N60508.AR.000791
NAS WHITING FIELD
5090.3a

TECHNICAL MEMORANDUM NUMBER 3 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY PHASE IIA FOR SOIL ASSESSMENT NAS WHITING FIELD FL

5/1/1995

ABB ENVIRONMENTAL

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# REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

## PHASE IIA

## TECHNICAL MEMORANDUM NO. 3
## SOIL ASSESSMENT

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

**Unit Identification Code (UIC): N60508**

**Contract No. N62467-89-D-0317**

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**May 1995**

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/031 are complete and accurate and comply with all requirements of this contract.

DATE: May 24, 1995

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(DFAR 252.227-7036)

This document Remedial Investigation and Feasibility Study, Phase IIA Technical Memorandum No. 3 Soils Assessment, Naval Air Station Whiting Field Milton, Florida has been prepared under the direction of a Florida Registered Professional Geologist. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice.

Gerald A. Walker

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Florida Professional Geologist No. 1180
Date: 5/23/95

# FOREWORD

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, amended by the 1986 Superfund Amendments and Reauthorization Act (SARA), and as directed in Executive Order 12580 of January 1987, the Department of Defense (DOD) conducts an Installation Restoration (IR) program for evaluating and remediating problems related to releases and disposal of toxic and hazardous materials at DOD facilities.

The IR program consists of Preliminary Assessment and Site Inspection, Remedial Investigation and Feasibility Study (RI/FS), and Remedial Design and Remedial Action at sites where chemicals were allegedly disposed. The Preliminary Assessment and Site Inspection identify the presence of pollutants. The RI/FS analyzes the nature and extent of contamination and determines the optimum remedial solution. The Remedial Design and Remedial Action complete the implementation of the solution.

Previous investigations prepared for the Naval Energy and Environmental Support Activity and Southern Division, Naval Facilities Engineering Command (SOUTHNAV-FACENGCOM) have determined that Naval Air Station (NAS) Whiting Field has 23 waste sites that may pose a threat to human health or the environment. Consequently, an RI/FS is being conducted under the Navy IR program to address the extent, magnitude, and impact of possible contamination at these waste sites.

This Technical Memorandum discusses field methods, transmits data, and summarizes the soil assessment results of the RI.

Questions regarding this report should be addressed to the Commanding Officer, NAS Whiting Field, or to SOUTHNAVFACENGCOM Code 1859, at AUTOVON 563-0341 or (803) 743-0341.

## EXECUTIVE SUMMARY

A Remedial Investigation and Feasibility Study (RI/FS) is being conducted at the Naval Air Station (NAS) Whiting Field facility in Milton, Florida, by Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) as part of the Department of Defense Installation Restoration (IR) program. The IR program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations.

A phased approach was implemented to conduct the RI. Phase I was completed in May 1992. The subsequent phase of the RI was designated as Phase IIA. Field work for Phase IIA was completed in March 1994. Technical Memorandum No. 3, Soil Assessment, is the third in a series of seven technical memoranda that summarizes the results of the data gathered during the RI Phase IIA. These memoranda will form the supporting basis for the RI report and any additional work to be completed at the facility.

The purpose of the RI soil assessment is to characterize site-specific and facility-wide soil contamination at NAS Whiting Field. Data obtained from this assessment will be used to evaluate the nature and extent of soil contamination and to support feasibility studies and the baseline risk assessment to be conducted later in the RI/FS program.

The field work for the soil assessment was conducted between April 1992 and February 1993. The field tasks included the following:

- geophysical survey,
- collection and analyses of 146 surface soil samples,
- excavation of test pits and collection and analyses of 22 subsurface soil samples,
- collection and analyses of soil gas samples, and
- completion of soil borings and collection and analyses of 190 subsurface soil samples.

The soil samples were analyzed for target compound list (TCL) organic analytes, target analyte list (TAL) inorganic analytes, and total petroleum hydrocarbons (TPHs). Soil samples from the crash crew training sites (Sites 17 and 18) and one from Site 33 were also analyzed by toxicity characteristics leaching procedure (TCLP) for volatile organic compounds (VOCs) and metals.

The soil assessment at NAS Whiting Field revealed the following results, which are presented in an area-specific format. These areas represent groupings of sites according to past waste disposal practices: landfill and disposal areas, crash crew training areas, and the industrial areas (underground liquid waste storage tank areas).

Landfill and Disposal Areas. Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, 16, and 31 received liquid and/or solid wastes that were either buried in trenches or disposed on the land surface. The following summarizes results of data collected from the landfill and disposal sites.

- Subsurface disposal areas were identified by geophysical methods at Sites 10, 11, 13, 14, 15, and 16.

- Laboratory analyses of surface soil samples collected from Sites 10, 11, 13, 16, and 31 indicated the presence of organic compounds. Semivolatile organic compounds (SVOCs) were detected at Sites 11, 13, 15, and 31; pesticide compounds were detected at Sites 11, 16, and 31; and polychlorinated biphenyl (PCB) compounds were detected at Sites 10 and 31. Soil samples from Sites 1, 10, 11, 12, 13, 14, 15, 16, and 31 contained various combinations and concentrations of inorganic analytes, some of which exceeded the background screening criteria of 2 times the arithmetic mean or single detection value for individual analytes.

- Buried wastes were identified from test pits excavated at Sites 10, 11, 13, 14, 15, and 16. The observed buried wastes included items such as household solid wastes, construction debris, aircraft mechanical parts, and a flare.

- Laboratory analyses of subsurface soil samples from test pits indicated the presence of VOCs at Sites 1, 10, 11, 13, 14, and 16. SVOCs were detected at Site 13, 14, 15, and 16; pesticide compounds were detected at Sites 10, 11, and 16; and PCB compounds were detected at Sites 11 and 15. Surface soil samples from Sites 1, 10, 11, 13, 14, 15, and 16 contained various combinations and concentrations of inorganic analytes, some of which exceeded the background screening criteria.

Crash Crew Training Areas. Sites 17 and 18 received liquid wastes in shallow pits that were ignited and extinguished as part of fire-fighting training exercises conducted on NAS Whiting Field.

- Laboratory analyses of surface soil samples indicate the presence of VOCs, SVOCs, and TPHs at both sites. Some of the inorganic analytes detected in surface soil samples exceed the background screening criteria. Surface soil samples from Site 17 analyzed by TCLP for VOCs and metals did not exceed toxicity criteria. Cadmium was detected in excess of the toxicity characteristic limit at Site 18.

- Laboratory analyses of subsurface soil samples from soil borings indicated the presence of VOCs, pesticides, TPHs, and inorganic analytes at both sites. SVOCs were also detected in Site 18 subsurface soil samples.

Industrial Area. Sites 3, 6, 29, 30, 32, and 33 either received liquid wastes in underground storage tanks or were exposed to accidental spills or releases. The following presents summaries of soil investigative results from the Industrial Area sites.

- Soil gas survey results indicated the presence of target organic gases, notably benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds, tetrachloroethene (PCE), trichloroethene (TCE), cycloalkanes, and naphthalenes.

- Laboratory analyses of subsurface soil samples from soil borings indicated the presence of VOCs, pesticides, and TPHs at Sites 3 and 29; VOCs, SVOCs, pesticides, one PCB, and TPHs at Sites 6 and 32; and VOCs, SVOCs, pesticides, and TPHs at Sites 30 and 33. Inorganic analytes were also detected at various combinations and concentrations. However, background samples have not been collected to assess whether the detected concentrations are anthropogenic and are related to release(s) of contamination.

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## GLOSSARY

| | |
|---|---|
| ABB-ES | ABB Environmental Services, Inc. |
| AVGAS | aviation gasoline |
| ARARs | applicable or relevant and appropriate requirements |
| ASTM | American Society for Testing and Materials |
| AWQC | Ambient Water Quality Criteria |
| BEHP | bis(2-ethylhexyl)phthalate |
| bls | below land surface |
| BTEX | benzene, toluene, ethylbenzene, and xylenes |
| CAR | Contamination Assessment Report |
| CCJM | C.C. Johnston & Malhotra Environmental Engineers and Scientists |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| $CH_2M$ Hill | $CH_2M$ Hill Laboratories |
| CLP | Contract Laboratory Program |
| CRDL | contract required detection limit |
| CRQL | contract required quantitation limit |
| DCB | dichlorobenzene |
| DCE | dichloroethene |
| DC | direct current |
| DO | dissolved oxygen |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethene |
| DDT | dichlorodiphenyltrichloroethane |
| DQOs | data quality objectives |
| °C | degrees Celsius |
| ECBSOPQAM | Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual |
| EM | electromagnetic |
| ER-L | Effects Range Low |
| FAC | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| FDER | Florida Department of Environmental Regulation |
| FGFWFC | Florida Game and Fresh Water Fish Commission |
| FID | flame ionization detector |
| FS | Feasibility Study |
| FSWQS | Florida Surface Water Quality Standards |
| ft/day | feet per day |
| HRS | Hazard Ranking System |
| IAS | Initial Assessment Study |
| ICV | initial calibration verification |
| ID | inside diameter |
| IDL | instrument detection limit |
| IR | Installation Restoration |

## GLOSSARY (Continued)

| | |
|---|---|
| LCS | laboratory control samples |
| MAG | magnetometry |
| MDL | method detection limit |
| MEK | methyl ethyl ketone |
| $\mu g/kg$ | micrograms per kilograms |
| $\mu g/\ell$ | micrograms per liter |
| $\mu$mhos/cm | micromhos per centimeter |
| mg/kg | milligrams per kilograms |
| mg/$\ell$ | milligrams per liter |
| MS/MSD | matrix spike and matrix spike duplicate |
| MSL | mean sea level |
| NAS | Naval Air Station |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NEESA | Naval Energy and Environmental Support Activity |
| NERI | Northeast Research Institute |
| NFA | no further action |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollution Discharge Elimination System |
| NPL | National Priority List |
| OLF | Outlying Landing Field |
| OVA | organic vapor analyzer |
| PA | Preliminary Assessment |
| PAHs | polynuclear aromatic hydrocarbons |
| PARCC | precision, accuracy, representativeness, completeness, and comparability |
| PCBs | polychlorinated biphenyls |
| PCE | perchloroethene or tetrachloroethene |
| %RSD | percent relative standard deviation |
| %D | percent difference |
| QA/QC | quality assurance and quality control |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RI | Remedial Investigation |
| RPD | relative percent difference |
| RPM | Remedial Project Manager |
| RRF | relative response factors |
| SARA | Superfund Amendments and Reauthorization Act |
| SDG | sample delivery group |
| SI | Site Inspection |
| SOPs | Standard Operating Procedures |
| SOUTHNAV-FACENGCOM | Southern Division, Naval Facilities Engineering Command |
| SQC | sediment quality criteria |

| | |
|---|---|
| SVOCs | semivolatile organic compounds |
| SOW | statement of work |
| TAL | target analyte list |
| TCE | trichloroethene |
| TCL | target compound list |
| TCLP | toxicity characteristic leaching procedure |
| TCX | tetrachloro-m-xylene |
| TOC | total organic carbon |
| TP | test pit |
| TRAWING-FIVE | Training Air Wing Five |
| USEPA | U.S. Environmental Protection Agency |
| USCS | Unified Soil Classification System |
| USDA | U.S. Department of Agriculture |
| USGS | U.S. Geological Survey |
| UST | underground storage tanks |
| VOCs | volatile organic compounds |
| WWTP | Wastewater Treatment Plant |

# 1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), is submitting Technical Memorandum No. 3 for the Phase IIA Remedial Investigation and Feasibility Study (RI/FS) for Naval Air Station (NAS) Whiting Field located in Milton, Florida. The RI/FS is being conducted under contract number N62467-89-D-0317.

Technical Memorandum No. 3, Soil Assessment, is one in a series of seven technical memoranda that summarizes the results and transmits data gathered during the Phase IIA of the RI/FS. These technical memoranda provide data to support the RI report and any additional work to be completed at NAS Whiting Field. The following is a list of RI Phase IIA technical memoranda:

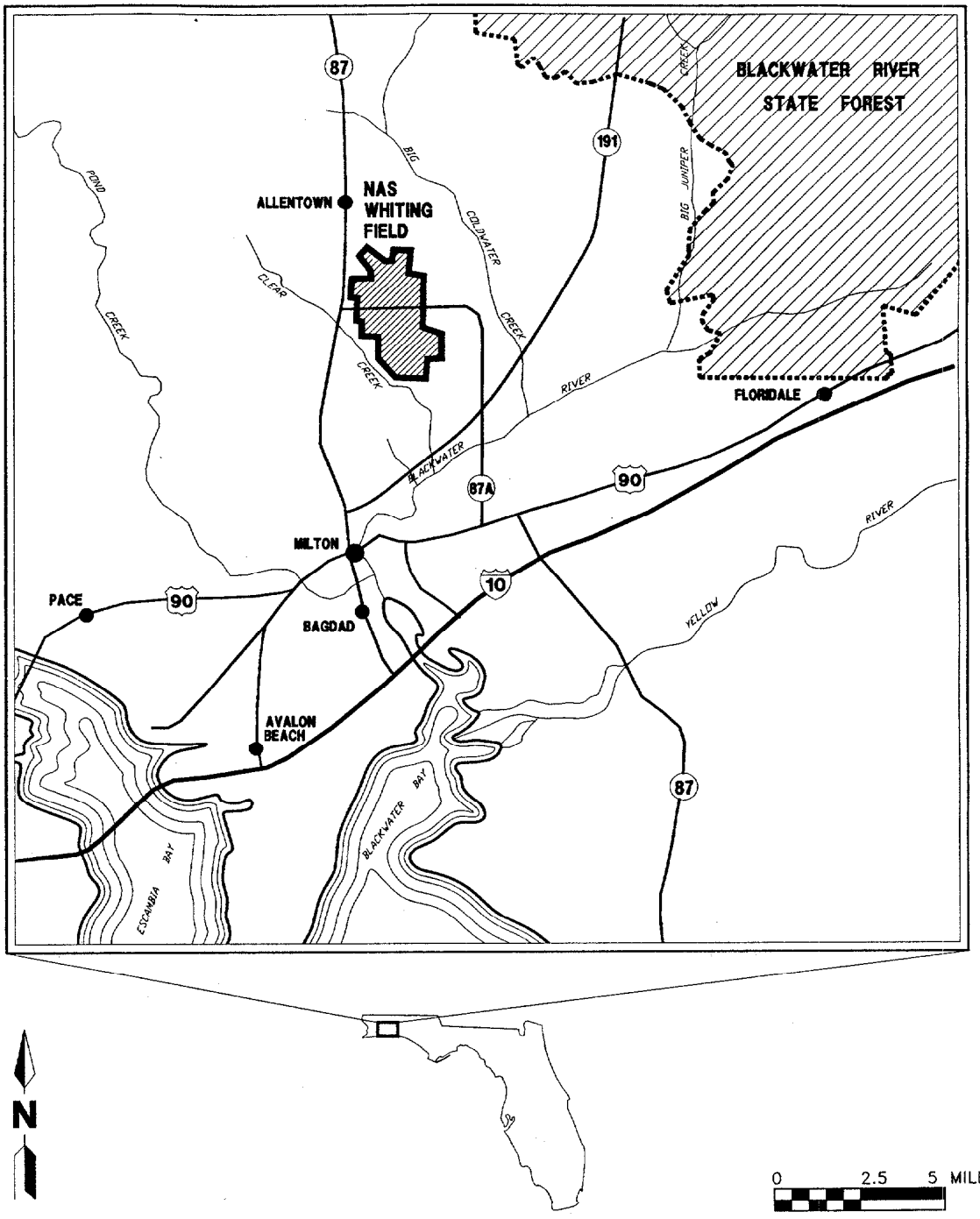
No. 1, Surface Water and Sediment Assessment;
No. 2, Geologic Assessment;
No. 3, Soil Assessment;
No. 4, Hydrogeologic Assessment;
No. 5, Groundwater Assessment;
No. 6, Definition of Operable Units; and
No. 7, RI Phase IIB Workplan.

The RI Phase IIA field program was conducted between April 1992 and February 1994.

Installation Location and Description. NAS Whiting Field is located in Santa Rosa County in northwest Florida, approximately 7 miles north of Milton and 20 miles northeast of Pensacola (Figure 1-1). NAS Whiting Field presently consists of two air fields separated by an industrial area. The installation is approximately 2,560 acres in size. Figure 1-2 presents the installation layout.

NAS Whiting Field, home of Training Air Wing Five (TRAWING FIVE), was constructed in the early 1940's. Subordinate commands currently stationed at NAS Whiting Field include training squadrons VT-2, VT-3, VT-6, HT-8, and HT-18 (SOUTHNAVFACENGCOM, 1988). NAS Whiting Field was commissioned as the Naval Auxiliary Air Station Whiting Field in July 1943 and has since served as a naval aviation training facility. The NAS Whiting Field's mission has been to train student naval aviators in the use of basic instruments, formation and tactical phases of fixed-wing and propeller-driven aircraft, and basic and advanced helicopter training.

**1.1 PURPOSE OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS).** The purpose of the NAS Whiting Field RI/FS is to identify and address any risks to public health and the environment that might be posed by toxic or hazardous chemicals present onsite as a result of past waste disposal practices or spills. To achieve this objective, an RI is in progress to assess the nature and distribution of chemicals associated with a number of sites at the installation. The data collected during the RI field program will be used in the FS to screen, evaluate, and select remedial alternatives as permanent, feasible solutions to environmental contamination problems at NAS Whiting Field.




Source: ABB Environmental Services Inc., 1992b

**FIGURE 1-1**
**FACILITY LOCATION MAP**

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

H:\WHITING\7560-16\TEC-MEM4\FIG1-1

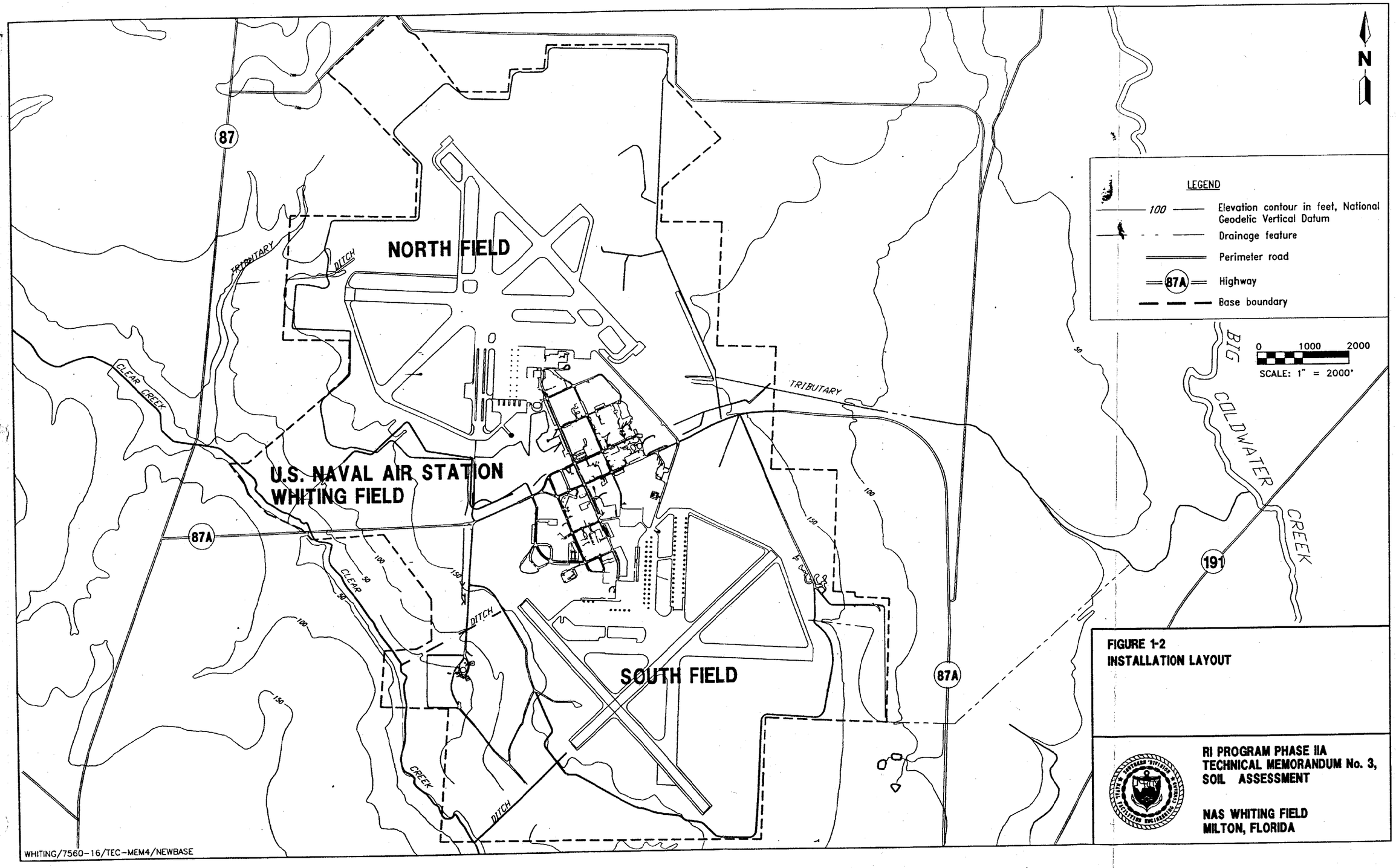



FIGURE 1-2
INSTALLATION LAYOUT

RI PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 3,
SOIL ASSESSMENT

NAS WHITING FIELD
MILTON, FLORIDA

WHITING/7560-16/TEC-MEM4/NEWBASE

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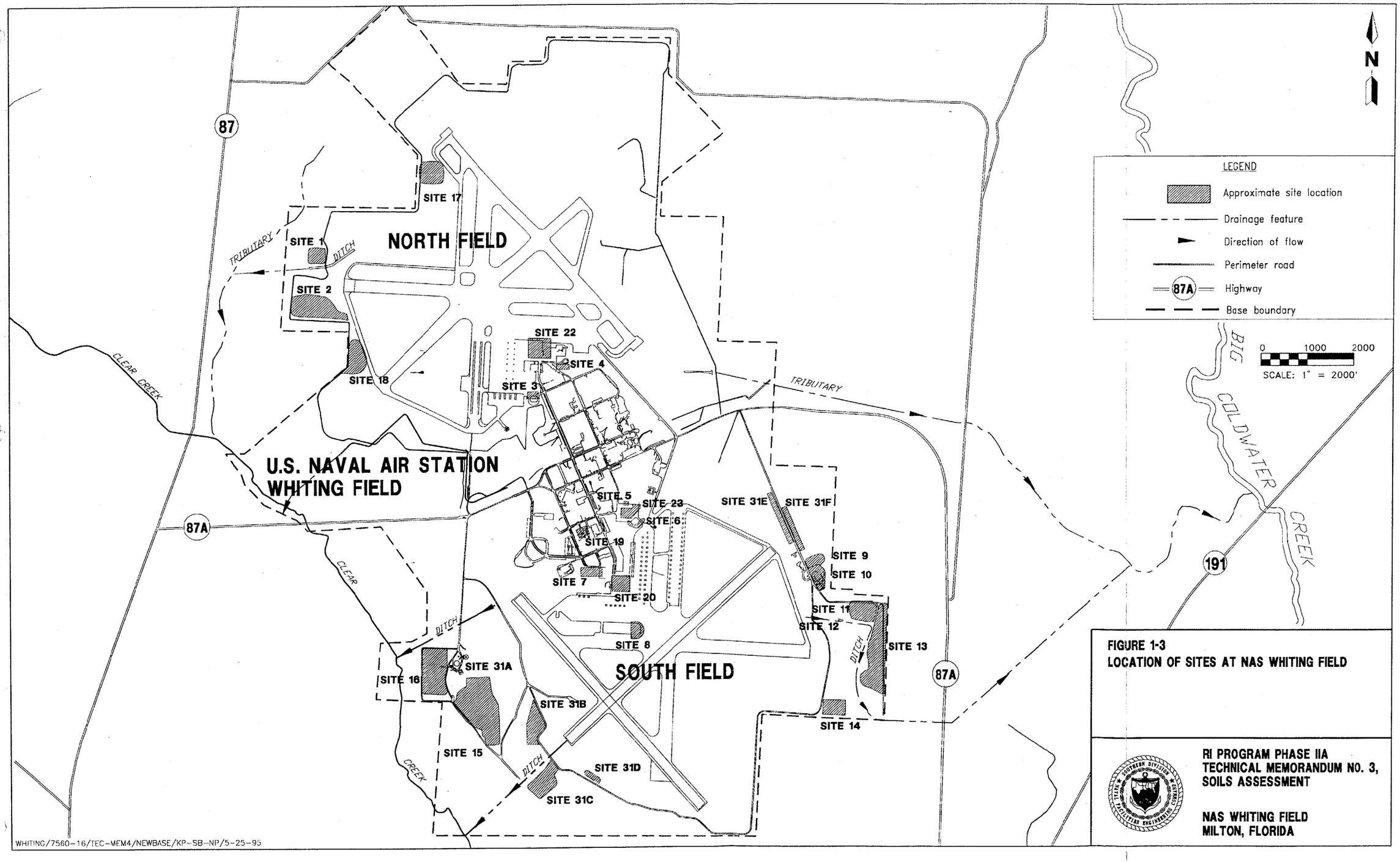


FIGURE 1-3
LOCATION OF SITES AT NAS WHITING FIELD

RI PROGRAM PHASE IIA
TECHNICAL MEMORANDUM NO. 3,
SOILS ASSESSMENT

NAS WHITING FIELD
MILTON, FLORIDA

WHITING/7560-16/TEC-MEM4/NEWBASE/KP-SB-NP/5-25-95

The Navy Installation Restoration (IR) program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations. The IR program is the Navy response authority under Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and Executive Order 12580. CERCLA requires that Federal facilities comply with the act, both procedurally and substantively. SOUTHNAVFACENGCOM is the agency responsible for the Navy IR program in the Southeastern United States. Therefore, SOUTHNAVFACENGCOM has the responsibility to process NAS Whiting Field through Preliminary Assessment (PA), Site Inspection (SI), priority listing, RI/FS, and remedial response selection in compliance with the guidelines of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300).

Section 105(a)(8)(A) of SARA required the U.S. Environmental Protection Agency (USEPA) to develop criteria to set priorities for remedial action based on relative risk to public health and the environment. To meet this requirement, USEPA has established the Hazard Ranking System (HRS) as Appendix A to the NCP. The HRS is a scoring system designed to assess relative threat to public health and the environment posed by documented or potential releases of hazardous substances at a site. First promulgated in 1982, the HRS was amended in December 1990, effective March 14, 1991 (55 Federal Register No. 241:51532-51667), to comply with requirements of Section 105(c)(1) of SARA to increase the accuracy of the assessment of relative risk. The recently promulgated HRS (March 1991) has been substantially revised and is designed to prioritize the sites after the SI phase of the CERCLA process.

The HRS score for NAS Whiting Field was generated in 1993. The score was sufficient to place NAS Whiting Field on the National Priority List (NPL). As of January 18, 1994, the USEPA placed NAS Whiting Field on the proposed list of sites to be included on the NPL (40 CFR 300, Federal Register, Vol. 59, January 18, 1994). NAS Whiting Field was officially included on the NPL on May 31, 1994 (40 CFR 300, Federal Register, Vol. 59, May 31, 1994). As a result, the RI/FS for NAS Whiting Field must follow the requirements of the NCP, as amended by SARA, and guidance for conducting RI/FS under CERCLA (USEPA, 1988a).

**1.2 PREVIOUS INVESTIGATIONS**. Five previous investigations have been conducted at NAS Whiting Field prior to the implementation of the Phase IIA RI/FS (Table 1-1). The investigations included an Initial Assessment Study (IAS), a Verification Study, and the Phase I RI completed in response to CERCLA requirements. In addition to these investigations, two other investigations have been completed at NAS Whiting Field. One investigation, which focused on the Battery Acid Seepage Pit (Site 5), was initiated under a Consent Order with the Florida Department of Environmental Regulation (FDER; now known as the Florida Department of Environmental Protection [FDEP], 1993). A second investigation has been conducted under the Navy's underground storage tank (UST) program on three UST sites. The following presents a summary of these investigations.

**Initial Assessment Study, 1985.** Historical records reviewed during the IAS (Envirodyne Engineers, 1985) indicated that throughout the years of operation, NAS Whiting Field has generated a variety of wastes associated with pilot training, the operation and maintenance of aircraft and ground support equipment, and the facility maintenance programs. Figure 1-3 provides a map showing the

**Table 1-1**
**Summary of Site Investigations**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Previous Studies | | | RI/FS Phase I | RI/FS Phase IIA | Navy's UST Program |
|---|---|---|---|---|---|---|---|
| | | IAS | Verification Study | Consent Order | | | |
| 1 | Northwest Disposal Area | * | * | | * | * | |
| 2 | Northwest Open Disposal Area | * | | | * | * | |
| 3 | Underground Waste Solvent Storage Area | * | * | | * | * | |
| 4 | North AVGAS Tank Sludge Disposal Area | * | * | | | * | * |
| 5 | Battery Acid Seepage Pit | * | | * | * | * | |
| 6 | South Transformer Oil Disposal Area | * | * | | * | * | |
| 7 | South AVGAS Tank Sludge Disposal Area | * | * | | | * | * |
| 8 | AVGAS Fuel Spill Area | * | * | | | * | * |
| 9 | Waste Fuel Disposal Pit | * | * | | * | * | |
| 10 | Southeast Open Disposal Area (A) | * | * | | * | * | |
| 11 | Southeast Open Disposal Area (B) | * | * | | * | * | |
| 12 | Tetraethyl Lead Disposal Area | * | * | | * | * | |
| 13 | Sanitary Landfill | * | * | | * | * | |
| 14 | Short-Term Sanitary Landfill | * | * | | * | * | |
| 15 | Southwest Landfill | * | * | | * | * | |
| 16 | Open Disposal and Burning Area | * | * | | * | * | |
| 17 | Crash Crew Training Area | | * | | * | * | |
| 18 | Crash Crew Training Area | | * | | * | * | |
| 29 | Auto Hobby Shop | | | | | * | |
| 30 | South Field Maintenance Hangar Area | | | | | * | |
| 31 | Sludge Drying Beds and Disposal Areas | | | | | * | |
| 32 | North Field Maintenance Hangar Area | | | | | * | |
| 33 | Midfield Maintenance Hangar Area | | | | | * | |

Notes: Sites 19 through 28 are located on OLF Barin and are discussed in separate Technical Memoranda.
IAS = Initial Assessment Study.
RI/FS = Remedial Investigation and Feasibility Study.
UST = underground storage tank.
AVGAS = aviation gasoline.

location of all potential sites of contamination that have been identified for investigation at NAS Whiting Field.

Interviews with facility personnel and record reviews indicated that prior to the establishment of hazardous waste management programs and programs to recycle waste oil in 1976, most of the hazardous wastes were reportedly disposed onsite. Waste materials were disposed either in dumpsters that were emptied into onsite disposal areas or they went into waste oil bowsers, which probably were used for crash crew training. Envirodyne Engineers (1985) estimated thousands of gallons of liquid wastes including waste paints, paint thinners, solvents, waste oils, waste gasoline, hydraulic fluids, aviation gasoline (AVGAS), tank bottom sludges, polychlorinated biphenyl (PCB) transformer fluids, and paint stripping wastewater were potentially dumped into onsite disposal areas. These disposal areas consisted of natural or man-made depressions located within the confines of the air station. In addition to the routine disposal of waste materials, additional materials were reportedly released onsite as a result of accidents or equipment failure.

Based on a review of historical data, aerial photographs, field inspections, and interviews with facility personnel, 16 potentially contaminated disposal or spill sites and/or sources for contaminant migration were initially identified at NAS Whiting Field by the IAS team (Envirodyne Engineers, 1985).

The IAS report (Envirodyne Engineers, 1985) concluded that 15 of the 16 sites warranted investigation under the Navy's IR program to assess potential long-term impacts. Only one site, Site 2, the Northwest Open Disposal Area, was determined not to warrant further consideration.

The 15 sites that were determined by Envirodyne Engineers to require investigation were evaluated by the Navy through a limited scope study. A Confirmation Study was conducted that included sampling and chemical analyses to confirm the presence or absence of suspected contamination and quantify the extent of any contamination that might exist.

**Confirmation Study, 1985-1986.** The Confirmation Study consisted of two parts: verification and characterization. In November 1985, Geraghty & Miller, Inc., prepared, on behalf of the Navy, a plan of action for the Verification Study entitled *Naval Assessment and Control of Installation Pollutants, Verification Study, NAS Whiting Field* (Geraghty & Miller, 1985b), which was subsequently submitted to the FDER and USEPA. This plan outlined the proposed scope of work for the Verification Study. In December 1985 during discussions with FDER, two additional sites (Sites 17 and 18) were added to the scope of the Verification Study. Both sites, in use in 1985, were locations where waste fuels and solvents were burned in crash crew training exercises.

The results of the Verification Study (*Verification Study, Assessment of Potential Ground-water Pollution at Naval Air Station Whiting Field, Florida,* Geraghty & Miller, 1986) provided an assessment of the physical and chemical conditions existing at the 16 sites that were under investigation. Groundwater contamination was confirmed at some sites and not at others. Based on the analytical results from environmental sampling, it was determined that a Characterization Study was needed to characterize the nature and extent of contamination at some of the sites.

The three-phase (IAS, Confirmation Study, and Remedial Measures) IR program was modified in 1987-88 to be congruent with CERCLA and SARA regulatory requirements. The updated nomenclature included:

- PA and SI,
- RI,
- FS, and
- planning and implementation of remedial design.

Under the updated rules, the IAS became equivalent to a PA and the first part of the Confirmation Study (the Verification Study) functioned as the SI. Subsequently, the Characterization Study was not performed and the existing investigations were used to support the updated IR program.

**Battery Shop Site Investigation, 1985.** During 1985, Site 5 (Battery Acid Seepage Pit) was investigated separately under a Consent Order with the FDER (Table 1-1). Results indicated no significant contamination had resulted from past activities at the Battery Acid Shop, and it was recommended that the Consent Order be rescinded on April 15, 1987. Data from this investigation were compiled in a report entitled *Detection and Monitoring Program, Battery Shop Site, Final Report, NAS Whiting Field, Florida* (Geraghty & Miller, 1985a) and submitted to FDER and USEPA.

**Phase I Remedial Investigation, 1990-1992.** In December 1990, ABB-ES, under contract to the Department of the Navy, SOUTHNAVFACENGCOM, initiated a Phase I RI at NAS Whiting Field. The objective of the RI Phase I was to assess the nature and extent of contamination at sites identified during the IAS and Verification Study. The Phase I of the RI program addressed 14 of 18 previously identified sites at the installation (Table 1-1). Investigations of limited scope were conducted at Sites 2 and 12 during the RI Phase I because no contaminants had been detected during the Verification Study.

No contamination attributable to Sites 2 and 12 was detected during the RI Phase I and, as a result, no further action (NFA) was proposed for both sites. Site 2, the Northwest Open Disposal Area, only received construction and demolition debris and was initially judged in the IAS to warrant no further consideration. However, at a Project Managers' meeting in Atlanta, Georgia, on November 13, 1992, USEPA and FDER requested that additional investigations be conducted at Sites 2 and 12 before a No Further Action (NFA) decision could be approved. Subsequently, Sites 2 and 12 were included for further study within the RI Phase IIA program.

A summary of the results of soil sample collection and analyses from RI Phase I are presented in Section 1.3.

Five additional sites were identified during the RI Phase I and subsequently added to the RI Phase IIA program for investigation. The site numbers and names are as follows:

Site 29, Auto Hobby Shop;
Site 30, South Field Maintenance Hangar;
Site 31, Sludge Drying Beds and Disposal Areas;
Site 32, North Field Maintenance Hangar; and
Site 33, Midfield Maintenance Hangar.

Site numbers 19 through 28 are not used at NAS Whiting Field because they identified potential sources of contamination sites located at Outlying Landing Field (OLF) Barin in Foley, Alabama. A separate investigation is being conducted at the OLF Barin sites.

Site 5 was not included in the RI Phase I. However, the detection of benzene in groundwater samples collected from the existing monitoring wells surrounding the seepage pit at Site 5 have warranted further consideration. The investigation activities associated with the presence of benzene at Site 5 were included within the scope of investigation of Site 33.

At an Remedial Project Managers' (RPM) meeting held on May 24, 1994, in Tallahassee, Florida, the USEPA and FDEP representatives recommended that the separate localities comprising Site 31 be addressed in alphabetical sequence: A, B, C, D, E, and F (Figure 1-3). Table 1-2 summarizes the historical information collected on the identified sites at NAS Whiting Field.

**1.3 PREVIOUS RESULTS FROM THE RI PHASE I SOIL INVESTIGATION**. The RI Phase I soil investigation at NAS Whiting Field was conducted on December 3 and 4, 1991. The investigation was limited to the collection and analyses of surface soil samples from four RI sites (Sites 6, 12, 15, and 16) and sediment samples from two stormwater drainage swales (Ditches 'A' and 'Y').

The results of the soil analyses are documented in the RI Phase I Technical Memorandum No. 3 (ABB-ES, 1992b). A summary of the analytical results from each RI site and the drainage swales are presented in Tables 1-3 and 1-4.

**1.3.1 Site 6, The South Transformer Oil Disposal Area** Twelve surface soil samples were collected from Site 6 during RI Phase I investigations. The samples were collected using stainless-steel spoons from 0 to 0.5 foot below land surface (bls). The samples were analyzed only for PCB compounds. One PCB compound, Aroclor-1260, was detected in 8 of 12 samples (Table 1-4). The detected concentrations ranged from 6.9 to 33 micrograms per kilogram ($\mu$g/kg), which was less than the reporting limit of 160 $\mu$g/kg.

**1.3.2 Site 12, The Tetraethyl Lead Disposal Area** Six soil samples were collected from centers of soil mounds (1 to 2 feet below the top of the mound) at Site 12 during RI Phase I investigations. All the samples were analyzed using SW-846 methods (USEPA, 1986) for total lead, corrosivity, flashpoint, and toxicity characteristic leaching procedure (TCLP). Lead was detected at concentrations ranging from 9.7 to 30 milligram per kilogram (mg/kg). None of the metals or the volatile organic compounds (VOCs) exceeded TCLP concentration limits (40 CFR 261-24). In addition, Site 12 soil samples did not exhibit characteristics of ignitability or corrosivity.

**1.3.3 Site 15, The Southwest Landfill, and Site 16, The Open Disposal and Burning Area** Six soil samples were collected at Sites 15 and 16 from 0 to 0.5 foot bls. The samples were analyzed for target compound list (TCL) organic and target analyte list (TAL) inorganic analytes. With the exception of acetone and bis(2-ethylhexyl)phthalate (BEHP), no other organic contaminants were detected in the soil samples from Sites 15 and 16. Acetone was detected in four of six soil samples at concentrations ranging from 29 to 71,000 $\mu$g/kg. BEHP was detected in all six soil samples at estimated concentrations ranging from 53 to 790 $\mu$g/kg.

## Table 1-2
## Summary of Past Waste Disposal Activities

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site No. | Site Name and Type | Location | Period of Operation | Estimated Size (acres) | Types of Material Disposed | Comments |
|---|---|---|---|---|---|---|
| 1 | Northwest Disposal Area (landfill). | North Field, west side | 1943-1965 | 1.3 | Refuse, waste paints, thinners, solvents, waste oils, and hydraulic fluids. | Secondary disposal area during this period; site covers less than 2 acres. |
| 2 | Northwest Open Disposal Area (landfill). | North Field, west side | 1976-1993 | 12 | Construction and demolition debris, tires, and furniture. | Former borrow pit location, commonly referred to as the "Wood Dump." |
| 3 | Underground Waste Solvent and Waste Oil Storage Area (USTs). | North Field, south of Building 2941. | 1980-1984 | 1 | Waste solvents, paint stripping residue, and 120-gallon spill. | Wastes generated by paint stripping operations. |
| 4 | North AVGAS Tank Sludge Disposal Area (USTs). | North Field, north of Tow Lane. | 1943-1968 | 2.5 | Tank bottom sludge containing tetraethyl lead. | Sludge disposal in shallow holes near tanks. |
| 5 | Battery Acid Seepage Pit (contaminated soil). | South Field, southwest of Building 1454. | 1964-1984 | 0.2 | Waste electrolyte solution containing heavy metals and waste battery acid. | Pits located 110 feet from potable supply well (W-S2). |
| 6 | South Transformer Oil Disposal Area (contaminated soil). | South Field, southeast of Building 1454. | 1940's-1960's | 1.0 | PCB-contaminated dielectric fluid. | Disposal in "0-2" drainage ditch. |
| 7 | South AVGAS Tank Sludge Disposal Area (USTs). | South Field, west of Building 1406. | 1943-1968 | 2 | Tank bottom sludge containing tetraethyl lead. | Sludge disposed in shallow holes near tanks. |
| 8 | AVGAS Fuel Spill Area (contaminated soil). | South Field, south of Building 1406. | Summer 1972 | 2 | AVGAS containing tetraethyl lead. | Fuel spill of about 25,000 gallons in a grassy depression. |
| 9 | Waste Fuel Disposal Pit (contaminated soil). | South Field, east side | 1950's-1960's | 2 | Waste AVGAS containing tetraethyl lead. | Fuel disposed in former borrow pit. |
| 10 | Southeast Open Disposal Area (A) (landfill). | South Field, southeast area | 1965-1975 | 4 | Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, PCBs, pesticides, and herbicides. | Secondary disposal area during this period. |
| 11 | Southeast Open Disposal Area (B) (landfill). | South Field, southeast area | 1943-1970 | 4 | Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, and PCBs. | Secondary disposal area during this period. |

See notes at end of table.

## Table 1-2 (Continued)
## Summary of Past Waste Disposal Activities

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site No. | Site Name and Type | Location | Period of Operation | Estimated Size (acres) | Types of Material Disposed | Comments |
|---|---|---|---|---|---|---|
| 12 | Tetraethyl Lead Disposal Area (waste pile). | South Field, southeast area | May 1, 1968 | 0.06 | Tank bottom sludge and fuel filters contaminated with tetraethyl lead. | Disposal area posted with warning; site consists of six mounds; 100 foot by 25 foot area. |
| 13 | Sanitary Landfill (landfill) | South Field, southeast area | 1979-1984 | 5.5 | Refuse, waste solvents, paint, hydraulic fluids, and asbestos. | Primary sanitary landfill, potentially received hazardous wastes the first year of operation. |
| 14 | Short-Term Sanitary Landfill (landfill). | South Field, southeast area | 1978-1979 | 1 | Refuse, waste solvents, oils, paint, and hydraulic fluids. | Primary sanitary landfill for brief period; relocated due to drainage problems. |
| 15 | Southwest Landfill (landfill) | South Field, southwest area | 1965-1979 | 15 | Refuse, waste paints, oils, solvents, thinners, asbestos, and hydraulic fluid. | Primary landfill for this time period. |
| 16 | Open Disposal and Burning Area (landfill). | South Field, southwest area | 1943-1965 | 10 | Refuse, waste paints, oils, solvents, thinners, PCBs, and hydraulic fluid. | Primary disposal area for this time period. |
| 17 | Crash Crew Training Area (contaminated soil). | North Field, west side | 1951-1991 | 3 | JP-5. | Waste fuels and some solvents ignited, then extinguished. |
| 18 | Crash Crew Training Area (contaminated soil). | North Field, west side | 1951-1991 | 5.5 | JP-5. | Waste fuels and some solvents ignited, then extinguished. |
| 29 | Automotive Hobby Shop (USTs). | Area around Building 1404 | 1940's-present | 2 | Paint, oils, and solvents | Abandoned underground waste oil tank. |
| 30 | South Field Maintenance Hangar (USTs). | Area around Building 1406 | 1940's - present | 5 | Fuels, solvents, and oils | Abandoned underground waste oil, solvents, and detergents tanks. |
| 31 | Sludge Drying Beds and Disposal Areas (contaminated soil). | Wastewater Treatment Plant and along perimeter roads. | 1940's - 1990 | 13 | Wastewater treatment plant sludge. | Sludge from beds spread on ground along perimeter road. |
| 32 | North Field Maintenance Hangar (USTs). | Area around Building 1424 | 1940's - present | 5 | Fuels, solvents, and oils | Abandoned underground waste solvents, fuel and solvent tanks. |
| 33 | Midfield Maintenance Hangar (USTs). | Area around Building 1454 | 1940's - present | 2 | Fuels, solvents, and oils | Abandoned underground waste oil tank. |

Notes: UST = underground storage tank.
AVGAS = aviation gasoline.
PCB = polychlorinated biphenyls.

## Table 1-3
## Summary of Detected Inorganic Analytes in Surface Soil, RI Phase I

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Parameter | Drainage Swales Samples | | | | | | Landfill Samples | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12-SD-01 | 12-SD-02 | 12-SD-03 | 15-SD-01 | 15-SD-02 | 15-SD-03 | 15-SL-01 | 15-SL-02 | 15-SL-03 | 16-SL-01 | 16-SL-02 | 16-SL-03 |
| Aluminum | 5,990 | 10,500 | 4,240 | 10,400 | 4,590 | 1,170 | 7,660 | 9,000 | 8,220 | 9,900 | 10,400 | 16,100 |
| Antimony | 11.1 J | 9.1 J | 9.3 J | 7.9 J | 8.4 J | 8.9 J | 8.4 J | 9.1 J | 10.1 J | 10 J | -- | 8.8 J |
| Arsenic | -- | 1.7 J | 1.8 J | 3.2 J | -- | 2.1 | -- | -- | -- | -- | 3 | 5 |
| Barium | 8.68 J | 10 J | 7.8 J | 13.8 J | 5.2 J | 14.9 J | 5.3 J | 4.5 J | 8.8 J | 14.8 J | 19.2 J | 26.2 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 3,750 | -- | 137 | 2,240 | -- | -- | -- | -- | -- | 300 | 233 | 355 |
| Chromium | 6.7 | 7 | 2.7 | 8.6 | 3.4 | 6.9 | 4.8 | 9.5 | 4.7 | 7.5 | 8.6 | 12.1 |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | 4.8 | 7.9 | 4.4 | -- | -- | -- | -- | 5.3 | 7.2 | 10.8 |
| Cyanide | -- | 0.27 J | 0.28 J | 0.62 J | 0.29 J | 0.48 J | 0.32 J | 0.35 J | 0.39 J | 0.29 J | 0.29 J | 0.29 J |
| Iron | 3,140 | 3,340 | 2,790 | 4,990 | 2,770 | 6,340 | 3,810 | 4,870 | 4,110 | 4,800 | 4,840 | 7,440 |
| Lead | 5.5 | 8.6 | 23.1 | 23.3 | 12.9 | 6.5 | 2.4 J | 6 J | 3.1 J | 14 J | 46.5 J | 43.7 |
| Magnesium | 864 | 144 | 93.2 | 365 | 83.5 | 166 J | 92.2 J | -- | 138 J | 147 J | 169 J | 272 |
| Manganese | 52.2 | 92.7 | 51.1 | 72 | 19.5 | 144 | 32.4 | 19.3 | -- | 76.2 | 83.8 | 141 J |
| Mercury | -- | 0.01 | 0.01 | 0.04 | 0.05 | 0.02 | -- | -- | -- | 0.01 | 0.02 | 0.08 |
| Nickel | -- | -- | -- | -- | -- | -- | 6.7 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 9.8 J | 13.6 | 5.2 J | 15 | 6 J | 15.6 | 10.1 | 12.8 | 10.6 | 13.9 | 14.6 | 22.7 |
| Zinc | -- | 6.4 | 14.8 | 15.5 | 10.8 | 7.2 | -- | 3.7 | 4.7 | 16.3 | 29.4 | 35.6 |

Notes: All concentrations are in micrograms per kilogram (mg/kg).
-- = the analyte was not detected during analyses.
J = the associated numerical value is an estimated quantity.



