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FEASIBILITY STUDY FOR SITE 11 SOUTHEAST OPEN DISPOSAL AREA B NAS WHITING FIELD FL

3/1/2001

HARDING LAWSON ASSOCIATES

FEASIBILITY STUDY

SITE 11, SOUTHEAST OPEN DISPOSAL AREA (B)

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

USEPA ID NO.: FL2170023244

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

MARCH 2001

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

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March 2001

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

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

DATE: March 28, 2001

NAME AND TITLE OF CERTIFYING OFFICIAL: Rao Angara
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Project Technical Lead

(DFAR 252.227-7036)

The evaluations and professional opinions rendered in this planning document describing the Feasibility Study for Site 11, Naval Air Station Whiting Field, Milton, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document is not intended to be used for construction of the selected alternative.

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4-5-01

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FOREWORD

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

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

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

The IR program is conducted in several stages as follows:

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

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

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

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

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

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ARAR	applicable or relevant and appropriate requirement
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
ELCR	excess lifetime cancer risk
ERA	ecological risk assessment
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FS	feasibility study
GGC	groundwater guidance concentration
GIR	General Information Report
HHRA	human health risk assessment
HI	hazard index
HLA	Harding Lawson Associates
IR	Installation Restoration
LUC	land-use control
LUCAP	Land-Use Control Assurance Plan
LUCIP	Land-Use Control Implementation Plan
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
PAH	polynuclear aromatic hydrocarbons
PPE	personal protective equipment
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation and feasibility study
RME	reasonable maximum exposure
ROD	record of decision

GLOSSARY (Continued)

SARA	Superfund Amendments and Reauthorization Act
SCG	soil cleanup goal
SCTL	soil cleanup target level
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
su	standard unit
TAT	turnaround time
TBC	to be considered
TC	central tendency
TCLP	toxicity characteristic leaching procedure
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yd^3	cubic yard

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) to complete a feasibility study (FS) for Site 11, Southeast Open Disposal Area (B), at Naval Air Station (NAS) Whiting Field, Milton, Florida. The FS is being completed under contract number N62467-89-D-0317-116. The FS report for Site 11 is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) (HLA, 1998) and Remedial Investigation (RI) report (HLA, 2000) to present the results of the overall remedial investigation and feasibility study (RI/FS) for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives that address soil at Site 11.

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

The goals of the RI/FS for Site 11 at NAS Whiting Field are (1) to assess the extent, magnitude, and impact of contamination at the sites, (2) to qualitatively and quantitatively assess the risk posed to human health and the environment by site-related contamination, and (3) to develop remedial alternatives that address threats to human health and/or the environment. The first two elements have been discussed in the GIR and RI reports; the remaining element will be presented and discussed in this FS report.

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

- facility information and history,
- description of physical characteristics of the facility (climatology, hydrology, soil, geology, and hydrogeology),
- summary of previous investigations,
- summary of the field investigations conducted during the RI,
- human health and ecological risk assessment methodology, and
- an evaluation of the facilitywide background conditions.

The RI serves as the mechanism for collecting data to identify the source of contamination and migration pathway characteristics, for conducting a baseline remedial action, and for collecting physical measurements and chemical analytical data necessary for evaluating remedial alternatives in the FS. The RI provides the basis for determining whether or not remedial action is necessary. The RI report for Site 11 at NAS Whiting Field provides the following information:

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

In 1999, Interim Remedial Action (IRA) was completed by the Navy Response Action contractor (RAC), CH2M Hill. Additional information pertaining to the interim remedial action (IRA) is provided in Section 1.4 of this report and Appendix J of the RI report. The RI identified pesticides (including dieldrin) and lead were identified as the primary risk drivers for ecological receptors, based on sublethal effects. Elevated concentrations of these analytes were detected at sample location 11-SL-02. Soil in the vicinity of this sample location was subsequently excavated as a part of an IRA in June 1999. Ecological risks to wildlife were recalculated using the food web model developed for this site to reevaluate data from surface soil after sample 11-SL-02 was eliminated. The reasonable maximum exposure and CT exposures were recalculated with the analytical results from sample 11-SL-02 eliminated. Consistent with the ecological risk assessment (ERA), reasonable maximum exposure (RME) and CT exposures were estimated using the 95th upper confidence limit and arithmetic mean, respectively, of the surface soil data set. The results (i.e., hazard indices) of this evaluation are presented in Table 1-1.

While recalculating risks to ecological receptors, a computational error was discovered in the risk calculation of the food web model, which affected the risk estimates for sublethal effects to top predator species in the model (i.e., red fox and great horned owl). The results of this re-evaluation are presented in the first two columns in Table 1-1. The third column in Table 1-1 presents the recalculated sublethal risks to ecological receptors, using the RME concentrations calculated with analytical data from surface soil sample 11-SL-02 eliminated.

Table 1-1
Summary of Hazard Indices (HIs) for Representative Wildlife

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	Sublethal Effects from Exposure to RME Concentrations	Sublethal Effects from Exposure to CT Concentrations	Sublethal Effects from Exposure to RME Concentrations (w/out 11-SL-02)
Cotton mouse	0.91	0.55	0.24
Short-tailed shrew	4.5	2.2	0.93
Eastern meadowlark	3.5	1.8	1.0
Red fox	0.004	0.0022	0.0024
Great horned owl	0.32	0.15	0.064

Notes: RME = reasonable maximum exposure.
CT = central tendency.

Risks were originally identified for small mammals, small birds and top predators at the site, based on RME and CT concentrations and sublethal effects. Risk estimates for sublethal effects to the red fox and great horned owl presented in the BERA were 6.3 and 20, respectively, based on RME concentrations. Correcting the computational error resulted in HIs of 0.002 and 0.15 indicating that there are no sublethal risks to top predators. Although, there are risks predicted for the shrew and eastern meadowlark, based on RME concentrations, as shown in Table 1. It is unlikely that there would be sublethal effects from exposure to CT concentrations, based on the HIs presented in Table 1-1. Risks based on RME concentrations (with sample 11-SL-02 eliminated) were recalculated, and none of the HIs exceed 1. Risks were not recalculated for CT concentrations, because there were no risks predicted based on RME concentrations.

The results presented in Table 1-1 indicate that the IRA (i.e., excavation of soil from sample location 11-SL-02) conducted at the site eliminated any potential ecological risk at Site 11.

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

The remaining sections in this chapter describe the FS process for CERCLA sites (Section 1.1), present how this process is applied to NAS Whiting Field sites (Section 1.2), provide the environmental conditions (Section 1.3), and present the supplemental sampling details from the IRA (Section 1.4).

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

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

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

The next step in the FS process is to identify and screen applicable technologies for each general response action. This step eliminates technologies that cannot be implemented technically. Technologies passing the screening phase are then

assembled into remedial alternatives. Remedial alternatives are then described and analyzed in detail using seven criteria described in the NCP, including

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

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

- State acceptance, and
- community acceptance.

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

Threshold criteria:

- protection of human health and the environment; and

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

Primary Balancing criteria:

- cost effectiveness;
- use of permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable; and
- preference for treatment that reduces toxicity, mobility, or volume of contaminants as a principal element.

These criteria are used because SARA requires them to be considered during remedy selection. **Modifying criteria**, which include State and community acceptance, are also evaluated. State acceptance is evaluated when the State reviews and comments on the draft FS report. A proposed plan is then prepared in consideration of the State's comments. Community acceptance is evaluated based on comments received on proposed plan during a public comment period. This evaluation is described in a responsiveness summary in the Record of Decision (ROD).

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

1.2 PURPOSE. The purpose of the FS report is to document the results of the study including developing RAOs to address contaminated media at the site and developing, screening, and evaluating potential remedial alternatives to meet

these objectives. The FS was based on the results and conclusions of the RI and the information presented in the GIR. Information presented in these reports will not be repeated in this FS Report.

The FS report for Site 11 was developed in accordance with the NCP and with USEPA's *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a); both of these documents provide guidance for identifying technologies for municipal landfills. Because municipal landfill sites typically have similar characteristics, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for waste (e.g., landfills) that poses a relatively low long-term threat or where treatment is impracticable (Section 300.430[a][1][iii][B]). Additionally, the USEPA expects treatment to be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii][A]).

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

The following components are considered in identifying appropriate remedial action for Site 11:

- RAOs. RAOs are developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals for the site.
- Applicable Technologies. Technologies applicable for addressing contaminated media at the site are identified and screened. Technologies that cannot be implemented are eliminated.
- Remedial Alternatives. Technologies that pass 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 identified are compared against one another using threshold and primary balancing criteria.

Upon completion of the FS report, a proposed plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Site 11. This document will be written in community-friendly language and will be made available for public comment. Upon receipt of public comments, responses to these comments will be developed in a responsiveness summary and the ROD will be prepared. The ROD will document the chosen alternative for the site and will include the responsiveness summary as an appendix. Once the ROD is signed, the chosen remedial alternative will be implemented.

1.3 ENVIRONMENTAL CONDITIONS. Site 11 is located along the eastern boundary of NAS Whiting Field near the South Field (Figure 1-1). The site covers approximately a 3-acre area encompassing an old borrow pit (Figure 1-2) that was used from 1943 until approximately 1970. The site received a wide variety of wastes, including general refuse, construction debris, furniture, waste solvents, paint, transformer oils, hydraulic fluid, and various other oils. Site background information was taken from the Initial Assessment Study (Envirodyne Engineers, Inc., 1985). Disposal operations were discontinued in 1970 and a final cover was placed over the site and pine trees were planted at the site (Geraghty & Miller, 1986).

According to the U.S. Department of Agriculture (USDA) (USDA, 1980), the soil at Site 11 is classified as predominantly Troup loamy sand. The site contains a "Y" drainage ditch along the southern boundary where surface water runoff drains during heavy rainfall conditions.

Based on results of the RI field investigation conducted prior to April 1999, Site 11 received wastes from a variety of sources. The results of the RI (HLA, 2000) indicate these wastes do not pose a principal threat to human health or the environment. As a result, Site 11 exhibits the characteristics of a CERCLA municipal landfill site and will be addressed as such in this FS.

1.4 INTERIM REMEDIAL ACTION. On April 1, 1999, a 100-foot by 100-foot sampling grid was set up around the location of former Phase IIA sample 11-SL-02. The grid was set up on 25-foot centers to aid in the delineation of lead above soil cleanup target levels. CH2M HILL, the RAC, collected 25 surface soil samples from the grid area surrounding 11-SL-02. Based on results of the initial round of sampling, CH2M HILL collected five additional samples on April 7, 1999.

Of the 25 original samples collected and analyzed for lead, only one sample exhibited a total lead concentration (666 milligram per kilogram [mg/kg]) above the associated FDEP and USEPA residential soil cleanup target levels. All data are presented in the CH2M HILL report titled Final Data Transfer Memorandum: Results of Additional Soil Sampling at Site 11, NAS Whiting Field. To delineate the area containing elevated lead levels, additional soil samples were collected at sample location 11SO3801. All results were below the residential soil cleanup target levels.

As part of this field effort, a land surveyor also located Phase IIA sample location 11-SL-04. On June 2, 1999, CH2M HILL personnel excavated an area 2 feet long by 2 feet wide and approximately 2 feet deep at the same location to remove soil containing elevated levels of benzo(a)pyrene. The soil was placed in a 55-gallon drum. Based on analytical results, the drum was properly disposed of by NAS Whiting Field at a subtitle C landfill.

Results from this field effort are presented in Appendix E.

Figure 1-1 Location of RI/FS Sites at NAS Whiting Field

Figure 1-2 General Features

2.0 REMEDIAL ACTION OBJECTIVES

This section presents the goals and objectives for remedial action at Site 11, and provides the basis for selecting appropriate RAOs and, subsequently, identifying remedial technologies and developing alternatives to address contamination at the sites. To establish these objectives, ARARs are first identified (Section 2.1). Next, RAOs are defined based on consideration of ARARs, the results and conclusions of the RI, the RA, and other criteria (Section 2.2). Next, the volume of contaminated media for Site 11 is presented (Section 2.3). Finally, general response actions appropriate for technology identification are discussed (Section 2.4). The information presented in this chapter will be used to identify appropriate remedial technologies for the sites (presented in Chapter 3.0).

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

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

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

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

Other requirements "to be considered guidance material" (TBC) are Federal and State nonpromulgated advisories or guidance that are not legally binding and do

not have the status of potential ARARs (i.e., they have not been promulgated by statute or regulation). However, if there are no specific ARARs for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

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

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

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

2.1.1 Chemical-Specific ARARs Chemical-specific requirements are standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels or the basis for calculating such levels. The State of Florida has promulgated Soil Cleanup Target Levels (SCTLs) under Chapter 62-777 (Contaminant Cleanup Target Levels, Florida Administrative Code [FAC]). The USEPA Region III has also developed a risk-based concentration (RBC) table which includes Soil Screening Levels for protection of groundwater and air (USEPA, 1998).

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

As stated in the RI (ABB-ES, 1998), no State or federally listed rare, threatened, or endangered species or species of concern are known to inhabit Site 11 (Nature Conservancy, 1997). Furthermore, Site 11 is not located within the 100-year flood plain or known to contain areas of historical or archeological significance. Therefore, location-specific ARARs do not apply to Site 11.

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,

Table 2-1
Synopsis of Federal and State ARARs and Guidance

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Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Hazardous Substance and Contingency Plan Regulations (40 Code of Federal Regulations [CFR], Section 300.430)	Discusses the types of institutional controls to be established at CERCLA sites.	**Applicable.** These regulations may be used as guidance in establishing appropriate institutional controls at Site 11.	Action-specific
Occupational Safety and Health Act (OSHA) Occupational Safety and Health Standards (29 CFR, Part 1910)	Requires establishment of programs to ensure worker health and safety at hazardous waste sites.	**Applicable.** These requirements apply to all response activities conducted in accordance with the National Contingency Plan. During the implementation of any remedial alternative for Site 11, compliance with these regulations must be attained.	Action-specific
Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Waste (40 CFR, Part 261)	Defines those solid wastes that are subject to regulation as hazardous wastes.	**Applicable.** Any alternative that would excavate and dispose of soil off-site would be sampled and analyzed for hazardous characteristics as defined by 40 CFR, Part 261.	Action-specific
RCRA Regulations, Standards Applicable to Transporters of Hazardous Wastes (40 CFR, Part 263)	Establishes the responsibilities of the generators and transporters of hazardous waste in the handling, transportation, and management of that waste. To avoid duplicative regulation, USEPA has expressly adopted certain U.S. Department of Transportation (DOT) regulations governing the transportation of hazardous waste.	**Applicable.** For excavation and off-site disposal alternatives, the hazardous material would need to be handled, manifested, and transported to a permitted off-site disposal facility in compliance with these regulations.	Action-specific
RCRA Regulations, Landfills (40 CFR, Part 264, Subpart N)	Provides monitoring, inspection, closure, and post-closure care requirements for landfills that contain hazardous waste.	**Applicable.** These regulations are not applicable to Site 11 because they apply only to landfills receiving waste after 1980. These regulations may be used for developing a landfill inspection program, as necessary.	Action-specific
RCRA Regulations, Releases from Solid Waste Management Units (40 CFR, Part 264, Subpart F)	Contains general groundwater monitoring requirements. Establishes detection and compliance monitoring programs that apply to owners and operators of solid waste units.	**TBC.** For capping alternatives, these regulations provide guidance for establishing and conducting a groundwater monitoring program at sites contaminated with RCRA wastes.	Guidance

See notes at end of table.

Table 2-1 (Continued)
Synopsis of Federal and State ARARs and Guidance

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Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Hazardous Materials Transportation Act Regulations (49 CFR, Parts 171-179)	DOT provides requirements for packaging, labeling, manifesting, and transporting hazardous materials. Similar requirements are found in 40 CFR, Part 263.	**Relevant and Appropriate.** For excavation and off-site disposal alternatives, the hazardous material would need to be handled, manifested, and transported to a permitted off-site disposal facility in compliance with these regulations.	Action-specific
Solid Waste Disposal Act Regulations, Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258)	This rule establishes minimum standards for design and operation of municipal solid waste landfills.	**TBC.** Although this regulation applies to RCRA municipal landfills, not CERCLA landfills, some applications such as closure design and final cover design for closed landfills may apply.	Guidance
Design and Construction of RCRA/ CERCLA Final Covers (USEPA, 1991b)	Provides guidance on components of landfill closure, including long-term maintenance, groundwater monitoring, and institutional controls. Recommends groundwater sampling frequency and strategy.	**TBC.** This guidance may be used for establishing remedial action alternatives for closure of the Site 11 disposal area.	Guidance
Florida Solid Waste Disposal Facility Regulations (Chapter 62-701, FAC)	Provides the minimum landfill final closure standards for inactive landfills. Chapter 62-701.600 provides information on closure procedures, permits, closure report, design plan, final cover design, and postclosure monitoring.	**Relevant and Appropriate.** Although these regulations are not directly applicable because Site 11 did not receive wastes after the effective date of regulation (1985); Chapter 62-700.600, FAC, provides guidance on landfill cover design for capping alternatives at Site 11.	Action-specific; Guidance
Region III Risk-Based Concentrations (USEPA, 1998)	Provides RBCs from ingestion or exposure to chemicals in soil, tap water, ambient air, and fish consumption.	**Relevant and Appropriate.** The chemicals detected at Site 11 are screened against these standards for selection of chemicals of concern and developing remedial action alternatives.	Chemical-specific

See notes at end of table.

