive permitting in the state of Alaska.
- The technology has the potential to cause some contaminants to volatilize and migrate to the outside boundaries of the treatment area instead of to the surface for collection (EPA 1991).
- Special equipment and trained personnel are required.
- Mobilization and electrical costs for this process are high.

Physical/Chemical: Electrokinetics

This technology can remove heavy metals and other contaminants from the soil and groundwater when the soil is electrically charged with direct current. The movement of ions, particles, and water are transported under the influence of an electrical field (EPA 1991). An electrokinetic phenomenon occurs when liquid migrates through a charged porous medium under the influence of a charged electrical field, which is applied through anodes. Cations in the soil will migrate toward the negatively charged cathode. Concentration gradients established between the cathode and anode cause diffusion from areas of low concentration to areas of high concentration (EPA 1991). The contaminants are then captured in chemical solutions within the cathode and anode housings and are brought to a purification system.

Advantages to electrokinetics include the following:

- Dissolved and sorbed contaminants are removed from low-permeability matrix.
- Technology is applied in situ with little surface disturbance.
- A wide range of contaminant concentrations are treated.

Disadvantages of electrokinetics include the following:

- Effectiveness is sharply reduced when moisture content is less than 10 percent.
- Precipitation of salt and secondary minerals could decrease the effectiveness.
- The process may raise the soil pH to levels that result in the mobilization of metallic contaminants. The high pH levels could also inhibit or destroy microbial populations present within the soil.
- Chlorine gas may be formed from the reduction of chlorine ions in the vicinity of the anode.
- Mobilization and electrical costs for this process are high.

<u>Ex Situ Treatment</u>

A variety of ex situ processes are available for the treatment of excavated lead-contaminated soil. Technologies are grouped as physical/chemical or thermal treatment processes (refer to Table 2-1) and are discussed in the subsequent subsections.

Physical/Chemical: Extraction

Extraction refers to several processes that separate the contaminants from soil particles. There are two general extraction processes: soil washing and acid leaching (EPA 1991). Soil washing uses a washing solution and mechanical agitation to extract the contaminant from the soil particles. The acid leaching process converts lead sulfate and lead dioxide to lead carbonate, which is soluble in fluorosilicic acid (EPA 1991). Lead is recovered from the leaching solution by electrowinning, and the acid is recycled back into the leaching process (EPA 1991). Several extraction solvents and follow-on solvent treatment (e.g., S/S) procedures are used to treat the lead-contaminated soil (EPA 1991). This process requires significant site set-up and presents risks associated with handling solvents and treatment/disposal of liquid waste.

Physical/Chemical: Ex Situ Solidification/Stabilization

The ex situ S/S process is the same as the in situ process previously described in this FS. However, ex situ treatment of the soil would, in simple terms, mix the soil with aggregate, admixtures, and cement, as determined in the treatability or pilot studies in the same general way that concrete is mixed. This process could require mobilizing mixing units (e.g., pugmills) and conveyance systems (e.g., screw conveyors) to the site to mix, hydrate, and process the treated soil. An advantage to ex situ treatment is control of the process. Additionally, pre-treatment, including removal of debris and addition of any admixture prior to introduction of the cement, can be performed more effectively than in situ processing. The long-term stability of the S/S treatment is uncertain and depends on many factors, including site-specific factors. Therefore, treatability studies and/or pilot studies are often performed to optimize the admixture, cement, and soil ratio. This process requires significant site set-up and also presents risks associated with the emission of volatile organic compounds during mixing procedures.

Physical/Chemical: Ex Situ Vitrification

Ex situ vitrification uses the same process as the in situ process previously described in this FS (EPA 1992).

Advantages of ex situ vitrification include the following:

- It is not limited to the area of electrode coverage, as with in situ.
- There is increased control of combustion and the final product.
- It is conducted at a lower temperature, which is more easily obtained and maintained than the higher temperature required for in situ treatment.

Disadvantages of ex situ vitrification include the following:

- There is an increased short-term risk to site workers.
- There are site set-up and safety issues.
- The costs of mobilization and energy are high.

Thermal: Flame Reactor Process

The flame reactor process uses a flash smelting system that treats residues and wastes containing metals (EPA 1991). Wastes are processed with a very hot reducing gas produced from the combustion of solid or gaseous hydrocarbon fuels in oxygen-enriched air. The end products are a non-leachable slag and a recyclable, heavy metal-enriched oxide (EPA 1991). The process requires that wet agglomerated wastes be dry enough to be gravity-fed and fine enough to react rapidly. Larger particles can be processed; however, the efficiency of metals recovery decreases. This technology has not been widely tested for use at Superfund cleanup sites.

<u>Land-Use Controls</u>

The two types of LUCs considered are institutional controls and site controls. Consideration of limited actions to address site contaminants applies to soil.

Institutional Controls

Institutional controls are legal or administrative measures designed to prevent or reduce human or environmental exposure to contamination and to prevent activities that may result in increased exposure to, or the spread of, contamination. ADEC provides guidance describing varying levels of institutional controls that are likely to be required based on the cleanup standard used at any given site. Table 2-2 presents Institutional Controls Quick Reference Guide – Soil, from the ADEC *Site Closure Policy and Procedures* (ADEC 2011).

Table 2-2
Institutional Controls Quick Reference Guide – Soil

Description	Residual Contaminant Concentrations		
	Representative contaminant levels greater than human health levels (Method Two direct contact or inhalation) or site-specific ecological risk levels	**Representative contaminant levels between the most conservative default cleanup levels and human health levels (Method Two direct contact or inhalation); ecological risk mitigated or controlled**	**Representative contaminant concentrations below the most stringent level for the applicable precipitation zone (under 40-inch)**
Implementation Mechanism or Instrument	**Generally enforceable:** • Equitable servitude • Restrictive covenant • Management right assignment • Compliance order by consent • On-line availability of cleanup complete determination • Other decision documents and land and activity use control details • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination	**Generally informational:** • In some cases, informational controls, such as a deed notice or other informational mechanism, may be used if concerned about relocation of contaminated soil to a sensitive area • On-line availability of cleanup complete determination and any condition details • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination	**Generally no institutional controls:** • On-line availability of cleanup complete determination • Default "reopener" and soil disposal notification conditions articulated in cleanup complete determination
Monitoring and Reporting	Annual scheduled monitoring and reporting periods tracked on the ADEC database, possibly combined with ADEC inspections.	Variable monitoring and reporting requirements, based on individual site circumstances, tracked on the ADEC database; ADEC inspections infrequent or unnecessary.	Generally none.
Enforcement	Formal enforcement action discretionary for non-compliance depending on site-specific factors.	Formal enforcement action usually unnecessary but other measures, such as a site inspection or responsible party meeting, may be appropriate for non-compliance.	Generally none.

Site Controls

Site controls are physical measures taken to prevent access to sites that may pose an unacceptable risk to human health. Site controls can also be used to prevent actions that could cause the spread of contaminants or to prevent vehicular access. Typical site controls include signs, fences, and barricades.

2.4.2 Evaluation of Technologies and Selection of Representative Technologies

Following identification of the remedial and containment technologies appropriate for SR018, these technologies were screened based on their effectiveness, implementability, and cost. Technology screening is presented in Figure 2-1 and summarized in Table 2-3.

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TECHNOLOGY CATEGORY		REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
Disposal		Onsite Disposal	Effective at containing contaminated soil onsite	Not readily implementable; would require development of permitted lead landfill	Moderate waste transportation cost
		Offsite Disposal	Effective at removing contaminated soil from site	Implementable; substantial waste transportation from remote site	High waste transportation cost
Containment		Permeable Cap	Moderately effective at containing lead and preventing exposure	Implementable	Moderate cost for long-term maintenance
		Impermeable Cap *	Highly effective at containing lead, preventing exposure, and protecting groundwater	Implementable	Moderate cost to import liner material and long-term maintenance
In Situ Treatment	Physical/Chemical Treatment	Solidification/Stabilization	Effective at containing contaminated soil	Implementable	Moderate mobilization and treatment costs
		Vitrification	Effective at containing and treating contaminated soil	Not readily implementable; substantial site set-up and safety issues	High mobilization and energy costs
		Electrokinetics	Effective at containing and treating contaminated soil	Not readily implementable; substantial site set-up and safety issues	High mobilization and energy costs
Ex Situ Treatment	Physical/Chemical Treatment	Extraction	Moderately effective at reducing lead concentrations	Not readily implementable; requires handling and treatment of solvents, substantial site set-up, and safety issues	High mobilization and treatment costs
		Solidification/Stabilization	Effective at containing contaminated soil	Implementable	Moderate mobilization and treatment costs
		Vitrification	Effective at containing and treating contaminated soil	Not readily implementable; substantial site set-up and safety issues	High mobilization and energy costs
	Thermal Treatment	Flame Reactor Process	Effective in laboratory scale studies and pilot studies; not a proven technology	Not readily implementable; substantial site set-up and safety issues	High mobilization and energy costs
Land-Use Controls		Institutional Controls	Moderately effective at preventing exposure	Implementable; must be maintained over the long term	Moderate cost for long-term monitoring and maintenance
		Site Controls	Moderately effective at preventing exposure	Implementable; must be maintained over the long term	Moderate cost for long-term monitoring and maintenance

Legend

[shaded box] Indicates a technology option that will no longer be considered viable as a primary technology for the site

* Due to the remote location of SR018 at Cape Romanzof LRRS and depth to groundwater, a permeable cap is believed to be sufficient at the site.

TECHNOLOGY SCREENING PROCESS FOR METALS CONTAMINATION
SITE SR018
CAPE ROMANZOF, ALASKA

JACOBS | DATE: 4 DEC 2014 | PROJECT MANAGER: J. Wehrmann | FIGURE NO: 2-1

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Table 2-3
SR018 Technology Screening for Contaminated Soils

General Response Action	Technology Process Option	Effectiveness	Implementability	Cost	Technology Screening
No Action	No Action	○	●	●	Retained[1]
Disposal	Onsite Disposal	◐	◐	◐	Eliminated
	Offsite Disposal	●	●	○	Retained
Containment	Permeable Cap	◐	●	●	Retained
	Impermeable Cap	●	●	◐	Eliminated[2]
In Situ Treatment	Solidification/Stabilization	●	◐	◐	Retained
	Vitrification	●	○	○	Eliminated
	Electrokinetics	◐	◐	○	Eliminated
Ex Situ Treatment	Extraction	◐	○	○	Eliminated
	Solidification/Stabilization	●	◐	◐	Eliminated
	Onsite/Offsite Vitrification	●	○	○	Eliminated
	Flame Reactor Process	◐	○	○	Eliminated
LUCs	Institutional Controls	◐	●	●	Retained
	Site Controls	◐	●	●	Retained

Notes:

[1] This is retained to establish baseline conditions

[2] Due to the remote location of SR018, depth to groundwater, and the fact that the contaminants are not readily mobile, a permeable cap is believed to be sufficient at the site.

● Highly effective, easy to implement, or low cost

◐ Somewhat effective, difficult to implement, or moderate cost

○ Not effective, very difficult to implement, or high cost

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3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Remedial alternatives for lead-contaminated soil at SR018 have been developed for detailed and comparative evaluation in this FS. The alternatives described in Section 3.1 were developed based on the RAOs and general response actions identified for SR018 and on the screening of potential remedial technologies described in Section 2.0.

The following alternatives were evaluated for treatment of lead-contaminated soil at SR018:

- **Alternative 1:** No Action
- **Alternative 2:** LUCs and Long-Term Monitoring (LTM)
- **Alternative 3:** Capping, LUCs, and LTM
- **Alternative 4:** Debris Removal, In Situ Soil Treatment, Capping, and LUCs
- **Alternative 5:** Removal and Offsite Disposal

Based on the estimated soil volume, approximately 8.3 cy of lead-contaminated soil at this site require action under CERCLA.

Implementation of these alternatives would include strictly documented procedures that would be audited and evaluated during execution of the work to ensure that workers, individuals from the local community intermittently visiting the site, and the environment are protected from any potential risks.

3.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES FOR SR018

To develop a remedial strategy for lead-contaminated soil at SR018, a conceptual understanding of the volume and location of the contamination is needed. Approximately 8.3 cy (12.5 tons) of lead-contaminated soil remain at the site. Estimates of contaminant mass and distribution were developed as follows:

- Analytical data from the CSE Phase I/II were considered (USACE 2013).
- Volumes of contaminated media were estimated (Section 1.2.3).
- An estimated density of the soil of 1.5 tons per cy was used to convert volume estimates to weight estimates.

3.1.1 Alternative 1: No Action

Under the No Action alternative, no activities would be undertaken to treat or remove the contamination present or to otherwise prevent exposure to the contamination. No monitoring would be conducted. A No Action alternative is required for consideration under NCP and serves as a baseline against which other alternatives can be compared.

3.1.2 Alternative 2: Land-Use Controls and Long-Term Monitoring

Under this alternative, LUCs would be implemented to restrict invasive and residential activities and protect human health from exposure to lead contamination in soil above the ADEC Method Two cleanup level (400 mg/kg). LUCs would include controlled access, dig restrictions, deed restrictions, and signage. LTM to inspect for erosion and other site conditions and CERCLA five-year reviews would be required indefinitely to evaluate the long-term protectiveness of the remedy. LTM inspections would be coordinated with other site inspections for IRP sites at Cape Romanzof LRRS and would occur no less often than once every five years, along with the five-year review.

3.1.3 Alternative 3: Capping, Land-Use Controls, and Long-Term Monitoring

Under this alternative, munitions debris at the site and soil contaminated with lead greater than 400 mg/kg would be capped with a minimum 2-foot soil cap. The cap and LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contamination in soil over the cleanup level. LUCs would include controlled access, dig restrictions, deed restrictions, and signage. LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter, indefinitely.