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## Table 1-4
## Summary of Detected Organic Analytes in Surface Soil, RI Phase I

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Sample Location | Analytical Concentration (μg/kg) | | |
|---|---|---|---|
| | Acetone[1] | Bis(2-Ethylhexyl)phthalate | Aroclor-1260 |
| Drainage Swales | | | |
| 12-SD-01 | 1,700/870 | -- | -- |
| 12-SD-02 | 4,700/3,400 | -- | -- |
| 12-SD-03 | 1,500 | -- | -- |
| 12-SD-03 | -- | 65 J | -- |
| 12-SD-02 | 530/240 | 52 J | -- |
| 12-SD-03 | -- | 59 J | -- |
| Landfill Areas (Sites 15 and 16) | | | |
| 15-SL-01 | 10,000/8,100 | 81 J | -- |
| 15-SL-02 | -- | 77 J | -- |
| 15-SL-03 | 29 | 53 J | -- |
| 16-SL-01 | 68 | 130 J | -- |
| 16-SL-02 | 71,000 | 790 J | -- |
| 16-SL-03 | -- | 72 J | -- |
| South Transformer Oil Disposal Area (Site 6) | | | |
| 6-SL-01 | NA | NA | -- |
| 6-SL-02 | NA | NA | 22 J |
| 6-SL-03 | NA | NA | -- |
| 6-SL-04 | NA | NA | 33 J |
| 6-SL-05 | NA | NA | 6.9 J |
| 6-SL-06 | NA | NA | 18 J |
| 6-SL-07 | NA | NA | -- |
| 6-SL-08 | NA | NA | 21 J |
| 6-SL-09 | NA | NA | -- |
| 6-SL-10 | NA | NA | 7.0 J |
| 6-SL-11 | NA | NA | 7.8 J |
| 6-SL-12 | NA | NA | 25 J |

[1] 1,700/870 = initial sample and duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected during analyses.
J = the associated numerical value is an estimated quantity.
NA = the samples were not analyzed for this particular analyte.

Aluminum, antimony, barium, chromium, cyanide, iron, lead, magnesium, manganese, vanadium, and zinc were detected in five of six soil samples. Inorganic concentrations in sample 16-SL-03 were typically 2 times greater than those in the other Site 15 and 16 samples.

1.3.4 **Drainage Ditches** Six sediment samples were collected from stormwater drainage ditches "A" and "Y". Old drainage ditch "A" is located between Sites 15 and 16. Drainage ditch "Y" is located among Sites 11, 12, 13, and 14. Sample collection depths ranged from 0 to 2.0 foot bls. The samples were analyzed for TCL organic and TAL inorganic analytes. Acetone and BEHP were the only organic compounds detected in the sediment samples. BEHP concentrations were below the contract required quantitation limit (CRQL) for the compound (350 $\mu$g/kg). Acetone concentrations ranged from 240 to 4,700 $\mu$g/kg. Aluminum, antimony, barium, chromium, cyanide, iron, lead, magnesium, manganese, mercury, vanadium, and zinc were detected in five of six samples.

**Underground Storage Tank (UST) Investigations, 1991-94.** UST Sites 4, 7, and 8 (also referred to as UST Sites 1467, 1466, and 3054, respectively) have been investigated under the Navy's UST program and, therefore, have not been incorporated into the Navy's IR program. During a Project Managers' meeting at Whiting Field on July 7, 1992, an agreement was reached among the Navy, USEPA, and FDER to sample monitoring wells at Sites 4, 7, and 8 for full scan TCL and TAL analytes. Based on the results of these analyses, a decision would be made regarding whether Sites 4 and 7 should remain in the Navy's UST program or be transferred into the Navy's IR program. The UST field work was completed between August 16 and 30, 1993, and included the collection of groundwater samples from 11 monitoring wells at Site 4 (UST Site 1467) and 19 monitoring wells at Site 7 (UST Site 1466).

The results of the UST program investigation were reported in the Jurisdiction Assessment Report (ABB-ES, 1994). The report concluded that the benzene, toluene, ethylbenzene, and xylene (BTEX) and trichloroethene (TCE) plumes at the sites are co-mingled and that petroleum contaminants could not be remediated without design considerations for TCE contamination. Based on these findings, the report recommended that additional site investigations be returned to the IR program. The decision by the Navy, USEPA, and FDEP to act on these recommendations was discussed at an RPM meeting on May 24, 1995, and following the meeting both sites were transferred to the IR program.

Site 8 (UST Site 3054) was investigated under separate contamination assessments conducted from October 1991 to July 17, 1993. The results of the investigations were reported in the Contamination Assessment Report (CAR) and CAR Addendum for Site 3054 (IR Site 8), NAS Whiting Field, Milton, Florida (ABB-ES, 1992c; 1993a). Based on the CAR Addendum, no further action (NFA) was recommended for the site. In a correspondence dated January 20, 1994, the FDEP formally accepted the NFA proposed in the CAR Addendum for Site 3054. The NFA recommendation was incorporated into a Site Rehabilitation Completion order, which was signed by the FDEP Director of the Division of Waste Management.

1.4 **PHASE IIA SOIL INVESTIGATION**. The objectives of the RI Phase IIA soil investigation were to:

- characterize the nature and extent of soil contamination that may have resulted from spills or previous disposal practices at the NAS Whiting Field facility,

- characterize analytes and concentrations from facility-wide background surface soil samples, and

- identify the lithologic characteristics of soil in both the vadose zone and the upper saturated zone of the sand-and-gravel aquifer within the facility (results are compiled in Technical Memorandum No. 2, Geologic Assessment [ABB-ES, 1995a]).

**1.5 ENVIRONMENTAL SETTING**. This section summarizes the regional and local topography, surface water drainage, and soil types occurring in the northern parts of Santa Rosa County and at NAS Whiting Field.

**1.5.1 Topography** Santa Rosa County is located within the Coastal Plain Physiographic Province of the southeastern United States. Within Santa Rosa County are two main physiographic divisions: the Western Highlands and the Gulf Coast Lowlands. NAS Whiting Field is part of the Western Highlands, which is a well-drained, southward sloping plateau with numerous streams flowing into either Escambia Bay or East Bay farther south.

NAS Whiting Field is located on an escarpment between Big Coldwater Creek and Clear Creek, both of which are tributaries of the Blackwater River (Figure 1-2). Elevations in the area range from 50 to 190 feet above mean sea level (msl). Relatively steep scarps on the west, east, and south flanks of NAS Whiting Field drop as much as a 100 feet into the stream valleys below. Erosion was a serious problem when the original land surface was cleared. As a result, soil conservation measures in the form of extensive contouring and construction of large paved ditches were developed to control surface runoff from the upland areas of the base. This included a system of ditches to convey surface runoff from NAS Whiting Field to Clear Creek, Big Coldwater Creek, and their tributaries. Contours of the land surface and local surface drainage features are shown in Figure 1-2.

**1.5.2 Soil Types and Occurrences** The general soil classification for the NAS Whiting Field location is the Troup-Dothan-Bonifay map unit, which is typically composed of gently sloping to strongly sloping, well drained soil (U.S. Department of Agriculture [USDA] Soil Conservation Service, 1980). This soil is sandy to loamy and typically overlies a loamy subsoil at shallow depth. The Troup-Dothan-Bonifay map unit covers approximately 27 percent of Santa Rosa County and consists of 53 percent Troup soil, 15 percent Dothan soil, 12 percent Bonifay soil, and 20 percent soil of minor extent. The minor soils in this area are well drained Fuquay, Lucy, and Orangeburg soils and excessively drained Lakeland soil (USDA Soil Conservation Service, 1980).

Troup loamy sand soil type is predominant in the southern part of NAS Whiting Field and complemented with localized occurrences of Dothan fine sandy loam and Lucy loamy sand (Figure 1-4). In the northern part of NAS Whiting Field, Troup loamy sand is the dominant soil followed by Orangeburg sandy loam and localized occurrences of Red Bay, Bonifay, Lucy, and Dothan soil. Soil of the Lakeland sand series are subordinate to Troup loamy sand in the areas between the North Field

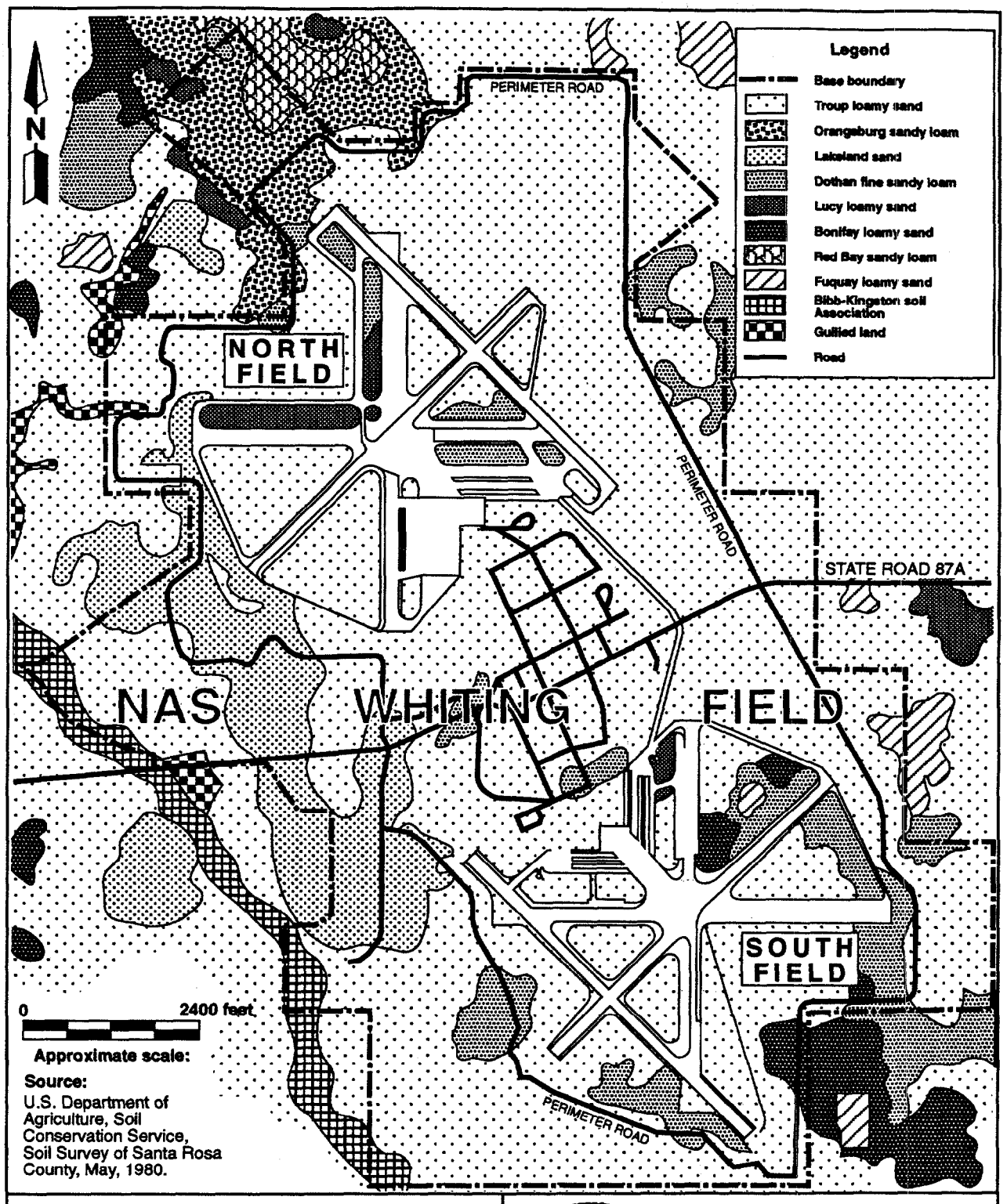


**FIGURE 1-4**

**NAS WHITING FIELD SOIL TYPES**

**RI PROGRAM PHASE IIA, TECHNICAL MEMORANDUM 3, SOIL ASSESSMENT**

**NAS WHITING FIELD MILTON, FLORIDA**

7560-16 94829WEM

and South Field (Figure 1-4). The RI sites being investigated are associated with one or more of soils from Troup, Orangeburg, or Lakeland series.

The following is a description of the four major soil types at NAS Whiting Field (USDA Soil Conservation Services, 1980).

**Troup loamy sand.** This soil consists of a thick sandy surface layer overlying a loamy, red subsoil at a depth of 40 to 80 inches bls. Slopes vary from 0 to 8 percent. Permeability is 12 to 40 feet per day (ft/day) down to a 5-foot depth and diminishes to 1.2 to 4.0 ft/day below a 5-foot depth.

**Orangeburg sandy loam.** This soil consists of a brown sandy loam overlying red, loamy subsoil. Surface slopes vary from 0 to 2 percent. Permeability is 4.0 to 12.0 ft/day down to a depth of 1 foot bls and diminishes to 1.2 to 4.0 ft/day from 1 to 6 foot bls.

**Lakeland sand.** This soil consists of dark, grayish brown sand overlying yellowish brown sand with low organic matter content down to 7 foot bls. Slopes vary from 0 to 12 percent. Permeability is in excess of 40 ft/day.

**Lucy loamy sand.** This soil consists of dark, grayish brown loamy sand overlying red, loamy subsoil. Slopes vary from 0 to 5 percent. Permeability is 12 to 40 ft/day in the upper 2 feet of soil, decreasing to 1.2 to 4.0 ft/day from 3 to 7 feet bls.

Background soil samples were not collected from occurrences of Lucy loamy sand because none of the RI/FS sites are associated or occur within Lucy loamy sand.

## 2.0 FIELD INVESTIGATIVE METHODS

The Phase IIA RI soil assessment field program at NAS Whiting Field consisted of the following:

- geophysical surveys,
- surface soil sampling,
- subsurface soil sampling,
- test pit excavations,
- soil gas surveys, and
- soil borings.

All field and laboratory activities associated with the RI Phase IIA soil assessment were based on Phase I Data Summary and Phase IIA Workplan (ABB-ES, 1992c) and the RI/FS Planning Documents (E.C. Jordan, 1990). These planning documents covered the scope of the RI/FS including sampling and analyses methodology, rationale, quality assurance, health and safety procedures, data management, data evaluation, reporting and project management approach.

Soil samples were collected at the following sites during the Phase IIA field program: Sites 1, 2, 3, 6, 10, 11, 12, 13, 14, 15, 16, 17, 18, 29, 30, 31, 32, and 33. In addition, facility-wide background surface soil samples were collected during the field program.

The RI sites were grouped into three areas based on the type of field methods employed during the Phase IIA soil investigations. A summary of the groups is presented below:

- Landfill and Disposal Area Sites 1, 2, 10, 11, 12, 13, 14, 15, 16, and 31;

- Crash Crew Training Area Sites 17 and 18; and

- Industrial Areas Sites 3, 6, 29, 30, 32, and 33.

Geophysical survey stations, test pit locations, and soil sample locations were surveyed by a Florida-licensed surveyor (Northwest Florida Engineering, Pensacola, Florida) following completion of the soil sampling program.

Sections 2.1 through 2.5 present a detailed description of each of the field investigative programs for the Phase IIA soil assessment.

**2.1 GEOPHYSICAL SURVEY, LANDFILL AND DISPOSAL AREA SITES**. Geophysical surveys at NAS Whiting Field were conducted between May 26, 1992, and June 14, 1992, at eight of the Landfill and Disposal Area sites (1, 9, 10, 11, 13, 14, 15, and 16) (site names and disposal activities are included in Table 1-2).

The purpose of the geophysical surveys at NAS Whiting Field was to assess the lateral and vertical extent of waste disposal areas and locate buried metallic or nonmetallic objects that may indicate potential waste disposal areas. In addition, geophysical methods were used to locate possible underground utility

lines, fuel distribution lines, and other anthropogenic obstructions that may interfere with subsurface explorations.

Geophysical methods used at the sites include electromagnetic (EM) induction, magnetometry (MAG), and direct current (DC) resistivity. The DC resistivity method used was the Wenner array. Blackhawk Geosciences, Inc., Golden, Colorado, was subcontracted by ABB-ES to conduct the geophysical tasks. A technical report describing the methodology, results, and conclusions of the geophysical survey was prepared in February 1993 (ABB-ES, 1993b). This report is included in Appendix A. The following paragraphs present a brief description of the geophysical field program.

Data from the EM and MAG surveys were collected along north to south and east to west grid lines at a spacing of 20 or 40 feet. Data were typically collected at stations located at 10-foot intervals along each grid line, which was oriented with a magnetic compass and measuring tape. These stations were later surveyed by a Florida-licensed surveyor.

Two DC resistivity soundings were conducted at Site 13 and an additional two at Site 16 in an attempt to determine the depth of fill.

**2.2 SURFACE SOIL SAMPLING, FACILITY BACKGROUND, LANDFILL AND DISPOSAL AREA, AND CRASH CREW TRAINING AREA SITES.** A total of 144 surface soil samples were collected between August 10 and August 19, 1992, from the facility-wide background locations; Landfill and Disposal Area Sites 1, 10, 11, 13, 14, 15, 16, and 31; and from the Crash Crew Training Area Sites 17 and 18. Site names and details of disposal activities are included in Table 1-2.

The background surface soil samples were collected from locations that were not likely to be affected by past or present waste disposal practices. The purpose of the background soil characterization was to assess the ambient concentration of various chemicals in the surface soil at the installation. The characterization included determining the identity of a chemical substance and its concentration that was either naturally occurring or resulted from manmade sources unrelated to waste disposal activities. The surface soil samples were collected from one of the three major soil series, Lakeland sand, Orangeburg sandy loam, and Troup loamy sand, that occur at the RI/FS sites. Facility background sample locations are presented in Figure 2-1. The following describes the number of samples collected from each soil series.

- Troup loamy sand, four samples;
- Orangeburg sandy loam, three samples; and
- Lakeland sand, three samples.

Sites 1, 9, 10, 11, 13, 14, 15, 16, and 31 are located in areas with Troup loamy sand. Site 17 is located in an area with Orangeburg sandy loam and Site 18 is located in an area with Lakeland sand (USDA Soil Conservation Service, 1980) (Table 2-1).

Surface soil samples were collected from locations where geophysical anomalies were identified and the samples were analyzed to assess potential surface soil contamination.

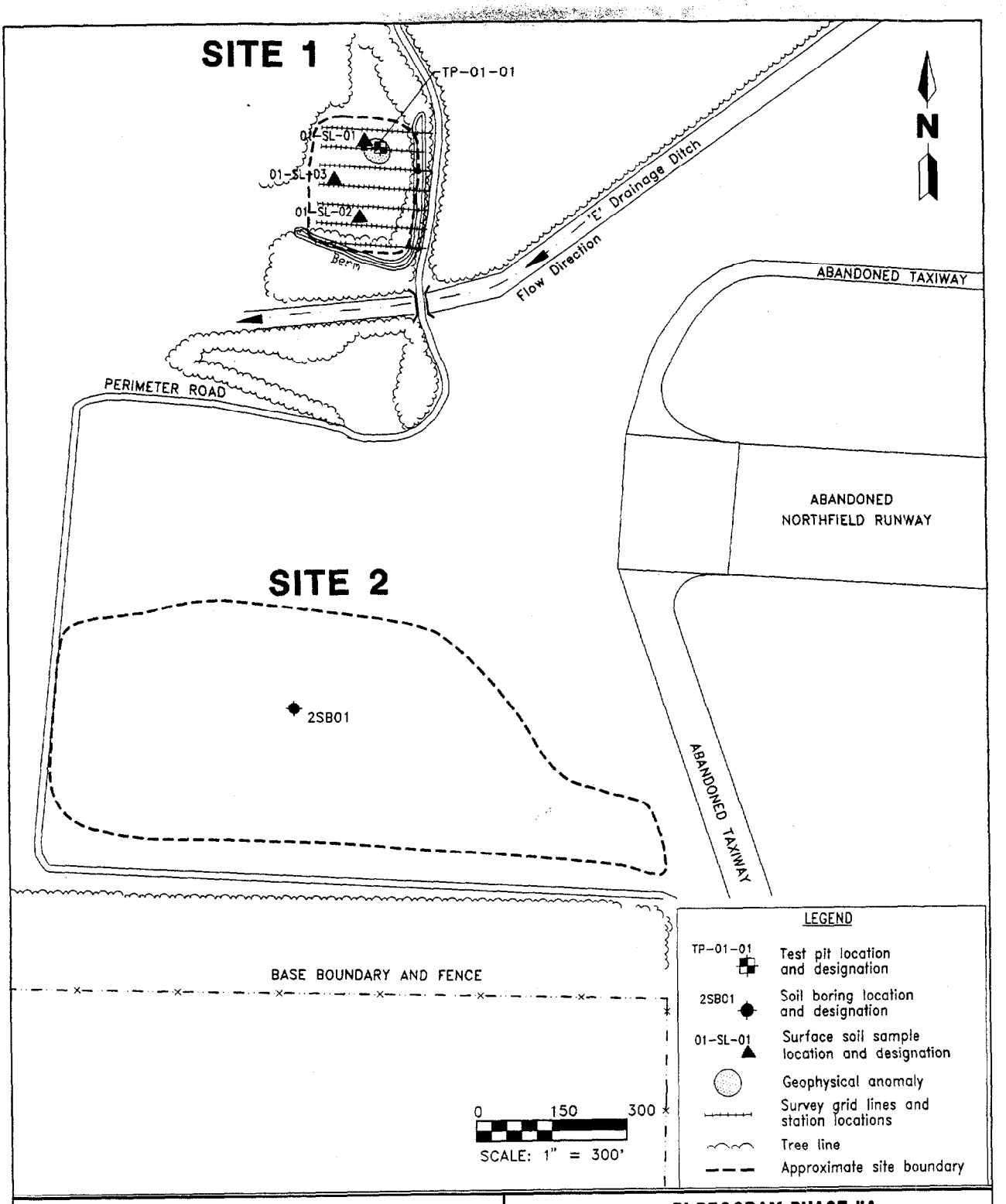


**FIGURE 2-1**
**SITES 1 AND 2,**
**LOCATIONS OF SURFACE SOIL SAMPLES,**
**TEST PITS, SOIL BORINGS,**
**AND GEOPHYSICAL GRID LINES**

WHITING/7560-16/TEC-MEM3/NORTHEST/kgp-sb/05/09/95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

**Table 2-1**
**Surface Soil at Remedial Investigation and Feasibility Study (RI/FS) Sites Cross Referenced with U.S. Department of Agriculture (USDA) Soil Types**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| USDA Soil Type | RI/FS Sites |
|---|---|
| Troup loamy sand | 1, 9, 10, 11, 12, 13, 14, 15, 16, and 31 |
| Orangeburg sandy loam | 17 |
| Lakeland sand | 18 |

Ten surface soil samples were collected at the facility background location, 53 surface soil samples were collected from the Landfill and Disposal Area sites, and 81 surface soil samples were collected from the Crash Crew Training Area sites.

Table 2-2 summarizes the number of samples collected at each of the individual areas. The surface soil sample locations from the Landfill and Disposal Area and Crash Crew Training Area sites are shown in Figures 2-2 through 2-12.

**Table 2-2**
**Summary of Surface Soil Sample Collection**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site | Description | Number of Surface Soil Samples | Figure Numbers[1] |
|---|---|---|---|
| | Facility Background | 10 | 2-9 |
| 1 | Northwest Disposal Area (Landfill) | 3 | 2-1 |
| 10 | Southeast Open Disposal Area (A) | 5 | 2-2 |
| 11 | Southeast Open Disposal Area (B) | 5 | 2-3 |
| 12 | Tetraethyl Lead Disposal Area | 8 | 2-4 |
| 13 | Sanitary Landfill | 5 | 2-3 |
| 14 | Short-term Sanitary Landfill | 3 | 2-3 |
| 15 | Southwest Landfill | 5 | 2-5 |
| 16 | Open Disposal and Burning Area | 3 | 2-6 |
| 17 | Crash Crew Training Area | 34 | 2-7 |
| 18 | Crash Crew Training Area | 47 | 2-8 |
| 31 | Sludge Drying Beds and Disposal Areas: | | |
| | 31A | 8 | 2-10 |
| | 31B | 3 | 2-11 |
| | 31C | 4 | 2-11 |
| | 31D | 1 | 2-11 |
| | 31E | 4 | 2-12 |
| | 31F | 4 | 2-12 |

[1] Locations of surface soil samples are presented in the referenced figure.

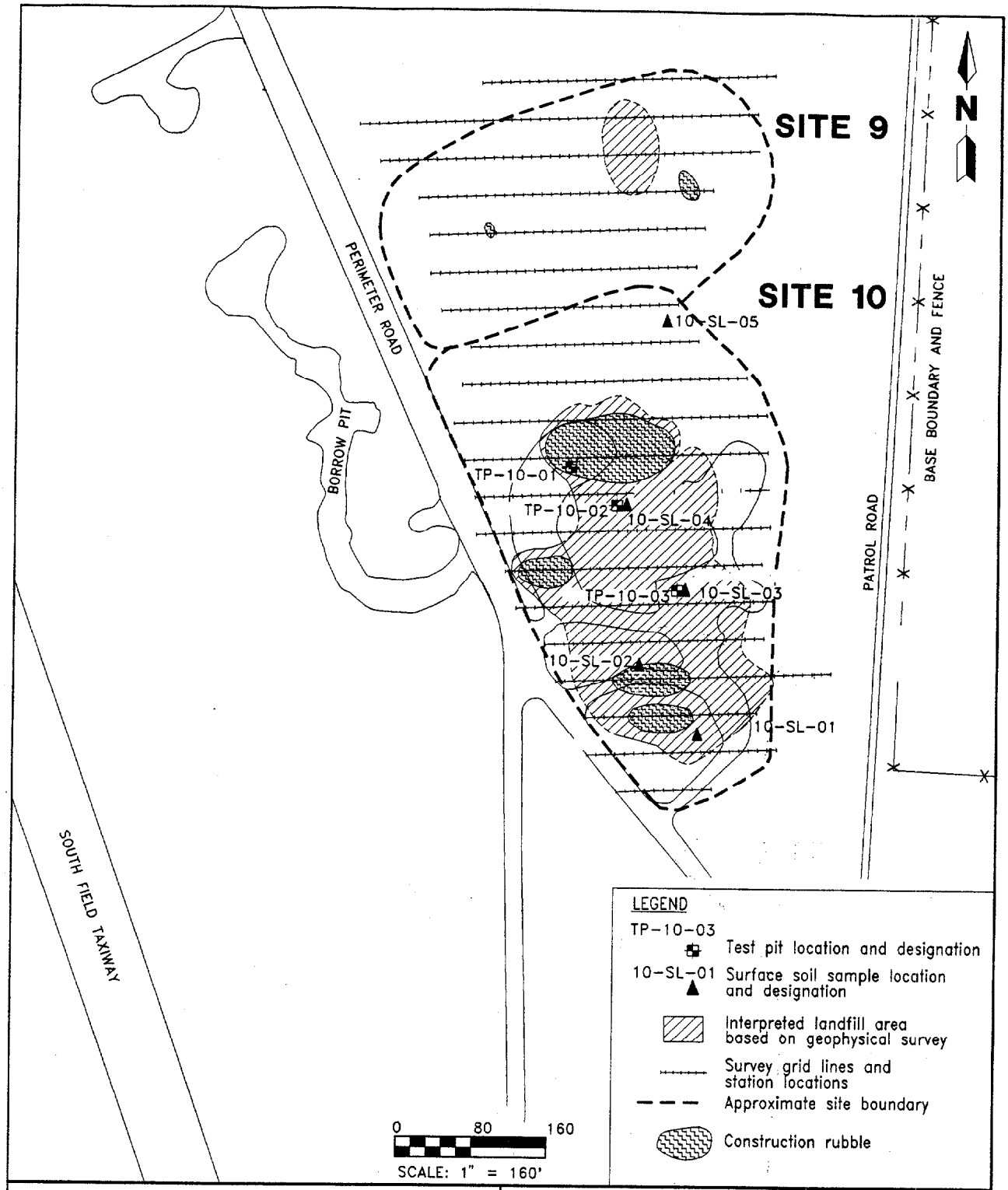


**FIGURE 2-2**
**SITES 9 AND 10**
**LOCATION OF SURFACE SOIL SAMPLES, TEST PITS, AND GEOPHYSICAL GRID LINES**

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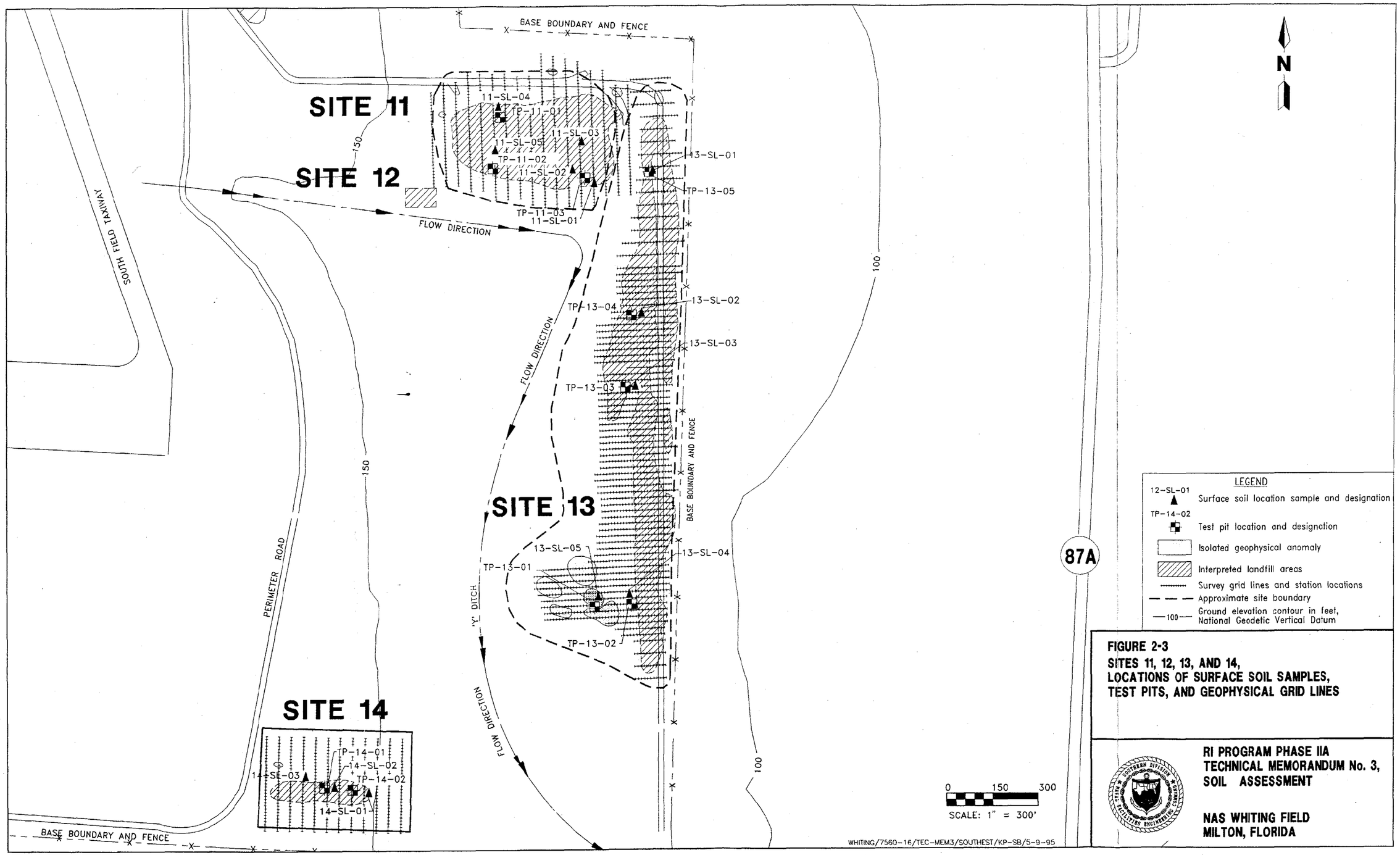
**NAS WHITING FIELD**
**MILTON, FLORIDA**

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- 12-SL-01 ▲ Surface soil location sample and designation
- TP-14-02 Test pit location and designation
- Isolated geophysical anomaly
- Interpreted landfill areas
- Survey grid lines and station locations
- Approximate site boundary
- —100— Ground elevation contour in feet, National Geodetic Vertical Datum

**FIGURE 2-3**
**SITES 11, 12, 13, AND 14, LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, AND GEOPHYSICAL GRID LINES**

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

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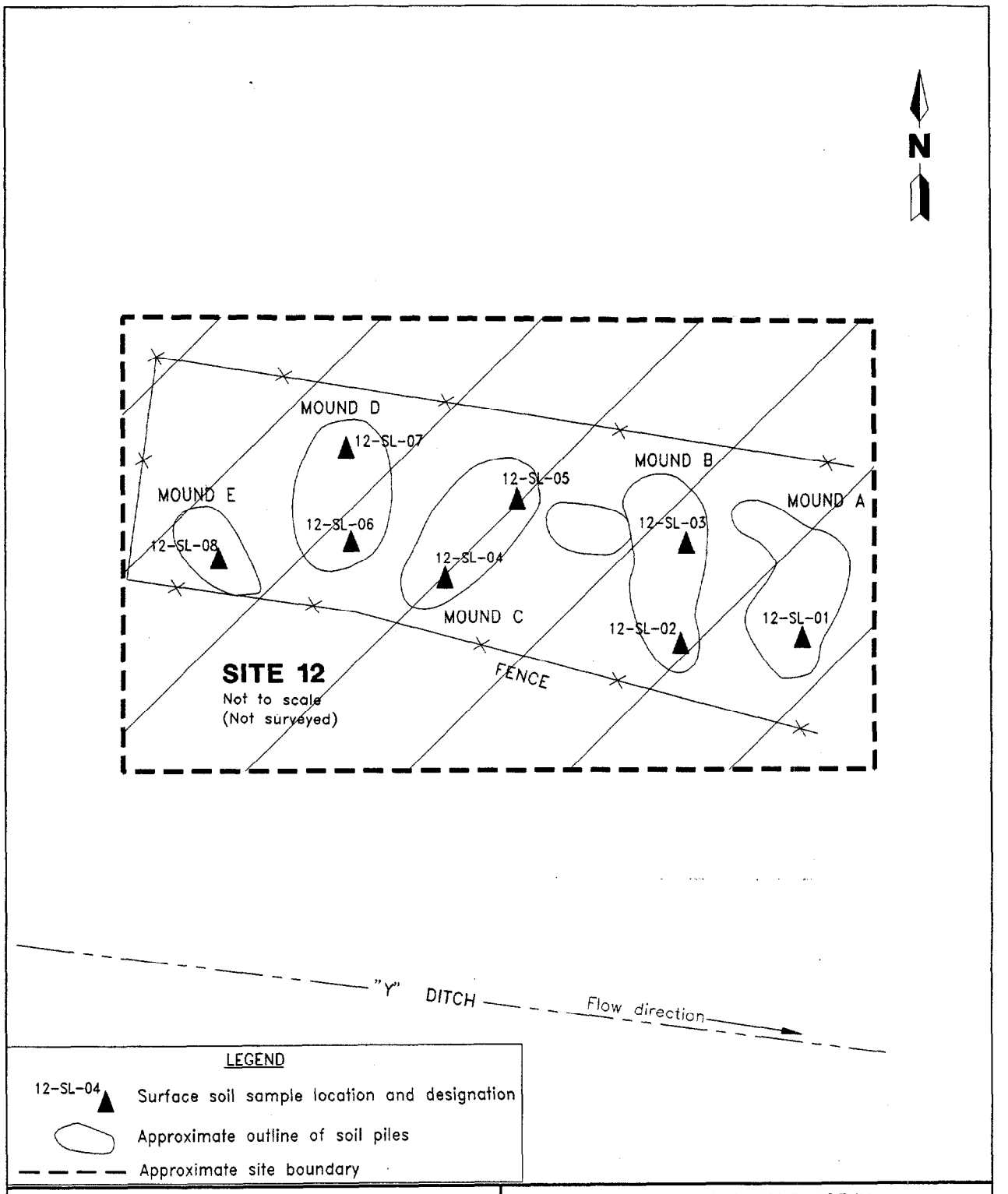


**FIGURE 2-4**
**SITE 12,**
**LOCATIONS OF SURFACE SOIL SAMPLES**

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**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

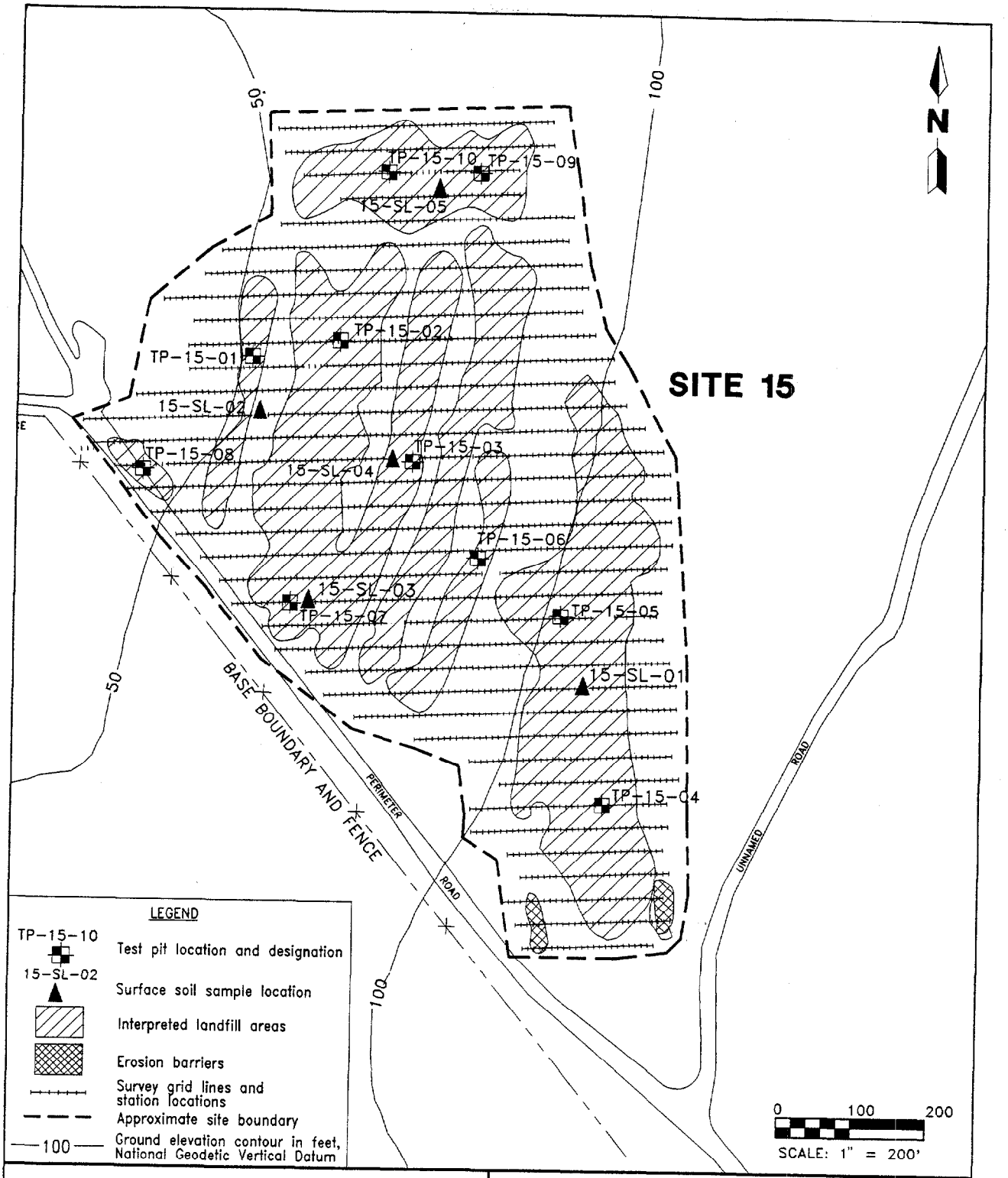


**FIGURE 2-5**
**SITE 15,**
**LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, AND GEOPHYSICAL GRID LINES**

WHITING/7560-16/TEC-MEM3/SOUTHEST/KP-SB/5-10-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

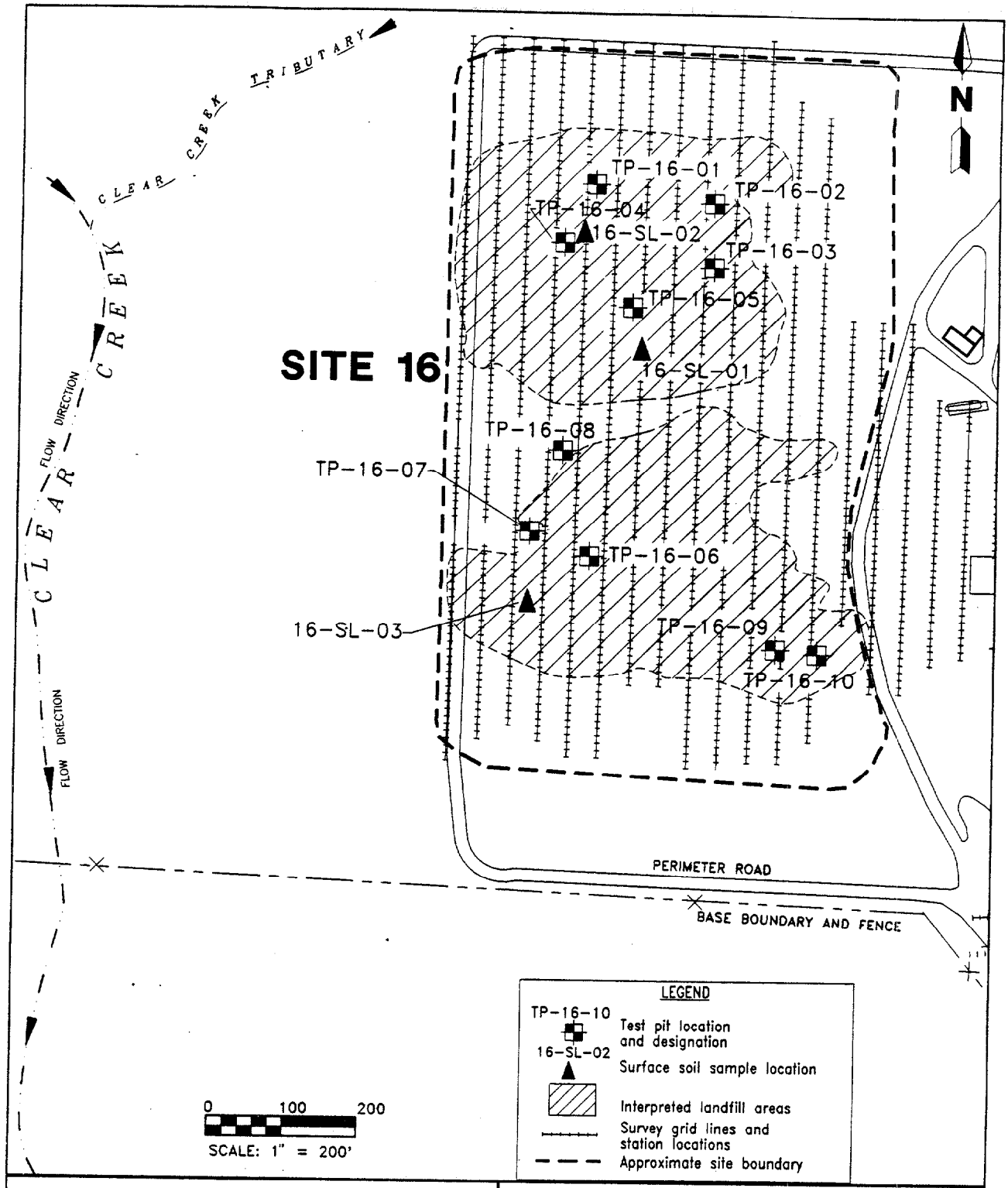


**FIGURE 2-6**
**SITE 16,**
**LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, AND GEOPHYSICAL GRID LINES**

WHITING/7560-16/TEC-MEM3/SOUTHEST/KP-SB/05/10/95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

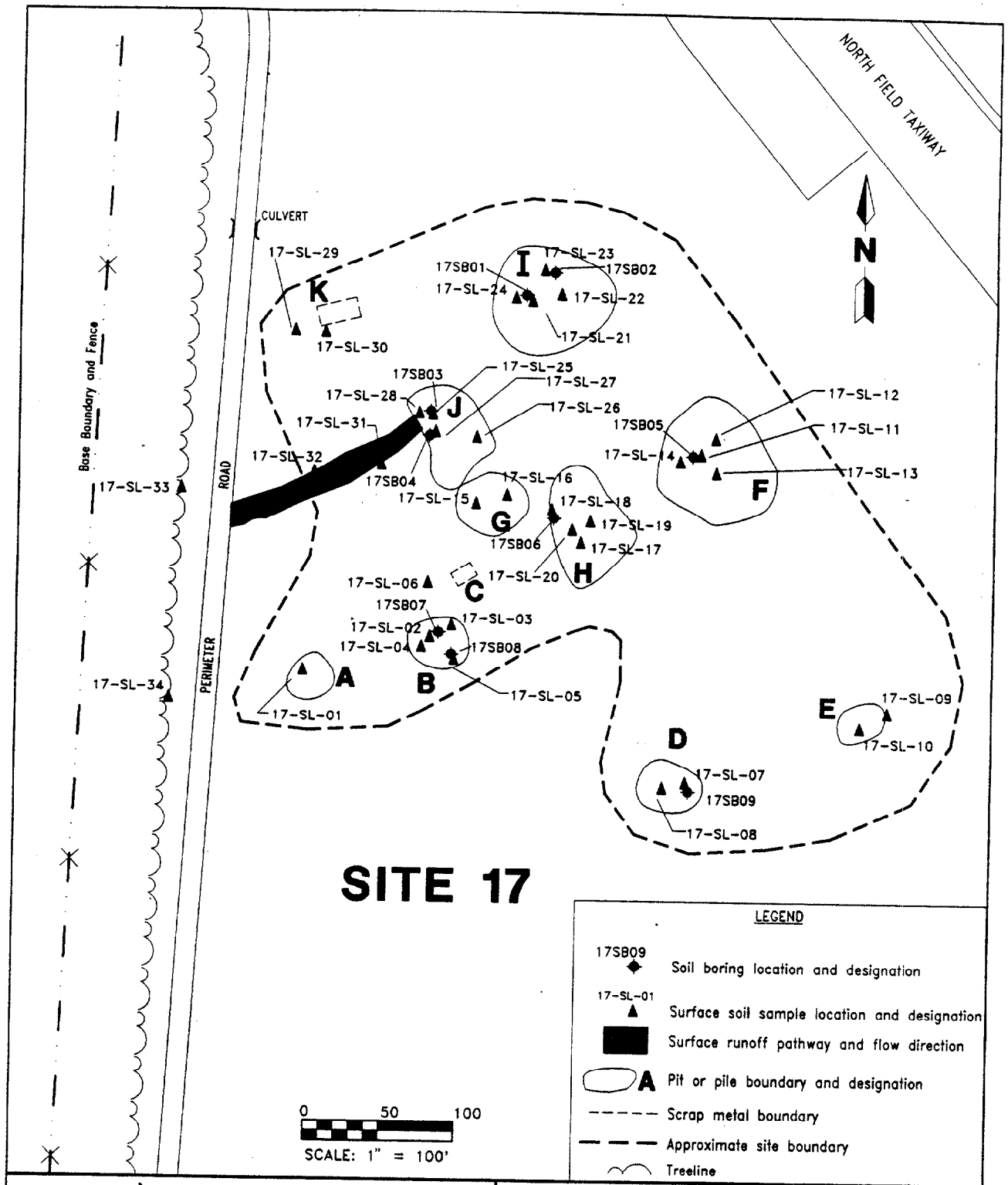


**FIGURE 2-7**
**SITE 17, LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORINGS, AND SAMPLED PITS AND PILES**

WHITING/7560-16/TEC-MEM3/northest/KP-SB/05-23-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

