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FINAL FEASIBILITY STUDY FOR SITE 35 NAS WHITING FIELD FL
8/10/2006
TETRA TECH NUS

# Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-94-D-0888

Rev. 1
08/10/06

# Feasibility Study
## for
# OU 22, Site 35, Building 1429, Public Works Maintenance Facility Surface and Subsurface Soil

## Naval Air Station Whiting Field
## Milton, Florida
USEPA ID No. FL2170023244

## Contract Task Order 0079

## August 2006


NAVFAC
Naval Facilities Engineering Command
Southeast
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

# FEASIBILITY STUDY
# FOR
# OU 22, SITE 35, BUILDING 1429, PUBLIC WORKS MAINTENANCE FACILITY
# SURFACE AND SUBSURFACE SOIL

## NAVAL AIR STATION WHITING FIELD
## MILTON, FLORIDA

**COMPREHENSIVE LONG-TERM**
**ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:**
**Naval Facilities Engineering Command**
**Southeast**
**2155 Eagle Drive**
**North Charleston, South Carolina 29406**

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**CONTRACT NUMBER N62467-94-D-0888**
**CONTRACT TASK ORDER 0079**

**AUGUST 2006**

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This document, *Feasibility Study for Surface and Subsurface Soils at Site 35, Naval Air Station Whiting Field, Milton, Florida*, has been prepared under the direction of a Florida Registered Professional Engineer. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document was prepared for Naval Air Station Whiting Field, Milton, Florida and should not be construed to apply to any other site.

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# ACRONYMS

| | |
|---|---|
| ABB-ES | ABB Environmental Services, Inc. |
| ARARs | Applicable or Relevant and Appropriate Requirements |
| BRA | Baseline Risk Assessment |
| bls | Below Land Surface |
| BSL | Background Screening Levels |
| BTEX | benzene, toluene, ethylbenzene and xylenes |
| CCI | CH2M Hill Constructors, Inc. |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CLEAN | Comprehensive Long-term Environmental Action Navy |
| CLP | Contract Laboratory Program |
| COCs | Constituents of Concern |
| COPCs | Constituents of Potential Concern |
| cPAHs | carcinogenic polynuclear aromatic hydrocarbons |
| DCE | dichloroethene |
| DoD | Department of Defense |
| DNAPLs | dense nonaqueous phase liquids |
| DPT | Direct Push Technology |
| ECs | Engineering Controls |
| ERA | Ecological Risk Assessment |
| F.A.C. | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| FID | Flame Ionization Detector |
| FR | Federal Register |
| FS | Feasibility Study |
| ft | Feet (or Foot) |
| GC | gas chromatograph |
| GCTL | Groundwater Cleanup Target Levels |
| GIR | General Information Report |
| GRAs | General Response Actions |
| HHRA | Human Health Risk Assessment |
| HI | Hazard Index |
| HLA | Harding Lawson Associates |
| HRS | Hazard Ranking System |

## ACRONYMS (Continued)

| | |
|---|---|
| LDRs | Land Disposal Restrictions |
| ILCR | Incremental Life-Time Cancer Risk |
| IR | Installation Restoration |
| IRA | Interim Removal Action |
| LE | Leachability |
| LUCs | Land Use Controls |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| NA | No Action |
| NACIP | Naval Assessment and Control of Installation Pollutants |
| NAS | Naval Air Station |
| NAVFAC SE | Naval Facilities Engineering Command Southeast |
| Navy | United States Navy |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NEPA | National Environmental Policy Act |
| NFA | No Further Action |
| NPL | National Priorities List |
| NPW | Net Present Worth |
| OVA | Organic Vapor Analyzer |
| PA | Preliminary Assessment |
| PAHs | Polynuclear Aromatic Hydrocarbons |
| PCBs | Polychlorinated Biphenyls |
| PCE | tetrachloroethene |
| ppm | parts per million |
| PRGs | Preliminary Remediation Goals |
| RAOs | Remedial Action Objectives |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| RPO | Representative Process Option |
| SARA | Superfund Amendments and Reauthorization Act |
| SCTLs | Soil Cleanup Target Levels |

## ACRONYMS (Continued)

| | |
|---|---|
| SERA | Screening-level Ecological Risk Assessment |
| SIs | Site Inspections |
| SOW | Statement of Work |
| SPLP | Synthetic Precipitate Leaching Procedure |
| SSI | Site Screening Investigation |
| SVOCs | Semivolatile Organic Compounds |
| TAL | Target Analyte List |
| TBC | To Be Considered |
| TCE | trichloroethylene |
| TCL | Target Compound List |
| TRPH | Total Recoverable Petroleum Hydrocarbons |
| TSDF | Treatment, Storage, and Disposal Facility |
| TtNUS | Tetra Tech NUS, Inc. |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VOCs | Volatile Organic Compounds |

# FOREWORD

To meet its mission objectives, the United States Navy (Navy) performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment. With growing knowledge of the long-term effects of hazardous materials on the environment, the United States Department of Defense (DoD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at its 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 (RCRA), 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. CERCLA and SARA form the basis for what is commonly known as the Superfund Program. Hereafter, CERCLA, as amended by SARA, shall be referred to as CERCLA.

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 consists of Preliminary Assessment (PA) and Site Inspection (SI) at sites with suspected releases of hazardous substances and Remedial Investigation and Feasibility Study (RI/FS), remedial design (RD) and remedial action at sites with confirmed releases of hazardous substances. The PA provides historical information for the site and the SI identifies and confirms the presence of hazardous substances. The nature and extent of contamination as well as the potential remedial solutions are determined during the RI/FS. The RD and remedial action are performed to complete implementation of the solution.

The Naval Facilities Engineering Command Southeast (NAVFAC SE) manages and the United States Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP) 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. Sarah Reed, Code OPGEVRSR, at (843) 820-5574.

# EXECUTIVE SUMMARY

A Feasibility Study (FS) has been conducted for Site 35 at NAS Whiting Field in Milton, Florida, by the NAVFAC SE, as part of the DoD IR program. The RI Report [Tetra Tech NUS, Inc. (TtNUS), 2005] for Sites 5A, 7, 29, 35, and 38 was submitted in March 2005 and approved in April 2005.

This FS report develops and evaluates potential remedies for subsurface soil contamination for Site 35. In this FS, Remedial Action Objectives (RAOs) have been identified, Preliminary Remediation Goals (PRGs) have been developed, and remedial action alternatives to achieve those objectives have been identified and evaluated. The FS identifies and discusses the applicable or relevant and appropriate requirements (ARARs), and presents a brief overview of the findings of the Remedial Investigation (RI) and the risk assessment in order to identify RAOs. For this FS, RAOs have been formulated based on the following criteria: (1) Unacceptable human health risks, (2) State of Florida Soil Cleanup Target Levels (SCTLs), and (3) USEPA Region IX PRGs. Remedial technologies addressing site-specific considerations were identified and screened; those technologies passing the screening phase were then developed into remedial alternatives. A limited number of technologies were identified based on guidance established under the CERCLA of 1980, as amended by the SARA of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 *Code of Federal Regulations (CFR)* 300]. Assessment of groundwater and the leaching of soil at these sites will be performed as part of the ongoing Site 40 Basewide Groundwater Investigation.

Site 35 consists of Building 1429, the Public Works Maintenance Facility (Figure 1-1). Building 1429 was built in 1943 and used for the maintenance of vehicles and equipment, generation of power and heat, storage of fire fighting equipment, woodworking and metals repair, and offices. A gasoline service station (formerly Building 2848) with a pump island and underground fuel storage tanks was located at the northeast side of the building. The service station was equipped with three underground storage tanks (USTs) (one diesel – Tank Number 2851 and two gasoline – Tank Numbers 1429 I and 1429 J) located west of the pump island and under the vehicle shed. All three tanks were abandoned in place in 1984. The tanks were abandoned by pumping out the remaining fuel, filling the tanks with sand, and capping the fill ports with concrete. None of the tanks have been removed since abandonment.

Based on a record search and interviews with facility personnel, Building 1429 was identified as a potential site in July 1993 and designated as Site 35. The site was added to the IR program in 1995 and a Site Screening Investigation (SSI) was initiated in December 1996. The purpose of the SSI was to complete an initial screening assessment to determine if contaminants were present and if additional investigations were warranted.

The SSI included the advancement of soil borings, subsurface soil sampling, monitoring well installation, and groundwater sampling. Four soil borings were advanced to a depth of 30 feet (ft) below land surface (bls) at Site 35. One additional soil boring (35B001) was advanced to a depth of 54 ft bls. The deeper soil boring was located to investigate the fuel pump island and UST area. All of the soil borings were continuously split spoon sampled to the total depth of the boring. The split spoon samples were screened in the field for dense nonaqueous phase liquids (DNAPLs) using an ultraviolet light and centrifuge red dye test, total organic vapor analyzer (OVA) headspace measurements, and field gas chromatograph (GC) screening. The field GC analysis was conducted using a HNU™ 311 portable GC. The soil samples were analyzed for volatile organic compounds (VOCs) benzene, toluene, ethylbenzene and xylenes (BTEX), dichloroethene (DCE), tetrachloroethene (PCE), and trichloroethylene (TCE). In addition, confirmation soil samples were collected for a fixed-base laboratory analysis. Three subsurface soil samples from each soil boring were analyzed for Target Compound List (TCL) VOCs (as described in the Contract Laboratory Program (CLP) Statement of Work (SOW), OLM04.0).

Six monitoring wells were installed at the site at two nested well locations. Following the installation and development of the monitoring wells, a groundwater sample was collected from each well and analyzed for TCL VOCs, TCL semivolatile organic compounds (SVOCs), TCL Pesticides/polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) inorganics (as provided in the CLP SOW, ILM04.2).

The analytical results from the SSI are summarized in the Report on the Investigation at Sites 35, 36, and 37, NAS Whiting Field, Milton, Florida completed on February 3, 1999 by Harding Lawson Associates (HLA, 1999). The summary and recommendations of the report indicated no VOCs were detected at concentrations exceeding regulatory criteria in the subsurface soil samples collected from Sites 36 and 37. However, the analytical results for soil boring 35B001 (associated with the Site 35 fuel pump island) indicated contaminated soil at levels exceeding the soil gas headspace criteria of 50 parts per million (ppm) for excessively contaminated soils as defined by the State of Florida [Chapter 62-770, Florida Administrative Code (F.A.C.)]. Laboratory analysis of the subsurface soil samples also indicated VOC concentrations typically associated with petroleum contamination exceeding the Florida SCTLs for leaching soils (HLA, 1999). In addition, the shallow and deep groundwater samples collected from Site 36 contained TCE at concentrations exceeding Florida and Federal regulatory limits.

Additional soil sampling at the former gas pumps and UST area at Site 35 was recommended to assess the extent of petroleum contamination identified in the HLA report (HLA, 1999). The report also noted that the soil at Site 35 had not been analyzed for SVOCs.

During the RI in 2000-2001, 10 subsurface soil samples were collected from four borings at Site 35. The four soil borings were selected for sampling based on the flame ionized detector (FID) readings and the

geologist's discretionary judgment. The samples were analyzed for TCL VOCs, polynuclear aromatic hydrocarbons (PAHs), total recoverable petroleum hydrocarbons (TRPH), and TAL inorganics.

Site 35 is completely covered by concrete and asphalt and, therefore, has no surface soil to sample.

Five VOCs, one PAH, and 17 inorganics were detected in the subsurface soil. Ethylbenzene and total xylenes were detected above the FDEP leachability (LE) SCTL. Vanadium was detected above the FDEP DE1 SCTL. Chromium was detected above the USEPA Residential PRG. Aluminum and lead were detected above the FDEP Groundwater Cleanup Target Levels (GCTLs) in subsurface soil leachate samples.

After comparison to site specific screening levels, conducting a human health risk assessment (HHRA), and conducting a screening-level ecological risk assessment (SERA), it was determined benzo(a)pyrene may pose a risk to future residents at Site 35.

Three alternatives were evaluated for Site 35 representing a range of actions including no action (NA), containment/limited action addressing principal threats, and an aggressive action minimizing the need for long-term management. The three alternatives providing a range of treatment options for Site 35 are listed below:

- Alternative S35-1: NA
- Alternative S35-2: Subsurface Soil (exceeding PRGs) Engineering Controls (ECs) and Land Use Controls (LUCs)
- Alternative S35-3: Subsurface Soil (exceeding PRGs) Removal

# 1.0 INTRODUCTION

TtNUS, under Comprehensive Long-term Environmental Action Navy (CLEAN) III Contract Number N62467-94-D-0888 to NAVFAC SE, is submitting this FS to address subsurface soil at Site 35 NAS Whiting Field, Milton, Florida. The impact of these soils on groundwater will be evaluated in the FS for Site 40, Basewide Groundwater. This FS is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) [ABB Environmental Services, Inc. (ABB-ES), 1998] and RI report (TtNUS, 2005) to present the results of the overall RI/FS for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives addressing affected soil at Site 35.

The IR program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations.

The goals of the RI/FS are (1) to assess the extent, magnitude, and impact of contamination at the site; (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 addressing threats to human health and/or the environment. The first two goals have been discussed in the GIR and RI reports; the remaining goal will be presented and discussed in this FS report. For brevity, general information presented in the GIR and RI reports will not be repeated in this FS report.

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 selected previous investigations.
- Risk Assessment methodology for both human health and ecological receptors.
- A summary of the facility-wide background evaluation.

The RI serves as the mechanism for collecting data to identify the nature and extent of contamination and migration pathway characteristics for conducting a baseline risk assessment (BRA) and for collecting physical measurements and chemical analytical data necessary for the remedial alternative evaluation in the FS. The RI provides the basis for determining whether remedial action is necessary. The RI report for Sites 5A, 7, 29, 35, and 38 at NAS Whiting Field provides the following information:

- Site descriptions and a summary of previous investigations for Sites 5A, 7, 29, 35, and 38.
- A summary of the field investigation methods used during the RI.
- A site-specific data quality assessment.

- The identification of Constituents of Potential Concern (COPCs) for the site.
- An assessment of the extent, magnitude, and impact of contamination at the site.
- A qualitative and quantitative assessment of risks to human health and the environment which leads to the identification of site specific Constituents of Concern (COCs).

The FS uses the results of the RI and the information presented in the GIR to identify RAOs, PRGs, and to develop, screen, and evaluate potential remedial alternatives. The FS has been 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"); NCP (40 CFR Part 300); and RI/FS Guidance (USEPA, 1988).

## 1.1 THE CERCLA FS PROCESS

The development of remedial alternatives for CERCLA sites consists of developing PRGs and areas and volumes of contamination and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the PRGs.

