FEASIBILITY STUDY FOR SURFACE AND SUBSURFACE SOILS AT SITES 9 AND 10 NAS WHITING FIELD

3/1/2001

HARDING LAWSON ASSOCIATES

FEASIBILITY STUDY

SURFACE AND SUBSURFACE SOILS
SITE 9, WASTE FUEL DISPOSAL PIT AND
SITE 10, SOUTHEAST OPEN DISPOSAL AREA (A)

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

USEPA ID No.: FL2170023244

UNIT IDENTIFICATION CODE: N60508
CONTRACT NO.: N62467-89-D-0317/116

MARCH 2001

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA 29418

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March 2001

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/116 are complete and accurate and comply with all requirements of this contract.

DATE: March 29, 2001

NAME AND TITLE OF CERTIFYING OFFICIAL: Rao Angara
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Eric Blomberg, P.G.
Project Technical Lead

(DFAR 252.227-7036)

The engineering evaluations and professional opinions rendered in this planning document describing the Feasibility Study for Sites 9 and 10, Naval Air Station Whiting Field, Milton, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document is not intended to be used for construction of the selected alternative.

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FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, and/or disposal of hazardous materials. Through accidental spills or leaks, or as a result of conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by current standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act, and the Hazardous and Solid Waste Amendments of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. The CERCLA and SARA acts form the basis for what is commonly known as the Superfund Program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adopted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follows:

- The preliminary assessment (PA) identifies potential sites through record searches and interviews.
- A site inspection (SI) then confirms which areas contain contamination, constituting actual "sites." (Together, the PA and SI steps were called the Initial Assessment Study under the NACIP program).
- Next, the Remedial Investigation and Feasibility Study together determine the type and extent of contamination, establish criteria for cleanup, and identify and evaluate any necessary remedial action

alternatives and their costs. As part of the RI/FS, a risk assessment identifies potential effects on human health or the environment in order to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the remedial design and remedial action stages. Monitoring then ensures the effectiveness of the effort.

The Southern Division, Naval Facilities Engineering Command manages and the U.S. Environmental Protection Agency and the Florida Department of Environmental Protection oversee the Navy environmental program at Naval Air Station (NAS) Whiting Field. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the CERCLA program at NAS Whiting Field should be addressed to Ms. Linda Martin, Code 1859, at (843) 820-5574.

TABLE OF CONTENTS

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

TABLE OF CONTENTS (Continued)

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

LIST OF FIGURES

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ARAR	Applicable or relevant and appropriate requirement
BEI	Bechtel Environmental Inc.
BRA	baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of concern
ELCR	Excess lifetime cancer risk
ERA	Ecological risk assessment
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FS	Feasibility study
GGC	Groundwater guidance concentration
GIR	General Information Report
HHRA	Human health risk assessment
HI	Hazard index
HLA	Harding Lawson Associates
IR	Installation Restoration
LUC	Land-use control
LUCAP	Land-Use Control Assurance Plan
LUCIP	Land-Use Control Implementation Plan
MCL	Maximum contaminant level
mg/kg	Milligrams per kilogram
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
PAH	Polynuclear aromatic hydrocarbons
RA	Remedial action
RAO	Remedial action objective
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
RI/FS	Remedial investigation and feasibility study
RME	Reasonable maximum exposure
ROD	Record of decision
SARA	Superfund Amendments and Reauthorization Act
SCG	Soil cleanup goal
SCTL	Soil cleanup target level

GLOSSARY (Continued)

SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
su	Standard unit
TAT	Turnaround time
TBC	To be considered
TCLP	Toxicity characteristics leaching procedure
TRPH	Total recoverable petroleum hydrocarbons
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
yd^3	Cubic yard

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) to complete a feasibility study (FS) for Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A), Surface and Subsurface Soils, at Naval Air Station (NAS) Whiting Field, Milton, Florida. Groundwater as a media of concern will be addressed in a future FS for Site 40. The FS is being completed under contract number N62467-89-D-0317-116. The FS report for Sites 9 and 10 is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) (HLA, 1998) and Remedial Investigation (RI) report (ABB Environmental Services, Inc. [ABB-ES], 1998) to present the results of the overall remedial investigation and feasibility study (RI/FS) for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives that address contaminated media at Sites 9 and 10.

Investigations at NAS Whiting Field, a facility listed on the National Priority List, are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR], Part 300). The investigations at the facility are being conducted under the Navy's Installation Restoration (IR) program, which is designed to identify and abate or control contaminant migration resulting from past operations at naval installations while working within the aforementioned regulatory framework. SOUTHNAVFACENGCOM is the agency responsible for the Navy's IR program in the southeastern United States. Therefore, SOUTHNAVFACENGCOM has the responsibility to process NAS Whiting Field through preliminary assessment, site inspection, RI/FS, and remedial response selection.

The goals of the RI/FS for Sites 9 and 10 at NAS Whiting Field are (1) to assess the extent, magnitude, and impact of contamination at the sites, (2) to qualitatively and quantitatively assess the risk posed to human health and the environment by site-related contamination, and (3) to develop remedial alternatives that address current threats to human health and/or the environment. The first two elements have been discussed in the GIR and RI reports; the remaining element will be presented and discussed in this FS report. This process must take place in light of the placement of a soil cover during the interim remedial action (IRA) completed at Sites 9 and 10 in 1999 (see Section 1.4).

The GIR provides information common to all sites at NAS Whiting Field, such as

- facility information and history,
- description of physical characteristics of the facility (climatology, hydrology, soil, geology, and hydrogeology),
- summary of previous investigations,
- summary of the field investigations conducted during the RI,

- human health and ecological remedial action (RA) methodology, and
- an evaluation of the facilitywide background conditions.

The RI serves as the mechanism for collecting data to identify the source of contamination and migration pathway characteristics, for conducting a baseline RA, and for collecting physical measurements and chemical analytical data necessary for evaluating remedial alternatives in the FS. The RI provides the basis for determining whether or not remedial action is necessary. The RI report for Sites 9 and 10 at NAS Whiting Field provides the following information:

- a site description and a summary of previous investigations for Sites 9 and 10;
- a summary of the field investigation methods used during the RI at the sites;
- a site-specific data quality assessment;
- an assessment of the extent, magnitude, and impact of contamination at the sites; and
- a qualitative and quantitative assessment of risks to human health and the environment.

The FS, described in more detail later in this chapter, uses the results of the RI, the information presented in the GIR, and the results of the IRA as described in the *Draft Removal Action Completion Report* (Bechtel Environmental Inc. [BEI], 1999) to identify remedial action objectives (RAOs) and to develop, screen, and evaluate potential remedial alternatives. The FS is prepared in accordance with the following regulations and guidance documents: CERCLA, as amended by SARA (references made to CERCLA in this report should be interpreted as "CERCLA, as amended by SARA"); the NCP (40 CFR, Part 300); and *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (RI/FS Guidance) (U.S. Environmental Protection Agency [USEPA], 1988).

The remaining sections in this chapter describe the FS process for CERCLA sites (Section 1.1), present how this process is applied to NAS Whiting Field sites (Section 1.2), provide the environmental conditions at Sites 9 and 10 (Section 1.3), and describe the IRA taken at Sites 9 and 10 (Section 1.4).

1.1 THE CERCLA FS PROCESS. The development of remedial alternatives for CERCLA sites consists of developing RAOs and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the RAOs. The NCP requires that a range of alternatives be presented in the FS to the maximum extent practicable.

The first step in the FS process is to develop RAOs that specify the contaminants, media of interest, exposure pathways, and preliminary remedial goals that permit a range of alternatives to be developed. The preliminary remedial goals are developed based on chemical-specific applicable or relevant and appropriate requirements (ARARs), when available, site-specific risk-based factors, or other available information.

Once RAOs are identified, general response actions for each medium of interest are developed. General response actions typically fall into the following categories: no action, containment, excavation, extraction, treatment, disposal, or other actions, singular or in combination, that may be taken to satisfy the RAOs for the site.

The next step in the FS process is to identify and screen applicable technologies for each general response action. This step eliminates those technologies that cannot be implemented technically. Those technologies that pass the screening phase are then assembled into remedial alternatives. Remedial alternatives are then described and analyzed in detail using seven criteria described in the NCP, including

- overall protection of human health and the environment;
- reduction of toxicity, mobility, or volume of contaminants through treatment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- short-term effectiveness;
- implementability; and
- economics (i.e., cost).

Alternatives are evaluated against two additional factors after State participation and the public comment period for the FS:

- State acceptance, and
- community acceptance.

The results of the detailed analyses (for the first seven criteria) are summarized and compared in a comparative analysis. The alternatives are compared with one another against several criteria, including the following:

Threshold criteria:

- protection of human health and the environment; and

- attainment of Federal and State human health and environmental requirements identified for the site.

Primary Balancing criteria:

- cost effectiveness;

- use of permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable; and

- preference for treatment that reduces toxicity, mobility, or volume of contaminants as a principal element.

These criteria are used because SARA requires them to be considered during remedy selection. **Modifying criteria**, which include State and community acceptance, are also evaluated. State acceptance is evaluated when the State reviews and comments on the draft FS report and a proposed plan is then prepared in consideration of the State's comments. Community acceptance is evaluated based

on comments received on the FS and proposed plan during a public comment period. This evaluation is described in a responsiveness summary in the Record of Decision (ROD).

The entire FS process provides the technical information and analyses that form the basis for a proposed remedial action plan (proposed plan) and subsequent ROD that documents the identification and selection of the remedy.

1.2 PURPOSE. The purpose of the FS report for Sites 9 and 10 at NAS Whiting Field is to document the results of the study that includes developing RAOs to address contaminated media at the site and developing, screening, and evaluating potential remedial alternatives to meet these objectives. The FS was based on the results and conclusions of the RI completed for the site, the information presented in the GIR, and the results of the IRA as described in the draft Removal Action Completion Report (BEI, 1999). Information presented in these reports will not be repeated in this FS Report.

The FS report for Sites 9 and 10 was developed in accordance with the NCP and with USEPA's *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a); both of these documents provide guidance for identifying technologies for municipal landfills. Because municipal landfill sites typically have similar characteristics, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for waste (e.g., landfills) that poses a relatively low long-term threat or where treatment is impracticable (Section 300.430[a][1][iii][B]). Additionally, the USEPA expects treatment to be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii][A]).

Therefore, the purpose of the FS report for Sites 9 and 10 is not to present all the possible variations and combinations of remedial actions that could be taken at the site, but to present distinctly different alternatives representing a range of opportunities for meeting the RAOs. It is expected that these different alternatives can be adjusted during the proposed plan and decision process, and to a lesser extent during detailed design, to accomplish RAOs in a manner similar to the initially proposed alternative.

The following components are considered in identifying appropriate remedial action for Sites 9 and 10:

- Remedial Action Objectives - Chapter 2.0. RAOs are developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals for the site.

- Applicable Technologies - Chapter 3.0. Technologies applicable for addressing contaminated media at the site are identified and screened. Technologies that cannot be implemented are eliminated.

- Remedial Alternatives - Chapter 3.0. Technologies that pass the screening phase are assembled into remedial alternatives.

- Detailed Analysis - Chapter 4.0. Selected remedial alternatives are described and evaluated using seven of the nine criteria outlined in the NCP.

- Comparative Analysis - Chapter 5.0. Remedial alternatives identified for Sites 9 and 10 are compared against one another using threshold and primary balancing criteria.

Upon completion of the FS report, a proposed plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Sites 9 and 10. This document will be written in community-friendly language and will be made available for public comment. Upon receipt of public comments, responses to these comments will be developed in a responsiveness summary and the ROD will be prepared. The ROD will document the chosen alternative for the site and will include the responsiveness summary as an appendix. Once the ROD is signed, the chosen remedial alternative will be implemented.

1.3 SITES 9 AND 10 ENVIRONMENTAL CONDITIONS. This section describes each site on a separate basis:

Site 9 - Waste Fuel Disposal Pit. Site 9 is located along the eastern boundary near the South Field (Figure 1-1). Site 9 is a 2-acre parcel of land (Figure 1-2) that was used during the 1950s and 60s to dispose of waste fuel (i.e., aviation gasoline) containing tetraethyl lead in the northern part of the site. According to anecdotal information, a tanker truck was used to transport and drain waste fuel to the disposal pit. Approximately 200 to 300 gallons of waste fuel was disposed at the site per trip. The total quantity of fuel disposed at the site is unknown. Furthermore, the precise location of the disposal pit is unknown.

Prior to the IRA, Site 9 was forested with pine trees that were approximately 25 to 40 feet in height with limited construction debris present on the ground surface. Site 9 contained a surface depression in the same location as the suspected disposal pit where standing water (i.e., ephemeral pond) was observed.

According to the U.S. Department of Agriculture (USDA) (1980), the soil at Site 9 is classified as Troup loamy sand and Fuquay loamy sand. Because the soil at the site is predominantly silty sand, storm water infiltrates directly into the soil.

Based on previous investigations, Site 9 received wastes from a variety of sources, including waste fuel. The results of the RI (ABB-ES, 1998) indicate these wastes do not pose a principal threat to human health or the environment. Site 9 exhibits the characteristics of a CERCLA landfill site and will be addressed as such in the FS.

Site 10 - Southeast Disposal Area (A). Site 10 is contiguous to Site 9 and is approximately 4 acres in size (Figure 1-2). From 1965 to 1973, this site was used for the disposal of construction debris, trees, brush, metal cans, and similar materials not suitable for sanitary landfill disposal. Transformer oil and empty pesticide/herbicide containers were also reportedly disposed of at the site. Access to the site was uncontrolled and other potentially hazardous wastes may have been disposed at the site.