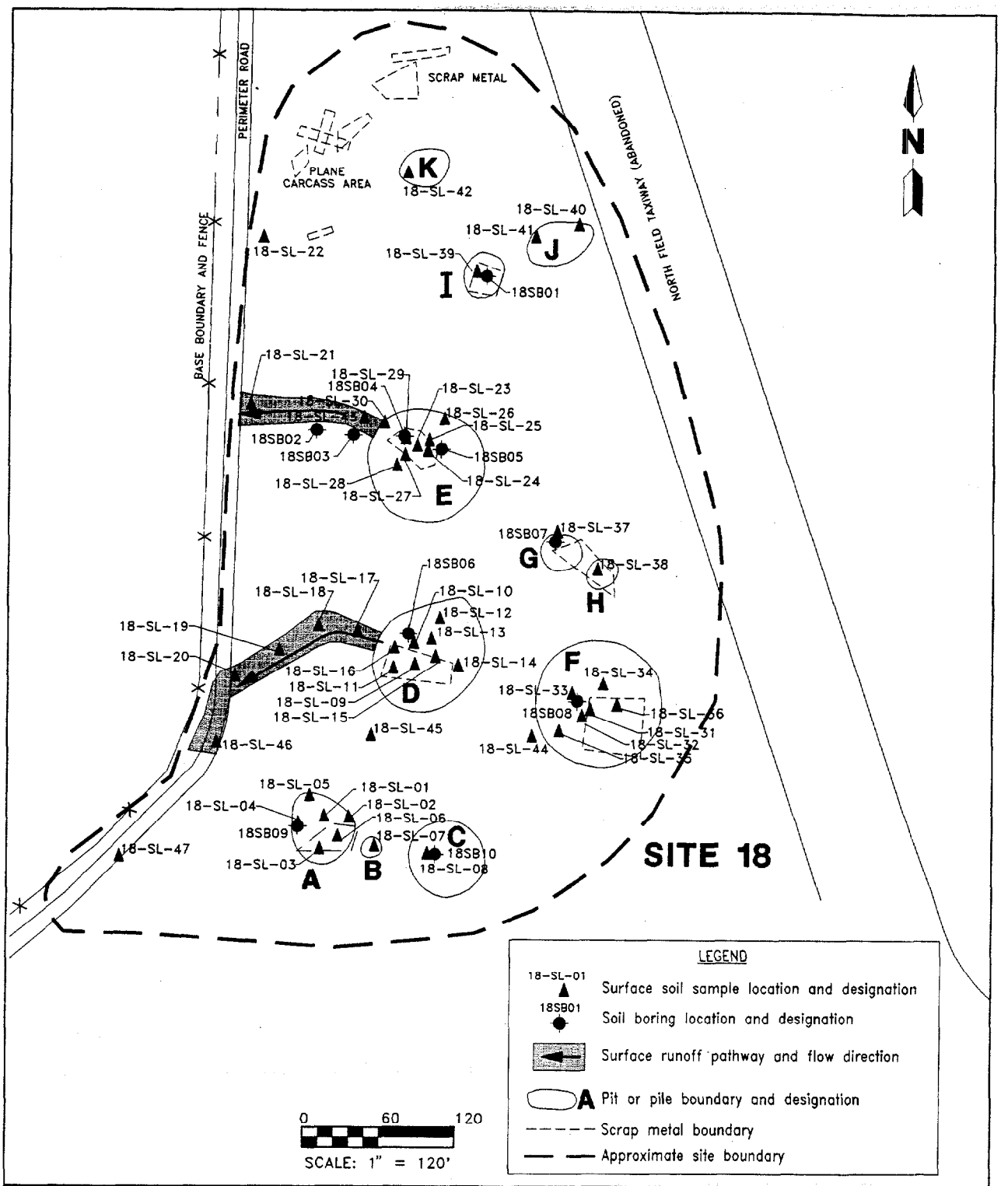


**FIGURE 2-8**
**SITE 18, LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORINGS, AND SAMPLED PITS AND PILES**

WHITING/7560-16/TEC-MEM3/SITE18/KP-SB/05-10-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

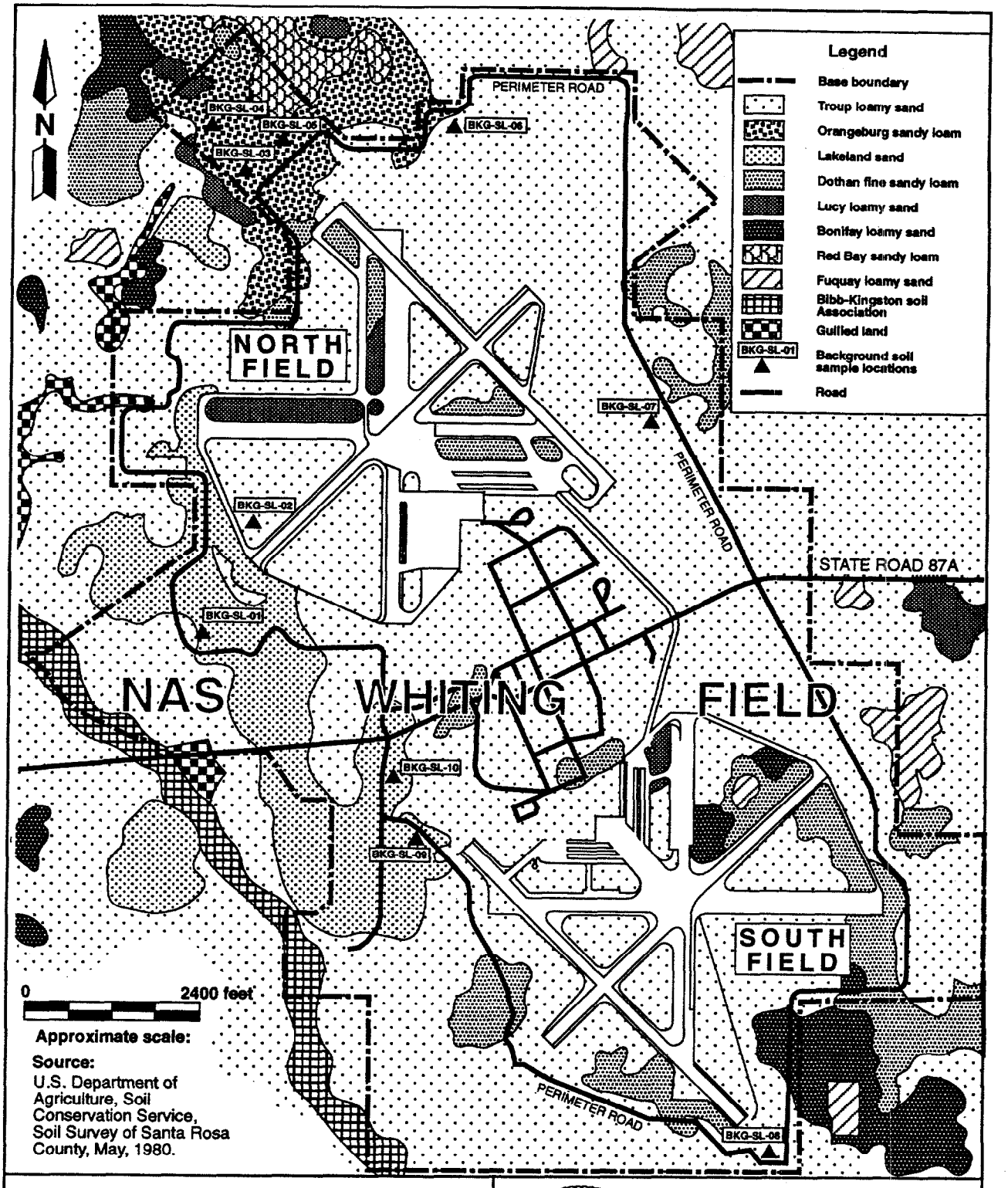


**FIGURE 2-9**

**NAS WHITING FIELD BACKGROUND SURFACE SOIL SAMPLE LOCATIONS AND ASSOCIATED SOIL TYPES**

**RI PROGRAM PHASE IIA, TECHNICAL MEMORANDUM NO. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD MILTON, FLORIDA**

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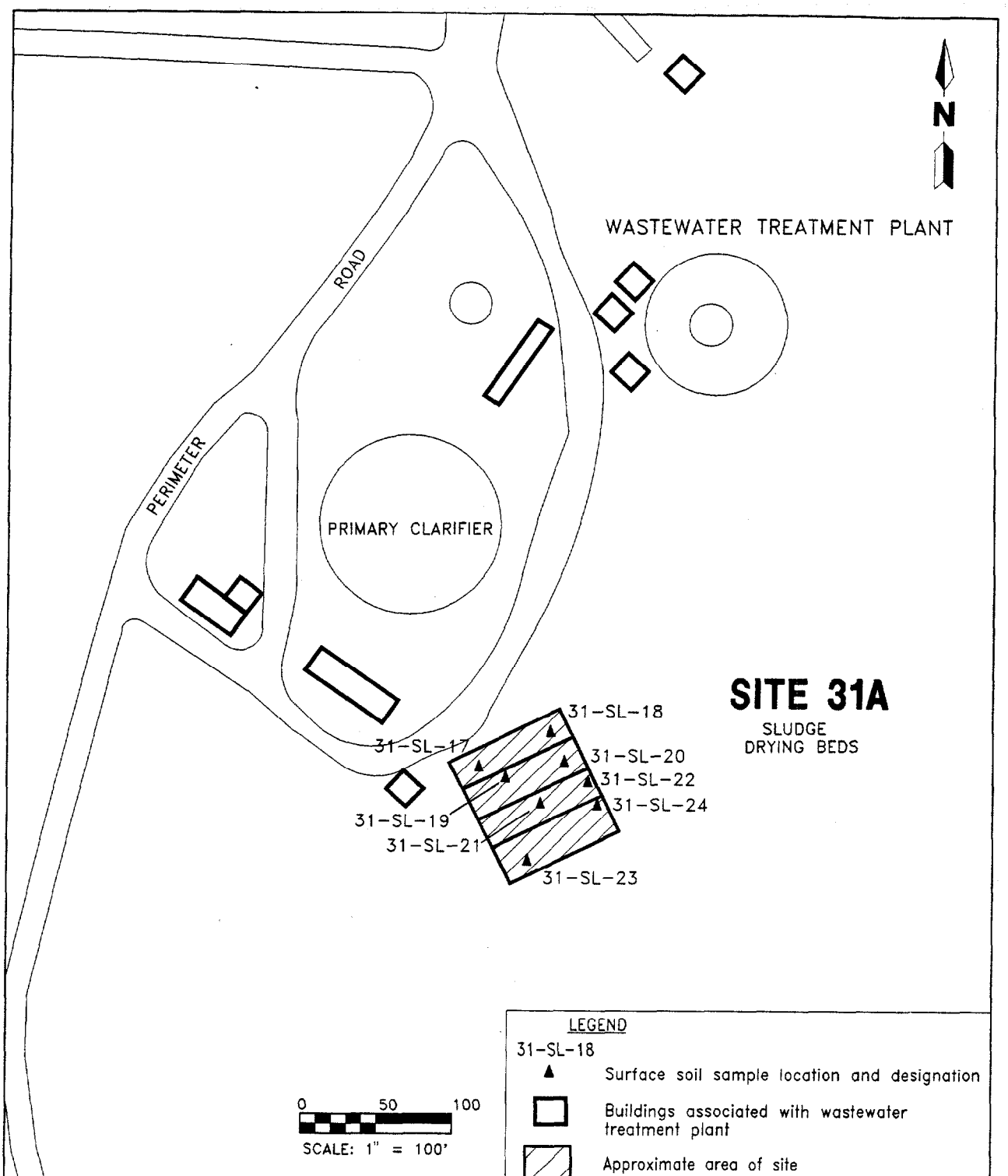


**FIGURE 2-10**
**SITE 31A,**
**LOCATIONS OF SURFACE SOIL SAMPLES**

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**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

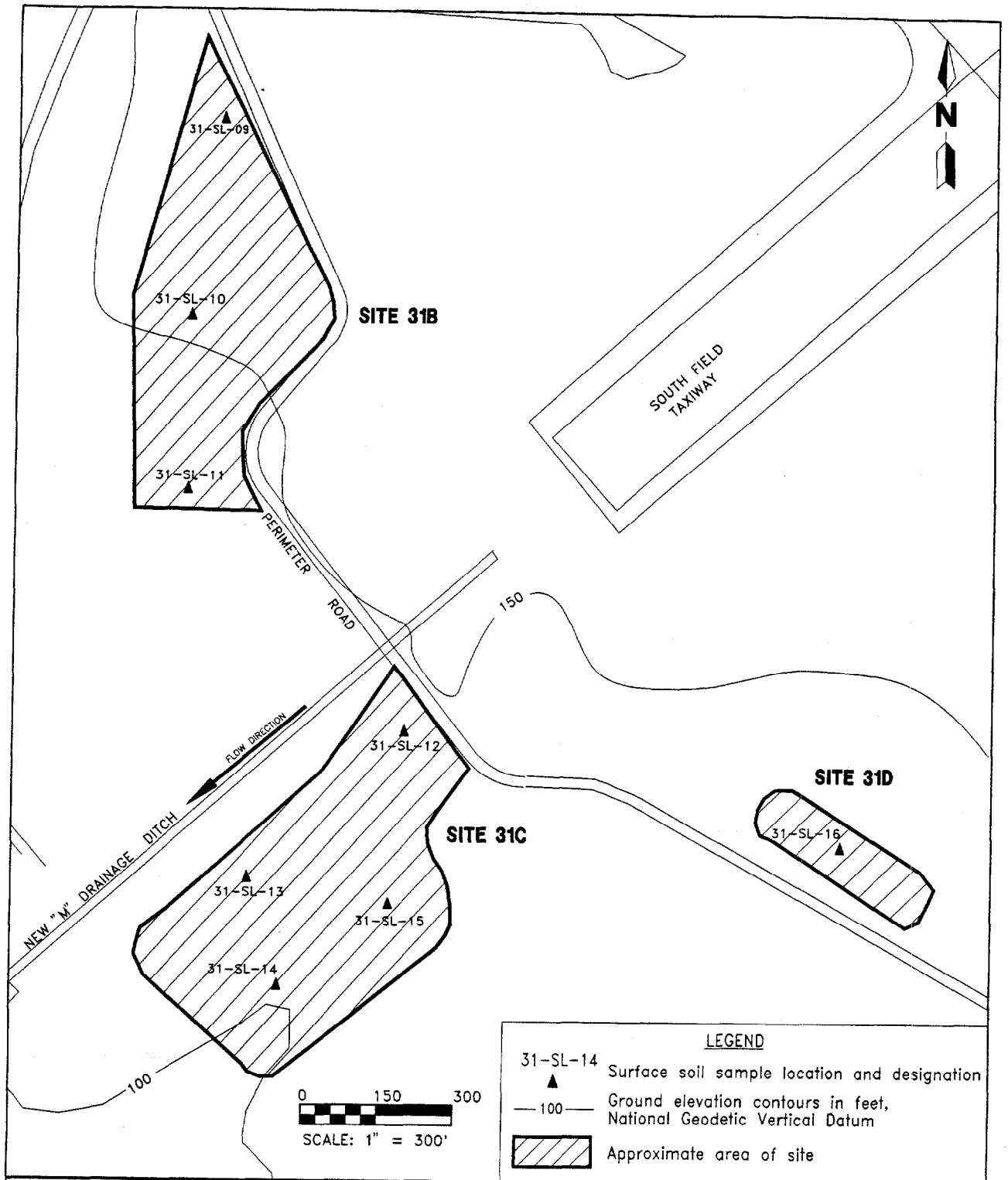


**FIGURE 2-11**
**SITES 31B, 31C, AND 31D,**
**LOCATIONS OF SURFACE SOIL SAMPLES**

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**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

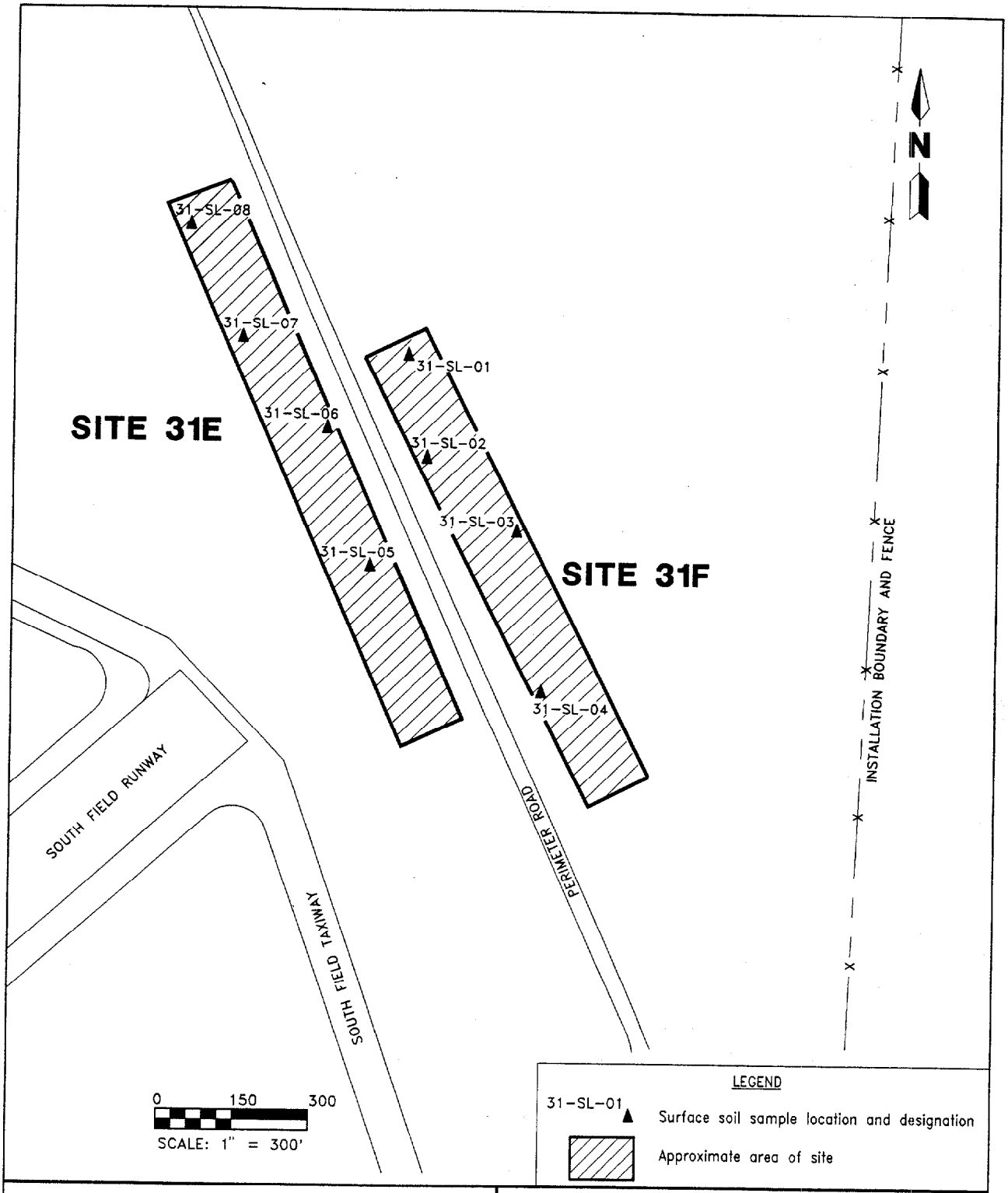


**FIGURE 2-12**
**SITES 31E AND 31F,**
**LOCATIONS OF SURFACE SOIL SAMPLES**

WHITING/7560-16/TEC-MEM3/SITE31EF/KGP-SB/05-10-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

Surface soil sample locations from the Landfill and Disposal Area sites were located within the boundaries where geophysical anomalies were interpreted to be present. Crash Crew Training Area surface soil sample locations were based on features such as burn pits, burnt airplane fuselages, and other miscellaneous debris associated with fire-fighting training.

Surface soil samples were collected from the land surface to a maximum depth of 12 inches bls using a decontaminated stainless-steel auger. To minimize volatilization, samples for VOC analyses were directly transferred from the stainless-steel auger bucket with a stainless-steel spoon into standard soil sample jars. The remaining sample was emptied into a glass bowl using a stainless-steel spoon. Soil samples for all other analyses were thoroughly mixed in a glass bowl prior to transferring into standard sample containers. All sample collection and equipment decontamination procedures were performed in accordance with the USEPA Region IV *Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual* (ECBSOPQAM) (USEPA, 1991). Soil samples were described and recorded in a bound field log book by ABB-ES personnel using the Unified Soil Classification System (USCS).

Surface soil samples were designated by "WHF" for Whiting Field, an RI/FS site number, followed by "SL," and a 2-digit integer representing the order of sampling at a particular RI site. For example, WHF-13-SL-01 represents the first surface soil sample location at RI Site 13. (For background samples, "BKG" replaces the RI site number). To conserve space, the prefix "WHF" is omitted from the sample designations used in this report.

The soil samples were placed on ice at 4 degrees Celsius (°C) and shipped in a cooler, under chain-of-custody protocols, to a Naval Energy and Environmental Support Activity (NEESA)-approved USEPA Contract Laboratory Program (CLP) laboratory and analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL metals and cyanide. The background surface soil samples were analyzed for TCL pesticides, PCBs, and polynuclear aromatic hydrocarbons (PAH) and TAL inorganics (Table 2-3).

Thirty-four samples from Site 17 and 47 samples from Site 18 were analyzed for TCL VOCs and SVOCs (including PAHs) and TAL metals and cyanide. Eight samples were analyzed for pesticides and PCBs from Site 17 and 13 from Site 18. Ten of the samples from Site 17 and 12 from Site 18 were collected from areas with visibly stained soils and were analyzed for TCLP VOCs and metals. Samples for TCLP analyses were collected at the centers of burn pits where high organic vapor analyzer (OVA) readings were recorded. A summary of sample analyses is presented in Table 2-3. The analytical results for the surface soil samples are presented in Section 4.3.

## 2.3 TEST PITTING AND SUBSURFACE SOIL SAMPLING, LANDFILL AND DISPOSAL AREA SITES.

Test pits were excavated between September 11, 1992, and October 8, 1992, at Sites 1, 10, 11, 13, 14, 15, and 16 following the completion of the geophysical survey. UXB International, Inc., from Chantilly, Virginia, was subcontracted by ABB-ES to conduct the test pit excavations.

Test pits were excavated at those locations where geophysical anomalies potentially defined buried materials. The purpose of the test pits were to characterize associated wastes by the description, collection, and analyses of

**Table 2-3**
**Summary of Surface Soil Sample Analyses**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Samples Collected Per Chemical Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | TCL VOC | TCL SVOC | TCL Pesticide and PCB | TAL Total Metals | TAL Cyanide | PAH | TCLP VOC and Metals |
| 1 | Northwest Disposal Area | 3 | 3 | 3 | 3 | 3 | 0 | 0 |
| 10 | Southeast Open Disposal Area (A) | 5 | 5 | 5 | 5 | 5 | 0 | 0 |
| 11 | Southeast Open Disposal Area (B) | 5 | 5 | 5 | 5 | 5 | 0 | 0 |
| 13 | Sanitary Landfill | 5 | 5 | 5 | 5 | 5 | 0 | 0 |
| 14 | Short-term Sanitary Landfill | 3 | 3 | 3 | 3 | 3 | 0 | 0 |
| 15 | Southwest Landfill | 5 | 5 | 5 | 5 | 5 | 0 | 0 |
| 16 | Open Disposal and Burning Area | 3 | 3 | 3 | 3 | 3 | 0 | 0 |
| 17 | Crash Crew Training Area | 34 | 34 | 8 | 34 | 34 | 0 | 10 |
| 18 | Crash Crew Training Area | 47 | 47 | 13 | 47 | 47 | 0 | 12 |
| 31 | Sludge Drying Beds and Disposal Areas | 24 | 24 | 24 | 24 | 24 | 0 | 0 |
| Background | | 0 | 0 | 10 | 10 | 10 | 10 | 0 |

Notes: TCL = target compound list.
VOC = volatile organic compound.
SVOC = semivolatile organic compound.
PCB = polychlorinated biphenyl.
TAL = target analyte list.
PAH = polynuclear aromatic hydrocarbon.
TCLP = toxicity characteristic leaching procedure.

subsurface soil samples. The analytical data were used to characterize the nature of soil contamination within the test pit.

Prior to excavating each test pit, the proposed areal dimensions and orientations of each test pit were surveyed by UXB with a hand held magnetometer, a terrain conductivity meter (FEREX™ 4.021), and in some cases a metal detector. Actual locations and dimensions of the test pits were based on the following criteria:

- areas where geophysical signal transmissions ran from high to low or vice versa,
- areas where a geophysical anomaly was persistent over an extended part of the site, and
- the orientation of a test pit was selected to be perpendicular to the long dimension of a given geophysical anomaly.

Table 2-4 summarizes the number of test pits excavated and samples collected at each RI site. The number of test pits excavated was based on the size and number of geophysical anomalies encountered at each site. Locations of the test pits are shown in Figures 2-1 through 2-3 and Figures 2-5 and 2-6.

Site-specific field activities for excavation of test pits included clearing of vegetation and surveying the test pit location with a terrain conductivity meter or magnetometer. After the test pit location and orientation had been determined, the four corners of the test pit were staked. The staked locations were referenced to the grid coordinates defined for the geophysical survey. A backhoe was used to excavate a rectangular trench or pit. Typical dimensions of the test pits were 12 feet long by 3 feet wide by 10 feet deep. Some test pits were as long as 20 feet (Site 15) and others as shallow as 4 feet (Site 13). The vertical dimensions of the test pits were recorded in the test pit logs, which are included in Appendix B. Each test pit was designated by the RI site number and an integer sequence from 1 to 10, according to the order of excavation (example, test pit TP–10-04 was the fourth test pit excavated at Site 10) at a particular site. Each test pit sample was designated by the RI site number, followed by "SS", the test pit number, and an integer representing the order of sampling in a particular test pit. These units were separated by hyphens. For example, sample 13-SS-05-03 was the third sample collected from the fifth test pit at Site 13. Following sample collection, each test pit was backfilled with excavated soil and the backhoe arm and bucket were decontaminated with a steam cleaner prior to the excavation of the next test pit.

The physical description of each soil layer and waste type was recorded in the field log book during test pit excavation (Appendix B).

Typically, one subsurface soil sample was collected from each test pit. No subsurface soil samples were collected from test pits that did not contain domestic or industrial wastes or other refuse. Soil samples for VOC analyses were collected with a decontaminated stainless-steel spoon directly from the backhoe bucket and placed into a sample jar. Additional sample portions were scooped from the backhoe bucket with a stainless-steel spoon, mixed thoroughly in a glass bowl, and then transferred to the appropriate standard sample containers. Soil sample collection and equipment decontamination procedures were conducted in accordance with USEPA Region IV ECBSOPQAM (1991). Test pit sampling information from each RI site are summarized in Table 2-4.

## Table 2-4
## Summary of Sample Collection From Test Pits

Remedial Investigation and Feasibility Study, Phase IIA
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NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Test Pits | Designations of Sampled Test Pits | Number of Samples | Sample Number | Collection Date | Sample Depth (feet bls) |
|---|---|---|---|---|---|---|---|
| 1 | Northwest Disposal Area | 1 | TP-01-01 | 1 | 01-SS-00-01 | 10/08/92 | 5 to 6 |
| 10 | Southeast Open Disposal Area (A) | 5 | TP-10-02 | 3 | 10-SS-02-01 | 10/07/92 | 4 to 5 |
| | | | TP-10-03 | | 10-SS-03-02 | 10/07/92 | 6 to 8 |
| | | | TP-10-05 | | 10-SS-05-03 | 10/07/92 | 8 to 9.5 |
| 11 | Southeast Open Disposal Area (B) | 3 | TP-11-01 | 3 | 11-SS-01-01 | 10/07/92 | 7 to 8 |
| | | | TP-11-02 | | 11-SS-02-02 | 10/08/92 | 5 to 6 |
| | | | TP-11-03 | | 11-SS-03-03 | 10/08/92 | 5 to 6 |
| 13 | Sanitary Landfill | 5 | TP-13-02 | 3 | 13-SS-02-01 | 10/06/92 | 5 to 6 |
| | | | TP-13-03 | | 13-SS-03-02 | 10/06/92 | 8 to 10 |
| | | | TP-13-05 | | 13-SS-05-03 | 10/06/92 | 8 to 9 |
| 14 | Short-term Sanitary Landfill | 2 | TP-14-01 | 2 | 14-SS-01-01 | 10/08/92 | 5 to 6 |
| | | | TP-14-02 | | 14-SS-02-02 | 10/08/92 | 11.5 to 12.5 |
| 15 | Southwest Landfill | 10 | TP-15-02 | 5 | 15-SS-02-01 | 10/02/92 | 10 |
| | | | TP-15-05 | | 15-SS-05-02 | 10/03/92 | 10 to 12 |
| | | | TP-15-06 | | 15-SS-06-03 | 10/03/92 | 10 to 12 |
| | | | TP-15-08 | | 15-SS-08-04 | 10/04/92 | 4 to 5 |
| | | | TP-15-10 | | 15-SS-10-05 | 10/04/92 | 10 |
| 16 | Open Disposal and Burning Area | 10 | TP-16-02 | 5 | 16-SS-02-01 | 10/04/92 | 2 to 3.5 |
| | | | TP-16-03 | | 16-SS-03-02 | 10/04/92 | 6 to 8 |
| | | | TP-16-04 | | 16-SS-04-03 | 10/05/92 | 9 to 10 |
| | | | TP-16-06 | | 16-SS-06-04 | 10/05/92 | 10.5 |
| | | | TP-16-10 | | 16-SS-10-05 | 10/05/92 | 2 |

Note: bls = below land surface.

Twenty-two subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL metals and cyanide. The results of the chemical analyses of the test pit soil samples are presented in Section 4.4.

**2.4 SOIL GAS SURVEY, INDUSTRIAL AREA SITES.** A passive soil gas survey was conducted using the Petrex™ method at Industrial Area Sites 3, 5, 6, 29, 30, 32, and 33. A total of 221 Petrex™ soil gas sample collection jars were installed at the selected Industrial Area sites from June 14 through June 24, 1992. The field effort for the soil gas survey was conducted by Northeast Research Institute (NERI) of Farmington, Connecticut. The objective of the soil gas survey was to locate potential source areas and, if possible, assess the horizontal extent of contamination. The results of the survey were used to locate soil borings and to collect subsurface soil samples in areas where VOCs were released to the environment.

The soil gas samples were shipped, under chain-of-custody protocols, to the NERI laboratory and analyzed for target VOCs: BTEX; tetrachloroethene (PCE), and TCE and target SVOCs: cycloalkanes and naphthalenes.

Details of the soil gas sample collection, analysis, results, and interpretations are documented in a summary report located in Appendix C (ABB-ES, 1993c).

The following subsections provide a brief summary of the soil gas survey field program for the Industrial Area sites.

**2.4.1 Site 3 and Site 32 (North Field Maintenance Hangar Area)** A total of 106 Petrex™ soil gas samplers were installed at the North Field Maintenance Hangar Area. The samplers were placed on approximately 80-foot centers surrounding the maintenance hangar buildings at Site 3 (Underground Waste Solvent Storage Area) and Site 32 (North Field Maintenance Hangar Area).

**2.4.2 Site 29 and Site 30 (South Field Maintenance Hangar Area)** A total of 71 Petrex™ soil gas samplers were installed at the South Field Maintenance Hangar Area. This survey area consisted of two neighboring sites: the Auto Hobby Shop Area (Site 29) and the South Field Maintenance Hangar (Site 30).

**2.4.3 Sites 5, 6, and 33 (Midfield Maintenance Hangar Area)** Sites within the boundary of the Midfield Maintenance Hangar Area soil gas grid included Site 5 (Battery Acid Shop), Site 6 (South Transformer Oil Disposal Area), and Site 33 (Midfield Maintenance Hangar). Although Sites 5 and 6 are within the soil gas survey grid, the focus of the survey was on Site 33 due to the nature of Site 33 waste disposal activities (Table 1-2).

**2.5 SUBSURFACE SOIL SAMPLING, SOIL BORINGS.** A total of 204 subsurface soil samples were collected between December 1, 1992, and January 27, 1993, from Industrial Area sites (3, 6, 29, 30, 32, and 33) and the Crash Crew Training Area sites (17 and 18).

One hundred and fifty-two subsurface soil samples were collected from a total of 52 soil borings drilled at Industrial Area sites and 42 subsurface soil samples were collected from a total of 20 soil borings drilled at the Crash Crew Training Area sites. Table 2-5 summarizes the number of soil borings drilled at each site,

## Table 2-5
## Summary of Soil Boring Sample Collection

Remedial Investigation and Feasibility Study, Phase IIA
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NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Borings | Number of Samples | Sample Identification | Sampling Interval[1] (feet bls) | Features Associated with Boring Locations |
|---|---|---|---|---|---|---|
| **Industrial Area Sites** | | | | | | |
| 3 | Underground Waste Solvent Storage Area | 10 | 33 | 3SB1 | 0, 1, 5, 15, and 25 | Waste oil, waste solvent tanks, and soil gas anomalies. |
| | | | | 3SB2 | 1, 5, and 10 | |
| | | | | 3SB3 | 0, 5, and 10 | |
| | | | | 3SB4 | 0, 5, and 10 | |
| | | | | 3SB5 | 1, 5, and 10 | |
| | | | | 3SB6 | 1, 5, 10, 15, 25, 70, and 100 | |
| | | | | 3SB7 | 10 | |
| | | | | 3SB8 | 10 and 15 | |
| | | | | 3SB9 | 1, 5, 15, and 30 | |
| | | | | 3SB10 | 10 and 15 | |
| 6 | South Transformer Oil Disposal Area | 4 | 17 | 6SB1 | 5, 15, and 20 | Drainage ditch channeling surface discharge from the Midfield hangar, transformer oil, and an abandoned underground storage tank near the ditch. |
| | | | | 6SB2 | 0, 15, and 20 | |
| | | | | 6SB3 | 0, 5, 10, 15, 25, 60, and 117 | |
| | | | | 6SB4 | 0, 5, 10, and 20 | |
| 29 | Auto Hobby Shop | 5 | 15 | 29SB1 | 0, 5, 60, and 125 | Abandoned waste oil and mineral spirits tank. Soil gas anomalies. |
| | | | | 29SB2 | 0 and 12 | |
| | | | | 29SB3 | 0 and 10 | |
| | | | | 29SB4 | 0, 5, and 15 | |
| | | | | 29SB5 | 0, 5, 10, and 15 | |

See notes at end of table.

## Table 2-5 (Continued)
## Summary of Soil Boring Sample Collection

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Borings | Number of Samples | Sample Identification | Sampling Interval[1] (feet bls) | Features Associated with Boring Locations |
|---|---|---|---|---|---|---|
| **Industrial Area Sites (Continued)** | | | | | | |
| 30 | South Field Maintenance Hangar Area | 7 | 23 | 30SB1 | 2, 5, 10, 15, 35, 60, and 120 | Abandoned waste oil tank, solvent, detergent and kerosene tanks, soil gas anomalies, and the South Field washrack. |
| | | | | 30SB2 | 0, 10, and 20 | |
| | | | | 30SB3 | 0 and 10 | |
| | | | | 30SB4 | 0, 5, 10, 15, and 25 | |
| | | | | 30SB5 | 0 and 15 | |
| | | | | 30SB6 | 0 and 10 | |
| | | | | 30SB7 | 0 and 10 | |
| 32 | North Field Maintenance Hangar Area | 8 | 41 | 32SB1 | 1, 5, 10, 15, 20, 25, 35, and 50 | Kerosene, solvent and detergent underground storage tanks, plus washrack and soil gas anomalies. |
| | | | | 32SB2 | 0, 5, and 12 | |
| | | | | 32SB3 | 0, 5, 10, 20, and 30 | |
| | | | | 32SB4 | 0, 15, 20, 25, 35, and 45 | |
| | | | | 32SB5 | 1, 5, 10, 20, 45, 61, and 95 | |
| | | | | 32SB6 | 0, 5, 10, 20 30, and 45 | |
| | | | | 32SB7 | 0, 5, 15, and 30 | |
| | | | | 32SB8 | 5 and 13 | |
| | | 3 | 12 | WRSB1 | 5, 10 15, and 20 | North Field washrack |
| | | | | WRSB2 | 5, 10, 15, and 20 | |
| | | | | WRSB3 | 5, 10, 15, and 20 | |
| 33 | Midfield Maintenance Hangar Area | 5 | 22 | 33SB1 | 3, 10, and 25 | Abandoned waste oil, fuel, and solvent tank, and soil gas anomalies. |
| | | | | 33SB2 | 2, 5, 10, 15, 35, 60, 80, 95, and 120 | |
| | | | | 33SB3 | 4, 10, and 15 | |
| | | | | 33SB4 | 3, 5, and 15 | |
| | | | | 33SB5 | 0, 5, 10, and 20 | |

See notes at end of table.

## Table 2-5 (Continued)
## Summary of Soil Boring Sample Collection

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Borings | Number of Samples | Sample Identification | Sampling Interval[1] (feet bls) | Features Associated with Boring Locations |
|---|---|---|---|---|---|---|
| **Crash Crew Training Area Sites** | | | | | | |
| 17 | Crash Crew Training Area | 9 | 18 | 17SB1 | 5 and 15 | Seven visually identified burn pits, runoff pathway, and one stained area. |
| | | | | 17SB2 | 5 and 10 | |
| | | | | 17SB3 | 10 | |
| | | | | 17SB4 | 5 and 10 | |
| | | | | 17SB5 | 5, 10, and 20 | |
| | | | | 17SB6 | 5 and 10 | |
| | | | | 17SB7 | 5 and 15 | |
| | | | | 17SB8 | 5 and 10 | |
| | | | | 17SB9 | 5 and 10 | |
| 18 | Crash Crew Training Area | 8 | 24 | 18SB1 | 5 and 10 | Five visually identified burn pits and runoff pathway. |
| | | | | 18SB2 | 5, 10, 15, and 20 | |
| | | | | 18SB4 | 5, 10, 15, 25, 35, and 40 | |
| | | | | 18SB6 | 5, 10, 15, and 20 | |
| | | | | 18SB7 | 5 and 15 | |
| | | | | 18SB8 | 5, 10, and 15 | |
| | | | | 18SB9 | 5 and 15 | |
| | | | | 18SB10 | 5 | |

[1] The numbers under 'sampling interval' denote the depth at the top of the 2-foot split-spoon sample.

Notes: bls = below land surface.
AVGAS = aviation gasoline.

the total number of subsurface soil samples collected from each site, the sampling depths, and features that are potential source areas.

To minimize volatilization, samples for VOC analyses were transferred directly from a split spoon into standard soil sample jars with a stainless-steel spoon. Soil samples collected with a split-spoon sampler were screened for organic vapors with an OVA equipped with a flame ionization detector (FID). The physical description of the soil sample was recorded in the field log book by ABB-ES personnel using the USCS. Soil boring sample collection and equipment decontamination was conducted in accordance with the USEPA Region IV ECBSOPQAM (1991).

Termination depth of samples collected for laboratory analyses was primarily determined based on OVA readings. If OVA readings exceeded ambient air levels for the last (deepest) soil sample proposed for collection and analysis, the soil boring was continued until OVA readings were at or below the ambient air levels, at which point a sample was collected for laboratory analysis. The OVA measurements are included in Appendix B, Technical Memorandum No. 2, as part of the lithologic soil boring logs (ABB-ES, 1995a).

Soil samples for VOC analyses were collected from split-spoon samples using a stainless-steel spoon and transferred to sample jars. Soil samples for analyses of SVOCs, pesticides, PCBs, inorganics, and cyanide were mixed thoroughly in a glass bowl prior to transferring into the appropriate standard sample container. All subsurface soil samples collected were placed on ice and shipped in a cooler, under chain-of-custody protocols, to an NEESA-approved CLP laboratory and analyzed for TCL VOCs, SVOCs, pesticides, PCBs and TPHs and TAL metals and cyanide.

Selected samples from the Crash Crew Training Area sites were also analyzed for TCLP metals, TCLP VOCs, and total organic carbon (TOC). These samples were collected from centers of the most recent burn pits located at the Crash Crew Training Area sites and areas of detected contaminants based on OVA readings.

Soil borings were designated by RI site numbers, followed by "SB", and an integer representing the order of drilling at a particular site. For samples collected at the North Field Washrack, the designation "WR" replaced the RI site number. Samples collected from each boring location were designated by the boring designation followed by the depth interval (in feet) of sample retrieval, separated by hyphens. For example, 30SB4-10-12 represents the fourth soil boring location at Site 30, which was sampled from the 10- to 12-foot bls interval.

All of the soil borings were drilled with 4.25-inch inside diameter (ID) hollow-stem auger, except for 17SB10, which was completed with a stainless-steel hand auger. The upper 2 to 4 feet bls of each soil boring location was initially excavated with a post-hole digger to avoid damage to buried utilities such as pipelines or electrical cables. Soil samples were collected at depth intervals of 5 feet with a 2-foot split-spoon sampler using American Society for Testing and Materials (ASTM) Method D1586 (Table 2-5).

Table 2-6 presents a summary of the chemical analyses performed on the subsurface soil samples collected at the Crash Crew Training Area sites and the Industrial Area sites. The results of the chemical analyses for the soil boring samples are presented in Subsections 4.5.1 and 4.5.2.

## Table 2-6
## Summary of Soil Boring Sample Analyses

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Number | Site Name | Number of Samples Collected Per Chemical Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | TCL VOC | TCL SVOC | TCL Pesticide and PCB | TAL (Total) Metals and Cyanide | TPHs | TCLP Metals | TOC |
| 3 | North Field Maintenance Hangar Area | 33 | 33 | 33 | 33 | 33 | 0 | 0 |
| 6 | South Transformer Oil Disposal Area | 17 | 17 | 17 | 17 | 4 | 0 | 0 |
| 17 | Crash Crew Training Area (A) | 18 | 18 | 18 | 18 | 18 | 0 | 0 |
| 18 | Crash Crew Training Area (B) | 24 | 24 | 24 | 24 | 24 | 0 | 0 |
| 29 | Auto Hobby Shop | 15 | 15 | 15 | 15 | 15 | 0 | 0 |
| 30 | South Field Maintenance Hangar | 23 | 23 | 23 | 23 | 22 | 0 | 0 |
| 32 | North Field Maintenance Hangar | 53 | 53 | 41 | 41 | 41 | 0 | 0 |
| 33 | Midfield Maintenance Hangar | 22 | 22 | 22 | 22 | 22 | 1 | 1 |

Notes: TCL = target compound list.
VOC = volatile organic compound.
SVOC = semivolatile organic compound.
PCB = polychlorinated biphenyl.
TAL = target analyte list.
TPH = total petroleum hydrocarbon.
TCLP = toxicity characteristic leaching procedure.
TOC = total organic carbon.

One sample from Site 33 (Midfield Maintenance Hanger) was also analyzed for TOC and extractable metals using the TCLP.

**2.5.1 Sites 17 and 18, Crash Crew Training Area Sites** The Crash Crew Training Area sites are fire-fighting pits with visually definable boundaries; therefore, a geophysical survey was not conducted. Surface and subsurface soil contamination was assessed by the collection and analyses of surface and subsurface soil samples.

The objectives of the assessment were to characterize contaminants and assess the lateral and vertical extent of soil contamination at the fire-fighting training pits. Forty-two subsurface soil samples were collected from 20 soil borings drilled at Site 17 and Site 18. Surface and subsurface soil samples were also collected at surface water drainage paths that lead away from two of the larger pits at Site 18.

Figure 2-7 provides locations of soil borings at Site 17 and Figure 2-8 provides locations of soil borings at Site 18. Table 2-5 provides a summary of the number of borings, number of samples collected with sampling depth intervals, and nearby features associated with the soil boring locations at each site.

Two soil borings each were drilled in the burn pits most recently used for fire-fighting training activities at Site 17 (Pits B and J) and one at location I (airplane carcass) (Figure 2-7). In addition, three borings were drilled at the other three burn pits (Pits D, F, and H) at Sites 17. Three soil borings were drilled at the burn pit most recently used for fire-fighting training (Pit E) (Figure 2-8) and seven borings were drilled at Burn Pits A, C, D, F, G, and I and in the runoff pathway from Pit E at Site 18.

**2.5.2 Industrial Area Sites** The objectives of the soil investigations at the Industrial Area sites were to characterize the contaminants and assess the lateral and vertical extent of soil contamination resulting from waste liquids storage tank leaks, and releases of oil, solvents, paints, and fuel to the environment. Soil gas survey results were used to identify the locations of soil borings.

Soil borings were drilled at Industrial Area RI sites 3, 6, 29, 30, 32, and 33. Environmental samples were not collected at Industrial Area Sites 4, 7, and 8 because they are being assessed under the Navy UST program. Sites 3 and 32 are located at the North Field Maintenance Hangar (Figure 2-13). Sites 6 and 33 are located at the Midfield Maintenance Hangar (Figure 2-14). Site 29 is located at the Auto Hobby Shop. Site 30 is located at the South Field Maintenance Hangar (Figure 2-15).

One hundred and sixty-two subsurface soil samples were collected from 42 soil borings drilled at Industrial Area sites (3, 6, 29, 30, 32, and 33). The purpose of subsurface soil sampling activities was to assess the lateral and vertical extent of contamination. Table 2-5 provides a summary of the number of subsurface soil borings, number of subsurface soil samples collected with sampling intervals, and features associated with potential source areas at each site.

North Field Maintenance Hangar Area Sites. Seventy-three subsurface soil samples were collected from 18 soil borings drilled at Sites 3 and 32 (Table 2-5).