Table 2-1 (Continued)
Synopsis of Federal and State ARARs and Guidance

Feasibility Study
Site 11, Southeast Open Disposal Area (B)
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Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Florida Hazardous Waste Rules (Chapter 62-730, FAC)	Adopts specific sections of the Federal hazardous waste regulations, including the section regulating hazardous waste landfills (40 CFR, Part 264, Subpart N) and makes additions to these regulations.	**Relevant and Appropriate.** These regulations are not applicable to Site 11 because they apply only to landfills receiving waste after 1983.	Chemical-specific; Action-specific
Florida Rules on Hazardous Waste Warning Signs (Chapter 62-736, FAC)	Requires warning signs at National Priorities List (NPL) sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** This requirement is applicable for sites that are on the NPL.	Action-specific
Florida Contaminant Cleanup Target Levels (Chapter 62-777, FAC)	Establishes soil and groundwater cleanup criteria.	**Relevant and Appropriate.** The cleanup target levels should be used when evaluating remedial goal options.	Chemical-specific

Notes: ARAR = applicable or relevant and appropriate requirement.
TBC = to be considered guidance materials.

each alternative will be analyzed to determine compliance with action-specific ARARs.

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

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

2.2 IDENTIFICATION OF RAOs. RAOs are defined in the CERCLA RI/FS guidance manual as media-specific goals established to protect human health and the environment and are typically based on chemicals of concern (COCs), exposure routes, and receptors present or available at the site. RAOs are developed to ensure compliance with ARARs. RAOs for Site 11 will be identified by consideration of ARARs, the RI, the RA, and results from the supplemental sampling event.

Groundwater. Groundwater at NAS Whiting Field has been identified as a separate site (Site 40) and will be investigated and remediated separately from Site 11. If necessary, an FS will be prepared upon completion of the Site 40 Basewide Groundwater study.

Surface Water. Site 11 does not contain surface water; therefore, no RAOs will be established.

Surface Soil. Chemical-specific ARARs and TBCs for surface soil were considered when identifying RAOs. The State of Florida has promulgated SCTLs under the Contaminant Cleanup Target Levels, Chapter 62-777, FAC. Table 2-2 provides a summary of the detected concentrations for COPCs at Site 11 and their respective SCTLs and USEPA Region III RBCs.

Two PAHs (benzo(a)anthracene and benzo(a)pyrene), one pesticide (dieldrin), and three inorganics (arsenic, iron, and lead) were identified as COPCs in the HHRA. PAHs around sample location 11-SL-04 were delineated and excavated. The high lead concentration detected during the RI resampled and additional samples were collected on a grid pattern around the previous sampling location. The highest concentration of lead was 666 mg/kg. All other detections were below the residential SCTLs. Dieldrin is still present in the Site 11 soils at concentrations above the leachability criteria.

The pre-supplemental sampling HHRA completed for Site 11 evaluated risks to current and future users of the site. For current land-use, the cancer risks posed to trespassers and site maintenance workers based on exposure to surface soil at Site 11 via direct (dermal) contact, ingestion, or inhalation of particulates are 3×10^{-6} and 1×10^{-6}, respectively, which are within the acceptable

Table 2-2
Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Surface Soil

Feasibility Study
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Naval Air Station Whiting Field
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Analyte	Frequency of Detection[1]	Range of Detected Analyte Concentrations	Mean Analyte Concentration[2]	Site-Specific Soil Cleanup Goal[3]	Florida Contaminant Cleanup Target Level[4] Residen-tial/Industrial/Leaching	USEPA Region III RBCs[5] Residential/Industrial
Inorganic Analytes (mg/kg)						
Arsenic	10/10	0.93 to 3.8	2.1	4.62	0.8/3.7/29	0.43/3.8
Iron	10/10	1,500 to 11,700	5,250	NA	23,000/480,000/SPLP	2,300/61,000
Lead	18/18	5.2 to 2,230	146	NA	500/920/SPLP	400
Polynuclear Aromatic Hydrocarbons (µg/kg)						
Benzo(a)anthracene	1/10	1,800	1,800	NA	1,400/5,000/3,200	870/7,800
Benzo(a)pyrene	1/10	910	910	NA	100/500/8000	87/780
Pesticides (µg/kg)						
Dieldrin	8/10	4.9 to 210	42.9	NA	70/300/4	40/360

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] The mean of detected concentrations is the arithmetic mean of all environmental samples in which the analyte was detected, including duplicate samples. The arithmetic mean does not include those environmental samples in which the analyte was not detected.
[3] Source: Based on Navy's request for a site-specific soil cleanup goal for arsenic at disposal sites at Naval Air Station Whiting Field (see Appendix A).
[4] Source: Florida Contaminant Cleanup Target Levels, Chapter 62-777, Florida Administrative Code (July, 1999).
[5] Region III RBCs for soil ingestion based on an excess lifetime cancer risk of 10^{-6} or an adjusted hazard quotient of 0.1 (USEPA, 1998).

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

USEPA risk range. The noncancer risks for the trespasser and site maintenance worker under current land-use were below the acceptable USEPA and FDEP target HI of 1.

Under future land-use, the cancer risks posed to trespassers, occupational workers, site maintenance workers, excavation workers, and residents based on the same exposure pathways and RME assumptions are 3×10^{-6}, 2×10^{-6}, 1×10^{-6}, 5×10^{-8}, and 7×10^{-5}, respectively, which are within the acceptable USEPA risk range. However, the future residential risk exceeds the FDEP risk level of 1×10^{-6} due to arsenic and benzo(a)pyrene. However, benzo(a)pyrene has been addressed by delineation and removal in August 1999 (CH2MHILL, 2000). The noncancer risks under future land-use for all receptors were below the acceptable USEPA and FDEP target HI of 1.

Because Site 11 and several other sites at NAS Whiting Field are disposal sites, the Navy requested that the FDEP consider a site-specific soil cleanup goal (SCG) for arsenic because the fill and cover material obtained at NAS Whiting Field included subsurface soil which contained elevated arsenic levels. The Navy recommended an SCG for arsenic at NAS Whiting Field covered landfill sites (Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, and 16) of 4.62 milligrams per kilogram (mg/kg). This request is included as Appendix A of this FS report.

The FDEP responded to this request in a letter dated April 27, 1998 (Appendix B). The FDEP concurred that a site-specific SCG for arsenic of 4.62 mg/kg is acceptable at NAS Whiting Field disposal sites (Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, and 16), given the following conditions:

- In the future, the disposal sites will be used for activities that involve less than full-time contact with surface soil at the site. These activities could include parks, recreation areas, or agricultural sites.
- The Navy will incorporate these land-use considerations into a Land-Use Control (LUC) Agreement.
- The SCG for arsenic will not be used at any other site without prior FDEP approval.

As presented in Table 2-2, concentration of arsenic in surface soil at Site 11 does not exceed 4.62 mg/kg.

In order to apply the site-specific cleanup goal for arsenic at NAS whiting Field disposal sites, the Navy must adhere to the conditions of the FDEP concurrence letter and the MOA.

As stated earlier, RAO to address exposure to surface soil at Site 11 are to be identified for dieldrin, lead, and arsenic at Site 11. Therefore, the following RAO is identified to address exposure to contaminants in surface soil at Site 11:

RAO 1: Address surface soil at Site 11 where concentrations of contaminants exceed action levels.

The ERA completed for Site 11 considered exposure of terrestrial plants, terrestrial invertebrates, and wildlife to chemicals in surface soil. At Site

11, ingestion of surface soil containing pesticides and lead by small mammals may result in a potential sublethal risk such as reduction in growth and population. However, the concentrations of pesticides and lead detected were localized in the immediate area of one sampling location (11-SL-04) at the site. Based on data collected during the supplemental sampling event in 1999, soils around location 11-SL-04 (2'x2'x2') were removed and disposed. Confirmation samples collected after the removal action indicate lead concentrations were below the Florida ecological screening values. Therefore, no RAO will be established for ecological exposure to surface soil at Site 11.

Subsurface Soil. Chemical-specific ARARs and TBCs for subsurface soil were considered when identifying RAOs. For Site 11, subsurface soil samples were collected and none of the chemicals detected in subsurface soil were selected as human health or ecological COCs. Furthermore, chemicals detected in subsurface soil at Site 11 were compared to the Florida industrial SCTLs and no exceedances were noted.

Based on this analysis, no RAO will be developed for subsurface soil at Site 11.

Waste Disposal. Action-specific ARARs related to landfill closure were considered for identifying RAOs. In order to complete this review, it was noted that Site 11 did not receive wastes after 1973. Based on this review, Federal landfill closure regulations were deemed not applicable to Site 11 for the following reasons:

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

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

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

The closure requirements described in these regulations do not apply to disposal areas that received their final covers before 1983; however, closure certification of the site has not been provided by the FDEP. Therefore, the following RAO has been developed for Sites 11:

RAO 2: Complete closure of the disposal areas in accordance with State and Federal ARARs for landfill closure.

Other Considerations. Although the above-referenced regulations are not directly applicable to remedial action at Site 11, portions of the regulations may be relevant for developing remedial alternatives for the sites. For example, the *Technical Manual for Solid Waste Disposal Criteria* (USEPA, 1992) provides information regarding statistical evaluation of groundwater monitoring data. In addition, guidance published for CERCLA sites provides information regarding closure of CERCLA landfills.

As stated in *Design and Construction of RCRA/CERCLA Final Covers* (USEPA, 1991b), closure of CERCLA landfills that are not subject to specific closure regulations can be achieved by "hybrid-landfill closure." A "hybrid-landfill closure" may be used when residual contamination poses a direct contact threat, but does not pose a groundwater threat. USEPA guidance (USEPA, 1991b) suggests the following items be considered for hybrid-landfill closures:

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

Based on consideration of these items and the recommendations of the RI (including the RA), some or several of these components will be considered in developing remedial alternatives for Site 11.

Summary of RAOs. Two RAOs have been established for Site 11. Table 2-3 lists these RAOs.

Table 2-3
Summary of Remedial Action Objectives

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Remedial Action Objective	Description
1	Address surface soil at Site 11 where concentrations of contaminants exceed action levels.
2	Complete closure of the disposal areas in accordance with State and Federal ARARs for landfill closure.

Notes: ARAR = applicable or relevant and appropriate requirement.

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

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

To develop appropriate response actions for former disposal sites, the NCP and USEPA provide guidance for developing general response actions for such sites. The USEPA has produced a document entitled *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a). Because municipal landfill sites typically have similar characteristics as land disposal sites, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for landfills that pose a relatively low long-term threat or where treatment is impracticable (Section 300.430[a][1][iii][B]). Therefore, the number of general response actions identified for Site 11 is limited based on these guidance documents.

The USEPA states in *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a) that treatment technologies should be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii][A]). However, the RI for Site 11 did not identify highly toxic areas or materials that pose a principal threat; therefore, the general response actions identified for Site 11 do not include physical or thermal treatment technologies. As a result, the presumptive remedy for Site 11 are focused on containment rather than on physical or chemical treatment technologies.

In summary, the general response actions identified for Site 11 include the following:

- no action,
- limited action (i.e., land-use controls), and
- containment (i.e., soil cover).

3.0 REMEDIAL ACTION ALTERNATIVES

The approach and rationale leading to the development of remedial alternatives for Site 11 are presented in this chapter. The development of remedial alternatives for CERCLA sites consists of identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial alternatives that accomplish the RAOs identified in Chapter 2.0.

The NCP requires that a range of remedial alternatives be considered, and SARA emphasizes the use of treatment technologies. Treatment alternatives range from those that eliminate the need for long-term management to those that reduce toxicity, mobility, or volume of contaminants. As stated in Section 2.4, the RI did not identify areas of highly toxic or mobile material that posed a principal threat; therefore, treatment technologies are not considered applicable. Also, the relatively low concentrations of COCs in surface soil (Table 2-3) and the relatively low volume of contaminated surface soil (193 yd^3) make treatment technologies impractical and not cost effective. Therefore, the presumptive remedies for surface soil contamination include limited action, excavation, and containment alternatives.

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

- no action,
- limited action (LUCs), and
- containment (i.e., landfill capping, soil cover).

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

3.1 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES. The purpose of this section is to identify and screen appropriate technologies for assembly into remedial alternatives that address RAOs identified for Site 11. Each technology is then screened based on site- and waste-limiting characteristics.

Site characteristics considered during this process included the following:

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

Based on the review of site characteristics, no special site features or characteristics exist at Site 11 that would preclude any remedial technology from implementation.

The following waste characteristics were also considered:

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

Table 3-1 presents and screens the remedial technologies applicable for addressing the RAOs at Site 11. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site- and waste-limiting factors. Technologies deemed ineffective or not implementable (such as physical or chemical treatment technologies) were eliminated from Table 3-1. The remaining technologies are assembled into remedial alternatives in Section 3.2.

3.2 REMEDIAL ALTERNATIVES. Remedial technologies that passed the technology screening are assembled into alternatives that meet the RAOs. Table 3-2 presents the alternative development. The alternatives for Site 11 were developed to address closure of the disposal areas at Site 11 in accordance with ARARs.

Based on the applicable technologies identified in the preceding section, three remedial alternatives were developed for Site 11. These alternatives are options under the no action, limited action, containment, and disposal general response categories. The no action alternative was developed to provide a baseline for comparison with other alternatives (USEPA, 1988). The alternatives developed for Site 11 are discussed in the following subsections.

3.2.1 Alternative 1: No Action The NCP requires the development of the no action alternative to provide a baseline for comparison against other remedial alternatives. This alternative does not involve the implementation of any remedial technologies to treat wastes at Site 11. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. The 5-year site review typically involves an administrative review of site records. For this FS, Alternative 1 would include 5-year reviews for a period of 30 years. A period of 30 years was chosen for costing purposes only.

3.2.2 Alternative 2: Land Use Controls Alternative 2 consists of activities necessary to maintain LUCs at Site 11. These activities are:

- LUCs (i.e., LUC documents), and
- 5-year site reviews.

LUCs restricting the use of the land in the vicinity of a landfill and placing regulatory controls on excavation of soil would be drafted, implemented, and enforced in compliance with local regulations as a part of this alternative. The LUCs would be enforced on the parcel of land encompassing the

Table 3-1
Identification and Screening of Remedial Technologies

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General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
No Action				
No action	No remedial actions are taken at Site 11. Five-year site reviews would be required.	Applicable.	Applicable.	Retained. This alternative is retained as a baseline for comparison with other alternatives as required by CERCLA.
Five-year site reviews	Under CERCLA, if wastes are left on a site after closure, the site should be reviewed every 5 years.	Applicable.	Applicable.	Retained. This alternative is retained based on the CERCLA requirement that if wastes remain on site after closure, a review of the site must be completed every 5 years.
Limited Action				
Land-use controls (LUC)	Use of LUC documents to maintain the site for non-residential purposes.	Applicable.	Applicable.	Retained. This alternative is retained because it would achieve RAOs 1 and 2.
LUC Implementation Plan (LUCIP)	Identifies each LUC objective for Site 11 and specifies actions required to achieve those objectives (i.e, install fencing, post warning signs). LUCIP includes a description of the disposal history and the status of the site conditions during inspections and sampling and analysis, if required.	Applicable.	Applicable.	Retained. May be necessary to obtain landfill closure certification. This component would achieve RAO 2.
Containment				
Closure Plan development	Development of a Closure Plan for site monitoring and maintenance. Plan includes a description of the disposal history, status of the site conditions during inspections and sampling, and effectiveness of the landfill cover design.	Applicable.	Applicable.	Retained. May be necessary to obtain landfill closure certification. This component would achieve RAO 2.

See notes at end of table.

Table 3-1 (Continued)
Identification and Screening of Remedial Technologies

Feasibility Study
Site 11, Southeast Open Disposal Area (B)
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Milton, Florida

General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
Containment (continued)				
Soil Cover:				
Site Clearing and Grubbing	Removal of vegetation, shrubs, and small and large brush to allow for proper grading of landfill cap.	Applicable.	Not applicable.	Retained. May be necessary if the disposal areas are capped.
Placement of Compacted Soil Cover	Placement, grading, and compacting of low-permeability capping system.	Applicable. Low-permeability cap does not exist; suitable low-permeability soil will be obtained from an off-site borrow source.	Applicable. Presence of clean cover would minimize human and ecological direct contact exposure to existing surface contaminants at Site 11.	Retained. May be necessary if the disposal areas are capped.
Vegetative Support Layer	A 6-inch-thick soil cover is placed over a compacted soil cover to reduce water infiltration and erosion and enhance evapotranspiration through vegetative growth.	Applicable. Reduces infiltration of precipitation, thus providing source control at Site 11.	Applicable. Would reduce infiltration of precipitation into the waste.	Retained. May be necessary if the disposal areas are capped.
Vegetative Cover	Establishment of vegetation by fertilizing, mulching, seeding, and planting.	Applicable. Vegetation would reduce infiltration and reduce erosion of soil cover.	Applicable. Would reduce direct contact with exposed waste.	Retained. May be necessary if the disposal areas are capped.

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

Table 3-2
Development of Remedial Alternatives

Feasibility Study
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Alternative	Description of Key Components
Alternative 1: No action	Five-year site reviews.
Alternative 2: Land Use Controls	Land-Use Controls (LUCs) including LUC Implementation Plan (LUCIP).
	Five-year site reviews.
Alternative 3: Soil Cover and LUCs	Closure plan (including post-closure care) development to monitor and maintain site after landfill cover.
	LUCs including LUCIP.
	Posting of warning signs.
	Removal and disposal of surface debris.
	Clearing and grubbing of landfill site.
	Cover placement.
	Vegetative establishment to minimize erosion of final cover and enhance evapotranspiration.
	Five-year site reviews.

disposal site, including a typical buffer zone, as is currently used at other landfill sites in the State.

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

3.2.3 Alternative 3: Soil Cover and LUCs One containment alternative consisting of all components of Alternative 2 with the addition of a soil cover component has been developed for Site 11. Containment alternatives require no treatment of contaminated materials.

Under this alternative, a cover system would be constructed over the former disposal sites to reduce the infiltration of precipitation, control surface water runoff, and minimize potential direct contact risks.

Prior to cover placement, the site would be cleared, grubbed, and graded. The soil cover would consist of clean fill placed and compacted in 6-inch lifts to a minimum thickness of 18 inches. Six inches of topsoil would then be placed on top of the clean fill for a total cover thickness of 24 inches. Once in place, the soil layer would be fertilized and seeded to promote vegetative cover.