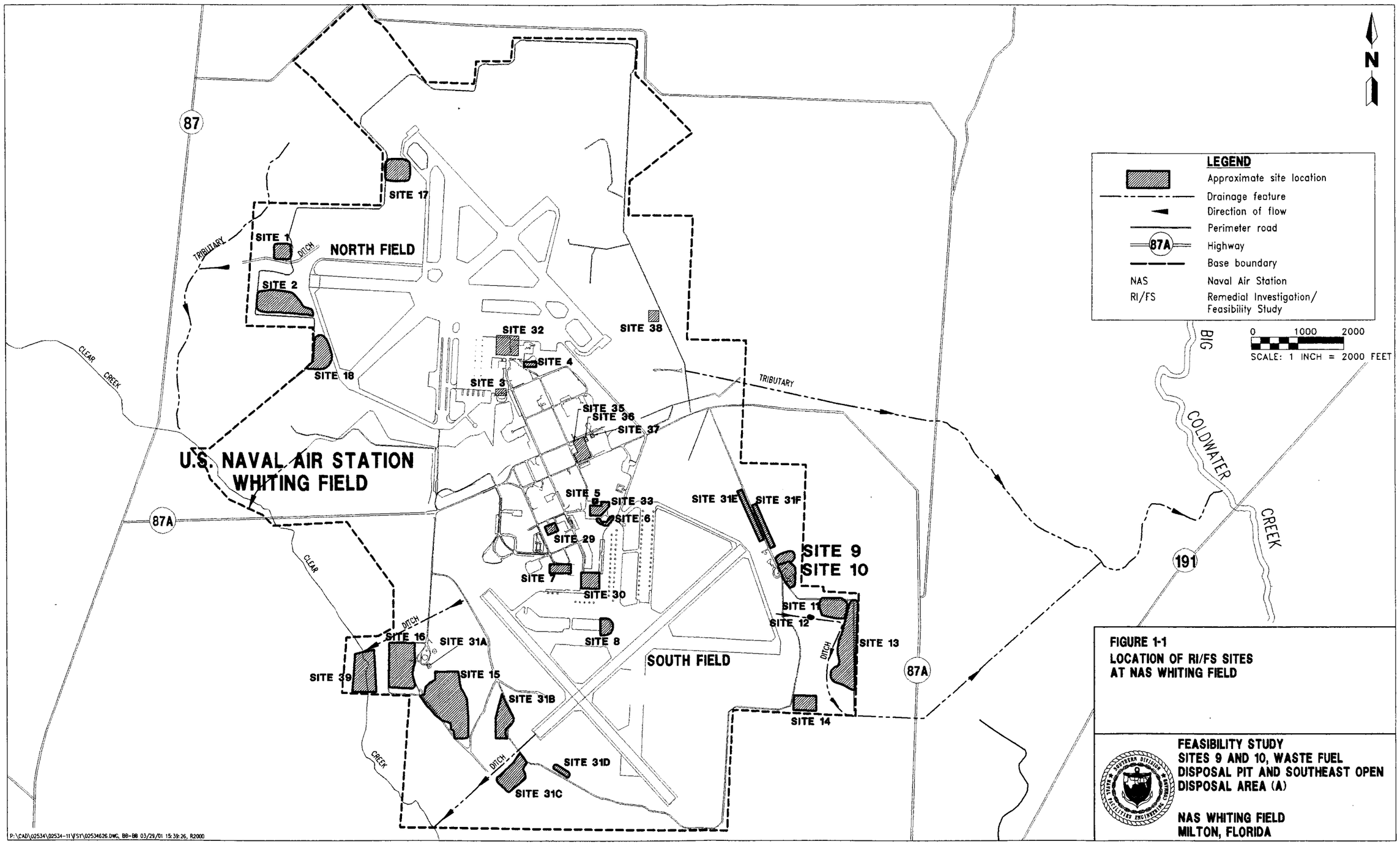

FIGURE 1-1
LOCATION OF RI/FS SITES
AT NAS WHITING FIELD

FEASIBILITY STUDY
SITES 9 AND 10, WASTE FUEL DISPOSAL PIT AND SOUTHEAST OPEN DISPOSAL AREA (A)

NAS WHITING FIELD
MILTON, FLORIDA

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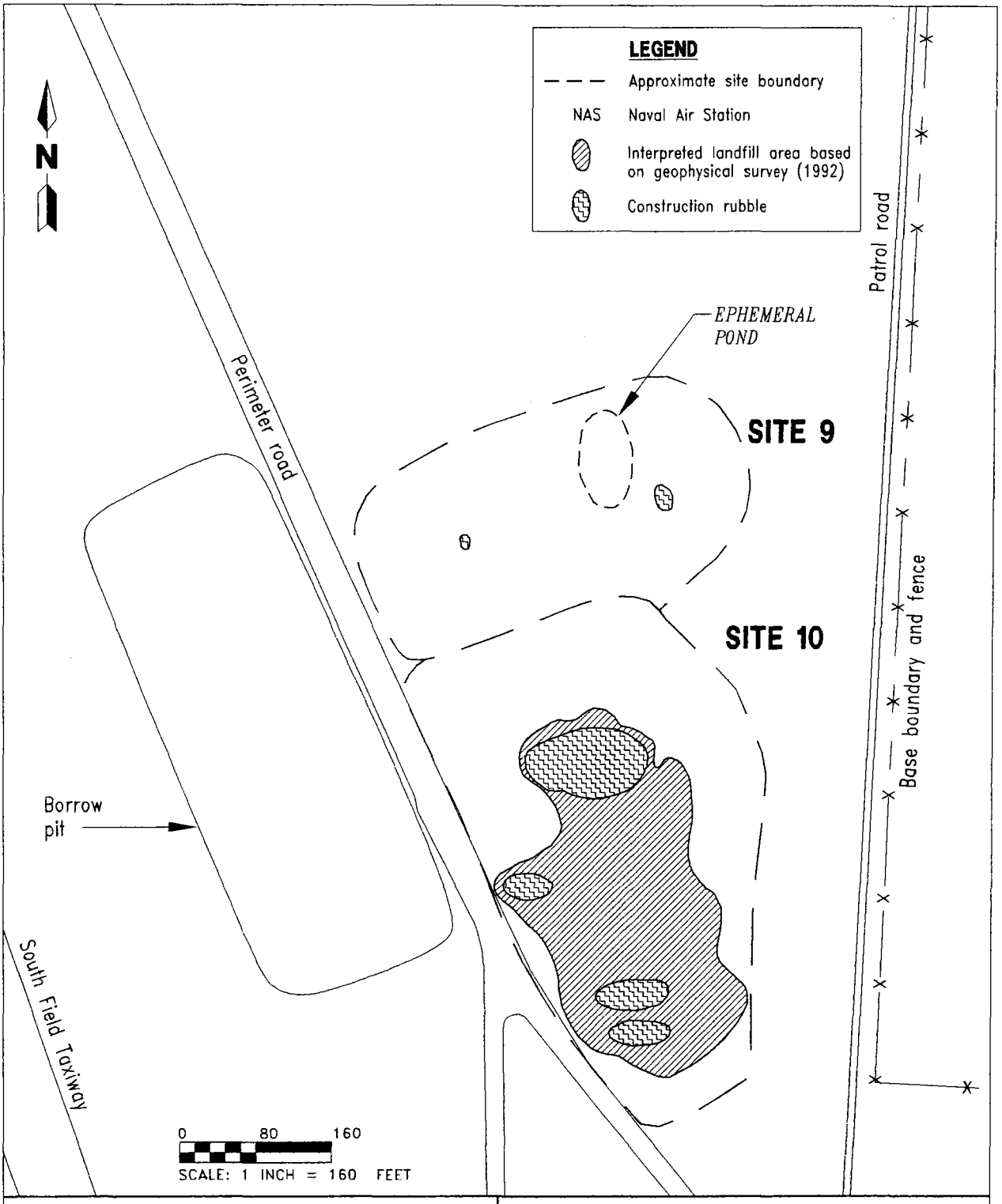

FIGURE 1-2
SITES 9 AND 10
GENERAL FEATURES

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FEASIBILITY STUDY
SITES 9 AND 10, WASTE FUEL DISPOSAL PIT AND SOUTHEAST OPEN DISPOSAL AREA (A)

NAS WHITING FIELD
MILTON, FLORIDA

The precise locations of the disposal areas at Site 10 are unknown; however, the approximate location of the disposal areas are shown on Figure 1-2, based on a geophysical survey conducted during the RI Phase IIA fieldwork (ABB-ES, 1993).

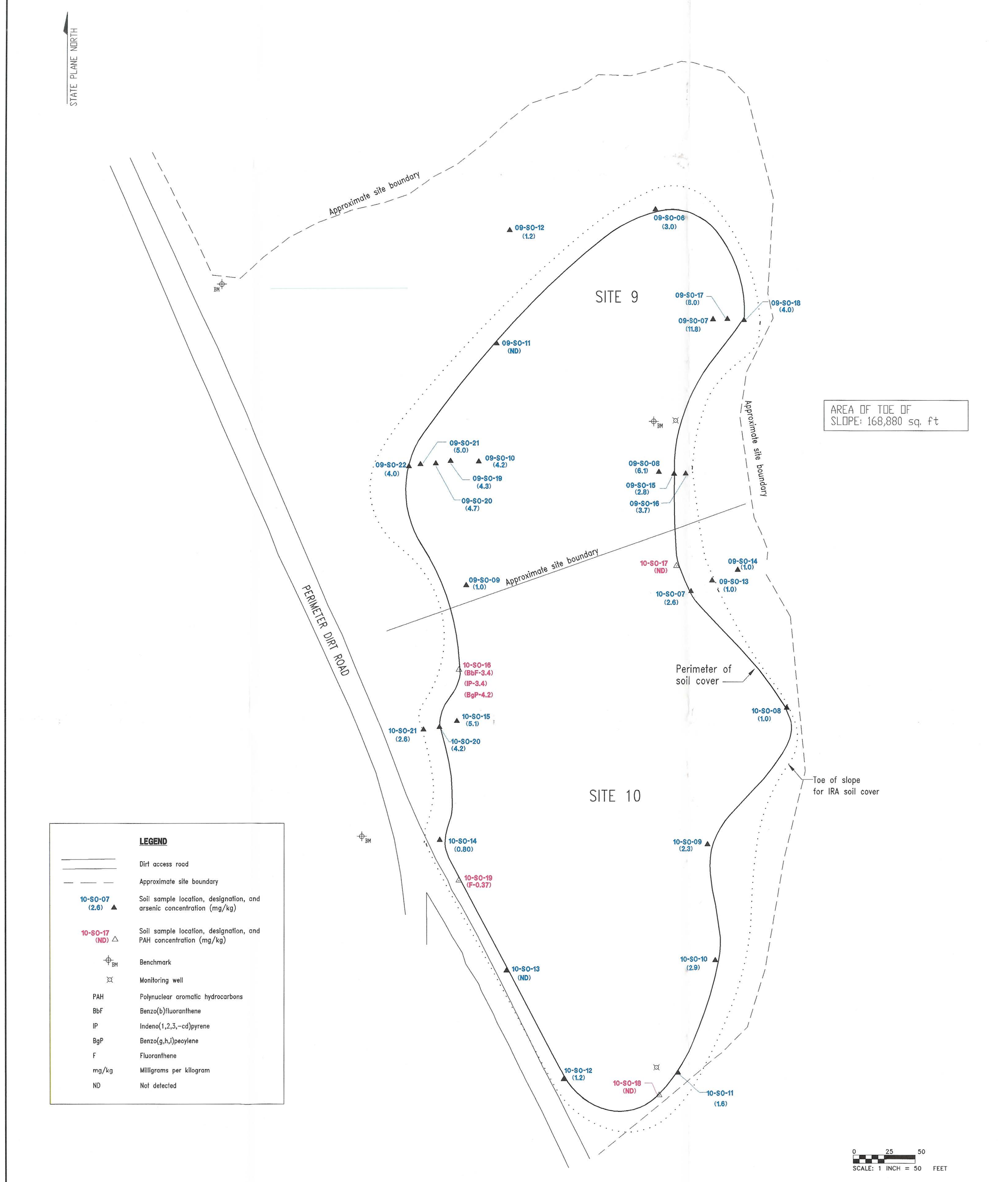
Prior to the IRA, the site consisted of shrubs and pine trees approximately 25 to 40 feet in height. Construction debris was present on the ground surface at the site.

According to the USDA (1980), the soil at Site 10 is classified as Troup loamy sand. Because the soil at the site is predominantly silty sand, storm water infiltrates directly into the soil.