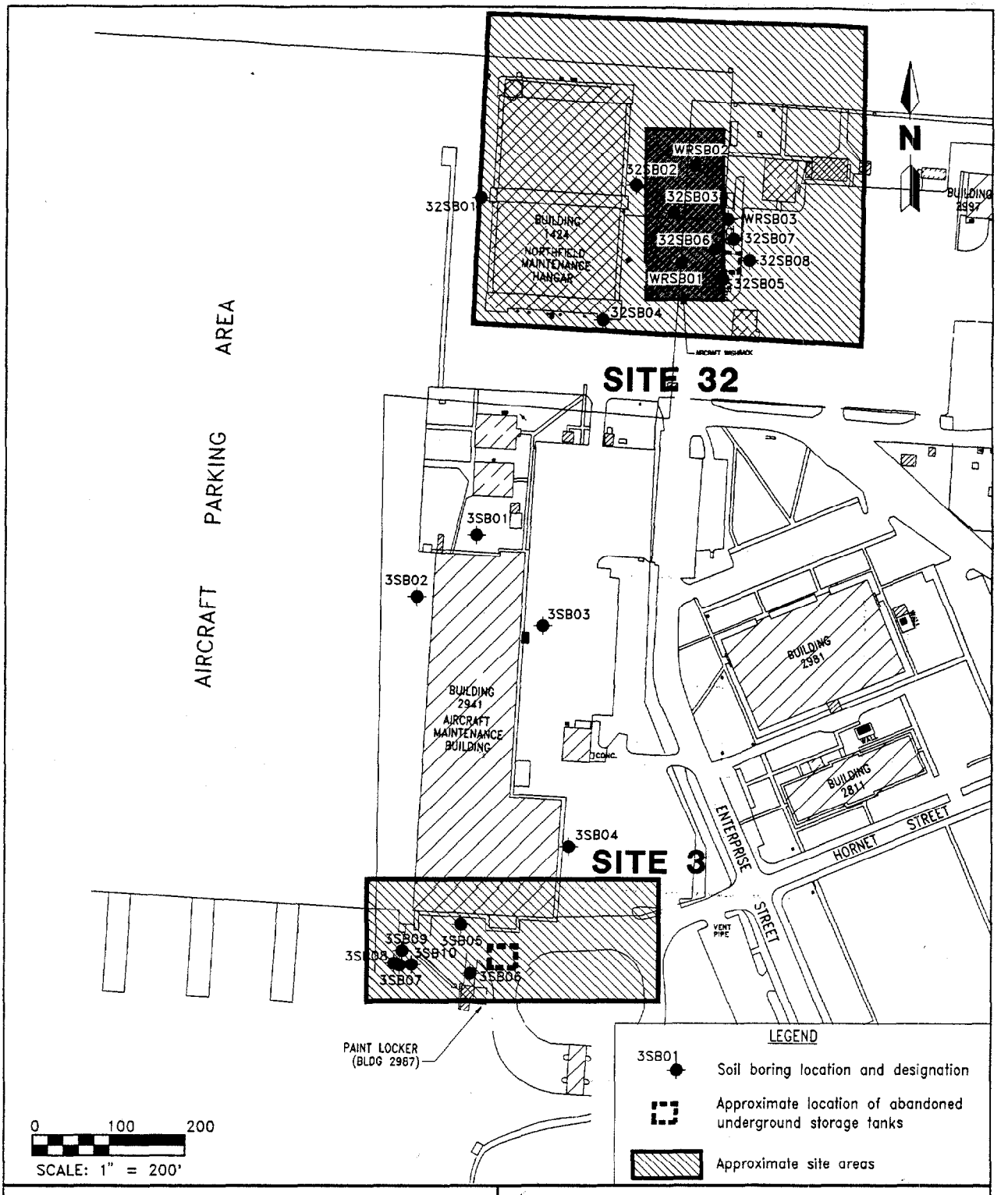


**FIGURE 2-13**
**SITES 3 AND 32,**
**LOCATIONS OF SOIL BORINGS**

WHITING/7560-16/TEC-MEM3/FIG-12/KGP-SB/05-23-95

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**NAS WHITING FIELD**
**MILTON, FLORIDA**

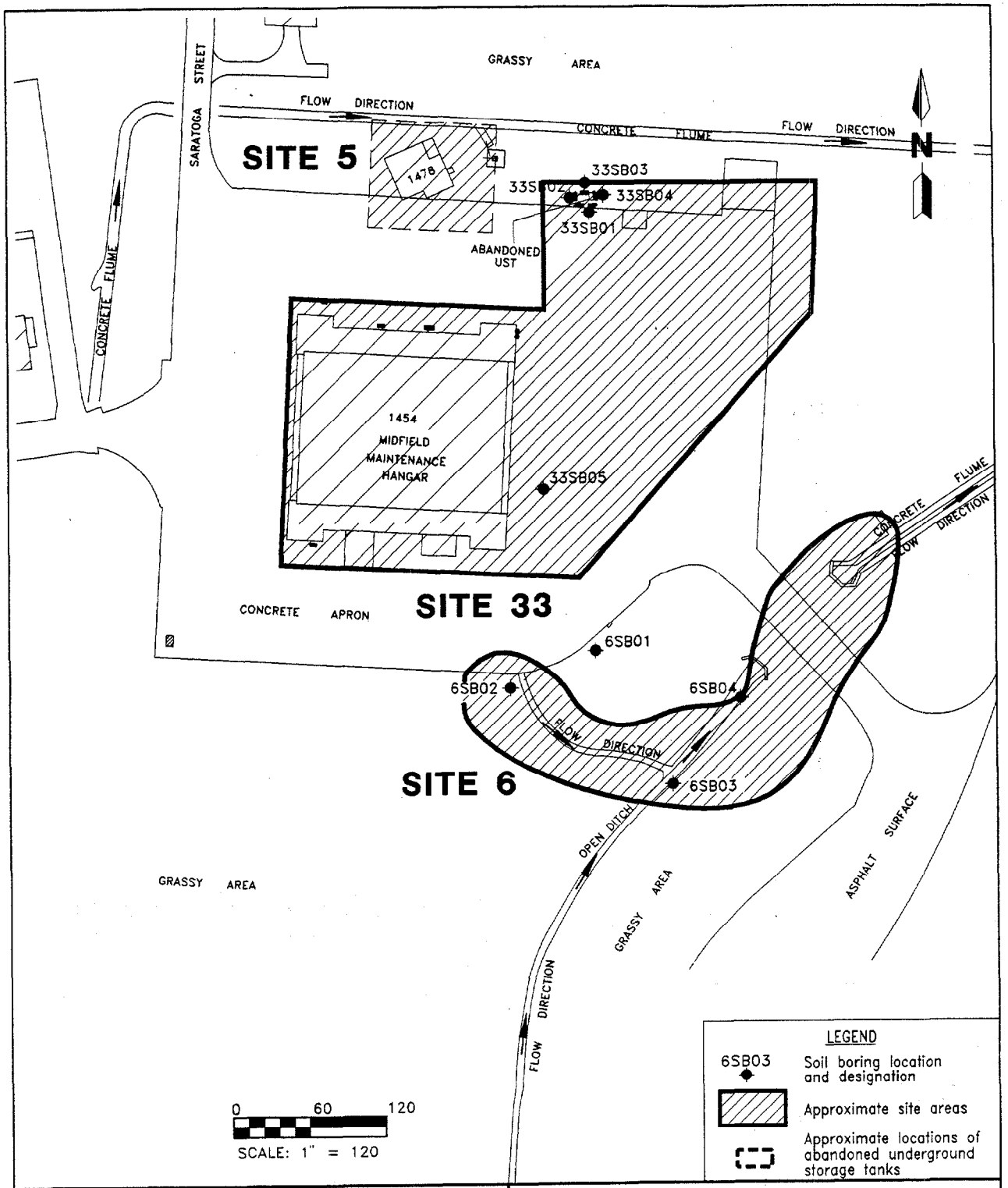


**FIGURE 2-14**
**SITES 5, 6, AND 33, LOCATIONS OF SOIL BORINGS**

H:\WHITING\7560-16\TEC-MEM3\FIG-2\KP-SB\5-10-95

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**NAS WHITING FIELD**
**MILTON, FLORIDA**

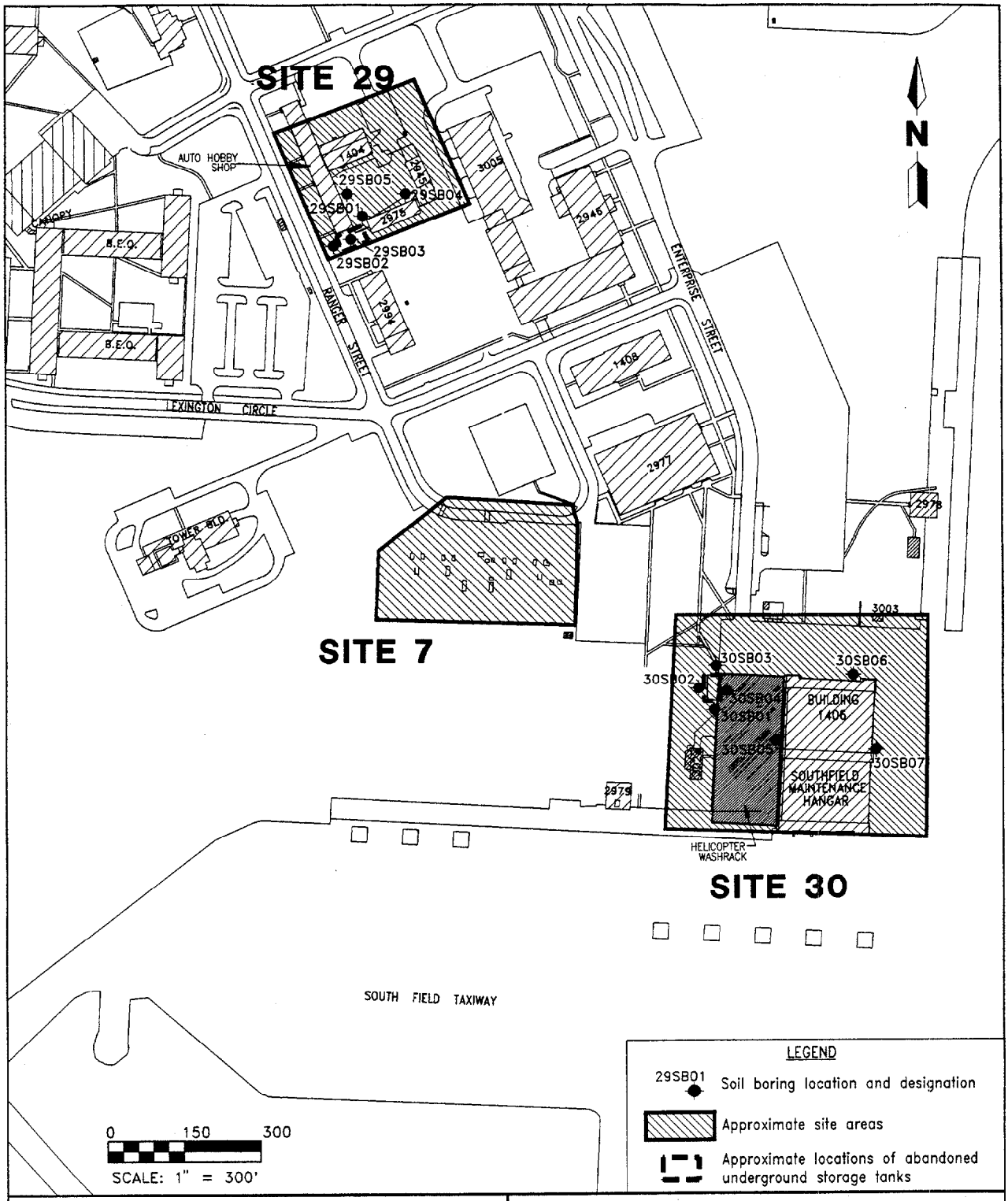


**FIGURE 2-15**
**SITES 7, 29, AND 30, LOCATIONS OF SOIL BORINGS**

WHITING/7560-16/TEC-MEM3/SOUTHCTR/KP-SB/5-15-95

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**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

One boring, 3SB6, near the paint locker building at Site 3, was advanced down to the water table, and a sample was collected near the water table at a depth of 100 to 102 feet bls. All other borings at Site 3 were advanced from the land surface to a maximum depth of 30 feet bls.

One boring at Site 32, 32SB5, was advanced to within 3 feet of the water table, and a sample was collected from the last split-spoon interval at a depth of 95 to 97 feet bls. All other borings at Site 32 were advanced from the land surface to a maximum depth of 50 feet bls.

Midfield Maintenance Hangar Area Sites. Thirty-seven subsurface soil samples were collected from nine soil borings drilled at Sites 6 and 33 (Table 2-5).

One boring at Site 6, 6SB3, was advanced down to the water table, and a sample was collected from the last sample interval at a depth of 117 to 119 feet bls. All other borings at Site 6 were advanced from the land surface to a maximum depth of 22 feet bls.

One boring at Site 33, 33SB2, was advanced down to the water table, and a sample was collected from the last sample interval at a depth of 120 to 122 feet bls. All other borings at Site 33 were advanced from the land surface to a maximum depth of 27 feet bls.

South Field Maintenance Hangar Area Sites. Thirty-eight subsurface soil samples were collected from 12 soil borings drilled at Sites 29 and 30 (Table 2-5).

One boring at Site 29, 29SB1, was advanced down to the water table, and a sample was collected from the last sample interval, at a depth of 125 to 127 feet bls. All other borings at Site 29 were advanced from the land surface to a maximum depth of 17 feet bls.

One boring at Site 30, 30SB1, was advanced down to the water table, and a sample was collected from the last sample interval at a depth of 120 to 122 feet bls. The other borings at Site 30 were drilled to a maximum depth of 27 feet bls.

## 2.6 INVESTIGATIONS TO SUPPORT NO FURTHER ACTION DECISIONS FOR SITES 2 AND 12.

Site 2 (the Northwest Open Disposal Area) and Site 12 (the Tetraethyl Lead Disposal Area) were proposed by the Navy for NFA at the end of the RI Phase I sampling and analyses program.

In 1992, regulatory agencies, FDEP and USEPA, requested that additional sampling and analyses be conducted at Sites 2 and 12 during RI Phase IIA investigation before an NFA decision could be considered.

Sampling at Site 2 consisted of the completion of one soil boring in the middle of the site and collection of seven subsurface soil samples from the borehole at selected intervals between 0 and 70 feet bls (Table 2-7). The samples were shipped to $CH_2M$ HILL laboratory in Montgomery, Alabama, under chain-of-custody protocols, and analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL metals.

**Table 2-7**
**Summary of Sample Collection at Site 2**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Description | Type of Sample | Sample Identification | Sample Interval (feet bls) |
|---|---|---|---|
| **2, Northwest Open Disposal Area** | Subsurface Soil | 2SB01 | 0 to 2 |
| | | 2SB01A | 5 to 7 |
| | | 2SB01B | 10 to 12 |
| | | 2SB01C | 15 to 17 |
| | | 2SB01D | 20 to 22 |
| | | 2SB01E | 50 to 52 |
| | | 2SB01F | 68 to 70 |

Note: bls = below land surface.

Sampling at Site 12 consisted of collecting eight surface soil samples with a stainless-steel hand auger from the interface of each waste pile and the ground surface (Figure 2-8). The samples were shipped under chain-of-custody protocols to $CH_2M$ HILL laboratory in Montgomery, Alabama, and analyzed for TAL metals and cyanide. A summary of the samples collected at Site 12 is presented in Table 2-8. The analytical results are summarized in Section 4.6.

**Table 2-8**
**Summary of Sample Collection at Site 12**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Description | Type of Sample | Mound | Sample Identification | Height of Mound (feet) |
|---|---|---|---|---|
| **12, Tetraethyl Lead Disposal Waste Piles** | Surface Soil | A | 12SS1 | 2.5 |
| | | B | 12SS2 | 3.0 |
| | | B | 12SS3 | 2.8 |
| | | C | 12SS4 | 3.3 |
| | | C | 12SS5 | 2.2 |
| | | D | 12SS6 | 3.3 |
| | | D | 12SS7 | 3.8 |
| | | E | 12SS8 | 3.2 |

## 3.0 DATA QUALITY OBJECTIVES (DQO) ASSESSMENT OF SOIL SAMPLING AND ANALYSIS

3.1 QUALITY CONTROL (QC). This chapter summarizes the overall quality of the results for the RI Phase IIA soil sampling and analytical activities conducted at NAS Whiting Field. It describes the field and laboratory QC procedures observed during the investigation and provides an overall assessment of data quality based on the data validation process. Data validation is the technical review of individual analytical results relative to the criteria defined by the DQOs and the Quality Assurance Project Plan (QAPP). The DQO for the RI Phase IIA was to attain NEESA Level C data quality for 90 percent of the data and 10 percent of data at Level D. The data validation process described in this section assessed each data package individually for laboratory performance, but did not evaluate the analytical results relative to field QC samples such as trip, field, or rinsate blanks. The evaluation of the analytical results based on their associated QC samples is summarized separately for validated data obtained for specific samples and target compounds.

3.1.1 Sample Handling, Delivery, and Chain of Custody Collection of surface soil samples, subsurface soil samples from test pits, and soil borings was performed in accordance with the procedures outlined in the Site-Specific Quality Assurance Plan Addendum and Quality Assurance Plan (ABB-ES, 1990), and in accordance with the USEPA Region IV ECBSOPQAM (USEPA, 1991).

All samples were properly preserved, placed in coolers packed with bagged ice immediately after their collection, and shipped to the laboratory. All samples were shipped, complete with chain-of-custody forms, to $CH_2M$ HILL Laboratories in Montgomery, Alabama, and/or Redding, California. Upon arrival at the laboratory, the chain-of-custody form and temperature were checked for each cooler. The chain-of-custody form was then signed by laboratory personnel and the samples were accepted for analyses.

Review of the field notebooks and chain-of-custody forms and sample receipt acknowledgment did not identify any non-conformance relative to sample collection, handling, shipping, or storage.

3.1.2 Field QC Field QC samples are used to: (1) assess the existence and magnitude of contaminants introduced during sample collection, and (2) assess the potential for introduction of contaminants during sample storage and transport. Three types of field QC samples were used to assess contamination that may have been introduced by field activities: equipment rinsate blanks, field blanks, and trip blanks. The description and purpose of each of these three samples are presented in the following paragraphs.

- Equipment Rinsate Blank. After a piece of sampling equipment was decontaminated, it was rinsed with organic-free ASTM Type II water manufactured onsite using a potable water filtration system. A sample of the final rinse water was submitted as an equipment rinsate blank. The purpose of the equipment rinsate blank is to assess the adequacy of decontamination procedures by identifying contaminants that may be introduced because of incomplete equipment decontamination. The equipment rinsate blanks were analyzed for the same analytical parameters as the corresponding environmental samples. Equipment rinsate blanks were identified with the letters "RB" in the alphanumeric designator.

- Field Blank. The field blank was a sample of the ASTM Type II water. This blank was used to assess contamination that may have been introduced by the potable water source or the water filtration system. The number of field blanks analyzed was based on either one field blank for each batch of ASTM Type II samples or one per sampling event. A sampling event is considered to be from the time the sampling personnel arrive at the site until the personnel leave for more than a day. The field blank was analyzed for the same parameters as the corresponding environmental samples. Field blanks were identified with the letters "FB" in the alpha-numeric designator.

- Trip Blank. The trip blank is a sample of ASTM Type II water that is prepared and similarly packaged by the laboratory prior to the sampling event and travels with the sampling bottles to the site. The trip blank samples are not opened at the site or at any time prior to laboratory analysis. The purpose of the trip blank is to assess the potential for contamination of the samples by VOCs during sample bottle shipment and storage, or during sample shipment prior to analysis. One trip blank was included in each shipping container that contained VOC samples.

Target analytes detected in the field QC samples are discussed in Appendix D of this report.

**3.1.3 Laboratory QC** Laboratory QC samples are used to (1) assess the existence and magnitude of contaminants introduced during the analysis of the samples, (2) assess the potential introduction of contaminants during sample storage and transport, and (3) assess the precision and accuracy of the chemical analytical methodology. Two types of laboratory QC samples were used to assess the existence and magnitude of contamination that may have been introduced by laboratory activities: the method blank for organic compounds analyses and the preparation blank for inorganic analyte analysis. The other four laboratory QC samples are the duplicate sample, matrix spike and matrix spike duplicate (MS/MSD), and laboratory control samples (LCS) used to assess analytical precision and/or accuracy. Compounds of known concentration (surrogates) are added (spiked) to each environmental sample to assess analytical accuracy and precision. The description and purpose of these samples are presented in the following paragraphs.

- Duplicate Sample. One duplicate or replicate field sample was collected for every 10 field samples of the same matrix. Matrix refers to the type of media sampled. The duplicate sample is collected from the same location and depth interval, as appropriate, of an environmental sample. The purpose of the duplicate sample is to assess sampling and analysis precision. The duplicate sample is analyzed for the same analytical parameters as the environmental sample.

- MS/MSD Sample Pairs. One MS/MSD sample pair was collected for every 20 field samples of the same matrix. The MS/MSD sample pair is collected from the same location and depth interval, as appropriate, of an environmental sample. The purpose of the MS/MSD sample pair is to assess sample analytical accuracy and precision of analytical methods for organic compounds.

- Method Blank and Preparation Blank. The method and preparation blanks are samples of ASTM Type II water prepared by the laboratory at the time of analysis. Method and preparation blanks are treated as samples in that they

undergo the same analytical process as the corresponding environmental samples. The purpose of the method blank is to assess the potential for contamination of samples within the laboratory via VOCs, SVOCs, pesticides, and PCBs during sample analysis. The preparation blank is used to assess the potential contamination of samples via TAL inorganic parameters. The method and preparation blanks are used by the laboratory to monitor analytical performance, to assess contamination introduced during the analytical process, and to assess the representativeness of the chemical analytical procedure.

- Laboratory Control Sample (LCS). An LCS consists of an ideal matrix (usually ASTM Type II water) spiked with a known amount of the CLP TAL inorganic parameter of interest; the LCS is prepared (digested) and analyzed with the field samples. The LCS is designed to monitor the efficiency of the overall laboratory analytical procedure, including sample preparation, and the resulting analyte recoveries must fall within pre-established acceptance limits.

- Matrix Spike Sample. Pre-digestion CLP TAL inorganic parameter spikes are analogous to the MS/MSD spike recovery for organic analyses in that they measure the effects of the sample matrix on the recovery of a known quantity of analyte after both sample preparation and analysis. If the pre-digestion spike recovery did not fall within the acceptance window of 75 to 125 percent, then a post-digestion spike monitors instrument performance and matrix effects. If both the pre- and post-digestion spike recoveries fall outside the acceptance limits, then the data are flagged to indicate nonconformance.

- Surrogate Spikes. Surrogate compounds are the structural homologs of target compounds, often with deuterium substituted for hydrogen (in the aqueous solvent), and are, therefore, expected to behave in a similar manner during analysis. Each matrix is spiked with one or more surrogate compounds and the recoveries are used to monitor both matrix effects and instrument accuracy performance. Surrogate spike recoveries serve to estimate accuracy and the surrogates are added to each environmental sample.

**3.1.4 Data Review and Validation Summary** Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. The QC data were reduced and spike recoveries were included in control charts, and the resulting data were reviewed to ascertain whether they were within the laboratory defined limits for accuracy and precision. Any nonconforming data were discussed in the data package cover letter and case narrative.

Data validation is the technical review of a data package using criteria established in the DQOs and the QAPP. The data were reviewed and validated using the NEESA (1988) guidance document 20.2-047B, *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*. The data review and validation process is independent of the laboratory data checks.

Analytical results (see Appendix E) were validated by C.C. Johnson & Malhotra Environmental Engineers and Scientists (CCJM), Lakewood, Colorado. CCJM followed USEPA National Functional Guidelines for Inorganic and Organic Analysis (1988b; 1988c) and requirements found in Section 7.3 of the NEESA sampling program (1988).

Laboratory QC is assessed in batches of samples each containing no more than 20 environmental samples, defined as a sample delivery group (SDG).

Tables D-1, D-2, and D-3 provided in Appendix D present a list of SDG identification numbers and the corresponding sites and the samples associated with each SDG for: surface soil sampling, subsurface soil sampling from test pits, and soil borings, respectively.

Samples that did not meet the acceptance limit criteria were qualified with a flag (single letter abbreviations that indicate a problem with the data). Flags used in the data summary tables include the following.

U Undetected. The organic analyte was not detected above the CRQL or the inorganic analyte was not detected above the CRDL. The "U" designator is also used to qualify common laboratory contaminants. The "U" designator is applied to an environmental sample when a common laboratory contaminant is detected in an environmental sample at a concentration less than 10 times the value of the concentration detected in any corresponding field QC blank, method blank, or preparation blanks.

J Estimated. The analyte was present, but the reported value may not be accurate or precise. The "J" designator is used to qualify an analyte that was present at a concentration between the CRQL of CRDL and the method detection limit (MDL), or the data "failed" some of the analytical validation criteria but not a sufficient number of validation criteria to reject the data. When combined with the U designator "UJ" indicates that the quantitation limit is estimated.

R Rejected. Data were rejected by the data validator during comparison of the NEESA Level C data package with the analytical functional guideline criteria. The "R" designator indicates a significant variance in acceptable laboratory performance. Either re-analysis or re-sampling and analysis would be necessary to determine the presence or absence of the target analyte(s).

The above data qualifiers, as defined by USEPA Functional Guidelines (USEPA, 1988b; 1990) were used in reporting validated data.

All analytical results reference the CRQL for organic compounds or the CRDL for inorganic analytes. The CRQL and CRDL are constant or fixed concentrations for each analyte, specified by the Navy for each statement of work (SOW). CRQLs are not adjusted for soil samples based on percent moisture, but the CRQLs and CRDLs may be adjusted to dilutions during the course of the analyses; therefore, the unqualified usage of the CRQLs and CRDLs is retained. CRQLs and CRDLs are included in Appendix E (Validated Analytical Reports). CRQLs for organic analyses are provided in Table 3-1 and CRDLs for inorganic analyses are provided in Table 3-2.

## Table 3-1
## Target Compound List (TCL) Contract Required Quantitation Limits (CRQL)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Compound | CAS Number | Quantitation Limit[1] | |
|---|---|---|---|
| | | Water (µg/ℓ) | Soil (µg/kg) |
| Chloromethane | 78-87-3 | 10 | 10 |
| Bromomethane | 74-83-9 | 10 | 10 |
| Vinyl chloride | 75-01-4 | 10 | 10 |
| Chloroethane | 75-00-3 | 10 | 10 |
| Methylene chloride | 75-09-2 | 10 | 10 |
| Acetone | 67-64-1 | 10 | 10 |
| Carbon disulfide | 75-15-0 | 10 | 10 |
| 1,1-Dichloroethene | 75-35-4 | 10 | 10 |
| 1,1-Dichloroethane | 75-34-3 | 10 | 10 |
| 1,2-Dichloroethene (total) | 540-59-0 | 10 | 10 |
| Chloroform | 67-66-3 | 10 | 10 |
| 1,2-Dichloroethane | 107-06-2 | 10 | 10 |
| 2-Butanone | 78-93-3 | 10 | 10 |
| 1,1,1-Trichloroethane | 71-55-6 | 10 | 10 |
| Carbon tetrachloride | 56-23-5 | 10 | 10 |
| Bromodichloromethane | 75-27-4 | 10 | 10 |
| 1,2-Dichloropropane | 78-87-5 | 10 | 10 |
| cis-1,3-Dichloropropene | 10061-01-5 | 10 | 10 |
| Trichloroethene | 79-01-6 | 10 | 10 |
| Dibromochloromethane | 124-48-1 | 10 | 10 |
| 1,1,2-Trichloroethane | 79-00-5 | 10 | 10 |
| Benzene | 71-43-2 | 10 | 10 |
| trans-1,3-Dichloropropene | 10061-02-6 | 10 | 10 |
| Bromoform | 75-25-2 | 10 | 10 |
| 4-Methyl-2-pentanone | 108-10-1 | 10 | 10 |
| 2-Hexanone | 591-78-6 | 10 | 10 |
| Tetrachloroethene | 127-18-4 | 10 | 10 |
| Toluene | 108-88-3 | 10 | 10 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 10 | 10 |
| Chlorobenzene | 108-90-7 | 10 | 10 |
| Ethylbenzene | 100-41-4 | 10 | 10 |
| Styrene | 100-42-5 | 10 | 10 |
| Xylenes (total) | 1330-20-7 | 10 | 10 |
| Phenol | 108-95-2 | 10 | 330 |
| bis(2-Chloroethyl)ether | 111-44-4 | 10 | 330 |

See notes at end of table

**Table 3-1 (Continued)**
**Target Compound List (TCL) Contract Required Quantitation Limits (CRQL)**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Compound | CAS Number | Quantitation Limit[1] | |
|---|---|---|---|
| | | Water (µg/ℓ) | Soil (µg/kg) |
| 2-Chlorophenol | 95-57-8 | 10 | 330 |
| 1,3-Dichlorobenzene | 541-73-1 | 10 | 330 |
| 1,4-Dichlorobenzene | 106-46-7 | 10 | 330 |
| 1,2-Dichlorobenzene | 95-50-1 | 10 | 330 |
| 2-Methylphenol | 95-48-7 | 10 | 330 |
| 2,2'-oxybis(1-Chloropropane)[2] | 108-60-1 | 10 | 330 |
| 4-Methylphenol | 106-44-5 | 10 | 330 |
| N-Nitroso-di-n-propylamine | 621-64-7 | 10 | 330 |
| Hexachloroethane | 67-72-1 | 10 | 330 |
| Nitrobenzene | 98-95-3 | 10 | 330 |
| Isophorone | 78-59-1 | 10 | 330 |
| 2-Nitrophenol | 88-75-5 | 10 | 330 |
| 2,4-Dimethylphenol | 105-67-9 | 10 | 330 |
| bis(2-Chloroethoxy)methane | 111-91-1 | 10 | 330 |
| 2,4-Dichlorophenol | 120-83-2 | 10 | 330 |
| 1,2,4-Trichlorobenzene | 120-82-1 | 10 | 330 |
| Naphthalene | 91-20-3 | 10 | 330 |
| 4-Chloroaniline | 106-47-8 | 10 | 330 |
| Hexachlorobutadiene | 87-68-3 | 10 | 330 |
| 4-Chloro-3-methylphenol | 59-50-7 | 10 | 330 |
| 2-Methylnaphthalene | 91-57-6 | 10 | 330 |
| Hexachlorocyclopentadiene | 77-47-4 | 10 | 330 |
| 2,4,6-Trichlorophenol | 88-06-2 | 10 | 330 |
| 2,4,5-Trichlorophenol | 95-95-4 | 25 | 800 |
| 2-Chloronaphthalene | 91-58-7 | 10 | 330 |
| 2-Nitroaniline | 88-74-4 | 25 | 800 |
| Dimethylphthalate | 131-11-3 | 10 | 330 |
| Acenaphthylene | 208-96-8 | 10 | 330 |
| 2,6-Dinitrotoluene | 606-20-2 | 10 | 330 |
| 3-Nitroaniline | 99-09-2 | 25 | 800 |
| Acenaphthene | 83-32-9 | 10 | 330 |
| 2,4-Dinitrophenol | 51-28-5 | 25 | 800 |
| 4-Nitrophenol | 100-02-7 | 25 | 800 |
| Dibenzofuran | 132-64-9 | 10 | 330 |
| 2,4-Dinitrotoluene | 121-14-2 | 10 | 330 |

See notes at end of table.

## Table 3-1 (Continued)
## Target Compound List (TCL) Contract Required Quantitation Limits (CRQL)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Compound | CAS Number | Quantitation Limit[1] | |
|---|---|---|---|
| | | Water (µg/ℓ) | Soil (µg/kg) |
| Diethylphthalate | 84-66-2 | 10 | 330 |
| 4-Chlorophenyl-phenyl ether | 7005-72-3 | 10 | 330 |
| Fluorene | 86-73-7 | 10 | 330 |
| 4-Nitroaniline | 100-01-6 | 25 | 800 |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | 25 | 800 |
| N-nitrosodiphenylamine | 86-30-6 | 10 | 330 |
| 4-Bromophenyl-phenylether | 101-55-3 | 10 | 330 |
| Hexachlorobenzene | 118-74-1 | 10 | 330 |
| Pentachlorophenol | 87-86-5 | 25 | 800 |
| Phenanthrene | 85-01-8 | 10 | 330 |
| Anthracene | 120-12-7 | 10 | 330 |
| Carbazole | 86-74-8 | 10 | 330 |
| Di-n-butylphthalate | 84-74-2 | 10 | 330 |
| Fluoranthene | 206-44-0 | 10 | 330 |
| Pyrene | 129-00-0 | 10 | 330 |
| Butylbenzylphthalate | 85-68-7 | 10 | 330 |
| 3,3'-Dichlorobenzidene | 91-94-1 | 10 | 330 |
| Benzo(a)anthracene | 56-55-3 | 10 | 330 |
| Chrysene | 218-01-9 | 10 | 330 |
| bis(2-Ethylhexyl)phthalate | 117-81-7 | 10 | 330 |
| Di-n-octylphthalate | 117-84-0 | 10 | 330 |
| Benzo(b)fluoranthene | 205-99-2 | 10 | 330 |
| Benzo(k)fluoranthene | 207-08-9 | 10 | 330 |
| Benzo(a)pyrene | 50-32-8 | 10 | 330 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 10 | 330 |
| Dibenz(a,h)anthracene | 53-70-3 | 10 | 330 |
| Benzo(g,h,i)perylene | 191-24-2 | 10 | 330 |
| alpha-BHC | 319-84-6 | 0.05 | 1.7 |
| beta-BHC | 319-85-7 | 0.05 | 1.7 |
| delta-BHC | 319-86-8 | 0.05 | 1.7 |
| gamma-BHC (Lindane) | 58-89-9 | 0.05 | 1.7 |
| Heptachlor | 76-44-8 | 0.05 | 1.7 |
| Aldrin | 309-00-2 | 0.05 | 1.7 |
| Heptachlor epoxide | 1024-57-3 | 0.05 | 1.7 |
| Endosulfan I | 959-98-8 | 0.05 | 1.7 |

See notes at end of table.

## Table 3-1 (Continued)
## Target Compound List (TCL) Contract Required Quantitation Limits (CRQL)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Compound | CAS Number | Quantitation Limit[1] | |
|---|---|---|---|
| | | Water (µg/ℓ) | Soil (µg/kg) |
| Dieldrin | 60-57-1 | 0.10 | 3.3 |
| 4,4-DDE | 72-55-9 | 0.10 | 3.3 |
| Endrin | 72-20-8 | 0.10 | 3.3 |
| Endosulfan II | 33213-65-9 | 0.10 | 3.3 |
| 4,4-DDD | 72-54-8 | 0.10 | 3.3 |
| Endosulfan sulfate | 1031-07-8 | 0.10 | 3.3 |
| 4,4'-DDT | 50-29-3 | 0.10 | 3.3 |
| Methoxychlor | 72-43-5 | 0.50 | 17.0 |
| Endrin ketone | 53494-70-5 | 0.10 | 3.3 |
| Endrin aldehyde | 7421-36-3 | 0.10 | 3.3 |
| alpha-Chlordane | 5103-71-9 | 0.05 | 1.7 |
| gamma-Chlordane | 5103-74-2 | 0.05 | 1.7 |
| Toxaphene | 8001-35-2 | 5.0 | 170.0 |
| Aroclor-1016 | 12674-11-2 | 1.0 | 33.0 |
| Aroclor-1221 | 11104-28-2 | 2.0 | 67.0 |
| Aroclor-1232 | 11141-16-5 | 1.0 | 33.0 |
| Aroclor-1242 | 53469-21-9 | 1.0 | 33.0 |
| Aroclor-1248 | 12672-29-6 | 1.0 | 33.0 |
| Aroclor-1254 | 11097-69-1 | 1.0 | 33.0 |
| Aroclor-1260 | 11096-82-5 | 1.0 | 33.0 |

[1] Quantitation limits listed for soil are based on wet weight. The quantitation limits calculated by the laboratory for soil, calculated on dry weight basis as required by the contract, will be higher.

Source: U.S. Environmental Protection Agency (USEPA), 1993.

Notes: CAS = Chemical Abstract Service
µg/ℓ = micrograms per liter.
µg/kg = micrograms per kilogram.
BHC = benzenehexachloride.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.

**Table 3-2**
**Inorganic Target Analyte List (TAL) Contract Required Detection Limits (CRDLs)**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Analyte | Contract Required Detection Limit ($\mu g/\ell$) |
|---|---|
| Aluminum | 200 |
| Antimony | 60 |
| Arsenic | 10 |
| Barium | 200 |
| Beryllium | 5 |
| Cadmium | 5 |
| Calcium | 5,000 |
| Chromium | 10 |
| Cobalt | 50 |
| Copper | 25 |
| Iron | 100 |
| Lead | 3 |
| Magnesium | 5,000 |
| Manganese | 15 |
| Mercury | 0.2 |
| Nickel | 40 |
| Potassium | 5,000 |
| Selenium | 5 |
| Silver | 10 |
| Sodium | 5,000 |
| Thallium | 10 |
| Vanadium | 50 |
| Zinc | 20 |
| Cyanide | 10 |

Notes: Any analytical method specified in Exhibit D of U.S. Environmental Protection Agency (USEPA) contract laboratory "Statement of Work for Inorganic analytes, Multi-Media, Multi-Concentration," ILMO3.0, 1991 may be used as long as the documented instrument or method detection limits meet the contract required detection limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance.

If the sample concentration exceeds 5 times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the CRDL. This is illustrated in the example below.

For lead:

Method in use = inductively coupled plasma (ICP)
Instrument detection limit (IDL) = 40
Sample concentration = 220
CRDL = 3

$\mu g/\ell$ = micrograms per liter.

**3.2 DQO ASSESSMENT**. The QC sample results were evaluated in terms of DQOs. DQOs refer to a set of qualitative and quantitative statements that assess the quality of data generated during the sampling and analytical phases of the project as defined in *Data Quality Objectives for Remedial Response Activities* (USEPA, 1987). The DQOs are defined by: precision, accuracy, representativeness, completeness, and comparability (PARCC). These parameters present an indication of data quality and the confidence that a particular compound may be present or absent in an associated environmental sample. The soil sampling program DQOs as stated in Chapter 4.0 of Volume I of the RI/FS Planning Document (E.C. Jordan, 1990) are NEESA Level C with 10 percent being NEESA Level D.

**3.3 SITE-SPECIFIC DATA QUALITY ASSESSMENT**. All samples including QA samples (excluding background surface soil samples) were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL metals and total cyanide. A portion of the samples was also analyzed for the additional parameters of TPH, TOC, TCLP metals, and TCLP VOCS. The surface soil background samples were analyzed for TCL pesticides, PCBs, PAHs, and TAL metals, and cyanide. All samples were analyzed in accordance with USEPA Contract Laboratory Program (CLP) methodology. Results from QC samples as presented in Appendix D are used to measure the PARCC parameters. The following sections present the PARCC measurements specific to each analysis and an overall assessment of DQOs.

**3.3.1 Precision** Precision is a measure of the reproducibility of the analytical results under a given set of conditions. It is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is measured as the relative percent difference (RPD) between a sample and its duplicate, as calculated for both field duplicate samples and MS/MSD samples. The following equation is used to calculate the RPD:

$$RPD = 100 \times \frac{|D_1 - D_2|}{0.5(D_1 + D_2)} \qquad (1)$$

where $D_1$ and $D_2$ are the detected concentrations for sample duplicate analyses. The duplicate samples are taken from the same source and analyzed under identical conditions to evaluate precision.

The following section presents the results of precision evaluations for each type of soil sampling program completed at NAS, Whiting Field, Milton, Florida.

**Precision Summary for Soil Sampling and Analytical Program**.

Appendix D Tables D-5, D-6, and D-7 summarize compounds detected in field duplicates and MS/MSD samples for surface soil, subsurface soil from test pits, and subsurface soil from soil borings.

Although the results of the duplicate and MS/MSD analyses indicate that for some analytes the precision was outside control limits, the associated samples for organic analyses were not qualified because the blank spike results were all within acceptance limits and the surrogate recoveries for these samples were acceptable (CCJM, 1993). No qualifications were required for the inorganic analytical results based on the RPD values alone.

All data, based on RPD, are acceptable for use in site characterization and risk assessment.

3.3.2 **Accuracy** Accuracy is a quantitative parameter that determines the nearness of a result to its true value. Accuracy measures the bias in a measurement system. The accuracy of each analytical method is evaluated based on percentage recoveries for MS/MSD samples, surrogate recoveries, and initial and continuing calibration standard results. Each of these criteria was evaluated and is discussed below.

**Percent Recovery.** Percent recovery is calculated using the equation:

$$100 \times \frac{A-B}{C} \qquad (2)$$

where

A = measured concentration of spike compound in the spiked samples,
B = measured concentration of the spike compound in the unspiked sample, and
C = concentration of the spike compound.

For those analytes having high recoveries (compared to the QC limits established by the NEESA Level C and D guidelines), the results for the associated samples may be biased high and false positives may be present among the detected concentrations. Low recoveries indicate that the detected results may be biased low and false negatives may be present among the undetected results.

**Surrogate Recovery.** Laboratory performance on individual samples is established by means of sample spiking. All samples are spiked with system monitoring compounds (surrogates) prior to sample purging to measure their recovery in environmental samples. Surrogate spiking is performed for all analyses except for inorganics. Recoveries for surrogates must be within the limits specified in Appendix A, Contractual Requirements and Equations, Multi-media Multi-concentration, of the USEPA national functional guidelines for organic data review (USEPA, 1988c).

For surrogate recoveries with results higher than upper control limits, samples were flagged with a 'J' qualifier, indicating a potentially biased high result. Low surrogate recoveries resulted in samples being flagged with a 'UJ' qualifier, indicating a potentially biased low result.

**Initial and Continuing Calibrations.** Initial calibrations are performed to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for volatile organic constitutions. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear calibration curve. Continuing calibrations are performed to ensure that the instrument is capable of producing acceptable qualitative and quantitative data.

Continuing calibration establishes the 12-hour relative response factors (RRF) on which the quantitations are based and checks satisfactory performance of the instrument on a day-to-day basis. Initial and continuing calibrations for organic analysis are measured by the percent relative standard deviation (%RSD) and the

percent difference (%D). For inorganic analyses the initial calibration verification (ICV) and continuing calibration verification are the measured equivalents.

The evaluation of the %RSD for the initial calibrations and the %D for the continuing calibrations indicates that the response factors for the system performance check compounds (SPCC) generally met the required criteria for VOCs, SVOCs, pesticides, and PCBs. Samples associated with certain SDGs in which several VOCs and SVOCs having RRF, %RSD, and/or %D not meeting the minimum requirements were qualified as "J/UJ". Initial and continuing calibration details for each instrument used during laboratory analyses of soil samples are included in SDG-specific data validation reports (CCJM, 1993).

The following sections present the quality control evaluation results for the soil sampling and analyses program completed at NAS Whiting Field, Milton, Florida.

<u>Surface Soil Sampling Program</u>.

**Percent Recovery**. Appendix D, Table D-7, summarizes the MS/MSD samples and the analytes that were outside control limits for the surface soil samples collected at the Landfill and Disposal Area Sites and the Crash Crew Training Area Sites. The required control limits were also identified for each analyte.

Certain organic compounds (see Table D-7 in Appendix D) were found to be outside the QC limits for the MS/MSD associated with samples 01-SL-03, 18-SL-01, 31-SL-01, 17-SL-31, 17-SL-11, and 17-SL-03. Qualifications were not necessary for any of the samples associated with those MS/MSD samples because either these compounds were not detected in the unspiked samples or the problems associated with these compounds were determined not to be systemic (CCJM, 1993).

The samples associated with MS/MSD 18-SL-23 samples were qualified as "J/UJ" due to both poor percent recoveries and RPDs for both base neutral and acid spikes. In addition, no surrogate recoveries or RPDs were obtained for the pesticide and PCB MS/MSD for sample 18-SL-23 due to required dilution. The samples associated with the pesticide and PCB results for this sample were also qualified as "J/UJ".

Certain inorganic analytes (see Table D-7 in Appendix D) were found to be outside the QC limits for the MS/MSD associated with samples 01-SL-03, 11-SL-01, 18-SL-01, and 31-SL-22. All the samples associated with these MS/MSD were qualified either as 'UJ,' 'J,' or 'R' according to the NEESA regulations.

**Surrogate Recovery**. Appendix D, Table D-8, summarizes the surrogate spike samples and the surrogate compounds that were outside control limits for the surface soil samples collected at the Landfill and Disposal Area Sites and the Crash Crew Training Area Sites. The required control limits were also identified for each surrogate compound.

Samples found to have surrogate recoveries outside the specified QC criteria include: 31-SL-01R (reanalysis), 31-SL-12R, 31-SL-14R, 31-SL-15, and 31-SL-15R for VOCs; SL-17-16, SL-17-17, SL-17-23, and SL-17-23A for the semivolatile analyses; and SL-31-14 and 18-SL-23 for pesticide and PCB analyses. All the samples associated with these surrogates were qualified in accordance with Section 7.3 of the NEESA guidelines (NEESA, 1988).

Subsurface Soil Sampling Program, Test Pits.

**Percent Recovery.** Appendix D, Table D-9, summarizes the MS/MSD samples and the analytes that were outside control limits for the subsurface soil samples collected from test pits at the Landfill and Disposal Area Sites. The required control limits were also identified for each analyte.

The samples associated with the MS/MSD of samples 16SS0403 and 16SS0302 were qualified as "J/UJ" due to both poor percent recoveries and RPD's for both base neutral and acid extractable spikes.

**Surrogate Recovery.** Appendix D, Table D-10, summarizes the surrogate spike samples and the surrogate compounds that were outside control limits for the subsurface soil samples collected from test pits at the Landfill and Disposal Area Sites. The required control limits were also identified for each surrogate compound.

Samples found to have surrogate recoveries outside specified QC criteria include: 16-SS-06-04 for one of the indicator compounds (tetrachloro-m-xylene [TCX]); and 16SS0302, 15SS0502, 15SS0603, 11SS0202, 14SS0303, 14SS0101, 14SS0202 for two indicator compounds (TCX and decachlorobiphenyl [DCB]), for pesticides and PCB analyses. All samples associated with these surrogates were qualified in accordance with the NEESA guidelines as presented in subsection 3.6.2.

Subsurface Soil Sampling Program, Soil Borings

**Percent Recovery.** Appendix D, Table D-11, summarizes the MS/MSD samples and the analytes that were outside control limits for the subsurface soil samples collected from soil borings at the Industrial Area Sites. The required control limits were also identified for each analyte.

Certain organic compounds were found to be outside the QC limits for the MS/MSD associated with samples 3SB8-15-17, 6SB3-0-2, 18SB4-25-27, 29SB1-0-2, 33SB2-35-37, 33SB2-35-37, and 33SB5-0-2 (see Appendix D). Qualifications were not necessary for any of the samples associated with those MS/MSD samples because either these compounds were not detected in the unspiked samples or the problems associated with these compounds were determined not to be systemic (CCJM, 1992).

Certain inorganic analytes (see Table D-11 in Appendix D) were found to be outside the QC limits for the MS/MSD associated with samples SB7-10-12, 6SB3-0-2, 17SB5-5-7, and 32SB6-5-7. Samples associated with these MS/MSD were qualified as "J/UJ" due to both poor percent recoveries and RPD's.

**Surrogate Recovery.** Appendix D, Table D-12, summarizes the surrogate spike samples and the surrogate compounds that were outside control limits for the subsurface soil samples collected from soil borings at the Industrial Area Sites. The required control limits were also identified for each surrogate compound.

Several samples were found to have surrogate recoveries outside specified QC criteria for one indicator compound (DCB), and a few samples were found to have surrogate recoveries outside the specified QC criteria for two indicator compounds (TCX and DCB) for pesticide and PCB analyses. All samples associated with these surrogates were qualified in accordance with the NEESA guidelines as presented in subsection 3.6.2.

3.3.3 Representativeness Representativeness is the degree to which the data obtained from a sample collection activity accurately reflect site conditions. Factors such as the proper selection of analytical methodology and sampling strategies establish the degree of representativeness achieved. Methods used during the field sampling activities to confirm sampling representativeness include collection of field blanks (source water), equipment rinsate blanks, and trip blanks. Methods used during the chemical analyses of environmental samples to confirm analytical representativeness include the analyses of method blanks and the adherence to analytical holding times.

Appendix D, Tables D-13, D-14, and D-15, presents the schedule of field QC samples for surface soil samples, subsurface soil samples from test pits, and soil borings, respectively.