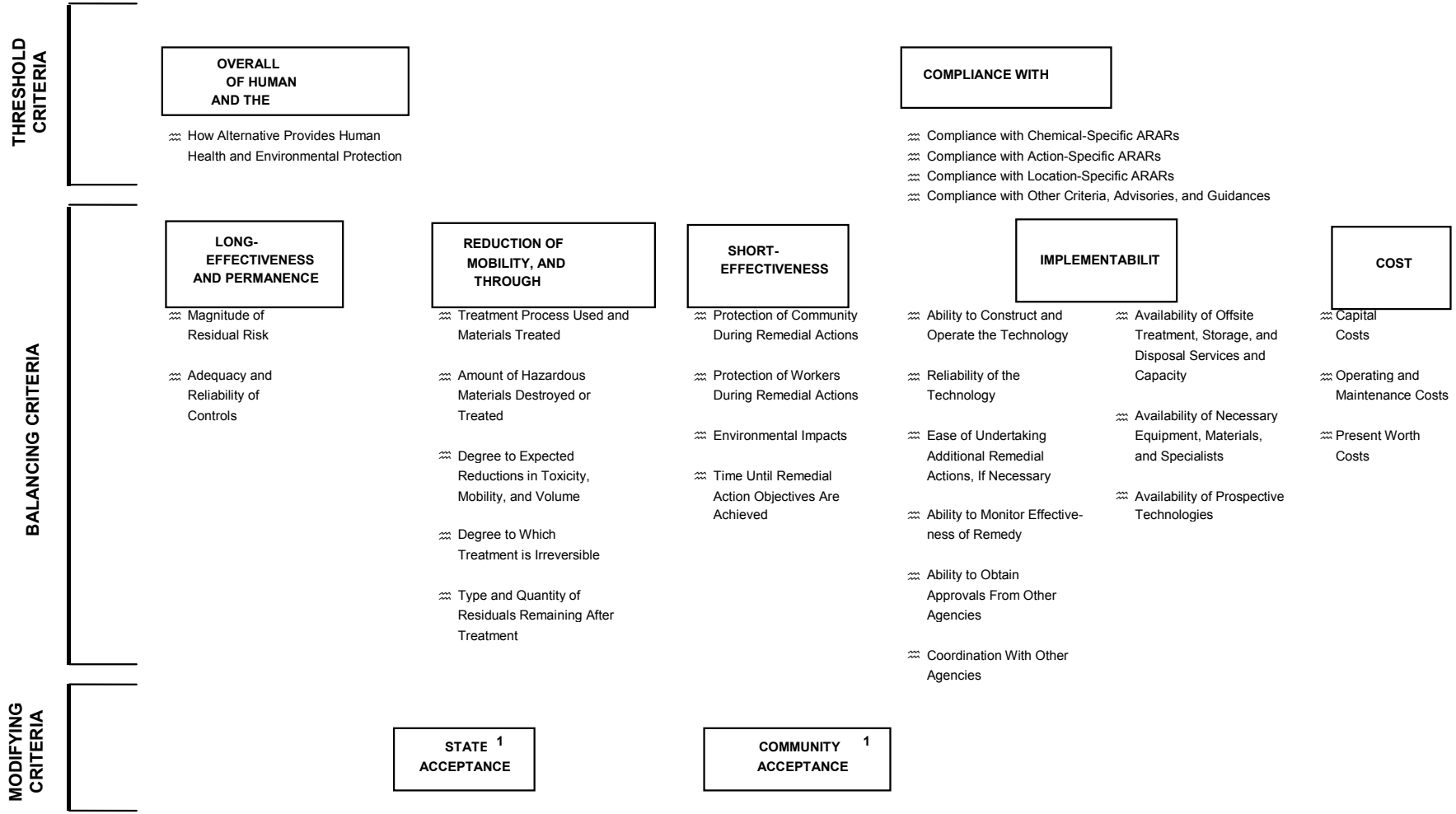
The first step in the FS process is to develop RAOs specifying the contaminants, media of interest, and exposure pathways leading to development of the PRGs. The PRGs are developed based on chemical-specific ARARs, when available; site-specific risk-based factors; or other available information. COCs, as identified in the RI, are those chemicals with average concentrations exceeding the PRGs and background. Once the PRGs and COCs have been determined, the areas and volumes of contamination requiring remedial action are determined.

Once RAOs/PRGs are identified, general response actions (GRAs) for each medium of interest are developed. GRAs typically fall into the following categories: NA, containment, excavation, extraction, treatment, disposal, or other actions, singular or in combination, taken to satisfy the RAOs for the site.

The next step in the FS process is to identify and screen alternatives. This step considers applicable technologies for each GRA. This step eliminates technologies not technically feasible. Those technologies passing the screening phase are then assembled into remedial alternatives. The NCP requires a range of alternatives be presented in the FS to the maximum practicable extent. Remedial alternatives are then described and analyzed in detail using the CERCLA evaluation criteria (see Table 1-1) described in the NCP, including:

# TABLE 1-1

## CRITERIA FOR DETAILED ANALYSIS OF ALTERNATIVES
## NAS WHITING FIELD, MILTON, FLORIDA




1 These criteria are assessed following regulatory and public comment on the RI/FS report and the proposed plan.
Source: Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988).

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with ARARs

Balancing Criteria

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

Alternatives are evaluated against two additional factors (Modifying Criteria) after state participation:

Modifying Criteria

- State acceptance
- Community acceptance

The results of the detailed analyses are summarized and compared in a comparative analysis. The alternatives are compared against each other using the CERCLA evaluation criteria.

These criteria are used because SARA requires them to be considered during remedy selection. Modifying criteria, including 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 proposed plan during a public comment period. This evaluation is described in a responsiveness summary and will be included in the Record of Decision (ROD).

Upon completion of the FS report, the Proposed Plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Site 35. This document will be written in community-friendly language and will be made available for public comment. Following receipt of all public comments, responses to these comments will be developed in a responsiveness summary within the ROD. 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.

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

## 1.2 PURPOSE

The purpose of the FS report for Site 35 at NAS Whiting Field is to develop remedial alternatives to address threats to human health and the environment resulting from contaminated soil. RAOs are used to develop, screen, and evaluate potential remedial alternatives to meet the objectives.

The FS report was developed in accordance with the NCP, providing guidance for identifying applicable remedial action technologies. The FS report does not present all the possible variations and combinations of remedial actions possible, but presents distinctly different alternatives representing a range of opportunities for meeting the RAOs. It is expected these different alternatives can be adjusted during the proposed plan and decision process, and to a lesser extent during detailed design, to accomplish the RAOs in a manner similar to the initially proposed alternative. Also, the FS report does not present information on alternatives failing to meet the RAOs.

The following criteria are considered in identifying appropriate remedial action for Site 35:

- RAOs: RAOs are developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals.
- Applicable Technologies: Technologies applicable for addressing contaminated media are identified and screened. Technologies are eliminated if they cannot be implemented.
- Remedial Alternatives: Technologies passing the screening phase are assembled into remedial alternatives.
- Detailed Analysis: Selected remedial alternatives are described and evaluated using seven of the nine criteria outlined in the NCP.
- Comparative Analysis: Remedial alternatives are compared against each other using threshold and primary balancing criteria.

## 1.3 ENVIRONMENTAL CONDITIONS

NAS Whiting Field is located in Santa Rosa County, in Florida's northwestern coastal area, approximately 5 miles north of Milton and 20 miles northeast of Pensacola. Mobile, Alabama is approximately 60 miles west of the air station, and Tallahassee, the capital of Florida, is 165 miles to the east. The installation was constructed in the early 1940s and since has served as a naval aviation training facility. NAS Whiting Field presently consists of two airfields (North and South Fields) separated by an industrial area. The installation is approximately 3,842 acres in size. NAS Whiting Field provides the support facilities for flight and academic

training. Figure 1-1 presents the installation layout and the location of Site 35 at NAS Whiting Field.

Land surrounding NAS Whiting Field consists primarily of agricultural land to the northwest, residential and forested areas to the south and southwest, and forests along the remaining boundaries. Located on an upland area, elevations at NAS Whiting Field range from 50 to 190 ft above sea level. The facility is bounded by the following low-lying receiving waters: Clear Creek to the west and south and Big Coldwater Creek to the east. These two streams are tributaries of the Blackwater River. The Blackwater River discharges to the estuarine waters of the East Bay of the Escambia Bay coastal system. Both Clear Creek and Big Coldwater Creek are classified by the FDEP as Class II Waters Recreation-Propagation and Management of Fish and Wildlife. The Blackwater River is classified as an Outstanding Florida Water. Outstanding Waters are considered to be of exceptional recreational and ecological significance.

## 1.4 REGULATORY SETTING

The Navy IR program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations, with the goal of expediting and improving environmental response actions while protecting human health and the environment. The IR program is conducted in accordance with Section 120 of CERCLA as amended by SARA and Executive Order 12580. CERCLA requires federal facilities to comply with the act, both procedurally and substantively. NAVFAC SE is the agency responsible for the Navy IR program in the southeastern United States; therefore, NAVFAC SE has the responsibility of processing NAS Whiting Field through the PA, SI, RI/FS, and remedial response in compliance with the guidelines of NCP (40 CFR 300).

Section 105(a)(8)(A) of SARA required the USEPA to develop criteria to set priorities for remedial action based on relative risk to human health and the environment. To meet this requirement, USEPA has established the Hazard Ranking System (HRS) as Appendix A to the NCP. First promulgated in 1982, the HRS was amended in December 1990, effective March 14, 1991 [55 *Federal Register* (FR) No. 241:51532-51667], to comply with requirements of Section 105(c)(1) of SARA to increase the accuracy of the assessment of relative risk.

The HRS score for NAS Whiting Field was generated in 1993. The score was sufficient to place NAS Whiting Field on the National Priorities List (NPL); therefore, in January 1994, USEPA placed NAS Whiting Field on a list of sites proposed for inclusion on the NPL (40 CFR 300; FR 18 January 1994), and on May 31, 1994, NAS Whiting Field was placed on the NPL effective June 30, 1994 (40 CFR Part 300; FR 31 May 1994). Consequently, the RI/FS for NAS Whiting Field must follow the requirements of CERCLA, the NCP, and the “Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA” (USEPA, October 1988).

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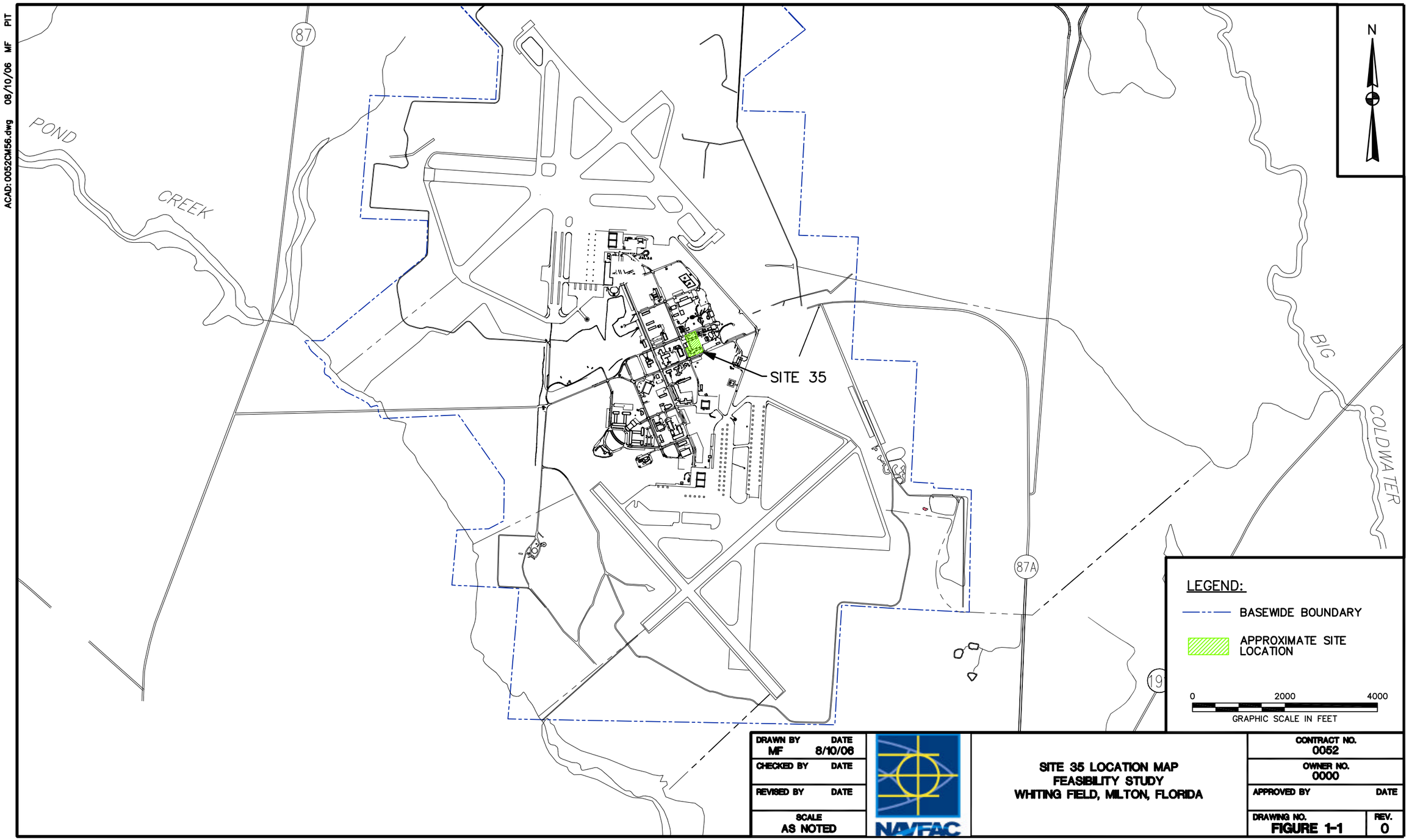


| | | | |
|---|---|---|---|
| DRAWN BY MF | DATE 8/10/06 | SITE 35 LOCATION MAP<br>FEASIBILITY STUDY<br>WHITING FIELD, MILTON, FLORIDA | CONTRACT NO. 0052 |
| CHECKED BY | DATE | | OWNER NO. 0000 |
| REVISED BY | DATE | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 1-1 / REV. 0 |

NAVFAC

FORM CADD NO. SDIV-BH.DWG – REV 1 – 9/10/98

Per CERCLA Section 121(d), the Navy will follow ARARs of the State of Florida for all IR program activities at NAS Whiting Field.

## 1.5 REPORT ORGANIZATION

The FS report is organized into two chapters. Chapter 1.0 presents the purpose, site description, and regulatory setting for the FS at NAS Whiting Field. Chapter 2.0 presents the development of the RAOs, PRGs, and areas and volumes of contamination; identifies and screens the alternatives; presents the detailed analysis of the alternatives; and presents the comparative analysis for Site 35.

The FS report also includes Appendices A, B and C. GRAs are described in Appendix A, and CERCLA evaluation criteria are discussed in Appendix B. Remedial alternative cost estimates are provided in Appendix C.

# 2.0 SITE 35 – BUILDING 1429, PUBLIC WORKS MAINTENANCE FACILITY

Site 35 consists of Building 1429, the Public Works Maintenance Facility. Building 1429 was built in 1943 and used for the maintenance of vehicles and equipment, generation of power and heat, storage of fire fighting equipment, woodworking and metals repair, and offices. A gasoline service station (formerly Building 2848) with a pump island and underground fuel storage tanks was located at the northeast side of the building. The service station was equipped with three USTs (one diesel – Tank Number 2851 and two gasoline – Tank Numbers 1429 I and 1429 J) located west of the pump island and under the vehicle shed. All three tanks were abandoned in place in 1984. The tanks were abandoned by pumping out the remaining fuel, filling the tanks with sand and capping the fill ports with concrete. None of the tanks have been removed since abandonment.

Based on a record search and interviews with facility personnel, Building 1429 was identified as a potential site in July 1993 and designated as Site 35. The site was added to the IR program in 1995 and a SSI was initiated in December 1996. The purpose of the SSI was to complete an initial screening assessment to determine if contaminants were present and if additional investigations were warranted.

The SSI included the advancement of soil borings, subsurface soil sampling, monitoring well installation, and groundwater sampling. Four soil borings were advanced to a depth of 30 ft bls at Site 35. One additional soil boring (35B001) was advanced to a depth of 54 ft bls. The deeper soil boring was located to investigate the fuel pump island and UST area. All of the soil borings were continuously split spoon sampled to the total depth of the boring. The split spoon samples were screened in the field for DNAPLs using an ultraviolet light and centrifuge red dye test, total OVA headspace measurements, and field GC screening. The field GC analysis was conducted using a HNU™ 311 portable GC. The soil samples were analyzed for VOCs BTEX, DCE, PCE, and TCE. In addition, confirmation soil samples were also collected for a fixed-base laboratory analysis. Three subsurface soil samples from each soil boring were analyzed for TCL VOCs (as described in the CLP SOW, OLM04.0).