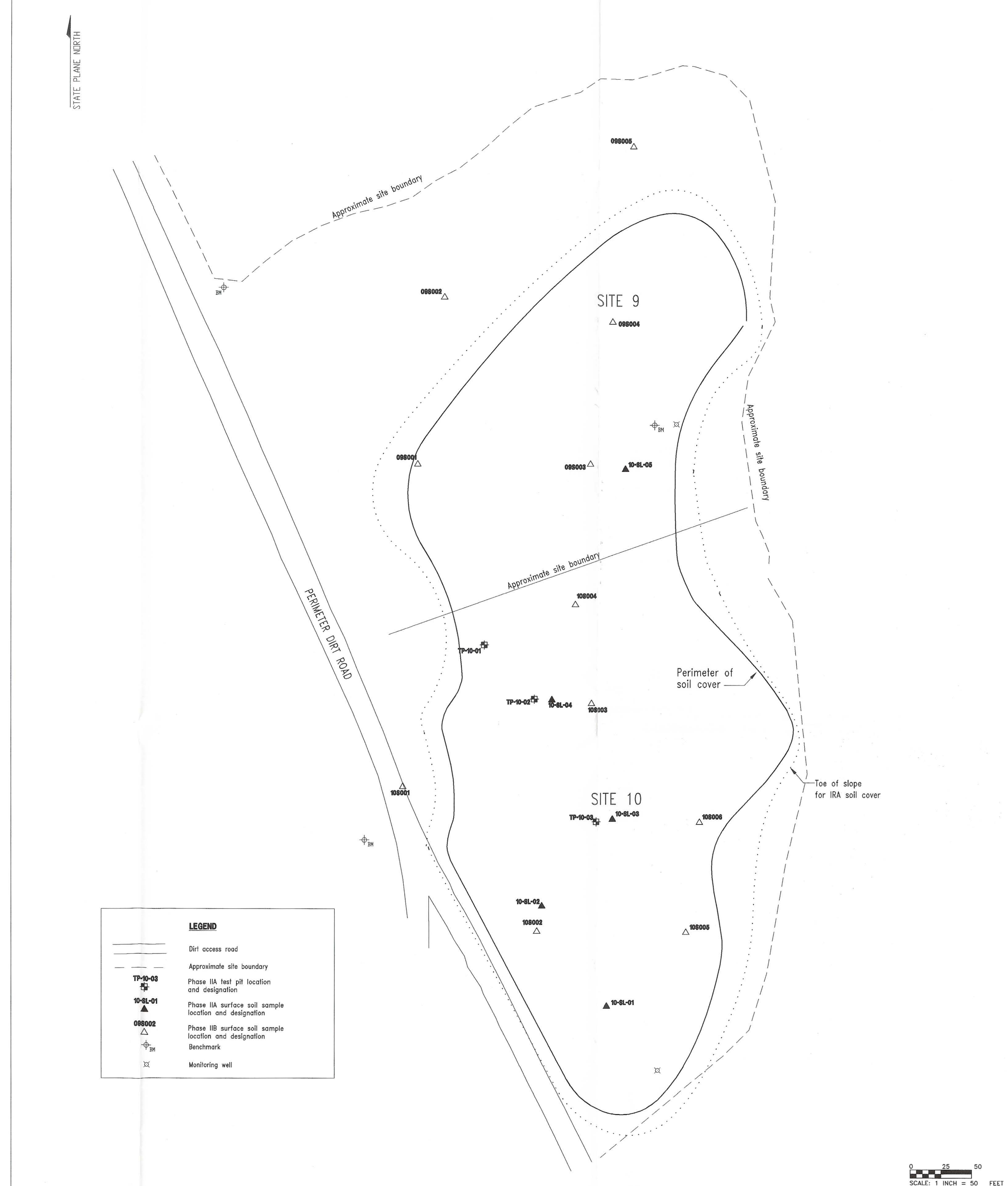
Based on previous investigations, Site 10 received wastes from a variety of sources, primarily construction and demolition debris. The results of the RI (ABB-ES, 1998) indicate that these wastes do not pose a principal threat to human health or the environment. As a result, Site 10 exhibits the characteristics of a CERCLA municipal landfill site and will be addressed as such in this FS.

1.4 INTERIM ACTIONS. Interim actions at Sites 9 and 10 were completed by Bechtel Environmental, Inc. (BEI) to address levels of arsenic in surface and subsurface soils in excess of Federal and State standards. The interim action at Site 9 consisted of placement of a permeable soil layer and vegetative cover over areas where previous activities resulted in chemical concentrations in surface soil exceeding the Florida industrial SCTLs (BEI, 1999). The interim action at Site 10 was similar to that at Site 9, except that the Site 10 debris piles were leveled and graded before continuing with the Site 10 IRA. The interim action began on January 11, 1999 and was completed on March 31, 1999.

A total of 15,940 cubic yards of fill material was placed on the sites and compacted. Figure 1-3 shows extent of the resulting soil cover at Sites 9 and 10. Additional information is presented in the draft Removal Action Completion Report, Sites 9, 10, 17, 18, 31C, Surface Soil Remediation (BEI, 1999).



IRA SAMPLE LOCATIONS AND ANALYTICAL RESULTS



RI SAMPLE LOCATIONS

FIGURE 1-3
LOCATION OF SOIL COVER AND IRA SOIL ANALYTICAL RESULTS

FEASIBILITY STUDY
SITES 9 AND 10

NAVAL STATION WHITING FIELD
MILTON, FLORIDA

2.0 REMEDIAL ACTION OBJECTIVES

This section presents the goals and objectives for remedial action at Sites 9 and 10, and provides the basis for selecting appropriate RAOs and, subsequently, identifying remedial technologies and developing alternatives to address contamination at the sites. To establish these objectives, ARARs are first identified (Section 2.1). Next, RAOs are defined based on consideration of ARARs, the results and conclusions of the RI, the RA, and other criteria (Section 2.2). Next, the volume of contaminated media for Sites 9 and 10 is presented (Section 2.3). Finally, general response actions appropriate for technology identification are discussed (Section 2.4). The information presented in this chapter will be used to identify appropriate remedial technologies for the sites (presented in Chapter 3.0).

2.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS. ARARs are Federal and State human health and environmental requirements used to define the appropriate extent of site cleanup, identify sensitive land areas or land uses, develop remedial alternatives, and direct site remediation. CERCLA and the NCP require that remedial actions comply with State ARARs that are more stringent than Federal ARARs, legally enforceable, and consistently enforced statewide.

The NCP defines two ARAR components: (1) applicable requirements, and (2) relevant and appropriate requirements.

> Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. State standards that may be applicable are only those which (1) have been identified by the State in a timely manner, (2) are consistently enforced, and (3) are more stringent than Federal requirements.
>
> Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements under Federal and State environmental and facility citing laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, or remedial action, address situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

"Applicability" is a legal determination of jurisdiction of existing statutes and regulations, whereas "relevant and appropriate" is a site-specific determination of the appropriateness of existing statutes and regulations. Therefore, relevant and appropriate requirements allow flexibility not provided by applicable requirements in the final determination of cleanup levels. Once a requirement is identified as an ARAR, the selected remedy must comply with ARARs, even if the ARAR is not required to assure protectiveness. The general relevant and appropriate requirements apply only to actions at the site. Applicable requirements apply to both on- and off-site remedial actions.

Other requirements "to be considered guidance material" (TBC) are Federal and State nonpromulgated advisories or guidance that are not legally binding and do not have the status of potential ARARs (i.e., they have not been promulgated by statute or regulation). However, if there are no specific ARARs for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

Under the description of ARARs set forth in the NCP and SARA, State and Federal ARARs are categorized as the following:

- chemical-specific (i.e., governing the extent of site remediation with regard to specific contaminants and pollutants);
- location-specific (i.e., governing site features such as wetland, floodplains, and sensitive ecosystems, and pertaining to existing natural and man-made site features such as historical or archaeological sites); and
- action-specific (i.e., pertaining to the proposed site remedies and governing the implementation of the selected site remedy).

During the detailed analysis of remedial alternatives, each alternative will be analyzed to determine its compliance with ARARs. Chemical-, location-, and action-specific ARARs are discussed in the following subsections and presented in Table 2-1.

2.1.1 Chemical-Specific ARARs Chemical-specific requirements are standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels or the basis for calculating such levels. Currently, there are no promulgated Federal or State chemical-specific ARARs that provide limits for the concentration of chemicals in soil. However, the State of Florida has promulgated Soil Cleanup Target Levels (SCTLs) under Chapter 62-777, Florida Administrative Code (FAC). The USEPA Region III has also developed a risk-based concentration (RBC) table which includes Soil Screening Levels for protection of groundwater and air (USEPA, 1997).

2.1.2 Location-Specific ARARs Location-specific ARARs govern site features (e.g., wetland, floodplains, wilderness areas, and endangered species) and manmade features (e.g., places of historical or archaeological significance). These ARARs place restrictions on concentrations of hazardous substances or the conduct of activities based solely on the site's particular characteristics or location.

As stated in the RI (ABB-ES, 1998), no State or federally listed rare, threatened, or endangered species or species of concern are known to inhabit Sites 9 and 10 (Nature Conservancy, 1997). Furthermore, Sites 9 and 10 are not located within the 100-year flood plain or known to contain areas of historical or archeological significance. Therefore, location-specific ARARs do not apply to Sites 9 and 10.

Table 2-1
Synopsis of Federal and State ARARs and Guidance for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Hazardous Substance and Contingency Plan Regulations (40 Code of Federal Regulations [CFR], Section 300.430)	Discusses the types of institutional controls to be established at CERCLA sites.	**Applicable.** These regulations may be used as guidance in establishing appropriate institutional controls at Sites 9 and 10.	Action-specific
Occupational Safety and Health Act (OSHA) Occupational Safety and Health Standards (29 CFR, Part 1910)	Requires establishment of programs to ensure worker health and safety at hazardous waste sites.	**Applicable.** These requirements apply to all response activities conducted in accordance with the National Contingency Plan. During the implementation of any remedial alternative for Sites 9 and 10, compliance with these regulations must be attained.	Action-specific
Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Waste (40 CFR, Part 261)	Defines those solid wastes that are subject to regulation as hazardous wastes.	**Relevant and Appropriate.** Any alternative that would excavate and dispose of soil off site would be sampled and analyzed for hazardous characteristics as defined by 40 CFR, Part 261.	Action-specific
RCRA Regulations, Standards Applicable to Transporters of Hazardous Wastes (40 CFR, Part 263)	Establishes the responsibilities of the generators and transporters of hazardous waste in the handling, transportation, and management of that waste. To avoid duplicative regulation, USEPA has expressly adopted certain U.S. Department of Transportation (DOT) regulations governing the transportation of hazardous waste.	**Relevant and Appropriate.** For excavation and off-site disposal alternatives, the hazardous material would need to be handled, manifested, and transported to a permitted off site disposal facility in compliance with these regulations.	Action-specific
RCRA Regulations, Landfills (40 CFR, Part 264, Subpart N)	Provides monitoring, inspection, closure, and post-closure care requirements for landfills that contain hazardous waste.	**TBC.** These regulations are not applicable to Sites 9 and 10 because they apply only to landfills that received waste after 1980; however, the requirements may be used as guidance for developing a landfill inspection program.	Guidance
RCRA Regulations, Releases from Solid Waste Management Units (40 CFR, Part 264, Subpart F)	Contains general groundwater monitoring requirements. Establishes detection and compliance monitoring programs that apply to owners and operators of solid waste units.	**TBC.** For capping alternatives, these regulations provide guidance for establishing and conducting a groundwater monitoring program at sites contaminated with RCRA wastes.	Guidance
Hazardous Materials Transportation Act Regulations (49 CFR, Parts 171-179)	DOT provides requirements for packaging, labeling, manifesting, and transporting hazardous materials. Similar requirements are found in 40 CFR, Part 263.	**Relevant and Appropriate.** For excavation and off site disposal alternatives, the hazardous material would need to be handled, manifested, and transported to a permitted off-site disposal facility in compliance with these regulations.	Action-specific

See notes at end of table.

Table 2-1 (Continued)
Synopsis of Federal and State ARARs and Guidance for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Solid Waste Disposal Act Regulations, Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258)	This rule establishes minimum standards for design and operation of municipal solid waste landfills.	**TBC.** Although this regulation applies to RCRA municipal landfills, not CERCLA landfills, some applications such as closure design and final cover design for closed landfills may apply.	Guidance
Design and Construction of RCRA/ CERCLA Final Covers (USEPA, 1991b)	Provides guidance on components of landfill closure, including long-term maintenance, groundwater monitoring, and institutional controls. Recommends groundwater sampling frequency and strategy.	**TBC.** This guidance may be used for establishing remedial action alternatives for closure of the Sites 9 and 10 disposal areas.	Guidance
Region III Risk-Based Concentrations (USEPA, 1997)	Provides RBCs from ingestion or exposure to chemicals in soil, tap water, ambient air, and fish consumption.	**Relevant and Appropriate.** The chemicals detected at Sites 9 and 10 are screened against these standards for selection of chemicals of concern and developing remedial action alternatives.	Chemical-specific
Florida Solid Waste Disposal Facility Regulations (Chapter 62-701, FAC)	Provides the minimum landfill final closure standards for inactive landfills. Chapter 62-701.600 provides information on closure procedures, permits, closure report, design plan, final cover design, and post-closure monitoring.	**Relevant and Appropriate.** Although these regulations are not directly applicable because Sites 9 and 10 did not receive wastes after the effective date of regulation (1985); Chapter 62-700.600, FAC, provides guidance on landfill cover design for capping alternatives at Sites 9 and 10.	Action-specific; Guidance
Florida Hazardous Waste Rules (Chapter 62-730, FAC)	Adopts specific sections of the Federal hazardous waste regulations, including the section regulating hazardous waste landfills (40 CFR, Part 264, Subpart N) and makes additions to these regulations.	**Relevant and Appropriate.** These regulations are not applicable to Sites 9 and 10 because they apply only to landfills that received waste after 1983; however, the requirements may be used as guidance for developing a landfill inspection program.	Chemical-specific; Action-specific

See notes at end of table.

Table 2-1 (Continued)
Synopsis of Federal and State ARARs and Guidance for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Florida Rules on Hazardous Waste Warning Signs (Chapter 62-736, FAC)	Requires warning signs at National Priorities List (NPL) sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** This requirement is applicable for sites that are on the NPL.	Action-specific
Florida Petroleum Contaminated Site Cleanup Criteria (Chapter 62-770, FAC)	Rule establishes a cleanup process to be followed at petroleum-contaminated sites. The cleanup criteria apply to sites contaminated with petroleum or petroleum products but does not apply to sites contaminated with significant quantities of other substances.	**Relevant and Appropriate.** Site 9 was a former waste fuel disposal pit; however, analytical data does not show evidence of petroleum contamination in the soil or groundwater. Site 10 does show evidence of petroleum contamination in soil; cleanup criteria may be used as guidance.	Chemical-specific
Florida Contaminant Cleanup Target Levels (Chapter 62-777, FAC)	Establishes soil and groundwater cleanup criteria.	**TBC.** The contaminant cleanup target levels should be considered when evaluating remedial goal options.	Chemical-specific

Notes: ARAR = applicable or relevant and appropriate requirement.
USEPA = U.S. Environmental Protection Agency.
USDOT = U.S. Department of Transportation.
TBC = to be considered guidance materials.

2.1.3 Action-Specific ARARs Action-specific ARARs are technology- or activity-based limitations controlling activities for remedial actions. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the detailed analysis of remedial alternatives. During the detailed analysis of alternatives, each alternative will be analyzed to determine compliance with action-specific ARARs.

Certain action-specific ARARs include permit requirements. Under CERCLA Section 121(e), permits are not required for remedial actions conducted entirely on site at Superfund sites. This permit exemption applies to all administrative requirements, including approval of or consultation with administrative bodies, documentation, record keeping, and enforcement. However, the substantive requirements of these ARARs must be attained.