**Organics**: Associated sample results (for compounds other than the common volatile laboratory contaminants) greater than the CRQL but less than 5 times the amount detected in the trip blank were appropriately flagged with a 'J' or 'UJ' qualifier due to blank contamination (CCJM, 1993). Analytical results for common laboratory contaminants (methylene chloride, acetone, 2-butanone, toluene, and phthalate esters) when the sample concentration is less than 10 times the blank concentration are amended during the validation process by qualifying the samples with the "U" qualifier and using the analytes CRQL or CRDL as the detection limit.

**Inorganics**: Associated sample analytical results greater than the instrument detection limit (IDL) but less than 10 times the amount detected in the rinsate blank were appropriately flagged with a 'J' or 'UJ' qualifier due to blank contamination (CCJM, 1993).

The results of the evaluation for each type of soil sampling program are summarized below.

Surface Soil Sampling Program.

Adherence to holding times was evaluated for surface soil samples collected from Landfill and Disposal Area and Crash Crew Training Area Sites. Field and laboratory quality assurance and quality control (QA/QC) blank samples included 10 trip blanks, 2 field blanks, 9 rinsate blanks, laboratory method blanks, and laboratory preparation blanks from each sample delivery group.

**Holding Times**. Each sample was extracted and analyzed within holding times specified by the NEESA data validation guidelines (NEESA, 1988).

Appendix D, Table D-16, presents the analytical results of trip blanks, rinsate blanks, and field blanks. The results of the overall evaluation of representativeness are summarized below.

**Trip Blanks**. Methylene chloride and acetone were detected at concentrations ranging from 2 micrograms per liter ($\mu g/\ell$) to 8 $\mu g/\ell$, and 5 $\mu g/\ell$ to 8 $\mu g/\ell$, respectively.

**Rinsate Blanks**. Di-n-butylphthalate was detected in some rinsate blanks at concentrations ranging from 9 $\mu g/\ell$ to 12 $\mu g/\ell$. Methylene chloride was detected in each rinsate blank at concentrations ranging from 2 $\mu g/\ell$ to 7

$\mu g/\ell$. Carbon disulfide was detected in one rinsate blank (SUR/SL-RB-04) at 18 $\mu g/\ell$.

Aluminum, arsenic, barium, calcium, chromium, copper, iron, lead, selenium, sodium, thallium, and zinc were detected in rinsate blanks collected during the surface soil sampling program.

TPH was detected in rinsate blank SUR/SL-RB-07 at a concentration of 0.07 milligrams per liter (mg/$\ell$). All sample results are greater than 5 times the rinsate blank result; thus, no qualifiers were required.

**Field Blank.** Methylene chloride and di-n-butylphthalate were detected in field blank SUR/SL-FB-01 at concentrations of 2 $\mu g/\ell$ and 9 $\mu g/\ell$.

Arsenic, barium, calcium, copper, iron, lead, sodium, and zinc were detected in field blank SUR/SL-FB-01. The associated samples were appropriately flagged with a "UJ" qualifier due to blank contamination (CCJM, 1993).

**Laboratory Method Blanks.** Methylene chloride, acetone, and di-n-butylphthalate were detected in the laboratory method blanks at concentrations ranging from 1 $\mu g/kg$ to 280 $\mu g/kg$ for methylene chloride, 8 $\mu g/kg$ to 730 $\mu g/kg$ for acetone, and 40 $\mu g/kg$ to 160 $\mu g/kg$ for di-n-butylphthalate.

**Laboratory Preparation Blanks.** Aluminum, arsenic, beryllium, calcium, cobalt, copper, iron, mercury, nickel, and sodium were detected in laboratory preparation blanks.

Some of the environmental samples had the laboratory reported concentrations and qualifiers amended because of contaminants detected in the field and laboratory QA/QC samples.

<u>Subsurface Soil Sampling Program, Test Pits</u>.

Adherence to holding times was evaluated for the subsurface soil samples collected from test pits at Landfill and Disposal Area Sites and analyzed. Field and laboratory QA/QC blank samples included six trip blanks, seven rinsate blanks, one field blank, laboratory method blanks, and laboratory preparation blanks from each SDG.

**Holding Times.** Each sample was extracted and analyzed within holding times specified by the NEESA data validation guidelines.

Appendix D, Table D-17, presents the analytical results of trip blanks, field blanks, and rinsate blanks. The results of the overall evaluation of representativeness are summarized below.

**Trip Blanks.** Methylene chloride was detected at a concentration of 2 $\mu g/\ell$ in samples SS-TB-03 and SS-TB-06 from SDGs 22910 and 22927, respectively. Acetone was detected at a concentration of 16 $\mu g/\ell$ in sample SS-TB-06 from SDG 22927.

**Rinsate Blanks.** Acetone was detected in rinsate blank SS-RB-02 at 7 $\mu g/\ell$ and methylene chloride was detected in rinsate blank SS-RB-04 at 2 $\mu g/\ell$. Di-n-butylphthalate was detected in rinsate blank SS-RB-04 at 12 $\mu g/\ell$.

**Field Blanks.** No organic compounds were detected in field blank SS-FB-01. Arsenic, barium, calcium, copper, iron, lead, sodium, and zinc were detected in field blank SUR/SL-FB-01. Sample results greater than the IDL but less than 5 times the amount detected in the field blank were appropriately flagged with a "UJ" qualifier due to blank contamination.

**Laboratory Method Blanks.** Methylene chloride, acetone, bis(2-ethylhexyl)-phthalate, and di-n-butylphthalate were detected in the laboratory method blanks.

Some of the environmental samples had the laboratory reported concentrations and qualifiers amended because of contaminants detected in the field and laboratory QA/QC samples.

**Laboratory Preparation Blanks.** Barium, calcium, iron, manganese, nickel, mercury, and sodium were detected in laboratory preparation blanks.

<u>Subsurface Soil Sampling Program, Soil Borings</u>.

Adherence to holding times was evaluated for the subsurface soil samples collected from soil borings at Industrial Area Sites and analyzed. Field and laboratory QA/QC blank samples included 21 trip blanks, 15 rinsate blanks, 3 field blank, laboratory method blanks, and laboratory preparation blanks from each SDG.

**Holding Times.** Each sample was extracted and analyzed within holding times specified by the NEESA data validation guidelines.

Appendix D, Table D-18, presents the analytical results of trip blanks, field blanks, and rinsate blanks. The results of the overall evaluation of representativeness are summarized below.

**Trip Blanks** Methylene chloride and acetone were detected at concentrations ranging from 2J $\mu g/\ell$ to 6J $\mu g/\ell$ and 4J $\mu g/\ell$ to 18 $\mu g/\ell$, respectively, in the trip blanks.

**Rinsate Blanks** Methylene chloride and acetone were detected at concentrations ranging from 2J $\mu g/\ell$ to 3J $\mu g/\ell$ and 2J $\mu g/\ell$ to 3J $\mu g/\ell$, respectively, in the trip blanks.

Carbon disulfide, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate were detected in rinsate blanks. Carbon disulfide was detected at a concentration of 11 $\mu g/\ell$ in one rinsate blank. Di-n-butylphthalate was detected at concentrations ranging from 5 J $\mu g/\ell$ to 11 J $\mu g/\ell$. Bis(2-ethylhexyl)phthalate was detected at concentration ranging from 2J $\mu g/\ell$ to 38 $\mu g/\ell$.

Total petroleum hydrocarbons (TPHs) were detected at concentrations ranging from 0.08 $mg/\ell$ to 0.12 $mg/\ell$ in rinsate blanks.

Arsenic, barium, calcium, cobalt, copper, iron, magnesium, manganese, selenium, sodium, thallium, zinc, and cyanide were detected in rinsate blanks.

**Field Blanks.** Methylene chloride was detected at concentrations ranging from 2 J $\mu g/\ell$ to 4 J $\mu g/\ell$ in two of the three field blanks.

Di-n-butylphthalate was detected at concentrations ranging from 8 J μg/L to 10 μg/ℓ in two of the three field blanks.

Aluminum, barium, calcium, iron, magnesium, sodium, zinc, and cyanide were detected in two of the field blanks.

**Laboratory Method Blanks**. Methylene chloride, acetone, bis-2-(ethylhexyl)-phthalate, and di-n-butylphthalate were detected in the laboratory preparation blanks at concentrations ranging from 2 μg/kg to 4 μg/kg for methylene chloride, 2 μg/kg to 7 μg/kg for acetone, 37 μg/kg to 120 μg/kg for bis-2-(ethylhexyl)phthalate, and 8 μg/kg to 160 μg/kg for di-n-butylphthalate.

**Laboratory Preparation Blanks**. Barium, cadmium, calcium, copper, magnesium, potassium, silver, sodium, and zinc were detected in laboratory preparation blanks.

Some of the environmental samples had the laboratory reported concentrations and qualifiers amended because of contaminants detected in the field and laboratory QA/QC samples.

3.3.4 Completeness Completeness is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. Valid, usable values are data that are not qualified as rejected (R qualifier) by comparison of the analytical procedures with Level C or D data validation guidelines as specified by NEESA (1988). Completeness is evaluated to determine if an acceptable level of data was obtained so that a scientific site assessment can be completed with valid usable data. Completeness equals the total number of analytes in each sample (equipment rinsate, field and trip blanks, and duplicate samples) minus the total number of rejected analytes divided by the total number of analytes.

$$Completeness = \frac{Total\ Analytes - Rejected\ Analytes}{Total\ Analytes} \times 100 \qquad (3)$$

The data validation process indicated that a completeness of greater than 90 percent has been achieved for the Phase IIA soil sampling and analytical program at NAS Whiting Field sites (CCJM 1993)

3.3.5 Comparability Comparability is a qualitative measure designed to express the confidence with which one data set may be compared with another. Comparability is assessed by reviewing the data to determine that all data were acquired using standard operating procedures for sampling, and standard analytical methods were used for analysis. Data may also be assessed by review of the analytical method practical quantitation limits. Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical methods. Comparability is limited by other PARCC parameters because only when precision and accuracy are known can data sets be compared with confidence.

Comparability of the data was assured by using standard operating procedures for sample collection, by using standard chemical analytical methods, and by reporting the analytical results in standard units.

Comparability was achieved during the soil sampling program through the following means.

- Adherence to standard procedures as described in Chapter 2.0 was maintained for all sampling and analytical phases of the soil sampling program.

- Consistent units of measure were used throughout the project for all the analytical results of the soil samples.

3.4 SUMMARY. Based on the results of the QC sample analyses, the established precision and accuracy goals of the project were achieved (Table 3-3). Some contamination was present in some of the field and laboratory blank samples, and environmental sample results were qualified according to NEESA (1988) to reflect this bias. Evaluation of the analytes and data based on the completeness criteria indicates that greater than 90 percent completeness was achieved; thus, satisfying the 85 percent completeness goal. Standard methods of analyses and units of measure were used throughout the project; therefore, meeting the QC criteria and the DQOs mentioned in the workplan.

The validated data are qualified as acceptable for use in the remedial investigation, risk assessment, and feasibility study for NAS Whiting Field.

**Table 3-3**
**Summary of DQO Assessment (PARCC Parameters)**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| | Precision[1] | Accuracy[2] | Representativeness | Completeness (%) | Comparability |
|---|---|---|---|---|---|
| **Surface and Subsurface Soil Samples** | | | | | |
| TCL VOC | Acceptable | Acceptable | Acceptable | > 90 | Acceptable |
| TCL SVOCs | Acceptable | Acceptable | Acceptable | > 90 | Acceptable |
| Pesticides and PCBs | Acceptable | Acceptable | Acceptable | > 90 | Acceptable |
| TAL Metals and Total Cyanides | Acceptable | Acceptable | Acceptable | > 90 | Acceptable |
| Total Petroleum Hydrocarbons | Acceptable | Acceptable | Acceptable | > 90 | Acceptable |

[1] Cumulative of sampling and analytical components.
[2] Analytical component.

Notes: All the units are expressed as the ratio of number of analytes meeting the quality control criteria to the total number of analytes.

% = percent.
PARCC = precision, accuracy, reproducibility, completeness, and comparability.
TCL VOCs = target compound list volatile organic compounds.
TCL SVOCs = target compound list semivolatile organic compounds.
PCBs = polychlorinated biphenyls.

# 4.0 RESULTS AND FINDINGS

The following chapter presents the results of the RI Phase IIA soil sampling program at NAS Whiting Field. This chapter of the report is organized as follows.

- Sections 4.1 and 4.2 provide summaries of the results of the geophysical and soil gas surveys, respectively.
- Sections 4.3 through 4.5 provide summaries of the analytical results for surface soil samples, subsurface soil samples from test pits, and subsurface soil samples from soil borings.
- Section 4.6 provides a summary of the analytical results for soil samples collected from investigations at Sites 2 and 12.

**4.1 SUMMARY OF GEOPHYSICAL SURVEY**. A summary of the geophysical results and interpretations for each of the sites investigated is presented in Appendix A. In addition, a site-by-site narrative summary of the overall findings is presented below.

**Site 1.** One isolated geophysical anomaly was identified (see Figure 2-1). This anomaly was later determined during the test pit excavation to be concrete reinforcement rod present on the surface without any materials disposed below the land surface within the explored depth of the test pit.

**Site 10.** Three anomalies were identified at the site. One anomaly was interpreted to be a disposal area (approximately 4 acres) at Site 10. In addition, two small, low amplitude anomalies were identified on the northern part of the grid (Figure 2-2).

**Site 11.** Four anomalies were identified at this site. One large anomaly (approximately 7 acres) was interpreted to be a disposal area. Three isolated anomalies were also identified and interpreted to be ferromagnetic metals present at or near the land surface (Figure 2-3).

**Site 13.** Four geophysical anomalies were identified at this site. One landfill area (approximately 8 acres) was interpreted from the geophysical survey results at this site (Figure 2-3). Several additional isolated geophysical anomalies were also identified on the western part of the grid. The isolated anomalies were interpreted to be associated with large amounts of buried ferromagnetic metals.

**Site 14.** A single geophysical anomaly was identified at this site. One landfill area (approximately 3 acres) was interpreted from the geophysical survey results at this site. One low amplitude isolated anomaly (Figure 2-3) was also identified on the northwestern part of the gridded area.

**Site 15.** Seven geophysical anomalies were identified at this site. Two large landfill cells were interpreted (a total of approximately 15 acres) at this site. In addition, a series of trenches in the central and western

parts of the gridded area (Figure 2-5) were identified based on interpretation of geophysical survey results.

**Site 16**. This site contained two anomalies interpreted to be landfill areas (a total of approximately 10 acres), one in the northern part of the grid and the other in the southern part (Figure 2-6). Several localized geophysical anomalies existed, most of which lie in the eastern part of the grid.

Discussion of the geophysical survey is provided in Appendix A. The lateral boundaries of each of the investigated disposal areas, with the exception of Site 1 (Northwest Disposal Area), have been delineated using the geophysical survey results and are provided in Figures 2-1 through 2-6. Depicted in the figures are potential landfill areas that may have been the primary disposal areas, along with numerous isolated metallic and non-metallic anomalies. The vertical extent of the landfills was not determined by the geophysical survey nor were contaminant plumes or subsurface preferential pathways of migration for each site identified.

Geophysical anomalies that were thought to be potential landfill areas were verified by conducting test pit excavations. Field logs of the test pits are included in Appendix B.

**4.2 SUMMARY OF SOIL GAS SURVEY**. The results of the analytical data generated by the soil gas survey at NAS Whiting Field were used to locate potential source areas for contaminants in soil gas including BTEX, PCE, TCE, cycloalkanes, and naphthalenes at the North Field, South Field, and Midfield Maintenance Hangar RI sites. Definitive contaminant concentrations and precise plume boundaries were not identified. The results of the soil gas investigation were used to determine locations for subsurface soil borings to assess potential source areas of soil contamination at Industrial Area Sites. Table 4-1 presents a summary of the soil gas survey analytical results at NAS Whiting Field. A summary of the soil gas survey is presented in Appendix C.

**4.3 SURFACE SOIL SAMPLES**. Surface soil (0 to 12 inches bls) samples collected from the RI sites consisted mostly of fine- to coarse-grained, loamy sand (loamy sand contains some silt and clay). Table 4-2 presents lithologic descriptions of USDA soil groups for surface soil collected from Sites 1, 10, 11, 13, 14, 15, 16, 17, 18, and 31. In general silty sand, sandy clay, and clay were present at 0 to 12 inches bls. Soil colors included white, dark brown, yellowish orange, reddish brown, and tan. Black staining and debris was present at some locations (Sites 10 and 11). Additional lithologic descriptions of the vadose and saturated zones of the sand-and-gravel aquifer are included in Technical Memoranda No. 2, Geologic Assessment, and No. 4, Hydrogeologic Assessment (ABB-ES, 1995a; 1995b).

The analytical results for TCL pesticides, TCL PCBs, and PAHs detected in surface soil samples from the RI sites were compared to twice the arithmetic mean of analyte concentrations detected in background surface soil samples associated with the same USDA soil series (Table 4-2). The arithmetic mean of analytes detected in the background surface soil samples was calculated by summing up individual analyte concentrations per soil series and then dividing the sum by the number of samples from which the analytes were detected. The duplicate pair BKG-SL09

## Table 4-1
## Summary of Soil Gas Survey Findings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site Grouping | Compound Detected | Frequency of Detection | Ion Count Threshold | Location of Individual Sampling Points Exceeding the Threshold Ion Count | | | | |
|---|---|---|---|---|---|---|---|---|
| Sites 3 and 32 North Field Maintenance Hangar Area | | | | NFMH | WR | AUWOST | PLA | Building 2941 |
| | BTEX | 9 of 106 | > 100,000 | 2 | 2 | 1 | 1 | 3 |
| | PCE | 9 of 106 | > 100,000 | 4 | 3 | 1 | -- | 1 |
| | TCE | 3 of 106 | > 100,000 | 3 | -- | -- | -- | -- |
| | Cycloalkanes and naphthalenes | 28 of 106 | > 100,000 | 7 | 9 | 1 | 6 | 5 |
| Sites 29 and 30 South Field Maintenance Hangar Area | | | | SFMH | WR | AUWOST | PLA | Auto Hobby Shop |
| | BTEX | 17 of 71 | > 100,000 | 6 | 4 | 3 | 2 | 2 |
| | PCE | 12 of 71 | > 100,000 | 3 | 2 | 2 | 2 | 3 |
| | TCE | 8 of 71 | > 100,000 | 8 | -- | -- | -- | -- |
| | Cycloalkanes and naphthalenes | 19 of 71 | > 100,000 | 3 | 3 | 3 | 3 | 5 |
| Sites 5, 6, and 33 Midfield Maintenance Hangar Area | | | | MFMH | | AUWOST | Drainage Ditch | |
| | BTEX | 6 of 44 | > 85,000 | 6 | | -- | -- | |
| | PCE | 5 of 44 | > 10,000 | 5 | | -- | -- | |
| | TCE | 5 of 44 | > 100,000 | 5 | | 1 | -- | |
| | | 4 of 44 | > 50,000 | 4 | | 1 | -- | |
| | Cycloalkanes and naphthalenes | 7 of 44 | > 100,000 | 7 | | -- | -- | |

Source: ABB-ES, 1993b (Appendix B).

Notes: NFMH = North Field Maintenance Hangar.
WR = Wash Rack area.
AUWOST = Abandoned Underground Waste Oil Storage Tanks.
PLA = Parking Lot Area.
BTEX = benzene, toluene, ethylbenzene, and xylenes.
PCE = tetrachloroethene.
TCE = trichloroethene.
-- = the analyte was not detected in laboratory analysis.
SFMH = South Field Maintenance Hangar.
MFMH = Midfield Maintenance Hangar.

## Table 4-2
## Summary of Lithologic Descriptions of Surface Soil Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Site No. | Site Name | USDA Soil Group[1] | General Lithologic Description |
|---|---|---|---|
| 1 | Northwest Disposal Area | Troup loamy sand | Clayey, silty, loamy sand, fine to very fine, yellowish orange, reddish brown, and light tan. |
| 10 | Southeast Open Disposal Area (A) | Troup loamy sand | Silty sand, fine to very fine, yellowish orange, reddish brown. Debris at depths to greater than 5 inches at some locations. |
| 11 | Southeast Open Disposal Area (B) | Troup loamy sand | Clayey, silty, loamy sand and some coarse gravel; reddish brown to light tan. Debris at depth to 6 inches. |
| 13 | Sanitary Landfill | Troup loamy sand | Clayey sand, fine to very fine, reddish brown. |
| 14 | Short-Term Sanitary Landfill | Troup loamy sand | Clayey, silty sand, fine to very fine, red to reddish brown, and light tan. |
| 15 | Southwest Landfill | Troup loamy sand | Silty, loamy sand, fine to very fine, little clay, orange, reddish brown to tan. |
| 16 | Open Disposal and Burning Area | Troup loamy sand | Silty, clayey, loamy sand, fine to very fine yellowish orange, reddish brown, and olive green. |
| 17 | Crash Crew Training Area | Orangeburg sandy loam | Silty, little to no clay, loamy sand, fine to very fine, white, dark brown, yellowish orange, reddish brown, and tan. |
| 18 | Crash Crew Training Area | Lakeland sand | Silty, clayey, loamy sand, fine to very fine, white, dark brown, yellowish orange, reddish brown, and tan. |
| 31 | Sludge Drying Beds and Disposal Areas | Troup loamy sand | Silty, clayey, loamy sand, fine to very fine, dark brown to brown and tan. |

[1] U.S. Department of Agriculture (USDA), 1980.

Note: These soil descriptions are for soil from 0 to 12 inches below land surface.

and BKG-SL09A collected from the Lakeland sand series was averaged prior to use in the calculation of the arithmetic mean.

The following sections describe the analytical results for background surface soil samples and surface soil samples from the two site groups: Landfill and Disposal Area (Sites 1, 10, 11, 12, 13, 14, 15, 16, and 31), and the Crash Crew Training Area (Sites 17 and 18). The soil types at the three groups of sites, according to the USDA (1980), are characterized as: Troup loamy sand, Orangeburg sandy loam, and Lakeland sand (Table 4-2).

Data validation was performed on all soil analytical results at NEESA Level C and D, which are equivalent to USEPA Level III and Level IV DQOs, respectively (NEESA, 1988; USEPA, 1988c; 1991).

### 4.3.1 Facility Background

Troup Loamy Sand. Table 4-3 summarizes the analytical results for organic and inorganic analytes detected in the four background surface soil samples collected from Troup loamy sand. The sample locations are shown on Figure 2-9.

No pesticides, PCBs, or PAH compounds were detected in any of the four background surface soil samples.

Twenty TAL metals were detected in surface soil samples collected from the Troup loamy sand soil types. Nine of the metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, vanadium, and zinc) were detected at concentrations above the CRDLs (Table 4-3). Aluminum, chromium, iron, lead, manganese, and zinc were detected above the CRDLs in each of the four background surface soil samples. Concentrations of the remaining TAL metals were detected below CRDLs. Concentrations of 16 TAL metals were qualified as estimated during data validation process.

Orangeburg Loamy Sand. Table 4-4 summarizes the analytical results for all organic and inorganic analytes detected in the three background surface soil samples collected from Orangeburg sandy loam (Figure 2-9).

Six pesticide compounds were detected in the Orangeburg sandy loam soil samples. The detected concentrations were qualified as estimated because they were below the CRQLs. No PAHs or PCBs were detected in the Orangeburg sandy loam background soil samples.

Nineteen TAL metals were detected in the Orangeburg sandy loam soil samples. Eleven TAL metals (aluminum, arsenic, calcium, chromium, copper, iron, lead, magnesium, manganese, vanadium, and zinc) were detected at concentrations above the CRDLs. The remaining TAL metals (barium, beryllium, mercury, nickel, potassium, silver, and sodium) were detected at concentrations below the CRQLs. Concentrations of 15 TAL metals were qualified as estimated during the data validation process.

Lakeland Sand. Table 4-5 summarizes the analytical results for organic and inorganic analytes detected in the three background surface soil samples (and a duplicate) collected from Lakeland sand. The sample locations are shown on Figure 2-9.

## Table 4-3
## Summary Analytical Results for Detected Analytes in Background Surface Soil Samples from Troup Loamy Sand Soil Type

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | BKG-SL-02 | BKG-SL-06 | BKG-SL-07 | BKG-SL-08 | Arithmetic Mean | 2X Arithmetic Mean |
|---|---|---|---|---|---|---|
| Collect Date | 10-AUG-92 | 10-AUG-92 | 10-AUG-92 | 10-AUG-92 | | |
| Lab Sample No. | 22440002 | 22440006 | 22440007 | 22440008 | | |
| **Polynuclear Aromatic Hydrocarbons (PAHs) (µg/kg)** | | | | | | |
| None detected | | | | | | |
| **Target Compound List (TCL)** | | | | | | |
| **Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | |
| None detected | | | | | | |
| **Target Analyte List (TAL)** | | | | | | |
| **Metals and Total Cyanide (mg/kg)** | | | | | | |
| Aluminum | 5,410 | 21,300 | 6,350 | 7,900 | 10,240 | 20,480 |
| Antimony | 2.9 J | 5 J | -- | -- | 3.95 | 7.9 |
| Arsenic | 0.91 J | 3.7 | 1.2 J | 1.3 J | 1.8 | 3.6 |
| Barium | 7.8 J | 26.2 J | 10.5 J | 9.3 J | 13.5 | 26.9 |
| Beryllium | 0.09 J | 0.35 J | 0.11 J | -- | 0.18 | 0.36 |
| Cadmium | -- | -- | -- | -- | ND | ND |
| Calcium | 269 J | 262 J | 216 J | 210 J | 239 | 478 |
| Chromium | 6.2 | 16.3 | 4.5 | 5.4 | 8.1 | 16.2 |
| Cobalt | 1.2 J | 2.9 J | 0.89 J | 0.97 J | 1.5 | 3.0 |
| Copper | 4.6 J | 8.5 | 3.9 J | 5.4 | 5.6 | 11.2 |
| Iron | 3,380 | 12,400 | 3,400 | 4,430 | 5,902 | 11,805 |
| Lead | 2.7 J | 8 J | 3.3 | 9.8 J | 5.9 | 11.8 |
| Magnesium | 149 J | 316 J | 109 J | 119 J | 173 | 346 |
| Manganese | 66.7 | 236 | 314 | 149 | 191 | 383 |
| Mercury | -- | 0.07 J | -- | -- | 0.07 | 0.14 |
| Nickel | -- | 5.9 J | -- | -- | 5.9 | 11.8 |
| Potassium | -- | -- | -- | -- | ND | ND |
| Selenium | -- | -- | 0.4 J | -- | 0.4 | 0.80 |
| Silver | 0.35 J | -- | -- | -- | 0.35 | 0.70 |
| Sodium | 190 J | 227 J | 149 J | 235 J | 200 | 400 |
| Thallium | -- | -- | -- | -- | ND | ND |
| Vanadium | 8.7 J | 31.1 | 8.8 J | 10.5 J | 14.8 | 30.0 |
| Zinc | 7.4 | 16.3 J | 7.7 J | 8.7 J | 10.0 | 20.0 |
| Cyanide | -- | -- | -- | -- | ND | ND |

Notes: µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
ND = not detected in background samples; therefore, no arithmetic mean or 2 times arithmetic mean was calculated.

## Table 4-4
## Summary Analytical Results for Detected Analytes in Background Surface Soil Samples, from Orangeburg Loamy Sand Soil Type

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | BKG-SL-3 | BKG-SL-4 | BKG-SL-5 | Arithmetic Mean | 2X Arithmetic Mean |
|---|---|---|---|---|---|
| Collect Date | 10-AUG-92 | 10-AUG-92 | 10-AUG-92 | | |
| Lab Sample No. | 22440003 | 22440004 | 22440005 | | |
| **Polynuclear Aromatic Hydrocarbons (PAHs) (µg/kg)** | | | | | |
| None detected | | | | | |
| **Target Compound List (TCL) Pesticides and Polychlorinated Biphenyls (µg/kg)** | | | | | |
| 4,4'-DDE | 8.7 J | -- | -- | 8.7 | 17.4 |
| 4,4'-DDT | 6.0 J | -- | 9.6 J | 7.8 | 15.6 |
| Heptachlor epoxide | -- | -- | 3.4 J | 3.4 | 6.8 |
| Dieldrin | -- | -- | 9.0 J | 9.0 | 18.0 |
| alpha-Chlordane | -- | -- | 1.4 J | 1.4 | 2.8 |
| gamma-Chlordane | -- | -- | 5.2 J | 5.2 | 10.4 |
| **Target Analyte List (TAL) Metals and Total Cyanide (mg/kg)** | | | | | |
| Aluminum | 12,400 | 11,100 | 20,800 | 14,766.6 | 29,533 |
| Antimony | -- | -- | -- | ND | ND |
| Arsenic | 1.9 J | 2 J | 3.1 | 2.33 | 4.7 |
| Barium | 33.9 J | 11.9 J | 26.8J | 24.2 | 48.4 |
| Beryllium | 0.23 J | 0.12 J | 0.3 J | 0.22 | 0.44 |
| Cadmium | -- | | -- | ND | ND |
| Calcium | 439 J | 327 J | 3,750 | 1,505 | 3,011 |
| Chromium | 9 | 7.9 | 16.2 | 11.03 | 22.1 |
| Cobalt | 2.6 J | 1.2 J | 2.5 J | 2.1 | 4.2 |
| Copper | 5 J | 3.9 J | 6.3 | 5.1 | 10.1 |
| Iron | 7,720 | 5,900 | 12,500 | 8,707 | 17,413 |
| Lead | 7.6 | 4.1J | 8.4 | 6.7 | 13.4 |
| Magnesium | 219 J | 153 J | 1,570 | 647 | 1,295 |
| Manganese | 976 | 233 | 698 | 636 | 1,271 |
| Mercury | 0.04 J | -- | -- | 0.04 | 0.08 |
| Nickel | 3.1 J | -- | 4.2 J | 3.6 | 7.3 |
| Potassium | -- | -- | 236 J | 236 | 472 |
| Selenium | -- | -- | -- | ND | ND |
| Silver | -- | -- | 0.42 J | 0.42 | 0.84 |
| Sodium | 152 J | 141 J | 158 J | 150 | 300 |
| Thallium | -- | -- | -- | ND | ND |
| Vanadium | 20.1 | 15.2 | 31.9 | 22.4 | 44.8 |
| Zinc | 9.8 J | 9.7 J | 11.9 J | 10.5 | 21 |
| Cyanide | -- | -- | -- | ND | ND |

Notes: µg/kg = micrograms per kilogram.
DDE = dichlorodiphenyldichloroethene.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected during laboratory analysis.
DDT = dichlorodiphenyltrichloroethane.
mg/kg = milligram per kilogram.
ND = not detected; therefore no arithmetic mean or 2 times arithmetic mean was calculated.

## Table 4-5
## Summary Analytical Results for Detected Analytes in Background Surface Soil Samples from Lakeland Sand Soil Type

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | BKG-SL-01 | BKG-SL-09 | BKG-SL-09A[1] | BKG-SL-10 | Arithmetic Mean | 2X Arithmetic Mean |
|---|---|---|---|---|---|---|
| Collect Date | 10-AUG-92 | 10-AUG-92 | 10-AUG-92 | 10-AUG-92 | | |
| Lab Sample No. | 22440001 | 22440009 | 22440010 | 22440011 | | |
| **Polynuclear Aromatic Hydrocarbons (PAHs) (μg/kg)** | | | | | | |
| None detected | | | | | | |
| **Target Compound List (TCL) Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | |
| Dieldrin | -- | 23 J | 35 | -- | 29 | 58 |
| **Target Analyte List (TAL) Metals and Cyanide (mg/kg)** | | | | | | |
| Aluminum | 2,510 | 2,510 | 4,090 | 5,040 | 3,617 | 7,233 |
| Antimony | -- | -- | -- | | ND | ND |
| Arsenic | 0.69 J | 0.58 J | 0.73 J | 1 J | 0.78 | 1.6 |
| Barium | 2.7 J | 2.4 J | 3.9 J | 5.2 J | 3.7 | 7.4 |
| Beryllium | -- | -- | -- | -- | ND | ND |
| Cadmium | -- | -- | -- | 0.9 J | 0.9 | 1.8 |
| Calcium | 290 J | 118 J | 240 J | 401 J | 290 | 580 |
| Chromium | 3.4 | 2.3 | 4.2 | 3.8 | 3.5 | 7.0 |
| Cobalt | -- | -- | -- | 0.75 J | 0.75 | 1.5 |
| Copper | 2.1 J | 1.8 J | 4.3 J | 3.3 J | 2.8 | 5.6 |
| Iron | 2,260 | 1,670 | 2,780 | 2,780 | 2,422 | 4,843 |
| Lead | 1.8 | 5.9 J | 3.8 J | 4.1 J | 3.6 | 7.2 |
| Magnesium | 88.9 J | 46.9 J | 78.8 J | 122 J | 91.2 | 183 |
| Manganese | 44.4 | 14 | 27.6 | 144 | 69.7 | 140 |
| Mercury | -- | -- | -- | -- | ND | ND |
| Nickel | -- | -- | 4.1 J | -- | 4.1 | 8.2 |
| Potassium | -- | -- | -- | -- | ND | ND |
| Selenium | -- | -- | -- | -- | ND | ND |
| Sodium | 150 J | 145 J | 217 J | 144 J | 158 | 317 |
| Silver | -- | -- | -- | -- | ND | ND |
| Thallium | -- | -- | -- | -- | ND | ND |
| Vanadium | 6.1 J | 3.7 J | 6.2 J | 6.7 J | 5.9 | 11.8 |
| Zinc | 4.8 | 5.5 J | 11.8 J | 12.1 J | 8.5 | 17.0 |
| Cyanide | -- | -- | -- | -- | ND | ND |

[1] The "A" in the locator designation indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
mg/kg = milligram per kilogram.
ND = not detected in background samples; therefore, no arithmetic mean or 2 times arithmetic mean calculated.

One pesticide compound, dieldrin, was detected in one of the three background surface soil samples (and in the duplicate) at a concentration exceeding the CRQL. The detected concentration was estimated. Neither PCBs nor PAHs were detected in any of the three background surface soil samples.

Sixteen TAL metals were detected in the Lakeland sand surface soil samples. Six TAL metals (aluminum, chromium, iron, lead, manganese, and zinc) were detected above the CRDLs in all three background surface soil samples (and a duplicate). Concentrations of the remaining 10 TAL metals (arsenic, barium, cadmium, calcium, cobalt, copper, magnesium, nickel, sodium, and vanadium) were detected below the CRDLs. Concentrations of 12 TAL metals were qualified as estimated during the data validation process.

4.3.2 Surface Soil Samples, Landfill and Disposal Area Sites. The lithologic description for surface soil samples (0 to 12 inches bls) collected from the sites indicated mostly of fine- to coarse-grained loamy sand with some silt and clay (Table 4-2). In general silty sand, sandy clays, and clay were present at 0.5 foot bls at some locations. The soil types at Sites 1, 9, 11, 13, 14, 15, 16, and 31 were characterized as Troup loamy sand according to the USDA (1980) and, therefore, the analytical results for TCL pesticides, TCL PCBs, PAHs, and TAL metals in surface soil samples from the landfill disposal areas will be compared to the analytical results of the background surface soil samples BKG-SL-02, BKG-SL-06, BKG-SL-07, and BKG-SL-08.

4.3.2.1 Site 1, Northwest Disposal Area Table 4-6 summarizes the analytical results for organic compounds and inorganic analytes detected in three surface soil samples (and a duplicate) at Site 1. The sample locations are shown on Figure 2-1.

TCL VOCs. Xylenes (total) were the only VOCs detected in two of the three surface soil samples (and a duplicate). Reported concentrations of xylenes (total) were less than the CRQL and were qualified as estimated.

TCL SVOCs. SVOCs were not detected in the surface soil samples and a duplicate.

Pesticides and PCBs. A single pesticide compound, dieldrin, was detected in one surface soil sample (01-SL-01). The concentration detected was qualified as estimated because it was below the CRQL. No PCBs were detected in the surface soil samples.

TAL Meals and (Total) Cyanide. Seventeen TAL metals were detected in the surface soil samples. Nine metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, and zinc) were detected at concentrations exceeding the CRDLs. Concentrations of arsenic and lead were qualified as estimated during the data validation process. Concentrations of the remaining eight TAL metals were detected at concentrations below the CRDLs and were qualified as estimated during the data validation process. Five metals (cadmium, chromium, iron, mercury, and potassium) were detected at concentrations exceeding 2 times the background mean concentrations. Three metals (chromium, iron, and mercury) were detected in sample 01-SL-3, but not its duplicate, 01-SL-3A, at concentrations exceeding 2 times the background mean concentrations. Cyanide (total) was not detected in the surface soil samples at this site.

## Table 4-6
## Summary of Analytical Results for Surface Soil Samples from Site 1

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 01-SL-01 | 01-SL-02 | 01-SL-03 | 01-SL-03A[1] | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|
| Collect Date | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | |
| Lab Sample No. | S22454011 | S22454012 | 22457001 | 22457002 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | |
| Xylenes (total) | 1 J | -- | 2 J | 2 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | |
| None detected | | | | | |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | |
| Dieldrin | 1.5 J | -- | -- | -- | ND |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | | |
| Aluminum | 5,700 | 10,500 | 1,800 | 13,500 | 20,480 |
| Arsenic | 1.3 J | 1.8 J | 3.2 J | 3.2 J | 3.6 |
| Barium | 9.6 J | 14.7 J | 15.7 J | 14.3 J | 26.9 |
| Beryllium | 0.1 J | 0.15 J | 0.14 J | 0.15 J | 0.36 |
| Cadmium | -- | 0.71 J | -- | -- | ND |
| Calcium | 321 J | 264 J | -- | -- | 478 |
| Chromium | 5.5 | 17.5 | 48 J | 11.9 J | 16.2 |
| Cobalt | 1.3 J | 1.2 J | 0.87 J | 0.92 J | 3.0 |
| Copper | 5.6 J | 7.1 | -- | -- | 11.2 |
| Iron | 3,960 | 10,400 | 137,00 | 9,940 | 11,805 |
| Lead | 8.9 J | 3.5 J | -- | -- | 11.8 |
| Magnesium | 84.8 J | 193 J | 219 J | 153 J | 346 |
| Manganese | 85 | 5.6 | 20.2 | 20.5 | 383 |
| Mercury | -- | -- | 0.34 | -- | 0.14 |
| Nickel | -- | -- | 3.6 J | 3.4 J | 11.8 |
| Potassium | -- | -- | 157 J | -- | ND |
| Zinc | 8 J | 8.3 J | 11.7 | 11.3 | 20.0 |

[1] The "A" in the locator designation indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected during laboratory analysis.
NA = not analyzed in background samples.
ND = not detected in Troup loamy sand background samples.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
mg/kg = milligrams per kilogram.

**4.3.2.2 Site 10, Southeast Open Disposal Area (A)** Table 4-7 summarizes the analytical results for all organic compounds and inorganic analytes detected in five surface soil samples collected at Site 10. The sample locations are shown on Figure 2-2.

TCL VOCs. Xylenes (total) were the only VOCs detected in the five surface soil samples. The concentration detected was below the CRQL and was qualified as estimated.

TCL SVOCs. Eleven TCL SVOCs (diethylphthalate, phenanthrene, fluoranthene, pyrene, butylbenzylphthalate, benzo(a) anthracene, chrysene, bis(2-ethylhexyl)-phthalate, benzo(b)fluoranthene, benzo(k) fluoranthene, and benzo(a)pyrene) were detected in four surface soil samples collected at Site 10. The detected concentrations of SVOCs were less than the CRQLs and were qualified as estimated. The detected SVOCs are PAHs. None of the SVOC compounds were detected in background surface soil samples from the representative soil type.

Pesticides and PCBs. One pesticide compound (4,4'-dichlorodiphenyltrichloroethane [DDT]) and two PCBs (Aroclor-1254 and Aroclor-1260) were detected in three surface soil samples. The concentrations detected were qualified as estimated because they were below the CRQLs. Pesticide and PCB compounds were not detected in the Troup loamy sand background surface soil samples.

TAL Metals and (Total) Cyanide. Eighteen TAL metals were detected in either one or more of the five surface soil samples collected from the site. Twelve metals (aluminum, arsenic, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected at concentrations exceeding the CRDLs. Concentrations of the six remaining TAL metals were detected below the CRDLs. Concentrations of a total of 11 TAL metals were qualified as estimated during the data validation process. Thirteen metals (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected at concentrations exceeding 2 times the average background surface soil concentrations. Cyanide (total) was not detected in the surface soil samples.

**4.3.2.3 Site 11, Southeast Open Disposal Area (B)** Table 4-8 summarizes the analytical results for organic compounds and inorganic analytes detected in five surface soil samples (and a duplicate) collected at Site 11 (Figure 2-2).

TGL VOCs. VOCs were not detected in any of the surface soil samples.

TCL SVOCs. Thirteen SVOCs (2-methylnaphthalene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene) were detected in one surface soil sample. The detected SVOCs, with the exceptions of 2-methylnaphthalene, anthracene, indeno(1,2,3-cd) pyrene, and benzo(g,h,i) perylene, were detected at concentrations above the CRQLs. Concentrations of four SVOCs were qualified as estimated during the data validation process. None of the compounds were detected in the Troup loamy sand background surface soil samples.

Pesticides and PCBs. Neither pesticides nor PCB compounds were detected in the surface soil samples collected at Site 11.

## Table 4-7
## Summary Analytical Results for Surface Soil Samples from Site 10

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 10-SL-01 | 10-SL-02 | 10-SL-03 | 10-SL-04 | 10-SL-05 | 2X Arithmetic Mean Troup Loamy Sand |
|---|---|---|---|---|---|---|
| Collect Date | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | |
| Lab Sample No. | 22462001 | 22462002 | 22462003 | 22462004 | 22462005 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | |
| Xylenes (total) | -- | -- | -- | 1 J | -- | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | |
| Diethylphthalate | -- | -- | 96 J | -- | -- | NA |
| Phenanthrene | 94 J | -- | 48 J | 36 J | -- | ND |
| Fluoranthene | 130 J | 69 J | 96 J | 59 J | -- | ND |
| Pyrene | 140 J | 87 J | 85 J | 46 J | -- | ND |
| Butylbenzylphthalate | 46 J | 85 J | 40 J | -- | -- | NA |
| Benzo(a)anthracene | 81 J | 57 J | 59 J | 42 J | -- | ND |
| Chrysene | 100 J | 64 J | 78 J | 45 J | -- | ND |
| bis(2-Ethylhexyl)phthalate | 95 J | 130 J | 100 J | 57 J | -- | NA |
| Benzo(b)fluoranthene | 71 J | 78 J | 62 J | -- | -- | ND |
| Benzo(k)fluoranthene | 76 J | 74 J | 62 J | -- | -- | ND |
| Benzo(a)pyrene | 46 J | 45 J | -- | -- | -- | ND |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | |
| 4,4'-DDT | 15 J | 14 J | 33 J | -- | -- | ND |
| Aroclor-1254 | 210 J | 210 J | 310 J | -- | -- | ND |
| Aroclor-1260 | 49 J | 60 J | -- | -- | -- | ND |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | | | |
| Aluminum | 11,300 | 21,600 | 13,500 | 37,000 | 23,200 | 20,480 |
| Arsenic | 4.1 | 6.9 | 5.4 | 8.8 | 6.1 | 3.6 |
| Barium | 9 J | 31.5 J | 9.7 J | 17.5 J | 7.5 J | 26.9 |
| Beryllium | 0.14 J | 0.18 J | 0.12 J | 0.21 J | -- | 0.36 |
| Cadmium | 0.89 J | 2.4 | 2.3 | -- | -- | ND |
| Calcium | 620 J | 1,620 J | 583 J | 1,720 | 157 J | 478 |
| Chromium | 13.2 | 29.9 | 19.4 | 31.9 | 21.2 | 16.2 |
| Cobalt | 1.4 J | 2.4 J | 1.1 J | 1.8 J | 2.1 J | 3.0 |
| Copper | 7.4 | 24.2 | 15.8 | 13 | 6.6 J | 11.2 |
| Iron | 10,000 | 19,600 | 13,200 | 23,800 | 16,100 | 11,805 |
| Lead | 19 J | 47 | 34.1 | 29.3 | 12.5 J | 11.8 |
| Magnesium | 121 J | 191 J | 96.1 J | 294 J | 106 J | 346 |
| Manganese | 41.9 | 70.5 | 389 | 57.1 | -- | 383 |
| Mercury | -- | -- | 0.2 | -- | -- | 0.14 |
| Nickel | -- | 4.9 J | 4.2 J | 3.5 J | -- | 11.8 |
| Sodium | 182 J | 290 J | 228 J | 387 J | 289 J | 400 |
| Vanadium | 25 | 48.1 | 35.7 | 63.4 | 41.1 | 30.0 |
| Zinc | 23.9 J | 92.7 J | 705 | 42.5 J | 11.3 J | 20.0 |

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
NA = not analyzed for background samples.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
ND = not detected in Troup loamy sand background samples.
DDT = dichlorodiphenyltrichloroethane.
mg/kg = milligrams per kilogram.

## Table 4-8
## Summary Analytical Results for Surface Soil Samples from Site 11

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 11-SL-01 | 11-SL-01A[1] | 11-SL-02 | 11-SL-03 | 11-SL-04 | 11-SL-05 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 33701001 | 33701002 | 33701003 | 33701104 | 33701005 | 33701006 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | 49 J | -- | ND |
| Phenanthrene | -- | -- | -- | -- | 2,100 | -- | ND |
| Anthracene | -- | -- | -- | -- | 280 J | -- | ND |
| Fluoranthene | -- | -- | -- | -- | 1,300 | -- | ND |
| Pyrene | -- | -- | -- | -- | 3,400 | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | 1,800 | -- | ND |
| Chrysene | -- | -- | -- | -- | 2,500 | -- | ND |
| bis(2-Ethylhexyl)-phthalate | -- | -- | -- | -- | 540 | -- | NA |
| Benzo(b)fluoranthene | -- | -- | -- | -- | 710 | -- | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | 870 | -- | ND |
| Benzo(a)pyrene | -- | -- | -- | -- | 910 | -- | ND |
| Ideno(1,2,3-cd)pyrene | -- | -- | -- | -- | 230 J | -- | ND |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | 310 J | -- | ND |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | | | | |
| Aluminum | 9,790 | 10,800 | 10,800 | 9,380 | 6,100 | 2,110 | 20,480 |
| Antimony | -- | -- | 3.5 J | -- | -- | -- | 7.9 |
| Arsenic | 2 J | 1.6 J | 3.8 | 2.1 J | 1.5 J | 0.93 J | 3.6 |
| Barium | 16.4 J | 17.8 J | 96 | 3.1 J | 6.3 J | 6.2 J | 26.9 |
| Beryllium | 0.13 J | 0.1 J | 0.14 J | -- | -- | -- | 0.3 |
| Calcium | 183 J | 186 J | 1,790 | 375 J | 248 J | 331 J | 478 |
| Chromium | 6.9 | 7.4 | 19.6 | 7.7 | 4.5 | 2.7 | 16.2 |
| Cobalt | 1.2 J | 1.6 J | 3.4 J | 1.2 J | 0.35 J | -- | 3.0 |
| Copper | 5.2 J | 5.1 J | 19.4 | 5.3 J | 4 J | 8.1 | 11.2 |
| Iron | 5,810 | 5,860 | 11,700 | 5,500 | 3,540 | 1,500 | 11,805 |
| Lead | 5.7 | 5.5 | 2,230 | 22.3 | 7.8 | 8.6 | 11.8 |
| Magnesium | 108 J | 142 J | 1,260 | 99.7 J | 82.7 J | 65.1 J | 346 |
| Manganese | 275 | 285 | 230 | 182 | 39.4 | 31.4 | 383 |
| Mercury | 0.05 J | 0.05 | 0.06 J | 0.04 J | 0.04 J | 0.05 J | 0.14 |
| Nickel | -- | -- | 10 | -- | -- | -- | 11.8 |
| Potassium | -- | 139 J | 166 J | -- | -- | 133 J | ND |
| Silver | 1.2 J | 0.67 J | 1.9 J | 0.55 J | 0.93 J | 0.79 J | 0.70 |
| Sodium | 177 J | 169 J | 307 J | 184 J | 189 J | 177 J | 400 |
| Vanadium | 14.9 | 15.7 | 20.3 | 14.6 | 9.5 J | 4.4 J | 30.0 |
| Zinc | 8.8 J | 9.9 J | 260 | 47.8 | 9.4 J | 21.5 | 20.0 |

[1] The A in the locator designation indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected during the background surface soil samples.
J = the associated numerical value is an estimated quantity.
ND = not detected in Troup loamy sand background samples.
NA = not analyzed for background samples.
mg/kg = milligrams per kilogram.