During the construction phase of this alternative, temporary erosion control measures would remain in place until a vegetative cover was established. Post-closure monitoring and maintenance of the installed cover system would be required until the cover system stabilized. This monitoring program would include visual inspections and maintenance of the vegetative cover. For cost estimating purposes, inspection and monitoring is estimated for a period of 30 years after closure. Finally, LUCs and 5-year reviews would be implemented as previously discussed. The 5-year site reviews will assess the need for continued landfill monitoring.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

This chapter presents detailed analyses of alternatives for Site 11 at NAS Whiting Field. A detailed analysis is performed to provide decision makers with sufficient information to select the appropriate remedial alternative for a site. The detailed analysis has been conducted in accordance with CERCLA Section 121, the NCP, and USEPA RI/FS Guidance (USEPA, 1988). The detailed evaluation of each remedial alternative includes the following:

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

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

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

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

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

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

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

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

Table 4-1
Criteria for Evaluation of Remedial Action Alternatives

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

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

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

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

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

Overall Protection of Human Health and the Environment. This alternative would provide no additional protection to human or ecological receptors who may be exposed to surface soil at Site 11. If this alternative were selected, 5-year site reviews would be instituted. No adverse short-term or cross-media effects are anticipated with this no-action alternative.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., maximum contaminant levels [MCLs], Florida SCTLs) in the short term. This alternative may comply with ARARs in the long term if natural processes including physical, chemical, and biological degradation in the soil and groundwater reduce concentrations. However, this alternative would not comply with ARARs for lead, arsenic, and dieldrin concentrations in soil.

Long-Term Effectiveness and Permanence. Naturally-occurring processes such as biological activity may reduce concentrations in the soil over the long term, but would not address lead and arsenic in soil. Human risks due to exposure to site soil would not be addressed via this alternative. Therefore, these risks would remain for inorganics and may be reduced for organics by natural processes in soil.

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

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

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

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

This alternative would not comply with RAOs in the short term because the only means of contaminant and lead reduction for any organics is natural degradation processes. No reduction in arsenic and lead concentrations would be anticipated. This alternative does not pose a threat to workers through exposure to contaminated soil because remedial construction activities are not proposed under this alternative.

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

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

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

Feasibility Study
Site 11, Southeast Open Disposal Area (B)
Naval Air Station Whiting Field
Milton, Florida

Operation and Maintenance Cost (O&M) (per event)		
5-year site review		$5,000
	Total O&M cost (per event)	$5,000
	Total O&M cost (present worth of semi-annual O&M for 30 years)	$17,000
	Contingency (10 percent)	$2,000
	Total cost Alternative 1: No Action	$19,000

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

4.2 DETAILED ANALYSIS FOR ALTERNATIVE 2: LAND USE CONTROLS. Alternative 2 consists of LUC actions to limit exposure to surface soil at Site 11. A description of this alternative is presented in Subsection 4.2.1 and a technical assessment of this alternative is presented in Subsection 4.2.2.

4.2.1 Detailed Description of Alternative 2 Under this alternative, LUCs would be implemented to provide protection of human receptors. LUCs would involve the use of institutional controls that would restrict the use of the land in the

vicinity of Site 11. LUCs would place regulatory controls on the excavation of soil or similar activities that have the potential to disturb the site soil or increase the likelihood of exposure to the site soil.

The LUCs would be placed on a parcel of land slightly larger than the boundaries of Site 11. This would ensure that an appropriate buffer zone is created and maintained between the disposal areas and other areas of NAS Whiting Field.

The LUCs would remain in place until the level of contamination at the sites has been adequately addressed. As part of this alternative, a site inspection program would be established to insure that compliance with the agreed upon LUCs is maintained. The results of these inspections would be summarized in reports provided to appropriate parties. The inspection and reporting activities would be performed as long as the LUCs are in place. The following components would be included as part of this alternative:

- LUCs
- 5-year site reviews

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

The LUCAP is developed for the entire facility on which LUCs are necessary. In this case, an LUCAP would be developed for NAS Whiting Field. This document would identify an individual at the facility who is responsible for ensuring that any activities at Site 11 would not violate what has been specified in the LUCs.

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

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

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

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

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida SCTLs) in the short term. Eventually, this alternative may comply with ARARs for organics if natural processes in the soil

reduce organic contaminant concentrations. Reduction of arsenic concentrations are not expected; therefore, ARARs would not be achieved.

Long-Term Effectiveness and Permanance. Naturally occurring processes, such as biological activity, may reduce organic contaminant concentrations in the soil over the long term but would not reduce arsenic and lead concentrations. The risks presented to the future resident based on exposure to surface soil at the site would be addressed via the LUCs. The long-term effectiveness and permanence of these controls will be controlled by the facility under the LUCAP developed for NAS Whiting Field.

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

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

Short-Term Effectiveness. This alternative would reduce human health risks in the short term by reducing the potential exposure to Site 11 surface soil by human receptors. However, ecological risks would not be reduced by implementation of this alternative. Furthermore, the threat to trespassers is considered to be minimal. Access to the base is restricted and continued operation of the base is expected.

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

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

Cost. The present worth cost of Alternative 2 is presented on Table 4-3. Both the LUCs and 5-year site reviews were costed over a 30-year monitoring period. A 30-year period was chosen because RI/FS guidance suggest using this timeframe where COCs remain on site. The total present worth cost of Alternative 2 is $135,000. Cost estimates are presented in Appendix D.

4.3 DETAILED ANALYSIS FOR ALTERNATIVE 3: SOIL COVER AND LUCS. Alternative 3 consists of constructing a soil cover followed by LUCs. A description of this alternative is presented in Subsection 4.3.1 and a technical criteria assessment of this alternative is presented in Subsection 4.3.2.

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

Feasibility Study
Site 11, Southeast Open Disposal Area (B)
Naval Air Station Whiting Field
Milton, Florida

Direct Cost	
Land-use controls	$12,000
Total direct cost	$12,000
Total capital cost (direct)	$12,000
Operation and Maintenance Cost (O&M) (per event)	
5-year site review	$ 5,000
Inspection and reporting	$7,000
Total O&M cost (per event)	$ 12,000
Total O&M cost (present worth of semi-annual O&M for 30 years)	$110,000
Total Capital and O&M	$123,000
Contingency (10 percent)	$12,000
Total cost Alternative 2: LUCs	$135,000

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

The criteria presented in this section are intended for cost comparison purposes only and are not intended to be final specifications. If Alternative 3 is the selected remedy for Site 11, it is recommended that land surveying, additional field sampling, and geotechnical testing be completed prior placement of soil cover.

4.3.1 Detailed Description of Alternative 3 Alternative 3 is designed to address closure of the disposal area and exposure to surface soil at Site 11. The following components would be included as part of this alternative:

- LUCs and Site Closure Plan
- Site preparation, clearing, and grubbing
- Soil cover design
- Post-closure care
- Five-year site reviews

LUCs and Site Closure Plan. Refer to Alternative 2 for a description of LUCs. The Site Closure Plan would consist of a closure report, closure design plan, and closure operation plan.

Site Preparation, Clearing, and Grubbing. A stockpile area, with a 12-inch-thick gravel base, would be installed at the site and would be large enough to provide sufficient volume for several days of filling and grading operations associated with this alternative. An area adjacent to the stockpile area would be prepared with a 12-inch-thick gravel base to be used as a parking area for construction-support trailers and heavy equipment. Equipment mobilized to the site would include earth-moving equipment such as backhoes, front-end loaders, bulldozers, and dump trucks.

Approximately 10 percent of the site is assumed to be covered by trees; a sparse layer of groundcover covers the remainder of the site. Pine trees, shrubs, and other vegetation will be cleared with a trackhoe or other type of excavation equipment to provide a cleared surface for placement of the landfill cover. Small brush and vegetation will be chopped and spread over the landfill surface. Large trees will be disposed as yard-waste at an appropriate mulching or tree recycling facility, or chipped and spread over the landfill surface prior to construction of the soil cover.

Soil Cover. The primary intent of the landfill cover is to limit direct contact exposure to surface soil. As a result, the soil cover will be approximately 24 inches thick and consist of an 18-inch thick barrier soil layer and 6-inch topsoil for vegetative cover. This barrier layer will be placed and compacted in 6-inch lifts to ensure proper compaction and cover stability. A fine-grained, low-permeable soil layer (9,000 yd^3) will be obtained from an off-site borrow source. The borrow soil will be tested to verify that it is "clean" fill and exhibits a pH between 6 and 7.5 standard units (su).

This soil will be compacted with a sheepsfoot or smooth roller to achieve a structurally stable surface. The final compacted soil layer will consist of a minimum of 2 feet soil cover. Only minimal modification of the existing topography will be performed.

A final 6-inch layer of topsoil (3,000 yd^3) will be placed over the compacted soil to support vegetative growth. The soil will be obtained from an off-site

borrow source to provide the adequate soil composition required to stimulate and support natural vegetation. The soil will be tested to verify that it is "clean" fill and exhibits a pH between 6 and 7.5 su.

Selected seed and fertilizer will be placed on the vegetative support layer to establish vegetation. Hay will be used to protect the seed and fertilizer during initial development. Post-closure care will include provisions to stimulate growth. The vegetative cover will minimize erosion by developing root systems within the vegetative support layer that overlies the compacted soil cover material. The vegetation will also provide evapotranspiration of moisture contained in the soil cover, which will increase the cover's structural stability.

Post-Closure Care. Post-closure care will consist of the activities listed below, performed on an annual basis for a period of 30 years after cover construction.

- Visually inspecting, seeding, watering, and otherwise maintaining the vegetation on the surface of the closed landfill.

- Visually inspecting the landfill cover for signs of wear or discontinuities, such as seeps, pits, cracks, or other imperfections that may compromise the cover's structural integrity.

Groundwater monitoring is not included in post-closure care as groundwater is being investigated on a facilitywide basis at NAS Whiting Field (designated Site 40). The need for groundwater monitoring will be assessed in the Site 40 RI for groundwater.

Five-Year Site Reviews. Refer to Alternative 1 for a description of this component.

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

Overall Protection of Human Health and the Environment. Protection of human receptors would be provided by the implementation of this alternative in that a landfill cover and regulatory controls (i.e., LUCs) would prohibit potential human receptors from coming into contact with the soil at Site 11. This alternative would also provide protection for ecological receptors at the site; however, in doing so, this alternative would alter the native ecological habitat present at the site.

Compliance with ARARs. Landfill closure requirements under RCRA Subtitles C and D, as well as Florida Solid Waste Disposal Facilities Regulations, were referenced as appropriate concerning the soil cover design.

Worker safety standards will be maintained during construction activities to comply with ARARs. Dust control will be used to minimize the spread of wind-blown soil during site grading. A site-specific health and safety plan will be developed and implemented during all site activities. However, contact with landfill wastes is not anticipated during construction of the cover.

Five-year site reviews will be prepared to assess the effectiveness of the alternative.

Long-Term Effectiveness and Permanence. The construction of a soil cover will prevent human health risks posed by ingestion of surface soil and ecological risks to small mammals exposed to surface soil.

Alternative 3 can be viewed as a permanent method of reducing human health risks posed by ingestion of surface soil if the cover stability shows permanence after completion of the 5-year review. Similar to human health risk reduction, the soil cover will also be designed to prevent risks posed to ecological receptors. A vegetative cover will be placed over the compacted soil to allow growth of native vegetation. The vegetation will increase evapotranspiration and reduce cover erosion. The risk posed to local species by ingesting biota that contain contaminants in their tissue, or by directly ingesting surface soil that contains contaminants, will be eliminated by placement of the compacted soil.

Alternative 3 will include clearing and grubbing vegetation that currently exists on the landfills. Existing vegetation will be removed, and ecological diversity will be reduced at Site 11. This ecological loss is not permanent; new vegetation will be planted on the final cover to induce continued ecological growth. However, this new vegetation will consist of mostly grasses and small brush, which is not quite as diverse as the natural vegetation that currently exists (due to the removal of some trees). The clearing and grubbing of the existing vegetation can be viewed as a permanent long-term ecological impact.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Alternative 3 does not include treatment of contaminants, and does not physically or chemically alter contaminants contained in the landfills. Thus, this alternative does not reduce the toxicity and/or volume of contaminants through treatment. However, the cover design will effectively reduce the mobility of contaminants contained in surface soil by preventing the spread of wind-blown particulates. The cover will also prevent the uptake of contaminants contained in surface soil, which will prevent biomagnification of contaminants through the local ecological food chain.

Short-Term Effectiveness. During the clearing, grubbing, and grading of the site, fugitive dust will be generated. This dust may contain hazardous particulates that pose an inhalation risk to site workers. Dust suppression by the use of water trucks and hoses is included in this alternative to minimize these potential short-term risks.

Site workers may be exposed to contaminated surface soil during construction activities. Appropriate PPE can be used to minimize this increased risk.

Alternative 3 will include clearing and grubbing vegetation that currently exists. Ecological species that depend upon the surface of the landfills for food and other natural resources will be impacted by the removal of existing vegetation. This detrimental impact is an adverse short-term impact that will be reversed upon the growth of new vegetation. Construction operations are expected to last for 2 months, and new vegetation will likely require years to mature. Thus, the short-term ecological impacts as a result of clearing and grubbing the site may be significant.

Implementability. Equipment and materials are readily available to construct the cover designed for Alternative 3. Site work will be completed within a 2-month period, and will require standard construction expertise. Because of the difficulty in obtaining borrow soil in the vicinity of the site, compacted soil will be obtained from a non-local borrow source. The lack of local borrow sources would result in additional transportation cost, but does not render the alternative infeasible.

Cost. The cost estimate for Alternative 3 is presented in Table 4-4 and detailed cost calculations are provided in Appendix D. This estimate is based on the preliminary design criteria presented in this section. If this alternative is selected, land surveying, additional field sampling, and geotechnical testing should be performed during design to prepare a complete set of design plans and specifications. The total present worth cost of Alternative 3 is approximately $489,000.

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

Feasibility Study
Site 11, Southeast Open Disposal Area (B)
Naval Air Station Whiting Field
Milton, Florida

Direct Cost		
Land-use controls		$12,000
Mobilization and site preparation		$36,000
Site clearing and grubbing		$14,000
Soil cover		$162,000
Dust control		$2,000
Site restoration		$6,000
	Total direct cost	$232,000
Indirect Cost		
Health and safety (3 percent)		$7,000
Administration and permitting (3 percent)		$7,000
Engineering and design (10 percent)		$23,000
Construction support services (10 percent)		$23,000
	Total indirect cost	$60,000
	Total capital cost (direct + indirect)	$232,000
Operation and Maintenance (O&M) Cost (capitalized)		
Soil cover inspection and maintenance		$42,000
Land-use controls - Quarterly & Annual inspections and reporting		$93,000
5-year site review		$17,000
	Total O&M cost (capitalized)	$152,000
	Total capital and O&M costs	$445,000
	Contingency (10 percent)	$44,000
	Total cost Alternative 4: Site Closure and Capping	$489,000

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

5.0 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial alternatives for Site 11 were developed in Chapter 3.0 and were individually evaluated in Chapter 4.0 using seven technical criteria. For comparative purposes, these criteria are grouped into the following categories:

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

This chapter presents a comparison of remedial alternatives with respect to these criteria. This comparison is intended to provide technical information required to support the selection of a preferred alternative for Site 11. It is anticipated that modifying criteria (i.e. State and community acceptance) will be used in conjunction with the information presented herein to select an appropriate remedial alternative for Site 11. The remainder of this chapter presents this comparison.

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

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

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

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

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

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

These criteria are used to provide an assessment of the permanence of each remedial alternative, while ensuring the implementability and cost-effectiveness of each remedial alternative. An individual assessment of each alternative with respect to these criteria is presented in Chapter 4.0. An overall comparative analysis of alternatives using primary balancing criteria is presented in Section 5.2.

5.1.3 Modifying Criteria The final two criteria are as follows:

- State acceptance, and
- community acceptance.

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

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

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

5.2 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES. This section provides the comparative analysis for remedial alternatives for Site 11 with respect to the criteria described in Section 5.1. Alternatives presented in this FS include the following:

- Alternative 1: No Action
- Alternative 2: Land Use Controls
- Alternative 3: Soil Cover and Land Use Controls

5.2.1 Comparison of Threshold Criteria The remedial alternatives for Site 11 were first compared to the two threshold criteria, overall protection of human health and the environment and compliance with ARARs.

Alternative 1 would not achieve any of the RAOs. Alternative 1 does not provide a means of restricting future land use of the area. Site closure of the landfills would not be achieved via implementation of this alternative. Therefore, this alternative does not protect potential future residents from environmental conditions at the site.

The implementation of Alternative 2 would provide a limited measure of protection of human health and the environment because the alternative includes LUCs. Alternative 2 would achieve RAOs 1 and 2, but would only address the RAOs by restricting access to the site. Therefore, Alternative 2 would not provide optimal protection of human health or the environment and would not achieve compliance with all ARARs.

Alternative 3 would achieve the RAOs, but would adversely affect the existing environment at the site. Construction of a soil cover at the site would result in habitat destruction including destruction of planted pine tree area and other features of the site. Implementation of Alternative 3 may also have potential short-term effects of exposure to site workers.

Because the implementation of Alternative 2 would achieve the RAOs, Alternative 2 is the best alternative in providing overall protection of human health and the

environment. Furthermore, Alternative 2 would not destroy habitat in meeting RAOs, unlike Alternative 3.

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

For long-term effectiveness, Alternatives 1 and 2 may reduce concentrations of organics through natural mechanisms, but the natural degradation of inorganics is unlikely. Alternative 3 would provide long-term effectiveness by limiting exposure to COCs and through natural degradation processes for organic contaminants.