2.1.4 To Be Considered Criteria As previously stated, TBCs are Federal and State nonpromulgated advisories or guidance that are not legally binding and do not have the status of being a potential ARAR (i.e., have not been promulgated by statute or regulation). However, if there are no specific regulatory requirements for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

2.2 IDENTIFICATION OF RAOs. RAOs are defined in the CERCLA RI/FS guidance manual as media-specific goals established to protect human health and the environment and are typically based on chemicals of concern, exposure routes, and receptors present or available at the site. RAOs are developed to ensure compliance with ARARs. RAOs for Sites 9 and 10 will be identified by consideration of ARARs, the RI, the baseline risk assessment and the IRA. Note that the risk assessment (ABB-ES, 1998) used to develop the RAOs was conducted before the IRA. The risk assessment will not be revised in light of the IRA. the interim actions were conducted to partially address the risk identified in the risk assessment. Therefore, RAOs will focus on the residual risk remaining following the IRA. The interim actions were conducted to partially address the risk identified in the risk assessment. Therefore, the RAOs will focus on the residential risk remaining following the IRA.

Groundwater. Groundwater at NAS Whiting Field has been identified as a separate site (Site 40) and will be investigated and remediated separately from Sites 9 and 10.

Surface Water. Site 9 used to contain a surface depression where standing water (i.e., ponding) occurred after heavy rainfall conditions. The surface water in the ephemeral pond was sampled and analyzed during the RI and a human health and ecological RA was completed. Results from the HHRA indicate that incidental ingestion and dermal contact with surface water while wading does not pose an unacceptable cancer or noncancer risk, based on USEPA and FDEP target thresholds. Furthermore, no lethal or sublethal risks were identified for wildlife ingestion of surface water at Site 9. Also, the IRA provided additional soil cover and the site was regraded. Therefore, no RAOs will be established for surface water at Site 9. Site 10 does not contain surface water; therefore, no RAOs are established.

Surface Soil. Chemical-specific ARARs and TBCs for surface soil were considered when identifying RAOs based on ARARs.

For Sites 9 and 10, arsenic was the primary COC detected in surface soil during the RI that exceeded its Florida industrial SCTL. At Site 10, other COCs such as polynuclear aromatic hydrocarbons (PAHs) were detected during the RI in surface soil that exceeded their respective Florida industrial SCTLs (Table 2-2).

Since Sites 9 and 10 and several other sites at NAS Whiting Field are disposal sites where the surface soil was removed and cover fill was brought to the site from an off-site borrow source, or where subsurface soils from other parts of NAS Whiting Field were used for cover fill, the Navy requested that FDEP consider a site-specific soil cleanup goal (SCG) for arsenic. The Navy recommended a site-specific SCG for arsenic at NAS Whiting Field disposal sites (Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, and 16) of 4.62 mg/kg. This request is included as Appendix A of this report.

Table 2-2
Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Surface Soil at Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Analyte	Frequency of Detection[1]	Range of Detected Analyte Concentrations	Mean Analyte Concentration[2]	Florida Soil Cleanup Target Level[3] Residential/-Industrial/Leaching	USEPA Region III RBCs[4] Residential/-Industrial
Inorganic Analytes (mg/kg) - Sites 9 and 10					
Arsenic (Site 9)	5/5	2.8 to 10.1	7.0	0.8/3.7/29	0.43/3.8
Arsenic (Site 10)	11/11	2.55 to 8.8	4.8	0.8/3.7/29	0.43/3.8
PAHs (µg/kg) - Site 10					
Benzo(a)pyrene	6/11	45 to 2,500	627	100/500/8,000	88/780
Dibenz(a,h)anthracene	2/11	177.5 to 1,000	589	100/500/30,000	88/780
TRPH (mg/kg) - Site 10					
TRPH	3/11	3.3 to 666	252	340/2,500/340	NA

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] The mean of detected concentrations is the arithmetic mean of all environmental samples in which the analyte was detected, including duplicate samples. The arithmetic mean does not include those environmental samples in which the analyte was not detected.
[3] Source: Florida Contaminant Cleanup Target Levels Chapter 62-777, Florida Administrative Code (1999).
[4] USEPA Region III RBCs for soil ingestion based on an excess lifetime cancer risk of 10^{-6} or an adjusted hazard quotient of 0.1 (October 1998).

Notes: ARAR = applicable or relevant and appropriate requirement.
TBC = to be considered guidance material.
USEPA = U.S. Environmental Protection Agency.
RBC = risk-based concentration.
mg/kg = milligrams per kilogram.
PAHs = polynuclear aromatic hydrocarbon.
µg/kg = micrograms per kilogram.
NA = not available.
TRPH = total recoverable petroleum hydrocarbons.

The FDEP responded to this request in a letter dated April 27, 1998 (Appendix B). The FDEP concurred that a site-specific soil cleanup goal for arsenic of 4.62 mg/kg is acceptable at NAS Whiting Field disposal sites, given the following conditions:

1. In the future, the disposal sites will be used for activities that involve less than full-time contact with surface soil at the site. These activities could include parks, recreation areas, or agricultural sites.

2. The Navy will incorporate these land-use considerations into a legally binding Land-Use Control (LUC) Agreement.

3. The SCG for arsenic will not be used at any other site without prior FDEP approval.

Several surface soil samples taken during the RI at Sites 9 and 10 showed analytical results for arsenic greater than this site-specific SCG. Table 2-2 compares the RI surface soil analytical results for Sites 9 and 10 COCs with SCTLs, RBCs, and the site-specific arsenic SCG. As the table shows, the site-specific SCG for arsenic was exceeded at both sites, while SCTLs for PAHs were exceeded at Site 10. In response, the Navy conducted the interim action at Sites 9 and 10.

The interim action conducted at Sites 9 and 10 involved placing 2 feet of clean soil and vegetative cover over the former landfills. The soil cover addressed exposure to surface soil contamination by residents, trespassers, and excavation workers. The extent of this soil cover was governed by site-specific COC concentrations. At Site 9, areas determined to have surface soil arsenic concentrations greater than the site-specific SCTL of 4.62 mg/kg were covered. At Site 10, areas determined to have surface soil arsenic concentrations greater than the site-specific SCTL of 4.62 mg/kg and/or PAH concentrations greater than SCTLs were covered. The fate of the remaining surface soil with arsenic concentrations below the site-specific SCG for arsenic is still governed by the letter from the FDEP dated April 27, 1998. Also, those areas of Site 10 with surface soil PAH concentrations below the industrial SCTLs may have PAH concentrations greater than residential SCTLs. Thus, a LUC Agreement is necessary to comply with the above-mentioned letter from the FDEP. Therefore, the following RAO is established for Sites 9 and 10:

> RAO 1: Address human health concerns due to arsenic and PAH concentrations greater than residential SCTLs.

The human health risk assessment (HHRA) and the ecological risk assessment (ERA) were conducted before the IRA. To summarize the results of the HHRA, excess lifetime cancer risks (ELCR) for occupational workers at Sites 9 and 10 above the 1×10^{-6} FDEP target risk threshold were caused by arsenic, PAHs, and Aroclor-1254. The IRA addressed the risks posed by these contaminants by covering all areas where Aroclor-1254 was detected, and by covering areas of surface soil with arsenic and PAH concentrations above the industrial SCTL (PAHs) or site-specific SCG (arsenic). Noncancer risks at Sites 9 and 10 were at acceptable levels under an industrial use scenario.

The ERA found that ecological risks posed by surface soil contaminants of potential concern at Sites 9 and 10 was primarily due to elevated total

recoverable petroleum hydrocarbon (TRPH) concentrations. The IRA also addressed these ecological risks by covering those areas with TRPH concentrations above 100 mg/kg.

Comparison of Site 9 RI surface soil data to leachability SCTLs reveals that no analytes exceed leachability SCTLs. Site 10 RI surface soil (prior to RRA) exceeds leachability SCTLs for TRPH and dieldrin. This will be addressed in the basewide groundwater study.

In light of the conditions currently existing at Sites 9 and 10 following the interim actions, no additional RAOs are necessary to address the risks posed by surface soils identified at Sites 9 and 10.

Subsurface Soil. Chemical-specific ARARs and TBCs for subsurface soil were considered when identifying RAOs.

During the RI, subsurface soil samples were not collected at Site 9 based on the results of the surface soil samples and lack of evidence of buried wastes from the geophysical survey (ABB-ES, 1993). For Site 10, subsurface soil samples were collected and none of the chemicals detected in subsurface soil were selected as human health or ecological COCs. Furthermore, the chemicals detected in subsurface soil at Site 10 were compared to the Florida SCTLs for industrial sites and no exceedances were noted (Appendix E). However, since the RI, the IRA has made what once were surface soils into subsurface soils. As noted in the Surface Soil discussion above, surface soils with arsenic and PAH concentrations above site-specific SCGs and industrial SCTLs, respectively, were covered with 2 feet of clean soil during the IRA. Direct exposure to these subsurface soils will only occur in the event of invasive activities at Sites 9 and 10. In order to address the risk posed by this direct exposure, the following RAO is established:

RAO 2: Incorporate provisions into the LUCs to address the risk of exposure to an excavation worker at Sites 9 and 10.

Waste Disposal. Action-specific ARARs related to landfill closure were considered for identifying RAOs. In order to complete this review, it was noted that the disposal sites at Sites 9 and 10 did not receive wastes after 1973. Based on this review, Federal landfill closure regulations were deemed not applicable to Sites 9 and 10 for the following reasons:

- Federal regulations for closure of Resource Conservation and Recovery Act (RCRA) hazardous waste landfills (40 CFR, Part 264, Subpart N) are not applicable because the disposal sites did not receive waste after the effective date of RCRA, November 19, 1980;

- Federal regulations for the closure of solid waste landfills (40 CFR, Part 258) are not applicable because the disposal site did not receive waste after the effective date of the regulation, October 9, 1991; and

- Florida Solid Waste Disposal Facilities Regulations (Chapter 62-701, FAC) are not applicable because the disposal site did not receive waste after the effective date of the regulation, July 1, 1985.

The closure requirements described in these regulations do not apply to disposal areas that received their final covers before 1983; however, closure certification of the site has not been provided by the FDEP. Therefore, the following RAO has been developed for Sites 9 and 10:

RAO 3: Complete closure of the disposal areas in accordance with State and Federal ARARs for landfill closure.

Other Considerations. Although the above-referenced regulations are not directly applicable to remedial action at Sites 9 and 10, portions of the regulations may be relevant for developing remedial alternatives for the sites. For example, the *Draft Technical Manual for Solid Waste Disposal Criteria* (USEPA, 1992) provides information regarding statistical evaluation of groundwater monitoring data. In addition, guidance published for CERCLA sites provides information regarding closure of CERCLA landfills.

As stated in *Design and Construction of RCRA/CERCLA Final Covers* (USEPA, 1991b), closure of CERCLA landfills that are not subject to specific closure regulations can be achieved by "hybrid-landfill closure." A "hybrid-landfill closure" may be used when residual contamination poses a direct contact threat, but does not pose a groundwater threat. As indicated from the results of the RI (ABB-ES, 1998), chemicals in soil and groundwater at Sites 9 and 10 do not pose a serious groundwater threat. Therefore, Sites 9 and 10 qualify for a hybrid-landfill closure, and USEPA guidance (USEPA, 1991b) suggests the following items be considered for hybrid-landfill closures:

- covers, which may be permeable, to prevent a direct-contact threat;
- limited long-term cover maintenance;
- minimal groundwater monitoring; and
- institutional controls (e.g., land use-restrictions), as necessary.

Based on consideration of these items and the recommendations of the RI (including the RA), some or several of these components will be considered in developing remedial alternatives for Sites 9 and 10.

Summary of RAOs. Three RAOs have been established for Sites 9 and 10. Table 2-3 lists these RAOs.

Table 2-3
Summary of Remedial Action Objectives for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Remedial Action Objective	Description
1	Address human health concerns due to arsenic and PAH concentrations greater than residential SCTLs.
2	Incorporate provisions into the LUCs to address risk of exposure to an excavation worker at Sites 9 and 10.
3	Complete closure of the disposal areas in accordance with State and Federal ARARs for landfill closure.

Notes: LUC = land-use control.
SCTL = soil cleanup target level.
ARAR = applicable or relevant and appropriate requirement.

2.3 VOLUME OF CONTAMINATED MEDIA. Appendix C contains detailed calculations used to develop the soil volume.

2.4 IDENTIFICATION OF GENERAL RESPONSE ACTIONS. General response actions describe potential medium-specific measures that may be employed to address RAOs. Potential response actions for CERCLA sites include the following general response categories:

- no action
- limited action
- containment
- treatment (either *in situ* or *ex situ*)
- disposal

To develop appropriate response actions for former disposal sites, the NCP and USEPA provide guidance for developing general response actions for such sites. The USEPA has produced a document entitled *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a). Because municipal landfill sites typically have similar characteristics as land disposal sites, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for landfills that pose a relatively low long-term threat or where treatment is impracticable (Section 300.430[a][1][iii][B]). Therefore, the number of general response actions identified for Sites 9 and 10 are limited based on these guidance documents.

The USEPA states in *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a) that treatment technologies should be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii][A]). However, the RI for Sites 9 and 10 did not identify highly toxic areas or materials that pose a principal threat; therefore, the general response actions identified for Sites 9 and 10 do not include physical or thermal treatment technologies. Furthermore, the IRA implemented at Sites 9 and 10 was a containment action that renders further containment actions redundant. As a result, the presumptive remedy for Sites 9 and 10 are focused on limited action and/or treatment and disposal technologies rather than on physical or chemical treatment technologies.

In summary, the general response actions identified for Sites 9 and 10 include the following:

- no action,
- limited action (i.e., land-use controls),
- disposal (i.e., soil removal).

3.0 REMEDIAL ACTION ALTERNATIVES

The approach and rationale leading to the development of remedial alternatives for Sites 9 and 10 are presented in this chapter. The development of remedial alternatives for CERCLA sites consists of identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial alternatives that accomplish the RAOs identified in Chapter 2.0.