A permeable cap would be appropriate at this location because offsite migration through groundwater is not likely. Based on the estimated extent of contamination, the cap would need to cover approximately 150 square feet and would be constructed with 2 feet of locally available gravel.

The land would continue to be held by USAF under Section 121 of CERCLA, as amended by Superfund Amendments and Reauthorization Act (SARA). NCP requires that remedial actions resulting in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure protection of HHE. Therefore, five-year reviews would be required until cleanup levels are met for the site (indefinitely).

3.1.4 Alternative 4: Debris Removal, In Situ Soil Treatment, Capping, and Land-Use Controls

Under this alternative, surficial munitions debris would be removed and disposed of offsite. Soil to a depth of 18 inches containing lead above 400 mg/kg would be treated with a chemical stabilization product to prevent leaching and limit migration. The treated soil would then be covered with a 2-foot soil cap. The cap and LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead-contaminated soil over the cleanup level. LUCs would include controlled access, dig restrictions, deed restrictions, and signage. LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter, indefinitely.

Following collection of pre-treatment soil samples, calcium hydroxyapatite (or equivalent stabilizer) would be placed on the soil in situ using water and a sprayer to increase stabilization and prevent leaching of lead. The stabilizer would soak into the soil just past the estimated depth of contamination at 18 inches bgs. This action would limit the migration of lead from the site. Post-application samples would be collected after stabilization and analyzed for total lead and lead after performing the toxicity characteristic leaching procedure. A pilot study will not be conducted based on the success of similar treatment at the LF006 Distressed Area (Lima Bean) at Driftwood Bay Radio Relay Station, Alaska, in 2009 (USAF 2010). As with Alternative 3, a permeable cap would then be placed over the lead-contaminated soil to prevent direct contact. A permeable cap would be appropriate at this location because migration offsite is not likely. Based on the approximate extent of contamination, the cap would need to cover approximately 150 square feet and would be constructed with 2 feet of locally available gravel.

The land would continue to be held by USAF under Section 121 of CERCLA, as amended by SARA. NCP requires that remedial actions resulting in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure protection of HHE. Therefore, five-year reviews would be required indefinitely until cleanup levels are met for the site.

3.1.5 Alternative 5: Removal and Offsite Disposal

Under this alternative, munitions debris and soil contaminated with lead above the ADEC Method Two cleanup level (400 mg/kg) would be excavated, staged, manifested, and transported for disposal to an RCRA-permitted chemical waste landfill capable of managing RCRA-regulated lead-contaminated soil. Soil would be excavated and staged onsite prior to transport. Approximately 8.3 cy (12.5 tons) of lead-contaminated soil remain at the site; when excavated, the amount of soil to be disposed equates to approximately 10 cy (15 tons) of soil when adjusting for bulk factor (see Appendix B). Analytical samples would be collected from the staged soil for waste profiling. It is anticipated that excavation activities would focus on surface soil to an 18-inch depth.

The following logistical coordination and manifesting activities would be required for excavation, staging, transport, and disposal of lead-contaminated soil at a licensed TSDF:

- Segregating excavated soils into RCRA hazardous and non-RCRA hazardous waste streams and containing lead-contaminated soils in stockpiles
- Collecting and analyzing confirmation samples to ensure cleanup levels have been met
- Loading lead-contaminated soil into Super Sacks for transport from Lower Camp to the airstrip
- Chartering an aircraft from Cape Romanzof LRRS to Anchorage
- Staging Super Sacks in containers in Anchorage for transport to the TSDF
- Barging and trucking containers from Anchorage to the TSDF in the contiguous United States

Confirmation sampling of the excavation would be required to ensure lead is no longer present at concentrations above the ADEC cleanup level. Once analytical results from confirmation samples indicate that all contaminated soil has been removed, the excavation would be backfilled. Under this alternative, the site would be restored for unlimited exposure/unrestricted use. CERCLA five-year reviews would not be required with this alternative.

3.2 SCREENING OF ALTERNATIVES FOR SR018

Table 3-1 compares the effectiveness, implementability, and cost of the screened alternatives.

Table 3-1
Screening of Alternatives for SR018

Remedial Alternative	Effectiveness	Implementability	Cost	Retained for Detailed Analysis?[1]
1: No Action	○	○	●	Yes
2: LUCs and LTM	◐	●	●	Yes
3: Capping, LUCs, and LTM	◐	●	◐	Yes
4: Debris Removal, In Situ Soil Treatment, Capping, and LUCs	●	◐	◐	Yes
5: Removal and Offsite Disposal	●	◐	◐	Yes

Notes:
[1] These alternatives will be further evaluated in the Proposed Plan for SR018.
● Highly effective, easy to implement, or low cost
◐ Somewhat effective, difficult to implement, or moderate cost
○ Not effective, very difficult to implement, or high cost

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4.0 DETAILED ANALYSIS OF ALTERNATIVES

Remedial options in this section are evaluated assuming approximately 8.3 cy (12.5 tons) of lead-contaminated soil at the site. Based on the screening presented in Section 3.2, all alternatives screened were retained for detailed analysis. These include the following:

- Alternative 1: No Action
- Alternative 2: LUCs and LTM
- Alternative 3: Capping, LUCs, and LTM
- Alternative 4: Debris Removal, In Situ Soil Treatment, Capping, and LUCs
- Alternative 5: Removal and Offsite Disposal

Section 4.1 presents the criteria for evaluating the acceptability of an alternative and Sections 4.2.1 through 4.2.5 present detailed analyses for each selected alternative. Section 4.4 presents a comparison of the alternatives and their ability to achieve NCP criteria.

4.1 CRITERIA CATEGORIES

NCP (40 CFR 300) presents nine criteria for evaluating the acceptability of a given alternative; these nine criteria comprise two threshold criteria, five primary balancing criteria, and two modifying criteria.

4.1.1 Threshold Criteria

Threshold criteria represent the minimum requirements that each alternative must meet to be eligible for selection. Failure to achieve each threshold criterion will eliminate the alternative from further consideration. The two threshold criteria are as follows:

- Overall protection of HHE
- Compliance with ARARs

Overall Protection of Human Health and the Environment

This criterion assesses the overall effectiveness of an alternative and focuses on whether that alternative achieves adequate protection and risk reduction, elimination, or control. This criterion overlaps with considerations under compliance with ARARs, as well as with some primary balancing criteria, such as long-term and short-term effectiveness.

Compliance with ARARs

This criterion assesses whether an alternative complies with all federal and state ARARs or whether a waiver would be required and would be justified under CERCLA and NCP [42 USC 9621(d)(4); 40 CFR 300.430(f)(1)(ii)(C)], such as for TI. ARARs include chemical-specific, requirements such as risk-based levels established for safe drinking water (e.g., maximum contaminant levels); location-specific, requirements such as protection of wetlands; and action-specific, requirements such as post-closure requirements. Other potential requirements that are not necessarily laws or promulgated regulations, such as EPA Regional Screening Levels, are TBCs that can be treated as ARARs, particularly when no other specific laws or regulations are available as ARARs. Appendix A presents ARARs for SR018.

4.1.2 Primary Balancing Criteria

Primary balancing criteria form the basis for comparing alternatives in light of site-specific conditions. The five primary balancing criteria are as follows:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

Long-Term Effectiveness and Permanence

This criterion assesses the destruction or removal of contaminants, the magnitude of residual risks remaining at the conclusion of remedial activities, and the adequacy and reliability of controls to be used to manage residual risk at the site after the selected remedy has been implemented. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by untreated residual contamination.

The following factors of the criterion are addressed for each alternative:

- **Magnitude of residual risk**. This factor assesses the risk from residual COCs at the conclusion of the proposed activities. The characteristics of the residual COCs will be considered to the degree that they remain hazardous, and the evaluation will account for volume, toxicity, mobility, and propensity to bioaccumulate.
- **Adequacy and reliability of controls**. This factor assesses the adequacy and suitability of controls, if any, that are used to manage COCs that remain at the site. It also assesses the long-term reliability of management controls for providing continued protection from residual COCs and includes an assessment of potential needs for replacement of technical and engineered components of the alternative.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Section 9621 of CERCLA (Cleanup Standards) states: "Remedial actions in which treatment permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants is a principal element, are to be preferred over remedial actions not involving such treatment." This criterion addresses the capacity of the alternative to reduce primary risks through destruction of contaminants, reduction in the total mass of contaminants, irreversible reduction in contaminant mobility, or reduction in the total volume of contaminated media. This evaluation focuses on these specific factors:

- Treatment processes employed and the materials and COCs treated
- Amount of hazardous materials destroyed or treated, including how the principal threats will be addressed
- Degree of expected reduction in toxicity, mobility, or volume through treatment as measured as a percentage of reduction
- Degree to which the treatment will be irreversible
- Type and quantity of treatment residuals remaining after treatment
- Whether the alternative will satisfy the statutory preference for treatment as a principal element

Short-Term Effectiveness

This criterion addresses the effects of the alternative during construction and operation until RAOs are met. Each alternative is evaluated with respect to its potentially negative effects on community health, worker safety, and environmental quality during the course of remedial actions. This criterion also addresses the time required by each alternative until RAOs are achieved. Although not included in the NCP as part of this balancing criterion, additional risk to the environment includes potential harm to the environment where increased fossil fuels and greenhouse gas emissions are required for remedy implementation (ITRC 2011).

Implementability

The implementability criterion is used to assess the technical and administrative feasibility of implementing an alternative. Technical issues include the reliability of the technology under consideration; potential construction difficulties; and the availability of required services, materials, and equipment, preferably from multiple sources. Administrative issues include permitting and access for construction and monitoring. Factors addressed include the following:

- Whether the technology is proven under the site-specific conditions
- The administrative requirements and relative difficulties associated, such as requirements for permits
- Whether skilled workers are required and are available locally
- Whether materials are locally available or would require transportation

Consequent evaluation factors for transportation of materials may include risk from transport of the materials while other factors, such as cost of transport, would be addressed under the cost evaluation.

Cost

Details of the cost estimates are provided in Appendix B. A detailed cost analysis of each alternative involves estimating the cost required to complete each measure through the entire life cycle until the remedy is complete, which includes capital costs and annual operation and maintenance costs. Annual operation and maintenance costs of each alternative are given as a present worth cost using a 5 percent rate of return over 30 years (consistent with EPA Guidance [EPA 2000]). A present worth cost is used for comparative analysis. Cost estimates for each alternative are based on site-specific conceptual designs and are expressed in 2014 dollars. Cost estimates include equipment, materials, construction-related labor, and site development. Cost estimates are prepared using data available from the 2011 CSE Phase I/II (USACE 2013) and are intended to provide an accuracy of between +50 and –30 percent. The cost estimates provided are preliminary and were developed in accordance with *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000). More detailed and accurate cost estimates will be developed as the CERCLA process progresses. Cost estimates included in this document are intended for comparative purposes only. They intentionally emphasize comparability (a key factor in the decision-making process) versus accuracy. Present worth costs for each alternative provided in this FS include the following:

- Estimates of the volume of contaminated soil to be addressed
- Capital costs, including design, planning, permitting, work plans, procurement, and construction
- Annual operation and maintenance costs, if applicable
- A 10-percent contingency on construction capital costs to account for unforeseen project complexities, such as adverse weather, unexpected subsurface conditions, increased standby times, etc.

The cost estimates include consistent assumptions and methodologies such that potential unit cost, quantity, or other biases will have an equal impact on each cost estimate. Consequently, the cost estimates should be proportionally affected and the relative difference for comparative analysis maintains the ranking of relative cost. The cost estimate, however, is not adequate for budgetary planning purposes. Budgetary cost estimates may subsequently refine these comparative analysis cost estimates as more information is developed. Key assumptions used to estimate project costs include the availability of onsite housing, water, and wastewater through the onsite LRRS support contractor for personnel, as well as the access road conditions are safe and well-maintained for hauling soil between the Lower Camp and the airstrip.

4.1.3 Modifying Criteria

The two modifying criteria are state acceptance and community acceptance. State and community acceptance will be addressed when final decisions are made and decision documents prepared. Alternatives are not evaluated against modifying criteria in this document.

State Acceptance

State acceptance evaluates the technical and administrative issues related to each alternative, as well as regulatory concerns.

Community Acceptance

Community acceptance evaluates the issues and concerns that the public may have regarding each of the alternatives. In accordance with EPA Guidance (EPA 1988), modifying criteria will be evaluated following the regulatory comment and public response period that will occur after the Proposed Plan has been distributed.

4.1.4 Comparative Analysis

A rating system based on the definitions provided in 40 CFR 300.430(e)(9)(iii) was developed for this document to evaluate and summarize the ability of the alternatives to meet the criteria (Table 4-1). A pass or fail determination was used for each threshold criterion; failure to pass either threshold criteria eliminated the alternative from further evaluation. Except for cost, a number between 0 and 5 was assigned to each of the primary balancing criterion, as follows:

- Criterion was fully met (5).
- Criterion was partially met (1 through 4, depending on the degree to which the criterion is satisfied).
- Criterion was not met (0).