The alternatives evaluated for Site 11 would not reduce the toxicity or volume of contaminants at the site, as none of the alternatives involve treatment of contaminants in media at the site. Alternative 3 provides a reduction in the mobility (i.e., leaching) of contaminants from the soil; however, it does not appear that contaminants are currently leaching to the groundwater.

Alternative 3 would provide the greatest direct adverse short-term impacts on potential ecological receptors via clearing and grubbing activities that would destroy habitat. These impacts could be mitigated if Alternatives 1 or 2 were implemented; no short-term impacts to the environment are expected during implementation of Alternatives 1 and 2.

The implementability of Alternatives 1 and 2 would be relatively easy. For Alternatives 1, 2, and 3, an LUCAP and LUCIP would need to be developed.

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

- Alternative 1: $19,000
- Alternative 2: $135,000
- Alternative 3: $489,000

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

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

REFERENCES

ABB Environmental Services, Inc. (ABB-ES). 1993. *Geophysical Survey Technical Report, Naval Air Station Whiting Field, Milton, Florida.* Prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFAC-ENGCOM), North Charleston, South Carolina.

Envirodyne Engineers, Inc. 1985. *Initial Assessment Study, Naval Air Station Whiting Field, Milton, Florida.* Prepared for Naval Energy and Environmental Support Activity, Port Hueneme, California.

Florida Department of Environmental Protection (FDEP). 1999. Contaminant Cleanup Criteria Rule: Chapter 62-777. Florida Administrative Code. Tallahassee, Florida.

FDEP. 1998. Letter dated April 27, 1998. Response to report by Navy (see Appendix A).

Geraghty & Miller, Inc. 1986. *Verification Study, Assessment of Potential Groundwater Pollution at NAS Whiting Field, Milton, Florida.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

Harding Lawson Associates. 1998. *Remedial Investigation and Feasibility Study, General Information Report, Naval Air Station Whiting Field, Milton, Florida.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (June).

HLA. 2000. *Remedial Investigation for Site 11, Southeast Open Disposal Area (B), Naval Air Station Whiting Field, Milton, Florida.* Prepared for SOUTHNAV-FACENGCOM, North Charleston, South Carolina. (March).

Nature Conservancy/Florida Natural Areas Inventory. 1997. "Rare Plant, Rare Vertebrate, and Natural Community Survey of NAS Whiting Field..." Final Report, sub-agreement (N62467-95-RP00236) to the 1995 Cooperative Agreement between Department of Defense and the Nature Conservancy.

U.S. Department of Agriculture. 1980. *Soil Survey of Santa Rosa County, Florida.* Soil Conservation Service. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.* Office of Solid Waste and Emergency Response. Washington, D.C. (October).

USEPA. 1991a. *Streamlining the RI/FS for CERCLA Municipal Landfill Sites.* Washington, D.C.

USEPA. 1991b. *Design and Construction of RCRA/CERCLA Final Covers.* Office of Research and Development. (May).

USEPA. 1991c. *Conducting Remedial Investigations and Feasibility Studies for CERCLA Municipal Landfill Sites*. Office of Emergency Remedial Response. Washington, D.C. (February).

USEPA. 1992. *Technical Manual for Solid Waste Disposal Facility Criteria*. Washington, D.C.

USEPA. 1998. *Risk-Based Concentrations Table*. USEPA Region III, (October 1).

USEPA, Region IV. 1998. Memorandum from Jon D. Johnston, Chief of Federal Facilities Branch to the Region IV Federal Facilities Branch. Subject: "Assuring Land Use Controls at Federal Facilities." Washington, D.C.

APPENDIX A

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

Evaluation of Background Arsenic Concentrations for Covered Landfill Sites

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

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

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

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

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

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

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

Notes: mg/kg = milligram per kilogram.

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

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

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

[1] Source: FDEP Memorandum from John Ruddell, Director Division of Waste Management, to District Directors and Waste Program Administrators. Subject: Applicability of Soil Cleanup Goals for Florida, January 19, 1996.
[2] The modified Industrial Use Cleanup Goal for arsenic is twice the mean of detected concentrations in the surface and subsurface soil samples.

Notes: mg/kg = milligram per kilogram.

APPENDIX B

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

Department of Environmental Protection

Lawton Chiles
Governor

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Virginia E. Wetherell
Secretary

April 27, 1998

Ms. Linda Martin
Department of the Navy, Southern Division
Naval Facilities Engineering Command
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file: arsenic1.doc

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

Dear Ms. Martin:

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

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

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

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

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

Sincerely,

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

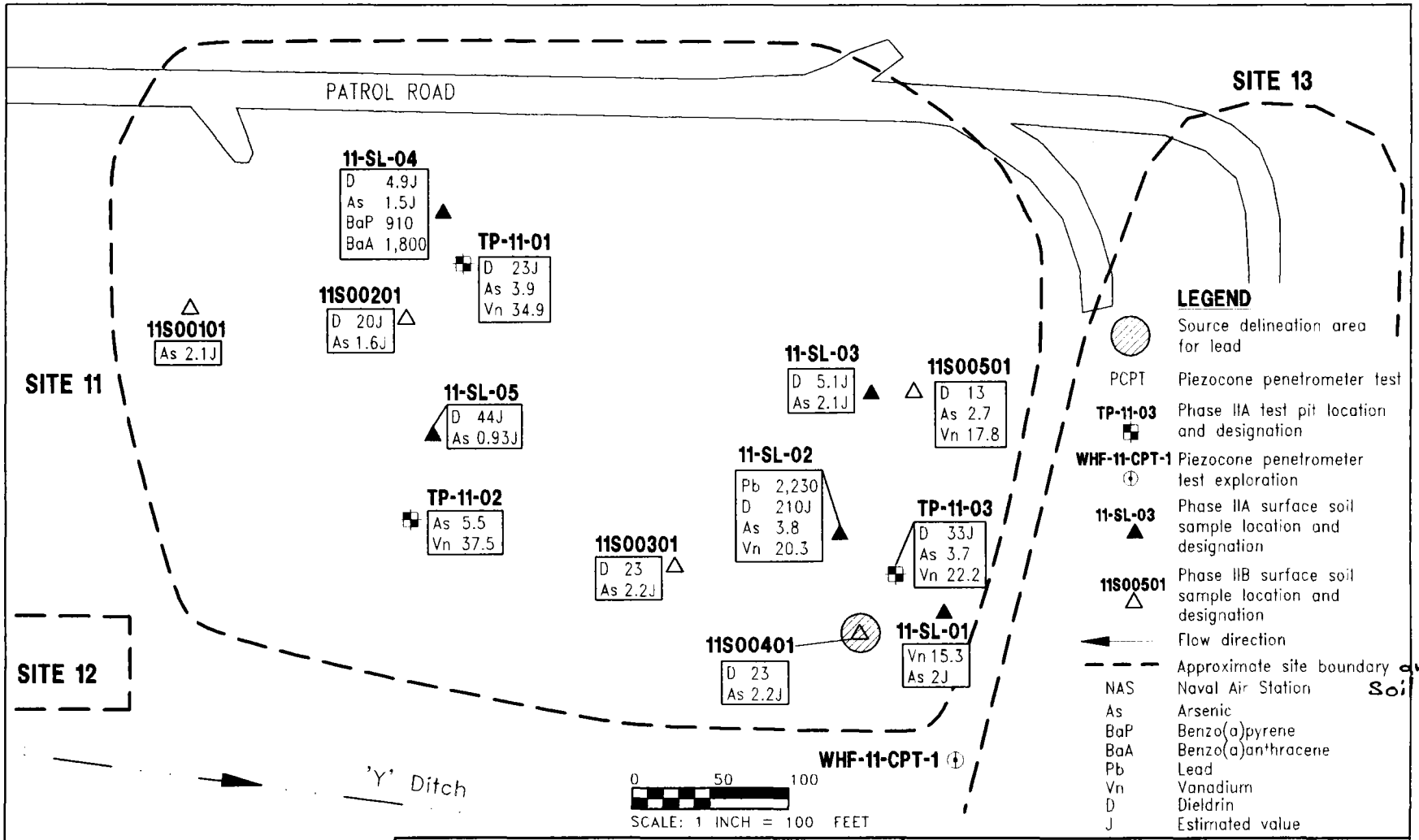
APPENDIX C

VOLUME ESTIMATES FOR SOIL COVER

FEASIBILITY STUDY - NAS WHITING FIELD SITE 11

ALTERNATIVE 3: SOIL COVER AND LUCS
VOLUME REQUIRED FOR 2' THICK SOIL COVER OVER ENTIRE SITE

MATERIAL	AREA (Acres)	THICKNESS (ft.)	VOLUME (cyd)	BULK FACTOR (20%xVol)	TOTAL VOL (cyd)	UNIT COST ($/cyd)	TOTAL COST ($)
Common Fill	3	1.5	7,260	1,452	8,712	$10	$87,120
Topsoil	3	0.5	2,420	484	2,904	$10	$29,040
	TOTAL				11,616		$116,160



NOTES:
1. Only compounds with detections above Florida cleanup target levels are shown.
2. Organic concentration are in micrograms per kilogram.
3. Inorganic concentrations are in milligrams per kilograms.

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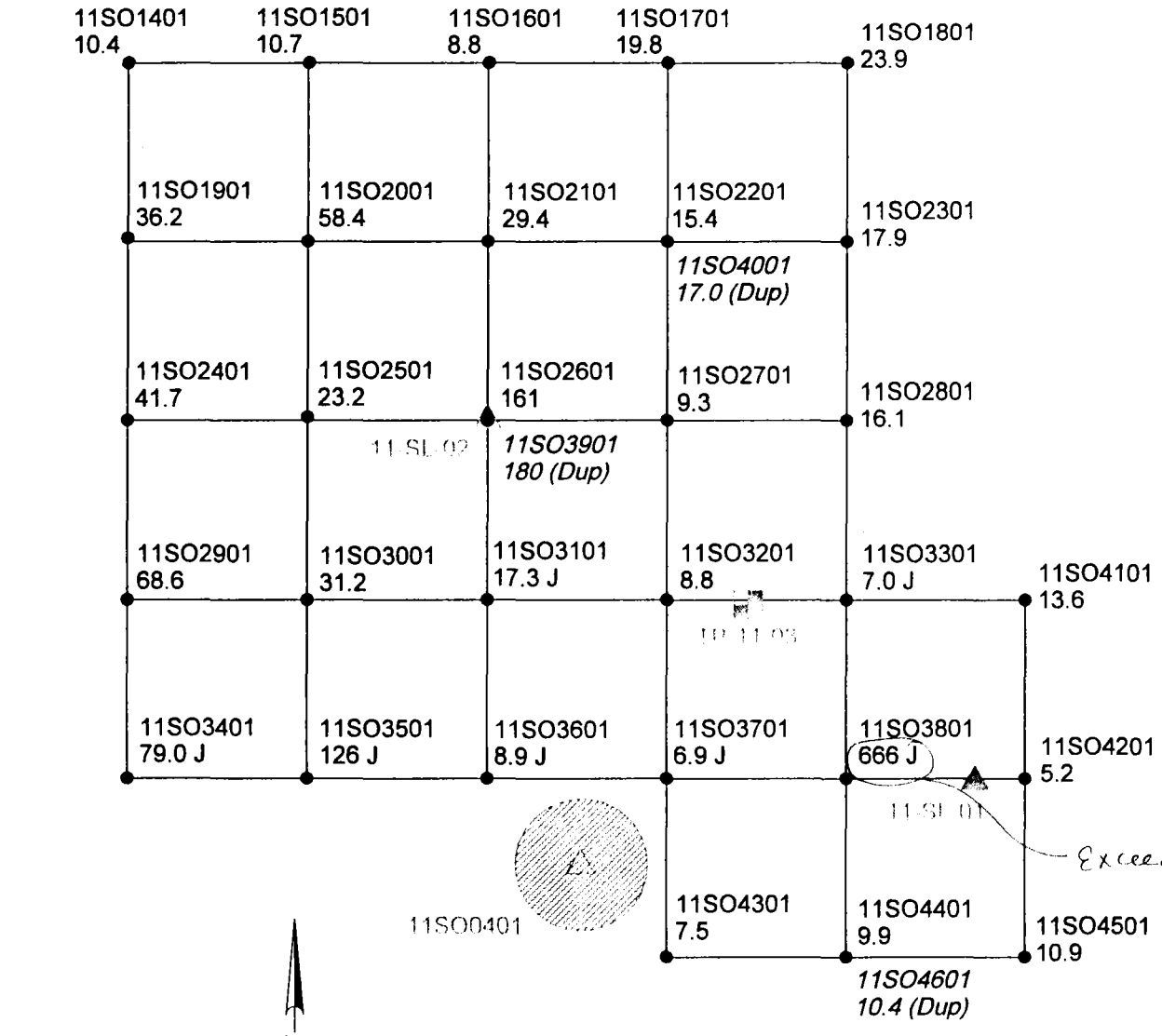
SURFACE AND SUBSURFACE SOIL ANALYTICAL RESULTS

~~REMEDIAL INVESTIGATION REPORT~~
SITE 11, SOUTHEAST OPEN DISPOSAL AREA (B)

NAS WHITING FIELD
MILTON, FLORIDA



LEGEND

- Source delineation
- Phase IIA test pit location
- Phase IIA surface soil sample location
- Phase III step out sample location
- ● April 1999 surface soil sample location
- 10.4 Lead Analytical Result (mg/kg)
  400 / 720 / SP C.P.
- J Estimated value

~~FIGURE 5~~

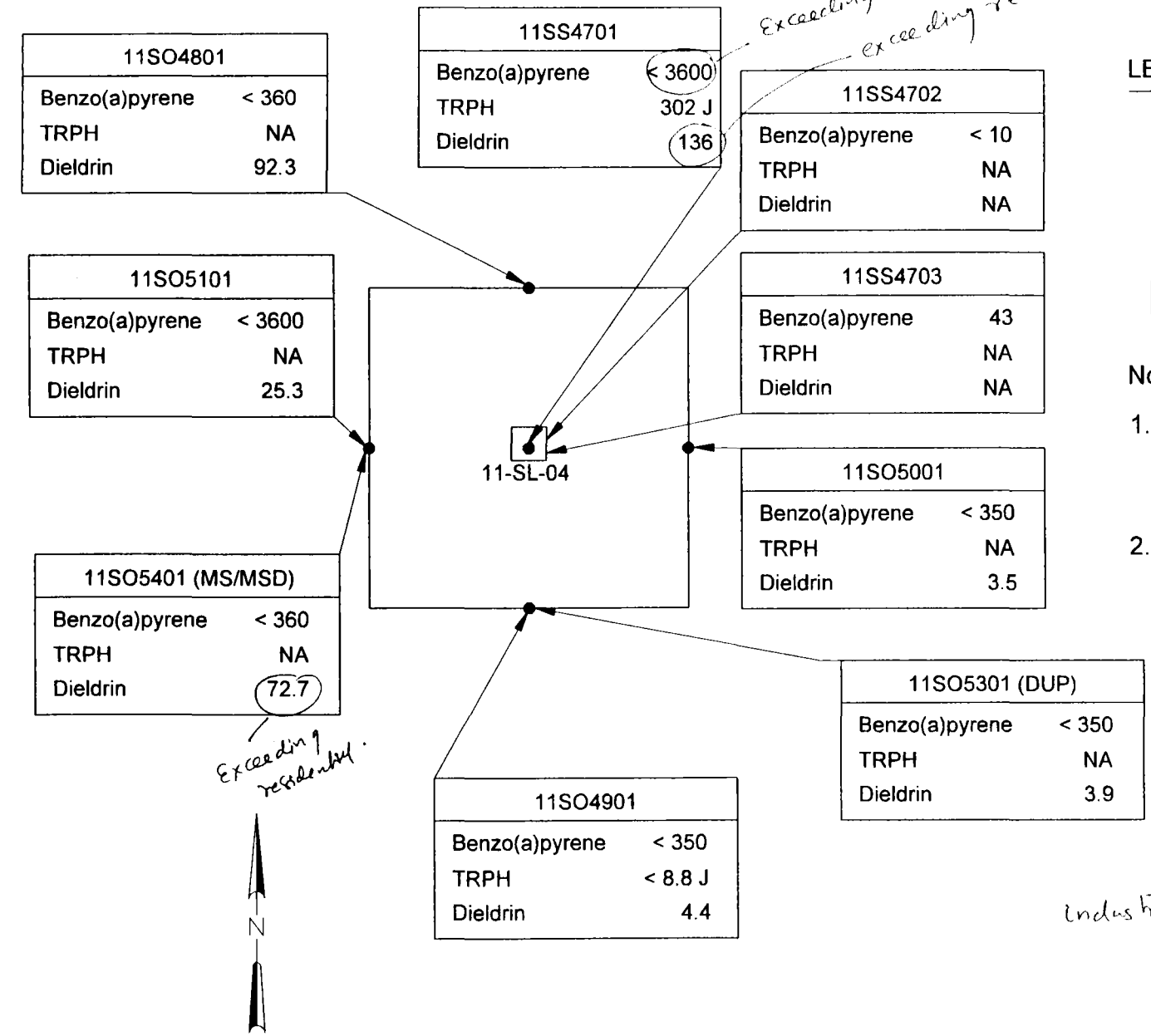
Analytical Results for Lead in Soil

Site 11, NAS Whiting Field

CH2MHILL

2170FIG5.DL\
12-OCT-1999

BaP - 100/500/8,000
TRPH - 340/2,500/
Dieldrin - 70/300/4



LEGEND

- ● June 1999 surface soil sample location
- □ September 1999 surface soil sample location

Notes:

1. Benzo(a)pyrene and dieldrin results are shown in ug/kg. TRPH results are shown in mg/kg.
2. TRPH = total recoverable petroleum hydrocarbons

   NA = not analyzed

Industrial Exceedance removed.