The NCP requires that a range of remedial alternatives be considered, and SARA emphasizes the use of treatment technologies. Treatment alternatives range from those that eliminate the need for long-term management to those that reduce toxicity, mobility, or volume of contaminants. As stated in Section 2.4, the RI did not identify areas of highly toxic or mobile material that posed a principal threat; therefore, treatment technologies are not considered applicable. Also, the relatively low concentrations of COCs in subsurface soil make treatment technologies impractical and not cost effective. Therefore, the presumptive remedies for soil contamination at Sites 9 and 10 include limited action and excavation alternatives.

The range of alternatives considered in this FS include alternatives from the following categories:

- no action,
- limited action (LUCs), and
- soil removal and LUCs (i.e., excavation and disposal).

In the following sections, technologies that contribute to achieving the RAOs are identified and evaluated. Next, alternatives are developed using the selected technologies. A detailed evaluation of remedial alternatives is presented in Chapter 4.0.

3.1 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES FOR SITES 9 AND 10.

The purpose of this section is to identify and screen appropriate technologies for assembly into remedial alternatives that address RAOs identified for Sites 9 and 10. Each technology is then screened based on site- and waste-limiting characteristics.

Site characteristics considered during this process included the following:

- site geology, hydrogeology, and terrain;
- availability of space and resources necessary to implement the technology; and
- presence of special site features (e.g., wetlands, forest areas, floodplains, or endangered species).

Based on the review of site characteristics, no special site features or characteristics exist at Sites 9 and 10 that would preclude any remedial technology from implementation.

The following waste characteristics were also considered:

- contaminated media,
- types and concentrations of waste constituents, and
- physical and chemical properties of the waste (e.g., volatility, solubility, and mobility).

Table 3-1 presents and screens the remedial technologies applicable for addressing the RAOs at Sites 9 and 10. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site- and waste-limiting factors. Technologies deemed ineffective or not implementable (such as physical or chemical treatment technologies) were eliminated from Table 3-1. The remaining technologies are assembled into remedial alternatives in Section 3.2.

Currently, COCs in Sites 9 and 10 soils are not known to be leaching into groundwater nor does groundwater pose a principal threat to human health and the environment. However, some alternatives propose to manage COCs in soils through limited action. For these alternatives, long-term groundwater monitoring may be necessary for Sites 9 and 10. Because groundwater assessment and monitoring will be presented under a basewide groundwater RI/FS designated Site 40, groundwater monitoring will not be included as a component in any alternatives for this FS.

3.2 REMEDIAL ALTERNATIVES FOR SITES 9 AND 10. Remedial technologies that passed the technology screening are assembled into alternatives that meet the RAOs. Table 3-2 presents the alternative development for Sites 9 and 10. The alternatives for Sites 9 and 10 were developed to address closure of the disposal areas at Sites 9 and 10 in accordance with ARARs.

Based on the applicable technologies identified in the preceding section, three remedial alternatives were developed for Sites 9 and 10. These alternatives are options under the no action, limited action, and disposal general response categories. The no action alternative was developed to provide a baseline for comparison with other alternatives (USEPA, 1988). The alternatives developed for Sites 9 and 10 are discussed in the following subsections.

3.2.1 Alternative 1: No Action The NCP requires the development of the no action alternative to provide a baseline for comparison against other remedial alternatives. This alternative does not involve the implementation of any remedial technologies to treat wastes at Sites 9 and 10. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. The 5-year site review typically involves an administrative review of site records. For this FS, Alternative 1 would include 5-year reviews for a period of 30 years. A period of 30 years was chosen for costing purposes only.

3.2.2 Alternative 2: Land Use Controls Alternative 2 consists of activities necessary to complete closure of the disposal sites at Sites 9 and 10 with the interim action of a soil cover in place (Figure 1-3):

- development and implementation of LUCs such as the LUC Implementation Plan (LUCIP),
- 5-year site reviews.

Table 3-1
Identification and Screening of Remedial Technologies for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
No Action				
No action	No remedial actions are taken at Sites 9 and 10. Five-year site reviews would be required.	Applicable.	Applicable.	Retained. This alternative is retained for a baseline for comparison with other alternatives as required by CERCLA.
Five-year site reviews	Under CERCLA, if wastes are left on a site after closure, the site should be reviewed every 5 years.	Applicable.	Applicable.	Retained. This alternative is retained based on the CERCLA requirement that if wastes remain on site after closure, a review of the site must be completed every 5 years.
Limited Action				
Land-use controls (LUC)	Use of LUC documents to maintain the site for non-residential purposes.	Applicable.	Applicable.	Retained. This alternative is retained because it would achieve RAO 1, 2, and 3.
LUC Implementation Plan (LUCIP)	Identifies each LUC objective for Sites 9 and 10 and specifies actions required to achieve those objectives (i.e, deed restrictions, restrictions on excavation). LUCIP includes a description of the disposal history and the status of the site conditions during inspections and sampling and analysis, if required.	Applicable.	Applicable.	Retained. May be necessary to obtain landfill closure certification. This component would achieve RAO 3.

See notes at end of table.

Table 3-1 (Continued)
Identification and Screening of Remedial Technologies for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
Disposal				
Excavate Soil	Surface soil is excavated to a depth of 4 feet in contaminated areas.	Applicable. Site is accessible for removal or excavation activities.	Applicable. Isolated "hot spot" areas have been identified where soil containing COCs above action levels would be removed.	Retained. Would achieve RAO 1, 2, and 3 and eliminate risks to human health and ecological receptors.
Off-site Soil Disposal:				
RCRA Subtitle D Solid Waste Landfill	Excavated soil is sampled and analyzed for waste classification. Soil is transported to a non-hazardous, solid waste landfill based on analytical results from excavated soil.	Applicable.	Not Applicable. Analytical results from the RI indicate that the soil would be classified as hazardous.	Eliminated.
RCRA Subtitle C Hazardous Waste Landfill	Excavated soil is sampled and analyzed for waste classification. Soil is transported to a hazardous, solid waste landfill based on analytical results from excavated soil.	Applicable.	Not Applicable. Analytical results from the RI indicate that the soil would not be classified as hazardous.	Retained. Would achieve RAO 3 and eliminate risks to human health and ecological receptors.

Notes: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
RAO = remedial action objective.
COC = chemical of concern.
RCRA = Resource Conservation and Recovery Act.
RI = remedial investigation.

Table 3-2
Development of Remedial Alternatives for Sites 9 and 10

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Alternative	Description of Key Components
Alternative 1: No action	Five-year site reviews.
Alternative 2: Land use controls	Land-Use Controls (LUCs) including LUC Implementation Plan (LUCIP). Five-year site reviews.
Alternative 3: Soil Removal and LUCs	LUCs including LUCIP. Soil Excavation. Sample and analyze excavated soil for waste classification. Confirmatory sampling of open excavation areas. Backfill excavation with clean fill. Establish vegetative cover. Five-year site reviews.

LUCs, such as documents that restrict the use of the land in the vicinity of a landfill and place regulatory controls on excavation of soil, would be drafted, implemented, and enforced in compliance with local regulations as a part of this alternative. The LUCs would be enforced on the parcel of land encompassing the disposal site, including a typical buffer zone, as is currently used at other sites in the State.

Once the buffer zone has been established, warning signs will be posted to discourage trespassing. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years.

3.2.3 Alternative 3: Soil Removal and LUCs One disposal alternative was developed for Sites 9 and 10 that consists of all components of Alternative 2 with the addition of soil removal and disposal. Disposal alternatives require no treatment of contaminated materials. This alternative would include LUCs and planning, site preparation, excavating, soil sampling, and off-site disposal.

Under this alternative, soil would be excavated and transported to a Subtitle C solid waste landfill. Removal of the soil would eliminate potential exposure to COCs by human and ecological receptors.

After the soil has been excavated and disposed, clean fill would be imported to the site and backfilled into the excavated areas. The area would be restored with a vegetative support layer and vegetative cover. All equipment would be demobilized and the site would be closed in accordance with CERCLA. Similar to Alternative 2, LUCs and LUC Plans would be implemented. A 5-year site review would be conducted to assess the need for additional site monitoring and sampling, if necessary.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

This chapter presents detailed analyses of alternatives for Sites 9 and 10 at NAS Whiting Field. A detailed analysis is performed to provide decision makers with sufficient information to select the appropriate remedial alternative for a site. The detailed analysis has been conducted in accordance with CERCLA Section 121, the NCP, and USEPA RI/FS Guidance (USEPA, 1988). The detailed evaluation of each remedial alternative includes the following:

- a detailed description of the alternative, emphasizing the applications of the technology or actions proposed for each alternative; and

- a detailed analysis of the alternative against seven of the nine CERCLA criteria.

The remedial alternatives are examined with respect to the requirements stipulated by CERCLA and factors described in the USEPA's *Guidance for Conducting RI/FS Under CERCLA* (USEPA, 1988). The nine criteria from the RI/FS Guidance document are

- overall protection of human health and the environment,
- compliance with ARARs,
- long-term effectiveness and permanence,
- reduction of toxicity, mobility, and volume of contaminants through treatment,
- short-term effectiveness,
- implementability,
- cost,
- State acceptance, and
- community acceptance.

This FS presents evaluation of the first seven criteria in the alternative evaluation process. Table 4-1 outlines the specific elements considered for these seven criteria.

Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the Final FS, and a summary of State acceptance of this FS will be included in the Final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

4.1 DETAILED ANALYSIS FOR ALTERNATIVE 1: NO ACTION. Alternative 1 is a no action alternative. Under this alternative, no action would be taken to address contamination at the site. A description of this alternative is presented in Subsection 4.1.1, and a technical assessment of this alternative is presented in Subsection 4.1.2.

Table 4-1
Criteria for Evaluation of Remedial Action Alternatives

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Factors	Criteria to Consider
Overall protection of human health and the environment	How risks are eliminated, reduced, or controlled. Short-term or cross-media effects.
Compliance with ARARs	Compliance with chemical-specific ARARs. Compliance with location-specific ARARs. Compliance with action-specific ARARs.
Long-term effectiveness and permanence	Magnitude of residual risk. Adequacy of controls. Reliability of controls.
Reduction of mobility, toxicity, and volume of contaminants through treatment	Treatment process and remedy. Amount of hazardous materials destroyed or treated. Reduction of mobility, toxicity, or volume through treatment. Irreversibility of treatment. Type and quantity of treatment residual.
Short-term effectiveness	Protection of community during remedial action. Protection of workers during remedial action. Environmental effects. Time until RAOs are achieved.
Implementability	Ease of remedial construction. Reliability of technology. Ease of undertaking additional remedial action, if necessary. Coordination with other agencies.
Cost	Capital cost. Operation and maintenance cost. Total present worth of alternative.

Notes: ARAR = applicable or relevant and appropriate requirement.
RAO = remedial action objective.

4.1.1 Detailed Description of Alternative 1 In accordance with the NCP, the no-action alternative is used as a baseline for comparison against other alternatives. Because hazardous substances, pollutants, or contaminants would be left in place at Sites 9 and 10, this alternative would include 5-year site reviews. Under this alternative, soils would remain in place, thus allowing natural processes to reduce the concentrations of organic COCs (PAHs and TRPH); however, concentrations of inorganic COCs (arsenic) would not be reduced. No other additional remedial or institutional controls would be implemented under this alternative. There would be no restrictions on land-use types; therefore, the site could be used for residential, industrial, or commercial uses.

Five-Year Site Reviews. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. It is assumed, for this FS, that these reviews would occur over a 30-year period. These reviews would consist of evaluating changes to site conditions at the site (e.g., construction, demolition, change in potential receptors, migration pathways, qualitative risks, etc.) to assess whether or not human health and the environment continue to be protected by the alternative. The appropriateness of this alternative would then be compared to other remedial alternatives to confirm that it is still the most appropriate selection.

4.1.2 Technical Criteria Assessment of Alternative 1 This subsection provides the technical criteria assessment of Alternative 1 against the seven criteria.

Overall Protection of Human Health and the Environment. This alternative would provide no additional protection to human or ecological receptors who may be exposed to surface soil at Sites 9 and 10. If this alternative were selected, 5-year site reviews would be instituted. No adverse short-term or cross-media effects are anticipated with this no-action alternative.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., maximum contaminant levels [MCLs], Florida SCTLs in the short term. In the long term, this alternative would not comply with ARARs for arsenic concentrations in soil, as no action would take place to eliminate potential residential exposure to arsenic in surface soils. Recall that areas with arsenic concentrations below industrial SCTLs, but above residential SCTLs are still exposed at Sites 9 and 10.

Long-Term Effectiveness and Permanence. Naturally occurring processes such as biological activity may reduce PAH and TRPH concentrations in the soil over the long term, but would not address arsenic in soil. Risks to excavation workers and/or residents due to arsenic would not be addressed by this alternative.

Administrative actions proposed in this alternative (e.g., 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative, but would not provide a permanent remedy for the site. Administrative actions are considered to be reliable controls.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Although treatment is not included in this alternative, this alternative may provide some reduction in PAH and TRPH toxicity through natural degradation processes. No reduction in arsenic toxicity is anticipated; however, arsenic can form low-solubility metal arsenates. This alternative would not provide a

reduction in contaminant mobility or volume because active mitigation of contaminant mobility or reduction in volume is not proposed. On the other hand, treatment residuals would not be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would not reduce human health risks in the short term because no land-use restrictions or active treatment would be implemented.

This alternative would not comply with RAOs in the short term because land-use controls would not be established, excavation and drilling workers would not be protected from direct exposure and leachability SCTLs exceedances at Site 10 would not be addressed. This alternative does not pose a threat to remedial construction workers through exposure to contaminated soil because remedial construction activities are not proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 1 is presented on Table 4-2. The cost includes 5-year site reviews over a 30-year monitoring period. A 30-year period was chosen because RI/FS guidance suggests using this timeframe when contaminants are left on site. The total present worth cost of Alternative 1 is $29,000. Cost estimates are presented in Appendix D.