Table 4-1
Remedial Alternative Evaluation System

Category	Evaluation Criteria	Standard	Value
Threshold Criteria	Overall Protection of HHE	Protective; provides adequate risk reduction.	Pass or Fail
	Compliance with ARARs	Complies with ARARs.	Pass or Fail
Primary Balancing Criteria	Long-Term Effectiveness and Permanence	Contaminants are destroyed or removed; no recurrence is possible.	5
		Some contaminants destroyed, removed, or contained.	1 to 4
		Contaminants not removed or contained.	0
	Reduction of Toxicity, Mobility, or Volume through Treatment	Significantly reduces toxicity, mobility, or volume through treatment; no residuals remaining after treatment.	5
		Somewhat reduces toxicity, mobility, or volume through treatment; some residuals remaining after treatment.	1 to 4
		Does not reduce toxicity, mobility, or volume through treatment; significant residuals remaining after treatment.	0
	Short-Term Effectiveness	Protective of community and workers during remediation; no environmental impacts; rapidly meets RAOs.	5
		Somewhat protective of community and workers during remediation; limited environmental impacts; meets RAOs over a period of years to decades.	1 to 4
		Not protective of community and workers during remediation; significant environmental impacts; will not meet RAOs in the near future.	0
	Implementability	Proven, reliable technologies; little or no difficulty in obtaining needed approval, equipment, personnel, and materials. Technical difficulties are expected to be minimal.	5
		Somewhat unproven technologies; potentially more difficulty in obtaining needed approval, equipment, personnel, and materials. Technical difficulties may be significant.	1 to 4
		Unproven technologies; obtaining needed approval, equipment, personnel, and materials could be very difficult. Technical difficulties could prevent implementation.	0
	Cost	Estimated present worth cost is listed for each alternative.	Estimate
Modifying Criteria[1]	State Acceptance	To be determined.	N/A
	Community Acceptance	To be determined.	N/A

Notes:
[1] State and community acceptance will be evaluated following public comment on the Proposed Plan and addressed when the Record of Decision is prepared.
N/A = not applicable
For additional definitions, see the Acronyms and Abbreviations section.

Numerical values were assigned subjectively, according to professional judgment, and used only as a means of weighing the trade-offs involved. The highest total numerical score does not indicate that an alternative was preferred. Consideration of modifying criteria (Section 4.1.3) is not within the scope of this document and can only be evaluated after state and community reviews of the alternatives are completed to provide information about acceptance; these criteria will be considered in the Record of Decision.

4.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

Remedial alternatives for lead-contaminated soil at SR018 have been developed for detailed and comparative evaluation in this report. The alternatives listed in Section 4.2.1 through 4.2.5 were developed from retained remediation technologies based on the RAOs, general response actions identified for SR018, and the screening of potential remedial alternatives described in Section 3.2. Feasibility of the alternatives considered was generally limited due to the site's remote location. All of the alternatives developed for SR018 were retained for detailed analysis. No alternatives were screened out, and the process was streamlined, as explained in Chapter 4, Section 4.1.2.1, of EPA Guidance (1988).

Implementation of these alternatives would include strictly documented procedures that would be audited and evaluated during execution of the work to ensure that workers, community members intermittently visiting the site, and the environment are protected from any potential risks. Sections 4.2.1 through 4.2.5 present the detailed analysis for each selected alternative. Section 4.4 presents a comparison of the alternatives and their ability to achieve NCP criteria.

4.2.1 Alternative 1: No Action

Under the No Action alternative, no activities would be undertaken to treat or remove the contamination present or to otherwise prevent or minimize the potential for exposure to the contamination. No monitoring would be conducted. Table 4-2 summarizes the ability of this alternative to meet NCP criteria; values are based on the rating system described in Section 4.1. This section discusses the rationale for those values presented in Table 4-2.

Table 4-2
Evaluation of Alternative 1 (No Action)

Evaluation Criteria	Value
Overall Protection of HHE	Fail
Compliance with ARARs	Fail
Long-Term Effectiveness and Permanence	0
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	0
Implementability	5
Cost	$0

Note:
For definitions, see the Acronyms and Abbreviations section.

Overall Protection of Human Health and the Environment

This alternative would not be protective of human health or the environment. The potential for unacceptable human or environmental exposure to site contaminants would remain for as long as contaminant concentrations remain above cleanup levels. This alternative does not include institutional or site controls to prevent or minimize the potential for human contact with the contamination.

Therefore, the No Action alternative would not be protective of HHE in the short or long term because the lead-contaminated soils would remain onsite providing a potential exposure pathway for human and ecological receptors. Consequently, the No Action alternative would not meet this threshold criterion and would not be an acceptable alternative.

Compliance with ARARs

There is a risk of human exposure to site contaminants at concentrations above cleanup limits because no action of any kind would be taken to mitigate the risks that have been identified at this site. Thus, this alternative fails to comply with chemical-specific ARARs (Appendix A).

Long-Term Effectiveness and Permanence

Under the No Action alternative, lead-contaminated soil above the RAO cleanup level would remain onsite. Without action, the RAOs would not be achieved within a reasonable timeframe.

Lead is relatively immobile and the concentration would not be expected to decrease over time without some type of remedial action. This alternative would not be effective as a treatment for lead-contaminated soil.

Reduction of Toxicity, Mobility, or Volume Through Treatment

This alternative would not treat, remove, or immobilize contamination.

Short-Term Effectiveness

Implementing this alternative would not involve intrusive activities or other actions that would subject workers or members of the community to short-term risks. Implementation would have no negative impacts on community or worker health and safety or environmental quality. However, natural processes would not reduce contaminants to concentrations below those presented in the RAOs within a reasonable timeframe.

Implementability

No technical obstacles would be involved with implementing the No Action alternative, but administrative approval is highly unlikely.

Cost

No costs are associated with this alternative.

4.2.2 Alternative 2: Land-Use Controls and Long-Term Monitoring

Table 4-3 summarizes the ability of Alternative 2 to satisfy the objectives established by NCP. The rationale for the values listed in Table 4-3 is presented in the following subsections.

Table 4-3
Evaluation of Alternative 2 (Land-Use Controls and Long-Term Monitoring)

Evaluation Criteria	Value
Overall Protection of HHE	Pass
Compliance with ARARs	Pass
Long-Term Effectiveness and Permanence	2
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	2
Implementability	4
Cost (in millions)	$0.32

Note:
For definitions, see the Acronyms and Abbreviations section.

Overall Protection of Human Health and the Environment

This alternative proposes to leave lead-contaminated soil at the site in place. This effectively protects human health under a recreational land-use scenario, but does not allow for unrestricted use of the site. RAOs would be achieved by limiting access—and thus exposure—to lead at the site.

Compliance with ARARs

This alternative would comply with all chemical-, location-, and action-specific ARARs (Appendix A). It would achieve chemical-specific ARARs at the site by limiting exposure to lead-contaminated soils. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable alternative.

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative is highly dependent on maintenance of LUCs. The site-specific risk assessment shows that concentrations of lead at the site are protective of HHE under a recreational land-use scenario. Because LUCs are the primary means of preventing exposure to the contamination, they must be enforced and monitored to allow this alternative to be effective. If implemented, contamination at concentrations above the RAOs would remain onsite for more than five years; therefore, CERCLA five-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The goal of this alternative would be to prevent exposure to, rather than treat, lead-contaminated soil. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

Implementation of this alternative would not involve intrusive activities. Implementation would have no negative impacts on community or worker health and safety or environmental quality. However, natural processes would not reduce lead to concentrations below those presented in the RAOs within a reasonable timeframe because the lead would remain indefinitely.

Implementability

Implementation of this alternative is relatively straightforward. Because LUCs are the primary means of preventing exposure to the contamination, they must be enforced and monitored. Contamination at concentrations above the RAOs will remain onsite for more than five years; therefore, CERCLA five-year reviews would be required. Administrative approval should be possible, though more challenging because lead-contaminated soil remains onsite.

Cost

Cost estimates for this alternative assume that LUCs would need to be maintained indefinitely. This alternative would cost approximately $320,804 to implement (Appendix B). Costs include the maintenance of LUCs at the site. The costs for this alternative have been developed based on the following assumptions:

- Signage would be necessary, requiring inspection and maintenance.
- LTM inspections would be required no less often than once every five years.
- CERCLA five-year reviews would be required.

4.2.3 Alternative 3: Capping, Land-Use Controls, and Long-Term Monitoring

Table 4-4 summarizes the ability of Alternative 3 to satisfy the objectives established by NCP. The rationale for the values listed in Table 4-4 is presented in the following subsections.

Table 4-4
Evaluation of Alternative 3 (Capping, Land-Use Controls, and Long-Term Monitoring)

Evaluation Criteria	Value
Overall Protection of HHE	Pass
Compliance with ARARs	Pass
Long-Term Effectiveness and Permanence	3
Reduction in Toxicity, Mobility, and Volume Through Treatment	0
Short-Term Effectiveness	2
Implementability	4
Cost (in millions)	$0.89

Note:
For definitions, see the Acronyms and Abbreviations section.

Overall Protection of Human Health and the Environment

This alternative proposes to cap munitions debris and lead-contaminated soil from the former recreational small arms use area, effectively protecting HHE. RAOs would only be achieved by limiting access—and thus, exposure—to the site.

Compliance with ARARs

This alternative would comply with all chemical-, location-, and action-specific ARARs (Appendix A). It would achieve chemical-specific ARARs at the site by limiting exposure to lead-contaminated soils. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable alternative.

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative is dependent on maintenance of the permeable cap and LUCs. The soil cover may require periodic maintenance. Contamination at concentrations above the RAOs will remain onsite for more than five years; therefore CERCLA five-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The goal of this alternative would be to prevent exposure to, rather than treatment of, lead-contaminated soil. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

This alternative would be moderately protective of the community and site workers during the remedial action. Because of surface contamination, there is a possibility of short-term exposure risk to workers associated with construction of the cap. Short-term risks associated with cap maintenance may also present an exposure concern for future site workers. However, natural processes would not reduce lead to concentrations below the RAOs; the lead would remain indefinitely. An increased volume of fossil fuels will be needed and released into the environment as a result of both the heavy machinery to construct the cap and the airplane/vehicles for transportation offsite.

Implementability

Implementation of this alternative would provide a moderate challenge. Equipment and personnel are not readily available in the area; therefore, mobilization to the installation would be required. Mobilization and demobilization of personnel, supplies, and equipment to the site would require transportation via air transport. Air transport would include a chartered aircraft to Cape Romanzof LRRS. Once flown to Cape Romanzof LRRS, equipment would need to be transported along an unmaintained road.

Because SR018 is within a wetland and this alternative includes adding fill to a wetland, coordination with USACE—and potentially permitting—will need to be conducted. Best management practices (BMP), such as silt fences and polyethylene plastic sheeting, should also be utilized to limit damage to surrounding wetlands.

Care would be taken to avoid spreading contamination during capping activities. Contamination at concentrations above the RAOs would remain onsite for more than five years; therefore, CERCLA five-year reviews would be required. Administrative approval should be possible, though more challenging because lead-contaminated soil remains onsite.

Cost

Cost estimates for this alternative are based on the assumption that 11.1 cy (16.65 tons) of soil would be required to cap the munitions debris and lead-contaminated soil with a 10-foot by 15-foot soil cover. This alternative would cost approximately $886,257 to implement (Appendix B). Costs include the addition of a 2-foot soil cover and the maintenance of LUCs at the site. The costs for this alternative have been developed based on the following assumptions:

- This alternative would require an estimated 1 week of onsite work to mobilize and install 2-feet of soil cover over the volume of contaminated soil located at SR018.
- Equipment and personnel would be air-transported from Anchorage to Cape Romanzof LRRS.
- Equipment and personnel would return to Anchorage by air.
- LTM and cap inspections would occur annually for the first five years, then every five years thereafter, indefinitely.

- CERCLA five-year reviews would be required.

4.2.4 Alternative 4: Debris Removal, In Situ Soil Treatment, Capping, and Land-Use Controls

Table 4-5 summarizes the ability of Alternative 4 to satisfy the objectives established by NCP. The rationale for the values listed in Table 4-5 is presented in the following subsections.

Table 4-5
Evaluation of Alternative 4 (Debris Removal, In Situ Soil Treatment, Capping, and Land-Use Controls)

Evaluation Criteria	Value
Overall Protection of HHE	Pass
Compliance with ARARs	Pass
Long-Term Effectiveness and Permanence	4
Reduction in Toxicity, Mobility, and Volume Through Treatment	2
Short-Term Effectiveness	2
Implementability	3
Cost (in millions)	$1.08

Note:
For definitions, see the Acronyms and Abbreviations section.

Overall Protection of Human Health and the Environment

This alternative proposes leaving lead-contaminated soil in place with the addition of a chemical stabilizer to limit migration, and a soil cover to prevent direct contact. This alternative also proposes removing surficial munitions debris, which would limit exposure. If properly maintained, this alternative effectively protects HHE but does restrict excavation at the site. RAOs would be only be achieved by limiting access—and thus exposure—to the site.

4.2.4.1 Compliance with ARARs

This alternative would comply with all chemical-, location-, and action-specific ARARs. It would achieve chemical-specific ARARs at the site by limiting exposure to lead-contaminated soils. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable possible alternative.

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative is dependent on maintenance of the permeable cap and LUCs, as well as the effectiveness of the treatment, which is based on a similar application at Driftwood Bay Radio Relay Station (USAF 2010). The soil cover may require periodic maintenance. Contamination at concentrations above the RAOs would remain onsite for more than five years, so CERCLA five-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Only Alternative 4 satisfies the statutory preference for a reduction in toxicity, mobility, and volume through treatment. Under Alternative 4, a chemical stabilizer would be applied to limit the mobility and leachability of residual lead contamination in soil. The lead would remain in the soil, though it will be less available and thus less hazardous. Reduction in toxicity would be confirmed with post-treatment analytical laboratory testing.