~~FIGURE 6~~

Analytical Results for Benzo(a)pyrene, TRPH, and Dieldrin in Soil
Site 11, NAS Whiting Field

CH2MHILL

2170FIG6.DLV
12-OCT 1999

APPENDIX D

COST CALCULATIONS FOR REMEDIAL ALTERNATIVES

ALTERNATIVE #1: NO ACTION, SITE 11

	Quantity	Unit	Unit Cost	Total Cost
FIVE YEAR SITE REVIEW COSTS				
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	16	hrs	$90.00	$1,440
Mid-level Engineer	16	hrs	$60.00	$960
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	15	hrs	$90.00	$1,350
Mid-level Engineer	20	hrs	$60.00	$1,200
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Total 5-year costs				*$5,310*
Present Worth of 5-year costs at i=6%				*$17,352*
TOTAL FIVE YEAR SITE REVIEW COSTS				**$17,352**
CONTINGENCY @ 10 PERCENT				**$1,735**
TOTAL COST OF ALTERNATIVE #1				**$19,087**

ALTERNATIVE #2: LAND USE CONTROLS, SITE 11

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs)				
Survey Plat	1	lump sum	$2,500.00	$2,500
Land Use Restriction Fees (Filling, Legal, etc.	1	lump sum	$5,000.00	$5,000
Land Use Implementation Plan:				
Senior Scientist	20	hrs	$90.00	$1,800
Mid-level Engineer	40	hrs	$60.00	$2,400
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
TOTAL DIRECT COSTS				**$11,950**
Operation and Maintenance (O&M) Costs				
Quarterly Inspection				
Senior Scientist	0	hrs	$90.00	$0
Mid-level Engineer	32	hrs	$60.00	$1,920
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$320.00	$320
Quarterly Reporting				
Senior Scientist	8	hrs	$90.00	$720
Mid-level Engineer	32	hrs	$60.00	$1,920
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$1,000.00	$1,000
Annual Reporting				
Senior Scientist	2	hrs	$90.00	$180
Mid-level Engineer	8	hrs	$60.00	$480
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$250.00	$250
Subtotal				$6,790
Present Worth of Land Use Control costs at i=6%				**$93,464**
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	16	hrs	$90.00	$1,440
Mid-level Engineer	16	hrs	$60.00	$960
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	15	hrs	$90.00	$1,350
Mid-level Engineer	20	hrs	$60.00	$1,200
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Subtotal				$5,310

Present Worth of 5-year costs at i=6%	**$17,352**
TOTAL O&M COSTS	**$110,816**
COST OF ALTERNATIVE #2	**$122,766**
CONTINGENCY @10 PERCENT	**$12,277**
TOTAL COST OF ALTERNATIVE #2	**$135,043**

ALTERNATIVE # 3: SOIL COVER AND LUCS, SITE 11

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs - See Alternative # 2)				**$12,000**
Equipment Delivery (Mobilization)				
Front End Loader	2	LS	$1,000.00	$2,000
Dozer	2	LS	$1,000.00	$2,000
Grad-all	2	LS	$1,000.00	$2,000
Dump Truck (15 cyd)	5	LS	$250.00	$1,250
Water Truck	1	LS	$250.00	$250
Backhoe	1	LS	$1,000.00	$1,000
Pressure Washer	1	LS	$250.00	$250
Equipment	1	LS	$1,200.00	$1,200
Site Preparation				
Office Trailer	2	mon	$150.00	$300
Storage Trailer	2	mon	$150.00	$300
Trailer Delivery, Setup, Removal	1	each	$300.00	$300
Telephone Service	2	mon	$50.00	$100
Electrical Hookup/Power	2	mon	$50.00	$100
Toilet/Water Cooler Service	2	mon	$50.00	$100
Miscellaneous Equipment	1	LS	$2,500.00	$2,500
Labor (Site Preparation)				
Electrician (2 men @ 2 days @ 10 hrs/day)	40	hrs	$42.00	$1,680
Carpenter (2 men @ 2 days @ 10 hrs/day)	40	hrs	$42.00	$1,680
Foreman (1 man @ 2 days @10 hrs/day)	20	hrs	$60.00	$1,200
Laborers (2 men @ 2 days @ 8 hrs/day)	32	hrs	$36.00	$1,152
Equipment and Disposal Costs (Site Preparation)				
Backhoe and Operator	3	days	$1,200.00	$3,600
Front End Loader and Operator	3	days	$700.00	$2,100
Micellaneous Tools	1	LS	$300.00	$300
Trans and Disposal - Concrete Debris	0	tons	$30.00	$0
Silt fencing	2000	lf	$5.00	$10,000
Signs	10	ea	$50.00	$500
Mobilization and Site Preparation				**$35,862**

Clearing and Grubbing				
Foreman (1 wk @ 50 hrs/wk)	50	hrs	$60.00	$3,000
Grubbing, Removal and Stockpile (Labor Included)	3	acres	$3,500.00	$10,500
Transport and Disposal (Grub and Stumps)	30	tons	$30.00	$900
Clearing and Grubbing				**$14,400**
Soil Cover - 3 Acres				
Grade Site (2 Dozers and Operators)	5	dy	$1,650.00	$8,250
Common Fill - minimum 1.5' layer, Purchase & Hau	8700	cy	$10.00	$87,000
Common Fill - min. 1.5' layer, Spread & Compact	3900	cy	$2.00	$7,800
Site Superintendant (16.0 wks @ 50 hrs/wk)	200	hr	$60.00	$12,000
Topsoil - 6" layer, Purchase & Haul	2900	cy	$10.00	$29,000
Topsoil - 6" layer, Spread	2900	cy	$6.00	$17,400
Soil Cover				**$161,450**
Dust Control				
Water Truck and Driver	4	wk	$550.00	$2,200
Dust Control				**$2,200**
Site Restoration				
Fertilize, Seed, Mulch	3.00	acres	$2,000.00	$6,000
Site restoration				**$6,000**
TOTAL DIRECT COSTS				**$231,912**
INDIRECT COSTS				
Health and Safety (@3% of Direct Costs)				$6,957
Administrative Fees (@3% of Direct Costs)				$6,957
Engineering and Design (@10% of Direct Costs)				$23,191
Construction Support Services (@10% of Direct Costs)				$23,191
TOTAL INDIRECT COSTS				**$60,297**
TOTAL CAPITAL COSTS = Direct Costs + Indirect Costs				**$292,209**

OPERATION AND MAINTENANCE COSTS (annual)

Soil Cover Inspection and Maintenance (Annual)

Replacement of Soil	6	ton	$20.00	$120
Dump Truck and Driver	2	dy	$730.00	$1,460
Laborers (2 @ 2dy @ 10 hrs/day)	40	hr	$36.00	$1,440
Subtotal Cost				$3,020
Present Worth (capitalized @ i = 6%, 30 years)				**$41,570**

5-Year Site Review (see Alternative #1)

Total LOE and ODCs	$5,310
Subtotal Cost	$5,310
Present Worth (capitalized @ i = 6%, 30 years)	**$17,352**

Land Use Controls - Quarterly and Annual Inspection and Reporting (see Alt. #2)

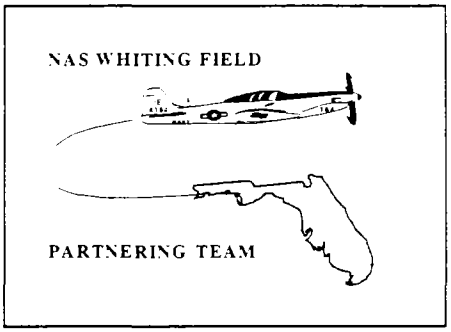
Total LOE and ODCs	$6,790
Subtotal Cost	$6,790
Present Worth (capitalized @ i = 6%, 30 years)	**$93,463**

TOTAL O&M COSTS (5-Year Reviews and LUCs)	**$152,385**
TOTAL CAPITAL COSTS AND O&M COSTS	**$444,594**
CONTINGENCY (@ 10 PERCENT)	**$44,459**
TOTAL COST OF ALTERNATIVE #3	**$489,053**

APPENDIX E

SUMMARY OF SUPPLEMENTAL SAMPLING

Results of Additional Soil Sampling at Site 11



PREPARED FOR: NAS Whiting Field Partnering Team

PREPARED BY: Amy Twitty, P.G.

DATE: September 28, 1999

Background

Site 11 is one of the Perimeter Road sites at Naval Air Station (NAS) Whiting Field and is located along the eastern facility property boundary near the South Air Field (**FIGURE 1**). The site was originally identified as an approximately 3-acre area encompassing an old borrow pit, previously used as an open disposal area from 1943 until approximately 1970. The site had uncontrolled access and received a wide variety of wastes, including general refuse, construction debris, tree clippings, furniture, waste solvents, paint, transformer oils, hydraulic fluid, and various other oils (ABB-ES, 1998).

Five surface soil samples were collected at Site 11 in August 1992 as part of the Phase IIA Remedial Investigation (RI). An additional 13 surface soil samples were collected in January 1996 during the Phase IIB RI. These soil sample locations are presented in **FIGURE 2**.

The five Phase IIA surface soil sampling locations (11-SL-01 through 11-SL-05, and duplicate sample 11-SL-01A) were identified based on visual inspection and geophysical anomalies. Surface soil samples were collected from the land surface to approximately 1 foot below land surface (bls) and were analyzed for target compound list (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs), and target analyte list (TAL) inorganic compounds (ABB-ES, 1998).

Five of the thirteen Phase IIB samples (11SO0101 through 11SO0501) were selected to obtain an unbiased characterization of onsite surface soil. Sample locations were determined using a systematic sampling method. Samples 11SO0101 through 11SO0501 were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic compounds, and total petroleum hydrocarbons (TPH).

The remaining eight Phase IIB samples (11SO0601 through 11SO1301) were collected on a 10-foot radius around Phase IIB soil sample 11SO0401. These samples were collected for source delineation of lead at this location and were analyzed for lead only. However, the elevated lead concentration was actually detected in the Phase IIA sample 11-SL-02 (2,230 milligrams per kilogram [mg/kg]) not sample 11SO0401. All of the samples collected to

delineate lead (11SO0601 through 11SO1301) were collected in the wrong location and exhibited lead concentrations below the U.S. Environmental Protection Agency (EPA) Region III Risk-Based Concentration (RBC) of 400 mg/kg and then current Florida Department of Environmental Protection (FDEP) residential and industrial soil cleanup levels of 500 mg/kg and 1,000 mg/kg, respectively (ABB-ES, 1998).

One out of the ten surface soil samples collected and analyzed for SVOCs contained concentrations of benzo(a)pyrene above the federal and state industrial cleanup levels. Phase IIA sample 11-SL-04 exhibited a concentration of benzo(a)pyrene at 910 micrograms per kilogram (µg/kg). The EPA Region III RBC for benzo(a)pyrene is 88 µg/kg for residential cleanup and 780 µg/kg for industrial cleanup. The FDEP residential and industrial soil cleanup levels for benzo(a)pyrene are 100 µg/kg and 500 µg/kg, respectively (Chapter 62-777, Florida Administrative Code [F.A.C.]).

Soil Investigation

On April 1, 1999, a 100-foot by 100-foot sampling grid was set up around the location of former Phase IIA sample 11-SL-02 (as identified by the land surveyor). The grid was set up on 25-foot centers to aid in the delineation of lead. CH2M HILL collected 25 surface soil samples (plus the appropriate quality assurance and quality control [QA/QC] samples) from the grid area surrounding 11-SL-02 (**FIGURE 3**). Based on the results of the initial round of sampling, CH2M HILL collected five additional samples on April 7, 1999.

The samples were collected from 0 to 1 foot bls using decontaminated stainless-steel hand augers. Soil was placed into stainless-steel bowls, thoroughly mixed using stainless-steel spoons, and placed in glass jars. Soil samples were described using the Unified Soil Classification System and recorded in a bound logbook by CH2M HILL personnel. All sampling was conducted in accordance with CH2M HILL's FDEP-approved Comprehensive Quality Assurance Plan (CompQAP).

Soil samples were shipped to Accutest Laboratories in Orlando, Florida (a Navy-approved laboratory) for analysis within 24 hours. Samples from the grid area were analyzed for lead only using Contract Laboratory Program (CLP) TAL inorganic compounds methodology (Inorganic Laboratory Method 03.0). Level IV Data Quality Objectives were used for reporting purposes.

As part of a source removal action, a land surveyor also located former Phase IIA sample location 11-SL-04 (**FIGURE 2**). On June 2, 1999, CH2M HILL personnel excavated an area 2 feet long by 2 feet wide and approximately 2 feet deep at the sample location to remove the soil containing the elevated levels of benzo(a)pyrene. The soil was placed in a 55-gallon drum to be properly disposed of by the facility.

Four side-wall samples (11SO4801 [north], 11SO4901 [south], 11SO5001 [east], and 11SO5101 [west]) and one bottom sample (11SS4701) were collected from the excavation (**FIGURE 4**). The samples were sent to Accutest Laboratories and analyzed for SVOCs in accordance with SW-846 Method 8270. An Accutest chemist notified CH2M HILL that some of the soil samples were oily in nature and likely contained petroleum hydrocarbons. The chemist also noted that several pesticides were showing up on the chromatograph. CH2M HILL notified the Navy, and the samples were subsequently analyzed for total

recoverable petroleum hydrocarbons (TRPH) in accordance with Florida Petroleum Residual Organic (FL-PRO) methodology and for pesticides in accordance with SW-846 Method 8081.

On September 1, 1999, CH2M HILL personnel collected two additional samples from the bottom of the excavation (11SS4702 and 11SS4703). Each sample was sent to a different laboratory (Accutest Laboratories and Severn Trent Laboratories) and analyzed for SVOCs in accordance with SW-846 Method 8310.

Results

Of the 25 original samples collected and analyzed for lead under this investigation, only one sample exhibited a total lead concentration above the associated FDEP and EPA residential soil cleanup levels. Sample 11SO3801 exhibited a lead concentration of 666 mg/kg, which is above the EPA Region III residential RBC of 400 mg/kg and the current FDEP residential soil cleanup level adopted in August 1999 (also 400 mg/kg). The remaining 24 sample results did not exceed residential soil cleanup levels.

To delineate the area containing elevated lead levels at sample location 11SO3801, five additional soil samples were collected around the original sample location. The analytical results of these five additional samples were below the residential soil cleanup levels. **TABLE 1** presents a summary of the soil analytical results. The complete results are presented in Attachment A. **FIGURE 5** graphically presents the results of the lead investigation.

A total of five soil samples were collected from the excavation around sample location 11-SL-04 and analyzed for SVOCs. None of the samples exhibited benzo(a)pyrene concentrations above the associated detection limits. The detection limit for most samples was 360 µg/kg; however, due to their oily nature, two samples (11SS4701 and 11SO5101) were diluted by a factor of 10 in order to be analyzed. The detection limit on these samples was 3,600 µg/kg, higher than the industrial soil cleanup levels of 500 µg/kg (FDEP) and 780 µg/kg (EPA). As part of the QA/QC protocol, one matrix spike/matrix spike duplicate (MS/MSD) sample was collected as a split sample of 11SO5101. This MS/MSD sample was not diluted and did not contain detectable concentrations of benzo(a)pyrene above 360 µg/kg. **FIGURE 6** graphically presents the results of the benzo(a)pyrene investigation.

In order to quantify the bottom of the excavation, two additional samples (11SS4702 and 11SS4703) were collected and analyzed for SVOCs. The resulting benzo(a)pyrene concentrations were <10 µg/kg and 43 µg/kg, lower than the residential soil cleanup levels of 100 µg/kg (FDEP) and 88 µg/kg (EPA).

Two of the original samples collected from the excavation were also analyzed for TRPH (11SS4701 and 11SO4901). One sample (11SS4701, collected from the bottom of the excavation) contained detectable TRPH at 302 mg/kg, below the Soil Cleanup Target Level (SCTL) of 340 mg/kg. TRPH results are shown in **FIGURE 6**.

All five of the samples collected from the excavation were also analyzed for pesticides. Concentrations of alpha-chlordane, gamma-chlordane, dieldrin, 4,4'-DDE, 4,4'-DDT, heptachlor, and heptachlor epoxide were detected in at least one of these samples. Only

dieldrin was detected above any residential standards, but concentrations did not exceed any of the industrial soil standards. Dieldrin results are shown in **FIGURE 6**.

The Data Quality Evaluation (DQE) performed for the analytical results is presented in Attachment B. Survey coordinates for the soil sample locations are presented in Attachment C.

Conclusions

Soil samples analyzed for lead, benzo(a)pyrene, TRPH, and pesticides did not exhibit concentrations above industrial soil target cleanup levels.

Works Cited

ABB-ES. *Remedial Investigation Report, Site 11, Southeast Open Disposal Area (B) (Landfill), Naval Air Station Whiting Field, Milton, Florida*. April 1998.

CH2M HILL, Inc. *Health and Safety Plan, Whiting Field, Milton, Florida*. 1999.

CH2M HILL, Inc. *Comprehensive Quality Assurance Plan*. 1998.

This Data Transfer Memorandum for Site 11 at Naval Air Station Whiting Field was prepared under the direction of a Registered Professional Geologist.