Six monitoring wells were installed at the site at two nested well locations. Following the installation and development of the monitoring wells, a groundwater sample was collected from each well and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL inorganics (as provided in the CLP SOW, ILM04.2).

The analytical results from the SSI are summarized in the Draft Final report on the Investigation at Sites 35, 36, and 37, NAS Whiting Field, Milton, Florida completed on February 3, 1999 by HLA (HLA, 1999). The summary and recommendations of the report indicated no VOCs were detected at concentrations exceeding regulatory criteria in the subsurface soil samples collected from Sites 36 and

37. However, the analytical results for soil boring 35B001 (associated with the Site 35 fuel pump island) indicated contaminated soil at levels exceeding the soil gas headspace criteria of 50 ppm for excessively contaminated soils as defined by the State of Florida (Chapter 62-770, F.A.C.). Laboratory analysis of the subsurface soil samples also indicated VOC concentrations typically associated with petroleum contamination exceeding the Florida SCTLs for leaching soils (HLA, 1999). In addition, the shallow and deep groundwater samples collected from Site 36 contained TCE at concentrations exceeding Florida and Federal regulatory limits.

Additional soil sampling at the former gas pumps and UST area at Site 35 was recommended to assess the extent of petroleum contamination by the HLA report (HLA, 1999). It was also determined soil at Site 35 had not been analyzed for SVOCs.

## 2.1 ENVIRONMENTAL CONDITIONS

### 2.1.1 Nature and Extent of Contamination

Constituents detected in the subsurface soils at Site 35 include VOCs, PAHs, and inorganics. Figure 2-1 presents the soil boring location map for Site 35.

**Surface Soil**

Site 35 is completely covered by concrete and asphalt and, therefore, has no “surface soil”.

**Subsurface Soil**

During the RI, 10 subsurface soil samples were collected from four borings (35SB10, 35SB11, 35SB12, and 35SB13) at Site 35. The four soil borings were selected for sampling based on the FID readings. The samples were analyzed for TCL VOCs, PAHs, TRPH, and TAL inorganics. Analytical results are summarized in the RI Report (TtNUS, 2005) with SCTLs from Chapter 62-777, F.A.C., USEPA PRG values, and the background screening levels (BSLs). Synthetic Precipitate Leaching Procedure (SPLP) leachate analytical results are summarized in the RI.

**VOCs**

Five compounds (2-butanone, acetone, benzene, ethylbenzene, and total xylenes) were detected in the subsurface soil at Site 35. Ethylbenzene and/or total xylenes were detected above the FDEP LE SCTL in three samples. Neither ethylbenzene or total xylenes were detected in the SPLP leachate analysis.

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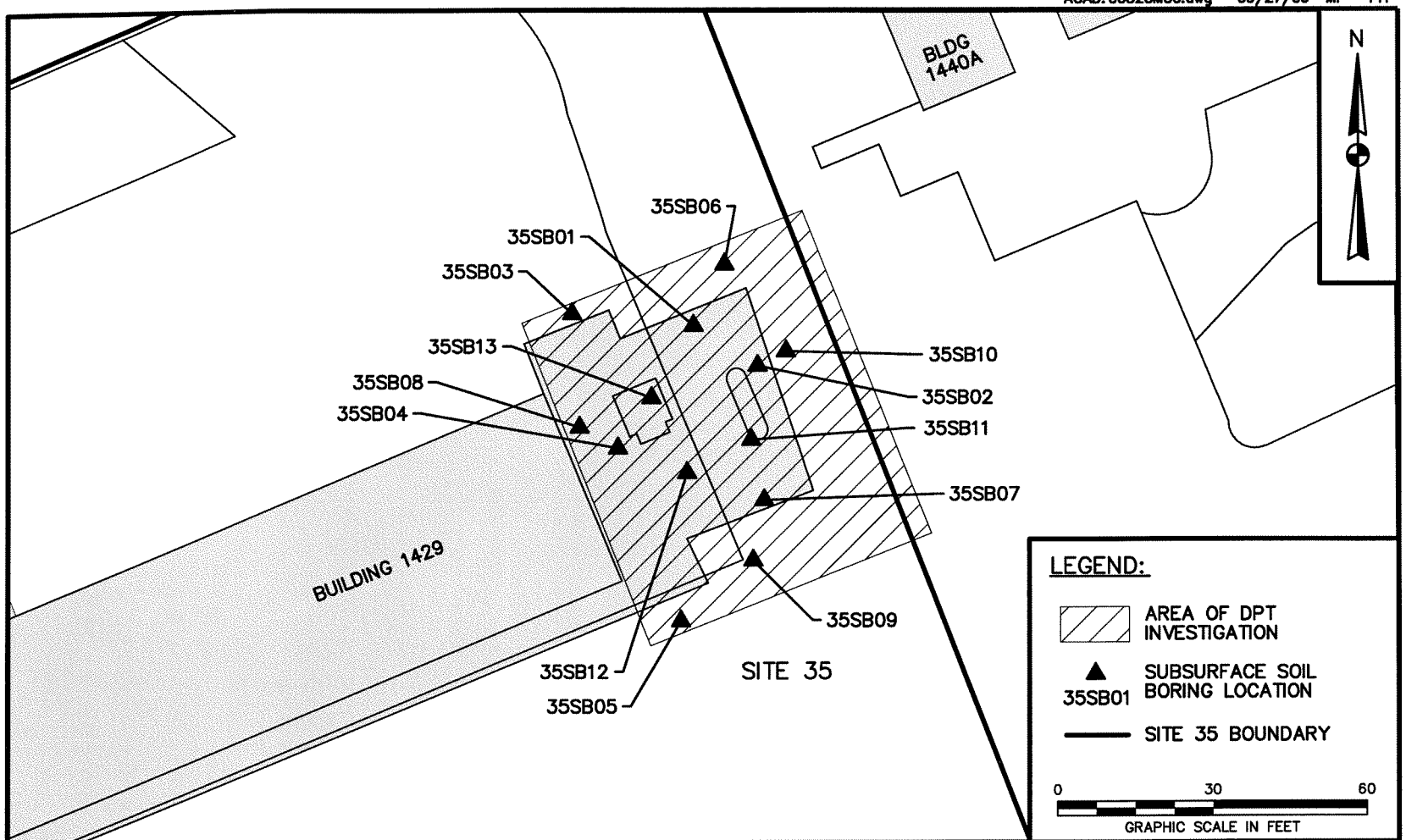


| | | | |
|---|---|---|---|
| DRAWN BY MF DATE 2/22/05 | NAVFAC | SITE 35 SUBSURFACE SOIL BORING LOCATION MAP FEASIBILITY STUDY NAS WHITING FIELD, MILTON, FLORIDA | CONTRACT NO. 0052 |
| CHECKED BY DATE | | | OWNER NO. 0000 |
| REVISED BY DATE | | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 2-1 REV. 0 |

FORM CADD NO. SDIV-AH.DWG – REV 1 – 9/10/98

**PAHs**

One PAH [benzo(a)pyrene] was detected in sample 35SB01220 [0.335 milligrams per liter (mg/L)] above the FDEP DE1 SCTL (0.1 mg/L).

**Inorganics**

Seventeen inorganic analytes were detected in the subsurface soil at Site 35. Twelve analytes (aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, vanadium, and zinc) were detected in all of the samples. Three analytes (antimony, arsenic, and chromium) were detected in five samples (35D010202, 35D01115, 35D1215, 35D1230, and 35D1320). Cobalt was detected in two samples (35D01115 and 35D1215) and selenium was detected in sample 35D01115.

Seven analytes (aluminum, chromium, copper, iron, lead, selenium, and vanadium) were detected above the BSLs. Vanadium was detected above FDEP DE1 SCTL [15 milligrams per kilogram (mg/kg)] in five samples [35D01020 (61.5J mg/kg), 35D01115 (65.6J mg/kg), 35D1215 (62.9J mg/kg), 35D1230 (55.6J mg/kg), and 35D1320 (48.7J mg/kg)]. Chromium was detected above the USEPA Residential PRG (30 mg/kg) in sample 35D1215 (32.2J mg/kg).

Arsenic was detected above the BSL, FDEP DE1 and DE2 SCTL, and the USEPA Residential and Industrial PRGs in two samples (35D01115 and 35D01215). Iron was detected above FDEP DE1 SCTL (23,000 mg/kg) and USEPA Residential PRG (23,000 mg/kg) in samples 35D01115 (24,800J mg/kg) and 35D1215 (24,700J mg/kg). Although arsenic and iron were detected above the regulatory limits, upon closer examination of all the data collected at NAS Whiting Field, arsenic and iron have been determined to be a naturally occurring constituents in the soil at NAS Whiting Field. Therefore, neither arsenic nor iron will be addressed as a COPC.

Several analytes (aluminum, cobalt, copper, iron, lead, and manganese) detected in the subsurface soil do not have specific FDEP LE SCTLs for comparison. LE SCTLs are determined on a site-specific basis. Therefore, SPLP analysis was performed on five samples (35D01320, 35D01325, 35D01115, 35D01220, and 35D01315). Aluminum and iron were detected above FDEP GCTLs in three samples (35SB01115, 35SB01220, and 35SB01315). Based on these results it is possible the subsurface soil may be leaching contaminants into the groundwater. The impact on groundwater will be addressed in the Site 40 RI Report.

**Summary**

Five VOCs, one PAH, and 17 inorganics were detected in the subsurface. Ethylbenzene and total xylenes were detected above the FDEP LE SCTL. Vanadium was detected above the FDEP DE1 SCTL. Chromium was detected above the USEPA Residential PRG. Aluminum and lead were detected above

the FDEP GCTLs in subsurface soil leachate samples. Arsenic was detected above the FDEP and USEPA regulatory limits and iron and was detected above the FDEP DE1 SCTL; however, upon closer examination of all the data collected at NAS Whiting Field, arsenic and iron have been determined to be naturally occurring constituents in the soil at NAS Whiting Field.

### 2.1.2 Risk Assessment Results

#### 2.1.2.1 Surface Soil

Site 35 is completely covered by concrete and asphalt and, therefore, has no surface soil to sample and thus, no risk assessment was conducted on surface soil.

#### 2.1.2.2 Subsurface Soil

The initial candidate COPCs included five carcinogenic constituents; therefore, the carcinogenic screening levels were divided by five. Two constituents (benzo(a)pyrene and chromium) were selected as COPCs for subsurface soil at Site 35. One constituent benzo(a)pyrene was selected as a COC for subsurface soil at Site 35.

Risk Characterization

This section contains a summary of the HHRA for Site 35. The methodology used to calculate the risk estimates is provided in the RI.

Cancer risk estimates and Hazard Indices (HIs) calculated for the COPCs for subsurface soils are presented in the RI.

The estimated Incremental Life-Time Cancer Risk (ILCRs) calculated for the hypothetical future resident and the typical occupational worker (based on the Florida SCTLs) are 5.0E-06 and 1.0E-06, respectively. These risk estimates are within the USEPA target risk range often used to evaluate the need for environmental remediation; but exceed the State of Florida benchmark of 1E-06. The primary risk driver (i.e., contributor to risk) is the carcinogenic PAH benzo(a)pyrene. The ILCR for benzo(a)pyrene exceeds 1E-06 for the hypothetical future resident. The ILCRs for chromium do not exceed 1E-06 for either the hypothetical future resident or the typical occupational worker.

The remaining five carcinogenic polynuclear aromatic hydrocarbons (cPAHs) were selected as COPCs either because of the conservative COPC selection process of lowering the screening level according to the number of carcinogenic initial COPCs.

Summary

An HHRA was conducted for Site 35 to determine if a human health risk from the detected contaminants existed for a construction worker, on-site worker, trespasser or on-site resident. According to the HHRA, benzo(a)pyrene may pose a risk to future residents.

Based on the RA results, one COC, benzo(a)pyrene, has been identified for subsurface soil at Site 35.

#### 2.1.2.3 Ecological

A SERA was performed for Site 35. Several constituents were detected in subsurface soil at maximum concentrations exceeding conservative screening levels and, thus, were initially retained as COPCs. These COPCs were assessed in a less conservative Step 3A evaluation. The results of the Step 3A analysis indicate the constituents detected in the subsurface soil at Site 35 do not pose unacceptable risks to ecological receptors and will not be evaluated further.

## 2.2 REMEDIAL ACTION OBJECTIVES

The objectives and goals for remedial actions at Site 35 provide the basis for selecting RAOs and identifying remedial technologies to address unacceptable human health risks associated with direct exposure to surface and subsurface soil contamination at the site. RAOs addressing groundwater and leaching to groundwater will be addressed in the FS for Site 40, Basewide Groundwater.

To establish RAOs, ARARs are first identified. RAOs are then defined primarily on consideration of ARARs and the results and conclusions of the RI. Next, action levels (PRGs) for each media of concern are defined. Volumes of affected media above action levels are then calculated. Finally, GRAs satisfying the RAOs are identified. The information presented in this section is used to identify and evaluate appropriate remedial technologies for Site 35 (see Section 2.3).

### 2.2.1 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 remedial actions to comply with state ARARs when more stringent than federal ARARs.

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 siting laws specifically addressing a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. Applicable state standards are only those (1) identified by the state in a timely manner, (2) consistently enforced, and (3) 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 siting laws, while not "applicable" to a hazardous substance, pollutant, contaminant, or remedial action, addressing situations sufficiently similar to those encountered at the CERCLA site so their use is well suited to the particular site. Only those state standards identified (1) in a timely manner and (2) 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 or be waived from the ARAR, 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 (TBC) guidance criteria" are federal and state nonpromulgated advisories or guidance not legally binding and not having 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 manmade site features such as historical or archaeological sites).

- 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 sections and presented in Table 2-1.

#### 2.2.1.1 Chemical-Specific ARARs

Chemical-specific requirements are standards limiting 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. The FDEP has developed chemical-specific, risk-based SCTLs for soil in Florida (FDEP, 2005). The USEPA Region IX has developed PRGs (Soil Screening Levels) (USEPA, 2002) requested by the USEPA to be used at NAS Whiting Field as a "Relevant and Appropriate" ARAR.

#### 2.2.1.2 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.

Observations made during the ecological assessment for Site 35 indicate no state or federally listed rare, threatened, or endangered species of concern are known to exist on this site (TtNUS, 2005). Site 35 does not contain wetland areas, and no part of the site is located within a 100-year floodplain.