Short-Term Effectiveness

This alternative would be moderately protective of the community and site workers during the remedial action. Because of surface contamination, the possibility of short-term exposure risk to workers associated with construction of the cap exists. Short-term risk associated with cap maintenance may also present an exposure concern for future site workers. Natural processes would not reduce lead to concentrations below the RAOs. This alternative poses greater risk of exposure or potential release through the long and complex transportation chain from the Cape Romanzof LRRS to an appropriately permitted TSDF in the contiguous United States (Section 3.1.4). An increased volume of fossil fuels will be needed and released into the environment as a result of both the heavy machinery to construct the cap and the airplane/vehicles necessary for transportation offsite.

Implementability

Implementation of this alternative provides a moderate challenge. The greatest complexity is in the logistics of mobilizing the necessary equipment and chemical stabilizer to the site. Chemical stabilizer is generally applied at a rate of 2.5 percent by weight. For SR018, approximately 0.3 tons of stabilizer would be required to be placed on the berm.

Because SR018 is within a wetland and this alternative includes adding fill to a wetland, coordination with USACE—and potentially permitting—will need to be conducted. BMPs, such as silt fences and polyethylene plastic sheeting, should also be utilized to limit damage to surrounding wetlands.

Mobilization of personnel, supplies, and equipment to the site would require transportation via air transport (likely from Anchorage). Once flown to Cape Romanzof LRRS, equipment would need to be transported along an unmaintained road. Demobilization of personnel and surplus supplies would be handled similarly to mobilization. Surficial debris would be flown from Cape Romanzof LRRS to Anchorage and then barged to a TSDF in Washington. It is estimated that this action, including offload of equipment and mobilization to the site from the airstrip, could be performed in 1.7 weeks. Administrative approval should be possible, though more challenging because lead-contaminated soil remains onsite.

Cost

Cost estimates for this alternative are based on the assumption that 8.3 cy (12.5 tons) of soil would require chemical stabilization and a 10-foot by 15-foot soil cover. This alternative would cost approximately $1,075,127 to implement (Appendix B). Costs include the removal and disposal of surficial debris, application of chemical stabilizer, onsite disposal by addition of a 2-foot soil cover, and maintenance of LUCs at the site. The costs for this alternative have been developed based on the following assumptions:

- This alternative would require an estimated 1.7 weeks of onsite work to mobilize, clear the berm, remove surficial debris, apply chemical stabilizer, collect pre- and post-treatment samples, and install 2 feet of soil cover over the volume of contaminated soil located at SR018.

- Surficial debris would be hand-shoveled and loaded into a 1-cy Super Sack, holding approximately 1/2 ton. The Super Sack would be placed on a flatbed for transport to the airstrip.
- The Super Sack staged at the airstrip would be placed on a chartered plane for transport to Anchorage.
- Stabilizer, equipment, and personnel would be air-transported to the site from Anchorage.
- Equipment and personnel would return to Anchorage by air.
- LTM and cap inspections would occur annually for the first five years, then every five years thereafter, indefinitely.
- CERCLA five-year reviews would be required.

4.2.5 Alternative 5: Removal and Offsite Disposal

Table 4-6 summarizes the ability of Alternative 5 to satisfy the objectives established by NCP. The rationale for the values listed in Table 4-6 is presented in the following subsections.

Table 4-6
Evaluation of Alternative 5 (Removal and Offsite Disposal)

Evaluation Criteria	Value
Overall Protection of HHE	Pass
Compliance with ARARs	Pass
Long-Term Effectiveness and Permanence	5
Reduction in Toxicity, Mobility, and Volume through Treatment	0
Short-Term Effectiveness	2
Implementability	3
Cost (in millions)	$0.92

Note:
For definitions, see the Acronyms and Abbreviations section.

Overall Protection of Human Health and the Environment

This alternative proposes to remove lead-contaminated soil from the facility, effectively protecting HHE. RAOs would be achieved at project completion.

Compliance with ARARs

Alternative 5 could be implemented in a manner that complies with all chemical-, location-, and action-specific ARARs (Appendix A).

This alternative would achieve chemical-specific ARARs for the lead-contaminated soils at the site by removing any soils with concentrations greater than the RAOs, as well as by removing munitions debris. This alternative would be implemented with appropriate controls to comply with any location-specific and/or action-specific ARARs. Therefore, this alternative would meet this threshold criterion and would be an acceptable possible alternative.

Long-Term Effectiveness and Permanence

This alternative has the potential to be highly effective for addressing site contamination. Lead-contaminated soil would be removed from the site for a high degree of long-term effectiveness. Removal would be confirmed with analytical laboratory testing.

Reduction of Toxicity, Mobility, or Volume Through Treatment

No lead-contaminated soil in excess of RAOs would remain at the site, but the excavated soil would not be treated. Instead, excavated soil and munitions debris would be sent to a TSDF (RCRA-regulated, when necessary) for ultimate disposition. This alternative would not satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

Removal of lead-contaminated soil would be highly effective in a short time. The removal of contaminated soil will be conducted by hand-shoveling, which would mitigate any negative environmental impacts. Because much of the site has previously been developed, anticipated impacts are not considered significant. The estimated two round trips between the Lower Camp and the airstrip required to implement this alternative pose a moderate risk to workers due to dangers associated with the road condition between the Lower Camp and the airstrip at the Cape Romanzof LRRS. Soil removal and containerization would expose site workers to the contamination, as well as to hazards associated with shoveling. These hazards would be addressed by instituting Occupational Safety and Health Administration/Hazardous Waste Operations and Emergency Response requirements. This alternative poses greater risk of exposure or potential release through the long and complex transportation chain from the Cape Romanzof LRRS to an appropriately permitted TSDF in the contiguous United States (Section 3.1.5). An increased volume of fossil fuels will be needed and released into the environment as a result of the heavy machinery to backfill the excavation and load Super Sacks, as well as the airplane/vehicles for transportation offsite.

Implementability

Implementation of this alternative would be logistically challenging. Equipment and personnel are not readily available in the area; therefore, mobilization to the installation would be required. Mobilization of equipment, supplies, and personnel could be achieved through air transport to the Cape Romanzof LRRS. All would require transport along an unmaintained road.

Because SR018 is within a wetland and this alternative includes dredging and filling of a wetland, coordination with USACE—and potentially permitting—will need to be conducted. BMPs, such as silt fences and polyethylene plastic sheeting, should also be utilized to limit damage to surrounding wetlands.

Demobilization of equipment, personnel, and surplus supplies would be handled similarly to mobilization. Contaminated soil would be flown from Cape Romanzof LRRS to Anchorage and then barged to the TSDF(s) in Washington. Care would be taken to avoid spreading contamination during excavation and containerization activities. No additional activities would be required for lead-contaminated soil if this alternative were implemented. Administrative approval should be easily attained.

Cost

Cost estimates for this alternative were based on the assumption that 8.3 cy (10 cy with bulk factor), or 12.5 tons, of soil would require excavation and offsite disposal. This alternative would cost approximately $917,871 to implement (Appendix B). Costs include shoveling, containerization, shipment, and disposal of lead-contaminated soil. The costs for this alternative have been developed based on the following assumptions:

- This alternative would require an estimated two weeks of onsite work to establish work areas, address the total volume of contaminated soil located at the site, collect post-excavation samples, and wait for sample results.
- Equipment and personnel would be air-transported to the site from Anchorage.
- Soil would be hand-shoveled and loaded into 1-cy Super Sacks, each holding approximately 1/2 ton. Five Super Sacks would be placed on a flatbed for transport to the airstrip.
- Approximately two trips between the Lower Camp and the airstrip would be made to transfer lead-contaminated soil (12.5 tons, maximum 7.5 tons per outgoing trip).
- Super Sacks staged at the airstrip would be placed on a chartered plane for transport to Anchorage.
- Approximately 1/3 of the soil generated during excavation will be considered RCRA hazardous waste and would be handled accordingly.
- Equipment and personnel would return to Anchorage by air.

4.3 ASSUMPTIONS AND LIMITATIONS

The following is a list of assumptions and limitations used during development of the cost analysis for each alternative (Appendix B):

- All personnel, supplies, and equipment will mobilize to Cape Romanzof LRRS via air transport (Alternatives 2, 3, 4, and 5).
- Cargo loads on the incoming flights must weigh less than 40,500 pounds and departures can carry only 25,000 pounds (Alternatives 3, 4, and 5).
- Soil excavation will be performed by hand using laborers and shovels (Alternative 5).
- Super Sacks with contaminated soil and/or debris will be flown out of Cape Romanzof LRRS during demobilization (Alternatives 4 and 5).
- All personnel will stay at the Cape Romanzof LRRS facility (Alternatives 2, 3, 4, and 5).

- No road maintenance or improvements will occur (Alternatives 2, 3, 4, and 5).
- A local borrow pit will be available for source material for cap and excavation backfill (Alternatives 3, 4, and 5).
- Coordination with USACE for approval of dredging and/or filling of a wetland will be conducted (Alternatives 3, 4, and 5).
- The occurrence of LTM and cap inspections will follow the precedence set by the selected remedies at other IRP sites at Cape Romanzof LRRS (USAF 2012); inspections will occur no less often than once every five years, along with a CERCLA five-year review (Alternatives 2, 3, and 4).

4.4 COMPARISON OF REMEDIAL ALTERNATIVES FOR SR018

Table 4-7 summarizes the five alternatives that received detailed analysis according to their ability to comply with NCP criteria.

4.4.1 Threshold Criteria

Alternative 1 fails to comply with the threshold criteria. Because this alternative lacks both LUCs and active treatment, humans could be exposed to lead at concentrations above the ADEC Method Two cleanup level. The remaining alternatives are protective of HHE and could be implemented in a manner that complies with all chemical-, location-, and action-specific ARARs.

Because Alternative 1 fails to attain the threshold criteria, it will not be considered further.

Table 4-7
Comparison of Alternatives for SR018

Evaluation Criteria	Alternative 1: No Action	Alternative 2: LUCs and LTM	Alternative 3: Capping, LUCs, and LTM	Alternative 4: Debris Removal, In Situ Soil Treatment, Capping and LUCs	Alternative 5: Removal and Offsite Disposal
Overall protection of HHE	Fail	Pass	Pass	Pass	Pass
Compliance with ARARs	Fail	Pass	Pass	Pass	Pass
Long-term effectiveness and permanence	0	2	3	4	5
Reduction in toxicity, mobility, and volume through treatment	0	0	0	2	0
Short-term effectiveness	0	2	2	2	2
Implementability	5	4	4	3	3
Cost (in millions)	$0	$0.32	$0.89	$1.08	$0.92

Note:
For definitions, see the Acronyms and Abbreviations section.

4.4.2 Primary Balancing Criteria

Alternatives 2 through 5 would be effective. Alternatives 2, 3, and 4 would require extra costs due to the maintenance of LUCs indefinitely. In contrast, Alternative 5 would not require any LUCs or LTM and has a lower cost than Alternative 4; however, Alternative 5 results in greater greenhouse gas emissions relative to the other alternatives due to additional mobilization and demobilization flights. Only Alternative 4 satisfies the statutory preference for a reduction in toxicity, mobility, and volume through treatment. Under Alternative 4, a chemical stabilizer would be applied to limit the mobility and leachability of residual lead contamination in soil. The lead would remain in the soil, though it would become less available and thus be less hazardous. Alternatives 4 and 5 are most effective but have higher difficulties in implementability and cost. Alternative 2 is the easiest to implement but does not significantly lower risk compared to Alternatives 3, 4, and 5.

5.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2014 (October). *Oil and Other Hazardous Pollution Control Regulations – Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances*. Title 18 Alaska Administrative Code, Section 75.

ADEC. 2011 (February). *Site Closure Policy and Procedures* Appendix A

ATSDR (Agency for Toxic Substances and Disease Registry). 2007 (August). *Toxicological Profile for Lead*.

ATSDR. 1992 (September). *Toxicological Profile for Antimony and Compounds*.

EPA (U.S. Environmental Protection Agency). 2005 (December). *Reference Guide to Non-Combustion Technologies for Remediation of Persistent Organic Pollutants in Stockpiles and Soil*. EPA-542-R-05-006.

EPA. 2001 (January). Lead-Safe Yards: Developing and Implementing a Monitoring, Assessment, and Outreach Program for Your Community. EPA/625/R-00/012

EPA. 2000 (July). *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. EPA 540-R-00-002.

EPA. 1992 (May). *Vitrification Technologies for Treatment of Hazardous and Radioactive Waste. Handbook*. EPA/625/R-92/002.

EPA. 1991 (April). *Treatment of Lead-Contaminated Soils*. EPA/540/2-91/009.

EPA. 1988 (October). *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. EPA/540/G-89/004.

EPA. 1987 (July). *Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements.* OSWER Directive 9234.0-05.

FRTR (Federal Remedial Technologies Roundtable). 2008 (September). Treatment Technologies Screening Matrix. http://www.frtr.gov/matrix2/top_page.html.

ITRC (Interstate Technology and Regulatory Council). 2011 (March). *Project Risk Management for Site Remediation*.

USACE (U.S. Army Corps of Engineers). 2013 (October). *Cape Romanzof Long Range Radar Site Comprehensive Site Evaluation Phase I/II*. Prepared for USAF Pacific Air Forces and 611th CES. Prepared by HDR Environmental.

USAF (U.S. Air Force). 2012 (December). *Land Use Control Management Plan 2012: 611th Air Support Group Installations*. Joint Base Elmendorf-Richardson. Environmental Restoration Program.

USAF. 2010 (October). *Findings of the Data Gap Sample Collection at LF006, Driftwood Bay RRS*. Prepared by Jacobs Engineering Group Inc.