_____

Amy T. Twitty, P.G. No. 1703

_____

Date

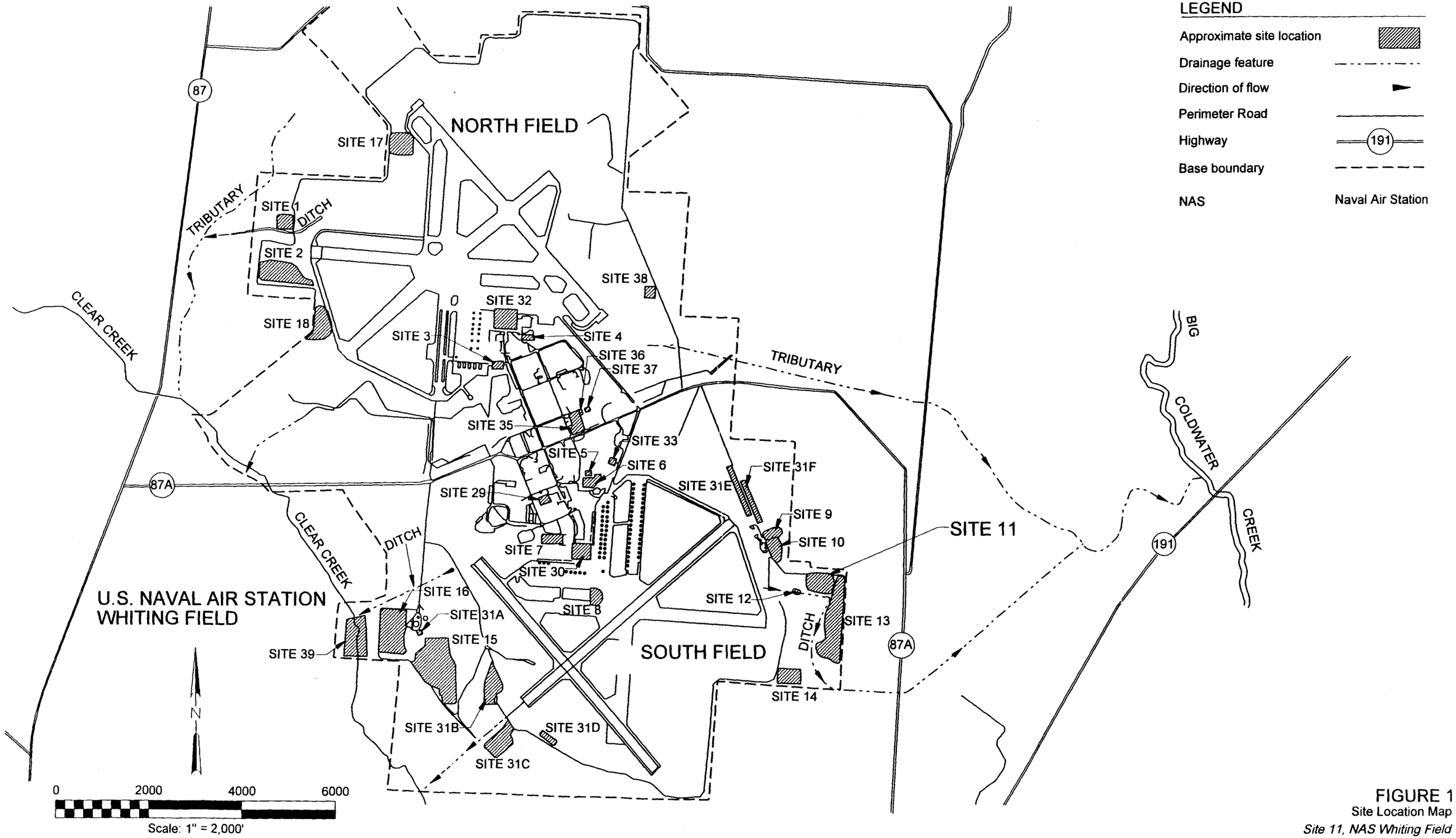


FIGURE 1
Site Location Map
Site 11, NAS Whiting Field

CH2MHILL

2170FIG1.DLV
12-OCT-1999

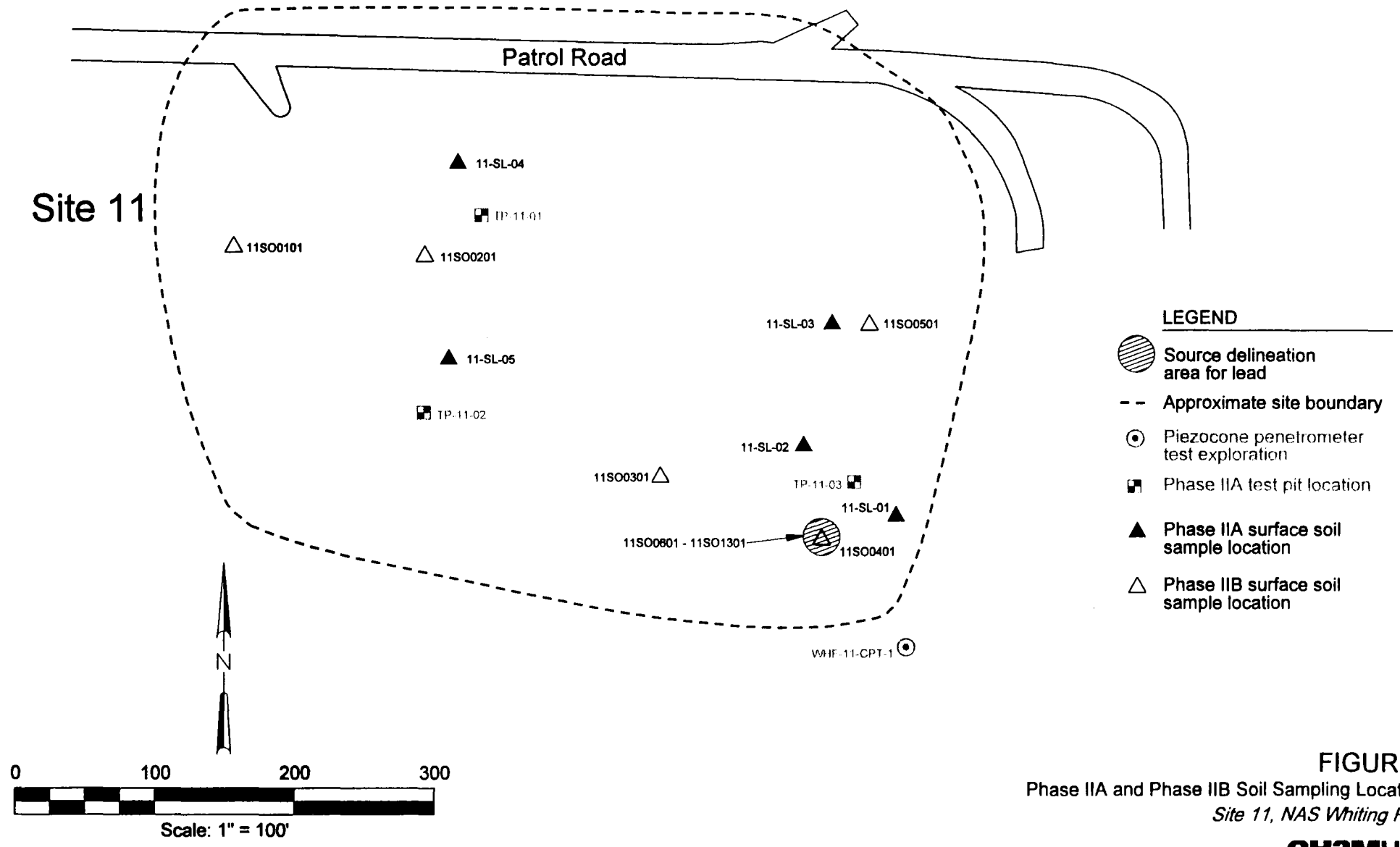


FIGURE 2

Phase IIA and Phase IIB Soil Sampling Locations

Site 11, NAS Whiting Field

CH2MHILL

2170Fig2.dlv
12-OCT-1999

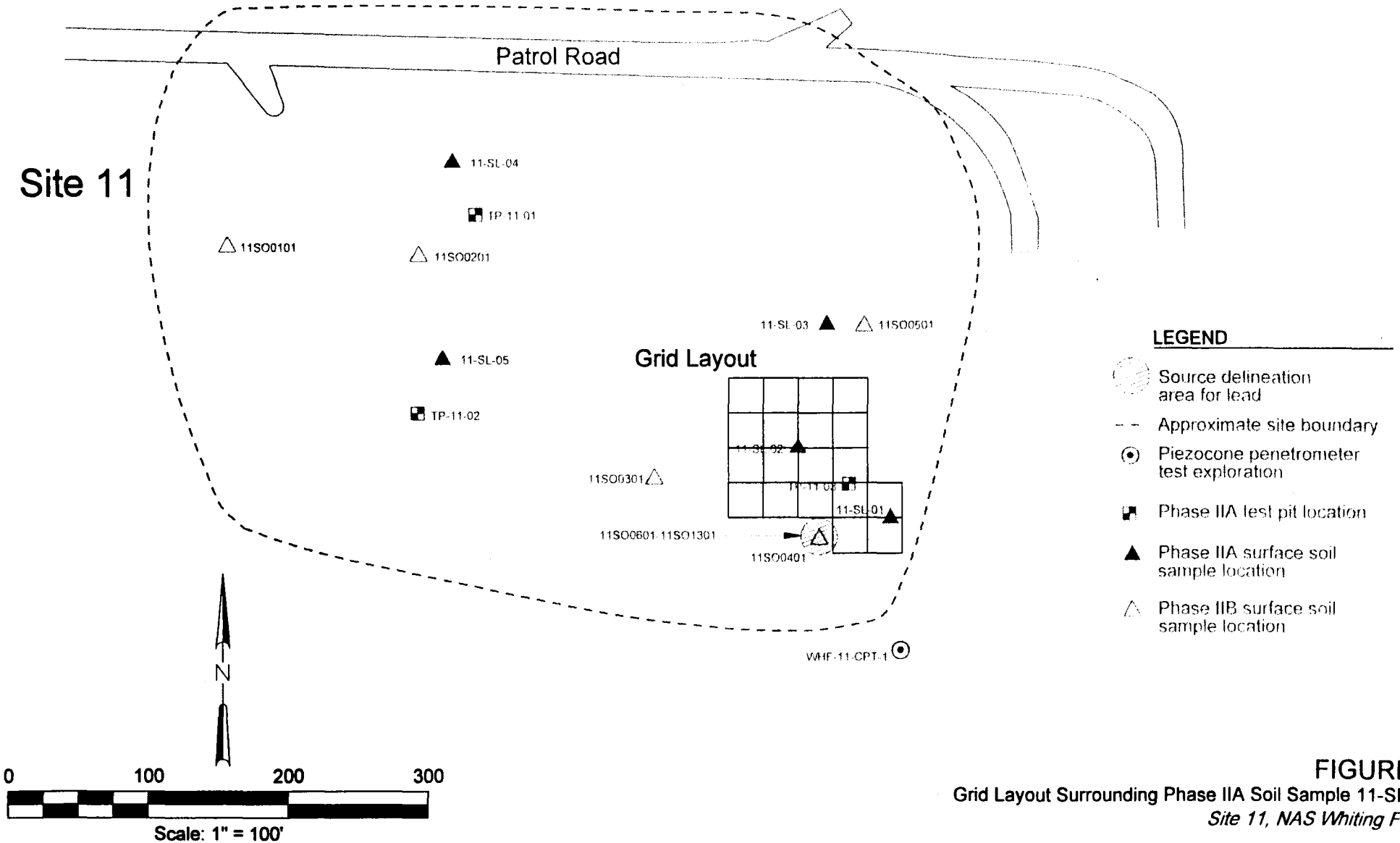


FIGURE 3

Grid Layout Surrounding Phase IIA Soil Sample 11-SL-02

Site 11, NAS Whiting Field

CH2MHILL

2170Fig3.dlv
12-OCT-1999

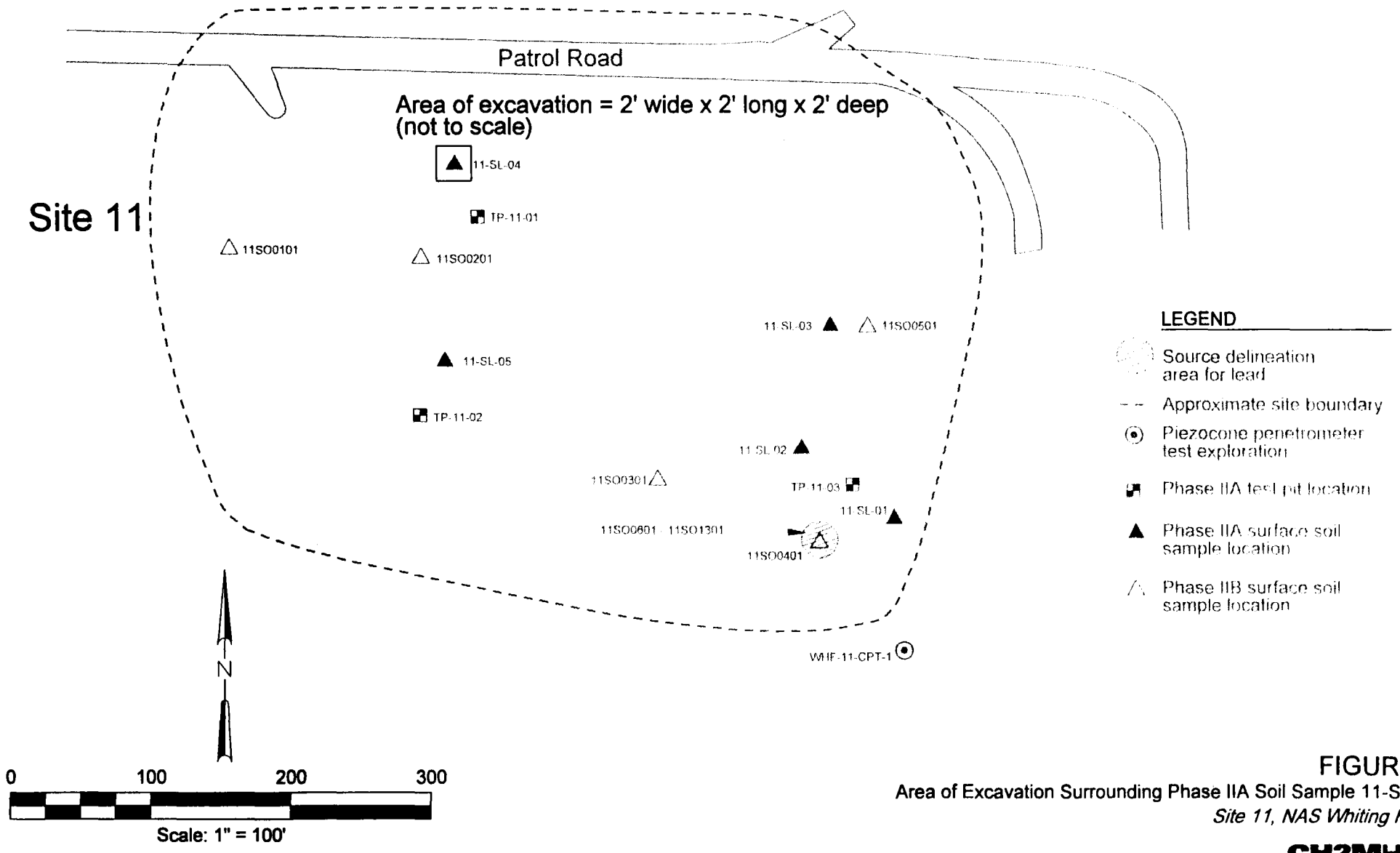


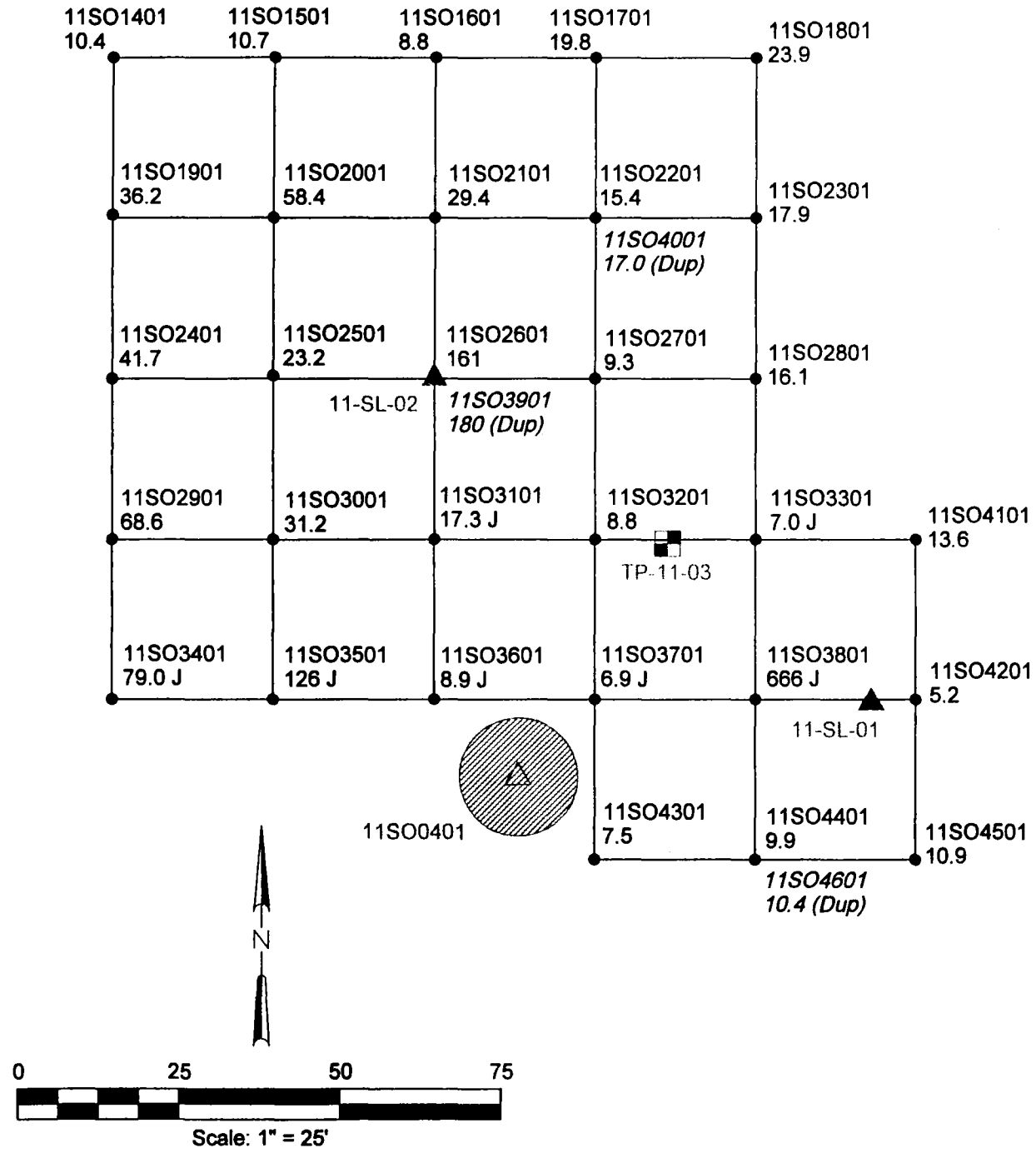
FIGURE 4

Area of Excavation Surrounding Phase IIA Soil Sample 11-SL-04

Site 11, NAS Whiting Field

CH2MHILL

2170Fig4.dlv
12-OCT-1999



LEGEND

- Source delineation area for lead
- Phase IIA test pit location
- Phase IIA surface soil sample location
- Phase IIB surface soil sample location
- April 1999 surface soil sample location
- 10.4 — Lead Analytical Result (mg/kg)
- J — Estimated value