#### 2.2.1.3 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.

**TABLE 2-1**
**SYNOPSIS OF FEDERAL AND STATE ARARs AND GUIDANCE FOR SITE 35**
**NAS WHITING FIELD, MILTON, FLORIDA**

| Name and Regulatory Citation | Description | Consideration in the Remedial Action Process | Type |
|---|---|---|---|
| **FEDERAL** | | | |
| USEPA Region IX PRGs | Provides risk-based concentrations for screening of soil. | Relevant and Appropriate. These guidelines aid in the screening of chemicals in soil and have been requested by the USEPA to be used at NAS Whiting Field as an ARAR. | Chemical-specific |
| CERCLA and the NCP Regulations (40 CFR, Section 300.430) | Discusses the types of LUCs to be established at CERCLA sites. | Applicable. These regulations may be used as guidance in establishing appropriate LUCs at Site 35. | Action-specific |
| Occupational Safety and Health Act (29 CFR Part 1910) | Requires establishment of programs to ensure worker health and safety at hazardous waste sites. | Applicable. These requirements apply to response activities conducted in accordance with the NCP. During the implementation of any remedial alternative for Site 35, these regulations must be followed. | Action-specific |
| Hazardous Materials Transportation Act Regulations (49 CFR 171-179) | Provides requirements for packaging, labeling, manifesting, and transporting hazardous materials. | Applicable: If soil is excavated and transported and is found to be hazardous, the soil would need to be handled, manifested, and transported as a hazardous waste. | Action-specific |
| National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) | Standards promulgated under the Clean Air Act for significant sources of hazardous air pollutants. | Relevant and Appropriate: Remedial Action (e.g., soil excavation) may result in release of hazardous air pollutants. | Action-specific |
| Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal of Hazardous Waste (40 CFR 262-266) | Regulates the treatment, storage, and disposal of hazardous waste | Relevant and Appropriate: Hazardous waste generated by site remediation activities must meet RCRA generator and treatment, storage, or disposal requirements. | Action-specific |
| Land Disposal Restrictions (40 CFR 268) | Restricts certain listed or characteristic hazardous waste from placement or disposal on land without treatment. | Excavated soils or treatment residuals (such as spent activated carbon) may require disposal in a land fill. | Action-specific |
| **STATE** | | | |
| Florida SCTLs (Chapter 62-777, F.A.C.) | Default SCTLs. Human health risk-based cleanup goals for soil. | Applicable. These regulations apply to all remedial actions in the State of Florida. | Chemical-specific |
| Florida SCTLs (Chapter 62-785, F.A.C.) | Default SCTLs. Human health risk-based cleanup goals for Brownfield soils. | TBC: These regulations apply to all Brownfield remedial actions in the State of Florida. | Guidance |
| Florida Hazardous Waste Rules (Chapter 62-730, F.A.C.) | Adopts by reference, specific sections of the Federal hazardous waste regulations. | Relevant and Appropriate. These regulations are not applicable to Site 38 because they apply the handling of hazardous waste. These regulations may apply if material is removed from a site. | Action-specific |

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.

#### 2.2.1.4 TBC Criteria

As previously stated, TBCs are federal and state nonpromulgated advisories or guidance 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.

### 2.2.2 Identification of Remedial Action Objectives

RAOs are defined in USEPA RI/FS guidance as media-specific goals established to protect human health and the environment (USEPA, 1988). RAOs are based on the COCs, the exposure pathway, and the receptors present at the site. RAOs are identified in this section for subsurface soil and will consider the results of the RI discussed in Section 2.1, particularly the HHRA and Ecological Risk Assessment (ERA), as well as the ARARs and TBCs identified in Table 2-1.

For this FS, RAOs have been formulated based on the following criteria:

- FDEP SCTL
- USEPA Region IX PRGs

RAOs addressing groundwater and leaching to groundwater will be addressed in the FS for Site 40, Basewide Groundwater. The current and future anticipated use of the property at this site is industrial. The current and future receptors are occupational and construction workers in direct contact with the soil. Based on the current and future use receptors, two RAOs have been developed for Site 35. They are as follows:

**RAO 1**: To protect human health from carcinogenic and noncarcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with contaminated soils at Site 35 related to benzo(a)pyrene.

**RAO 2**: To comply with federal and state ARARs and TBCs in accordance with accepted USEPA and FDEP guidelines.

### 2.2.3 Preliminary Remediation Goals

Preliminary Remediation Goals (PRGs) establish acceptable exposure levels protective of human health and the environment. PRGs are based on regulatory requirements, USEPA-acceptable risk levels, and assumptions regarding ultimate land uses, as well as contaminant pathways. As part of the CERCLA process, PRGs are periodically revised because of new guidance requirements and promulgated or updated ARARs. Final Remediation Goals are not formally set until the approval of the ROD and are often refined during the FS process. Specifically PRGs are used to estimate areas and volumes of impacted media, and to set performance standards for potential remedial alternatives. The steps leading to the development of the PRGs include the development of RAOs and the identification of the ARARs (see Sections 2.2.1 and 2.2.2).

PRGs are determined based on ARARs, chemicals and media of interest, and exposure pathways. Two ARARs will be used for PRG development: the FDEP SCTLs (Chapter 62-777, F.A.C.) and the USEPA Region IX PRGs (see Table 2-1). The evaluation for groundwater beneath Site 35 will be performed in the FS for Site 40, Basewide Groundwater. The current and future anticipated use of Site 35 is for industrial purposes; therefore, the exposure pathways are to occupational and construction workers.

Cleanup of inorganic constituents below their established background concentrations will not be performed; therefore, background concentrations will be used as the lower limit for PRGs. The PRG selection process is summarized below.

1. The FDEP SCTLs (Chapter 62-777, F.A.C.) and the USEPA Region IX PRGs for Commercial/Industrial Direct Exposure will be used as PRGs.
2. Background concentration will be used as the lower limit for the PRG of inorganic COCs.

### 2.2.4 Areas and Volumes of Soil Requiring Remedial Action

The area and volume of soil requiring remedial action or removal based on current conditions encompasses only the area around subsurface soil sample location 35SB12 (Figure 2-1). This sample contained benzo(a)pyrene at concentrations exceeding target levels. To account for an adequate buffer around and below the location, the area to be addressed consists of a 10 ft by 10 ft area to a depth of 20 ft bls (one ft below the depth of the sample collected at this location).

In summary, the estimated area and volume of soil requiring remedial action or removal at Site 35 is 100 square feet or 74 cubic yards.

## 2.3 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

The development of remedial action alternatives for CERCLA sites consists of identifying GRAs, identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial action alternatives accomplishing the RAOs identified in Section 2.2.

The NCP requires a range of remedial alternatives be considered, and CERCLA emphasizes the use of treatment technologies. Treatment alternatives range from those minimizing the need for long-term management to those reducing toxicity, mobility, or volume of contaminants.

### 2.3.1 General Response Actions

GRAs describe those actions meeting the requirements of the remedial objectives. GRAs may include NA, limited action, treatment, containment, removal, disposal, or a combination of these. Like RAOs, GRAs are media specific.

The following GRAs were considered for the surface soils at Site 35.

- NA
- Limited action
- Removal

Soil GRAs are discussed in Appendix A.

The remaining sections of this chapter identify the types of technologies, evaluate and select representative technologies for each technology type, and develop remedial alternatives using the selected technologies. A detailed evaluation of remedial alternatives is presented in Section 2.4.

### 2.3.2 Identification and Screening of Remedial Technologies

The purpose of this section is to identify and screen appropriate technologies for remedial alternatives addressing the RAOs identified for Site 35. Each technology is then screened based on site- and waste-limiting characteristics.

Site-limiting characteristics considered during this process include the following:

- Site geology, hydrogeology, and terrain
- Availability of space and resources necessary to implement the technology
- Presence of special site features (e.g., wetlands, floodplains, or endangered species)

The following waste-limiting characteristics were also considered:

- Types and concentrations of waste constituents
- Physical and chemical properties of the waste (e.g., volatility, solubility, and mobility)

Table 2-2 presents the remedial technologies/process options applicable for addressing the RAOs for Site 35. This table also presents the results of the screening of those technologies. 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 were eliminated from further consideration.

**TABLE 2-2**

**IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS NAS WHITING FIELD, MILTON, FLORIDA**

| General Response Action | Remedial Technology | Process Option | Description | Screening Result |
|---|---|---|---|---|
| No Action (NA) | NA | None | No remedial actions taken. | Retained |
| Limited action | Engineering Controls (ECs) and Land Use Controls (LUCs) | ECs and LUCs | ECs for property in the area of soil contamination would include concrete and /or in-situ barriers. LUCs include access controls (e.g., fences, security guards, warning signs, etc.), and institutional controls (e.g., public advisories, Base Master Plan, etc.), and site monitoring to ensure compliance with the LUCs. | Retained |
| Removal | Excavation | Bulk excavation | Excavation is the removal of soils using common construction equipment such as a high lift and backhoe. | Retained |
| Disposal | On-site landfill | Hazardous landfill | Double-lined and capped permanent disposal facility. | Eliminated |
| | | Hybrid landfill | Unlined but capped permanent disposal facility. | Eliminated |
| | | Nonhazardous landfill | Unlined and uncapped permanent disposal facility. | Eliminated |
| | On-site landfill | Hazardous waste landfill | Existing RCRA hazardous waste disposal site. | Retained |
| | | Nonhazardous waste landfill | Existing nonhazardous waste disposal site. | Retained |

Table 2-3 summarizes the technologies/process options passing the screening criteria. Table 2-3 also shows the Representative Process Option (RPO) selected for alternative evaluations. The RPOs are assembled into remedial alternatives in Section 2.3.4.

**TABLE 2-3**

**SOIL TECHNOLOGIES AND PROCESS OPTIONS PASSING PRELIMINARY SCREENING**
**NAS WHITING FIELD, MILTON, FLORIDA**

| General Response Action | Remedial Technology | Process Option[1] | Representative Process Option |
|---|---|---|---|
| No action (NA) | NA | None | None |
| Limited action | ECs and LUCs | ECs and LUCs | ECs and LUCs |
| Removal | Excavation | Excavation | Excavation |
| Disposal | Off-site landfill | Hazardous waste landfill<br>Nonhazardous waste landfill | Nonhazardous waste landfill |

[1]At least one process option was retained as the representative process option for each acceptable remedial technology.

### 2.3.3 Alternative Range Development

CERCLA requires the selected RPOs to be assembled into alternatives representing a range of treatment and containment combinations, as appropriate (USEPA, 1988). The purpose of providing a range of alternatives is to ensure all reasonable GRAs are represented and evaluated.

For soil actions, alternatives address PRGs and/or exposure pathways and the time frame the alternative will achieve PRGs. Alternatives are developed by combining different RPOs to address the problems at a site. A range of alternatives is developed encompassing all probable actions from a baseline NA alternative to a maximum practical response. The range of alternatives is not necessarily ordered by increasing protection of human health and the environment. The alternatives are then compared to the nine CERCLA evaluation criteria. The range of alternatives developed for surface soil remediation at Site 35 is presented in Table 2-4.

**TABLE 2-4**

**RANGE OF ALTERNATIVES FOR SITE 35**
**NAS WHITING FIELD, MILTON, FLORIDA**

| Alternative Type |
|---|
| No Action (NA) |
| Limited Action – No or Minimal Treatment |
| Removal/Treatment – Minimizes Long-Term Management |

The first alternative type is NA. The NA alternative is used as the lowest level of remedial action and to provide a baseline for comparing alternatives. Under the NA alternative, there will not be implementation of any remedial technologies and therefore, no costs.

The second alternative type is limited action. The limited action alternative usually provides ECs and/or LUCs restricting the exposure pathways to receptors. This alternative type provides little or no treatment, but protects human health and the environment by preventing potential exposure to and/or reducing the mobility of constituents.

The third alternative type is removal/treatment minimizing long-term management. This alternative type represents the upper bound of the alternative range and relies on an aggressive treatment approach. Harmful constituents may be treated in-situ to irreversible and less harmful forms or removed from the site. For soil remedial responses, the time frame for this alternative type is usually short relative to those for other alternative types. Often a combination of various aggressive treatment systems is employed to reduce any harmful constituents in a timely manner.

### 2.3.4 Assembly of Soil Alternatives

Alternatives are developed to provide an appropriate range of options. Sufficient information is included to adequately evaluate and compare alternatives and to determine the most appropriate alternative. Alternatives are developed around USEPA's expectations pertaining to remediation of CERCLA sites. These expectations have been listed in the NCP [40 CFR 300.430(a)(1)(iii) and 55 FR 8846, March 8, 1990] and are summarized below.

- ECs such as in-situ barriers (concrete surfaces) could be used for waste posing a relatively low long-term threat and for sites where treatment is impracticable.
- Principal threats (i.e., highly mobile or highly toxic waste) will be treated, if practicable.
- A combination of ECs and treatment will be used, as appropriate, to achieve protection of human health and the environment. An example would include treatment of "hot spots" in combination with a cap.
- LUCs, will be used to supplement ECs, as appropriate, to prevent exposure to hazardous wastes.
- Innovative technologies will be considered when such technologies offer the potential for superior treatment performance or to lower costs for performance similar to the demonstrated technologies.

In developing soil alternatives, the range of options accounts for various site conditions. Soil alternatives are developed on a site-wide basis because of the type of constituent, constituent characteristics and concentrations, and depth and volume of impacted soil. A combination of RPOs is used to address not only cleanup levels, but also the time frame the remedial objectives will be achieved. Alternatives are developed to achieve ARARs and/or other protective health-based levels using different methodologies. Excavation of soils is considered to provide removal of near surface soil as well as bulk removal for permanent means of removing impacted soils, thereby minimizing worker exposure risks. Separate alternatives are developed to reflect the option of either near surface soil removal or bulk excavation. Soils needing to be removed will be taken to an approved off-site disposal facility.

### 2.3.5 Site 35 Soil Alternatives

The three alternatives for Site 35 represent a range of actions including NA, limited action addressing principal threats, and removal minimizing the need for long-term management. The three alternatives providing a range of treatment options for Site 35 are listed below.

Alternative S35-1: NA
Alternative S35-2: Subsurface Soil (Exceeding PRGs) ECs and LUCs
Alternative S35-3: Subsurface Soil (Exceeding PRGs) Removal

#### 2.3.5.1 Alternative S35-1: No Action (NA)

In an FS, the NA alternative is typically considered to serve as a baseline consideration or to address sites not requiring any active remediation. The NA alternative for Site 35 assumes no remedial action would occur and establishes a basis for comparison with the other alternatives. No remedial action, treatment, LUCs, or monitoring of conditions would remain or be implemented under the NA alternative.

#### 2.3.5.2 Alternative S35-2: Subsurface Soil (Exceeding PRGs) ECs and LUCs

Alternative S35-2 addresses the principal threats through the implementation of ECs and LUCs for surface and subsurface soil. The ECs are in place at Site 35 in the form of a concrete surface that covers the entire site and will provide a barrier minimizing direct exposure to contaminated soil. The ECs will ensure that the concrete cover remains in place and properly maintained. The LUCs for Site 35 would limit exposure pathways at the site by implementing the use of warning signs, fencing, or other containment barriers and to ensure appropriate future land use. ECs and LUCs are described further in Appendix A.

There is no impacted surface soil (up to 2 ft bls) present at Site 35 because the site is entirely covered with concrete. However, site inspections and maintenance would be required.

#### 2.3.5.3 Alternative S35-3: Subsurface Soil (Exceeding PRGs) Removal

Alternative S35-3 minimizes the need for long-term management because all subsurface soils containing COCs exceeding PRGs (hypothetical) would be removed. Excavation would be used to remove all impacted soil exceeding PRGs. The excavation would consist of removing the soil from the surface (below the concrete) down to approximately 20 ft bls. After all impacted soil within the excavation area exceeding PRGs is removed, the excavated areas would be backfilled with clean, native material, compacted, and revegetated with no long-term monitoring or maintenance required. Disposal in an approved off-base Treatment, Storage, and Disposal Facility (TSDF) and/or landfill would be used for the excavated soil from Site 35. Some pretreatment of the excavated soils may be necessary to meet Land Disposal Restrictions (LDRs) and would be provided by the TSDF, if required.

## 2.4 DETAILED ANALYSES OF SOIL ALTERNATIVES

For Site 35, the basic components of alternative analysis were conducted as required. Table 2-5 shows the three remedial alternatives assembled into the appropriate alternative types for the soil at this site. The first alternative, NA, is usually carried forward because CERCLA and National Environmental Policy Act (NEPA) regulations [40 CFR 1501.2(c)] require consideration of this alternative.