TAL Metals and (Total) Cyanide. Twenty TAL metals were detected in either one or more of the surface soil samples. Twelve TAL metals (aluminum, arsenic, barium, calcium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) were detected at concentrations exceeding CRDLs. Concentrations of the remaining metals were less than CRDLs and were qualified as estimated during the data validation process. Cyanide (total) was not detected in the surface soil samples. Eleven of the metals (arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, potassium, silver, and zinc) were detected at concentrations exceeding 2 times the background mean concentrations in at least one surface soil sample collected from the site. Potassium was not detected in the Troup loamy sand background samples. Concentrations of 14 TAL metals were qualified as estimated during the data validation process.

**4.3.2.4 Site 13, Sanitary Landfill** Table 4-9 summarizes the analytical results for all organic compounds and inorganic analytes detected in five surface soil samples and a duplicate at Site 13. Sample locations are shown in Figure 2-3.

TCL VOCs. VOCs were not detected in the surface soil samples collected.

TCL SVOCs. Three SVOCs (fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate) were detected in at least one of five surface soil samples (and a duplicate). The reported concentrations were qualified as estimated during the data validation process (except for bis(2-ethylhexyl)phthalate detected in sample 13-SL-04) and were below the CRQLs. Fluoranthene and pyrene were detected in one surface soil sample (13-SL-01) and neither compound was detected in the Troup loamy sand background samples. Bis(2-ethylhexyl)phthalate was detected in three of the five surface soil samples (and the duplicate). Bis(2-ethylhexyl)phthalate was not a target analyte in the background soil sample analyses.

Pesticides and PCBs. Pesticides or PCBs were not detected in the surface soil samples.

TAL Metals and ((Total)) Cyanide. Eighteen TAL metals were detected in at least one of the five surface soil samples (and a duplicate). Nine metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, vanadium, and zinc) were detected at concentrations above the CRDLs. Seven of these metals (aluminum, arsenic, calcium, chromium, iron, silver, and vanadium) were detected at concentrations exceeding 2 times the background mean concentration in at least one of the surface soil samples from the site. Concentrations of 12 TAL metals (arsenic, barium, beryllium, calcium, cobalt, copper, magnesium, mercury, nickel, silver, sodium, and zinc) were qualified as estimated during the validation process. Cyanide (total) was not detected in the surface soil samples.

**4.3.2.5 Site 14, Short-term Landfill** Table 4-10 summarizes the analytical results for organic compounds and inorganic analytes detected in three surface soil samples collected at Site 14. The sample locations are shown on Figure 2-3.

TCL VOCs. One VOC, xylene (total), was detected in one surface soil sample from Site 14. The concentration detected was qualified as estimated because it was below the CRQL.

## Table 4-9
## Summary Analytical Results for Surface Soil Samples from Site 13

Remedial Investigation and Feasibility Study, Phase IIA
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NAS Whiting Field, Milton, Florida

| Locator | 13-SL-01 | 13-SL-02 | 13-SL-03 | 13-SL-04 | 13-SL-5 | 13-SL-5A[1] | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 22526007 | 22526008 | 22526009 | 22526010 | 22526011 | 22526011 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | | |
| Fluoranthene | 51 J | -- | -- | -- | -- | -- | ND |
| Pyrene | 61 J | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)-phthalate | 95 J | 100 J | -- | 450 | -- | 64 J | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **Target Analyte List (TAL) Metals and Cyanide (mg/kg)** | | | | | | | |
| Aluminum | 14,100 | 19,300 | 10,900 | 20,900 | 10,500 | 8,070 | 20,480 |
| Arsenic | 2.9 | 3.9 | 3.4 | 6.9 | 2.4 | 2 J | 3.6 |
| Barium | 9.5 J | 7.6 J | 5.9 J | 9.1 J | 7.9 J | 6.6 J | 26.9 |
| Beryllium | 0.07 J | 0.08 J | 0.06 J | 0.16 J | -- | -- | 0.36 |
| Calcium | 525 J | 143 J | 350 J | 355 J | 78.4 J | 92.4 J | 478 |
| Chromium | 11.6 | 18.6 | 11 | 17.7 | 8.2 | 7.4 | 16.2 |
| Cobalt | -- | 0.73 J | 0.51 J | 1.3 J | 0.74 J | 1 J | 3.0 |
| Copper | 9.2 | 5.9 | 7.6 | 5.2 J | 4 | 4.2 J | 11.2 |
| Iron | 8,150 | 14,900 | 8,990 | 15,500 | 6,680 | 4,960 | 11,805 |
| Lead | 5.8 | 5.8 | 4.6 | 10.5 | 3.2 | 4 | 11.8 |
| Magnesium | 172 J | 98.9 J | 107 J | 87.5 J | 57.5 J | 50.6 J | 346 |
| Manganese | 32.8 | 25.4 | 18.7 | 62.1 | 79.1 | 77 | 383 |
| Mercury | 0.04 J | 0.05 J | 0.04 J | 0.04 J | 0.05 J | 0.05 J | 0.14 |
| Nickel | -- | 2.8 J | -- | -- | -- | 2.9 J | 11.8 |
| Silver | 0.74 J | 0.75 J | 0.39 J | 1.2 J | 0.48 J | 0.36 J | 0.70 |
| Sodium | 181 J | 202 J | 173 J | 193 J | 176 J | 262 J | 400 |
| Vanadium | 23.1 | 41.3 | 26.5 | 42 | 17.5 | 13.1 | 30.0 |
| Zinc | 13.2 | 8.2 J | 7.8 J | 10.8 J | 17.5 | 16.1 | 20.0 |

[1] The A in the locator designation indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected during laboratory analysis.
ND = not detected in Troup loamy sand background samples.
NA = not analyzed in background samples.
mg/kg = milligrams per kilogram.

## Table 4-10
## Summary Analytical Results for Surface Soil Samples from Site 14

Remedial Investigation and Feasibility Study, Phase IIA
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NAS Whiting Field, Milton, Florida

| Locator | 14-SL-01 | 14-SL-02 | 14-SL-03 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|
| Collect Date | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | |
| Lab Sample No. | 22454015 | 22454016 | 22454017 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | |
| Xylenes (total) | 2 J | -- | -- | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | |
| Chrysene | -- | 380 J | -- | ND |
| bis(2-Ethylhexyl)phthalate | -- | 40 J | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | |
| None detected | | | | |
| **Target Analyte List (TAL) Metals and Cyanide (mg/kg)** | | | | |
| Aluminum | 20,400 | 13,500 | 11,800 | 20,480 |
| Arsenic | 4.2 | 2.2 J | 1.8 J | 3.6 |
| Barium | 12 J | 6.2 J | 17.1 J | 26.9 |
| Beryllium | 0.15 J | 0.13 J | 0.12 J | 0.36 |
| Cadmium | 0.94 J | -- | -- | ND |
| Calcium | 118 J | 80.9 J | 110 J | 478 |
| Chromium | 17 | 17.6 | 7.2 | 16.2 |
| Cobalt | 1.5 J | 1.5 J | 1.8 J | 3.0 |
| Copper | 4.9 J | 5.1 J | 7.8 | 11.2 |
| Iron | 14,300 | 15,800 | 7,120 | 11,805 |
| Lead | 5.7 J | 5.1 J | 4.3 J | 11.8 |
| Magnesium | 87.4 J | 48.6 J | 106 J | 346 |
| Manganese | 62.3 | 33.6 | 113 | 383 |
| Sodium | 170 J | 179 J | 180 J | 400 |
| Vanadium | 37.4 | 42.1 | 16.9 | 30.0 |
| Zinc | 7.7 J | 11.1 | 7.8 J | 20.0 |

Notes: μg/kg = microgram per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected during laboratory analysis.
NA = not analyzed in background samples.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
ND = not detected in Troup loamy sand background samples.
mg/kg = milligrams per kilogram.

TCL SVOCs. Two SVOCs (chrysene and bis(2-ethylhexyl)phthalate) were detected in one surface soil sample. The concentrations detected were estimated because they were below the CRQLs.

Pesticides and PCBs. No pesticides or PCBs were detected in the surface soil samples.

TAL Metals and ((Total)) Cyanide. Sixteen TAL metals were detected in the three surface soil samples. Nine metals (aluminum, arsenic, chromium, copper, iron, manganese, vanadium, and zinc) were detected at concentrations above the CRDLs. All reported concentrations of eight of the metals (barium, beryllium, cadmium, calcium, cobalt, lead, magnesium, and sodium) were qualified as estimated during the data validation process. Four metals (arsenic, chromium, iron, and vanadium) were detected at concentrations exceeding 2 times the background mean concentrations. Cadmium was not detected in Troup loamy sand background samples. Cyanide (total) was not detected in any of the surface soil samples.

**4.3.2.6 Site 15, Southwest Landfill** Table 4-11 summarizes the analytical results for organic compounds and inorganic analytes detected in five surface soil samples (and a duplicate) collected at Site 15 (Figure 2-5).

TCL VOCS. Xylenes (total) were detected in three of five surface soil samples. The concentrations detected were below the CRQLs and were qualified as estimated. Background soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Bis(2-ethylhexyl)phthalate was detected in two of five samples. The concentrations detected were below the CRQLs and were qualified as estimated.

Pesticides and PCBs. No pesticides or PCBs were detected in the surface soil samples.

TAL Metals and (Total) Cyanide. Fifteen TAL metals were detected in at least three of five samples (and a duplicate). Eight of the metals (aluminum, chromium, copper, iron, lead, manganese, vanadium, and zinc) were detected at concentrations above the CRDLs. Concentrations of the remaining seven TAL metals were detected below CRDLs. Concentrations of 11 TAL metals (arsenic, barium, beryllium, calcium, cobalt, copper, lead, magnesium, sodium, vanadium, and zinc) were qualified as estimated during the data validation process. Cyanide (total) was not detected in the surface soil samples collected from this site. Two metals (copper and lead) were detected at concentrations exceeding 2 times the background mean concentrations.

**4.3.2.7 Site 16, Open Disposal and Burning Area** Table 4-12 summarizes the analytical results for organic and inorganic analytes detected in three surface soil samples collected at Site 16 (Figure 2-6).

TCL VOCs. Xylenes (total) were detected in the three surface soil samples collected at Site 16. The concentrations detected were estimated because they were below the CRQLs. Background soil samples were not analyzed for TCL VOC analytes.

## Table 4-11
## Summary Analytical Results for Surface Soil Samples from Site 15

Remedial Investigation and Feasibility Study, Phase IIA
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NAS Whiting Field, Milton, Florida

| Locator | 15-SL-01 | 15-SL-02 | 15-SL-03 | 15-SL-04 | 15-SL-05 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|
| Collect Date | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | |
| Lab Sample No. | 22454005 | 22454006 | 22454007 | 22454008 | 22454009 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | |
| Xylenes (total) | -- | 1 J | 2 J | 4 J | -- | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | |
| bis(2-Ethylhexyl)phthalate | 39 J | -- | 41 J | -- | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | |
| None detected | | | | | | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | | | |
| Aluminum | 11,800 | 5,160 | 7,450 | 6,790 | 4,940 | 20,480 |
| Arsenic | 1.6 J | 0.93 J | 2.2 J | 1 J | 0.98 J | 3.6 |
| Barium | 5.3 J | 7 J | 4.3 J | 9 J | 3.2 J | 26.9 |
| Beryllium | 0.07 J | -- | 0.08 J | 0.09 J | -- | 0.36 |
| Calcium | 75.6 J | 137 J | 79.6 J | 78.9 J | 136 J | 478 |
| Chromium | 10.8 | 3.3 | 6.3 | 3.9 | 3.8 | 16.2 |
| Cobalt | 1.2 J | 0.73 J | 0.85 J | 1 J | -- | 3.0 |
| Copper | 4.1 J | 4.2 J | 1.6 J | 5.1 J | 12.5 | 11.2 |
| Iron | 7,760 | 3,040 | 4,980 | 3,460 | 2,810 | 11,805 |
| Lead | 2.8 J | 4.4 J | 4.4 J | 10.7 J | 59.9 | 11.8 |
| Magnesium | 54.3 J | 74.3 J | 43 J | 93.9 J | 57.8 J | 346 |
| Manganese | 23.1 | 25.7 | 9.3 | 143 | 13.7 | 383 |
| Sodium | 170 J | 174 J | 172 J | 174 J | 179 J | 400 |
| Vanadium | 20.6 | 6.8 J | 12.6 | 8.3 J | 7.2 J | 30.0 |
| Zinc | 11.3 | 6.8 J | 5.4 J | 7.4 J | 8.8 | 20.0 |

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background samples.
mg/kg = milligrams per kilogram.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.

## Table 4-12
## Summary Analytical Results for Surface Soil Samples from Site 16

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 16-SL-01 | 16-SL-02 | 16-SL-03 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|
| Collect Date | 11-AUG-92 | 11-AUG-92 | 11-AUG-92 | |
| Lab Sample No. | S2454002 | S22454003 | S22454004 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | |
| Xylenes (total) | 5 J | 2 J | 1 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCS) (μg/kg)** | | | | |
| bis(2-Ethylhexyl)phthalate | -- | -- | 43 J | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | |
| Dieldrin | 33 | -- | -- | ND |
| 4,4'-DDE | -- | 5.5 J | 5.5 J | ND |
| 4,4'-DDT | -- | 9.1 J | 5.2 J | ND |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | |
| Aluminum | 10,900 | 18,600 | 14,200 | 20,480 |
| Arsenic | 1.9 J | 1.4 J | 3.1 | 3.6 |
| Barium | 19.4 J | 14.7 J | 42.9 J | 26.9 |
| Beryllium | 0.12 J | 0.12 J | 0.12 J | 0.36 |
| Calcium | 427 J | 345 J | 1,180 J | 478 |
| Chromium | 10.5 | 14.7 | 14.9 | 16.2 |
| Cobalt | 1.3 J | 0.95 J | 1.7 J | 3.0 |
| Copper | 9.7 | 8.3 | 50.8 | 11.2 |
| Iron | 6,300 | 8,150 | 13,500 | 11,805 |
| Lead | 76 | 6.7 J | 121 | 11.8 |
| Magnesium | 106 J | 134 J | 228 J | 346 |
| Manganese | 80.3 | 19.2 | 228 | 383 |
| Mercury | -- | -- | 0.10 | 0.14 |
| Nickel | -- | -- | 5.5 J | 11.8 |
| Potassium | -- | -- | 230 J | ND |
| Silver | -- | -- | 0.87 J | 0.70 |
| Sodium | 196 J | 189 J | 232 | 400 |
| Vanadium | 23.2 | 28.9 | 22.7 | 29.6 |
| Zinc | 22.7 | 12.5 | 128 | 20.0 |

Notes: μg/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background samples.
-- = the analyte was not detected in laboratory analysis.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
ND = not detected in Troup loamy sand background samples.
4,4'-DDE = dichlorodiphenyldichloroethene.
4,4'-DDT = dichlorodiphenyltrichloroethane.
mg/kg = milligrams per kilogram.

TCL SVOCs. One SVOC (bis(2-ethylhexyl)phthalate) was detected in one of the three surface soil samples. The concentration detected was estimated because it was below the CRQL.

Pesticides and PCBs. Three pesticide compounds (dieldrin, 4,4'-dichlorodiphenyl-dichloroethene [4,4'-DDE], and 4,4'-DDT) were detected in at least one of the three surface soil samples. Dieldrin was detected above CRQLs in sample 16-SL-01. The detected concentrations of 4,4'-DDE and 4,4'-DDT were detected below the CRQLs and were qualified as estimated.

TAL Metals and (Total) Cyanide. Nineteen TAL metals were detected in at least one of three surface soil samples. Ten metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected at concentrations exceeding CRDLs. Concentrations of the remaining nine metals were detected below CRDLs. Concentrations of 11 TAL metals (arsenic, barium, beryllium, calcium, cobalt, lead, magnesium, nickel, potassium, silver, and sodium) were qualified as estimated during the data validation process. Total cyanide was not detected in any of the surface soil samples collected at Site 16. Seven metals (barium, calcium, copper, iron, lead, silver, and zinc) were detected at concentrations exceeding 2 times the background mean concentrations in at least one of three surface soil samples from Site 16. Potassium was not detected in the Troup loamy sand background surface soil samples.

**4.3.2.8 Site 31, Sludge Drying Beds and Disposal Areas** Tables 4-13 and 4-14 summarize the analytical results for organic and inorganic analytes, respectively, detected in the 24 surface soil samples (and a duplicate) collected at Site 31. The sample locations are shown in Figures 2-10 through 2-12.

TCL VOCs. Ten VOCs were detected in surface soil samples. However only three of the compounds (methylene chloride, carbon disulfide, and acetone) were detected at concentrations exceeding the CRQLs. Seven of the 10 VOCs (1-1 dichloroethene, benzene, 2-hexanone, toluene, chlorobenzene, trichloroethene, and total xylenes) were only detected at concentrations less than the CRQLs and were qualified as estimated. Background soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Three SVOCs (bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, and benzo(k) fluoranthene) were detected in surface soil samples collected at the site. Bis(2-ethylhexyl)phthalate was detected at concentrations above the CRQL in 4 of the 24 surface soil samples. The remaining SVOC concentrations were qualified as estimated during the validation process. Benzo(b)fluoranthene and benzo(k)fluoranthene were not detected in the Troup loamy sand background soil samples. Bis(2-ethylhexyl)phthalate was not a SVOC target analyte in the background surface soil samples.

Pesticides and PCBs. Five pesticide compounds (dieldrin, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane) and one PCB compound (Aroclor-1260) were detected in surface soil samples. The concentrations detected were qualified as estimated because they were less than the CRQLs. No pesticide or PCB compounds were detected in Troup loamy sand background surface soil samples.

TAL Metals and (Total) Cyanide. Twenty-three TAL inorganic analytes were detected in the 24 surface soil samples collected from Site 31. Concentrations of 19 of the analytes were qualified as estimated in one or more of the samples during the data validation process. Concentrations of the remaining 10 TAL metals (antimony,

## Table 4-13
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
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| Locator | 31-SL-01 | 31-SL-02 | 31-SL-03 | 31-SL-04 | 31-SL-05 | 31-SL-06 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | |
| Lab Sample No. | 22515001 | 22527002 | 22515004 | 22515003 | 22515005 | 22515006 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | --/1 J | 3 J/4 J | -- | -- | -- | -- | NA |
| 1,1- Dichloroethane | --/-- | --/-- | -- | -- | -- | -- | NA |
| Benzene | --/-- | --/-- | -- | -- | -- | -- | NA |
| 2-Hexanone | --/-- | --/-- | -- | -- | -- | 1 J | NA |
| Toluene | --/-- | --/-- | -- | -- | -- | -- | NA |
| Chlorobenzene | --/-- | --/-- | -- | -- | -- | -- | NA |
| Xylenes (total) | --/-- | 3 J/4 J | -- | 2 J | -- | 3 J | NA |
| Acetone | --/-- | --/-- | -- | -- | -- | -- | NA |
| Trichloroethene | --/-- | --/-- | -- | -- | -- | -- | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | |
| bis(2-Ethylhexyl)phthalate | -- | -- | 81 J | 230 J | 190 J | -- | NA |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | |
| Dieldrin | -- | -- | -- | -- | -- | -- | ND |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | ND |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | ND |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | ND |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | ND |
| Aroclor-1260 | -- | -- | -- | -- | -- | -- | ND |

See notes at end of table.

## Table 4-13 (Continued)
## Summary Analytical Results for Organic Compounds detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-07 | 31-SL-08 | 31-SL-09 | 31-SL-10 | 31-SL-11 | 31-SL-12 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | |
| Lab Sample No. | 22515007 | 22515009 | 22515011 | 22515012 | 22515013 | 22515014 | |
| **TCL VOCs (µg/kg)** | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | [1]160 J/-- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | [1]6 J/22 J | NA |
| 1,1- Dichloroethane | -- | -- | -- | -- | -- | --/-- | NA |
| Benzene | -- | -- | -- | -- | -- | --/-- | NA |
| 2-Hexanone | -- | -- | -- | -- | -- | --/-- | NA |
| Toluene | -- | -- | -- | -- | -- | --/-- | NA |
| Chlorobenzene | -- | -- | -- | -- | -- | --/-- | NA |
| Xylenes (total) | 2 J | 2 J | 4 J | -- | 2 J | [1]4 J/8 J | NA |
| Acetone | -- | -- | -- | -- | -- | [1]--/14J | NA |
| Trichloroethene | -- | -- | -- | -- | -- | --/-- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | 1,300 | NA |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | 100 J | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | 110 J | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | |
| Dieldrin | -- | -- | -- | -- | -- | 27 J | ND |
| 4,4'-DDE | -- | -- | -- | -- | -- | 28 J | ND |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | ND |
| alpha-Chlordane | -- | -- | -- | -- | -- | 25 J | ND |
| gamma-Chlordane | -- | -- | -- | -- | -- | 27 J | ND |
| Aroclor-1260 | -- | -- | -- | -- | -- | 350 J | ND |

See notes at end of table.

## Table 4-13 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-13 | 31-SL-14 | 31-SL-15 | 31-SL-16 | 31-SL-17 | 31-SL-18 | 31-SL-19 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 22515015 | 22515016 | 22515017 | 22527004 | 22527005 | 22527006 | 22527007 | |
| **TCL VOCs (µg/kg)** | | | | | | | | |
| Methylene chloride | [1]120J/120J | [1]240 J/710 J | [1]160 J/100 J | -- | -- | -- | -- | NA |
| Carbon disulfide | [1]3 J | [1]8/19 J | [1]39 J/13 J | -- | -- | -- | -- | NA |
| 1,1- Dichloroethane | --/-- | --/-- | --/-- | -- | -- | -- | -- | NA |
| Benzene | --/-- | --/-- | --/-- | -- | -- | -- | -- | NA |
| 2-Hexanone | --/-- | --/-- | --/-- | -- | -- | -- | -- | NA |
| Toluene | --/-- | --/-- | --/-- | -- | -- | -- | -- | NA |
| Chlorobenzene | --/-- | --/-- | --/-- | -- | -- | -- | -- | NA |
| Xylenes (total) | [1]4 J/6 J | [1]5 J/10 J | [1]11 J/9 J | -- | -- | -- | -- | NA |
| Acetone | -- | -- | -- | 3 J | 6 | -- | -- | NA |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 1,300 | 2,600 J | 720 J | -- | -- | -- | -- | NA |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | |
| Dieldrin | 33 J | 99 J | 120 J | -- | -- | -- | -- | ND |
| 4,4'-DDE | 28 J | 99 J | 100 J | -- | -- | -- | -- | ND |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | ND |
| alpha-Chlordane | 14 J | 68 J | 65 J | -- | -- | -- | -- | ND |
| gamma-Chlordane | 17 J | 76 J | 49 J | -- | -- | -- | -- | ND |
| Aroclor-1260 | 340 J | 1,400 J | 860 J | -- | -- | -- | -- | ND |

See notes at end of table.

## Table 4-13 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-20 | 31-SL-21 | 31-SL-22 | 31-SL-22A[1] | 31-SL-23 | 31-SL-24 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 22527008 | 22527009 | 22528001 | 22528002 | 22527010 | 22527011 | |
| **TCL VOCs (µg/kg)** | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | -- | NA |
| 1,1- Dichloroethene | -- | -- | 2 J | -- | -- | -- | NA |
| Benzene | -- | -- | 1 J | -- | -- | -- | NA |
| 2-Hexanone | -- | 1 J | -- | -- | -- | -- | NA |
| Toluene | -- | -- | 2 J | -- | -- | -- | NA |
| Chlorobenzene | -- | -- | 1 J | -- | -- | -- | NA |
| Xylenes (total) | 3 J | 3 J | 3 J | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | 2 J | 1 J | NA |
| Trichloroethene | -- | -- | 2 J | -- | -- | -- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | NA |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | |
| Dieldrin | -- | -- | -- | -- | 1.3 J | -- | ND |
| 4,4'-DDE | -- | -- | -- | -- | 3.2 J | -- | ND |
| 4,4'-DDT | -- | -- | -- | -- | 1.6 J | -- | ND |
| alpha-Chlordane | -- | -- | -- | -- | 1.7 J | 1.9 J | ND |
| gamma-Chlordane | -- | -- | -- | -- | 2.3 J | 4 J | ND |
| Aroclor-1260 | -- | -- | -- | -- | -- | -- | ND |

[1] The A in the locator designation indicates a duplicate sample.

Notes: -/- original results and results of re-extraction and reanalysis because initial results were beyond the linear range of the analytical instrument.
µg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
NA = not analyzed in background samples.
J = the associated numerical value is an estimated quantity.
ND = not detected in Troup loamy sand background samples.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.

## Table 4-14
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-01 | 31-SL-02 | 31-SL-03 | 31-SL-04 | 31-SL-05 | 31-SL-06 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | |
| Lab Sample No. | 22515001 | 22527002 | 22515004 | 22515003 | 22515005 | 22527003 | |
| Aluminum | 10,700 | 9,930 | 6,600 | 5,800 | 9,190 | 7,870 | 20,480 |
| Antimony | -- | -- | -- | -- | -- | -- | 7.9 |
| Arsenic | 1.9 J | 1.3 J | 0.7 J | 0.98 J | 1.6 J | 1.1 J | 3.6 |
| Barium | 24.5 J | 21.1 J | 11.2 J | 13.4 J | 10.7 J | 22.8 J | 26.9 |
| Beryllium | 0.15 J | 0.11 J | 0.08 J | 0.09 J | 0.1 J | 0.1 J | 0.36 |
| Cadmium | -- | -- | -- | -- | -- | -- | ND |
| Calcium | 216 J | 126 J | 962 J | 138 J | 107 J | 281 J | 478 |
| Chromium | 7.1 | 5.8 | 4.6 | 3.9 | 6.6 | 4 | 16.2 |
| Cobalt | 1.1 J | 1.4 J | 0.66 J | 0.93 J | 0.97 J | 0.95 J | 3.0 |
| Copper | 5.6 J | 17.9 J | 4.6 J | 5.5 | 5.45 | 4 J | 11.2 |
| Iron | 5,380 | 4,800 | 3,060 | 2,850 | 4,490 | 3,980 | 11,805 |
| Lead | 6.4 | 5.5 | 2.9 | 4.5 | 5.6 | 4.4 | 11.8 |
| Magnesium | 164 J | 154 J | 549 J | 98.6 J | 104 J | 119 J | 346 |
| Manganese | 456 | 410 | 290 | 295 | 194 | 399 | 383 |
| Mercury | -- | -- | -- | -- | -- | -- | 0.14 |
| Nickel | -- | 6.9 J | -- | -- | -- | 3.6 J | 11.8 |
| Potassium | -- | -- | -- | -- | -- | -- | ND |
| Selenium | -- | -- | 0.52 J | -- | -- | -- | 0.80 |
| Silver | -- | -- | 4.1 | 3.7 | 2.8 | -- | 0.70 |
| Sodium | -- | -- | -- | 233 J | 180 J | 135 J | 400 |
| Vanadium | -- | 12.3 | 8.3 J | 7.3 J | 12.2 | 9.9 J | 30.0 |
| Zinc | -- | 23.1 | 7.9 J | 7.9 J | 8 J | 6 | 20.0 |
| Cyanide | -- | -- | -- | -- | -- | -- | ND |

See notes at end of table.

## Table 4-14 (Continued)
## Summary Analytical Results for Inorganic Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-07 | 31-SL-7A[1] | 31-SL-08 | 31-SL-9 | 31-SL-10 | 31-SL-11 | 31-SL-12 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | |
| Lab Sample No. | 22515007 | 22515008 | 22515009 | 22515011 | 22515012 | 22515013 | 22515014 | |
| **Target Analyte List (TAL) Metals and Cyanides (mg/kg)** | | | | | | | | |
| Aluminum | 6,550 | 6,480 | 6,840 | 10,900 | 8,700 | 6,700 | 6,520 | 20,480 |
| Antimony | -- | -- | -- | -- | -- | -- | 3.1 J | 7.9 |
| Arsenic | 0.89 J | 0.99 J | 0.87 J | 1.9 J | 1.6 J | 1.2 J | 0.96 J | 3.6 |
| Barium | 12.2 J | 12.5 J | 11 J | 12.5 J | 7.1 J | 7 J | 147 | 26.9 |
| Beryllium | 0.09 J | 0.11 J | 0.09 J | 0.15 J | 0.08 J | 0.09 J | 0.42 J | 0.36 |
| Cadmium | -- | -- | -- | -- | -- | -- | 11.6 | ND |
| Calcium | 169 J | 188 J | 168 J | 229 J | 237 J | 354 J | 2,000 | 478 |
| Chromium | 4.4 | 5 | 5.2 | 7.8 | 5.9 | 4.5 | 84.9 | 16.2 |
| Cobalt | 0.68 J | 1.2 J | 1.1 J | 0.81 J | 0.67 J | 1.2 J | 0.91 J | 3.0 |
| Copper | 5.4 J | 4.8 J | 4.4 J | 5.3 J | 4.5 J | 13.1 | 248 | 11.2 |
| Iron | 2,980 | 3,010 | 3,270 | 5,980 | 4,520 | 3,440 | 7,080 | 11,805 |
| Lead | 4.2 | 5.7 | 4 | 4.8 | 3.7 | 3.4 | 635 | 11.8 |
| Magnesium | 121 J | 119 J | 109 J | 117 J | 97.1 J | 250 J | 493 J | 346 |
| Manganese | 212 | 210 | 279 | 154 | 117 | 143 | 170 | 383 |
| Mercury | -- | -- | -- | -- | 0.37 | 0.08 J | 2.6 | 0.14 |
| Nickel | -- | 2.4 J | -- | -- | -- | -- | 4.9 J | 11.8 |
| Potassium | 7 | 146 J | -- | -- | -- | -- | -- | ND |
| Selenium | -- | -- | -- | -- | -- | -- | 1.5 J | 0.80 |
| Silver | 6.6 | 2.6 | -- | 5.9 | 4.2 | 3.6 | 73.7 | 0.70 |
| Sodium | 142 J | 179 J | 166 J | 202 J | 161 J | 176 J | 193 J | 400 |
| Vanadium | 8.1 J | 8.6 J | 8.8 J | 15.8 | 11.6 | 8.4 J | 6.1 J | 30.0 |
| Zinc | 20.6 | 7.8 J | 8.4 | 12 | 11.3 | 9.6 | 276 | 20.0 |
| Cyanide | -- | -- | -- | -- | -- | -- | 0.57 J | ND |

See notes at end of table.

## Table 4-14 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-13 | 31-SL-14 | 31-SL-15 | 31-SL-16 | 31-SL-17 | 31-SL-18 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 17-AUG-92 | 17-AUG-92 | 17-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 22515015 | 22515016 | 22515017 | 22527004 | 22527005 | 22527006 | |
| **Target Analyte List (TAL) Metals and Cyanides (mg/kg)** | | | | | | | |
| Aluminum | 5,030 | 16,800 | 9,260 | 4,360 | 154 | 240 | 20,480 |
| Antimony | 3.7 J | 7.1 J | 6.5 J | -- | -- | -- | 7.9 |
| Arsenic | 0.67 J | 1.7 J | 1.3 J | 0.66 J | -- | -- | 3.6 |
| Barium | 155 | 534 | 232 | 4.6 J | 1.2 J | 2.9 J | 26.9 |
| Beryllium | 0.3 J | 1.3 J | 0.55 J | 0.07 J | -- | -- | 0.36 |
| Cadmium | 12 | 26.8 | 13.6 | -- | -- | -- | ND |
| Calcium | 1,520 | 4,160 | 2,320 | 248 J | 73.8 J | 77.3 J | 478 |
| Chromium | 86.3 | 295 | 130 | 3.6 | 0.75 J | 2.2 | 16.2 |
| Cobalt | 0.83 J | 2.2 J | 1.1 J | -- | -- | -- | 3.0 |
| Copper | 279 | 948 | 468 | 3.7 J | 3.1 J | 6.1 | 11.2 |
| Iron | 6,220 | 22,500 | 11,200 | 2,590 | 576 | 541 | 11,805 |
| Lead | 344 | 1,890 | 912 | 4.4 | 3.4 | 7 | 11.8 |
| Magnesium | 438 J | 1,120 J | 695 J | 86.6 J | -- | 14.7 J | 346 |
| Manganese | 64 | 76.7 | 46 | 33.1 | 1.6 J | 1.8 J | 383 |
| Mercury | 2.4 | 8.8 | 6.7 | -- | -- | -- | 0.14 |
| Nickel | 7.8 J | 8.6 J | 3.9 J | -- | -- | -- | 11.8 |
| Potassium | -- | -- | -- | -- | -- | -- | ND |
| Selenium | 1.4 J | 4.9 | 2.6 | -- | -- | -- | 0.80 |
| Silver | 48.1 | 154 | 128 | -- | 0.62 J | -- | 0.70 |
| Sodium | 232 J | 294 J | 205 J | 127 J | 134 J | 123 J | 400 |
| Vanadium | 4.1 J | 12.1 J | 9.6 J | 6.6 J | 0.64 J | 0.42 J | 30.0 |
| Zinc | 287 | 346 | 186 | 8.6 | 4.3 | 5.8 J | 20.0 |
| Cyanide | 0.5 J | 1.1 J | 0.52 J | -- | -- | -- | ND |

See notes at end of table.

## Table 4-14 (Continued)
## Summary Analytical Results for Inorganic Surface Soil Samples from Site 31

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 31-SL-19 | 31-SL-20 | 31-SL-21 | 31-SL-22 | 31-SL-22A[1] | 31-SL-23 | 31-SL-24 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | 18-AUG-92 | |
| Lab Sample No. | 22527007 | 22527008 | 22527009 | 22528002 | 22528002 | 22527010 | 22527011 | |
| **Target Analyte List (TAL) Metals and Cyanides (mg/kg)** | | | | | | | | |
| Aluminum | 167 | 293 | 307 | 178 | 184 | 298 | 296 | 20,480 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | 7.9 |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | 3.6 |
| Barium | 2.6 J | 2.1 J | 2.5 J | 3 J | 6.9 J | 2.9 J | 2.9 J | 26.9 |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | 0.36 |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | ND |
| Calcium | 90.5 J | 68 J | 135 J | -- | -- | 76.7 J | 72.3 J | 478 |
| Chromium | 1.6 J | 1.5 J | 0.98 J | -- | -- | 1.5 J | 1.5 J | 16.2 |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | 3.0 |
| Copper | 7 J | 4.1 J | 4.5 J | 5.2 | -- | 5.9 J | 5.1 J | 11.2 |
| Iron | 284 | 522 | 528 | 609 | 479 | 536 | 431 | 11,805 |
| Lead | 4 | 2.7 | 7.2 | -- | -- | 10.8 | 4.7 | 11.8 |
| Magnesium | 13.2 J | 17 J | 13.7 J | 7 | 26.3 J | 13.2 J | 14 J | 346 |
| Manganese | 2.6 J | 1.5 J | 1.4 J | 1 J | 0.84 J | 1.7 J | 1.2 J | 383 |
| Mercury | -- | -- | -- | -- | -- | -- | 0.14 | 0.14 |
| Nickel | -- | -- | -- | -- | -- | -- | 6 J | 11.8 |
| Potassium | -- | -- | -- | -- | -- | -- | -- | ND |
| Selenium | -- | -- | -- | -- | -- | -- | -- | 0.80 |
| Silver | -- | -- | -- | -- | -- | 1.3 J | 1.3 J | 0.70 |
| Sodium | 164 J | 180 J | 127 J | -- | -- | 189 J | 124 J | 400 |
| Vanadium | 0.38 J | 1 J | 0.33 J | -- | -- | 0.38 J | -- | 30.0 |
| Zinc | 8.1 | 4.4 | 5.3 | -- | -- | 7.4 | 27.1 | 20.0 |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | ND |

[1] The A in the sample locator indicates a duplicate sample.

Notes: All inorganic concentrations are reported in milligrams per kilogram (mg/kg).
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

ND = not detected in Troup loamy sand background surface soil samples.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.

arsenic, beryllium, cobalt, magnesium, mercury, potassium, selenium, silver, and sodium) were detected below the CRDLs. Cyanide (total) was not detected in the Troup loamy sand background surface soil samples. Sixteen TAL metals (barium, beryllium, cadmium, calcium, chromium, copper, cyanide, iron, lead, magnesium, manganese, mercury, potassium, selenium, silver, and zinc) were detected at concentrations exceeding 2 times the background mean concentrations. The majority of the exceedances were identified in samples 31-SL-12, 31-SL-13, 31-SL-14, and 31-SL-15, which were all collected from Site 31C (Figure 2-12).

**4.3.3 Surface Soil Samples, Crash Crew Training Area Sites** The surface soil samples (0 to 12 inches) collected from Sites 17 and 18 consisted mostly of fine- to very fine-grained silty sand. Silty sand, sandy clay, and clay were present below 0.5 foot bls at some locations. Black staining was present at some locations (Areas H, I, and J) and an oil sheen was noted at sampling location 17-SL-12. The soil type at Site 17 was characterized as Orangeburg sandy loam and, therefore, the analytical results for TAL metals, PAHs, pesticides, and PCBs in surface soil samples were compared to the analytical results of the background surface soil samples BKG-SL-03, BKG-SL-04, and BKG-SL-05. The soil type at Site 18 was characterized as Lakeland sand and, therefore, the analytical results for TAL metals, PAHs, pesticides, and PCBs in surface soil samples were compared to those from background samples BKG-SL-01, BKG-SL-09, BKG-SL-09A (duplicate), and BKG-SL-10.

**4.3.3.1 Site 17** Table 4-15 presents a summary of the analytical results for organic compounds detected at Site 17. Sample locations are shown in Figure 2-7.

TCL VOCs. Seven VOCs (methylene chloride, carbon disulfide, 2-butanone, trichloroethane, toluene, ethylbenzene, and xylene [total]) were detected in surface soil samples. Four of these compounds (2-butanone, toluene, ethylbenzene, and xylenes [total]) were detected at concentrations exceeding CRQLs. Concentrations of the remaining three VOCs were qualified as estimated because they were detected below CRQLs. Background soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Four SVOCs (naphthalene, 2-methylnaphthalene, butylbenzylphthalate, and bis(2-ethylhexyl)phthalate) were detected in surface soils. Three of these SVOCs (naphthalene, 2-methylnaphthalene, and butylbenzylphthalate) were detected at concentrations exceeding CRQLs. Naphthalene and 2-methylnaphthalene were not detected in Orangeburg sandy loam background soil samples.

Bis(2-ethylhexyl)phthalate was detected in 8 of the 34 surface soil samples at concentrations below the CRQL and these detections were qualified as estimated.

Pesticides and PCBs. No pesticide nor PCB compounds were detected in surface soil samples collected at the site.

TPHs. TPHs were detected in 30 of the 34 surface soil samples at concentrations above the CRQL. Concentrations ranged from 2.3 $\mu$g/kg to 19,300 $\mu$g/kg. In general, the higher concentrations were found in former burn pits. Two of the three samples collected from the drainage ditch that drains Area J also had detectable levels of TPHs. Results of TPH analysis for Site 17 are summarized in Table 4-15. Concentrations of TPHs are also graphically presented on Figure 4-1.

# Table 4-15
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-01 | 17-SL-02 | 17-SL-03 | 17-SL-04 | 17-SL-05 | 17-SL-06 | 17-SL-07 | 17-SL-08 | 17-SL-09 | 17-SL-10 | 2X Arithmetic Mean of Orangeburg Loamy Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect date | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22505001 | 22505002 | 22505003 | 22505004 | 22505005 | 22505006 | 22505007 | 22505008 | 22505009 | 22505010 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | 2 J | -- | -- | 1 J | -- | 11 | 1 J | 1 J | 1 J | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Trichloroethene | -- | 160 J | -- | -- | -- | -- | -- | 2 J | -- | -- | NA |
| Toluene | -- | -- | -- | -- | -- | 2 J | -- | -- | -- | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | 3 J | -- | -- | -- | -- | NA |
| Xylenes (total) | 5 J | -- | -- | -- | -- | 11 | -- | 4 J | 4 J | 3 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | | | | | | |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | 190 J | -- | -- | -- | -- | ND |
| Butylbenzylphthalate | 360 J | -- | 490 | -- | -- | -- | -- | -- | -- | -- | NA |
| bis(2-Ethylhexyl)-phthalate | 49 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | | | | | | |
| None detected | | | | | | | | | | | |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | | |
| | -- | 616 | 81.6 | 19 | -- | 19,300 | -- | 2.5 | 2.3 | 4.2 | NA |

See notes at end of table.

## Table 4-15 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-11 | 17-SL-11A[1] | 17-SL-12 | 17-SL-13 | 17-SL-14 | 17-SL-15 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22516001 | 22516002 | 22514011 | 22514012 | 22514013 | 22520001 | |
| **TCL VOCs (µg/kg)** | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | --/-- | -- | NA |
| Carbon disulfide | -- | -- | 2 J | -- | 26J/9 J | -- | NA |
| 2-Butanone | -- | -- | 55 | -- | 80J/52 J | -- | NA |
| Trichloroethene | -- | -- | -- | -- | --/-- | -- | NA |
| Toluene | -- | -- | -- | -- | 38J/31 J | -- | NA |
| Ethylbenzene | 5,000 | 12,000 | 2 J | -- | --/-- | -- | NA |
| Xylenes (total) | 30,000 | 84,000 | 38 | -- | 570 J/500 J | -- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | |
| Naphthalene | 1,100 J | 1,700 | -- | -- | 7,200 | -- | ND |
| 2-Methylnaphthalene | 1,400 | 3,100 | -- | -- | -- | -- | ND |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | NA |
| bis(2-Ethylhexyl) phthalate | 430 J | 400 J | -- | 210 J | -- | -- | NA |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | |
| | 7,690 | 7,840 | 11,700 | 9,720 | 6,790 | 3.2 | NA |

See notes at end of table.

## Table 4-15 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-17 | 17-SL-17A[1] | 17-SL-18 | 17-SL-19 | 17-SL-20 | 17-SL-21 | 17-SL-21A[1] | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | 15-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | |
| Lab Sample No. | 22514014 | 22514008 | 22520004 | 22520003 | 22514015 | 22516003 | 22516004 | |
| **TCL VOCs (µg/kg)** | | | | | | | | |
| Methylene chloride | -- | -- | -- | --/-- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | --/-- | -- | -- | -- | NA |
| 2-Butanone | -- | -- | -- | --/-- | -- | -- | -- | NA |
| Trichloroethene | -- | -- | -- | --/-- | -- | -- | -- | NA |
| Toluene | -- | -- | -- | 23,000J/11,000 J | -- | -- | -- | NA |
| Ethylbenzene | -- | -- | -- | 14,000J/6,900 J | 6 J | 1,100 | 510 J | NA |
| Xylenes (total) | 340 J | -- | -- | 130,000J/70,000 J | 19 J | 9,600 | 3,700 | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | |
| Naphthalene | -- | -- | -- | 1,500 J | 81 J | 620 J | 520 J | ND |
| 2-Methylnaphthalene | -- | -- | -- | 4,100 | -- | 1,500 J | 1,400 J | ND |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | -- | NA |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | 750 J | 160 J | 450 J | -- | NA |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | |
| None detected | | | | | | | | |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | |
| | 768 | 647 | 33.3 | 7,510 | 949 | 8,180 | 8,550 | NA |

See notes at end of table.

## Table 4-15 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-23 | 17-SL-24 | 17-SL-25 | 17-SL-26 | 17-SL-27 | 17-SL-28 | 17-SL-29 | 17-SL-30 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22514002 | 22514003 | 22514004 | 22514005 | 22514006 | 22514007 | 22520005 | 22520006 | |
| **TCL VOCs (µg/kg)** | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | 69 J/-- | -- | NA |
| Carbon disulfide | -- | -- | 1 J | -- | -- | -- | 2 J/4 J | -- | NA |
| 2-Butanone | -- | -- | -- | -- | 6 J | -- | --/-- | -- | NA |
| Trichloroethene | -- | -- | -- | -- | -- | -- | --/-- | -- | NA |
| Toluene | -- | -- | -- | -- | -- | -- | 1 J/-- | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | --/-- | -- | NA |
| Xylenes (total) | 27 | -- | -- | -- | -- | -- | 2 J/2 J | 1 J | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | | |
| Naphthalene | 1,000 J | -- | -- | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | 4,900 | -- | -- | -- | -- | -- | -- | -- | ND |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | 420 | -- | NA |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | 75 J | -- | NA |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | |
| None detected | | | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | |
| | 5,540 | 2,340 | 160 | 208 | 2,820 | 5,940 | 14.4 | 5.6 | NA |

See notes at end of table.

## Table 4-15 (Continued)
## Summary of Organic Analytical Results of Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-31 | 17-SL-32 | 17-SL-33 | 17-SL-34 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|
| Collect Date | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22520007 | 22520008 | 22520009 | 22520010 | |
| **TCL VOCs (µg/kg)** | | | | | |
| Methylene chloride | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | 2 J | 2 J | 3 J | NA |
| 2-Butanone | -- | -- | -- | -- | NA |
| Trichloroethene | -- | -- | -- | -- | NA |
| Toluene | -- | -- | -- | -- | NA |
| Ethylbenzene | | | -- | -- | NA |
| Xylenes (total) | 3 J | 5 J | 5 J | 2 J | NA |
| **TCL SVOCs (µg/kg)** | | | | | |
| Naphthalene | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | ND |
| Butylbenzylphthalate | -- | -- | -- | -- | NA |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | NA |
| **Pesticides and PCBs (µg/kg)** | | | | | |
| None detected | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | 208 | -- | 563 | 13.2 | NA |

[1] The A in the sample locator indicates a duplicate sample.

Notes: --/-- = original results and results of re-extraction and reanalysis because initial results were beyond the linear range of the analytical instrument.
µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
-- = the analyte was not detected in laboratory analysis.
NA = not analyzed in background samples.
J = the associated numerical value is an estimated quantity.
ND = not detected in Orangeburg Sandy Loam.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.