Table 4-2
Cost Summary Table, Alternative 1: No Action

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Operation and Maintenance Cost (O&M) (per event)		
5-year site review		$8,000
	Total O&M cost (per event)	$8,000
	Total O&M cost (present worth of semi-annual O&M for 30 years)	$26,000
	Contingency (10 percent)	$3,000
	Total cost Alternative 1: No Action	$29,000

Note: Line item costs are rounded to the nearest $1,000. Total cost is based on a present worth cost over a 30-year period. See Appendix D for cost details.

4.2 DETAILED ANALYSIS FOR ALTERNATIVE 2: LAND-USE CONTROLS. Alternative 2 consists of LUCs to limit the exposure to surface and subsurface soils at Sites 9 and 10. A description of this alternative is presented in Subsection 4.2.1 and a technical assessment of this alternative is presented in Subsection 4.2.2.

4.2.1 Detailed Description of Alternative 2 Under this alternative, LUCs would be implemented to provide protection of human receptors. LUCs would involve the use of institutional controls that would restrict the use of the land in the vicinity of Sites 9 and 10 to non-residential use only. LUCs would place regulatory controls on the excavation of soil or similar activities that have the

potential to disturb the site soil or increase the likelihood of exposure to the site soil.

The LUCs would be placed on a parcel of land slightly larger than the boundaries of Sites 9 and 10. This would ensure that an appropriate buffer zone is created and maintained between the disposal areas and other areas of NAS Whiting Field.

The LUCs would remain in place indefinitely, or until such time as it was determined that contamination levels were non-hazardous to all potential (i.e., residential) receptors. As part of this alternative, a quarterly site inspection program would be established to insure that compliance with the agreed upon LUCs is maintained. The results of these inspections would be summarized in annual reports provided to appropriate parties. The inspection and reporting activities would be performed as long as the LUCs are in place. The following components would be included as part of this alternative:

- LUCs
- 5-year site reviews

LUCs. Under new USEPA Region IV guidance (USEPA, 1998), the use of LUCs as a remedy for contaminated sites requires the development of an LUCAP, as provided in the Memorandum of Agreement (MOA) dated November 1999, and an LUCIP. These two documents detail the actions required when LUCs are selected as a remedy for a site.

The LUCIP is developed for each site where LUCs are necessary on the facility. The LUCIP would include details regarding additional required activities, such as quarterly and annual inspections and reporting for the specific area. These activities are required as part of the LUC agreement to insure compliance while the LUCs for the sites are in effect. Further, as LUCs will remain in effect until the contamination at the sites has been adequately addressed, the activities identified in the LUCIP will also remain in effect until such time that the contamination present at the sites has been adequately addressed.

5-Year Site Reviews. Refer to Subsection 4.1.1 for a detailed description of these reviews.

4.2.2 Technical Criteria Assessment of Alternative 2 This subsection presents the technical criteria assessment of Alternative 2.

Overall Protection of Human Health and the Environment. Human receptors would be protected if this alternative were implemented. Regulatory controls (i.e., LUCs) would prohibit potential future residents from exposure to the site because residential use of the site would be restricted under the proposed LUCs. However, this alternative would not address the exceedance of leachability SCTLs.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., Florida SCTLs) in the short term. Eventually, this alternative may comply with ARARs for PAHs and TRPH if natural processes in the soil reduce organic contaminant concentrations.

Long-Term Effectiveness and Permanence. Naturally occurring processes, such as biological activity, may reduce organic contaminant concentrations (PAHs and TRPH) in the soil over the long term but would not reduce arsenic concentrations.

The risks presented to the future resident based on exposure to surface soil at the site would be addressed via the LUCs. The long-term effectiveness and permanence of these controls will be controlled by the facility under the LUCAP developed for NAS Whiting Field.

Administrative actions proposed in this alternative (e.g., LUCs and 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative. These administrative actions are considered to be reliable controls.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Although treatment is not included in this alternative, this alternative may provide some reduction in PAH and TRPH toxicity through natural degradation processes. No reduction in arsenic toxicity is anticipated; however, arsenic can form low-solubility metal arsenates. This alternative would not provide a reduction in contaminant mobility or volume because active mitigation of contaminant mobility or reduction in volume is not proposed. On the other hand, treatment residuals would not be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would reduce human health risks in the short term by reducing the potential exposure to Sites 9 and 10 surface soil by human receptors. Furthermore, the threat to trespassers is considered to be minimal. Access to the base is restricted and continued operation of the base is expected.

This alternative does not pose a threat to workers through exposure to contaminated soil because no construction activities are proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as LUCs and 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 2 is presented on Table 4-3. Both the LUCs and 5-year site reviews were costed over a 30-year monitoring period. A 30-year period was chosen because RI/FS guidance suggest using this timeframe where COCs remain on site. The total present worth cost of Alternative 2 is $183,000. Cost estimates are presented in Appendix D.

4.3 DETAILED ANALYSIS FOR ALTERNATIVE 3: SOIL REMOVAL AND LUCS. Alternative 3 includes remedial actions to excavate the constructed soil cover and pre-construction "hot spot" surface soil areas at Sites 9 and 10 and dispose of the excavated soil at an FDEP-approved and permitted disposal facility. A description of this alternative is presented in Subsection 4.3.1 and a technical criteria assessment of this alternative is presented in Subsection 4.3.2.

4.3.1 Detailed Description of Alternative 3 Under this alternative, the top 4 feet of soil (constructed soil cover and 2 feet of original surface soil) would be excavated, sampled and analyzed, transported and disposed at a CERCLA-approved and FDEP-approved offsite disposal facility. Based on the low COC concentrations in surface soil during the RI, the excavated soil would most likely be suitable for disposal at a Subtitle D (non-hazardous, solid waste) facility. Excavation and offsite disposal of the contaminated surface soil would eliminate COC exposure to humans and ecological receptors in Sites 9 and 10 soil.

Table 4-3
Cost Summary Table, Alternative 2: Land Use Controls

Feasibility Study
Site 9, Waste Fuel Disposal Pit, and Site 10, Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Direct Cost		
Land-use controls		$13,000
	Total direct cost	$13,000
Indirect Costs		
Health and safety (3 percent)		$1,000
Administration and permitting (3 percent)		$1,000
Engineering and design (10 percent)		$1,000
	Total indirect cost	$3,000
	Total capital cost (direct + indirect)	$16,000
Operation and Maintenance Cost (O&M) (per event)		
5-year site review		$ 8,000
Inspection and reporting		$9,000
	Total O&M cost (per event)	$17,000
	Total O&M cost (present worth of semi-annual O&M for 30 years)	$151,000
	Total Capital and O&M	$167,000
	Contingency (10 percent)	$16,000
	Total cost Alternative 2: Site Closure	$183,000

Note: Line item costs are rounded to the nearest $1,000. Total cost is based on a present worth cost over a 30-year period. See Appendix D for cost details.

The soil cover placed during the IRA was completed at a total cost of $302,000.

The following components of this alternative include:

- LUCs
- mobilization and site preparation
- excavation and stockpiling surface soil
- soil sampling and analysis
- transportation and offsite disposal
- site restoration
- Five-year site reviews

These activities are discussed in the following sections.

LUCs Refer to Alternative 2 for a description of this component.

Mobilization and Site Preparation Under this alternative, heavy equipment such as a front end loader and backhoe would be mobilized to the site. Mobilization and site preparation would include all activities and construction prior to excavating surface soil. Since there is no electrical power or water supply at Sites 9 and 10, a portable generator and a high pressure washer with water tank would be mobilized to the site to supply power and water during decontamination procedures. A temporary decontamination area would be constructed at the site. Equipment and vehicles used during site preparation, excavation, and soil sampling would be steam-cleaned and decontaminated at this location.

A staging area for excavated soil would be constructed on site using 2 layers of 6-mil plastic sheeting as lining.

Excavating and Stockpiling of Soil The constructed soil cover will be excavated to a depth of 4 feet below surface and stockpiled waste characterization. The excavation area is shown in Appendix C and is approximately 172,800 ft^2. The total volume of soil to be removed for disposal is approximately 39,000 tons.

Soil Sampling and Analysis A soil sampling and analysis plan would be developed for two reasons: (1) to characterize the excavated soil for offsite disposal and (2) to confirm COC removal from the open excavation areas. To meet offsite disposal requirements, stockpiled soil samples would be analyzed for hazardous waste characteristics (TCLP metals, VOCs, SVOCs, pesticide/herbicides) and TRPH. In addition, composite soil samples would be collected from the bottom of the open excavation areas to confirm contaminant removal. A total of 24 confirmatory soil samples would be collected and analyzed for COCs (i.e., metals and PAHs).

Transportation and Offsite Disposal Based on the relatively low concentrations of COCs in surface soil (Table 2-2), it was assumed that the excavated soil would be characterized as nonhazardous and would be disposed of in a nonhazardous, solid waste landfill (RCRA Subtitle D Landfill). Excavated soil would be loaded onto DOT-approved transport vehicles or rolloff containers (22 ton load capacity) and transported to a CERCLA-approved disposal facility and an FDEP-approved Subtitle D landfill.

Site Restoration and Demobilization Once contaminated soil has been removed, the excavation area would be backfilled with clean fill and topsoil. The fill material and topsoil would be transported from a nearby offsite borrow source using dump trucks and tractor trailers. The material would be spread across the excavated areas using a front-end loader. Once the excavation areas have been

backfilled, the areas would be seeded and fertilized to promote vegetative growth. Hay would be used to protect the seed and fertilizer during initial development. Decontamination water generated during implementation of this alternative would be sampled and either discharged on the ground at Sites 9 and 10 or transported to the NAS Whiting Field FOTW for treatment. The storage trailer, heavy equipment, miscellaneous equipment and tools used during the implementation of this alternative would be demobilized.

Five Year Site Reviews Since COCs above industrial SCTLs in soil would remain, five year site reviews would be conducted to assess the effectiveness of this alternative. Refer to Alternative 1 for a description of this component.

4.3.2 Technical Criteria Assessment of Alternative 3 This subsection presents the technical criteria assessment of Alternative 3.

Overall Protection of Human Health and the Environment. This alternative would minimize human and ecological exposure to COCs in Sites 9 and 10 surface soil because areas exhibiting greater than residential SCTLs would be excavated and disposed offsite. Soil, where concentrations of COCs are above the FDEP SCTLs, would be removed from the site and the resulting excavation would be backfilled with clean fill. As a result, risks posed to human and ecological receptors by exposure to contaminated surface soil would be minimized.

Compliance with ARARs. It is expected that source excavation, transportation and disposal, and backfilling activities would comply with ARARs (see Section 2.1).

Worker safety standards will be maintained during remedial activities to comply with ARARs. A site-specific health and safety plan will be developed and implemented during all site activities.

Long-Term Effectiveness and Permanence. This alternative is expected to provide long-term effectiveness and permanence by excavation and offsite disposal of contaminated surface soil. A five-year site review will be used to assess changes in site conditions to ensure long-term effectiveness and permanence. Alternative 3 can be viewed as a permanent method of reducing human health and ecological risks posed by ingestion of contaminated surface soil by excavation and removal of hot spot soil areas.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Disposal of the excavated surface soil within an approved landfill would not reduce the toxicity, mobility, or volume of the waste because active treatment of the soil would not occur. However, the toxicity, mobility, and volume of waste would be reduced onsite for Sites 9 and 10 surface soil because the waste would be transported and disposed at an approved offsite disposal facility.

Short-Term Effectiveness. Through implementation of this alternative, there would be an immediate reduction in risk to human health and the environment. During excavation and soil handling activities, site workers would wear appropriate personal protective equipment (PPE) for protection against exposure to site-related contaminants.

This alternative would also ensure the protection of non-site workers and trespassers immediately after backfilling the excavation with clean fill.

Implementability. This alternative is easily implementable. Equipment and materials are readily available for excavation and removal activities. Site work would be completed within a 2-month period, allowing for a 28-day turnaround time (TAT) for analytical results. If an expedited remedial action is required, this alternative can be completed within 2 to 4 weeks using an expedited TAT for analytical results.

Cost. The cost estimate for Alternative 3 is presented in Table 4-4 and detailed cost calculations are provided in Appendix C. O&M activities include a 5-year review and quarterly/annual reporting and inspections for a 30-year monitoring period. The total present worth cost of Alternative 3 is approximately $3,740,000.

Table 4-4
Cost Summary Table, Alternative 3: Soil Removal and LUCs

Feasibility Study
Sites 9 and 10, Waste Fuel Disposal Pit, and Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Direct Cost		
Land-use controls		$13,000
Mobilization and site preparation		$9,000
Excavating and stockpiling surface soil		$60,000
Soil sampling and analysis		$18,000
Off-site transportation and disposal		$1,662,000
Management of decontamination liquid		$16,000
Site restoration		$799,000
	Total direct cost	$2,580,000
Indirect Cost		
Health and safety (3 percent)		$77,000
Administration and permitting (3 percent)		$77,000
Engineering and design (10 percent)		$258,000
Construction support services (10 percent)		$258,000
	Total indirect cost	$670,000
	Total capital cost (direct + indirect)	$3,250,000
Operation and Maintenance (O&M) Cost (capitalized)		
Land-use controls - Quarterly and Annual inspections and reporting		$124,000
5-year site review		$27,000
	Total O&M cost (capitalized)	$151,000
	Total Capital and O&M costs	$3,400,000
	Contingency (10 percent)	$340,000
	Total cost Alternative 3: Hot Spot Soil Removal	$3,740,000

Note: Line item costs are rounded to the nearest $1,000. Total cost is based on a present worth costs. See Appendix D for cost details.

5.0 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial alternatives for Sites 9 and 10 were developed in Chapter 3.0 and were individually evaluated in Chapter 4.0 using seven technical criteria. For comparative purposes, these criteria are grouped into the following categories:

- threshold criteria,
- primary balancing criteria, and
- modifying criteria.

This chapter presents a comparison of remedial alternatives with respect to these criteria. This comparison is intended to provide technical information required to support the selection of a preferred alternative for Sites 9 and 10. It is anticipated that modifying criteria (i.e. State and community acceptance) will be used in conjunction with the information presented herein to select an appropriate remedial alternative for Sites 9 and 10. The remainder of this chapter presents this comparison.