APPENDIX A

Applicable or Relevant and Appropriate Requirements

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS SITE SR018 CAPE ROMANZOF LRRS, ALASKA

This appendix reviews potential Applicable or Relevant and Appropriate Requirements (ARAR) for SR018 at the Cape Romanzof Long-Range Radar Site (LRRS), Alaska. Under the Comprehensive Environmental Response, Compensation, and Liability Act, three types of ARARs are considered:

- Chemical-specific
- Location-specific
- Action-specific

Each ARAR has been assessed based on its applicability to the site, and categorized as applicable or relevant and appropriate. Table A-1 presents chemical-specific ARARs. These standards have been used to select cleanup levels appropriate to the site. Table A-2 presents location-specific ARARs and Table A-3 presents action-specific ARARs.

ACRONYMS AND ABBREVIATIONS

A	applicable
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirement
CFR	code of federal regulations
LRRS	long-range radar site
mg/kg	milligrams per kilogram
RA	relevant and appropriate
RCRA	Resource Conservation and Recovery Act
RSL	regional screening level
TBC	to be considered
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

CHEMICAL-SPECIFIC ARARS

Chemical-specific ARARs provide numerical cleanup values that establish acceptable contaminant concentrations that may remain following a remedial response (Table A-1). The Alaska Administrative Code (AAC), Title 18, Chapter 75, Article 3, *Oil and Hazardous Substances Pollution Control Regulations - Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances*, Method Two soil cleanup criteria (18 AAC 75.341[c] and [d]) – Tables B1 and B2) establish the applicable chemical-specific soil cleanup values (ADEC 2014). The regulation tabulates soil cleanup criteria for lead and antimony. The standards applicable at the Cape Romanzof LRRS are for sites located in a non-arctic zone with annual precipitation of less than or equal to 40 inches.

Human exposure can occur directly (by direct contact, ingestion, or inhalation) or indirectly (via migration from contaminated soil to groundwater). Different cleanup criteria are presented for each of these exposure routes: direct contact or ingestion, inhalation, and migration to groundwater. Depth to groundwater at the Lower Camp ranges from 0 to 60 feet below ground surface (USACE 2013); therefore, migration to groundwater is a potentially complete pathway and could act as a transport mechanism for site contaminants.

Table A-1
Chemical-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
RCRA of 1976 as amended by the hazardous and solid waste amendments of 1984, Subtitles C and D, other than corrective action requirements (U.S. Code, Title 42, Section 6901 [42 USC 6901])	Establishes protections and protocols for the creation and recycling of waste including cradle to grave manifesting.	A	Excavated materials designated as waste (e.g., contaminated soils) are subject to the requirements of RCRA.
Toxic Substances Control Act, Section 403 (Code of Federal Regulations, Title 40, Section 761 [40 CFR 761])	Regulates storage and disposal requirements, including onsite storage limitations for lead wastes. Specifies notification and recordkeeping requirements for lead disposal.	A	Concentrations of lead greater than 1,200 mg/kg (the residential threshold) exist at SR018. The maximum detected concentration of lead was 2,400 mg/kg (surface soil sample C-LS-CR-04-SS-107).
Alaska Oil and Other Hazardous Substance Pollution Control regulations (18 Alaska Administrative Code [AAC] 75)	Governs discharge of oil and hazardous substances and state cleanup requirements. Also establishes soil cleanup levels.	A	Cleanup levels for soil (18 AAC 75.340-341); methods for determination and application of cleanup levels. The site is known to be affected by a release of metals constituents. Alternative soil cleanup levels may be applied.
U.S. Environmental Protection Agency Regional Screening Levels for Chemical Contaminants at Superfund Sites (20 CFR 141.61)	RSLs for residential soil.	TBC	Used as a more conservative guideline for delineating potential antimony contamination.

Note:
For definitions, see the Acronyms and Abbreviations section.

LOCATION-SPECIFIC ARARS

Location-specific ARARs are restrictions developed on the conduct of activities at specific locations (Table A-2). These ARARs may restrict or preclude certain remedial actions, or they may apply only to certain portions of an installation. Location-specific factors that may require the identification of ARARs include sensitive habitats, floodplains, wetlands, endangered species habitat, fault locations, and historic or archeological resources.

Table A-2
Location-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
Bald and Golden Eagle Protection Act (16 USC 668-668c) Migratory Bird Act of 1972 (50 CFR Title Sections 10, 20 and 21)	Protects bald and golden eagles/habitat in the area and provides for permitted activities.	TBC	Bald or golden eagles have not been identified in the project area, but the possibility for their presence exists.
Protection of Fish and Game (AS 16.05.870; 5 AAC 95.010)	Provides for Alaska Department of Fish & Game consultation on actions affecting fish and wildlife	RA	Considered for possible impacts to wildlife at Cape Romanzof LRRS.
Fish and Wildlife Coordination Act (16 USC 661)	Provides for USFWS consultation on actions affecting fish and wildlife	TBC	Considered for possible impacts to wildlife at Cape Romanzof LRRS.
Migratory Bird Treaty Act (37 Stat. 878, Ch. 45; 16 USC 703-712 (§709 has been omitted); 50 CFR Parts 10, 20, 21)	Prohibits taking or possession of any migratory bird listed, including parts, nests, or products.	A	Considered for possible impacts to birds at Cape Romanzof LRRS.
Clean Water Act – Section 404 (33 USC 1344; 40 CFR 230: Section 404(b)(1))	Establishes a program to regulate the discharge or dredged and fill material into waters of the United States, including wetlands.	A	Considered for possible impacts to wetlands at Cape Romanzof LRRS. According to the NWI Wetlands Mapper, SR018 is within a freshwater emergent/scrub-shrub wetland. Several wetland areas are also located along the road from Lower Camp to the airstrip.
Alaska Solid Waste Management Regulations (18 AAC 60)	Lists the requirements for location standards of storage of solid wastes.	RA	Applicable if excavation options require solid waste storage locations onsite.

Note:
For definitions, see the Acronyms and Abbreviations section.

ACTION-SPECIFIC ARARS

Action-specific ARARs are requirements that apply to specific investigative or remedial actions (Table A-3). Action-specific requirements do not in themselves determine remedial alternatives; they indicate how a selected alternative must be achieved. Action-specific ARARs are refined during remedial design as specific information becomes available.

Table A-3
Action-Specific Applicable or Relevant and Appropriate Requirements

Regulation	Description	A or RA	Rationale
Alaska Spill Reporting and Notification (18 AAC 75)	Alaska Department of Environmental Conservation (ADEC) has authority for specifying sampling and analysis of soil, surface water, and groundwater resulting from the discharge of oil or a hazardous substance. ADEC has authority for specifying soil, surface water, and groundwater cleanup levels resulting from the discharge of oil or a hazardous substance. ADEC has authority for specifying institutional controls for residual soil, surface water, and groundwater left in excess of cleanup levels resulting from a discharge of oil or a hazardous substance.	A	18 AAC 75.355 lists requirements for sampling and analysis. 18 AAC 75.360 lists requirements for cleanup work plans. 18 AAC 75.375 lists requirements for institutional controls.
Alaska Air Quality Control Regulations (18 AAC 50, 15) and Clean Air Act (40 CFR 230, 33 CFR 320-330)	Regulations governing identification, prevention, abatement, and control of air pollution.	A	Cleanup methods will require the use of heavy machinery and trucks for transporting soil.
U.S. Department of Transportation Regulations (49 CFR 170-199; 40 CFR 263) Alaska Hazardous Waste Regulations (18 AAC 62)	Governs the packaging, marking, labeling, recordkeeping, transportation, and transporters of hazardous materials.	A	Monitoring and/or confirmation samples and potential waste are transported from the project area.
Solid Waste Management Regulations (40 CFR 257, 40 CFR 264, 49 CFR 265, 40 CFR 266, 40 CFR268, 40 CFR 270, 40 CFR 261, 40 CFR 262) Alaska Solid Waste Management Regulations (18 AAC 60)	Governs the management and transport of solid wastes generated during remedial activity. Specifies restrictions on land disposal of specific types of hazardous waste based on levels achievable by current technology.	A	Excavated soils and monitoring samples may be generated from the project area. Remedial alternatives may create contaminated media to be removed from the site. 18 AAC 60.010 lists requirements for accumulation, storage, and treatment of solid wastes. 18 AAC 60.015 lists requirements for transport of solid wastes.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Closure and Post-Closure 40 CFR 264.111 and 117	Closure performance standard and care requirements; maintenance and monitoring of waste containment systems.	RA	May be applicable if a containment alternative is selected for SR018.

Note: For definitions, see the Acronyms and Abbreviations section.

APPENDIX B

Cost Estimates

Cape Romanzof Long-Range Radar Site
Feasibility Study Cost Analysis Summary Table

Alternative	Alternative Description	Estimated Contaminated Soil Quantity Removed Offsite (CY)	Estimated Duration of Remedial Action Activities Onsite (Days)	Estimated Present Worth Cost for Alternative (+50% / -30%)
Alternative 1	No Action	0	0	$0
Alternative 2	Land-Use Controls (LUC) would be implemented to restrict invasive activities and protect human health and the environment (HHE) from exposure to lead contamination in soil above the Alaska Department of Environmental Conservation (ADEC) Method Two cleanup level (400 milligrams per kilogram [mg/kg]). Long-term monitoring (LTM) to ensure protectiveness and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Reviews would be required to evaluate the long-term protectiveness of the remedy.	0	0	$320,804
Alternative 3	Munitions debris at the site and soil contaminated with lead greater than 400 mg/kg would be capped with a minimum 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contamination in soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.	0	5	$886,257
Alternative 4	Surficial munitions debris would be removed and disposed of offsite. Soil to an 18-inch depth containing lead above 400 mg/kg would be treated with a chemical stabilization product to prevent leaching and limit migration. The treated soil would then be covered with a 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contaminated soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.	0	12	$1,075,127
Alternative 5	All munitions debris and lead-contaminated soil over 400 mg/kg would be excavated, segregated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle C- or D-permitted chemical waste landfill. It is anticipated that excavation activities will focus on surface soil to an 18-inch depth. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA Five-Year Reviews would not be required with this alternative.	10	13	$917,873

Notes:

Costs are based on subcontractor quotes, remedial investigation figures, and engineering estimates

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 2

Land-Use Controls (LUC) would be implemented to restrict invasive activities and protect human health and the environment (HHE) from exposure to lead contamination in soil above the Alaska Department of Environmental Conservation (ADEC) Method Two cleanup level (400 milligrams per kilogram [mg/kg]). Long-term monitoring (LTM) to ensure protectiveness and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
CAPITAL COSTS						
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 51.67	0	$ -
	Field Labor	Project Manager	HR	$ 201.37	0	$ -
		Site Manager / SSHO	HR	$ 114.49	0	$ -
		Project Engineer / CQC	HR	$ 102.37	0	$ -
		Lead Sampler	HR	$ 102.37	0	$ -
		Field Sampler	HR	$ 102.37	0	$ -
Excavation						
	Mobilization	Mobilization (see tab)	LS	$ 18,905	0	$ -
		Supervising for Safety	LS	$ 9,227	0	$ -
	Subcontractor	Site Superintendent	ST	$ 64.26	0	$ -
			OT	$ 80.13	0	$ -
		Operator (3 ea)	ST	$ 59.63	0	$ -
			OT	$ 74.36	0	$ -
		Laborer 1 (2 ea)	ST	$ 51.57	0	$ -
			OT	$ 64.31	0	$ -
	Additional Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 262.14	0	$ -
		Loader w/blade and forks 25,000 lb class	WK	$ 1,840.00	0	$ -
		Flat bed truck	WK	$ 1,055.12	0	$ -
		Crew Truck (2 ea)	MO	$ 3,780.00	0	$ -
		5 CY End Dump Truck	DY	$ 950.00	0	$ -
		Misc. Tools and Materials	LS	$ 500.00	0	$ -
		PID	WK	$ 132.00	0	$ -
		GPS/RTK	WK	$ 1,200.62	0	$ -
	Clear and Grub	Clearing and Grubbing	SF	$ 2	0	$ -
	Per Diem	ARS FY14 Costs	DY	$ 208.00	0	$ -
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ -
		Subcontractor Fee	%	10%	1	$ -
Materials						
	Non-Consumables	Fencing	EA	$ 768.00	0	$ -
	Consumables	PPE	MD	$ 50.33	0	$ -
		Fuel	GAL	$ 9.11	0	$ -
		Super Sak	EA	$ 25.62	0	$ -
Land Use Controls and Five-Year Reviews						
	Details provided in LUCs sheet (Present Worth Cost)					$ 181,482
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ -
Laboratory						
	Analytical	See Analytical Tab				$ -
				Subtotal		$ 181,482
Project Management			%	10%		$ 18,148
Contractor Fee			%	10%		$ 18,148
SUBTOTAL, CAPITAL COSTS						$ 217,778
				10% Estimating Contingency		$ 21,778

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 2

Land-Use Controls (LUC) would be implemented to restrict invasive activities and protect human health and the environment (HHE) from exposure to lead contamination in soil above the Alaska Department of Environmental Conservation (ADEC) Method Two cleanup level (400 milligrams per kilogram [mg/kg]). Long-term monitoring (LTM) to ensure protectiveness and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
TOTAL ESTIMATED CAPITAL COSTS						**$ 239,556**
ANNUAL COSTS						
Inspection (Conducted once every five years during Five-Year Review over 30 years)						
	Site Inspection					
		Planning and Procurements	HR	$ 72	20	$ 1,437
		Mobilization Costs	TRIP	$ 19,737	1	$ 19,737
		Site Visit	HR	$ 114	40	$ 4,580
		Documentation	HR	$ 72	20	$ 1,437
		Project Management	HR	$ 201	10	$ 2,014
TOTAL ESTIMATED ANNUAL COSTS						**$29,205**