**TABLE 2-5**

**SITE 35 SOIL REMEDIAL ALTERNATIVES**
**NAS WHITING FIELD, MILTON, FLORIDA**

| Alternative Number | Alternative Type | Representative Process Options Combined Into Alternatives | Alternative Description |
|---|---|---|---|
| Alternative S35-1 | No Action | None | • No Action. |
| Alternative S35-2 Subsurface Soil (exceeding PRGs) ECs and LUCs | Limited Action No or Minimal Treatment | ECs and LUCs | • ECs in the form of the concrete cover.<br>• LUCs including LUC Assurance Plan. (LUCAP) and LUC Implementation Plan (LUCIP).<br>• Posting of warning signs.<br>• Five-year site reviews. |
| Alternative S35-3 Subsurface Soil (exceeding PRGs) Removal | Removal – Minimizes Long-Term Management | Excavation, Disposal | • Delineation/confirmatory sampling of subsurface soil.<br>• Excavation/disposal of subsurface soil.<br>• Backfill excavation with clean fill.<br>• Establish vegetative cover.<br>• Five-year site reviews. |

The second and third alternatives, limited action and soil removal were carried forward because CERCLA, SARA, and NEPA Regulations [40 CFR 1501.2(c)] require consideration of at least three alternatives. Both Alternatives S35-2 and S35-3 meet all the RAOs.

The objective of the individual detailed analyses is to provide adequate information for each alternative to facilitate the selection of soil remedial actions at NAS Whiting Field. During detailed analysis of alternatives, soil remedial alternatives are assessed against the nine evaluation criteria outlined in USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The evaluation criteria, widely used in CERCLA investigations, are beneficial in selecting and reducing the number of remedial alternatives. Uncertainties associated with specific alternatives are included in the evaluation when changes in assumptions or unknown conditions could affect the analyses.

A three-phase approach is used in the detailed analyses with the evaluation criteria. Table 1-1 presents a summary of the criteria for detailed analyses of alternatives. The "threshold" criteria represent the initial evaluation step for an alternative. For an alternative to advance to the next set of criteria, it must (1) be protective of human health and the environment and (2) comply with ARARs.

The "balancing" criteria constitute the second step in the evaluation stage. In this step, an alternative is assessed as to (1) long-term effectiveness and permanence; (2) reduction of mobility, toxicity, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The third and final stage relates to the "modifying" criteria. In this step (1) State acceptance and (2) community acceptance are evaluated. Descriptions of the nine CERCLA evaluation criteria based on USEPA guidance (USEPA, 1988) are provided in Appendix B.

### 2.4.1 Alternative S35-1: No Action (NA)

**Threshold Criteria**

**Overall Protection of Human Health and the Environment**

The NA alternative would not provide protection to human health and the environment because it has been determined through previous analysis there is a threat (benzo(a)pyrene) to human health and the environment at Site 35.

**Compliance with ARARs**

On the basis of protecting human health and the environment, Alternative S35-1 would not satisfy ARARs and TBCs, including the SCTLs.

**Balancing Criteria**

**Long-Term Effectiveness and Permanence**

Alternative S35-1 would not provide long-term effectiveness and permanence for Site 35. Site 35 would pose a continuing risk to human health and the environment. The magnitude of and potential for residual risk within Site 35 would be relatively unchanged by the NA alternative. The adequacy and reliability of controls component is not applicable for Alternative S35-1 because no construction, installation, or equipment is associated with the alternative. The NA alternative would not include provisions for long-term monitoring.

**Reduction of Mobility, Toxicity, or Volume through Treatment**

The mobility, toxicity, and volume of constituents in Site 35 would not change significantly and the risk posed to human health and the environment by benzo(a)pyrene would remain on site.

**Short-Term Effectiveness**

The NA alternative would not provide short-term effectiveness or short-term risks during implementation. There would be no short-term risks to workers, the community, or the environment because no construction or implementation would occur. There would be no implementation time associated with the NA alternative. The time required to achieve remedial objectives under the NA alternative will be immediate upon acceptance and approval.

**Implementability**

No technical implementability issues exist because no remedial action would occur. There is no need to coordinate with other agencies or acquire permits. Services or materials are not required. Future actions, if needed, would not be hindered by the NA alternative.

**Cost**

There would be no costs associated with the NA alternative since no remedial action will occur and 5-year reviews are not required.

### 2.4.2 Alternative S35-2: Subsurface Soil (Exceeding PRGs) ECs and LUCs

**Threshold Criteria**

**Overall Protection of Human Health and the Environment**

Alternative S35-2 would provide protection to human health and the environment by minimizing all exposure pathways through the use of ECs, fencing, or other containment barriers (concrete surface) and

LUCs restricting future land use at the site to industrial activities. ECs and LUCs would be effective in the protection of human health. Fencing or other containment barriers would protect humans and the environment. There would be no significant risks to human health or the environment during implementation of Alternative S35-2 because no construction or implementation would occur; therefore, for overall protection of human health and environmental resources both on and off base, Alternative S35-2 would provide a high level of protection.

**Compliance with ARARs**

All ARARs applying to source control and reducing risk to humans would be satisfied by Alternative S35-2. Although fencing or other containment barriers are not active remedial processes, exposure to the constituents would be prevented. Constituent exposure and chemical-specific ARARs and TBCs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S35-2.

**Balancing Criteria**

**Long-Term Effectiveness and Permanence**

The degree of long-term effectiveness and permanence provided by Alternative S35-2 is high. ECs and LUCs provide long-term effectiveness and permanence in minimizing exposure pathways. The magnitude and potential of residual risk would be unchanged for on-base receptors, but the exposure pathways would be minimized as long as ECs and LUCs (e.g., fencing, concrete/containment barriers) remain in place. A 5-year review would be required to assess the effectiveness of the remedy in protecting human health and the environment.

The adequacy and reliability of ECs and LUCs would be sufficient to restrict access to impacted soils. Long-term management would consist of ECs and LUCs and monitoring and would be expected to last 30 years.

**Reduction of Mobility, Toxicity, or Volume through Treatment**

The mobility, toxicity, and volume of constituents in Site 35 would not change significantly and there would be no risk posed to human health and the environment because Alternative S35-2 involves no construction or remedial action.

ECs and LUCs would also reduce the mobility of inorganic constituents posing a risk through fugitive dust. Fencing and/or concrete barriers would minimize exposure pathways. This alternative would provide a low degree of irreversible treatment. The implementation and operation of Alternative S35-2 would produce no treatment residuals.

**Short-Term Effectiveness**

There would be no short-term risk to workers, on-base personnel, and the public from implementation of Alternative S35-2. Alternative S35-2 would be effective in minimizing all exposure pathways. The estimated time to achieve the RAOs is approximately 30 years.

**Implementability**

The RPOs associated with Alternative S35-2 would be easily implementable. All components of Alternative S35-2 would be reliable in the protection of human health and the environment. The need for future remedial actions would depend on the effectiveness of Alternative S35-2 in minimizing exposure pathways. Future remedial actions would not be hindered by the implementation of Alternative S35-2; however, modification of ECs and LUCs may be required. Coordination with regulatory agencies would be obtainable.

**Cost**

The estimated net present worth (NPW) cost for Alternative S35-2 is **$103,000** including $4,541 for monitoring of LUCs over a 30-year period.

### 2.4.3 Alternative S35-3: Subsurface Soil (Exceeding PRGs) Removal

**Threshold Criteria**

**Overall Protection of Human Health and the Environment**

Alternative S35-3 would provide protection of human health and the environment by removal and off-base disposal of all soil exceeding PRGs and minimizing all exposure pathways. Immediate and future risk from any potential industrial land use exposure would be reduced by the removal of all impacted soil and its subsequent off-base disposal. The reliability of excavation and off-base disposal is certain in the protection of human health and the environment because the source of risk is permanently removed from the site. There would be no significant risks to human health and the environment during implementation of Alternative S35-3 if normal dust control, runoff control, excavation, and transportation procedures are conducted and direct worker contact with impacted soils is minimized. Therefore, Alternative S35-3 would provide a high level of protection for human health and environmental resources both on and off base.

**Compliance with ARARs**

All ARARs applying to source control and reducing risk to human health and the environment would be satisfied by Alternative S35-3. Alternative S35-3 would satisfy chemical- and action-specific ARARs and TBCs for achieving remedial objectives including the FDEP SCTLs; however, pretreatment of excavated soil may be necessary to meet LDRs. If required, pretreatment would be provided by the TSDF.

Constituent exposure and chemical-specific ARARs and TBCs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S35-3.

**Balancing Criteria**

**Long-Term Effectiveness and Permanence**

The degree of long-term effectiveness and permanence provided by Alternative S35-3 is high since all impacted soils will be removed from the site. Excavation and off-base disposal provide long-term effectiveness and permanence by minimizing exposure pathways, assuming all impacted soil exceeding PRGs is identified, excavated, and disposed.

**Reduction of Mobility, Toxicity, or Volume through Treatment**

Excavation and off-base disposal of all impacted soil would reduce the mobility of constituents by physically moving them from the site to a secure landfill. The toxicity of the excavated constituents may be reduced through treatment in an off-base TSDF before landfill disposal. Minor inorganic constituent residuals would remain below action levels after the implementation of Alternative S35-3. No treatment residuals would be produced by the implementation of Alternative S35-3.

**Short-Term Effectiveness**

The short-term risk to workers, on-base personnel, and the public from implementation of Alternative S35-3 would be controllable and would result from the excavation, transportation, and off-base disposal of impacted soil. Health and safety issues include dust control, runoff control, and proper decontamination procedures. Construction time to implement Alternative S35-3 would be approximately 45 days. Minimal risk to the community would be expected from excavation and transportation of impacted soil during excavation and off-base disposal. Alternative S35-3 would be immediately effective in minimizing all exposure pathways. The estimated time to achieve the RAOs is less than 1 year.

**Implementability**

The RPOs associated with Alternative S35-3 would be implementable, and vendors are available to conduct this work. Soil sampling would be required to finalize the extent of impacted soil for the placement of the excavation areas. Excavation and disposal of Site 35 soils would require clean, native backfill to replace excavated materials; heavy construction equipment; sufficient area for staging/maneuvering; and accommodation for underground utilities. Excavation may be required around utilities. All components of Alternative S35-3 would be reliable in the protection of human health and the environment. The need for future remedial actions would depend on the effectiveness of Alternative S38-3 in minimizing the source areas. Future remedial actions would not be hindered by the implementation of Alternative S35-3. Coordination with regulatory agencies would be obtainable.

**Cost**

The estimated NPW cost for Alternative S35-3 is **$165,000**.

### 2.4.4. Summary of Site 35 Soil Alternatives

As part of the detailed analyses of alternatives for Site 35, one alternative involving NA, one alternative involving limited action (ECs and LUCs), and one alternative minimizing long-term management (Excavation) have been evaluated. Alternatives S35-2, and S35-3 both satisfy the threshold criteria to the full extent, provide varying degrees of protection and will be viable for the selection as a preferred alternative. The relative merits of all Site 35 alternatives are evaluated in Section 2.5.

## 2.5 COMPARATIVE ANALYSIS FOR SOIL ALTERNATIVES

In contrast to the preceding evaluation (Section 2.4) where each alternative was analyzed independently without consideration of other alternatives, the comparative analysis (presented in this section) evaluates the relative performance of each alternative in relation to each specific evaluation criterion. The comparative analysis focuses on the key differences between the alternatives and attempts to highlight critical issues of concern to the decision maker in selecting the preferred remedial action. The following sections provide a summary of the key comparative features and performance of each site-specific alternative relative to the other alternatives with respect to the CERCLA criteria (see Table 1-1).

The main objectives for the preferred remedial action are to be protective of human health and the environment and to comply with ARARs. Protection of human health and the environment and compliance with ARARs are considered threshold criteria. For an alternative to be considered as final, these two threshold criteria must be met. The following five criteria are referred to as the balancing criteria: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The balancing criteria require the most discussion in this section because the key differences between alternatives frequently relate to one or more of these five criteria. The modifying criteria include (1) state acceptance and (2) community acceptance. These criteria will be addressed after the public review and comment period has been completed in the form of a responsiveness summary in the ROD.

A summary of the comparative analyses for the Site 35 alternatives is presented in Table 2-6. This comparison between alternatives is based on the CERCLA evaluation criteria.

**TABLE 2-6**
**SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 35**
**NAS WHITING FIELD, MILTON, FLORIDA**
**PAGE 1 OF 4**

| Criteria | Alternative S35-1 No Action | Alternative S35-2 Subsurface Soil (Exceeding PRGs) ECs and LUCs | Alternative S35-3 Subsurface Soil (Exceeding PRGs) Removal |
|---|---|---|---|
| **THRESHOLD CRITERIA** | | | |
| **Overall Protection of Human Health and the Environment** | | | |
| Human Health Protection | Does not provide required level of protection. | Provides a high level of protection. ECs and LUCs reduce risk from residuals. Fencing and concrete barriers reduce risk of potential exposure. | Provides highest level of protection. Excavation and disposal eliminates risk of potential exposure. |
| Environmental Protection | Does not provide required level of protection. | Provides a high level of protection. ECs and LUCs reduce risk from potential exposure to COCs. | Excavation and disposal will reduce all concentration levels in a short period of time. |
| **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** | | | |
| Compliance with Chemical-Specific ARARs | Does not meet ARARs. | Meets ARARs. | Meets ARARs within 1 year. |
| Compliance with Action-Specific ARARs | Not applicable | Not applicable | Meets ARARs if proper PPE used during excavation and disposal. |
| Compliance with Location-Specific ARARs | Not applicable | Not applicable | Not applicable |
| Compliance with Other Criteria | Not applicable | Meets NAS Whiting Field requirements | Meets NAS Whiting Field requirements |
| **BALANCING CRITERIA** | | | |
| **Long-Term Effectiveness and Permanence** | | | |
| Reduction in Residual Risk | Residual risk | Provides high level of long-term residual risk reduction. Risk eliminated or reduced by barriers and future land use restrictions. | Provides highest level of long-term residual risk reduction. Risk eliminated or reduced by excavation and off-site disposal. |

**TABLE 2-6**
**SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 35**
**NAS WHITING FIELD, MILTON, FLORIDA**
**PAGE 2 OF 4**

| Criteria | Alternative S35-1 No Action | Alternative S35-2 Subsurface Soil (Exceeding PRGs) ECs and LUCs | Alternative S35-3 Subsurface Soil (Exceeding PRGs) Removal |
|---|---|---|---|
| Long-Term Reliability of Controls | Not applicable | Provides a high level of reliability. | Provides highest level of reliability. Excavation and disposal are adequate and reliable. |
| Need for 5-Year Review | Not Required | Required | Required |
| Prevention of Exposure to Residuals | Residual risk | Exposure risk reduced by ECs and LUCs. | Exposure to residuals is eliminated or reduced by excavation and disposal. |
| Potential Need for Replacement of Technical Components after Remedial Objectives Are Achieved | Not applicable | Fencing/concrete may require replacement or repair. | No technical components required. |
| Long-Term Management | Not applicable | Management required for estimated 30 years. | No management required |
| **Reduction of Mobility, Toxicity, or Volume through Treatment** | | | |
| Amount Destroyed or Treated | None | None | All impacted soil exceeding PRGs is excavated and disposed. Removal efficiency estimated >95%. |
| Reduction in Mobility, Toxicity, or Volume | Not applicable | Not applicable | Mobility reduced by excavation and disposal in landfill. Toxicity of excavated soils may be reduced in an off-site TSDF. |
| Irreversibility of Treatment | Not applicable | Not applicable | Off-site TSDF treatment is an irreversible process. |
| Type and Quantity of Residuals Remaining after Treatment | Not applicable | Not applicable | No residuals remain above action levels. |