5.1 OVERALL APPROACH TO COMPARATIVE ANALYSIS. As presented in Chapter 4.0, remedial alternatives were developed to accomplish the RAOs identified for the site. The three sets of criteria identified above are used to streamline the comparison between alternatives while ensuring compliance with the RAOs. Components of these criteria are described below.

5.1.1 Threshold Criteria Because the selected remedy must be protective of human health and the environment, as well as comply with ARARs, the following two threshold criteria are essential:

- overall protection of human health and the environment, and
- compliance with ARARs.

An individual assessment of each alternative with respect to these criteria was presented in Chapter 4.0. An overall comparative analysis of alternatives using threshold criteria is presented in Section 5.2.

5.1.2 Primary Balancing Criteria Primary balancing criteria consist of the following five components:

- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume of contaminants through treatment;
- short-term effectiveness;
- implementability; and
- cost.

These criteria are used to provide an assessment of the permanence of each remedial alternative, while ensuring the implementability and cost-effectiveness

of each remedial alternative. An individual assessment of each alternative with respect to these criteria is presented in Chapter 4.0. An overall comparative analysis of alternatives using primary balancing criteria is presented in Section 5.2.

5.1.3 Modifying Criteria The final two criteria are as follows:

- State acceptance, and
- community acceptance.

Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the Final FS, and a summary of State acceptance of this FS will be included in the Final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

Based on this information, an evaluation of modifying criteria is not included in this FS.

5.2 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES. This section provides the comparative analysis for remedial alternatives for Sites 9 and 10 with respect to the criteria described in Section 5.1. Alternatives presented in this FS include:

- Alternative 1: No Action
- Alternative 2: Land Use Controls (LUCs)
- Alternative 3: Soil Removal and LUCs

5.2.1 Comparison of Threshold Criteria The remedial alternatives for Sites 9 and 10 were first compared to the two threshold criteria, overall protection of human health and the environment and compliance with ARARs.

Alternative 1 does not provide a means of restricting future land use of the area. Therefore, this alternative does not protect potential future residents from environmental conditions at the site. Alternative 1 would not achieve the RAO established for Sites 9 and 10.

The implementation of Alternative 2 would provide a measure of continued protection of human health and the environment because the alternative includes LUCs (including LUCIP). In this manner, Alternative 2 would achieve the RAOs established for the site and would also achieve ARARs.

Alternative 3 would achieve the RAOs through removal of the previously constructed soil cover and other site soil and provide a measure of continued protection of human health and the environment. In this manner, Alternative 3 would achieve the RAOs established for the site and would therefore achieve ARARs. Implementation of Alternative 3 may have potential short-term effects of exposure to site workers.

Because the implementation of Alternative 3 would achieve the RAOs and reduce COC exposure in soils as opposed to leaving COCs in surface soil (i.e., Alternatives 1 and 2), Alternative 3 is the best alternative in providing overall protection of human health and the environment. However, Alternative 3 may be cost prohibitive in comparison to Alternative 2 that also meets the RAOs.

5.2.2 Comparison of Primary Balancing Criteria A comparison is made between alternatives with respect to five criteria: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume; short-term effectiveness; implementability; and cost.

For long-term effectiveness, Alternatives 1 and 2 may reduce concentrations of COCs through natural mechanisms, but unlikely for arsenic. Alternative 3 would provide long-term effectiveness by removing surface soil where COC concentrations exceed action levels established in the RAOs. Furthermore, background levels of arsenic are 3.2 mg/kg (slightly below the USEPA Region III Industrial RBCs and Florida Industrial SCTLs) and may be the result of naturally occurring sources of arsenic in the site soil.

The alternatives evaluated for Sites 9 and 10 would not reduce the toxicity or volume of contaminants at the site, as none of the alternatives involve treatment of contaminants in media at the site. On the other hand, Alternative 3 is the only alternative where offsite removal of contaminated surface soil would reduce the toxicity and volume onsite. Also, Alternative 3 would provide a reduction in the mobility (i.e., leaching) of contaminants from the soil; however, it does not appear that contaminants are currently leaching to the groundwater.

The implementability of Alternatives 2 and 3 would be relatively easy. For Alternatives 2 and 3 a LUCAP and LUCIP would need to be developed. The documents should be relatively easy to complete, but implementation of the LUCs may be extended until agreement is reached among the regulatory agencies as to the format for these documents at NAS Whiting Field.

The relative present-worth cost estimates are shown below for each alternative. In accordance with USEPA guidance for contaminants left in place, the cost for Alternatives 1, 2, and 3 is based on a 30-year timeframe.

Alternative 1:	$29,000
Alternative 2:	$183,000
Alternative 3:	$3,740,000

As expected, Alternative 1, the no-action alternative, has the lowest estimated overall cost. Alternative 2 involves LUCs and quarterly/annual inspections and reporting over 30 years and is the next lowest cost. Alternative 3 incorporates all the components (and costs) of Alternative 2 with soil removal.

5.2.3 Modifying Criteria As stated in Subsection 5.1.3, an evaluation of modifying criteria will not be included in this FS.

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APPENDIX A

NAVY'S REQUEST FOR SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC AT DISPOSAL SITES AT NAS WHITING FIELD

Evaluation of Background Arsenic Concentrations for Covered Landfill Sites

At Naval Air Station (NAS) Whiting Field, nine soil types, as identified by the U. S. Department of Agriculture, Soil Conservation Service (USSCS), are present. The Remedial Investigation (RI) sites at NAS Whiting Field are associated with seven of the nine soil types. The background surface soil data set for each RI site was initially determined to be comprised of background surface soil samples from the same USSCS soil types as occur on the individual sites. However, available information and review of historical aerial photographs indicated that in the construction of landfills at the facility, a borrow pit was dug to an approximate depth of 10 to 15 feet bls and the excavated soil was piled to the side. Following landfill operations, the borrow materials comprised of undifferentiated surface and subsurface soils were used for the landfill cover. Any additional soils required to complete the landfill cover are believed to have been obtained from other borrow pits located at the facility.

If a mix of surface and subsurface soils were used in the cover for landfills, it would be appropriate to use the combined data set of surface and subsurface soil samples as the background screening value. However, in order to be protective of human health and the environment, it is proposed that the background surface and subsurface data set be combined to a single value as the "Industrial Use Soil Cleanup Goal." This modified "Industrial Use Soil Cleanup Goal" is specifically limited to the covered landfill sites including Sites 1, 2, 9, 10, 11, 13, 14, 15, and 16, and to the inorganic analyte arsenic.

Tables 3-8 through 3-18 in the General Information Report present the detected concentrations and summarize the analytical data for the individual background soil samples collected at NAS Whiting Field. A summary of the arsenic background data set and the modified "Industrial Use Soil Cleanup Goal" for arsenic is presented in Table A-1. As indicated on the table, the modified "Industrial Use Soil Cleanup Goal" for arsenic to be used at covered landfill sites is 4.62 milligrams per kilogram.

Table A-1
Summary of Arsenic Detected in
Surface and Subsurface Background Soil Samples

Feasibility Study
Sites 9 and 10, Waste Fuel Disposal Pit, and Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Analyte	Frequency of Detection Surface Soil Samples[1]	Mean of Detected Concentrations Surface Soil Samples[2]	Frequency of Detection Subsurface Soil Samples[1]	Mean of Detected Concentrations Subsurface Soil Samples[2]	Frequency of Detection Surface and Subsurface Soil Samples[1]	Mean of Detected Concentrations Surface and Subsurface Soil Samples[2]	Surface and Subsurface Soil Background Screening Concentration (modified Industrial Use Cleanup Goal)
Inorganic Analytes (mg/kg)							
Arsenic	15/15	1.54	14/14	3.14	29/29	2.31	4.62

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed.
[2] The mean of detected concentrations is the arithmetic mean of all samples in which the analyte was detected. It does not include those samples in which the analyte was not detected.

Notes: mg/kg = milligram per kilogram.

Table A-2
Comparison of Detected Arsenic Concentrations in Surface and Subsurface Soil Samples to Florida Soil Cleanup Goals

Feasibility Study
Sites 9 and 10, Waste Fuel Disposal Pit, and Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Mean of Detected Concentrations	Soil Cleanup Goals for Florida (Residential)[1]	Soil Cleanup Goals for Florida (Industrial)[1]	Modified Industrial Use Cleanup Goal[2]
Inorganic Analyte (mg/kg)						
Arsenic	0.52	6.3	2.31	0.8	3.7	4.62

[1] Source: FDEP Memorandum from John Ruddell, Director Division of Waste Management, to District Directors and Waste Program Administrators. Subject: Applicability of Soil Cleanup Goals for Florida, January 19, 1996.

[2] The modified Industrial Use Cleanup Goal for arsenic is twice the mean of detected concentrations in the surface and subsurface soil samples.

Notes: mg/kg = milligram per kilogram.

APPENDIX B

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION'S RESPONSE AND ACCEPTANCE OF THE SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC FOR DISPOSAL SITES AT NAS WHITING FIELD

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

April 27, 1998

Ms. Linda Martin
Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, PO Box 190010
North Charleston, SC 29419-9010

file: arsenic1.doc

RE: Request for Site-Specific Arsenic Soil Cleanup Levels: Covered Landfill Sites, NAS Whiting Field

Dear Ms. Martin:

I have reviewed the request for approval of a site-specific Soil Cleanup Goal for arsenic at the "covered landfill sites" at NAS Whiting Field from Mr. Gerald Walker, ABB Environmental Services, dated April 22, 1998 (received April 22, 1998). Based on the prior presentation to Department Staff and the summary information furnished in the letter and the attached Appendix I, the request is granted to utilize a site-specific Soil Cleanup Goal for arsenic of 4.62 mg/kg at Sites 1, 2, 9, 10, 11, 12, 13, 14, 15 and 16., with the following conditions:

1. The sites may be utilized for activities that involve less than full-time contact with the site. This may include, but is not limited to, a.) parks b.) recreation areas that receive heavy use (such as soccer or baseball fields) or, c.) agricultural sites where farming practices result in moderate site contact (approximately 100 days/year, or less).

2. The Navy must assure adherence to the land use by incorporating the site and conditions in a legally binding Land Use Contol agreement.

3. The above Soil Cleanup Goal shall not be utilized at any other site without specific Department approval.

If you have questions or require further clarification, please contact me at (904) 921-4230.

Sincerely,

James H. Cason, P.G.
Remedial Project Manager

APPENDIX C

VOLUME ESTIMATES FOR CONTAMINATED MEDIA AND SURFACE DEBRIS

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FEASIBILITY STUDY - NAS WHITING FIELD SITE 9 AND 10
ALTERNATIVE 3: SOIL REMOVAL AND LUCs
VOLUME OF SOIL TO BE REMOVED
1. Soil volume is based on the estimates provided in the IRA report prepared by Bechtel Environmental Inc.
2. The Clean soil backfill added to site is 15,940 cubic yards
3. Additional 16,000 cubic yards will be removed to account for the 2-feet soil thick pre-IRA surface soil
4. Total soil volume to be removed is approximately 32,000 cubic yards.
5. Figure 1-3 provides the boundary of excavation.

APPENDIX D

COST CALCULATIONS FOR REMEDIAL ALTERNATIVES

ALTERNATIVE #1: NO ACTION, SITES 9&10

	Quantity	Unit	Unit Cost	Total Cost
FIVE YEAR SITE REVIEW COSTS				
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	28	hrs	$90.00	$2,520
Mid-level Engineer	28	hrs	$60.00	$1,680
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	20	hrs	$90.00	$1,800
Mid-level Engineer	30	hrs	$60.00	$1,800
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Total 5-year costs				*$8,160*
Present Worth of 5-year costs at i=6%				*$26,665*
TOTAL FIVE YEAR SITE REVIEW COSTS				**$26,665**
CONTINGENCY @ 10 PERCENT				**$2,667**
TOTAL COST OF ALTERNATIVE #1				**$29,332**

ALTERNATIVE #2: LUCs, SITES 9&10

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs)				
Survey Plat	1	lump sum	$3,500.00	$3,500
Land Use Restriction Fees (Filling, Legal, etc.	1	lump sum	$5,000.00	$5,000
Land Use Implementation Plan:				
Senior Scientist	20	hrs	$90.00	$1,800
Mid-level Engineer	40	hrs	$60.00	$2,400
ODCs (includes photocopying, etc.)	1	lump sum	$500.00	$500
TOTAL DIRECT COSTS				**$13,200**
INDIRECT COSTS				
Health and Safety (@3%)				$396
Administrative, Legal, and Permitting Fees (@3%)				$396
Engineering and Design (@10%)				$1,320
TOTAL INDIRECT COSTS				**$2,112**
TOTAL CAPITAL COSTS (Direct + Indirect Costs)				**$15,312**
Operation and Maintenance (O&M) Costs				
Quarterly Inspection				
Senior Scientist	0	hrs	$90.00	$0
Mid-level Engineer	48	hrs	$60.00	$2,880
ODCs (per diem, rental vehicle, etc.)	4	lump sum	$80.00	$320
Quarterly Reporting				
Senior Scientist	8	hrs	$90.00	$720
Mid-level Engineer	32	hrs	$60.00	$1,920
ODCs (per diem, rental vehicle, etc.)	4	lump sum	$500.00	$2,000
Annual Reporting				
Senior Scientist	2	hrs	$90.00	$180
Mid-level Engineer	8	hrs	$60.00	$480
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$500.00	$500
Subtotal				$9,000
Present Worth of Land Use Control costs at i=6%				*$123,885*
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	28	hrs	$90.00	$2,520

ALTERNATIVE #2: LUCs, SITES 9&10

	Quantity	Unit	Unit Cost	Total Cost
Mid-level Engineer	28	hrs	$60.00	$1,680
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	20	hrs	$90.00	$1,800
Mid-level Engineer	30	hrs	$60.00	$1,800
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Subtotal				$8,160
Present Worth of 5-year costs at i=6%				*$26,665*
TOTAL O&M COSTS				**$150,550**
COST OF ALTERNATIVE #2				**$165,862**
CONTINGENCY @10 PERCENT				**$16,586**
TOTAL COST OF ALTERNATIVE #2				**$182,449**