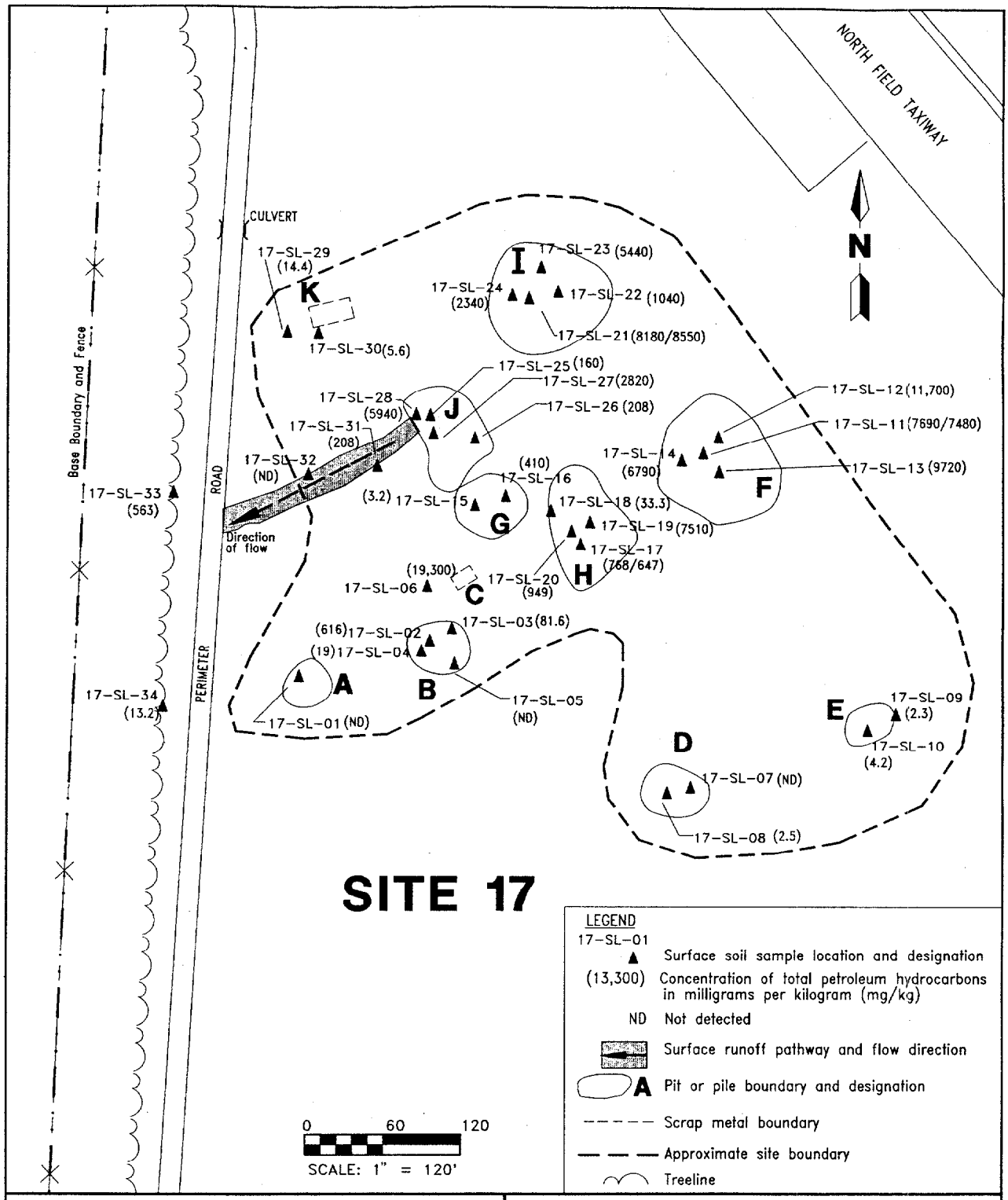


**FIGURE 4-1**
**TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS FOR SURFACE SOIL AT SITE 17**

WHITING/7560-16/TEC-MEM3/NORTHEST/10/25/94

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

TAL Metals and (Total) Cyanides. Table 4-16 summarizes the inorganic analytical results for Site 17 surface soil samples. Twenty inorganic analytes were detected in the surface soil samples. Twelve of the metals (aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) were detected at concentrations exceeding CRDLs. Concentrations of 16 TAL metals were qualified as estimated in one or more samples during the data validation process. Eleven metals (aluminum, arsenic, barium, chromium, copper, iron, lead, nickel, potassium, vanadium, and zinc) were detected at concentrations exceeding 2 times the background mean concentrations. Antimony and cadmium were not detected in the Orangeburg sandy loam background surface soil samples.

TCLP Metals. The metal analytes detected in the TCLP leachates include barium (0.618 to 1,350 $\mu g/\ell$), cadmium (3.6 J to 136 $\mu g/\ell$), chromium (1.9 to 3.1 $\mu g/\ell$), lead (11.8 to 1,780 [$\mu g/\ell$]), and mercury (0.14 to 0.19 $\mu g/\ell$) (Table 4-17). Arsenic, selenium ,and silver were not detected. None of the detected analytes exceeded the TCLP regulatory concentrations for these analytes.

None of the TCLP target VOCs were detected in the eight samples from Site 17. A summary of TCLP analytical results is presented in Table 4-17.

**4.3.3.2 Site 18** The analytical results for the 47 surface soil samples, are summarized in Table 4-18 (organic compounds), Table 4-19 (inorganic analytes), and Table 4-20 (TCLP analysis of 10 samples). Sample locations are shown in Figure 2-8.

TCL VOCs. Seven VOCs (methylene chloride, acetone, carbon disulfide, 2-butanone, toluene, ethylbenzene, and xylene [total]) were detected in surface soil samples (Table 4-18). All seven VOCs were detected in at least one sample at concentrations exceeding the CRQLs. Background surface soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Eleven SVOCs were detected in Site 18 surface soil samples. The detected SVOCs are summarized in Table 4-18. Four of these SVOCs (naphthalene, 2-methylnaphthalene, fluorene, and bis(2-ethylhexyl)phthalate) were detected at concentrations exceeding CRQLs. Concentrations of the remaining seven detected SVOCs (bis(2-chloroethoxy)methane, chrysene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, and benzo(a)pyrene) were less than the CRQLs and were qualified as estimated. PAHs were not detected in the Lakeland sand background surface soil samples.

Pesticides and PCBs. Neither pesticides nor PCBs were detected in surface soil samples.

Total Petroleum Hydrocarbons (TPHs). TPHs were detected in 45 of the 47 surface soil samples collected from Site 18. Concentrations ranged from 2.9 mg/kg to 23,500 mg/kg. In general, the higher concentrations were located in Areas A, D, E, and F, which are all former burn pits. Detected TPH concentrations are summarized in Table 4-18 and are presented on Figure 4-2.

# Table 4-16
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-01 | 17-SL-02 | 17-SL-03 | 17-SL-04 | 17-SL-05 | 17-SL-06 | 17-SL-07 | 17-SL-08 | 17-SL-09 | 17-SL-10 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22505001 | 22505002 | 22505003 | 22505004 | 22505005 | 22505006 | 22505007 | 22505008 | 22505009 | 22505010 | |
| Aluminum | 9,610 | 5,950 | 5,970 | 6,310 | 4,500 | 7,560 | 29,700 | 6,380 | 5,420 | 29,900 | 29,533 |
| Antimony | 3.3 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Arsenic | 1.3 J | 0.72 | 0.53 J | 0.7 J | 0.29 J | 0.55 J | 4.6 | 1.6 J | 0.81 J | 3.1 | 4.7 |
| Barium | 11.8 J | 9.1 J | 11 J | 9 J | 8.5 J | 11.1 J | 6.8 J | 3.6 J | 8.3 J | 12 J | 48.4 |
| Beryllium | 0.09 J | 0.07 J | 0.06 J | -- | -- | -- | 0.16 J | -- | -- | 0.07 J | 0.44 |
| Cadmium | 1.8 | 1.6 | 1.7 | -- | 0.76 J | 6.8 | -- | -- | 1.2 | -- | ND |
| Calcium | 279 J | 106 J | 94.9 J | 125 J | 129 J | 208 J | 97.5 J | 111 J | 97 J | 199 J | 3,011 |
| Chromium | 17.4 | 9.8 | 15.1 | 6.2 | 4.1 | 19.2 | 26.9 | 6.4 | 4 | 24.7 | 22.1 |
| Cobalt | 2.4 J | 2 J | 2 J | 1.8 J | 1.5 J | 1.8 J | 2 J | 1.1 J | 1.3 J | 0.85 J | 4.2 |
| Copper | 6.4 J | 9.8 | 8.9 | 7.1 | 5.1 J | 44.2 | 9.8 | 6.1 J | 2.4 J | 6.4 J | 10.1 |
| Iron | 4,920 | 3,970 | 3,120 | 3,370 | 2,730 | 3,430 | 23,800 | 4,550 | 3,020 | 12,300 | 17,413 |
| Lead | 6.3 | 54.8 | 18.2 | 11.8 | 7.7 | 70.1 | 6.8 | 4 | 3 | 4.3 | 13.4 |
| Magnesium | 178 J | 114 J | 124 J | 125 J | 93.3 J | 172 J | 106 J | 59.1 J | 106 J | 143 J | 1,295 |
| Manganese | 198 | 34.4 | 17.1 | 28.2 | 19.6 | 31.8 | 13.9 | 5.1 | 32.4 | 18 | 1,271 |
| Nickel | 4 J | 5.2 J | 2.8 J | 3.8 J | 3.2 J | 5.7 J | 4.7 J | 3.2 J | 3.1 J | 4.6 J | 7.3 |
| Potassium | -- | 252 J | 157 J | 198 J | -- | 288 J | -- | -- | -- | -- | 472 |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.84 |
| Sodium | 204 J | 245 J | 217 J | 157 J | 209 J | 186 J | 279 J | 172 J | 186 J | 184 J | 300 |
| Vanadium | 13.7 | 7.9 J | 8 J | 8.7 J | 6.4 J | 9.5 J | 71.3 | 12.8 | 7.6 J | 37 | 44.8 |
| Zinc | 13.4 J | 22.2 | 21.6 | 13 J | 7.3 | 69.1 | 11 | 8.7 J | 7.2 J | 8.9 J | 21 |

See notes at end of table.

## Table 4-16 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-11 | 17-SL-11A[1] | 17-SL-12 | 17-SL-13 | 17-SL-14 | 17-SL-15 | 17-SL-16 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22516001 | 22516002 | 22514011 | 22514012 | 22514013 | 22520001 | 22520002 | |
| Aluminum | 7,190 | 7,390 | 5,410 | 7,340 | 5,750 | 16,500 | 8,400 | 29,533 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | ND |
| Arsenic | -- | -- | 0.84 J | 1.2 J | 1.1 J | 3.4 | 1 J | 4.7 |
| Barium | 24 J | 10.6 J | 26.9 J | 20.7 J | 11.8 J | 17 J | 145 | 48.4 |
| Beryllium | -- | 0.1 J | -- | -- | -- | 0.16 J | 0.08 J | 0.44 |
| Cadmium | -- | -- | -- | 1.1 J | -- | 0.87 J | 13.9 | ND |
| Calcium | -- | -- | 136 J | 415 J | 107 J | 150 J | 357 J | 3,011 |
| Chromium | 12 J | 16.1 J | 6 | 12.9 | 5.4 | 16.5 | 64.7 | 22.1 |
| Cobalt | -- | -- | -- | 1 J | -- | 1.3 J | 0.98 J | 4.2 |
| Copper | 24.3 J | 44.9 J | 9.2 | 15.9 | 22.3 | 7.3 | 128 | 10.1 |
| Iron | 10,100 | 21,000 | 2,870 | 4,640 | 2,550 | 10,100 | 4,270 | 17,413 |
| Lead | 156 | 136 | 36.1 | 95.4 | 15.7 | 9 | 207 | 13.4 |
| Magnesium | 180 J | 205 J | 80.8 J | 148 J | 105 J | 183 J | 358 J | 1,295 |
| Manganese | 56.1 J | 117 J | 11 | 50.4 | 10 | 26.1 | 63.7 | 1,271 |
| Nickel | 8.5 J | 14.7 | -- | -- | -- | -- | -- | 7.3 |
| Potassium | 264 J | 277 J | 185 J | 384 J | 197 J | 248 J | 248 J | 472 |
| Silver | -- | -- | -- | 0.47 J | 0.44 J | -- | -- | 0.84 |
| Sodium | -- | -- | 157 J | 167 J | 199 J | 209 J | 198 J | 300 |
| Vanadium | 9.2 J | 9.3 J | 8.4 J | 10 J | 8.4 J | 25 | 10.3 J | 44.8 |
| Zinc | 74.1 J | 96.2 J | 18.8 | 56.4 | 20.7 | 10.2 | 179 | 21 |

See notes at end of table.

## Table 4-16 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-17 | 17-SL-17A[1] | 17-SL-18 | 17-SL-19 | 17-SL-20 | 17-SL-21 | 17-SL-21A[1] | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | 15-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | |
| Lab Sample No. | 22514014 | 22514008 | 22520004 | 22520003 | 22514015 | 22516003 | 22516004 | |
| Aluminum | 12,000 | 12,700 | 11,700 | 27,900 | 23,800 | 21,400 | 24,800 | 29,533 |
| Antimony | -- | -- | -- | -- | -- | 5.1 J | 3.1 J | ND |
| Arsenic | 1.6 J | 2.8 | 1.8 J | 5.9 | 2.2 J | 2.8 | 3.1 | 4.7 |
| Barium | 9.6 J | 12.2 J | 17 J | 22.6 J | 49.5 | 91.2 | 168 | 48.4 |
| Beryllium | 0.08 J | -- | 0.12 J | 0.22 J | 0.09 J | 0.21 J | 0.2 J | 0.44 |
| Cadmium | -- | -- | -- | -- | 8.4 | 22.4 J | 30.6 J | ND |
| Calcium | 197 J | 229 J | 123 J | 262 J | 253 J | -- | -- | 3,011 |
| Chromium | 10.1 | 12.1 | 8.9 | 21.6 | 40 | 58.1 J | 64.1 J | 22.1 |
| Cobalt | 0.86 J | 1.1 J | 1.1 J | 1.4 J | 1.5 J | -- | -- | 4.2 |
| Copper | 10.3 | 19.4 | 10 | 18.1 | 124 | 75.6 J | 235 J | 10.1 |
| Iron | 5,900 | 6,040 | 5,780 | 13,500 | 11,500 | 11,900 | 11,300 | 17,413 |
| Lead | 56.9 | 66.6 | 9.7 | 64.7 | 79.9 | 80.8 | 117 | 13.4 |
| Magnesium | 121 J | 162 J | 175 J | 238 J | 267 J | 484 J | 520 J | 1,295 |
| Manganese | 18.3 | 22.4 | 20 | 30 | 42.5 | 93.3 | 117 J | 1,271 |
| Nickel | -- | 2.7 J | 5.2 J | 3.5 J | 3.2 J | 8.8 J | 8.8 J | 7.3 |
| Potassium | 397 J | 403 J | 196 J | 875 J | 460 J | 805 J | 816 J | 472 |
| Silver | -- | 0.61 J | -- | -- | 0.5 J | -- | 0.53 J | 0.84 |
| Sodium | 257 J | 183 J | 178 J | 193 J | 157 J | -- | -- | 300 |
| Vanadium | 16.1 | 17.5 | 15.2 | 37.8 | 30.8 | 30.7 | 30.9 | 44.8 |
| Zinc | 13.8 | 23.4 | 11.1 | 21.9 | 73 | 131 J | 158 J | 21 |

See notes at end of table.

## Table 4-16 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-24 | 17-SL-25 | 17-SL-26 | 17-SL-27 | 17-SL-28 | 17-SL-29 | 17-SL-30 | 17-SL-31 | 17-SL-32 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22514003 | 22514004 | 22514005 | 22514006 | 22514007 | 22520005 | 22520006 | 22520007 | 22520008 | |
| Aluminum | 20,900 | 17,500 | 12,700 | 9,570 | 14,200 | 14,500 | 20,000 | 7,130 | 8,510 | 29,533 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | 10.3 J | -- | ND |
| Arsenic | 3.8 | 2.5 | 2.6 | 2.3 J | 2.4 J | 1.8 J | 3.1 | 1.1 J | 2 J | 4.7 |
| Barium | 46.7 J | 24.2 J | 14.8 J | 95.2 | 53.2 | 27.9 J | 8.3 J | 26.3 J | 19.9 J | 48.4 |
| Beryllium | 0.16 J | 0.08 J | 0.07 J | 0.12 J | 0.07 J | 0.17 J | 0.16 J | 0.08 J | -- | 0.44 |
| Cadmium | 2.8 | -- | -- | 1.8 | -- | 7.4 | -- | 1.8 | -- | ND |
| Calcium | 518 J | 339 J | 780 J | 196 J | 210 J | 532 J | 151 J | 280 J | 340 J | 3,011 |
| Chromium | 30.3 | 16.9 | 13.2 | 15.8 | 16.3 | 82.1 | 15 | 15.7 | 12.6 | 22.1 |
| Cobalt | 2.1 J | 1.7 J | 1.1 J | 0.72 J | 1.1 J | 1.8 J | 1.3 J | 0.67 J | 0.59 J | 4.2 |
| Copper | 14.1 | 19.8 | 24.5 | 22.9 | 27.1 | 139 | 5.1 J | 14.5 | 8.7 | 10.1 |
| Iron | 11,200 | 9,690 | 7,030 | 4,880 | 7,710 | 6,980 | 10,900 | 3,900 | 4,930 | 17,413 |
| Lead | 48.4 | 29.2 | 26.5 | 79.6 | 35.9 | 19.9 | 8.6 | 96 | 25.9 | 13.4 |
| Magnesium | 461 J | 187 J | 159 J | 128 J | 167 J | 302 J | 97.4 J | 95.1 J | 123 J | 1,295 |
| Manganese | 95.4 | 59.3 | 60.7 | 21.5 | 38.9 | 194 | 27.3 | 17.9 | 35.7 | 1,271 |
| Nickel | 4.9 J | 2.8 J | 3.3 J | -- | -- | 4 J | -- | -- | -- | 7.3 |
| Potassium | 641 J | 544 J | 564 J | 331 J | 616 J | 153 J | 184 J | -- | 155 J | 472 |
| Silver | -- | 0.53 J | -- | -- | -- | -- | -- | -- | -- | 0.84 |
| Sodium | 167 J | 163 J | 193 J | 271 J | 277 J | 179 J | 186 J | 206 J | 133 J | 300 |
| Vanadium | 30.9 | 27.4 | 19.3 | 13.8 | 20.4 | 19.6 | 33 | 10.8 J | 14.1 | 44.8 |
| Zinc | 52.8 | 23.3 | 41.9 | 48.3 | 49.8 | 54.5 | 11.1 | 43 | 20.5 | 21 |

See notes at end of table.

## Table 4-16 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-33 | 17-SL-34 | 2X Arithmetic Mean of Orangeburg Sandy Loam |
|---|---|---|---|
| Collect Date | 15-AUG-92 | 15-AUG-92 | |
| Lab Sample No. | 22520009 | 22520010 | |
| Aluminum | 26,200 | 17,700 | 29,533 |
| Antimony | -- | -- | ND |
| Arsenic | 5 | 1.8 J | 4.7 |
| Barium | 14.8 J | 14.5 J | 48.4 |
| Beryllium | 0.21 J | 0.19 J | 0.44 |
| Cadmium | -- | -- | ND |
| Calcium | 439 J | 411 J | 3,011 |
| Chromium | 17.9 | 12.4 | 22.1 |
| Cobalt | 1.3 J | 1.5 J | 4.2 |
| Copper | 11.9 | 7 | 10.1 |
| Iron | 13,900 | 9,180 | 17,413 |
| Lead | 59.6 | 8.7 | 13 |
| Magnesium | 194 J | 140 J | 1,295 |
| Manganese | 80.1 | 187 | 1,271 |
| Nickel | 4.6 J | 2.9 J | 7.3 |
| Potassium | -- | -- | 472 |
| Silver | -- | -- | 0.84 |
| Sodium | 136 J | 151 J | 300 |
| Vanadium | 39.4 | 24.8 | 44.8 |
| Zinc | 19.7 | 10.1 | 21 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: All inorganic concentrations are reported in milligrams per kilogram (mg/kg).
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.
ND = not detected in Orangeburg sandy loam.

## Table 4-17
## Summary Analytical Results of Toxicity Characteristic Leaching Procedure (TCLP) Compounds in Surface Soil Samples from Site 17

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17-SL-02TCLP | 17-SL-07TCLP | 17-SL-09TCLP | 17-SL-11TCLP | 17-SL-15TCLP | 17-SL-17TCLP | 17-SL-21-TCLP | 17-SL-25TCLP | Regulatory Limits[1] |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 15-AUG-92 | 15-AUG-92 | 15-AUG-92 | 16-AUG-92 | 15-AUG-92 | 16-AUG-92 | 16-AUG-92 | 16-AUG-92 | |
| Lab Sample No. | TC22505002 | TC22505007 | TC22505009 | 22516001TC | 22520001TC | 22514014TC | 16-AUG-92 | 22514004TC | |
| **TCLP Volatile Organic Compounds (VOCs) (μg/ℓ)** | | | | | | | | | |
| None detected | | | | | | | | | |
| **TCLP Metals (μg/ℓ)** | | | | | | | | | |
| Arsenic | <25.3 | <25.3 | <25.3 | -- | -- | -- | -- | <25.3 | 5,000 |
| Barium | 740 | 724 | 618 | 980 | 966 | 1,130 | 1,350 | 1,100 | 100,000 |
| Cadmium | 27.7 | 2.7 | 2.7 | 5.6 | 3.6 J | 12.3 | 136 | 14.9 | 1,000 |
| Chromium | 1.9 | 2.3 J | 1.9 | 2.4 J | -- | 2.7 J | 3.1 J | 3.1 J | 5,000 |
| Lead | 430 | 11.8 | 11.8 | 1,780 | -- | 366 | 488 | 79.3 | 5,000 |
| Mercury | 0.16 | 0.16 | 0.16 | -- | -- | 0.19 J | -- | 0.14 J | 200 |
| Selenium | <31.3 | <31.3 | <31.3 | -- | -- | -- | -- | -- | 1,000 |
| Silver | <1.5 | <1.5 | <1.5 | -- | -- | -- | -- | -- | 5,000 |

[1] Source: Federal Register, vol. 55, no. 126, 1990.

Notes: μg/ℓ = micrograms per liter.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
< = less than the detection limit.

# Table 4-18
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-01 | 18-SL-01A[1] | 18-SL-02 | 18-SL-03 | 18-SL-04 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|
| Collect Date | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | |
| Lab Sample No. | 22481001 | 22481002 | 22462010 | 22462011 | 22462012 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | |
| Methylene chloride | 64 J | -- | -- | 74 J | -- | NA |
| Acetone | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | 6 | -- | 4 J | 7 | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | NA |
| Toluene | -- | -- | 9 | 1 J | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | NA |
| Xylenes (total) | -- | -- | -- | 5 J | -- | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | |
| bis(2-Chloroethoxy)methane | -- | -- | -- | -- | -- | NA |
| Naphthalene | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | ND |
| Fluorene | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | ND |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)phthalate | 700 J | 1,200 J | -- | -- | 1,000 J | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | |
| None detected | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | 9,020 | 12,400 | 195 | -- | 13,300 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-05 | 18-SL-06 | 18-SL-07 | 18-SL-08 | 18-SL-09 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|
| Collect Date | 14-AUG-92 | 14-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22507005 | 22507006 | 22488001 | 22488002 | 22488003 | |
| **TCL VOCs (µg/kg)** | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | NA |
| Toluene | -- | -- | -- | -- | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | NA |
| Xylenes (total) | -- | -- | 3 J | -- | -- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | |
| bis(2-Chloroethoxy)-methane | -- | 440 J | -- | -- | -- | NA |
| Naphthalene | -- | -- | -- | -- | 2,200 | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | 8,100 | ND |
| Fluorene | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)phthalate | -- | -- | 56 J | -- | 340 J | ND |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | |
| None detected | | | | | | |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | |
| | 16.7 | 7,410 | 87.4 | 4.6 | 120 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-10 | 18-SL-10A[1] | 18-SL-11 | 18-SL-12 | 18-SL-13 | 18-SL-14 | 18-SL-15 | 18-SL-16 | 18-SL-17 | 18-SL-18 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22489001 | 22489002 | 22488004 | 22488005 | 22488006 | 22488008 | 22488009 | 22488010 | 22488011 | 22495001 | |
| **VOCs (µg/kg)** | | | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| 2-Butanone | 36 J | 35 J | -- | -- | 30 J | -- | -- | 36 J | 17 J | -- | NA |
| Toluene | 10 J | 28 | -- | -- | 14 J | -- | 34 | -- | -- | -- | NA |
| Ethylbenzene | 23 J | 70 | -- | -- | -- | -- | 120 | 15 J | -- | -- | NA |
| Xylenes (total) | 160 | 430 | 2 J | -- | 67 | 3 J | 1,000 | 76 | -- | -- | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | | |
| bis(2-chloroethoxy)-methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Naphthalene | -- | -- | -- | -- | 990 | -- | 3,000 J | 3,500 J | -- | -- | ND |
| 2-Methylnaphthalene | 1,100 J | -- | -- | -- | -- | -- | 11,000 J | 15,000 J | -- | -- | ND |
| Fluorene | -- | -- | -- | -- | 440 | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | 120 J | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Benzo(a(anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)-phthalate | -- | -- | 110 J | -- | 76 J | -- | -- | -- | 320 J | -- | NA |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | | |
| None detected | | | | | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | |
| | 6,210 | 4,820 | 56.6 | -- | 55.7 | -- | 23,500 | 10,600 | 7,040 | 1,350 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-19 | 18-SL-20 | 18-SL-21 | 18-SL-22 | 18-SL-23 | 18-SL-23A[1] | 18-SL-24 | 18-SL-25 | 18-SL-26 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22495002 | 22495003 | 22495004 | 22495005 | 22489003 | 22489004 | 22495006 | 22495007 | 22495008 | |
| **TCL VOCs (µg/kg)** | | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Toluene | -- | -- | -- | -- | -- | -- | -- | 47 | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | 190 | -- | NA |
| Xylenes (total) | 3 J | 4 J | 4 J | 2 J | -- | 2 J | -- | 670 | 1 J | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| bis(2-Chloroethoxy)-methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | 4,100 J | -- | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | 14,000 | -- | ND |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | 730 J | -- | ND |
| Fluoranthene | -- | -- | -- | -- | 3,500 J | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | 7,700 J | 6,200 J | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | 1,300 J | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | 1,400 J | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)-phthalate | -- | -- | -- | -- | 5,600 J | 4,100 J | 68 J | -- | -- | NA |
| Benzo(a)pyrene | -- | -- | -- | -- | 1,200 J | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| None detected | | | | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | 389 | -- | 2.9 | 54.8 | 18,800 | 17,800 | 113 | 9,950 | 58.6 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-27 | 18-SL-28 | 18-SL-29 | 18-SL-30 | 18-SL-31 | 18-SL-31A[1] | 18-SL-32 | 18-SL-33 | 18-SL-34 | 18-SL-35 | Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22495009 | 22495010 | 22495011 | 22495012 | 22506002 | 22507003 | 22506003 | 22506004 | 22506005 | 22506006 | |
| **TCL VOCs (µg/kg)** | | | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | 86 J | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | -- | -- | 340 J | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | 11 J | 7 J | -- | -- | -- | NA |
| 2-Butanone | 1,700 | -- | -- | -- | -- | -- | 140 | -- | -- | -- | NA |
| Toluene | 190 J | -- | -- | -- | 180 J | -- | 170 | 390 J | -- | -- | NA |
| Ethylbenzene | 430 J | -- | -- | -- | 290 J | -- | 73 | 800 | 240 J | -- | NA |
| Xylenes (total) | 3,300 | 1 J | -- | 12 J | 1,800 | 54 | 530 | 7,000 | 2,500 | 7 J | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | | |
| bis(2-Chloroethoxy)-methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | NA |
| Naphthalene | 7,500 J | -- | -- | -- | -- | -- | 5,700 J | 8,000 J | -- | -- | ND |
| 2-Methylnaphthalene | 33,000 J | -- | -- | -- | 1,200 J | -- | -- | 24,000 | -- | -- | ND |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Phenanthrene | 2,200 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | 730 J | 2,100 J | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)-phthalate | -- | -- | 790 J | 600 J | -- | -- | -- | -- | -- | 170 J | NA |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | | |
| None detected | | | | | | | | | | | |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | | |
| | 20,500 | -- | 8,770 | 2,170 | 9,190 | 11,300 | 15,600 | 17,400 | 14,100 | 806 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-36 | 18-SL-37 | 18-SL-37A[1] | 18-SL-38 | 18-SL-39 | 18-SL-40 | 18-SL-41 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22506007 | 22506008 | 22507001 | 22506009 | 22506010 | 22506011 | 22507002 | |
| **TCL VOCs (µg/kg)** | | | | | | | | |
| Methylene chloride | -- | 52 J | -- | 49 J | -- | -- | -- | NA |
| Acetone | -- | 1,400 J | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | -- | -- | -- | -- | -- | -- | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | NA |
| Toluene | 210 J | -- | -- | -- | -- | -- | -- | NA |
| Ethylbenzene | 320 J | -- | -- | -- | -- | -- | -- | NA |
| Xylenes (total) | 2,700 | 16 J | -- | 3 J | -- | 2 J | 2 J | NA |
| **TCL SVOCs (µg/kg)** | | | | | | | | |
| bis(2-Chloroethoxy)-methane | -- | -- | -- | -- | -- | -- | -- | NA |
| Naphthalene | 4,200 J | -- | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | 19,000 | -- | -- | -- | -- | -- | -- | ND |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)-phthalate | -- | 1,800 J | 3,500 | 220 J | -- | -- | -- | NA |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | |
| None detected | | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | |
| | 16,300 | 16,000 | 19,300 | -- | -- | 4.9 | 8.3 | NA |

See notes at end of table.

## Table 4-18 (Continued)
## Summary Analytical Results for Organic Compounds Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-42 | 18-SL-43 | 18-SL-44 | 18-SL-45 | 18-SL-46 | 18-SL-47 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22507007 | 22507008 | 22507009 | 22507010 | 22507011 | 22507012 | |
| **TCL VOCs (μg/kg)** | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | NA |
| Acetone | -- | -- | -- | -- | -- | -- | NA |
| Carbon disulfide | 1 J | -- | 1 J | 2 J | -- | -- | NA |
| 2-Butanone | -- | -- | -- | -- | -- | -- | NA |
| Toluene | -- | -- | -- | -- | -- | -- | NA |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | NA |
| Xylenes (total) | 3 J | 3 J | -- | -- | 2 J | -- | NA |
| **TCL SVOCs (μg/kg)** | | | | | | | |
| bis(2-Chloroethoxy)methane | -- | -- | -- | -- | -- | -- | NA |
| Naphthalene | -- | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | ND |
| Fluorene | -- | -- | -- | -- | -- | -- | ND |
| Phenanthrene | -- | -- | -- | -- | -- | -- | ND |
| Fluoranthene | -- | -- | -- | -- | -- | -- | ND |
| Pyrene | -- | -- | -- | -- | -- | -- | ND |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | ND |
| Chrysene | -- | -- | -- | -- | -- | -- | ND |
| bis(2-Ethylhexyl)phthalate | -- | -- | 75 J | -- | -- | -- | NA |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | ND |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | | |
| None detected | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | |
| | -- | 67.7 | 842 | 19.8 | 15.8 | -- | NA |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = microgram per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.
NA = not analyzed in background samples.
ND = not detected in Lakeland sand background samples.
mg/kg = milligrams per kilogram.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.

## Table 4-19
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-01 | 18-SL-01A[1] | 18-SL-02 | 18-SL-03 | 18-SL-04 | 18-SL-05 | 18-SL-06 | 18-SL-07 | 18-SL-08 | 18-SL-09 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 12-AUG-92 | 14-AUG-92 | 14-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22481001 | 22481002 | 22462010 | 22462011 | 22462012 | 22507005 | 22507006 | 22488001 | 22488002 | 22488003 | |
| Aluminum | 3,850 | 4,580 | 3,140 | 3,100 | 4,550 | 3,260 | 3,140 | 6,530 | 3,380 | 2,880 | 7,233 |
| Antimony | -- | 5.8 J | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Arsenic | -- | -- | 0.59 J | 0.77 J | 0.72 J | 0.26 J | -- | 0.64 J | 0.46 J | 1.1 J | 1.6 |
| Barium | 17.2 J | 45.2 J | 7.1 J | 5.5 J | 27.2 J | 6.5 J | 10.6 J | 38.6 J | 5.7 J | 32.4 J | 7.4 |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | 0.06 J | -- | ND |
| Cadmium | 22.6 J | 33.7 J | 2.8 | -- | 9 | -- | 9.3 | 20.6 | 0.88 J | -- | 1.8 |
| Calcium | -- | -- | 197 J | 151 J | 296 J | 91.3 J | 151 J | 153 J | 107 J | 115 J | 580 |
| Chromium | 16.5 J | 34.3 J | 5.4 | 2.9 | 8.3 | 4 | 10.7 | 39.8 | 3.6 | 3.6 | 7.0 |
| Cobalt | -- | -- | 1.3 J | 1 J | 0.87 J | 0.78 J | 0.47 J | -- | -- | 0.76 J | 1.5 |
| Copper | 177 | 864 | 8.4 J | 1.8 J | 32.6 | 6.8 | 45.3 | 201 | 8 | 13.9 | 5.6 |
| Iron | 1,710 | 2,580 | 1,800 | 1,700 | 2,180 | 1,790 | 1,490 | 1,990 | 1,690 | 7,050 | 4,843 |
| Lead | 62.6 | 96.1 J | 28.9 J | 6.7 J | 35.6 | 5.1 | 32.6 | 76.5 | 32.3 | 55.4 J | 7.2 |
| Magnesium | 94.7 J | 103 J | 94.9 J | 116 J | 126 J | 84.1 J | 125 J | 133 J | 81.8 J | 116 J | 183 |
| Manganese | 18.3 J | 22.6 J | 24.1 | 102 | 27.8 | 18.5 | 16 | 38.2 | 27.7 | 52.6 | 140 |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Nickel | -- | 15.9 | -- | 2.6 J | -- | -- | -- | 2.5 J | -- | 3.7 J | 8.2 |
| Potassium | -- | 216 J | 280 J | 293 J | -- | 199 J | 194 J | -- | -- | 175 J | ND |
| Silver | -- | -- | -- | 0.35 J | -- | -- | -- | -- | -- | -- | ND |
| Sodium | -- | -- | 279 J | 164 J | 220 J | 182 J | 155 J | 163 J | 171 J | 196 J | 317 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Vanadium | -- | -- | 4.4 J | 4.5 J | 5.4 J | 4.6 J | 4.2 J | 3.4 J | 4.4 J | 3.3 J | 11 |
| Zinc | 94.2 J | 174 J | 10.5 J | 4.9 J | 50.3 J | 9.1 J | 38.9 | 200 | 9.4 | 32.7 J | 17.0 |

See notes at end of table.

## Table 4-19 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
*Technical Memorandum No. 3, Soil Assessment*
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-10 | 18-SL-10A[1] | 18-SL-11 | 18-SL-12 | 18-SL-13 | 18-SL-14 | 18-SL-15 | 18-SL-16 | 18-SL-17 | 18-SL-18 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22489001 | 22489002 | 22488004 | 22488005 | 22488006 | 22488008 | 22488009 | 22488010 | 22488011 | 22495001 | |
| **TAL Metals (mg/kg)** | | | | | | | | | | | |
| Aluminum | 3,000 | 2,520 J | 3,240 | 2,480 | 3,990 | 4,880 | 4,240 | 3,910 | 2,260 | 3,780 | 7,233 |
| Antimony | 2.9J | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Arsenic | -- | -- | 0.53 J | 0.52 J | 0.66 J | 0.78 J | 0.56 J | 0.53 J | 0.36 J | 0.73 J | 1.6 |
| Barium | 97.7 | 92.3 | 14.1 J | 4.3 J | 5.7 J | 6 J | 10.9 J | 7.2 J | 25 J | 31.4 J | 7.4 |
| Beryllium | -- | 0.09 J | -- | -- | -- | 0.07 J | -- | -- | -- | 0.06 J | ND |
| Cadmium | -- | 0.7 J | 0.81 J | -- | -- | 0.99 J | -- | -- | -- | 1.2 | 1.8 |
| Calcium | -- | -- | 160 J | 112 J | 93 J | 80.1 J | 96.9 J | 151 J | 96.6 J | 181 J | 580 |
| Chromium | 95.7 J | 10.2 J | 4.5 | 1.5 J | 5.4 | 3.1 | 8.6 | 3.8 | 2.4 J | 15.5 | 7.0 |
| Cobalt | -- | -- | 0.45 J | -- | -- | 0.81 J | 0.4 J | 0.4 J | -- | 1.8 J | 1.5 |
| Copper | 65.3 J | 24.9 J | 6.5 | 2.4 J | 3.2 J | 3.5 J | 3 J | 8.7 | 3.8 J | 9.5 | 5.6 |
| Iron | 35,600 J | 14,100 J | 1,760 | 1,600 | 2,240 | 2,810 | 2,870 | 2,060 | 1,750 | 4,190 | 4,843 |
| Lead | 57.4 | 88.5 | 60 J | 3.2 J | 29.6 | 3.4 J | 54.5 J | 19 | 20 | 48.7 | 7.2 |
| Magnesium | 237 J | 185 J | 92.4 J | 63.4 J | 122 J | 88.7 J | 106 J | 137 J | 53.4 J | 94.6 J | 183 |
| Manganese | 317 J | 124 J | 13.8 | 68.8 | 21.3 | 79.3 | 19.3 | 22.9 | 15.1 | 20.8 | 140 |
| Mercury | 0.04 J | 0.06 J | -- | -- | -- | -- | -- | -- | -- | 0.07 J | ND |
| Nickel | 18.9 J | 5.4 J | 3.4 J | -- | 2.9 J | 3.9 J | -- | 7 J | 3.1 J | 2.6 J | 8.2 |
| Potassium | 276 J | 261 J | 318 J | 145 J | 247 J | 346 J | 301 J | 297 J | 166 J | 181 J | ND |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Sodium | -- | -- | 182 J | 169 J | 164 J | 179 J | 195 J | 213 J | 216 J | 155 J | 317 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Vanadium | 3.8 J | 2.9J | 4 J | 3.4 J | 5 J | 6.4 J | 6.2 J | 4.7 J | 3 J | 8.4 J | 11.8 |
| Zinc | 181 J | 99.3 J | 21.2 J | 4.3 J | 9.4 J | 8.9 J | 9.1 J | 27.5 J | 17.6 J | 16.5 J | 17.0 |

See notes at end of table.

## Table 4-19 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-19 | 18-SL-20 | 18-SL-21 | 18-SL-22 | 18-SL-23 | 18-SL-23A[1] | 18-SL-24 | 18-SL-25 | 18-SL-26 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22495002 | 22495003 | 22495004 | 22495005 | 22489003 | 22489004 | 22495006 | 22495007 | 22495008 | |
| **TAL Metals (mg/kg)** | | | | | | | | | | |
| Aluminum | 2,300 | 4,690 | 1,510 | 1,990 | 13,200 J | 4,970 J | 3,480 | 3,790 | 2,310 | 7,233 |
| Antimony | -- | -- | -- | -- | -- | 3.5 J | -- | -- | -- | ND |
| Arsenic | 0.67 J | 1 J | 0.37 J | 0.51 J | -- | -- | 0.63 J | 0.58 J | 0.56 J | 1.6 |
| Barium | 24 J | 9.2 J | 4.8 J | 3.4 J | 196 | 188 | 6.9 J | 5.2 J | 28.8 J | 7.4 |
| Beryllium | 0.09 J | 0.08 J | 0.11 J | -- | 0.09 J | 0.08 J | -- | 0.08 J | 0.1 J | ND |
| Cadmium | 2.5 | -- | -- | 1 J | 5.5 | 5 J | -- | 0.6 J | 1.2 J | 1.8 |
| Calcium | 353 J | 1,050 J | 367 J | 189 J | -- | -- | 185 J | 211 J | 100 J | 580 |
| Chromium | 5 | 3.5 | 3.1 | 3.4 | 33.9 | 23.4 J | 8.7 | 3.6 | 5.6 | 7.0 |
| Cobalt | 1.3 J | 1.4 J | 0.77 J | 1.1 J | -- | -- | 1.8 J | 1.9 J | 1.1 J | 1.5 |
| Copper | 10.3 | 3 J | 7.5 J | 7.3 J | 236 J | 88.6 J | 14.5 | 5.2 J | 6.9 J | 5.6 |
| Iron | 1,900 | 3,340 | 1,140 | 1,520 | 12,900 | 23,500 J | 2,070 | 2,500 | 1,530 | 4843 |
| Lead | 57.9 | 11.5 | 8.4 | 10.4 | 69.6 | 63.2 | 24.5 | 19.1 | 16.8 | 7.2 |
| Magnesium | 78.5 J | 87.6 J | 67.3 J | 33.8 J | 455 J | 267 J | 90 J | 93.2 J | 65.4 J | 183 |
| Manganese | 35.2 | 47.8 | 18 | 15.1 | 131 | 141 J | 12.2 | 134 | 45.8 | 140 |
| Mercury | 0.06 J | 0.06 J | 0.09 J | 0.08 J | 0.25 | 0.07 J | 0.09 J | 0.06 J | 0.05 J | ND |
| Nickel | -- | 3.3 J | 2.6 J | 2.6 J | 6.5 J | 6.7 J | -- | -- | 4.5 J | 8.2 |
| Potassium | 198 J | -- | -- | 149 J | 1,210 | 1,060 J | -- | 301 J | 260 J | ND |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Sodium | 137 J | 150 J | 232 J | 201 J | -- | -- | 173 J | 190 J | 231 J | 317 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Vanadium | 2.9 J | 8 J | 2.6 J | 4 J | 4.3 J | 3.8 J | 5 J | 5.4 J | 3.7 J | 11.8 |
| Zinc | 28.6 J | 21.3 J | 10.1 J | 9.8 J | 631 J | 210 J | 11.7 J | 7 J | 27.9 J | 17.0 |

See notes at end of table.

## Table 4-19 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-27 | 18-SL-28 | 18-SL-29 | 18-SL-30 | 18-SL-31 | 18-SL-31A[1] | 18-SL-32 | 18-SL-33 | 18-SL-34 | 18-SL-35 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22495009 | 22495010 | 22495011 | 22495012 | 22506002 | 22507003 | 22506003 | 22506004 | 22506005 | 22506006 | |
| **Target Analyte List (TAL) Metals (μg/ℓ)** | | | | | | | | | | | |
| Aluminum | 4,100 | 1,730 | 2,910 | 3,330 | 7,100 | 13,500 | 4,590 | 4,350 | 3,560 | 3,540 | 7,233 |
| Antimony | -- | -- | -- | -- | 4.1 J | 3 J | -- | -- | -- | -- | ND |
| Arsenic | 0.71 J | 0.24 J | 0.81 J | 0.74 J | 3.1 | 2.2 J | -- | -- | -- | -- | 1.6 |
| Barium | 4.7 J | 6.8 J | 46.2 J | 13.4 J | 265 | 290 | 59.7 | 46.1 | 22.6 J | 15.1 J | 7.4 |
| Beryllium | 0.06 J | -- | -- | 0.09 J | -- | 0.14 J | 0.07 J | -- | -- | -- | ND |
| Cadmium | -- | -- | 0.91 J | -- | 3.3 J | 15.6 | -- | -- | -- | -- | 1.8 |
| Calcium | 75.2 J | 63 J | 148 J | 167 J | -- | 592 J | -- | -- | -- | -- | 580 |
| Chromium | 3.6 | 1.8 J | 6.6 | 2.6 | 23.2 | 43.8 | 7.1 | 8 | 3.7 | 3.6 | 7.0 |
| Cobalt | 1.4 J | -- | 2 J | -- | -- | 5.9 J | -- | -- | -- | -- | 1.5 |
| Copper | 6.4 J | 5.6 J | 27.5 | 7.2 J | 192 J | 314 | 25.2 J | 32.7 J | 9.2 J | 10.9 J | 5.6 |
| Iron | 2,350 | 1,490 | 3,200 | 1,790 | 41,600 J | 51,700 | 2,590 J | 5,610 J | 2,110 J | 1,760 J | 4,843 |
| Lead | 35.1 | 3.2 | 32.1 | 22.2 | 160 | 168 | 61.1 | 44.9 | 23.4 | -- | 7.2 |
| Magnesium | 106 J | 35.6 J | 136 J | 83.4 J | 518 J | 657 J | 171 J | 192 J | 114 J | 97.2 J | 183 |
| Manganese | 21.7 | 39.6 | 35.4 | 45 | 309 J | 457 | 34.1 J | 57.2 J | 28.8 J | 23.8 J | 140 |
| Mercury | 0.08 J | 0.19 | 0.08 J | 0.07 J | -- | -- | -- | -- | -- | -- | ND |
| Nickel | -- | -- | 7.2 J | 2.5 J | -- | 19.7 | -- | -- | -- | -- | 8.2 |
| Potassium | 259 J | -- | 359 J | 168 J | 2,860 | 2,930 | 462 J | 436 J | 198 J | 170 J | ND |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Sodium | 169 J | 137 J | 203 J | 156 J | -- | 302 J | -- | -- | -- | -- | 317 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Vanadium | 5.4 J | 2.4 J | 3.3 J | 4.4 J | 5.7 J | 5.9 J | 5.9 J | 5 J | 4.5 J | 4.8 J | 11.8 |
| Zinc | 5.5 J | 11 J | 57.7 J | 9.8 J | 326 | 779 | -- | -- | -- | -- | 11.0 |

See notes at end of table.

## Table 4-19 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-36 | 18-SL-37 | 18-SL-37A[1] | 18-SL-38 | 18-SL-39 | 18-SL-40 | 18-SL-41 | 18-SL-42 | 18-SL-43 | 18-SL-44 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22506007 | 22506008 | 22507001 | 22506009 | 22506010 | 22506011 | 22507002 | 22507007 | 22507008 | 22507009 | |
| **Target Analyte List (TAL) Metals (μg/ℓ)** | | | | | | | | | | | |
| Aluminum | 3,790 | 4,190 | 3,600 | 4,100 | 4,840 | 6,050 | 4,740 | 8,390 | 3,880 | 3,680 | 7,233 |
| Antimony | -- | -- | -- | 3.2 J | -- | -- | -- | -- | -- | -- | ND |
| Arsenic | -- | -- | 0.67 J | -- | -- | -- | 0.75 J | 1.7 J | 0.49 J | 0.36 J | 1.6 |
| Barium | 24.6 J | 8.2 J | 7.2 J | 7.7 J | 5.6 J | 5.9 J | 6.4 J | 7 J | 5.7 J | 10.3 J | 7.4 |
| Beryllium | 0.06 J | 0.08 J | -- | -- | 0.06 J | 0.07 J | -- | 0.06 J | -- | 0.08 J | ND |
| Cadmium | 1.9 | 0.84 J | 1.4 | -- | -- | -- | -- | 38.8 | 0.95 J | -- | 1.8 |
| Calcium | -- | -- | 147 J | -- | -- | -- | 245 J | 116 J | 79.3 J | 98.3 J | 580 |
| Chromium | 9 | 4.5 | 3.8 | 32 | 4.4 | 5.4 | 5.9 | 8 | 5.2 | 3.1 | 7.0 |
| Cobalt | -- | -- | 0.55 J | -- | -- | -- | 0.53 J | 0.88 J | 0.62 J | 1 J | 1.5 |
| Copper | 106 J | -- | 5.6 | -- | -- | -- | 5.6 | 6.9 | 6.2 | 4.6 J | 5.6 |
| Iron | 2,090 J | 2,110 J | 1,980 | 3,270 J | 2,690 J | 3,880 J | 2,840 | 4,500 | 2,270 | 2,350 | 4,843 |
| Lead | 99.5 | 42.8 | 43.1 | -- | -- | -- | 6.7 | 10.6 | 9.3 | 4.9 | 7.2 |
| Magnesium | 127 J | 119 J | 69.4 J | 122 J | 75.9 J | 83.2 J | 140 J | 81.5 J | 77.5 J | 84.6 J | 183 |
| Manganese | 21.3 J | 15.7 J | 13.8 | 125 J | 58.8 J | 67.8 J | 132 | 77.5 | 58.6 | 29.7 | 140 |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Nickel | -- | -- | -- | -- | -- | -- | -- | 2.9 J | 3.3 J | 2.7 J | 8.2 |
| Potassium | 235 J | -- | -- | -- | -- | -- | 145 J | 165 J | -- | -- | ND |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | ND |
| Sodium | -- | -- | 185 J | -- | -- | -- | 171 J | 147 J | 170 J | 227 J | 317 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | 0.53 J | -- | ND |
| Vanadium | 4.2 J | 6 J | 5.2 J | 6.3 J | 7 J | 9.5 J | 7.4 J | 12.1 | 5.6 J | 5.2 J | 11.8 |
| Zinc | -- | -- | 19 J | -- | -- | -- | 14.9 J | 25.8 J | 20.1 J | 5.7 J | 17.0 |

See notes at end of table.