Alternative 2 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 239,556
Total Estimated Annual Costs	$29,205
Present Worth of Annual Costs, 5% Rate of Return	$81,248
Total Capital Cost with Present Worth Annual Costs	**$ 320,804**

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 3

Munitions debris at the site and soil contaminated with lead greater than 400 mg/kg would be capped with a minimum 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contamination in soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 51.67	5	$ 258
	Field Labor	Project Manager	HR	$ 201.37	60	$ 12,082
		Site Manager / SSHO	HR	$ 114.49	60	$ 6,869
		Project Engineer / CQC	HR	$ 102.37	60	$ 6,142
		Lead Sampler	HR	$ 102.37	0	$ -
		Field Sampler	HR	$ 102.37	0	$ -
Excavation						
	Mobilization	Mobilization (see tab)	LS	$ 232,411	1	$ 232,411
		Supervising for Safety	LS	$ 9,227	1	$ 9,227
	Subcontractor	Site Superintendent	ST	$ 64.26	40	$ 2,570
			OT	$ 80.13	10	$ 801
		Operator	ST	$ 59.63	40	$ 2,385
			OT	$ 74.36	10	$ 744
		Laborer 1	ST	$ 51.57	40	$ 2,063
			OT	$ 64.31	20	$ 1,286
		Driver 1	ST	$ 55.38	40	$ 2,215
			OT	$ 69.06	20	$ 1,381
	Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 259.50	0	$ -
		Skid Steer Loader (Track)	WK	$ 1,067.00	1	$ 889
		Dozer Blade	WK	$ 470.00	1	$ 392
		Crew Truck (2 ea)	MO	$ 3,780.00	1	$ 3,780
		5 CY End Dump Truck	WK	$ 2,475.00	1	$ 2,063
		Misc. Tools and Materials	LS	$ 500.00	1	$ 500
		GPS/RTK	WK	$ 1,172.48	1	$ 977
	Clear and Grub	Clearing and Grubbing	SF	$ 2	300	$ 600
	Per Diem	ARS FY14 Costs	DY	$ 208.00	30	$ 6,240
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ 3,397
		Subcontractor Fee	%	10%	1	$ 2,265
Permeable Cap (2 ft Soil Cover)						
	Backfill material		CY	$ 30	14	$ 411
Materials						
	Non-Consumables	Fencing	EA	$ 778.50	1	$ 779
	Consumables	PPE	MD	$ 50.33	12	$ 604
		Fuel	GAL	$ 9.11	450	$ 4,099
		Super sak	EA	$ 25.62	0	$ -
Land Use Controls and Five-Year Reviews						
	Details provided in LUCs sheet (Present Worth Cost)					$ 181,482
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ -
Laboratory						
	Analytical	See Analytical tab				$ -
				Subtotal		$ 488,912
Planning, Permitting, Design, Work Plans, Project Management			%	20%		$ 97,782
Contractor Fee			%	10%		$ 48,891

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 3

Munitions debris at the site and soil contaminated with lead greater than 400 mg/kg would be capped with a minimum 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contamination in soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
SUBTOTAL, CAPITAL COSTS						$ 635,586
				10% Estimating Contingency		$ 63,559
TOTAL ESTIMATED CAPITAL COSTS						**$ 699,144**
ANNUAL COSTS						
Cap Inspection (Once a year for first five years, every 5 years thereafter for next 25 years)						
	Site Inspection					
		Planning and Procurements	HR	$ 72	20	$ 1,437
		Mobilization Costs	TRIP	$ 19,737	1	$ 19,737
		Site Visit	HR	$ 114	40	$ 4,580
		Documentation	HR	$ 72	20	$ 1,437
		Project Management	HR	$ 201	10	$ 2,014
Cap Maintenance (over 30 years)						
	Mobilization, Labor and Materials					$150
TOTAL ESTIMATED ANNUAL COSTS						**$29,355**

Alternative 3 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 699,144
Total Estimated Annual Costs	$29,355
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$187,113
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 886,257**

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 4

Surficial munitions debris would be removed and disposed of offsite. Soil to an 18-inch depth containing lead above 400 mg/kg would be treated with a chemical stabilization product to prevent leaching and limit migration. The treated soil would then be covered with a 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contaminated soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 51.67	12	$ 620
	Field Labor	Project Manager	HR	$ 201.37	144	$ 28,997
		Site Manager / SSHO	HR	$ 114.49	144	$ 16,487
		Project Engineer / CQC	HR	$ 102.37	144	$ 14,741
		Lead Sampler	HR	$ 102.37	0	$ -
		Field Sampler	HR	$ 102.37	0	$ -
Excavation						
	Mobilization/Planning	Mobilization (see tab)	LS	$ 285,764	1	$ 285,764
		Supervising for Safety	LS	$ 9,227	1	$ 9,227
	Subcontractor	Site Superintendent	ST	$ 64.26	96	$ 6,169
			OT	$ 80.13	24	$ 1,923
		Operator (1 ea)	ST	$ 59.63	96	$ 5,724
			OT	$ 74.36	24	$ 1,785
		Laborer 1 (1ea)	ST	$ 51.57	96	$ 4,951
			OT	$ 64.31	48	$ 3,087
		Driver 1	ST	$ 55.38	40	$ 2,215
			OT	$ 69.06	20	$ 1,381
	Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 259.50	0	$ -
		Skid Steer Loader (Track)	WK	$ 1,067.00	2	$ 2,134
		Dozer Blade	WK	$ 470.00	2	$ 940
		Loader 2500lb class	WK	$ 1,840.00	1	$ 1,840
		Crew Truck (2 ea)	MO	$ 3,780.00	1	$ 3,780
		5 CY End Dump Truck	WK	$ 2,475.00	1	$ 2,063
		Misc. Tools and Materials	LS	$ 1,000.00	1	$ 1,000
		GPS/RTK	WK	$ 1,172.48	2	$ 2,345
	Clear and Grub	Clearing and Grubbing	SF	$ 2	300	$ 600
	Per Diem	ARS FY14 Costs	DY	$ 208.00	72	$ 14,976
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ 6,290
		Subcontractor Fee	%	10%	1	$ 4,194
Permeable Cap (2 ft Soil Cover)						
	Backfill material		CY	$ 30	14	$ 411
Materials						
	Non-Consumables	Fencing	EA	$ 778.50	1	$ 779
	Consumables	PPE	MD	$ 50.33	29	$ 1,449
		Fuel	GAL	$ 9.11	720	$ 6,558
		Super sak	EA	$ 25.62	1	$ 26
		Hydroxyapatite Stabilizer	TON	$ 2,875	0.4	$ 1,110
Land Use Controls and Five-Year Reviews						
	Details provided in LUCs sheet (Present Worth Cost)					$ 181,482
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ 3,941
Laboratory						
	Analytical	See Analytical tab				$ 2,000
				Subtotal		$ 620,989

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 4

Surficial munitions debris would be removed and disposed of offsite. Soil to an 18-inch depth containing lead above 400 mg/kg would be treated with a chemical stabilization product to prevent leaching and limit migration. The treated soil would then be covered with a 2-foot soil cap. LUCs would be implemented to restrict invasive activities and protect HHE from exposure to lead contaminated soil over the cleanup level. LTM would be implemented to ensure the integrity of the cap and CERCLA Five-Year reviews would be required to evaluate the long-term protectiveness of the remedy.

Task	Category	Item	Unit	Unit Cost	QTY	Cost
Planning, Permitting, Design, Work Plans, Project Management			%	20%		$ 124,198
Contractor Fee			%	10%		$ 62,099
SUBTOTAL, CAPITAL COSTS						$ 807,286
				10% Estimating Contingency		$ 80,729
TOTAL ESTIMATED CAPITAL COSTS						**$ 888,014**
ANNUAL COSTS						
Cap Inspection (Once a year for first five years, every 5 years thereafter for next 25 years)						
	Site Inspection					
		Planning and Procurements	HR	$ 72	20	$ 1,437
		Mobilization Costs	TRIP	$ 19,737	1	$ 19,737
		Site Visit	HR	$ 114	40	$ 4,580
		Documentation	HR	$ 72	20	$ 1,437
		Project Management	HR	$ 201	10	$ 2,014
Cap Maintenance (over 30 years)						
	Mobilization, Labor and Materials					$150
TOTAL ESTIMATED ANNUAL COSTS						**$29,355**

Alternative 4 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 888,014
Total Estimated Annual Costs	$29,355
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$187,113
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 1,075,127**

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 5

All munitions debris and lead-contaminated soil over 400 mg/kg would be excavated, segregated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle C- or D-permitted chemical waste landfill. It is anticipated that excavation activities will focus on surface soil to an 18-inch depth. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA Five-Year Reviews would not be required with this alternative.

Tas	Category	Item	Unit	Unit Cost	QTY	Cost
All Tasks						
	Office/Offsite Labor	Administrator	HR	$ 51.67	13	$ 672
	Field Labor	Project Manager	HR	$ 201.37	156	$ 31,414
		Site Manager / SSHO	HR	$ 114.49	156	$ 17,860
		Project Engineer / CQC	HR	$ 102.37	156	$ 15,970
		Lead Sampler	HR	$ 102.37	0	$ -
		Field Sampler	HR	$ 102.37	0	$ -
Excavation						
	Mobilization/Planning	Mobilization (see tab)	LS	$ 445,870	1	$ 445,870
		Supervising for Safety	LS	$ 9,227	1	$ 9,227
	Subcontractor	Site Superintendent	ST	$ 64.26	104	$ 6,683
			OT	$ 80.13	26	$ 2,083
		Operator (1 ea)	ST	$ 59.63	104	$ 6,202
			OT	$ 74.36	26	$ 1,933
		Laborer 1 (2 ea)	ST	$ 51.57	208	$ 10,727
			OT	$ 64.31	52	$ 3,344
		Driver 1 (1 ea)	ST	$ 55.38	104	$ 5,760
			OT	$ 69.06	26	$ 1,796
	Equipment	Excavator, 30,000 lb class	WK	$ 1,725.00	0	$ -
		Excavator Frost Bucket	WK	$ 259.50	0	$ -
		Skid Steer Loader (Track)	WK	$ 1,067.00	2	$ 2,312
		Dozer Blade	WK	$ 470.00	2	$ 1,018
		Loader 2500lb class	WK	$ 1,840.00	2	$ 3,987
		Flat bed truck	WK	$ 1,055.12	2	$ 2,286
		Crew Truck (2 ea)	MO	$ 3,780.00	1	$ 3,780
		5 CY End Dump Truck	WK	$ 2,475.00	1	$ 2,681
		Misc. Tools and Materials	LS	$ 1,500.00	1	$ 1,500
		GPS/RTK	WK	$ 1,172.48	2	$ 2,540
	Clear and Grub	Clearing and Grubbing	SF	$ 2	300	$ 600
	Per Diem	ARS FY14 Costs	DY	$ 208.00	91	$ 18,928
	Additional Sub Costs	General and Administrative Expense	%	15%	1	$ 8,885
		Subcontractor Fee	%	10%	1	$ 5,923
Backfill						
	Backfill material		CY	$ 30	11	$ 319
Materials						
	Non-Consumables	Fencing	EA	$ 778.50	1	$ 779
	Consumables	PPE	MD	$ 50.33	31	$ 1,570
		Fuel	GAL	$ 9.11	1365	$ 12,433
		Super Saks	EA	$ 25.62	11	$ 282
Waste Disposal						
	Out-of-state disposal	See Disposal tab				$ 9,007
Laboratory						
	Analytical	See Analytical tab				$ 3,501

Cape Romanzof Long-Range Radar Site
Cost Analysis for Alternative 5

All munitions debris and lead-contaminated soil over 400 mg/kg would be excavated, segregated, containerized, and removed for offsite disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle C- or D-permitted chemical waste landfill. It is anticipated that excavation activities will focus on surface soil to an 18-inch depth. Under this alternative, the site would be restored for unlimited use/unrestricted exposure (UU/UE). CERCLA Five-Year Reviews would not be required with this alternative.

Tas	Category	Item	Unit	Unit Cost	QTY	Cost
				Subtotal		$ 641,870
Planning, Permitting, Design, Work Plans, Project Management			%	20%		$ 128,374
Contractor Fee			%	10%		$ 64,187
SUBTOTAL, CAPITAL COSTS						$ 834,430
				10% Estimating Contingency		$ 83,443
TOTAL ESTIMATED CAPITAL COSTS						**$ 917,873**
ANNUAL COSTS						
Annual Costs						**$0**
TOTAL ESTIMATED ANNUAL COSTS						**$0**

Alternative 5 Cost Summary (+50% / - 30%)	
Total Estimated Capital Costs	$ 917,873
Total Estimated Annual Costs	$0
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$0
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 917,873**

Cape Romanzof Long-Range Radar Site
Land-Use Controls and Five-Year Reviews

All Tasks		Units	Unit Cost	Qty	# of Resources	Cost
CAPITAL COSTS						
Office/Offsite Labor	Administrator	HR	$ 51.67	5	1	$ 258
Field Labor	Site Manager / SSHO	HR	$ 114.49	24	1	$ 2,748
Site Controls						
Planning		HR	$ 77.85	60	2	$ 9,342
Survey						
Mobilization		TRIP	$ 6,718	1	3	$ 20,153
Labor		HR	$ 114.49	20	2	$ 4,580
Documentation		HR	$ 77.85	80	2	$ 12,456
SUBTOTAL CAPITAL COSTS						**$ 49,537**
ANNUAL COSTS						
Five-Year Reviews (Conducted once every five years)						
Community Involvment and Notification		HR	$ 71.86	30	2	$ 4,312
Document Review		HR	$ 71.86	80	2	$ 11,498
Data Review and Analysis		HR	$ 71.86	40	1	$ 2,874
Interviews		HR	$ 71.86	20	2	$ 2,874
Protectiveness Determination		HR	$ 71.86	180	2	$ 25,870
SUBTOTAL ANNUAL COSTS						**$47,428**

ICs Cost Summary	
Subtotal Capital Costs	$ 49,537
Subtotal Annual Costs	$ 47,428
Present Worth of Annual Costs over 30 years, 5% Rate of Return	$ 131,945
Total Capital Cost with Present Worth Annual Costs Over 30 Years	**$ 181,482**

Duration Estimates

Alternative 2

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Backfill Vol. (cy)	Time to Fill Sacks (hours)	Backfill (hours)	Misc. Time (hours)	Grain-size Separation (hours)	Days	Work Hours	Number of Day Trips of Herc	Notes
0	0	0	0	0	0	0	0	0	0	

Alternative 3

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Backfill Vol. (cy)	Time to Fill Sacks (hours)	Backfill (hours)	Misc. Time (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Number of Day Trips of Herc	Notes
0	0	0	0	0	44	3	5	50	0	Capping assumed to be concurrent with soil hauling activities.