ALTERNATIVE #3: Soil Removal and LUCs, SITES 9 & 10

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs - see Alternative #2)				$13,200
Equipment Delivery (Mob/Demob)				
Front End Loader	1	LS	$1,000.00	$1,000
Backhoe	1	LS	$1,000.00	$1,000
Pressure Washer & Water Tank	1	each	$250.00	$250
Pick-up Truck	4	wk	$350.00	$1,400
Site Preparation				
Decontamination Pad Materials	1	LS	$250.00	$250
Staging Area for Excavated Soil	1	LS	$500.00	$500
Storage Trailer	1	mon	$150.00	$150
Pressure Washer	4	weeks	$175.00	$700
Miscellaneous Equipment	1	LS	$2,500.00	$2,500
Labor (Site Preparation)				
Laborers (2 men @ 1 dy @ 10 hrs/dy)	20	hr	$36.00	$720
Equipment Operators (2 @ 1 dy @ 10 hrs/dy)	20	hr	$40.00	$800
Mobilization and Site Preparation				**$9,270**
Excavating and Stockpiling of Surface Soil (32000 cy = 39,000 tons)				
Backhoe and operator	25	dy	$1,200.00	$30,000
Laborers(2 @ 25dys @ 10hrs/dy)	500	hr	$36.00	$18,000
Site Superintendant (4 wk * 40 hr/wk)	200	hr	$60.00	$12,000
Excavating and Stockpiling Soil				**$60,000**
Soil Sampling and Analysis (Waste Characterization and Confirmatory Sampling)				
Sampling Plan:				
Mid-level Engineer/Scientist	40	hrs	$75.00	$3,000
ODCs	1	LS	$250.00	$250
Sample Collection:				
Associate Scientist	20	hrs	$60.00	$1,200
Technican	20	hrs	$40.00	$800
ODCs, Sample Equipment, Supplies	1	LS	$500.00	$500
Waste Characterization (1 composite sample/100 cyds)				
TCLP Metals, VOCs, SVOCs, Pest/Herb, TRP	4	ea	$800.00	$3,200
Confirmatory Samples (1 composite sample/open excavation)				
PPL Metals (including Arsenic)	24	ea.	$200.00	$4,800
PAHs	24	ea.	$125.00	$3,000
TRPH	24	ea.	$60.00	$1,440
Soil Sampling & Analysis				**$18,190**
Loading and Off-site Landfill disposal (39,000 tons)				

ALTERNATIVE #3: Soil Removal and LUCs, SITES 9 & 10

	Quantity	Unit	Unit Cost	Total Cost
Front End Loader and operator	10	dy	$1,200.00	$12,000
Laborers(2 @ 10dy @ 10hrs/dy)	200	hr	$36.00	$7,200
Site Superintendant	80	hr	$60.00	$4,800
RCRA Subtitle D (Solid Waste) Landfill				
Transportation	39,000	ton	$10.00	$390,000
Disposal	39,000	ton	$32.00	$1,248,000
Loading and Off-site Landfill disposal				**$1,662,000**
Mangement of Decontamination Fluid				
55-gallon drums (delivery and disposal)	80	drums	$150.00	$12,000
Laborers (2 @ 5 dys @ 10 hrs/dy)	100	hr	$36.00	$3,600
Management of Decontamination Fluid				**$15,600**
Site Restoration				
Front End Loader and operator	5	dy	$1,200.00	$6,000
Laborers(2 @ 2dys @ 10hrs/dy)	100	hr	$36.00	$3,600
Backfill (common fill)	28,000	cyds	$10.00	$280,000
Topsoil	8,000	cyds	$16.00	$128,000
Fertilize, Seed, and Mulch	190,400	sy	$2.00	$380,800
Site Restoration				$798,400
TOTAL DIRECT COSTS				**$2,576,660**
INDIRECT COSTS				
Health and Safety (@3%)				$77,300
Administrative, Legal, and Permitting Fees (@3%)				$77,300
Engineering and Design (@10%)				$257,666
Construction Support Services (@10%)				$257,666
TOTAL INDIRECT COSTS				**$669,932**
TOTAL CAPITAL COSTS (Direct + Indirect Costs)				**$3,246,592**
OPERATION AND MAINTENANCE COSTS (annual)				
5-Year Site Review (see Alternative #1)				
Total LOE				$7,800
Total ODCs				$360
Subtotal Cost				$8,160
Present Worth (capitalized @ 6%, 30 years)				**$26,665**
Land Use Controls - Quarterly and Annual Inspection and Reporting (see Alt. #2)				
Total LOE				$6,180
Total ODCs				$2,820

ALTERNATIVE #3: Soil Removal and LUCs, SITES 9 & 10

	Quantity	Unit	Unit Cost	Total Cost
Subtotal Cost				$9,000
Present Worth (capitalized @ 6%, 30 years)				**$123,883**
TOTAL O&M COSTS (5-Year Review and LUCs)				**$150,548**
TOTAL CAPITAL COSTS AND O&M COSTS				**$3,397,140**
CONTINGENCY (@10%)				**$339,714**
TOTAL COST OF ALTERNATIVE #3				**$3,736,854**

APPENDIX E

RESPONSE TO AGENCY'S COMMENTS

Response to Review Comments
Sites 9 and 10 Feasibility Study

USEPA Comments:

1. **Page -vi-**. The definition for "LUCIP" should be "Land Use Control Implementation Plan". The abbreviation "RA" is typically utilized for *remedial action.* "BRA" should be utilized as the abbreviation for *baseline risk assessment.*

   Response: Page vi will be revised as suggested by the reviewer.

2. **Page 1-1, Section 1.0**. In the first paragraph of this section, the text should clearly state that the FS only addresses surface and subsurface soils at Sites 9 and 10. Groundwater as a media of concern will be addressed in a future FS for Site 40.

   Response: The text will be revised to indicate the feasibility study report addresses only surface and subsurface soils and that groundwater will be addressed in a future FS.

3. **Page 1-10, Section 1.3**. Previous information does not support the statement in the second paragraph that Site 9 received wastes from a variety of sources. According to information presented earlier in the FS as well as in the Site 9 Remedial Investigation Report, the only waste disposed of at Site 9 was waste fuel. Based on this information, Site 9 does not exhibit the characteristics of a CERCLA municipal landfill as stated in the last sentence of the second paragraph. In the last sentence of the seventh paragraph, delete "As a result".

   Response: Text will be revised as suggested by the reviewer. The phrase "As a result" will be deleted.

4. **Page 1-11, Section 1.3, Interim Actions**. The first sentence of the first paragraph should be revised as follows: "Interim actions at Sites 9 and 10 were completed by BEI to address levels of arsenic in surface and subsurface soils in excess of federal and State standards." In addition, this section of the FS should contain a more complete description of the interim actions in order to evaluate the need for additional remedial actions later in the FS.

   Response: Text will be revised to include the wording, "Interim actions at Sites 9 and 10 were completed by BEI to address levels of arsenic in surface and subsurface soils in excess of federal and State standards."

5. **Page 2-5, Table 2-1 (Continued)**. Since this FS only addresses surface and subsurface soils at Sites 9 and 10, the Safe Drinking Water Act is not an appropriate ARAR. In addition, Sites 9 and 10 do not contain surface water except for occasional ponding during heavy rain events. Therefore, the Florida Surface Water Standards may not apply.

   Response: The ARARs table (Table 2-1) will be revised and any reference to groundwater will be deleted.

6. **Page 2-6, Table 2-1 (Continued)**. This FS only evaluates potential remedies for surface and subsurface soils at Sites 9 and 10; therefore, the Florida Groundwater Classes, Standards and Exemptions and the Florida Drinking Water Standards do not apply as ARARs.

   Response: The ARARs table (Table 2-1) will be revised and any reference to groundwater will be deleted.

7. **Page 2-8, Section 2.2**. In the third sentence of the first paragraph, "RA" should be changed to "BRA" or "baseline risk assessment". In addition, the following should be added to the end of the first paragraph:

"The interim actions were conducted to partially address the risk identified in the risk assessment. Therefore, the RAOs will focus on the residual risk remaining following the interim actions."

Response: Text will be revised as suggested by the reviewer.

8. **Page 2-9**. Since the FS only addresses surface and subsurface soils at Sites 9 and 10, the discussion of groundwater should not be included in the FS.

Response: As recommended by the reviewer, discussion on groundwater will be deleted from the FS.

9. **Page 2-12**. The last paragraph on this page should provide information related to the exposure pathway(s) addressed by the interim actions.

Response: The following statement will be added to the text. "The soil cover addressed exposure to surface soil contamination by residents, trespassers, and excavation workers."

10. **Page 2-14, RAO 1**. The second sentence in the first paragraph is not clearly written and should be revised.

Response: The second sentence in the first paragraph will be revised as follows: Thus, a LUC agreement is necessary to comply with the above mentioned letter from FDEP.

11. **Page 2-14, RAO 2**. Add "following the interim actions" after "Sites 9 and 10" in the first sentence.

Response: Text will be revised as recommended by the reviewer.

12. **Page 2-19, Bulleted Items**. While the general response actions listed are acceptable, LUCs should be added as an option for limited action and excavation and disposal should be added as a more appropriate disposal option in lieu of a "hot spot"removal.

Response: The bulleted items will be revised as suggested by the reviewer.

13. **Page 3-1, Section 3.0**. The three alternatives which should be considered for Sites 9 and 10 are no action, limited action, and excavation and disposal. Based on the limited sampling at Sites 9 and 10, it is not practical to consider only a "hot spot" removal. Before such a limited action can be considered, the Navy should complete a more thorough characterization of the two sites. In the absence of a thorough characterization, the Navy should incorporate an alternative which relies on the complete excavation and disposal of onsite soils followed by the application of clean fill.

Response: The hot spot removal action will be replaced with an alternative that considers complete excavation and disposal of onsite soils followed by the application of clean fill. Cost sheets related to the new alternative are attached to the response to comments.

14. **Page 3-6, Table 3-2**. Alternative 2 does not address the installation of fencing as described throughout the text of the FS. The Navy should determine whether fencing is a necessary component of the alternative and apply the alternative consistently throughout the FS.

Response: The text in the FS will be revised to eliminate the fencing option from Alternative 2. This will be consistent with the cost tables for this alternative.

15. **Page 3-7, Section 3.2.2**. The first sentence of the first paragraph under the bulleted items is fragmented and unclear. Please revise as appropriate. In the second paragraph of this section, the text states that fencing will be utilized to prevent direct contact with surface soil. However, as stated earlier in the FS, two feet of clean soil and a vegetative cover was placed over both sites. With the soil and vegetative cover, fencing will no longer be necessary to prevent direct contact with surface soils at the sites.

Response: All references to fencing will be deleted.

16. **Page 3-7, Section 3.2.3**. See Comment 13 as it relates to the feasibility of conducting a "hot spot" removal.

Response: Please refer to Navy response to USEPA Comment No. 13.

17. **Page 4-4, Section 4.1.2, Compliance with ARARs**. The second sentence of this section should be revised as follows: "In the long term, this alternative would not comply with ARARs for arsenic concentrations in soil, as no action would take place to eliminate potential residential exposure to arsenic in surface soils."

Response: Text will be revised as suggested by the reviewer.

18. **Page 4-5, Table 4-2**. A footnote should be added to the table to indicate that the total cost for the alternative is based on a present worth cost over a 30 year period.

Response: As recommended by the reviewer, a footnote will be added to the table to indicate that the total cost is based on a present worth cost over a 30-year period.

19. **Page 4-6, Section 4.2**. The term "LUC actions" should be changed to "LUCs" in the first sentence.

Response: Text will be revised as recommended by the reviewer.

20. **Page 4-6, Section 4.2.1**. This section should contain a more thorough description of the restrictions to be placed on the use of the two sites. For example, is use of the sites restricted to industrial uses only.

Response: The second sentence of Section 4.2.1 will be revised as follows. *LUCs would involve the use of institutional controls restricting land use in the vicinity of Sites 9 and 10 to non-residential use only.*

21. **Page 4-8, Section 4.2.2, Implementability**. See Comment 14. If the Navy determines fencing is necessary for Alternative 2, then this alternative will require remedial construction for implementation.

Response: Please refer to Navy response to USEPA Comment No. 14.

22. **Page 4-9, Table 4-3**. See Comment 18.

Response: Please see Navy response to USEPA Comment No. 18.

23. **Page 4-10, Section 4.3**. See the previous comments as they relate to the feasibility of conducting a "hot spot" removal. The text should state that the facility where excavated soil is disposed will be a CERCLA approved disposal facility as well as FDEP approved.

Response: Text in Section 4.3 will be revised to identify that the facility where excavated soil is disposed will be a CERCLA approved disposal facility and an FDEP approved facility.

24. **Page 4-15, Table 4-4**. See Comment 18.

Response: Please refer to Navy response to USEPA Comment No. 18.

FDEP Comments:

1. A figure should be presented similar, but at a larger scale, to Figure 1-3, which presents the contaminant data so that the reviewer can easily understand that the interim action, placement of two feet of soil cover, has adequately addressed the surface soil contaminants with regard to protection of human health and the environment. This information was previously requested and the Navy stated, following the request during the IRA review, that "the final RI Reports and/or feasibility Studies for each of these sites... will relate the pre-existing and newly-determined contaminant levels, the excavated and filled areas and the covered areas."

   Response: Figure 1-3 will be revised to include the contaminant concentrations on the figure.

2. Using the above figure, the Feasibility Study should clearly describe the nature of the interim action and that Alternative 2 is an action which places land use controls on the sites to further protect human health and the environment.

   Response: Upon revision of Figure 1-3, the figure will be referenced in Alternative 2 to support "Land Use Controls". Additional text will be added to describe the interim action.

3. Although this document is dated December 1999 I actually received the document on July 20. It appears that the document incorporates comments made by Mr. Craig Benedikt, EPA Region IV in his letter dated May 15, 2000. Please confirm this so that Craig and I will be able to discuss the proper documents if necessary.

   Response: Yes. Per Mr. Cason's request, comments provided by Mr. Benedikt were incorporated into the FS submitted in July 2000.