FIGURE 5

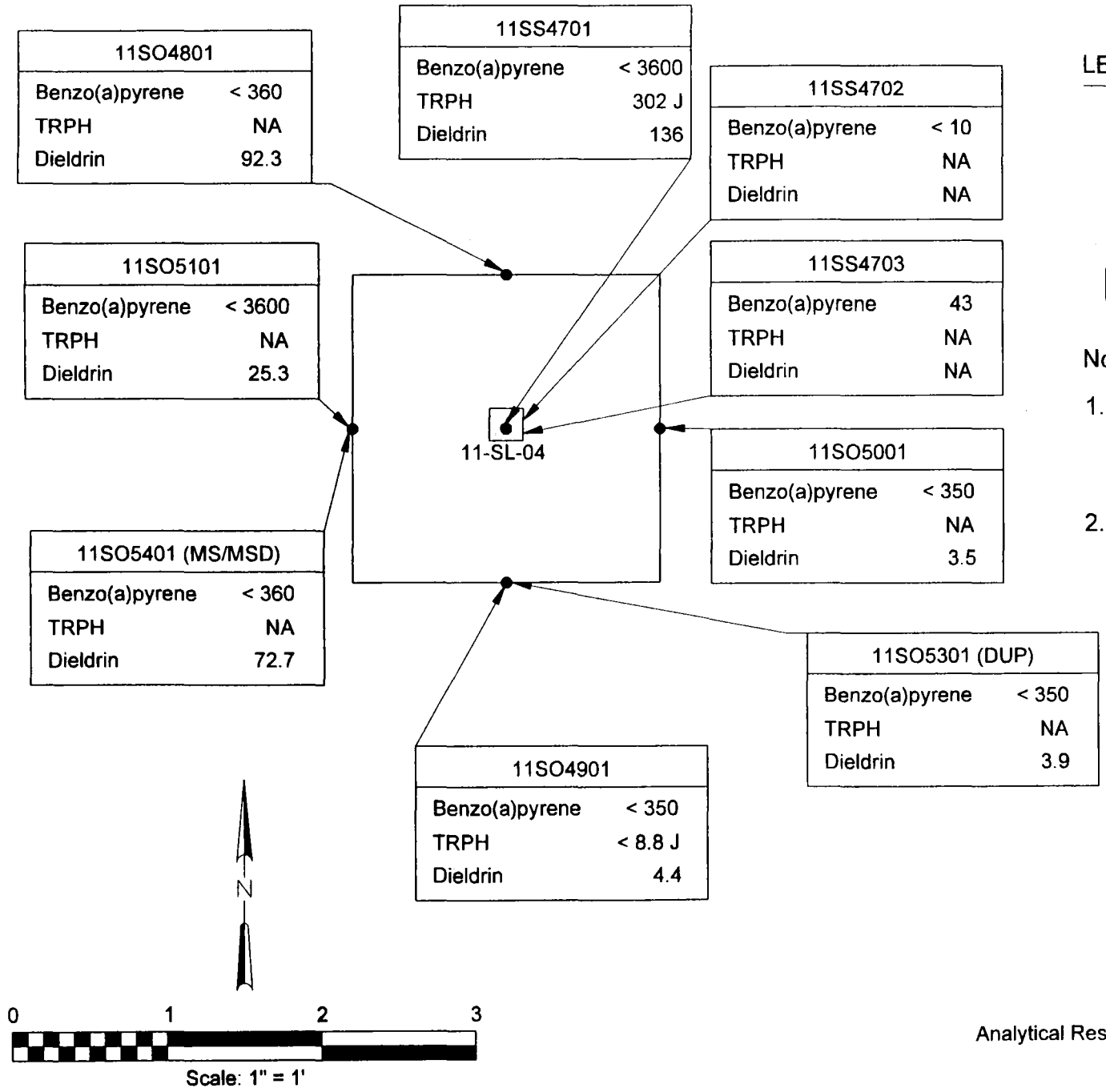
Analytical Results for Lead in Soil

Site 11, NAS Whiting Field

CH2MHILL

2170FIG5.DLV

2-OCT



LEGEND

- June 1999 surface soil sample location
- September 1999 surface soil sample location

Notes:

1. Benzo(a)pyrene and dieldrin results are shown in ug/kg. TRPH results are shown in mg/kg.
2. TRPH = total recoverable petroleum hydrocarbons

   NA = not analyzed

FIGURE 6

Analytical Results for Benzo(a)pyrene, TRPH, and Dieldrin in Soil

Site 11, NAS Whiting Field

CH2MHILL

2170FIG6.DLV

12-OCT-1999

TABLE 1
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO1401	11SO1501	11SO1601	11SO1701	11SO1801	11SO1901
					Sample Depth (feet bls):	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
					Date Sampled:	4/1/99	4/1/99	4/1/99	4/1/99	4/1/99	4/1/99
		APPLICABLE CRITERIA									
		62-777, F.A.C. Direct Exposure		EPA Region III RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	10.4	10.7	8.8	19.8	23.9	36.2
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
Dieldrin	ug/kg	70	300	40	360	NA	NA	NA	NA	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
Heptachlor	ug/kg	200	900	140	1,300	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630	NA	NA	NA	NA	NA	NA
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	NA	NA	NA	NA	NA	NA
TRPH	mg/kg	340	2,500	NC	NC	NA	NA	NA	NA	NA	NA

Notes:
bls = below land surface
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

						Sample ID:	**11SO2001**	**11SO2101**	**11SO2201**	**11SO4001**	**11SO2301**	**11SO2401**
						Sample Depth (feet bls):	**0 to 1**	**0 to 1**	**0 to 1**	**(duplicate of**	**0 to 1**	**0 to 1**
						Date Sampled:	**4/1/99**	**4/1/99**	**4/1/99**	**11SO2201)**	**4/1/99**	**4/1/99**
		APPLICABLE CRITERIA										
		62-777, F.A.C.		**EPA Region III**								
		Direct Exposure		**RBC Cleanup Goals**								
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**							
Inorganics												
Lead	mg/kg	400	920	400	NC		58.4	29.4	15.4	17.0	17.9	41.7
Pesticides												
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000		NA	NA	NA	NA	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000		NA	NA	NA	NA	NA	NA
Dieldrin	ug/kg	70	300	40	360		NA	NA	NA	NA	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000		NA	NA	NA	NA	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000		NA	NA	NA	NA	NA	NA
Heptachlor	ug/kg	200	900	140	1,300		NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630		NA	NA	NA	NA	NA	NA
Semivolatiles												
Benzo(a)pyrene	ug/kg	100	500	88	780		NA	NA	NA	NA	NA	NA
TRPH	mg/kg	340	2,500	NC	NC		NA	NA	NA	NA	NA	NA

Notes:
bls = below land surface
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO2501	11SO2601	11SO3901	11SO2701	11SO2801	11SO2901
					Sample Depth (feet bls):	0 to 1	0 to 1	(duplicate of	0 to 1	0 to 1	0 to 1
					Date Sampled:	4/1/99	4/1/99	11SO2601)	4/1/99	4/1/99	4/1/99
		APPLICABLE CRITERIA									
		62-777, F.A.C.		EPA Region III							
		Direct Exposure		RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	23.2	161	180	9.3	16.1	68.6
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
Dieldrin	ug/kg	70	300	40	360	NA	NA	NA	NA	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
Heptachlor	ug/kg	200	900	140	1,300	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630	NA	NA	NA	NA	NA	NA
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	NA	NA	NA	NA	NA	NA
TRPH	mg/kg	340	2,500	NC	NC	NA	NA	NA	NA	NA	NA

Notes:
bls = below land surface
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO3001	11SO3101	11SO3201	11SO3301	11SO3401	11SO3501
					Sample Depth (feet bls):	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
					Date Sampled:	4/1/99	4/1/99	4/1/99	4/1/99	4/1/99	4/1/99
		APPLICABLE CRITERIA									
		62-777, F.A.C. Direct Exposure		EPA Region III RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	31.2	17.3 J	8.8	7.0 J	79.0 J	126 J
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
Dieldrin	ug/kg	70	300	40	360	NA	NA	NA	NA	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
Heptachlor	ug/kg	200	900	140	1,300	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630	NA	NA	NA	NA	NA	NA
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	NA	NA	NA	NA	NA	NA
TRPH	mg/kg	340	2,500	NC	NC	NA	NA	NA	NA	NA	NA

Notes:
bls = below land surface
J = estimated value
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO3601	11SO3701	11SO3801	11SO4101	11SO4201	11SO4301
					Sample Depth (feet bls):	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
					Date Sampled:	4/1/99	4/1/99	4/1/99	4/7/99	4/7/99	4/7/99
		APPLICABLE CRITERIA									
		62-777, F.A.C.		EPA Region III							
		Direct Exposure		RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	8.9 J	6.9 J	666 J	13.6	5.2	7.5
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	NA	NA	NA
Dieldrin	ug/kg	70	300	40	360	NA	NA	NA	NA	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	NA	NA	NA
Heptachlor	ug/kg	200	900	140	1,300	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630	NA	NA	NA	NA	NA	NA
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	NA	NA	NA	NA	NA	NA
TRPH	mg/kg	340	2,500	NC	NC	NA	NA	NA	NA	NA	NA

Notes:
bls = below land surface
J = estimated value
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO4401	11SO4601	11SO4501	11SS4701	11SS4702	11SS4703
					Sample Depth (feet bls):	0 to 1	(duplicate of	0 to 1	2	2	2
					Date Sampled:	4/7/99	11SO4401)	4/7/99	6/2/99	9/1/99	9/1/99
		APPLICABLE CRITERIA									
		62-777, F.A.C.		EPA Region III							
		Direct Exposure		RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	9.9	10.4	10.9	NA	NA	NA
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	216	NA	NA
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	NA	NA	NA	184	NA	NA
Dieldrin	ug/kg	70	300	40	360	NA	NA	NA	136	NA	NA
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	<73	NA	NA
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	NA	NA	NA	36.5 J	NA	NA
Heptachlor	ug/kg	200	900	140	1,300	NA	NA	NA	<36	NA	NA
Heptachlor epoxide	ug/kg	100	400	70	630	NA	NA	NA	19.9 J	NA	NA
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	NA	NA	NA	<3600	<10	43
TRPH	mg/kg	340	2,500	NC	NC	NA	NA	NA	302 J	NA	NA

Notes:
bls = below land surface
J = estimated value
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

(CONTINUED)

TABLE 1 (CONTINUED)
Analytical Results of Additional Soil Sampling
Site 11, NAS Whiting Field

					Sample ID:	11SO4801	11SO4901	11SO5301	11SO5001	11SO5101	11SO5401
					Sample Depth (feet bls):	0 to 1	0 to 1	(duplicate of	0 to 1	0 to 1	(MS/MSD w/
					Date Sampled:	6/2/99	6/2/99	11SO4901)	6/2/99	6/2/99	11SO5101)
		APPLICABLE CRITERIA									
		62-777, F.A.C.		EPA Region III							
		Direct Exposure		RBC Cleanup Goals							
Analyte	**Units**	**Residential**	**Industrial**	**Residential**	**Industrial**						
Inorganics											
Lead	mg/kg	400	920	400	NC	NA	NA	NA	NA	NA	NA
Pesticides											
alpha-Chlordane	ug/kg	3,100	12,000	1,800	16,000	549	21.9	20.8	24.7	198	157
gamma-Chlordane	ug/kg	3,100	12,000	1,800	16,000	678	19.4	16.6	21.0	170	157
Dieldrin	ug/kg	70	300	40	360	92.3	4.4	3.9	3.5	25.3	72.7
4,4'-DDE	ug/kg	3,300	13,000	1,900	17,000	<140	<3.5	<3.5	<3.5	<36	187
4,4'-DDT	ug/kg	3,300	13,000	1,900	17,000	<140	<3.5	<3.5	<3.5	<36	54.8
Heptachlor	ug/kg	200	900	140	1,300	139	<1.8	<1.8	<1.8	<18	<18
Heptachlor epoxide	ug/kg	100	400	70	630	62.6 J	1.1 J	1.4 J	<1.8	18.6	22.7
Semivolatiles											
Benzo(a)pyrene	ug/kg	100	500	88	780	<360	<350	<350	<350	<3600	<360
TRPH	mg/kg	340	2,500	NC	NC	NA	<8.8 J	NA	NA	NA	NA

Notes:
bls = below land surface
J = estimated value
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
NA = not analyzed
NC = no criteria
RBC = risk-based concentration
TRPH = total recoverable petroleum hydrocarbons

APPENDIX F

RESPONSE TO AGENCY COMMENTS

Response to EPA Review Comments
Site 11, Southeast Open Disposal Area
Draft Feasibility Study

1. **Cover Page**. The EPA ID number should be included on the cover page both inside and outside.

   Response: The EPA ID number will be added to the cover page and the report title page.

2. **Glossary, Page –vi-**. The abbreviation "BRA" for "baseline risk assessment" should be included. "CPC" should be changed to "COPC". In the definition for "LUCIP", change the word "Installation" to "Implementation". The definition for "RA" should be "remedial action" instead of risk assessment. On page –vii-, remove "guidance material" from the definition for "TBC". These abbreviations should be changed throughout the document, accordingly, wherever they occur.

   Response: As suggested by the reviewer, the abbreviation "BRA" for "baseline risk assessment" will be included. Also "CPC" will be changed to "COPC". In the definition for "LUCIP", the word "Installation" will be replaced by "Implementation". The report will be revised to reflect "RA" means "remedial action" and not risk assessment. On page –vii-, the phrase "guidance material" will de deleted from the definition for "TBC". These abbreviations will be changed throughout the document.

3. **Section 1.1, Page 1-3**. In the discussion of the modifying criteria, community acceptance is generally evaluated based on comments received on the proposed plan and not necessarily the FS.

   Response: The 1st paragraph will be revised to read as follows.
   "Alternatives are evaluated against two additional factors after State participation and the public comment period:" The words "for the FS" will be deleted.

4. **Section 1.3, Page 1-4**. In the second sentence of the first paragraph, change the word "and" to "an".

   Response: In the second sentence, word "and" will be replaced by "an".

5. **Section 1.4, Page 1-7**. In the second paragraph of this section, the text should address the disposition of the soil with elevated levels of lead from the time of the original sampling to the time additional samples were obtained. The third paragraph should address whether the drum went to a subtitle C or D landfill.

   Response: Additional information pertaining to the disposition of the soil with elevated levels of lead will be included in Section 1.4. The information pertaining to drum disposal will be added to the FS after consulting with NAS Whiting Field personnel.

6. **Section 2.2, Page 2-6**. The third sentence of the second paragraph under the Surface Soil section should be revised for clarity.

   Response: The third sentence will be deleted. The next sentence explains other screening criteria the analytical data will be compared to.

7. **Section 2.2, Page 2-9**. The second to the last sentence in the paragraph at the top of the page should be revised. It is not appropriate to screen samples used to determine ecological exposure against FDEP residential SCTLs.

   Response: The second to last sentence in the paragraph at the top of page 2-9 will be revised to read as follows.

   "Confirmation samples collected after the removal action and lead concentrations were below the

ecological screening values."

8. **Section 3.2, Page 3-2**. In the second paragraph, the text states that four remedial alternatives were developed for Site 11; however, only 3 alternatives are presented.

   Response: The text will be revised to reflect that three alternatives are developed.

9. **Section 3.2.2, Page 3-2**. The first sentence of the first full paragraph should be revised for clarity. LUCAPs and LUCIPs are not themselves land use controls. These documents serve as tools in the administration of land use controls.

   Response: The first sentence of the first full paragraph will be revised as follows. "Alternative 2 consists of activities necessary to maintain LUCs at Site 11. These activities are,
   - LUCs (i.e. LUC documents)
   - 5-year site reviews.

10. **Section 4.0, Page 4-1**. The fourth paragraph states that a summary of State acceptance will be included in the final FS; however, only a response to the State's comments is typically prepared.

    Response: Agree. The fourth paragraph will be revised to state a response to the State's comments will be included in the final FS.

11. **Table 4-2, Page 4-4**. The table should indicate that the costs presented are present worth costs. This same notation should be provided in the cost summary tables for the other alternatives.

    Response: A foot-note stating the costs presented are present worth cost will be added to the tables.

12. **Section 4.2.1, Page 4-5**. Change "quarterly and annual inspections" to "frequency of inspections" in the second sentence of the third paragraph under the LUC section.

    Response: In the second sentence of the third paragraph, under the LUC section, "quarterly and annual inspections" will be changed to "frequency of inspections"

13. **Section 4.2.2, Page 4-5**. The third sentence states that a fence will be installed; however, the need for a fence has not been addressed previously.

    Response: The 3rd sentence referring to the installation of a fence will be deleted.

14. **Section 4.3.1, Page 4-8, Soil Cover Section**. Change the word "site" to "surface" in the first sentence.