Alternative 4

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Backfill Vol. (cy)	Time to Remove Debris and Fill Sacks (hours)	Stabilizer and Standby (hours)	Misc. Time (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Number of Day Trips of Herc	Notes
0	1	0	10	60	44	3	12	120	1	Assume 10 hours, or one full day to remove debris and fill Super Sack. Need to wait one week following application of chemical stabilizer for confirmation of anlaytical results prior to construction of cap. Capping assumed to be concurrent with soil hauling activities. Surficial debris removal, no backfill required.

Alternative 5

Estimated Vol. Excavated For Offsite Disposal (cy)	# of Super Sacks	Backfill Vol. (cy)	Time to Fill Sacks (hours)	Backfill (hours)	Misc. Time Plus Standby (hours)	Construct 2-foot cap (hours)	Days	Work Hours	Number of Day Trips of Herc	Notes
10	11	11	11	2	111	0	13	130	2	Excavation by hand concurrent with filling Supersacks. Need to wait one week for confirmation of sample results prior to backfilling. Backfilling assumed to be concurrent with backfill hauling activities.

Assumptions

1. Assume 1-cy Super Sacks.
2. For Alternative 5, excavation to be performed by hand using laborors and shovels.
3. Hauling Sacks to airstrip is concurrent for entire duration of project (from time between filling sack to demobilization).
4. For Alternative 5, loader with forks will follow truck and unload at the airstrip.
5. No compactor required to achieve hard durable surface of backfill.
6. Road is accessible by trucks and no improvements to the access road is needed.
7. One trip per day for Herc to load from Cape Romanzof airstrip and unload Super Sacks.
8. Herc payload departing Cape Romanzof is 25,000 lbs.
9. Use a local borrow source material for cap and excavation backfill consisting of gravel and sand, gravel pit located within 1 mile of site.
10. One 5-cy dump truck for earthwork activities, and skid steer used load backfill material into dump truck and to place cap/backfill at site.
11. For Alternative 4 and 5, use crew trucks or dump truck to transport supersack and drums to airstrip.
12. Alternative 4 and 5 includes an additional week (approximatetly 60 hours) to wait for analytical results.

Misc. Additional Time (hours)	
Tailgate	2
Mobilization	12
Demobilization	12
Site Setup (inc camp)	12
Seeding	6
Ramp Const.	2
Moving around site	2
Bin Issues	3

Constants		
Backfill Round Trip	1	hours
Dump Truck Capacity	5	cy
Grain-size sep and backhaul	25	cy/hr
Time to fill 1 1-cy Super Sack by hand	1	hour
Compaction Shrinkage Factor	3%	
Fluff Factor	20%	
Number 1-cy Super Sacks per Flatbed Load	5	each
Round trip to airstrip with full Super Sacks Load	1	hours

Out-of-State Disposal

Alternative 4	QTY Debris (cy):	0.3	QTY Debris (tons):	0.5

Description	Units	Estimated QTY	Unit Price	Sub Total	Notes
Waste Documentation and Management					
Pre-shipment Preparation and Submittals	LS	1	$ 558.84	$ 558.84	
Prepare and Submit Complete Manifest Packages	EACH	1.00	$ 56.45	$ 56.45	Total # of bins. Bins contain sacks and drums
Waste Container Management and Tracking	LS	1	$ 558.84	$ 558.84	
Waste-Specific Transportation and Disposal/Recycle Activities					
Contaminated Soil/Sediment and/or Concrete (Non-Hazardous) - Transportation	1 CONNEX	1.0	$ 1,467.65	$ 1,467.65	
Metals-Contaminated Soils/Sediments and/or Concrete (Nonhazardous) - Disposal	TON	1.0	$ 90.32	$ 90.32	
Contaminated Soil/Sediment (Hazardous) - Transportation	TON	0	$ 90.32	$ -	
Metals-Contaminated Soils/Sediments and/or Concrete (Hazardous) - Disposal	TON	0	$ 293.53	$ -	
Contaminated Purge/Decontamination Water (non-Hazardous) - Transportation	Drum	0	$ 73.39	$ -	55-gal drums
Metals-Contaminated Water (Nonhazardous) - Disposal	Drum	1	$ 169.35	$ 169.35	55-gal drums
Sampling Waste - Transportation	TON	0	$ 73.38	$ -	
Sampling Waste - Disposal	1 CY SUPER SACK	1	$ 90.32	$ 90.32	
3.0 Optional Waste Containers					
Top-Load 20-foot Intermodal Container Rental	DAY	20	$ 13.55	$ 270.95	Assume 20 days per container, 10 sacks per connex.
Chassis 20-foot	WEEK		$ 197.57		
Liner (suitable for Hazardous Waste)	EACH	1	$ 16.94	$ 16.94	
4.0 Other					
Fuel Surcharge on transportation of contain	LS	1	$ 146.76	$ 146.76	
Mark up on Fuel	LS	10%	$ 146.76	$ 14.68	
Bond Cost	LS	1	$ 500.00	$ 500.00	
Total				**$3,941.09**	

Alternative 5	QTY Soil (cy):	10	QTY Soil (tons):	15

Description	Units	Estimated QTY	Unit Price	Sub Total	Notes
Waste Documentation and Management					
Pre-shipment Preparation and Submittals	LS	1	$ 558.84	$ 558.84	

Out-of-State Disposal

Prepare and Submit Complete Manifest Packages	EACH	2	$ 56.45	$ 112.91	Total # of bins. Bins contain sacks and drums
Waste Container Management and Tracking	LS	1	$ 558.84	$ 558.84	
Waste-Specific Transportation and Disposal/Recycle Activities					
Contaminated Soil/Sediment and/or Concrete (Non-Hazardous) - Transportation	1 CONNEX	2.0	$ 1,467.65	$ 2,935.30	
Metals-Contaminated Soils/Sediments and/or Concrete (Nonhazardous) - Disposal	TON	10	$ 90.32	$ 930.26	
Contaminated Soil/Sediment (Hazardous) - Transportation	TON	5	$ 90.32	$ 465.13	
Metals-Contaminated Soils/Sediments and/or Concrete (Hazardous) - Disposal	TON	5	$ 286.65	$ 1,476.25	
Contaminated Purge/Decontamination Water (non-Hazardous) - Transportation	DRUM	0	$ 73.39	$ -	55-gal drums
Metals-Contaminated Water (Nonhazardous) - Disposal	DRUM	2	$ 169.35	$ 338.70	55-gal drums
Sampling Waste - Transportation	TON	0	$ 73.38	$ -	
Sampling Waste - Disposal	TON	2	$ 90.32	$ 180.63	
3.0 Optional Waste Containers					
Top-Load 20-foot Intermodal Container Rental	DAY	40	$ 13.55	$ 541.90	Assume 20 days per container, 10 sacks per connex.
Chassis 20-foot	WEEK		$ 197.57		
Liner (suitable for Hazardous Waste)	EACH	2	$ 16.94	$ 33.87	
4.0 Other					
Fuel Surcharge on transportation of containe	LS	1	$ 340.04	$ 340.04	
Mark up on Fuel	LS	10%	$ 340.04	$ 34.00	
Bond Cost	LS	1	$ 500.00	$ 500.00	
Total				**$9,006.67**	

Assumptions

Basis of rates is based on rates for work performed elsewhere in Alaska, with 2.4% inflation rate for 2014 cost

1.5 cubic yards of soil per ton of soil

Transportation costs only include Anchorage to final TSDF

No contaminated water and sampling waste to be on second connex box with other supersacks (i.e., no additional transportation needed)

Cost Estimates for Sampling and Analysis

Alternative	# pre and/or post samples	# waste samples	Total Samples	Unit Price (per sample)[1]	Total Esitmated Cost
Alternative 1	0	0	0	$500.12	$0
Alternative 2	0	0	0	$500.12	$0
Alternative 3	0	0	0	$500.12	$0
Alternative 4	2	2	4	$500.12	$2,000
Alternative 5	5	2	7	$500.12	$3,501

Laboratory Pricing

Method	TAT	Price	Del. Chrg.[2]	Total
TCLP by SW1311/SW6010C	1 day	$239.21		$239.21
Total Lead and Antimony by SW6020A	14 day	$60.91		$60.91
			Total	$300.12

Alternative 4 Pre- and Post-Treatment Lead Sampling

Treatment Area	Area (ft^2)	Pre Floor Samples[3]	Post Floor Samples[3]	Perimeter (ft)	Wall Samples[3]	Total Composite Samples
SR018	150	1	1	0	0	2
Total						**2**

Alternative 5 Post-Excavation Lead Sampling

Excavation	Area (ft^2)	Floor Samples[3]		Perimeter (ft)	Wall Samples[3]	Total Composite Samples
SR018	150	1		50	4	5
Total Samples						**5**

1 - includes labor for sample collection and shipping
2 - assumes shipping is on the air charter (cost already incurred)
3 - assumes floor sample frequency at 1/225 sq ft and wall samples at 1/15 LF

Volume Estimates

Alternative Volume Breakdowns

Alternative	Cap Footprint Area (ft^2)	Volume of Excavation (bank cy)	Excavated Volume After Fluff Factor (cy)[1]	Off-site Disposal (cy)	Hazardous Waste (cy)	Non-Hazardous Waste (cy)	Backfill (cy)
Alternative 2	0	0	0	0	0	0	0
Alternative 3	150	0	0	0	0	0	0
Alternative 4	150	0.25	0.30	0.30	0	0.3	0
Alternative 5	0	9	10	10	3	7	11

Notes:

1 A 20% fluff factor is assumed for excavated soils and debris

2 Assume use of local gravel pit material as backfill

Contsants

Factor	Value
Fluff Factor	20%
Backfill Compaction (Shrinkage)	3%

Cost Estimates for Mobilization and Demobilization to Cape Romanzof
Required for all Alternatives

Personnel Flights

Item/Task	Quantity	Units	Cost per unit[1]	Total Estimated Cost	
Travel between Anchorage and Cape Romanzof	1	Round Trip	$ 18,905.06	$ 18,905.06	*Sercurity Aviation 2014 quote - round trip air charter between Anchorage and Cape Romanzof; 9 PAX + 1700# gear*
			TOTAL	$ 18,905.06	

Herc and Trucking Rates

Item/Task	Units	Cost per unit[1]	
Herc Flight from ANC to Cape Romanzof	Each	$ 53,400.00	*Lynden Transport 2014 quote*
Herc Flight from Cape Romanzof to ANC	Each	$ 53,353.00	*Lynden Transport 2014 quote for a flag stop*

Herc Soil Removal Costs (Cape Romanzof to ANC)

Alternative	cy soil	# Super Sacks	wt/sack (lbs)	Herc capacity (lbs)	Herc Soil trips	Add'l Trips[2]	Total Herc Trips	Transport Cape Romanzof-ANC
Alternative 2	0	0	2500	25000	0	0	0	$0
Alternative 3	0	0	2500	25000	0	0	0	$0
Alternative 4	0	1	2500	25000	1	0	1	$53,353
Alternative 5	10	11	2500	25000	2	0	2	$106,706

Equipment Mob/Demob Costs

Equipment	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Excavator (<30,000lbs and <8'6")	0	0	0	0
Skid Steer with dozer blade	0	1	1	1
Loader with fork attachment	0	0	0	1
Flat bed truck (can carry 13,000 lbs)	0	0	0	0
5 cy Dump Truck (<30,000lbs and <8'6")	0	1	1	1
Number of Herc Mob Trips	0	2	2	3
Herc Mob Cost	$ -	$ 106,800	$ 106,800	$ 160,200
Number of Herc Demob Trips	0	2	2	3
Herc Demob Cost	$ -	$ 106,706	$ 106,706	$ 160,059
Total Equipment Mob/Demob Costs	$ -	$ 213,506	$ 213,506	$ 320,259

Assumptions

1 - 2014 rate. Payload to Cape Romanzof is 40,500 lbs and payload from Cape Romanzof is 25,000 lb or 30,000 lb depending on weather conditions.

2 - Additional Herc trips are assumed for additional waste material, including IDW. Alternative 4 and 5 will have waste, but assumed that the waste will be on same trip as the supersacks.