**TABLE 2-6**
**SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 35**
**NAS WHITING FIELD, MILTON, FLORIDA**
**PAGE 3 OF 4**

| Criteria | Alternative S35-1 No Action | Alternative S35-2 Subsurface Soil (Exceeding PRGs)ECs and LUCs | Alternative S35-3 Subsurface Soil (Exceeding PRGs) Removal |
|---|---|---|---|
| **Short-Term Effectiveness** | | | |
| Community Protection During Implementation | Not applicable | Not applicable | Temporary increases in dust emissions through excavation and disposal; controlled by proper construction techniques. |
| Worker Protection During Implementation | Not applicable | Not applicable | Workers use PPE, as required, to prevent dermal contact as well as dust inhalation and ingestion during construction. |
| Environmental Impacts | None | None | Excavation of impacted soils can generate runoff and fugitive dust. |
| Construction Time[a] | Not applicable | Not applicable | Less than 1 year |
| Time Until Remedial Response Objectives Are Achieved | Not applicable | Estimated at 30 years | Estimated at 1 year |
| **Implementability** | | | |
| Ability to Construct and Operate the Technology | Not applicable | Not applicable | Many contractors available to provide excavation. Fewer contractors accept impacted soil for disposal. |
| Reliability of Technology | Not applicable | ECs and LUCs are reliable for restricting soil access. | Excavation and disposal are reliable. |
| Ease of Undertaking Additional Remedial Action, if Required | Easily implementable | Easily Implementable | Implementable |

## TABLE 2-6
## SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 35
## NAS WHITING FIELD, MILTON, FLORIDA
## PAGE 4 OF 4

| Criteria | Alternative S35-1 No Action | Alternative S35-2 Subsurface Soil (Exceeding PRGs) ECs and LUCs | Alternative S35-3 Subsurface Soil (Exceeding PRGs) Removal |
|---|---|---|---|
| Ability to Monitor Effectiveness | Not applicable | Monitoring gives notice of potential presence of contaminants in subsurface. | Monitoring indicates excavation and effectiveness of removal. |
| Permitting Requirements | Not applicable | Not applicable | Transportation and Disposal Permit will be required. |
| Coordination with Other Agencies | Not applicable | Not applicable | All permits and/or permit modifications are obtainable. |
| Availability of Services and Capabilities | Not applicable | Not applicable | Readily available |
| Availability of Equipment, Specialists, and Materials | Not applicable | Not applicable | Readily available |
| **Cost**[b] | | | |
| Capital Costs | $0 | $0 | NA[c] |
| Short-Term O&M | $0 | $0 | NA[c] |
| Long-Term O&M | | | |
| 5-Year Review | $0 | $6,469 | NA[c] |
| Land-Use Controls | $0 | $4,541 | NA[c] |
| Total Project Present Worth Cost | $0 | $103,000 | 165,000[c] |

[a] Does not include testing or treatability studies.

[b] Includes, short- and long-term total present worth, and contingency.

### 2.5.1 Overall Protection of Human Health and the Environment

This evaluation criterion is used to assess whether an alternative provides adequate protection of human health and the environment and is described in Appendix B.

The existing exposure pathways to humans for Site 35 are dermal contact, inhalation, and incidental ingestion. There are no unacceptable exposure pathways for ecological receptors in the environment. Potential for the constituents to leach and impact groundwater is not considered in this FS, but will be considered in the Site 40, Basewide Groundwater RI/FS. For an alternative to be protective of human health and the environment, it must protect humans from all potential exposure pathways.

Both Alternatives S35-2 and S35-3 would provide adequate and required protection of human health and the environment at Site 35.

Table 2-6 presents a summary for the overall protectiveness of human health and the environment for all Site 35 alternatives.

### 2.5.2 Compliance with ARARs

This evaluation criterion is used to determine whether an alternative meets all Federal and state ARARs and is described in Appendix B.

Alternative S35-1 would not comply with all ARARs and would not meet all PRGs for Site 35.

Alternatives S35-3 would comply with chemical-specific ARARs and TBCs concerning worker and public safety by providing worker protection and emission control during construction and operation.

PRGs are numerical values representing chemical-specific ARARs. Following implementation S35-2 would not meet PRGs, but S35-3 would meet PRGs within Site 35. Table 2-6 presents a summary of ARARs compliance for each alternative.

### 2.5.3 Long-Term Effectiveness and Permanence

This criterion addresses (1) the effectiveness of an alternative in terms of residual risk remaining at the site after response objectives have been completed (e.g., after impacted soil management activities are concluded) and (2) the reliability and maintenance of controls used to manage the risk posed by treatment residuals and untreated wastes.

**Magnitude of Residual Risks**

Alternative S35-3, when implemented, would not produce or leave any residuals requiring treatment and/or disposal posing any future potential risk to the environment. Alternatives S35-2 and S35-3 would require 5-year reviews.

**Adequacy and Reliability of Controls**

Alternatives S35-2 and S35-3 would be adequate and reliable in controlling exposure to any residuals remaining at the site.

Table 2-6 provides a summary of the comparative evaluation of the long-term effectiveness and permanence, including magnitude of future residual risk, long-term reliability of controls, prevention of exposure to residuals, potential need for replacement of technical components, and long-term management requirements, of each Site 35 alternative.

### 2.5.4 Reduction of Mobility, Toxicity, or Volume through Treatment

This criterion addresses the degree each alternative permanently and significantly reduce mobility, toxicity, or volume of hazardous constituents in the soil and is described in Appendix B. Alternative S35-1 would not reduce mobility of chemical constituents for Site 35. Alternatives S35-2 and S35-3 would significantly reduce mobility of chemical constituents for Site 35.

All the alternatives would rely minimally on natural processes to aid in the remediation of the residuals remaining in the soil; however, the types and concentrations of constituent residuals are assumed to be below action levels. None of the alternatives would produce any residuals from treatment (e.g., sludges or soil-washing solutions).

Table 2-6 provides a summary of the comparative evaluation of the constituents destroyed; reduction of toxicity, mobility, or volume; irreversibility of treatment; and residuals remaining after treatment for each Site 35 alternative.

### 2.5.5 Short-Term Effectiveness

This criterion addresses the effects of each alternative during the implementation and construction phases until remedial response objectives are achieved (e.g., cleanup levels are achieved) and is described in Appendix B.

Alternative S35-1 would not protect human health because a COC would remain on site.

More complex and involved alternatives, such as Alternatives S35-2 and S35-3, would protect human health once completed. Alternatives S35-2 and S35-3 are estimated to reach remedial objectives in less than one year. Alternative S35-3 would create short-term risks of worker exposure and the potential of fugitive dust during excavation and transportation. These risks appear manageable using appropriate engineering and construction management controls. The environmental impacts (e.g., fugitive dust and runoff) are expected to be minimal during implementation of all alternatives. ECs would minimize any environmental impacts.

Table 2-6 provides a summary of the comparative evaluation of the short-term effectiveness, including construction time, remedial time to completion, community protection during implementation, and worker protection during implementation, of each Site 35 alternative.

### 2.5.6 Implementability

This criterion addresses whether there are any technical problems or administrative issues associated with an alternative as described in Appendix B.

Alternatives S35-1 and S35-2 would be easily implementable. Alternative S35-3 may require federal, state, or local permits because it includes excavation, transportation, and off-base disposal of impacted soils. In addition, any alternative involving phased construction would require appropriate integrated scheduling of any required permits and construction. Alternatives S35-2 and S35-3 would require coordination with other agencies for any required permitting. All remedial technologies are proven and reliable.

Future remedial actions are not necessary or applicable for Alternative S35-1. Future remedial actions would be easily implementable for Alternatives S35-2 and S35-3 because the site would remain at or be returned to original conditions.

Alternative S35-1 would not require any inspections or monitoring. Alternative S35-2 would require inspection for erosion and potential exposure. Alternative S35-3 would not require any long-term monitoring once the remediation is complete. In addition, monitoring for inhalation of fugitive dust would be performed during construction to protect workers and determine appropriate personal protective equipment. Exposure from dermal contact and ingestion of soil is difficult to monitor.

Alternative S35-3 would require the use of a TSDF or landfill for excavated soils. TSDFs are available and have sufficient capacity to meet the requirements of this alternative. Equipment, specialists, and materials are readily available.

Table 2-6 provides a summary of the comparative evaluation of implementability, including the ability to construct and operate the technology; reliability of the technology; ease of implementation of future remedial actions; ability to monitor effectiveness; ability to coordinate with other agencies; availability of services and capacities; and availability of equipment, specialists, and materials, for each Site 35 alternative.

### 2.5.7 Cost

This criterion addresses the estimated cost for each alternative and is described in Appendix B.

The estimated NPW values reflect a common degree of complexity and/or remedial time between the alternatives. Alternative S35-3 would have the highest cost, followed by Alternative S35-2, with Alternative S35-1 (no cost) being the least expensive.

Table 2-6 provides the NPW costs for each Site 35 alternative. Cost estimate spreadsheets for Alternatives S35-2 and S35-3 are provided in Appendix C.

### 2.5.8 State Acceptance

The state regulatory agency, FDEP, has reviewed and commented on the Draft FS for Site 35 prior to final approval and subsequent acceptance. The FDEP comments have been addressed in this Final FS for Site 35.

### 2.5.9 Community Acceptance

The information concerning community acceptance will be addressed following public comment on the Proposed Plan for Site 35 in the form of a responsiveness summary to be included in the ROD for Site 35.

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# APPENDIX A

# GRAs

## GENERAL RESPONSE ACTIONS

General response actions describe those actions that will satisfy the remedial action objectives. General response actions may include treatment, containment, excavation, extraction, disposal, institutional actions, or a combination of these. Like remedial action objectives, general response actions are medium-specific. General response actions that might be used at a site are initially defined during scoping and are refined throughout the RI/FS as a better understanding of site conditions is gained and action-specific ARARs are identified.

### No Action

The No Action general response action consists of no additional action. No Action is typically considered in an FS to serve as a baseline consideration or to address sites that do not require any active remediation. The No Action baseline condition for NAS Whiting Field consists of access restrictions. Access to the base is controlled in accordance with existing Navy regulations including controlled entrances on the base and security fencing. The regulations minimize the potential for accidental contact with any portion of the site and are assumed to remain in effect during remediation.

### Limited Action

The Limited Action would consist of Land Use Controls (LUCs) and fencing. LUCs are any restriction or control arising from the need to protect human health and the environment or to limit the use of and/or exposure to environmentally contaminated media (e.g., soils, surface water, groundwater) at any site on NAS Whiting Field. LUCs include controls on access (e.g., engineered and nonengineered mechanisms such as fences, caps, and security guards). Additionally, LUCs encompasses both affirmative measures to achieve the desired control (e.g., night lighting of an area) and prohibitive directives (e.g., no drilling of drinking water wells). LUCs include “institutional controls,” which are nonengineered mechanisms for ensuring compliance with necessary land use limitations (e.g., public advisories, Base Master Plan notations, and applicable legal restrictions on land or water usage). Monitoring of soil contamination would not be conducted.

### Containment

Containment would be used to control access to contaminants in soils. Containment using horizontal barriers, such as soil caps, can be used to minimize dermal contact risks.

**In Situ Treatment**

In situ treatment is the treatment of organic-contaminated soil "in place." In situ treatment allows the soils to be treated in place with minimal disturbance and typically includes soil venting when remediating organics.

**Removal and Disposal**

Removal and disposal would consist of excavating the contaminated soils and disposing of them without treatment in a disposal site. Additional excavation would be required to provide access to buried contaminated areas.

# APPENDIX B
# CERCLA EVALUATION CRITERIA

## CERCLA EVALUATION CRITERIA

The objective of the individual detailed analyses is to provide adequate information for each alternative to facilitate the selection of soil remedial actions at NAS Whiting Field. During detailed analysis of alternatives, soil remedial alternatives are assessed against the nine evaluation criteria outlined in USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The evaluation criteria, widely used in CERCLA investigations, are beneficial in selecting and reducing the number of remedial alternatives. Uncertainties associated with specific alternatives are included in the evaluation when changes in assumptions or unknown conditions could affect the analyses.

A three-phase approach is used in the detailed analyses with the evaluation criteria. Table 1-1 presents a summary of the criteria for detailed analyses of alternatives. The "threshold" criteria represent the initial evaluation step for an alternative. For an alternative to advance to the next set of criteria, it must (1) be protective of human health and the environment and (2) comply with ARARs. The "balancing" criteria constitute the second step in the evaluation stage in which an alternative is assessed as to (1) long-term effectiveness and permanence; (2) reduction of mobility, toxicity, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The third and final stage relates to the "modifying" criteria in which (1) state acceptance and (2) community acceptance are evaluated. Descriptions of the nine CERCLA evaluation criteria based on USEPA guidance (USEPA, 1988) are provided below.

### Threshold Criteria

#### Overall Protection of Human Health and the Environment

Evaluation of the overall protectiveness of an alternative focuses on whether a specific alternative provides adequate protection and describes how risks associated with the potential site-specific exposure pathways are eliminated, reduced, or controlled through treatment, engineering, and/or LUCs. This criterion also allows for consideration of whether an alternative poses any unacceptable short-term (during remedial activities) or cross-media impacts. The overall evaluation of protection draws on the assessments conducted under other criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Overall protection from impacted soil is based largely on the certainty that the remedy can achieve and maintain cleanup levels or minimize potential exposure pathways. This criterion must be satisfied for an alternative to be considered in the selection process.

**Compliance with ARARs**

This evaluation criterion is used to determine whether an alternative specific to the site will satisfy all the Federal and state ARARs including compliance with chemical-, action-, and location-specific ARARs. Applicable requirements are those cleanup standards, standards of control (technology- or activity-based), and substantive environmental protection requirements promulgated under Federal or state law that specifically address a situation encountered at NAS Whiting Field. Relevant and appropriate requirements are those Federal and state regulatory requirements that, while not "applicable," address problems or situations sufficiently similar to those encountered in NAS Whiting Field and are appropriate to the circumstances of release or threatened release. Chemical-specific ARARs are numerically represented by the PRGs. Action-specific ARARs are represented by such regulations as RCRA. Location-specific ARARs are represented by regulations regarding actions such as floodplain management. The Navy in consultation with the State of Florida and USEPA makes the final determination of which requirements are relevant and appropriate. This criterion must be satisfied for an alternative to be considered in the selection process.

**Balancing Criteria**

**Long-Term Effectiveness and Permanence**

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the exposure to risk remaining at the site after RAOs have been satisfied. This evaluation focuses on the extent and effectiveness of controls that may be required to manage risks posed by treatment residuals and/or untreated constituents. The following components of the criterion (USEPA, 1988) described below are addressed for each alternative.

- Magnitude of residual risk. This component provides an assessment of the residual risk (on a pathway basis) remaining from treatment residuals and/or untreated constituents at the conclusion of remedial activities. Issues for evaluation of the residual risk include identifying the remaining sources of risk and the requirement of a 5-year review.

- Adequacy and reliability. This component provides an assessment of the adequacy and reliability of remedial controls, if any, used to manage treatment residuals or untreated constituents remaining at the site. Issues for evaluation are type and degree of long-term management, long-term monitoring, operations and maintenance (O&M) functions, and degree of confidence.

Qualitative terms such as “high,” “medium,” “low,” “certain,” and “uncertain” are used to define how well an alternative satisfies the requirements of the evaluation criterion in achieving RAOs. Alternatives must be widely used and proven effective to be considered reliable. An evaluation of the reliability of an alternative is required by CERCLA.

**Reduction in Mobility, Toxicity, or Volume through Treatment**

This evaluation criterion addresses the preference for selecting remedial actions that employ, as their principal element, treatment technologies that permanently and significantly reduce mobility, toxicity, and/or volume of the constituents in the soil. This preference is satisfied when treatment is used to reduce the principal threats at an area through the destruction of toxic constituents, irreversible reduction in constituent mobility, and/or reduction of the total volume of impacted media.