    Response: The word "site" will be changed to "surface" in the first sentence.

15. **Section 5.1.3, Page 5-2, First Paragraph**. See comment No. 10.

    Response: Please see response to Comment No. 10.

16. **Section 5.2.1, Page 5-3**. In the first full sentence at the top of the page, change "Alternative 3" to "Alternative 2" and change "Alternative 2" to "Alternative 3".

    Response: The first full sentence at the top of the page will be revised as follows. "Alternative 3" will replace "Alternative 2" and "Alternative 2" will replace "Alternative 3".

17. **Section 5.2.2, Page 5-3**. In the fifth paragraph, delete the last sentence. The sentence is speculative.

Response: The last sentence will be deleted as recommended by the reviewer.

18. **References, Page Ref-2**. Delete the words "Washington, D.C." in the last reference. Jon Johnston is the Branch Chief of the Federal Facilities Branch within EPA, Region IV.

    Response: The words "Washington, D.C." will be deleted.

Response to FDEP Comments on
Draft Site 11 Feasibility Study
NAS Whiting Field, Milton, Florida

1. Please add a bulleted item in Section 1.0 (page 1-2) stating that an IRA was performed at the site, the description of which is contained in Appendix J of the RI.

   Response: As recommended by the reviewer a bulleted item stating that an IRA was performed at the site, the description of which is contained in Appendix J of the RI. will be added to Section 1.0.

2. Please justify why the alternatives proposed do not include how the dieldrin at the site will be addressed. I think this is important since the RI identified ecological risks at sampling site 11-SL-02 due to lead *and* pesticides. If the Navy believes that those risks have been addressed in the soil removal action, it should justify that belief. Please note that the RI stated in the Summary of Ecological Assessment for Site 11 (page 7-28) that "sublethal impacts to top predator populations are likely over the entire area of Site 11." For reference, the contaminant map presented as Figure 5-3 in the RI, documents the distribution of dieldrin at Site 11 and the figure in Appendix C of the FS documents high levels of dieldrin at several sampling points at Site 11.

   Response: Pesticides (including dieldrin) and lead were identified as the primary risk drivers for ecological receptors, based on sublethal effects. Elevated concentrations of these analytes were detected at sample location 11-SL-02. Soil in the vicinity of this sample location was subsequently excavated as a part of an interim remedial action (IRA) in June 1999. Ecological risks to wildlife were recalculated using the food web model developed for this site to reevaluate data from surface soil after sample 11-SL-02 was eliminated. The RME and CT exposures were recalculated with the analytical results from sample 11-SL-02 eliminated. Consistent with the ERA, RME and CT exposures were estimated using the 95th UCL and arithmetic mean, respectively, of the surface soil data set. The results (i.e., hazard indices) of this evaluation are presented in Table 1.

   While recalculating risks to ecological receptors, a computational error was discovered in the risk calculation of the food web model, which affected the risk estimates for sublethal effects to top predator species in the model (i.e., red fox and great horned owl). The results of this re-evaluation are presented in the first two columns in Table 1. The third column in Table 1 presents the recalculated sublethal risks to ecological receptors, using the RME concentrations calculated with analytical data from surface soil sample 11-SL-02 eliminated.

Table 1. Summary of Hazard Indices (HIs) for Representative Wildlife

	Sublethal Effects from Exposure to RME Concentrations	Sublethal Effects from Exposure to CT Concentrations	Sublethal Effects from Exposure to RME Concentrations (w/out 11-SL-02)
Cotton mouse	0.91	0.55	0.24
Short-tailed shrew	4.5	2.2	0.93
Eastern meadowlark	3.5	1.8	1.0
Red fox	0.004	0.0022	0.0024
Great horned owl	0.32	0.15	0.064

RME: Reasonable Maximum Exposure
CT: Central Tendency

Risks were originally identified for small mammals, small birds and top predators at the site, based on RME and CT concentrations and sublethal effects. Risk estimates for sublethal effects to the red fox and great horned owl presented in the BERA were 6.3 and 20, respectively, based on RME concentrations. Correcting the computational error resulted in HIs of 0.002 and 0.15 indicating that there are no sublethal risks to top predators. Although, there are risks predicted for the shrew and eastern meadowlark, based on RME concentrations, as shown in Table 1. It is unlikely that there would be sublethal effects from

exposure to CT concentrations, based on the HIs presented in Table 1. Risks based on RME concentrations (with sample 11-SL-02 eliminated) were recalculated, and none of the HIs exceed 1. Risks were not recalculated for CT concentrations, because there were no risks predicted based on RME concentrations.

The results presented in Table 1 indicate that the IRA (i.e., excavation of soil from sample location 11-SL-02) conducted at the site eliminated any potential ecological risk at Site 11.

Therefore, based on the information presented above, risks due to dieldrin are not an issue at this site. Information presented above will be added to the introduction section of the FS report.

3. If the ecological risk from pesticides at the site cannot be reconciled, that problem should be properly addressed in the FS.

Response: See response to Comment 2.

4. Data from the RI indicates that benzo (a) pyrene is present above industrial/commercial direct exposure levels. Does the Navy intend to address this contaminant in the FS (and the subsequent Proposed Plan)?

Response: The detection of benzo (a) pyrene above industrial levels was addressed through delineation, excavation, and removal during the supplemental assessment conducted by the Response Action Contractor (RAC), CH2MHILL in June 1999.

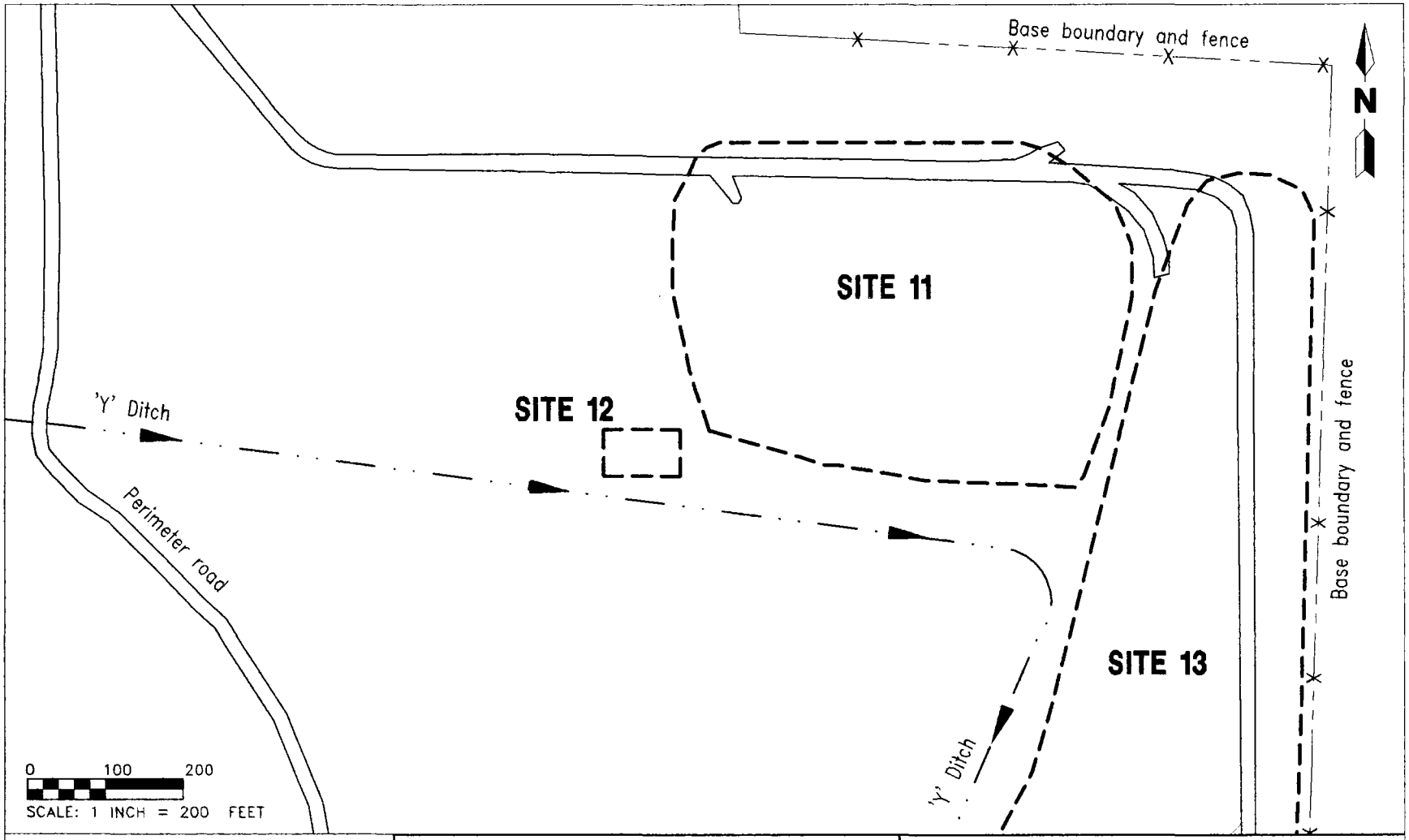


FIGURE 1-2
GENERAL FEATURES

FEASIBILITY STUDY REPORT
SITE 11, SOUTHEAST OPEN DISPOSAL AREA (B)

NAS WHITING FIELD
MILTON, FLORIDA

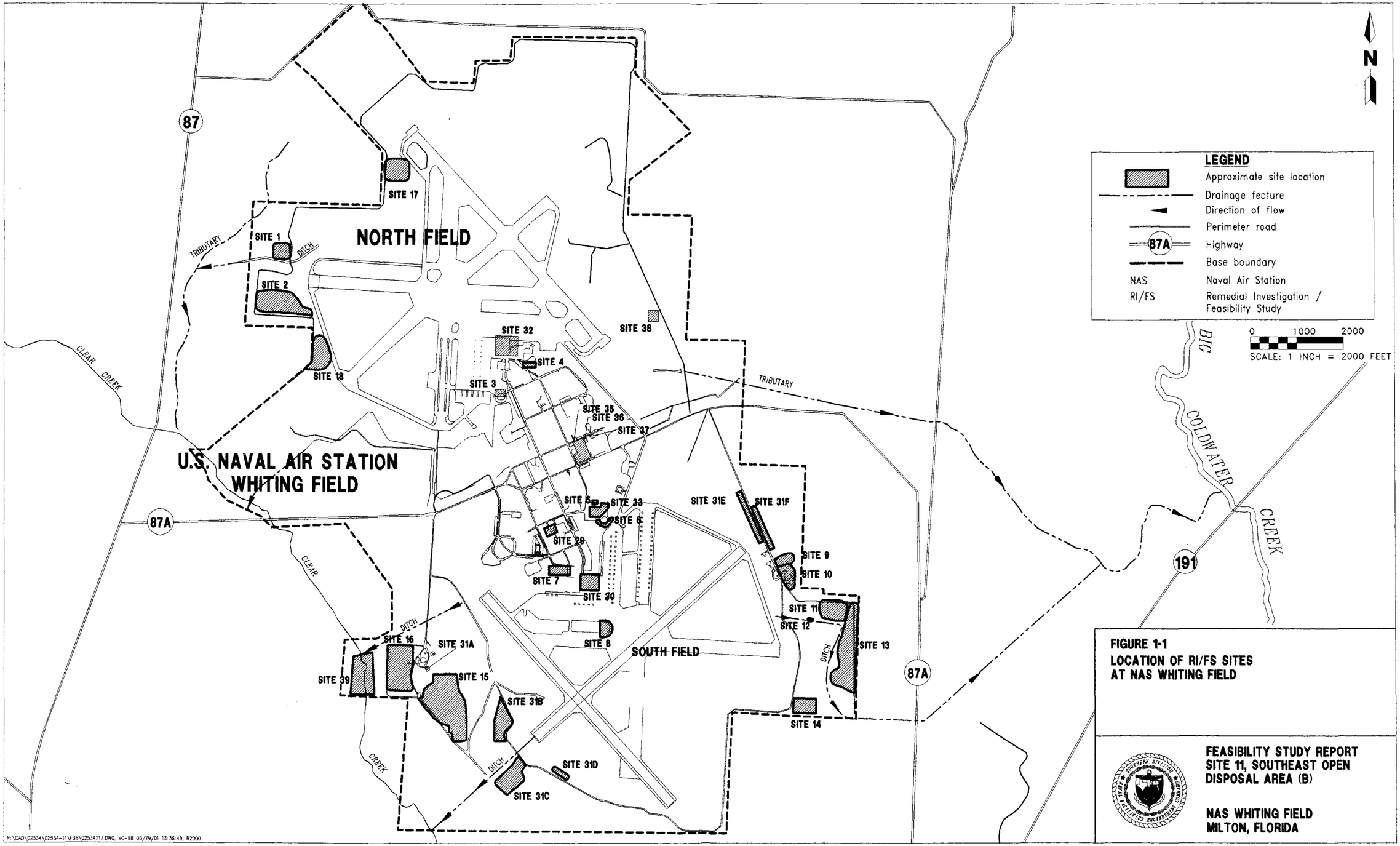


FIGURE 1-1
LOCATION OF RI/FS SITES AT NAS WHITING FIELD

FEASIBILITY STUDY REPORT
SITE 11, SOUTHEAST OPEN DISPOSAL AREA (B)

NAS WHITING FIELD
MILTON, FLORIDA

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Harding Lawson Associates

March 28, 2000

Ms. Gail Carmody
Fish and Wildlife Service
1612 June Avenue
Panama City, Fl 32405

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Ms. Carmody:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

Final Remedial Investigation Report, Errata page
Site 11, Southeast Open Disposal Area
Naval Air Station Whiting Field
Milton, Florida

This document is available at the West Florida Regional, Milton Branch Library, 805 Alabama Street, Milton, Florida and at the NAS Whiting Field Public Works office, Building 1418, 7151 USS Wasp Street, NAS Whiting Field, Milton, Florida. If you have any questions concerning the document or the environmental program in general, you should contact either the Public Affairs Officer, NAS Whiting Field (850/623-7651) or Mr. Jim Holland of the Public Works Department (850/623-7667 ext. 49).

Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 28, 2000

Mr. Hunter Walker
Santa Rosa County Administrator
Santa Rosa County Board of County Commissioners
6495 Caroline Street, Suite M
Milton, Fl. 32570-4592

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Mr. Walker:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

Final Remedial Investigation Report, Errata page
Site 11, Southeast Open Disposal Area
Naval Air Station Whiting Field
Milton, Florida

This document is available at the West Florida Regional, Milton Branch Library, 805 Alabama Street, Milton, Florida and at the NAS Whiting Field Public Works office, Building 1418, 7151 USS Wasp Street, NAS Whiting Field, Milton, Florida. If you have any questions concerning the document or the environmental program in general, you should contact either the Public Affairs Officer, NAS Whiting Field (850/623-7651) or Mr. Jim Holland of the Public Works Department (850/623-7667 ext. 49).

Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 28, 2000

Mr. Tom Dillon
Coastal Resource Coordinator
U. S. Department of Commerce, NOAA,
Hazardous Materials Response Branch
c/o USEPA Emergency Response Section
61 Forsyth Street, Waste Management Division
Atlanta, Ga 30303

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Mr. Dillon:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

Final Remedial Investigation Report, Errata page
Site 11, Southeast Open Disposal Area
Naval Air Station Whiting Field
Milton, Florida

This document is available at the West Florida Regional, Milton Branch Library, 805 Alabama Street, Milton, Florida and at the NAS Whiting Field Public Works office, Building 1418, 7151 USS Wasp Street, NAS Whiting Field, Milton, Florida. If you have any questions concerning the document or the environmental program in general, you should contact either the Public Affairs Officer, NAS Whiting Field (850/623-7651) or Mr. Jim Holland of the Public Works Department (850/623-7667 ext. 49).

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Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 28, 2000

Mr. William Sirmans
Santa Rosa County Health Department
5527 Stewart Street
Milton, Fl 32570-4375

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Mr. Sirmans:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

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Site 11, Southeast Open Disposal Area
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Milton, Florida

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Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 2, 2000

Ms. Gail Carmody
Fish and Wildlife Service
1612 June Avenue
Panama City, Fl 32405

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Ms. Carmody:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

Final Remedial Investigation Report
Site 11, Southeast Open Disposal Area (B)
Naval Air Station Whiting Field
Milton, Florida

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Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Engineering and
Environmental Services

2590 Executive Center Circle East, Tallahassee, FL 32301 850/656-1293 Fax: 850/656-3386

Harding Lawson Associates

March 2, 2000

Mr. Hunter Walker
Santa Rosa County Administrator
Santa Rosa County Board of County Commissioners
6495 Caroline Street, Suite M
Milton, Fl. 32570-4592

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Mr. Walker:

This letter is notification of the completion and availability of an Installation Restoration Program document for NAS Whiting Field, Milton, Florida. The document is titled:

Final Remedial Investigation Report
Site 11, Southeast Open Disposal Area (B)
Naval Air Station Whiting Field
Milton, Florida

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Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 2, 2000

Mr. Tom Dillon
Coastal Resource Coordinator
U. S. Department of Commerce, NOAA,
Hazardous Materials Response Branch
c/o USEPA Emergency Response Section
61 Forsyth Street, Waste Management Division
Atlanta, Ga 30303

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

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Milton, Florida

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Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Harding Lawson Associates

March 2, 2000

Mr. William Sirmans
Santa Rosa County Health Department
5527 Stewart Street
Milton, Fl 32570-4375

Subject: **Naval Air Station (NAS) Whiting Field Installation Restoration Program Document Available for Review.**

Dear Mr. Sirmans:

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Sincerely,

Harding Lawson Associates

Rao Angara
Project Manager

cc: Linda Martin; SouthDiv
Jim Holland; NAS WHF PWD
file: 2534-01

Engineering and
Environmental Services

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NAS WHITING FIELD
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Code 18300
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Mr. William Sirmans, Santa Rosa County Health Department
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