APPENDIX C

Response to Comments

REVIEW COMMENTS		PROJECT: DRAFT FEASIBILITY STUDY SITE SR018	LOCATION: CAPE ROMANZOF LRRS, ALASKA	
ADEC		**DATE: 26 January 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY:** **Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.		**General Comment** For the small amount of lead contaminated soil at SR018, ADEC would encourage the Air Force to rename the Feasibility Study (FS) an Engineering Evaluation/Cost Analysis (EE/CA), then do some editorializing to show that a non-time critical removal action is being conducted and write an EE/CA approval memorandum in support of a non-time critical removal action. However, it is the Air Force's choice to conduct an FS, Proposed Plan and Record of Decision (ROD) for the lead contaminated soil at SR018.	Noted. The Air Force will continue down the CERCLA path for SR018.	A
2.	Page 2-5, Section 2.3	**Applicable or Relevant and Appropriate Requirements** In identifying potential ARARs[1], the Parties recognize that actual ARARs can be identified only on a source-specific basis and that ARARs depend on the specific hazardous substances, pollutants, and contaminants at a source (e.g. SR018), the particular actions proposed as a remedy, and the characteristics of a source. The Parties recognize that ARAR identification is necessarily an iterative process and that potential ARARs must be re-examined throughout the Remedial Investigation/Feasibility (RI/FS) process until a ROD is issued.	Accepted. The text will be updated in Section 2.3 to incorporate this discussion regarding the CERCLA process and the identification of ARARs specific to the hazardous substances, pollutants, and contaminants at SR018. In addition, it will be noted that the ARARs may be re-examined throughout the CERCLA process.	A
3.	Page 3-2, Section 3.1.3	**Alternative 3: Capping, Land-Use Controls, and Long-Term Monitoring** The text states: "LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter for the next 25 years."	Accepted. "…thereafter for the next 25 years." will be replaced with "…thereafter, indefinitely."	A

[1] "ARARs or Applicable or Relevant and Appropriate Requirements" shall mean any standard, requirement, criterion, or limitation as provided in Section 121(d)(2) of CERCLA, 42 U.S.C. S 9621(d)(2), and the NCP. "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, as amended.

ADEC		**DATE: 26 January 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY:** **Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		ADEC requests the text state: "LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter, indefinitely."		
4.	Page 3-3, Section 3.1.4	**Alternative 4: Debris Removal, In Situ Soil Treatment, Capping, and Land-Use Controls** The text states: "LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter for the next 25 years." ADEC requests the text to state: "LTM would be implemented to ensure the integrity of the cap and inspections would occur once a year for the first five years, then every five years thereafter, indefinitely."	Accepted. "…thereafter for the next 25 years." will be replaced with "…thereafter, indefinitely."	A
5.	Page 4-4, Section 4.1.2	**Primary Balancing CriteriaShort-Term Effectiveness** The text states: "This criterion also addresses the time required by each alternative until RAOs are achieved and potential harm to the environment where increased fossil fuels and greenhouse gas emissions are required for remedy implementation." ADEC is unaware changes to NCP (40 CFR 300) and the "Nine Criteria for Evaluation": specifically, the primary balancing criteria of Short-Term Effectiveness to include a review of potential harm to the environment from increased fossil fuels and greenhouse gas emissions. It can be discussed in general, but ADEC does not consider increased fossil fuel usage and greenhouse gas emissions primary balancing criteria (comment also applies to Alternatives 3, 4, and 5 and Section 4.4.2).	Accepted. Our intention was to include greenhouse gases released into the environment as an additional risk to the environment for the multiple flights included in some of the alternatives, based on a risk management technical memorandum (ITRC 2011). The text in Section 4.1.2 and throughout the document will be changed to clarify that although not included in the NCP as part of the short-term effectiveness criterion, the release of greenhouse gases poses an additional risk. The text in Section 4.1.2 will be changed to: "This criterion also addresses the time required by each alternative until RAOs are achieved. Although not included in the NCP as part of this balancing criterion, additional risks to the environment include potential harm to the environment where increased fossil fuels and greenhouse gas emissions are required for remedy implementation (ITRC 2011)."	A

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		The NCP defines Short-Term Effectiveness as: "The *short-term impacts* of alternatives shall be assessed considering the following: (1) Short-term risks that might be posed to the community during implementation of an alternative; (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and (4) Time until protection is achieved." 6.2.3.6 Short Term Effectiveness EPA RI/FS Guidance (October 1988) states: "This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial response objectives are met (e.g., a cleanup target has been met). Under this criterion, alternatives should be evaluated with respect to their effects on human health and the environment during implementation of the remedial action.	ITRC 2011 will be added to Section 5.0 References as well.	

ADEC		**DATE: 26 January 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY:** **Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		The following factors should be addressed as appropriate for each alternative: *Protection of the community during remedial actions* – This aspect of short-term effectiveness addresses any risk that results from implementation of the proposed remedial action, such as dust from excavation, transportation of hazardous materials, or air-quality impacts from a stripping tower operation that may affect human health. *Protection of workers during remedial actions* – This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that would be taken. **Environmental impacts** – This factor addresses the potential adverse environmental impacts that may results from the construction and implementation of an alternative and evaluates the reliability of the available mitigation measures in preventing or reducing the potential impacts. *Time until remedial response objectives are achieved* – This factor includes an estimate of time required to achieve protection for either the entire site or individual elements associated with specific site areas or threats.		

REVIEW COMMENTS	PROJECT: DRAFT FEASIBILITY STUDY SITE SR018	LOCATION: CAPE ROMANZOF LRRS, ALASKA
ADEC	DATE: 26 January 2015 REVIEWER: Louis Howard PHONE: 907-269-7552	ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		Analysis Factor **Environmental impacts** **Basis for Evaluation During Detailed Analysis** What environmental impacts are expected with the construction and implementation of the alternative? What are the available mitigation measures to be used and what is their reliability to minimize potential impacts? What are the impacts that cannot be avoided should the alternative be implemented? There is the executive order 13514 that requires federal agencies to measure, manage, and reduce GHG emissions toward agency-defined targets. EO 13514 requires federal agencies to: ☐ Increase energy efficiency; ☐ Measure, report, and reduce GHG emissions from direct and indirect sources; ☐ Conserve and protect water resources through efficiency, reuse, and stormwater management; ☐ Eliminate waste, recycle, and prevent pollution; ☐ Leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services; ☐ Design, construct, maintain, and operate high performance buildings in sustainable locations; and ☐ Strengthen vitality and livability of communities where federal facilities are located. The executive order does not change or amend the NCP		

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		requirements for the nine criteria with regards to greenhouse gas emissions or fossil fuel usage. The EO does mention fossil fuel usage as follows: "In establishing the target, the agency head shall consider reductions associated with: …reducing the use of fossil fuels by: (A) using low greenhouse gas emitting vehicles including alternative fuel vehicles; (B) optimizing the number of vehicles in the agency fleet; and (C) reducing, if the agency operates a fleet of at least 20 motor vehicles, the agency fleet's total consumption of petroleum products by a minimum of 2 percent annually through the end of fiscal year 2020, relative to a baseline of fiscal year 2005." It may be DoD policy to incorporate green and sustainable remediation into RODs or other Decision Documents[2], however, the incorporation of green and sustainable remediation shall not be the primary criteria for remedy selection.		

[2] DUSD (Installations and Environment) "Consideration of Green and Sustainable Remediation Practices in the Defense Environmental Restoration Program" August 10, 2009: Remedy selection criteria remain the same under this policy but may include aspects of sustainability. For example, when green and sustainable remediation is cost effective, where it supports *long-term effectiveness and permanence*, where it expand the universe of long-term property use or reuse options, or where it supports *community acceptance*. The DoD Components shall consider and implement green and sustainable remediation opportunities *when and where they make sense.*

ADEC		DATE: 26 January 2015 REVIEWER: Louis Howard PHONE: 907-269-7552	ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
6.	Page 83 of the PDF, Table A-1	**Chemical-Specific Applicable or Relevant and Appropriate Requirements** 18 AAC 57.340 Soil cleanup levels; general requirements (A) 18 AAC 75.341. Soil cleanup levels; tables. (A) Description: Establishes cleanup goals for soil. Rationale: Cleanup levels for soil (18 AAC 75.340-341); methods for determination and application of cleanup levels.	Accepted. The Description for 18 AAC 75 will be updated to read: “Governs discharge of oil and hazardous substances and state cleanup requirements. Also establishes soil cleanup levels.” The Rationale for 18 AAC 75 will be updated to read: “Cleanup levels for soil (18 AAC 75.340-341); methods for determination and application of cleanup levels. The site is known to be affected by a release of metals constituents. Alternative soil cleanup levels may be applied.”	A
7.	Page 85 of the PDF, Table A-2	**Location-Specific Applicable or Relevant and Appropriate Requirements** 18 AAC 60.410 Location Standards (A) Description: lists the requirements for location standards of storage of solid wastes. Rationale: Applicable if excavation options require solid waste storage locations on site.	Accepted. 18 AAC 60 will be added to the Location-Specific ARARs table. The Description and Rationale suggested will be included in the text of the table.	A
8.	Page 87 of the PDF, Table A-3	**Action-Specific Applicable or Relevant and Appropriate Requirements** ADEC requests the Air Force include the following as specific ARARs for SR018: 18 AAC 75.355. Sampling and analysis (A) Description: Alaska Department of Environmental Conservation has authority for specifying sampling and analysis of soil, surface water, and groundwater resulting from the discharge of oil or a hazardous substance. Rationale: 18 AAC 75.355 lists requirements for sampling and analysis.	Accepted. The Description and Rationale for 18 AAC 75 will be updated, as suggested, in the Action-Specific ARARs table. The Description for 18 AAC 60 will be updated to state: “Governs the management and transport of solid wastes generated during remedial activity”	A

ADEC		DATE: 26 January 2015 REVIEWER: Louis Howard PHONE: 907-269-7552	ACTION TAKEN ON COMMENT BY: Jacobs Engineering Group Inc.	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		18 AAC 75.360.Cleanup operations requirements (A) Description: Alaska Department of Environmental Conservation has authority for specifying soil, surface water, and groundwater cleanup levels resulting from the discharge of oil or a hazardous substance. Rationale: 18 AAC 75.360 lists requirements for cleanup work plans. 18 AAC 75.375. Institutional controls. (A) Description: Alaska Department of Environmental Conservation has authority for specifying institutional controls for residual soil, surface water and groundwater left in excess of cleanup levels resulting from a discharge of oil or a hazardous substance. Rationale: 18 AAC 75.375 lists requirements for institutional controls. * The regulations below apply only to hazardous wastes and trigger if a hazardous waste facility needs to be constructed to accommodate hazardous waste from the remediation. 18 AAC 60.010. Accumulation, Storage, and Treatment (A) Description: Governs the management of solid wastes generated during remedial activity. Rationale: 18 AAC 60.010 lists requirements for accumulation, storage and treatment of solid wastes.		

ADEC		**DATE: 26 January 2015** **REVIEWER: Louis Howard** **PHONE: 907-269-7552**	**ACTION TAKEN ON COMMENT BY:** **Jacobs Engineering Group Inc.**	
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**CONTRACTOR RESPONSE**	**ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		18 AAC 60.015 Transport (A) Description: Governs the transport of solid wastes generated during remedial activity. Rationale: 18 AAC 60.015 lists requirements for transport of solid wastes. 18 AAC 60.330 Design Standards (A) Description: Establishes state requirements design standards for storage of solid waste. Rationale: Alaska Solid Waste Management applies to removal or contaminated soil if it is designated as a waste. If it is to be stockpiled and treated onsite, then it is not a waste, and the Act in that instance would not apply. 18 AAC 60.485 Industrial Solid Waste (A) Description: Establishes the state requirements for industrial solid waste generated during remedial activity. Rationale: 18 AAC 60.485 lists the requirements for a monofill accepting industrial solid waste.		

McDonald, Erika

From: Howard, Louis R (DEC) <louis.howard@alaska.gov>
Sent: Wednesday, February 11, 2015 3:01 PM
To: Wehrmann, Jennifer
Cc: AFCEC - Barnack, Keith; McDonald, Erika
Subject: RE: Cape Romanzof LRRS SR018 FS Comments

ADEC has reviewed the Air Force's responses to ADEC's comments and finds them acceptable. Please finalize the Feasibility Study (FS).

Louis Howard
Alaska Department of Environmental Conservation SPAR | Contaminated Sites Program Federal Facility Restoration
555 Cordova Street 2nd Floor, Anchorage AK 99501 Office 907.269.7552 | FAX 907.269.7649

-----Original Message-----
From: Wehrmann, Jennifer [mailto:jennifer.wehrmann@jacobs.com]
Sent: February 11, 2015 2:51 PM
To: Howard, Louis R (DEC)
Cc: AFCEC - Barnack, Keith; McDonald, Erika
Subject: Cape Romanzof LRRS SR018 FS Comments

Hello, Louis,
Attached please find draft responses to ADEC comments on the draft Feasibility Study for SR018, Cape Romanzof LRRS. Please let us know if we have your approval to make the changes and finalize the FS or if you'd like additional discussion.

Thank you,
Jennifer

Jennifer Wehrmann
Environmental Project Manager
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4300 B Street, Suite 600, Anchorage, AK 99503
Phone: 907-751-3459 Fax: 907-563-3320
Jennifer.wehrmann@jacobs.com

-----Original Message-----
From: Howard, Louis R (DEC) [mailto:louis.howard@alaska.gov]
Sent: Tuesday, January 27, 2015 12:22 PM
To: BARNACK, KEITH J GS-12 USAF AFCEC PACAF/CZOP
Subject: ADEC SR018 FS Comments

Hard copy to follow in the mail.

Louis Howard

Alaska Department of Environmental Conservation

SPAR | Contaminated Sites Program

Federal Facility Restoration

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