This evaluation focuses on the following specific factors for each alternative as summarized from CERCLA guidance (USEPA, 1988):

- The treatment process employed.
- The amount of hazardous materials destroyed or treated.
- The degree of expected reduction in mobility, toxicity, or volume.
- The degree to which the treatment is irreversible.
- The type and quantity of treatment residuals that will remain following treatment.
- The degree to which the alternative satisfies the statutory preference for a principal treatment element.

Qualitative terms such as “high,” “medium,” “low,” “certain,” and “uncertain” are used to define how an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

**Short-Term Effectiveness**

This evaluation criterion addresses the effects of the alternative during the construction, implementation, and operational phases of remedial action until remedial objectives (e.g., cleanup levels) are achieved. Under this criterion the alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The factors below are summarized from CERCLA guidance (USEPA, 1988) and are addressed as appropriate for each of the remedial action alternatives.

- Protection of the community and workers during construction phases. This aspect of short-term effectiveness addresses risk and inconvenience (such as odor) that may result from implementation of the proposed soil remedial action. These considerations include worker and community threats during remedial action and the effectiveness and reliability of available worker-protective measures.

- Environmental impacts. This factor addresses the potential adverse environmental impacts that may result from the construction and implementation of an alternative and evaluates the reliability of available mitigation measures to prevent or reduce potential impacts.

- Time. This factor addresses the time required to complete construction, implementation, and O&M activities, as well as to achieve remedial objectives. Estimated remedial times are based on the time required to remediate sites with similar conditions, computer modeling, pilot test data, and professional judgment.

Qualitative terms such as “high,” “medium,” “low,” “certain,” and “uncertain” are used to define how an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

**Implementability**

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative as well as the availability of services and materials required during implementation. This criterion involves analysis of the factors below as summarized from CERCLA guidance (USEPA, 1988).

- Technical feasibility
  - Ability to construct and operate the technology includes an evaluation of difficulties and uncertainties associated with the alternative.
  - Reliability of the technology focuses on the likelihood that technical problems associated with implementation could lead to schedule delays.
  - Ease of undertaking additional remedial action includes a discussion of any future remedial actions that may be required and the difficulty of implementing such additional actions. This criterion addresses the ability of the remedy to accommodate future technologies, capacities, or changing soil-constituent concentrations.
  - Monitoring considerations concern the ability to monitor the effectiveness of the remedy and include the effects of exposure if monitoring is insufficient to detect a system failure.

- Administrative Feasibility
  - Ability to coordinate with other offices and agencies for such requirements as construction permits and necessary access to treatment facilities is assessed.

- Availability of Services and Treatment
  - Availability of TSDF that have the required capacity is evaluated.
  - Availability of equipment, specialists, and provisions required to perform the remediation is evaluated.
  - Availability of sources for competitive services and materials is determined.

Qualitative terms such as “high,” “medium,” “low,” “certain,” and “uncertain” are used to define how well an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

**Cost**

The cost criterion addresses the capital costs and annual O&M costs. Costs are estimates for the scope of the remedial action described. A present worth analysis is used to evaluate remedial alternatives occurring over several years. The estimated present worth of each remedial alternative was determined based on a combined interest and inflation rate of 10 percent and a base long-term maintenance/monitoring of not greater than 30 years in accordance with current USEPA guidance (USEPA, 1991). Long-term maintenance/monitoring of alternatives begins upon completion of remedial actions and achievement of PRGs. Costs are presented for comparison and evaluation purposes only.

The cost estimates are prepared based on information from such sources as the *Means Environmental Remediation Cost Data – Assemblies* (Means, 1999a), the *Means Environmental Remediation Cost Data – Unit Price* (Means, 1999b), estimates for similar Tetra Tech NUS projects, telephone quotes provided by vendors, and details provided by treatment facilities personnel. The O&M costs developed are incremental increases over any current system costs. The procedure for preparing the cost estimate was taken from the *Remedial Action Costing Procedures Manual* (USEPA, 1987). A discussion of each component of the cost criterion is given below.

Capital Costs

Total capital costs are defined as those expenditures required to initiate and implement a remedial action. These are short-term costs and are exclusive of costs required to maintain the action throughout the project’s lifetime. These direct costs include construction costs or expenditures for equipment, labor, disposal, permits, startup, and materials required during the remedial action installation. A single contingency (10 to 30 percent of present worth project total) is included for each alternative for any bid and scope changes. The bid contingency covers changes during final design and implementation and accounts for factors such as economic/bidding climate, contractor's uncertainty regarding liability and

insurance on hazardous waste sites, adverse weather, strikes by material suppliers, and geotechnical unknowns tending to increase costs associated with constructing a project. Scope contingencies include provisions for inherent uncertainties such as expanding the extent of excavation needed and regulatory or policy changes that may affect the initial assumptions.

The cost for engineering design (between 5-20 percent of the capital cost) is included in the capital cost. Allowances for price inflation and abnormal technical difficulties are not accounted for in the contingencies.

Operations and Maintenance Costs

Short-term costs occur after construction and installation are complete, but before the remedial action is complete. Such costs include labor, monitoring, materials, utilities, energy, disposal, administrative support, services, rehabilitation, and progress reviews required to operate and maintain remedial action activities. Long-term annual O&M costs are costs incurred after remediation is complete and may also include labor, monitoring, materials, administrative support, and site reviews. The O&M costs presented herein are incremental increases from current system costs for each alternative.

## Modifying Criteria

### Regulatory Agency Acceptance

This assessment evaluates the technical and administrative issues and concerns that regulators may have regarding each alternative. When regulatory review of the FS report has been completed, the response summary to the Proposed Plan and ROD will address this criterion.

### Community Acceptance

This assessment evaluates the issues and concerns the public may have regarding each of the alternatives. As with regulatory agency acceptance, this criterion will be addressed in the response summary to the Proposed Plan and the ROD when public comments have been received.

# APPENDIX C
# REMEDIAL ALTERNATIVE COST ESTIMATES

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 3: EXCAVATION OF SUBSURFACE SOIL (EXCEEDING PRGs), OFFSITE DISPOSAL, AND LUCs**
**CAPITAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING** | | | | | | | | | | | |
| 1.1 Prepare Remedial Design | 130 | hr | | | $33.79 | | $0 | $0 | $4,393 | $0 | $4,393 |
| 1.2 Project Scheduling and Procurement | 50 | hr | | | $33.79 | | $0 | $0 | $1,690 | $0 | $1,690 |
| **2 MOBILIZATION/DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Equipment Mob/Demob (Exc., Loader, & Dozier) | 2 | ea | | | $200.00 | $250.00 | $0 | $0 | $400 | $500 | $900 |
| 2.2 Mobilize/Demobilize Personnel (3-persons) | 2 | ea | | $375.00 | $300.00 | | $0 | $750 | $600 | $0 | $1,350 |
| 2.3 Portable Toilet | 1 | mo | $74.18 | | | | $74 | $0 | $0 | $0 | $74 |
| 2.4 Storage Trailer (28' x 10') | 1 | mo | $98.33 | | | | $98 | $0 | $0 | $0 | $98 |
| 2.5 Office Trailer (32' x 8') | 1 | mo | $221.49 | | | | $221 | $0 | $0 | $0 | $221 |
| 2.6 Site Utilities | 1 | mo | $1,000.00 | | | | $1,000 | $0 | $0 | $0 | $1,000 |
| **3 DECONTAMINATION** | | | | | | | | | | | |
| 3.1 Temporary Decon Pad | 1 | ls | | $450.00 | $400.00 | $155.00 | $0 | $450 | $400 | $155 | $1,005 |
| 3.2 Decon Water Disposal | 10 | drum | $125.00 | | | | $1,250 | $0 | $0 | $0 | $1,250 |
| 3.3 Decon Water Storage Drums | 10 | ea | | $45.00 | | | $0 | $450 | $0 | $0 | $450 |
| 3.4 PPE (3 p * 5 days * 4 Weeks) | 60 | m-day | | $30.00 | | | $0 | $1,800 | $0 | $0 | $1,800 |
| 3.5 Decontaminate Equipment (Pressure Washer) | 12 | ea | | | $134.45 | $50.00 | $0 | $0 | $1,613 | $600 | $2,213 |
| **4 SITE PREPARATION** | | | | | | | | | | | |
| 4.1 Erosion Control Fencing | 100 | lf | | $0.23 | $1.17 | | $0 | $23 | $117 | $0 | $140 |
| 4.2 Collect/Analyze Delineation Samples (TPH & others) | 8 | ea | $200.00 | $10.00 | $23.52 | | $1,600 | $80 | $188 | $0 | $1,868 |
| 4.3 Construction Surveys (2-man crew) | 3 | day | $648.36 | | | | $1,945 | $0 | $0 | $0 | $1,945 |
| 4.4 Utility Location and Site Delineation/Layout | 8 | hrs | | | $33.23 | | $0 | $0 | $266 | $0 | $266 |
| 4.5 Concrete Demolition/Removal (6" reinforced) | 2 | cy | $45.58 | | | | $91 | $0 | $0 | $0 | $91 |
| 4.6 Concrete Debris Disposal | 2 | cy | $20.70 | | | | $41 | $0 | $0 | $0 | $41 |
| **5 EXCAVATION/BACKFILL** | | | | | | | | | | | |
| 5.1 Excavate/Load Contaminated Soil (2.0 cy Hyd. Exc.) | 74 | cy | | | $0.68 | $1.71 | $0 | $0 | $50 | $127 | $177 |
| 5.2 Standby, Crawler Mounted 2.0 CY Hydraulic Excavat | 45.9 | hrs | | | | $37.54 | $0 | $0 | $0 | $1,723 | $1,723 |
| 5.3 Wheel Loader, 3 cy | 38.25 | hrs | | | $27.20 | $56.31 | $0 | $0 | $1,040 | $2,154 | $3,194 |
| 5.4 Standby, Wheel Loader, 3 cy | 15.3 | hrs | | | | $14.07 | $0 | $0 | $0 | $215 | $215 |
| 5.5 Health & Safety Monitoring with OVA during Excavati | 20 | day | | | $188.16 | $100.00 | $0 | $0 | $3,763 | $2,000 | $5,763 |
| 5.6 Collect/Analyze Confirmatory Samples | 8 | ea | $200.00 | $10.00 | $23.52 | | $1,600 | $80 | $188 | $0 | $1,868 |
| 5.7 Import (Offsite) Place, Compact Clean Fill Material | 7.4 | cy | | $7.82 | $0.85 | $1.81 | $0 | $58 | $6 | $13 | $78 |
| 5.8 Backfill with Clean Excavated Material | 74 | cy | | $0.28 | $2.02 | $0.76 | $0 | $21 | $149 | $56 | $226 |
| 5.9 UST Removal | 0 | ea | | $340.72 | $485.04 | $1,638.12 | $0 | $0 | $0 | $0 | $0 |
| **6 OFF-SITE TRANSPORTATION/DISPOSAL** | | | | | | | | | | | |
| 6.1 Waste Profile | 4 | ls | $750.00 | | | | $3,000 | $0 | $0 | $0 | $3,000 |
| 6.2 Transport and Dispose of Soil (Non-haz.) in Landfill | 8.88 | ton | $45.00 | | | | $400 | $0 | $0 | $0 | $400 |
| 6.3 Prepare Shipment Manifests | 30 | hrs | | | $33.23 | | $0 | $0 | $997 | $0 | $997 |
| **7 SITE RESTORATION** | | | | | | | | | | | |
| 7.1 Concrete Slab (Reinforced) on Grade (6") | 100 | sf | $4.03 | | | | $403 | $0 | $0 | $0 | $403 |
| **8 LAND USE CONTROLS** | | | | | | | | | | | |
| 8.1 Site Survey (2-man crew) | 2 | days | $648.36 | | | | $1,297 | $0 | $0 | $0 | $1,297 |
| 8.2 Prepare Land Use Plan | 100 | hours | | | $33.79 | | $0 | $0 | $3,379 | $0 | $3,379 |
| 8.3 Modify Master Plan and Prepare Deed Restrictions | 80 | hours | | | $33.79 | | $0 | $0 | $2,703 | $0 | $2,703 |
| **Subtotal Direct Capital Costs less Subcontract** | | | | | | | | $3,712 | $21,944 | $7,543 | $33,199 |

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 3: EXCAVATION OF SUBSURFACE SOIL (EXCEEDING PRGs), OFFSITE DISPOSAL, AND LUCs**
**CAPITAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Local Area Adjustment** | | | | | | | | 84% | 84% | 84% | |
| | | | | | | | | $3,118 | $18,433 | $6,336 | $27,887 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $5,530 | | $5,530 |
| G & A on Labor Cost @ 10% | | | | | | | | | $1,843 | | $1,843 |
| G & A on Material Cost @ 10% | | | | | | | | $312 | | | $312 |
| **Total Direct Capital Cost** | | | | | | | | $3,430 | $25,806 | $6,336 | $35,572 |
| Indirects on Total Direct Labor Cost @ 75% | | | | | | | | | $19,354 | | $19,354 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $3,557 |
| **Subtotal** | | | | | | | | | | | $58,483 |
| Health & Safety Monitoring @ 3% | | (Includes Subcontractor cost) | | | | | | | | | $2,145 |
| **Total Field Cost** | | | | | | | | | | | **$60,628** |
| Subtotal Subcontractor Cost | | | | | | | $13,021 | | | | $13,021 |
| G & A on Subcontract Cost @ 10% | | | | | | | $1,302 | | | | $1,302 |
| Profit on Subcontractor Cost @ 5% | | | | | | | | | | | $651 |
| **Subcontractor Cost** | | | | | | | | | | | **$14,974** |
| Contingency on Total Field and Subcontractor Costs @ 10% | | | | | | | | | | | **$7,560** |
| Engineering on Total Field and Subcontractor Costs @ 5% | | | | | | | | | | | **$3,780** |
| **TOTAL Capital COST** | | | | | | | | | | | **$86,942** |

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 3: EXCAVATION OF SUBSURFACE SOIL (EXCEEDING PRGs), OFFSITE DISPOSAL, AND LUCs**
**ANNUAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost | Labor Overhead[a] | Total Cost |
|---|---|---|---|---|---|
| **1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)** | | | | | |
| 1.1 Site Review Meeting (2-persons for 2-days) | | | | | |
| Project Manager | 16 | hr | $40.12 | $40.12 | $1,284 |
| Staff Engineer | 16 | hr | $26.44 | $26.44 | $846 |
| ODCs (travel, etc.) | 1 | ls | $400.00 | | $400 |
| 1.2 Five Year Review Report | | | | | |
| Project Manager | 8 | hr | $40.12 | $40.12 | $642 |
| Staff Engineer | 32 | hr | $26.44 | $26.44 | $1,692 |
| ODCs (photocopies, telephone, etc.) | 1 | ls | $250.00 | | $250 |
| Subtotal Five Year Review Cost | | | | | $5,114 |
| G&A and Profit @ 15% | | | | | $767 |
| Subtotal | | | | | $5,881 |
| Contingency @ 10% | | | | | $588.11 |
| **Total Five Year Review Cost** | | | | | **$6,469** |
| **2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)** | | | | | |
| 2.1 Quarterly Site Inspections | | | | | |
| Project Manager (2 hrs for each Inspection) | 8 | hr | $40.12 | $40.12 | $642 |
| Staff Engineer | 32 | hr | $26.44 | $26.44 | $1,692 |
| 2.2 Annual Review and Report | | | | | |
| Project Manager | 4 | hr | $40.12 | $40.12 | $321 |
| Staff Engineer | 12 | hr | $26.44 | $26.44 | $635 |
| ODCs (photocopies, telephone, etc.) | 1 | ls | $250.00 | | $250 |
| 2.3 Sign/Fence Maintenance | 1 | ls | $50.00 | | $50 |
| Subtotal Land Use Control Monitoring | | | | | $3,590 |
| G&A and Profit @ 15% | | | | | $538 |
| Subtotal | | | | | $4,128 |
| Contingency @ 10% | | | | | $412.80 |
| **Total Land Use Control Monitoring Cost** | | | | | **$4,541** |

[a] Overhead on professional labor @ 100%.

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 3: EXCAVATION OF SUBSURFACE SOIL (EXCEEDING PRGs), OFFSITE DISPOSAL, AND LUCs**
**PRESENT WORTH ANALYSIS**

| Year | Capital Cost | Operation and Maintenance Cost | Annual Cost | Total Yearly Cost | Present-Worth Factor (i = 6%) | Present Worth |
|---|---|---|---|---|---|---|
| 0 | $86,942 | | | $86,942 | 1.000 | $86,942 |
| 1 | | $0 | $4,541 | $4,541 | 0.943 | $4,284 |
| 2 | | $0 | $4,541 | $4,541 | 0.890 | $4,041 |
| 3 | | $0 | $4,541 | $4,541 | 0.840 | $3,813 |
| 4 | | $0 | $4,541 | $4,541 | 0.792 | $3,597 |
| 5 | | $0 | $11,010 | $11,010 | 0.747 | $8,227 |
| 6 | | $0 | $4,541 | $4,541 | 0.705 | $3,201 |
| 7 | | $0 | $4,541 | $4,541 | 0.665 | $3,020 |
| 8 | | $0 | $4,541 | $4,541 | 0.627 | $2,849 |
| 9 | | $0 | $4,541 | $4,541 | 0.592 | $2,688 |
| 10 | | $0 | $11,010 | $11,010 | 0.558 | $6,148 |
| 11 | | $0 | $4,541 | $4,541 | 0.527 | $2,392 |
| 12 | | $0 | $4,541 | $4,541 | 0.497 | $2,257 |
| 13 | | $0 | $4,541 | $4,541 | 0.469 | $2,129 |
| 14 | | $0 | $4,541 | $4,541 | 0.442 | $2,008 |
| 15 | | $0 | $11,010 | $11,010 | 0.417 | $4,594 |
| 16 | | $0 | $4,541 | $4,541 | 0.394 | $1,787 |
| 17 | | $0 | $4,541 | $4,541 | 0.371 | $1,686 |
| 18 | | $0 | $4,541 | $4,541 | 0.350 | $1,591 |
| 19 | | $0 | $4,541 | $4,541 | 0.331 | $1,501 |
| 20 | | $0 | $11,010 | $11,010 | 0.312 | $3,433 |
| 21 | | $0 | $4,541 | $4,541 | 0.294 | $1,336 |
| 22 | | $0 | $4,541 | $4,541 | 0.278 | $1,260 |
| 23 | | $0 | $4,541 | $4,541 | 0.262 | $1,189 |
| 24 | | $0 | $4,541 | $4,541 | 0.247 | $1,121 |
| 25 | | $0 | $11,010 | $11,010 | 0.233 | $2,565 |
| 26 | | $0 | $4,541 | $4,541 | 0.220 | $998 |
| 27 | | $0 | $4,541 | $4,541 | 0.207 | $942 |
| 28 | | $0 | $4,541 | $4,541 | 0.196 | $888 |
| 29 | | $0 | $4,541 | $4,541 | 0.185 | $838 |
| 30 | | $0 | $11,010 | $11,010 | 0.174 | $1,917 |
| | | | | **TOTAL PRESENT WORTH** | | **$165,243** |

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 2: LAND USE CONTROLS**
**CAPITAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PROJECT PLANNING** | | | | | | | | | | | |
| 1.1 Prepare Remedial Design (Engineer) | 40 | hr | | | $26.44 | | $0 | $0 | $1,058 | $0 | $1,058 |
| 1.2 Project Scheduling and Procurement (Project Manager) | 8 | hr | | | $40.12 | | $0 | $0 | $321 | $0 | $321 |
| **2 MOBILIZATION/DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Equipment Mob/Demob (Exc. & Dozier) | 0 | ea | | | $200.00 | $250.00 | $0 | $0 | $0 | $0 | $0 |
| 2.2 Mobilize/Demobilize Personnel (2-persons) | 0 | ea | | $375.00 | $300.00 | | $0 | $0 | $0 | $0 | $0 |
| **3 DECONTAMINATION** | | | | | | | | | | | |
| 3.1 Temporary Decon Pad | 0 | ls | | $250.00 | $200.00 | $75.00 | $0 | $0 | $0 | $0 | $0 |
| 3.2 Decon Water Disposal | 0 | drum | $125.00 | | | | $0 | $0 | $0 | $0 | $0 |
| 3.3 Decon Water Storage Drums | 0 | ea | | $45.00 | | | $0 | $0 | $0 | $0 | $0 |
| 3.4 PPE (2 p * 2 days) | 0 | m-day | | $30.00 | | | $0 | $0 | $0 | $0 | $0 |
| 3.5 Decontaminate Equipment (Pressure Washer) | 0 | ea | | | $134.45 | $50.00 | $0 | $0 | $0 | $0 | $0 |
| **4 SITE PREPARATION** | | | | | | | | | | | |
| 4.1 Erosion Control Fencing | 0 | lf | | $0.23 | $1.17 | | $0 | $0 | $0 | $0 | $0 |
| 4.2 Collect/Analyze Delineation Samples (TPH) | 0 | ea | $200.00 | $10.00 | $22.24 | | $0 | $0 | $0 | $0 | $0 |
| 4.3 Construction Surveys (2-man crew) | 0 | day | $648.36 | | | | $0 | $0 | $0 | $0 | $0 |
| 4.4 Utility Location and Site Delineation/Layout | 0 | hrs | | | $26.44 | | $0 | $0 | $0 | $0 | $0 |
| **5 EXCAVATION/BACKFILL** | | | | | | | | | | | |
| 5.1 Excavate/Load Contaminated Soil (1.0 cy Hyd. Excavat | 0.00 | cy | | | $1.27 | $2.23 | $0 | $0 | $0 | $0 | $0 |
| 5.2 Standby, Crawler Mounted 1.0 CY Hydraulic Excavator | 0 | hrs | | | | $20.50 | $0 | $0 | $0 | $0 | $0 |
| 5.3 Health & Safety Monitoring with OVA during Excavation | 0 | day | | | $188.16 | $100.00 | $0 | $0 | $0 | $0 | $0 |
| 5.4 Collect/Analyze Confirmatory Samples | 0 | ea | $200.00 | $10.00 | $22.24 | | $0 | $0 | $0 | $0 | $0 |
| 5.5 Import (Offsite) Place, Compact Clean Fill Material | 0.00 | cy | | $7.82 | $0.85 | $1.81 | $0 | $0 | $0 | $0 | $0 |
| 5.6 UST Removal | 0 | ea | | $340.72 | $485.04 | $1,638.12 | $0 | $0 | $0 | $0 | $0 |
| **6 OFF-SITE TRANSPORTATION/DISPOSAL** | | | | | | | | | | | |
| 6.1 Waste Profile | 0 | ls | $750.00 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.2 Transport and Dispose of Soil (Non-hazard.) in Landfill | 0.00 | ton | $45.00 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.3 Prepare Shipment Manifests | 0 | hrs | | | $26.44 | | $0 | $0 | $0 | $0 | $0 |
| **7 SITE RESTORATION** | | | | | | | | | | | |
| 7.1 Import Vegetative Cover Material (Topsoil) | 0.00 | cy | | $15.00 | | | $0 | $0 | $0 | $0 | $0 |
| 7.2 Place/Grade Topsoil (6") | 0 | day | | | $227.20 | $435.00 | $0 | $0 | $0 | $0 | $0 |
| 7.3 Sod Disturbed Area | 0.0000 | acre | $20,859.00 | | | | $0 | $0 | $0 | $0 | $0 |
| **8 LAND USE CONTROLS** | | | | | | | | | | | |
| 8.1 Site Survey (2-man crew) | 2 | days | $700.00 | | | | $1,400 | $0 | $0 | $0 | $1,400 |
| 8.2 Survey Plat | 1 | ls | $3,000.00 | | | | $3,000 | $0 | $0 | $0 | $3,000 |
| 8.3 Prepare Land Use Control Implementation Plan/Docs (E | 100 | hours | | | $26.44 | | $0 | $0 | $2,644 | $0 | $2,644 |
| 8.4 Modify Master Plan and Prepare Deed Restrictions (En | 80 | hours | | | $40.12 | | $0 | $0 | $3,210 | $0 | $3,210 |
| **Subtotal Direct Capital Costs less Subcontract** | | | | | | | | $0 | $7,232 | $0 | $7,232 |
| **Local Area Adjustment** | | | | | | | | 84% | 84% | 84% | |
| | | | | | | | | $0 | $6,075 | $0 | $6,075 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $1,823 | | $1,823 |
| G & A on Labor Cost @ 10% | | | | | | | | | $608 | | $608 |
| G & A on Material Cost @ 10% | | | | | | | | $0 | | | $0 |
| **Total Direct Capital Cost** | | | | | | | | $0 | $8,505 | $0 | $8,505 |

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 2: LAND USE CONTROLS**
**CAPITAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost Subcontract | Material | Labor | Equipment | Extended Cost Subcontract | Material | Labor | Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Indirects on Total Direct Labor Cost @ | 75% | | | | | | | | $6,379 | | $6,379 |
| Profit on Total Direct Cost @ | 10% | | | | | | | | | | $851 |
| **Subtotal** | | | | | | | | | | | $15,734 |
| Health & Safety Monitoring @ | 3% | (Includes Subcontractor cost) | | | | | | | | | $604 |
| **Total Field Cost** | | | | | | | | | | | **$16,338** |
| Subtotal Subcontractor Cost | | | | | | | $4,400 | | | | $4,400 |
| G & A on Subcontract Cost @ | 10% | | | | | | $440 | | | | $440 |
| Profit on Subcontractor Cost @ | 5% | | | | | | | | | | $220 |
| **Subcontractor Cost** | | | | | | | | | | | **$5,060** |
| Contingency on Total Field and Subcontractor Costs @ | 10% | | | | | | | | | | **$2,140** |
| Engineering on Total Field and Subcontractor Costs @ | 5% | | | | | | | | | | **$1,070** |
| **TOTAL Capital COST** | | | | | | | | | | | **$24,608** |

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 2: LAND USE CONTROLS**
**ANNUAL COSTS**

| Cost Item | Quantity | Unit | Unit Cost | Labor Overhead[a] | Total Cost |
|---|---|---|---|---|---|
| **1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)** | | | | | |
| 1.1 Site Review Meeting (2-persons for 2-days) | | | | | |
| Project Manager | 16 | hr | $40.12 | $40.12 | $1,284 |
| Staff Engineer | 16 | hr | $26.44 | $26.44 | $846 |
| ODCs (travel, etc.) | 1 | ls | $400.00 | | $400 |
| 1.2 Five Year Review Report | | | | | |
| Project Manager | 8 | hr | $40.12 | $40.12 | $642 |
| Staff Engineer | 32 | hr | $26.44 | $26.44 | $1,692 |
| ODCs (photocopies, telephone, etc.) | 1 | ls | $250.00 | | $250 |
| Subtotal Five Year Review Cost | | | | | $5,114 |
| G&A and Profit @ 15% | | | | | $767 |
| Subtotal | | | | | $5,881 |
| Contingency @ 10% | | | | | $588.11 |
| **Total Five Year Review Cost** | | | | | **$6,469** |
| **2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)** | | | | | |
| 2.1 Quarterly Site Inspections | | | | | |
| Project Manager (2 hrs for each Inspection) | 8 | hr | $40.12 | $40.12 | $642 |
| Staff Engineer | 32 | hr | $26.44 | $26.44 | $1,692 |
| 2.2 Annual Review and Report | | | | | |
| Project Manager | 4 | hr | $40.12 | $40.12 | $321 |
| Staff Engineer | 12 | hr | $26.44 | $26.44 | $635 |
| ODCs (photocopies, telephone, etc.) | 1 | ls | $250.00 | | $250 |
| 2.3 Sign/Fence Maintenance | 1 | ls | $50.00 | | $50 |
| Subtotal Land Use Control Monitoring | | | | | $3,590 |
| G&A and Profit @ 15% | | | | | $538 |
| Subtotal | | | | | $4,128 |
| Contingency @ 10% | | | | | $412.80 |
| **Total Land Use Control Monitoring Cost** | | | | | **$4,541** |

[a] Overhead on professional labor @ 100%.

**NAVAL AIR STATION WHITING FIELD**
**MILTON, FLORIDA**
**SITE 35**
**SOIL ALTERNATIVE 2: LAND USE CONTROLS**
**PRESENT WORTH ANALYSIS**

| Year | Capital Cost | Operation and Maintenance Cost | Annual Cost | Total Yearly Cost | Present-Worth Factor (i = 6%) | Present Worth |
|---|---|---|---|---|---|---|
| 0 | $24,608 | | | $24,608 | 1.000 | $24,608 |
| 1 | | $0 | $4,541 | $4,541 | 0.943 | $4,284 |
| 2 | | $0 | $4,541 | $4,541 | 0.890 | $4,041 |
| 3 | | $0 | $4,541 | $4,541 | 0.840 | $3,813 |
| 4 | | $0 | $4,541 | $4,541 | 0.792 | $3,597 |
| 5 | | $0 | $11,010 | $11,010 | 0.747 | $8,227 |
| 6 | | $0 | $4,541 | $4,541 | 0.705 | $3,201 |
| 7 | | $0 | $4,541 | $4,541 | 0.665 | $3,020 |
| 8 | | $0 | $4,541 | $4,541 | 0.627 | $2,849 |
| 9 | | $0 | $4,541 | $4,541 | 0.592 | $2,688 |
| 10 | | $0 | $11,010 | $11,010 | 0.558 | $6,148 |
| 11 | | $0 | $4,541 | $4,541 | 0.527 | $2,392 |
| 12 | | $0 | $4,541 | $4,541 | 0.497 | $2,257 |
| 13 | | $0 | $4,541 | $4,541 | 0.469 | $2,129 |
| 14 | | $0 | $4,541 | $4,541 | 0.442 | $2,008 |
| 15 | | $0 | $11,010 | $11,010 | 0.417 | $4,594 |
| 16 | | $0 | $4,541 | $4,541 | 0.394 | $1,787 |
| 17 | | $0 | $4,541 | $4,541 | 0.371 | $1,686 |
| 18 | | $0 | $4,541 | $4,541 | 0.350 | $1,591 |
| 19 | | $0 | $4,541 | $4,541 | 0.331 | $1,501 |
| 20 | | $0 | $11,010 | $11,010 | 0.312 | $3,433 |
| 21 | | $0 | $4,541 | $4,541 | 0.294 | $1,336 |
| 22 | | $0 | $4,541 | $4,541 | 0.278 | $1,260 |
| 23 | | $0 | $4,541 | $4,541 | 0.262 | $1,189 |
| 24 | | $0 | $4,541 | $4,541 | 0.247 | $1,121 |
| 25 | | $0 | $11,010 | $11,010 | 0.233 | $2,565 |
| 26 | | $0 | $4,541 | $4,541 | 0.220 | $998 |
| 27 | | $0 | $4,541 | $4,541 | 0.207 | $942 |
| 28 | | $0 | $4,541 | $4,541 | 0.196 | $888 |
| 29 | | $0 | $4,541 | $4,541 | 0.185 | $838 |
| 30 | | $0 | $11,010 | $11,010 | 0.174 | $1,917 |
| | | | | **TOTAL PRESENT WORTH** | | **$102,909** |