## Table 4-19 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
*Technical Memorandum No. 3, Soil Assessment*
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-45 | 18-SL-46 | 18-SL-47 | 2X Arithmetic Mean of Lakeland Sand |
|---|---|---|---|---|
| Collect Date | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No | 22507010 | 22507011 | 22507012 | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | |
| Aluminum | 3,600 | 3,330 | 4,200 | 7,233 |
| Antimony | -- | -- | -- | ND |
| Arsenic | 0.32 J | 0.55 J | 0.31 J | 1.6 |
| Barium | 25.4 J | 2.5 J | 5.3 J | 7.4 |
| Beryllium | 0.07 J | 0.07 J | 0.08 J | ND |
| Cadmium | 1.2 | -- | 0.69 J | 1.8 |
| Calcium | 232 J | 157 J | 124 J | 580 |
| Chromium | 6.1 | 4.1 | 2.9 J | 7.0 |
| Cobalt | 0.74 J | 0.54 J | 0.62 J | 1.5 |
| Copper | 13.5 | 1.8 J | 5.7 | 5.6 |
| Iron | 2,050 | 2,700 | 2,370 | 4,843 |
| Lead | 22.6 | 4.3 | 6.6 | 7.2 |
| Magnesium | 110 J | 39.4 J | 83.2 J | 183 |
| Manganese | 92.5 | 12.1 | 67.3 | 140 |
| Mercury | -- | -- | -- | ND |
| Nickel | -- | -- | 3.1 J | 8.2 |
| Potassium | 138 J | -- | -- | ND |
| Silver | -- | -- | -- | ND |
| Sodium | 260 J | 181 J | 175 J | 317 |
| Thallium | -- | -- | -- | ND |
| Vanadium | 5.3 J | 7.1 J | 5.5 J | 11.8 |
| Zinc | 21.9 J | 7.8 | 9.3 J | 17.0 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: All inorganic concentrations are reported in milligrams per kilogram (mg/kg).
-- = the analyte was not detected in laboratory analysis.
10.5 = analyte concentration either exceeded twice the background mean concentration or the analyte was not detected in the background surface soil samples.
J = the associated numerical value is an estimated quantity.
ND = not detected in Lakeland sand.

## Table 4-20
## Summary Analytical Results for TCLP Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-01 TCLP | 18-SL-06 TCLP | 18-SL-07 TCLP | 18-SL-08 TCLP | 18-SL-09 TCLP | 18-SL-10 TCLP | 18-SL-23 TCLP | Regulatory Limits[1] |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-AUG-92 | 14-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | 13-AUG-92 | |
| Lab Sample No. | 22481001 | 22507006 | 22488001 | 22488002 | 22488003 | 22489001 | 22489003 | |
| **TCLP Volatile Organic Compounds (VOCs) (μg/ℓ)** | | | | | | | | |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | 200 |
| **TCLP Metals (μg/ℓ)** | | | | | | | | |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | 5,000 |
| Barium | 1,490 | 1,000 | 1,380 | 3,770 | 1,300 | 1,510 | 1,980 | 100,000 |
| Cadmium | 2,250 | 136 | 407 | 6.7 | 5 J | 5.8 | 186 | 1,000 |
| Chromium | 6.2 J | 8.8 J | 6.7 J | -- | -- | -- | 10.3 J | 5,000 |
| Lead | 450 | 259 | 474 | 152 | 142 | 599 | 70 | 5,000 |
| Mercury | 0.2 | -- | 0.26 | 0.21 | -- | -- | -- | 200 |

See notes at end of table.

## Table 4-20 (Continued)
## Summary of Analytical Results for TCLP Analytes Detected in Surface Soil Samples from Site 18

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18-SL-25 TCLP | 18-SL-31 TCLP | 18-SL-37 TCLP | 18-SL-38 TCLP | 18-SL-40 TCLP | Regulatory Limits[1] |
|---|---|---|---|---|---|---|
| Collect Date | 13-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | 14-AUG-92 | |
| Lab Sample No. | 22495007 | 22506002 | 22506008 | 22506009 | 22506011 | |
| **TCLP VOCs (μg/ℓ)** | | | | | | |
| 2-Butanone | 47 | -- | -- | -- | -- | 200 |
| **TCLP Metals (μg/ℓ)** | | | | | | |
| Arsenic | -- | 45.2 J | -- | -- | -- | 5,000 |
| Barium | 684 | 3,380 | 893 | 681 | 888 | 100,000 |
| Cadmium | -- | 67.8 | -- | -- | -- | 1,000 |
| Chromium | -- | 49.7 | -- | 5.7 J | 2.7 J | 5,000 |
| Lead | 256 | 4,630 | 734 | 44.7 J | 4,610 | 5,000 |
| Mercury | 0.14 J | -- | -- | -- | -- | 200 |

Source: Federal Register, vol. 55, no. 126, 1990.

Notes: TCLP = toxicity characteristic leaching procedure.
μg/ℓ = micrograms per liter.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

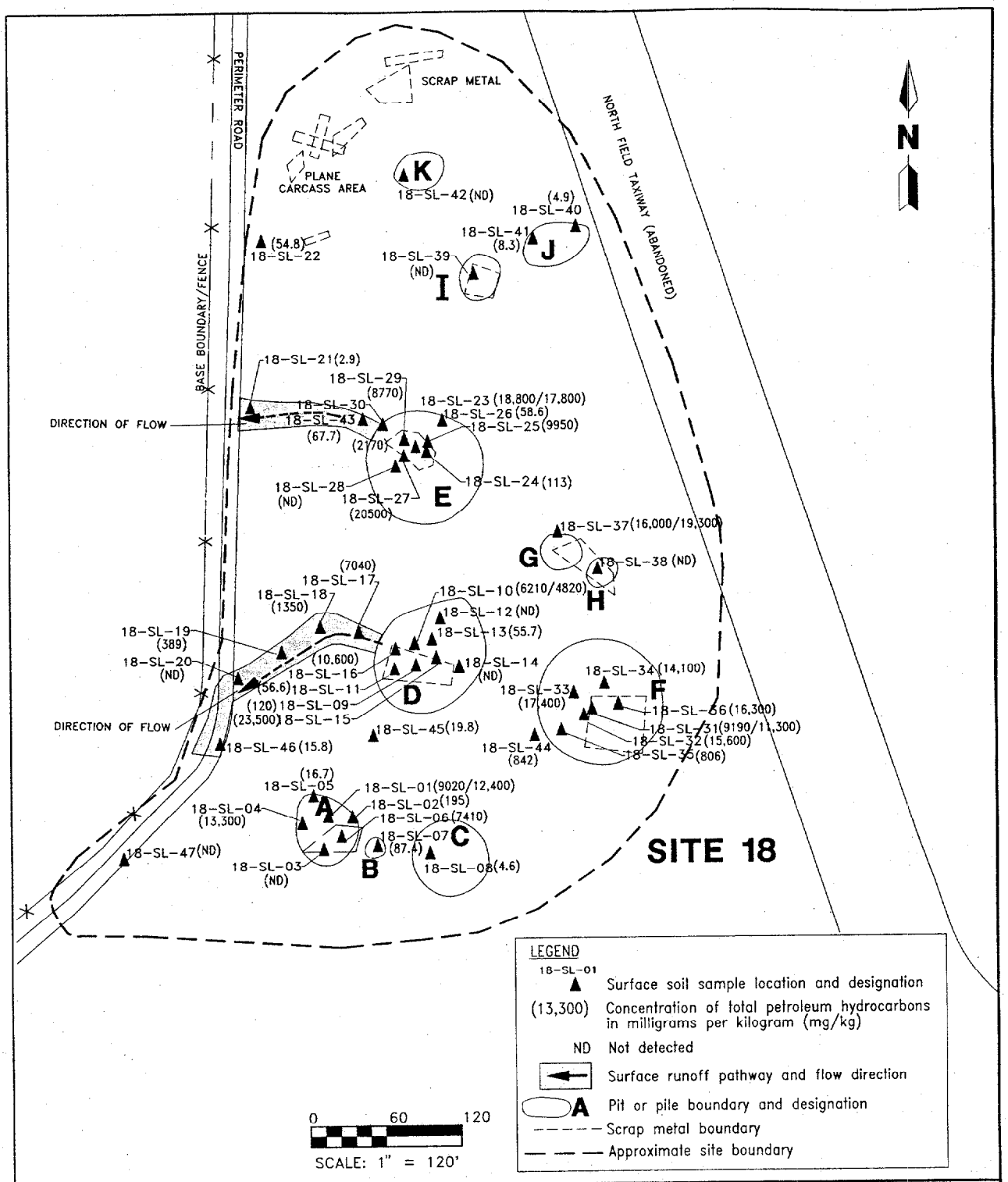


**FIGURE 4-2**
**TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS FOR SURFACE SOIL AT SITE 18**

WHITING/7560-16/TEC-MEM3/SITE18/10/25/94

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

TAL Metals and (Total) Cyanide. Table 4-19 presents a summary of the inorganic analytical results for Site 18. Twenty-two of the analytes were detected in surface soil samples. Thirteen metals (aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, nickel, potassium, vanadium, and zinc) were detected at concentrations exceeding CRDLs. Each of the target analytes were detected in one or more samples and were qualified as estimated during the data validation process. Fifteen metals (aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, vanadium, and zinc) were detected at concentrations exceeding 2 times the background mean concentrations. Antimony, beryllium, mercury, potassium, silver, and thallium were detected in Site 18 samples, but not in Lakeland sand background samples. Cyanide was not detected in Site 18 surface soil samples.

TCLP Metals and VOCs. Table 4-20 presents the detected concentration of TCLP metals at Site 18. Twelve samples collected from Areas A, B, D, E, F, G, H, J, and K were analyzed for TCLP Metals. The analytes detected include arsenic, barium, cadmium, chromium, lead, and mercury. According to 40 CFR Part 261.24, the regulatory limits that qualify the target analyte as toxic are: arsenic, 5,000 $\mu g/\ell$; barium, 100,000 $\mu g/\ell$; cadmium, 1,000 $\mu g/\ell$; chromium, 5,000 $\mu g/\ell$; lead, 5,000 $\mu g/\ell$; and mercury, 200 $\mu g/\ell$. Using these criteria, the soil at Site 18 exhibits the characteristics of toxicity only for cadmium. Cadmium was detected above the regulatory limit of 1.0 $mg/\ell$ (1,000 $\mu g/\ell$) in one of the seven samples. This sample was collected from Area A where the airplane carcass is located.

Twelve surface soil samples were collected from areas with relatively high OVA readings and stained soil and were analyzed for TCLP VOCs. 2-Butanone was detected in one sample (18-SL-25 TCLP) and was quantified at the detection limit of 47 $\mu g/\ell$. According to 40 CFR Part 261.24, the toxicity characteristics criteria for 2-butanone is 200 $mg/\ell$. Sample 18-SL-25 TCLP, which was collected from the burn pit at Area E, does not exhibit the characteristics of toxicity.

## 4.4 SUBSURFACE SOIL SAMPLES FROM TEST PITS, LANDFILL AND DISPOSAL AREA SITES.

According to the USDA (1980), the soil at the sites (Table 2-3) where test pit soil sampling took place is classified as Troup loamy sand. Four background surface soil samples (BKG-SL-02, BK-SL-06, BK-SL-07, and BK-SL-08) were collected from areas where Troup loamy sand was present. The test pit soil samples typically were collected from depths of 10 to 12 feet bls and will be compared to the surface soil background sample concentrations. The analytical results from soil samples collected from the test pits were compared to the background soil samples as surrogates to assess whether analyte concentrations exceed naturally occurring concentrations.

### 4.4.1 Site 1, Northwest Disposal Areas

Table 4-21 summarizes the analytical results for organic compounds and inorganic analytes for subsurface soil samples collected from Site 1 test pits. The locations of test pits are shown on Figure 2-1.

TCL VOCs. One VOC (acetone) was detected in the subsurface soil sample. Acetone was detected at a concentration below the CRQLs and was qualified as estimated. Background surface soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. No SVOCs were detected in subsurface soil samples collected from Site 1 (TP-01-01).

## Table 4-21
## Summary Analytical Results for Subsurface Soil Samples from Test Pit 5 at Site 1

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 01SS0101 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|
| Collect Date | 08-OCT-92 | |
| Lab Sample No. | 22935005 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | |
| Acetone | 51 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | |
| None detected | | |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | |
| None detected | | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | |
| Aluminum | 4,780 | 20,480 |
| Arsenic | 1.1 J | 3.6 |
| Barium | 6.3 J | 26.9 |
| Beryllium | 0.08 J | 0.36 |
| Calcium | 56.7 J | 478 |
| Chromium | 6 | 16.2 |
| Copper | 2.5 J | 11.2 |
| Iron | 5,100 | 11,805 |
| Lead | 2.6 | 11.8 |
| Magnesium | 76 J | 346 |
| Manganese | 8.4 | 383 |
| Mercury | 0.17 J | 0.14 |
| Nickel | 1.7 J | 11.8 |
| Sodium | 167 J | 400 |
| Vanadium | 13 | 29.6 |
| Zinc | 6.1 J | 20.0 |

Notes: μg/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
mg/kg = milligrams per kilogram.
4.3 = analyte concentrations either exceeded twice the mean background concentration of the analyte or analyte was not detected in the background surface soil samples.

## Table 4-22
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits at Site 10

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 10SS0201 | 10SS0302 | 10SS0302A[1] | 10SS0503 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|
| Collect Date | 07-OCT-92 | 07-OCT-92 | 07-OCT-92 | 07-OCT-92 | |
| Lab Sample No. | 22927009 | 22925001 | 22925002 | 22927010 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | |
| Carbon disulfide | 2 J | 3 J | 2 J | 5 J | NA |
| 2-Butanone | -- | 62 | 40 | -- | NA |
| Toluene | -- | 1 J | -- | -- | NA |
| Ethylbenzene | 20 | 4 J | 2 J | -- | NA |
| Xylenes (total) | 4 J | 5 J | 3 J | 1 J | NA |
| **TCL Semivolatile Organic Compounds (μg/kg)** | | | | | |
| Naphthalene | 160 J | 240 J | 260 J | -- | ND |
| 2-Methylnaphthalene | 95 J | 160 J | 190 J | -- | ND |
| Acenaphthene | 110 J | 47 J | -- | -- | ND |
| Dibenzofuran | 82 J | -- | -- | -- | NA |
| Fluorene | 140 J | 55 J | -- | -- | ND |
| Phenanthrene | 77 J | 130 J | 100 J | -- | ND |
| Fluoranthene | -- | 70 J | 46 J | -- | ND |
| Pyrene | -- | -- | 51 J | -- | ND |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | |
| Aldrin | 3.9 J | -- | -- | -- | ND |
| Dieldrin | 5 | -- | -- | -- | ND |
| 4,4'-DDE | 9.3 | -- | -- | 0.66 J | ND |
| 4,4'-DDD | 10 | -- | -- | 1.4 J | ND |
| 4,4'-DDT | 3.9 J | -- | -- | -- | ND |

Notes: See notes at end of table.

## Table 4-22 (Continued)
## Summary Analytical Results for
## Subsurface Soil Samples Collected from Test Pits at Site 10

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 10SS0201 | 10SS0302 | 10SS0302A[1] | 10SS0503 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|
| Collect Date | 07-OCT-92 | 07-OCT-92 | 07-OCT-92 | 07-OCT-92 | |
| Lab Sample No. | 22927009 | 22925001 | 22925002 | 22927010 | |
| **Target Analyte List (TAL) Metals and Cyanides (mg/kg)** | | | | | |
| Aluminum | 12,300 | 11,300 | 12,700 | 12,400 | 20,480 |
| Antimony | 7.9 J | -- | -- | -- | 7.9 |
| Arsenic | 1.7 J | 2.4 J | 2.5 | 3.7 | 3.6 |
| Barium | 14.6 J | 13.5 J | 12.5 J | 28.2 J | 26.9 |
| Beryllium | 0.4 J | 0.13 J | 0.21 J | 0.16 J | 0.36 |
| Cadmium | 0.91 J | -- | -- | -- | ND |
| Calcium | 4,100 | -- | -- | 502 J | 478 |
| Chromium | 207 | 11.9 J | 13.6 J | 11.2 | 16.2 |
| Cobalt | 2.5 J | -- | -- | -- | 2.98 |
| Copper | 11.9 | 4.7 J | 5.5 J | 4.5 J | 11.2 |
| Iron | 44,600 | 7,270 J | 7,720 J | 7,750 | 11,805 |
| Lead | 82.4 | 14.3 | 13.4 | 64.8 | 11.8 |
| Magnesium | 160 J | 130 J | 167 J | 90.9 J | 346 |
| Manganese | 124 | 39.8 J | 41.6 J | 13.3 | 383 |
| Mercury | 0.12 J | -- | -- | 0.08 J | 0.14 |
| Nickel | 4.2 J | -- | -- | 1.9 J | 11.8 |
| Potassium | 185 J | -- | 299 J | -- | ND |
| Selenium | -- | -- | 0.67 J | -- | 0.80 |
| Silver | 1 J | -- | -- | 0.46 J | 0.70 |
| Sodium | 182 J | -- | -- | 212 J | 400 |
| Vanadium | 104 | 18.8 J | 20.8 J | 22.7 | 29.6 |
| Zinc | 27.3 | 21.6 | 17.2 | 24.9 | 20.0 |
| Cyanide | -- | -- | -- | 0.49 J | ND |

[1] The A in the sample locator indicates a duplicate sample.

Notes: $\mu$g/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
-- = the analyte was not detected in laboratory analysis.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background samples.
ND = not detected in Troup loamy sand background samples.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.

Pesticides and PCBs. No pesticides or PCBs were detected in the subsurface soil sample.

TAL Metals and (Total) Cyanide. Sixteen TAL metals were detected in the subsurface soil sample. Eight TAL metals (aluminum, chromium, iron, lead, manganese, mercury, vanadium, and zinc) were detected above the CRDLs at the site. Mercury was detected at 0.17 mg/kg, which exceeds twice the background mean concentration of 0.14 mg/kg. Concentrations of the remaining TAL metals were detected below CRDLs and were qualified as estimated. Cyanide (total) was not detected in any of the samples.

**4.4.2 Site 10, Southeast Open Disposal Area (A)** Table 4-22 summarizes the analytical results for organic compounds and inorganic analytes detected in three subsurface soil samples (and a duplicate) from test pits at Site 10. The test pit locations are shown on Figure 2-2.

TCL VOCs. Five VOCs (carbon disulfide, 2-butanone, toluene, ethylbenzene, and xylenes [total]) were detected in the subsurface soil samples. Two VOCs (2-butanone and ethylbenzene) were detected above the CRQLs in the soil samples. Concentrations of the remaining three VOCs (carbon disulfide, toluene, and xylenes [total]) were qualified as estimated because they were detected below the CRQLs.

TCL SVOCs. Eight SVOCs (naphthalene, 2-methylnaphthalene, acenaphthene, dibenzofuran, fluorene, phenanthrene, fluoranthene, and pyrene) were detected in subsurface soil samples. Concentrations of all detected SVOCs were qualified as estimated during the data validation process because they were detected below the CRQLs. Naphthalene, 2-methylnaphthalene, acenaphthene, fluorene, phenanthrene, and fluoranthene were not detected in the background surface soil samples from the Troup loamy sand soil type.

Pesticides and PCBs. Five pesticide compounds were detected in subsurface soil samples. Four of the pesticide compounds (aldrin, dieldrin, 4,4'-DDE, and 4,4'-dichlorodiphenyldichloroethane [DDD]) were detected above the CRQLs in one sample (10SS0201) at Site 10. 4,4'-DDT was detected at a concentration equivalent to the CRQLs and was qualified as estimated. No pesticides were detected in the background samples.

TAL Metals and (Total) Cyanide. Twenty-three inorganic analytes were detected in subsurface soil samples. Eleven TAL metals (aluminum, arsenic, calcium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected above the CRDLs in subsurface soil samples at Site 10. Concentrations of the remaining 12 analytes were qualified as estimated because they were detected below CRDLs. Concentrations of 18 inorganic analytes were qualified as estimated during the data validation process. TAL metals exceeding 2 times background mean concentrations included antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, potassium, silver, vanadium, zinc, and cyanide. Cadmium, potassium, and cyanide were not detected in the Troup loamy sand background surface soil samples.

**4.4.3 Site 11, Southeast Open Disposal Area (B)** Table 4-23 summarizes the analytical results for organic compounds and inorganic analytes detected in subsurface soil samples collected from test pits at Site 11. The locations of test pits are shown on Figure 2-2.

## Table 4-23
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits at Site 11

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 11SS0101 | 11SS0202 | 11SS0303 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|
| Collect Date | 08-OCT-92 | 08-OCT-92 | 08-OCT-92 | |
| Lab Sample No. | 22935008 | 22935001 | 22935002 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | |
| Acetone | 100 J | -- | 80 J | NA |
| Toluene | 4 J | -- | -- | NA |
| Xylenes (total) | 4 J | 4 J | 8 J | NA |
| **TCL Semivolatile Organic Compounds (μg/kg)** | | | | |
| bis(2-Ethylhexyl) phthalate | 100 J | -- | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | |
| Aldrin | -- | -- | 7 J | ND |
| Dieldrin | 23 J | 2 J | 33 J | ND |
| 4,4'-DDE | 5 J | 27 | 22 J | ND |
| 4,4'-DDD | 22 J | -- | 120 | ND |
| 4,4'-DDT | -- | 8.4 | 28 J | ND |
| Aroclor-1254 | 250 J | -- | -- | ND |
| Aroclor-1260 | 62 J | -- | -- | ND |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | |
| Aluminum | 17,100 | 19,400 | 11,300 | 20,480 |
| Arsenic | 3.9 | 5.5 | 3.7 | 3.6 |
| Barium | 14.6 J | 10.7 J | 28.5 J | 26.9 |
| Beryllium | 0.18 J | 0.21 J | 0.12 J | 0.36 |
| Cadmium | 5 | -- | 6.5 | ND |
| Calcium | 601 J | 766 J | 12,100 | 478 |
| Chromium | 19.5 | 17.2 | 11.4 | 16.2 |
| Cobalt | 1.2 J | 1.1 J | 1.7 J | 3.0 |
| Copper | 17.2 | 5.9 | 6.7 | 11.2 |
| Iron | 16,800 | 15,600 | 7,780 | 11,805 |
| Lead | 64.4 | 7.4 | 109 | 11.8 |
| Magnesium | 85.2 J | 97 J | 311 J | 346 |
| Manganese | 20.6 | 41 | 188 | 383 |
| Mercury | 0.11 | 0.08 J | 0.2 J | 0.14 |
| Nickel | 3.7 J | 3.5 J | 3.9 J | 11.8 |
| Selenium | -- | 0.56 J | -- | 0.80 |
| Sodium | 176 J | 167 J | 189 J | 400 |
| Vanadium | 34.9 | 37.5 | 22.2 | 29.6 |
| Zinc | 298 | 12.8 J | 100 | 20.0 |

Notes: μg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background surface soil sampled.
ND = not detected in Troup loamy sand background samples.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.

TCL VOCs. Three VOCs (acetone, toluene, and xylenes [total]) were detected in subsurface soil samples. One VOC (acetone) was detected above the CRQLs in two samples at the site. Reported concentrations of all the VOCs were qualified as estimated during the data validation process. Background surface soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. One SVOC (bis(2-ethylhexyl)phthalate) was detected in subsurface soil samples. The detected concentration of this SVOC was qualified as estimated because it was below CRQLs. Bis(2-ethylhexyl)phthalate was not a target compound for background subsurface soil sample analyses. No PAHs were detected in the samples from Site 11.

Pesticides and PCBs. Five pesticide and two PCB compounds were detected in subsurface soil samples. All detected pesticide compounds (aldrin, dieldrin, 4,4'-DDT, and 4,4'-DDD) and a PCB compound (Aroclor-1254) were detected above the CRQLs in one or more of the three surface soil samples. Concentrations of dieldrin, 4,4'-DDE, and Aroclor-1260 were detected below CRQLs in at least one sample. Reported concentrations of all pesticide and PCB compounds were qualified as estimated in one or more samples during the data validation process. No pesticides or PCBs were detected in the background soil samples.

TAL Metals and (Total) Cyanide. Nineteen TAL metals were detected in the subsurface soil samples. Twelve metals (aluminum, arsenic, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected above the CRDLs at Site 11. Concentrations of the remaining seven TAL metals were detected below CRDLs and were qualified as estimated. Cyanide was not detected in the subsurface soil samples.

TAL metals with concentrations exceeding 2 times background mean concentrations include: arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, mercury, vanadium, and zinc. Cadmium was not detected in Troup loamy sand background surface soil samples.

**4.4.4 Site 13, Sanitary Landfill** Table 4-24 summarizes the analytical results for organic compounds and inorganic analytes detected in three subsurface soil samples (and a duplicate) collected from test pits at Site 13. The locations of the test pits are shown on Figure 2-3.

TCL VOCs. Seven TCL VOCs were detected in the subsurface soil samples. Three VOCs (acetone, 2-butanone, and 4-methyl-2-pentanone) were detected above the CRQLs. However all of the concentrations except three (sample 13SS0503 with 270 $\mu$g/kg of 2-butanone and sample 13SS0503A with 270 $\mu$g/kg of 2-butanone and 36 $\mu$g/kg of 4-methyl-2 pentanone) were collected at a single location and were qualified as estimated during the data validation process. Background surface soil samples were not analyzed for TCL VOC analyses.

TCL SVOCs. Five SVOCs (phenol, 4-methylphenol, naphthalene, diethylphthalate, and bis(2-ethylhexyl)phthalate) were detected in subsurface soil samples from test pits. Three SVOCs (4-Methylphenol, naphthalene, and bis(2-ethylhexyl)phthalate) were detected at concentrations above the CRQLs in one sample (13SS0503) and its duplicate. Concentrations of each of the SVOCs in one or more samples were detected below CRQLs and were qualified as estimated. PAHs were not detected in the Troup loamy sand background surface soil samples. Among the SVOC analytes

## Table 4-24
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits at Site 13

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 13SS0201 | 13SS0302 | 13SS0503 | 13SS0503A[1] | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|
| Collect Date | 06-OCT-92 | 06-OCT-92 | 06-OCT-92 | 06-OCT-92 | |
| Lab Sample No. | 22927002 | 22927003 | 22927005 | 22927006 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | |
| Acetone | 86 J | 67 J | 700 J | 580 J | NA |
| Carbon disulfide | -- | 2 J | -- | -- | NA |
| 2-Butanone | -- | -- | 270 | 270 | NA |
| 4-Methyl-2-pentanone | -- | -- | 27 J | 34 | NA |
| 2-Hexanone | -- | 3 J | -- | 19 J | NA |
| Toluene | -- | -- | -- | 10 J | NA |
| Xylenes (total) | 2 J | 2 J | -- | 12 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | |
| Phenol | -- | -- | 130 J | 130 J | NA |
| 4-Methylphenol | -- | 68 J | 1,200 | 990 | NA |
| Naphthalene | -- | -- | 510 | 140 J | ND |
| Diethylphthalate | -- | -- | 140 J | 99 J | NA |
| bis(2-Ethylhexyl)phthalate | -- | -- | 410 J | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | |
| None detected | | | | | |
| **Target Analyte List (TAL) Metals and Cyanide (mg/kg)** | | | | | |
| Aluminum | 23,900 | 10,700 | 14,800 | 11,500 | 20,480 |
| Antimony | -- | -- | 3.7 J | -- | 7.9 |
| Arsenic | 6.5 | 4.7 | 4.1 | 3.4 | 3.6 |
| Barium | 7.5 J | 6.3 J | 7.1 J | 7 J | 26.9 |
| Beryllium | 0.2 J | 0.16 J | 0.17 J | 0.16 J | 0.36 |
| Calcium | 130 J | 151 J | 192 J | 194 J | 478 |
| Chromium | 21 | 15.9 | 17.3 | 16.2 | 16.2 |
| Cobalt | 1.4 J | 0.75 J | 1.3 J | 0.63 J | 3.0 |
| Copper | 5.8 J | 3.9 J | 5 J | 5.3 J | 11.2 |
| Iron | 16,200 | 13,500 | 15,500 | 12,200 | 11,805 |
| Lead | 6 | 5.8 | 4.7 | 5.5 | 11.8 |
| Magnesium | 97.7 J | 73.2 J | 74.8 J | 72.9 J | 346 |
| Manganese | 41.6 | 21.7 | 22.5 | 15.1 | 383 |
| Mercury | 0.2 J | 0.16 J | 4.2 | 0.08 J | 0.14 |
| Nickel | 2.1 J | -- | -- | -- | 11.8 |
| Potassium | -- | -- | 180 J | -- | ND |
| Silver | 0.53 J | 0.5 J | 0.62 J | 0.52 J | 0.70 |
| Sodium | 206 J | 211 J | 206 J | 195 J | 400 |
| Vanadium | 44.6 | 38.2 | 40.1 | 34.9 | 29.6 |
| Zinc | 10.2 | 6 | 7.3 | 6.8 | 20.0 |
| Cyanide | -- | -- | -- | 0.12 J | ND |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = microgram per kilogram.
mg/kg = milligram per kilogram.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
-- = the analyte was not detected during laboratory analysis.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background surface soil sampled.
ND = not detected in Troup loamy sand background samples.

detected in the subsurface soil samples from test pits, naphthalene was the only target compound analyzed in the background soil samples.

Pesticides and PCBs. No pesticides or PCBs were detected in subsurface soil samples from test pits at Site 13.

TAL Metals and (Total) Cyanide. Twenty-one inorganic analytes were detected in the subsurface soil samples. Eleven TAL metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, vanadium, zinc, and cyanide (total)) were detected above the CRDLs. Concentrations of the remaining 11 inorganic analytes were detected below CRDLs. Reported concentrations of 12 TAL metals were qualified as estimated in one or more samples during the data validation process.

Aluminum, arsenic, chromium, iron, mercury, potassium, vanadium, and cyanide were detected in at least one subsurface soil sample at concentrations either exceeding 2 times the background mean concentrations or the compound was not detected in the background samples. Iron and vanadium exceeded 2 times the background mean concentration for all four subsurface soil samples.

**4.4.5 Site 14, Short-term Sanitary Landfill** Table 4-25 summarizes the analytical results for organic compounds and inorganic analytes detected in subsurface soil samples collected from test pits at Site 14. Figure 2-3 presents the locations of test pits completed at Site 14.

TCL VOCs. Three VOCs (acetone, toluene, and ethylbenzene) were detected in the subsurface soil samples from test pits at Site 14. All three compounds were detected in subsurface soil sample 14SS0202. Concentrations of acetone and toluene were qualified as estimated during the data validation process. Background surface soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Three SVOCs were detected in the subsurface soil samples from test pits at Site 14. All three compounds were detected in subsurface soil sample 14SS0202. Naphthalene, a PAH, was detected at a concentration of 1,500 $\mu g/\ell$. Concentrations of 4-methyl phenol and bis(2-ethylhexyl) phthalate were detected below CRQLs and were qualified as estimated during the data validation process. PAHs were not detected in the Troup loamy sand background samples. 4-Methylphenol and bis(2-ethylhexyl)phthalate were not target analytes in the background soil samples.

Pesticides and PCBs. No pesticides or PCBs were detected in subsurface soil samples from test pits at Site 14.

TAL Metals and (Total) Cyanide. Nineteen TAL metals were detected in subsurface soil samples from test pits. Eleven of the metals (aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected above the CRDLs. Concentrations of the remaining metals were detected below CRDLs. Cyanide was not detected in the subsurface soil samples. Reported concentrations of 11 TAL metals were qualified as estimated in one or more samples during the validation process. Arsenic, chromium, iron, mercury, and vanadium were detected in at least one sample at concentrations exceeding 2 times the background mean concentrations. Cadmium was not detected in the background samples.

## Table 4-25
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits at Site 14

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 14SS0101 | 14SS0202 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|
| Collect Date | 08-OCT-92 | 08-OCT-92 | |
| Lab Sample No. | 22935003 | 22935004 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | |
| Acetone | -- | 170 J | NA |
| Toluene | -- | 23 J | NA |
| Ethylbenzene | -- | 500 | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | |
| 4-Methylphenol | -- | 60 J | NA |
| Naphthalene | -- | 1,500 | ND |
| bis(2-Ethylhexyl)phthalate | -- | 290 J | NA |
| **TCL Pesticides/Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | |
| None detected | | | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | |
| Aluminum | 14,900 | 8,830 | 20,480 |
| Arsenic | 4.5 | 3.7 | 3.6 |
| Barium | 7.9 J | 7.7 J | 26.9 |
| Beryllium | 0.21 J | 0.2 J | 0.36 |
| Cadmium | -- | 1.7 | ND |
| Calcium | 126 J | 256 J | 478 |
| Chromium | 18.5 | 18.4 | 16.2 |
| Cobalt | 1.8 J | 1.4 J | 3.0 |
| Copper | 7.5 | 4.6 J | 11.2 |
| Iron | 18,800 | 15,300 | 11,805 |
| Lead | 7.3 | 5.6 | 11.8 |
| Magnesium | 104 J | 71.6 J | 346 |
| Manganese | 35 | 23.4 | 383 |
| Mercury | 0.12 J | 0.14 J | 0.14 |
| Nickel | 3.1 J | 3.6 J | 11.8 |
| Silver | -- | 0.5 J | 0.70 |
| Sodium | 169 J | 190 J | 400 |
| Vanadium | 47.7 | 38.8 | 29.6 |
| Zinc | 9.8 J | 15.4 | 20.0 |

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected during laboratory analysis.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background surface soil sampled.
ND = not detected in Troup loamy sand background samples. mg/kg = milligrams per kilogram.

**4.4.6 Site 15, Southwest Landfill** Table 4-26 summarizes the analytical results for organic and inorganic analytes detected in five subsurface soil samples from test pits at Site 15. The test pit locations are shown on Figure 2-5.

TCL VOCs. Three VOCs (2-hexanone, chlorobenzene, and xylenes [total]) were detected in subsurface soil samples. The reported concentrations were qualified as estimated during the data validation process.

TCL SVOCs. Seven SVOCs (phenol, 1,4-dichlorobenzene, 4-methylphenol, naphthalene, 2-methylnaphthalene, diethylphthalate, and BEHP) were detected in the subsurface soil samples from test pits. Concentrations of the seven SVOCs were qualified as estimated during the data validation process.

Pesticides and PCBs. One pesticide compound 4,4'-DDE and one PCB compound (Aroclor-1242) was detected in samples collected from test pits at Site 15 at a concentration of 2.3 J and 2,200 $\mu$g/kg, respectively. Analyses for pesticide and PCB compounds were performed for the background samples but none were detected.

TAL Metals and (Total) Cyanide. Twenty-one TAL inorganic analytes were detected in the subsurface soil samples from test pits at Site 15. Eleven TAL metals (aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected above the CRDLs. Concentrations of the remaining analytes were detected below CRDLs and were qualified as estimated concentrations during the data validation process. Lead and mercury were detected in at least one sample at concentrations exceeding 2 times background mean concentrations. Cadmium, potassium, and cyanide were detected in Site 15 subsurface soil samples, and not in the background samples.

**4.4.7 Site 16, Open Disposal and Burning Area** Table 4-27 summarizes the analytical results for organic and inorganic analytes detected in five subsurface soil samples (and a duplicate) collected from test pits at Site 16 (Figure 2-6).

TCL VOCs. Seven VOCs were detected in the subsurface soil samples from test pits at Site 16. Methylene chloride and carbon disulfide were detected at concentrations above the CRQLs in at least one of the three surface soil samples. All of the concentrations, except one reported concentration of carbon disulfide and one concentration of 2-butanone, were qualified as estimated during the data validation process. Background surface soil samples were not analyzed for TCL VOC analytes.

TCL SVOCs. Eleven SVOCs were detected in the subsurface soil samples from test pits at Site 16. All compounds, except for bis(2-ethylhexyl)phthalate, were detected in two samples (16SS0201 and 16SS0604) and were qualified as estimated because they were detected below CRQLs. The two reported concentrations of bis(2-ethyhexyl)phthalate were also detected below the CRQL and qualified as estimated.

Pesticides and PCBs. Four pesticide compounds (dieldrin, 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT) were detected in the subsurface soil samples collected from Site 16. The reported concentration of dieldrin was qualified as estimated because it was below the CRQL. Analyses for pesticide and PCB compounds were completed on the background samples but none were detected.

## Table 4-26
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits at Site 15

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 15SS0201 | 15SS0502 | 15SS0603 | 15SS0804 | 15SS1005 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|
| Collect Date | 02-OCT-92 | 04-OCT-92 | 04-OCT-92 | 04-OCT-92 | 04-OCT-92 | |
| Lab Sample No. | 22883001 | 22889004 | 22889005 | 22891002 | 22891004 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (μg/kg)** | | | | | | |
| 2-Hexanone | 3 J | -- | -- | -- | -- | NA |
| Chlorobenzene | -- | -- | -- | 2 J | -- | NA |
| Xylenes (total) | 4 J | -- | 5 J | 5 J | 6 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (μg/kg)** | | | | | | |
| Phenol | 53 J | -- | -- | -- | -- | NA |
| 1,4-Dichlorobenzene | -- | -- | -- | 110 J | -- | NA |
| 4-Methylphenol | 42 J | -- | 77 J | -- | -- | NA |
| Naphthalene | -- | -- | 140 J | 92 J | -- | ND |
| 2-Methylnaphthalene | -- | -- | 68 J | 76 J | -- | ND |
| Diethylphthalate | 41 J | -- | -- | -- | -- | NA |
| bis(2-Ethylhexyl)phthalate | 42 J | -- | 230 J | -- | -- | NA |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (μg/kg)** | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | 2.3 J | ND |
| Aroclor-1242 | -- | -- | -- | 2,200 | -- | ND |
| **Target Analyte List (TAL) Metals and Cyanide (mg/kg)** | | | | | | |
| Aluminum | 13,900 | 3,520 | 7,250 | 15,100 | 7,760 | 20,480 |
| Arsenic | 2.6 | 0.63 J | 1.5 J | 2.6 | 1.9 J | 3.6 |
| Barium | 5 J | 1.6 J | 9.6 J | 13.2 J | 6.5 J | 26.9 |
| Beryllium | 0.17 J | -- | 0.11 J | 0.16 J | 0.09 J | 0.36 |
| Cadmium | -- | -- | 2.1 | -- | -- | ND |
| Calcium | 131 J | 72.7 J | 148 J | 267 J | 264 J | 478 |
| Chromium | 11 | 3.8 | 6.6 | 12.7 | 6.5 | 16.2 |
| Cobalt | 0.71 J | -- | -- | -- | -- | 3.0 |
| Copper | 5.9 | 0.86 J | 3.5 J | 6.8 | 3.6 J | 11.2 |
| Iron | 7,520 | 2,100 | 3,650 | 9,640 | 4,530 | 11,805 |
| Lead | 4.3 | 2.8 | 5.7 | 8.4 | 86.2 | 11.8 |
| Magnesium | 78.9 J | 18.8 J | 109 J | 96 J | 70.7 J | 346 |
| Manganese | 21.4 | 10 | 22.9 | 44.2 | 28.1 | 383 |
| Mercury | 0.44 J | 0.09 J | 0.44 J | 0.59 | 0.43 J | 0.14 |
| Nickel | 2.3 J | -- | 2.1 J | -- | 3 J | 11.8 |
| Potassium | 137 J | -- | 157 J | 154 J | -- | ND |
| Silver | 0.51 J | -- | 0.48 J | 0.62 J | -- | 0.70 |
| Sodium | 175 J | 165 J | 175 J | 191 J | 182 J | 400 |
| Vanadium | 22.5 | 6.5 J | 11.1 | 25 | 13.9 | 29.6 |
| Zinc | 9.9 J | 3.1 J | 12.9 | 19.1 | 7.4 J | 20.0 |
| Cyanide | -- | 0.53 J | 0.55 J | -- | -- | ND |

Notes: μg/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.
NA = not analyzed in background surface soil samples.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background surface soil sampled.
ND = not detected in Troup loamy sand background samples.
DDE = dichlorodiphenyldichloroethene.
mg/kg = milligrams per kilogram.

## Table 4-27
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits in Site 16

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 16SS0201 | 16SS0302 | 16SS0403 | 16SS0403A[1] | 16SS0604 | 16SS1005 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 04-OCT-92 | 04-OCT-92 | 11-SEP-92 | 11-SEP-92 | 05-OCT-92 | 06-OCT-92 | |
| Lab Sample No. | 22891006 | 22897001 | 22898001 | 22898002 | 22910001 | 22910004 | |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | |
| Acetone | -- | -- | -- | -- | 87 J | -- | NA |
| Methylene chloride | -- | -- | 150 J | -- | -- | -- | NA |
| Carbon disulfide | 26 | 5 J | 13 | 9 J | 1 J | 5 J | NA |
| 2-Butanone | -- | -- | -- | -- | 19 | -- | NA |
| Toluene | 1 J | -- | -- | -- | -- | -- | NA |
| Ethylbenzene | -- | -- | 2 J | -- | -- | -- | NA |
| Xylenes (total) | 11 J | 3 J | 7 J | 5 J | 2 J | 4 J | NA |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | |
| Naphthalene | 39 J | -- | -- | -- | -- | -- | ND |
| 2-Methylnaphthalene | 39 J | -- | -- | -- | -- | -- | ND |
| Acenaphthene | -- | -- | -- | -- | 77 J | -- | ND |
| Fluorene | -- | -- | -- | -- | 110 J | -- | ND |
| Phenanthrene | 58 J | -- | -- | -- | 340 J | -- | ND |
| Fluoranthene | 120 J | -- | -- | -- | 270 J | -- | ND |
| Pyrene | 77 J | -- | -- | -- | 190 J | -- | ND |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | 150 J | 39 J | ND |
| Benzo(b)fluoranthene | -- | -- | -- | -- | 77 J | -- | ND |
| Benzo(k)fluoranthene | -- | -- | -- | -- | 48 J | -- | ND |
| Benzo(a)pyrene | -- | -- | -- | -- | 44 J | -- | ND |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | |
| Dieldrin | 1.6 J | -- | -- | -- | -- | -- | ND |
| 4,4'-DDE | 1.6 J | -- | -- | -- | 30 J | 83 | ND |
| 4,4'-DDD | 2.2 J | -- | -- | -- | 36 J | 4.9 J | ND |
| 4,4'-DDT | -- | -- | -- | -- | 5.7 J | 52 | ND |

See notes at end of table.

## Table 4-27 (Continued)
## Summary Analytical Results for Subsurface Soil Samples Collected from Test Pits in Site 16

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 16SS0201 | 16SS0302 | 16SS0403 | 16SS0403A[1] | 16SS0604 | 16SS1005 | 2X Arithmetic Mean of Troup Loamy Sand |
|---|---|---|---|---|---|---|---|
| Collect Date | 04-OCT-92 | 04-OCT-92 | 11-SEP-92 | 11-SEP-92 | 05-OCT-92 | 06-OCT-92 | |
| Lab Sample No. | 22891006 | 22897001 | 22898001 | 22898002 | 22910001 | 22910004 | |
| **Target Analyte List (TAL) Metals (mg/kg)** | | | | | | | |
| Aluminum | 17,000 | 15,400 | 29,000 | 19,500 | 11,000 | 17,300 | 20,480 |
| Antimony | 2.5 J | -- | -- | -- | 6.7 J | 5.9 J | 7.9 |
| Arsenic | 2.7 | 1.5 J | 5.1 J | 5.8 J | 15.1 | 11.0 | 3.6 |
| Barium | 36 J | 35 J | 21 J | 19 J | 175 | 122 | 26.9 |
| Beryllium | 0.18 J | 0.21 J | 0.23 J | 0.29 J | 0.19 J | 0.19 J | 0.36 |
| Cadmium | 2.4 J | -- | -- | -- | 9 | 8.7 | ND |
| Calcium | 877 J | 254 J | -- | -- | 5,870 | 1,370 | 478 |
| Chromium | 16.6 | 10.5 | 32.5 J | 27.3 J | 24.7 | 36.9 | 16.2 |
| Cobalt | 1.1 J | 1.2 J | 2.4 J | 1.4 J | 4.5 J | 9.6 J | 3.0 |
| Copper | 16.2 | 4.8 J | 13.7 | 7.9 | 143 | 3,620 | 11.2 |
| Iron | 8,440 | 6,670 | 21,700 | 17,600 | 37,500 | 74,800 | 11,805 |
| Lead | 74.6 | 6.8 | 17.3 J | 14.6 J | 766 | 567 | 11.8 |
| Magnesium | 243 J | 293 J | 211 J | 185 J | 586 J | 400 J | 346 |
| Manganese | 93.1 | 231 | 54 | 39.9 | 297 | 638 | 383 |
| Mercury | 0.29 J | 0.43 J | -- | -- | 0.25 J | 0.17 J | 0.14 |
| Nickel | 4.4 J | 4.4 J | 4.4 J | 2.3 J | 24.3 | 35.9 | 11.8 |
| Potassium | 258 J | -- | 270 J | 356 J | 442 J | 166 J | ND |
| Silver | 0.79 J | -- | -- | -- | 4.3 | 3.4 | 0.70 |
| Sodium | 243 J | 207 J | -- | -- | 514 J | 332 J | 400 |
| Vanadium | 25 | 19.1 | 63.3 | 67.5 | 19 | 27.9 | 29.6 |
| Zinc | 122 | 10.6 J | 43 J | 28 J | 518 | 895 | 20.0 |
| Cyanide | -- | -- | R | R | -- | 0.14 J | ND |

[1] The A in the sample locator indicates a duplicate sample.

Notes: µg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
NA = not analyzed in background surface soil samples.
4.3 = analyte concentration either exceeded twice the mean background concentration or the analyte was not detected in the background surface soil sampled.
ND = not detected in Troup loamy sand background samples.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
mg/kg = milligrams per kilogram.
R = the concentration determined was rejected.

TAL Metals and (Total) Cyanide. Twenty-two inorganic analytes were detected in the subsurface soil samples from test pits at Site 16. Fifteen of the metals (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, vanadium, and zinc) were detected at concentrations above the CRQLs. Concentrations of the remaining metals were detected below the CRDLs. Reported concentrations of 19 analytes were qualified as estimated in one or more samples during the data validation process. Aluminum, arsenic, barium, copper, iron, lead, calcium, chromium, mercury, silver, vanadium, and zinc were detected in one or more samples at concentrations exceeding 2 times the background mean concentrations. Cadmium and potassium were detected in Site 16 samples but were not detected in background samples. Cyanide was detected in one sample below the CRDL and was qualified as estimated. Cyanide was not detected in background samples.

**4.5 SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS**. The following sections present a summary discussion of the analytical results for subsurface soil samples collected from soil borings. Sample collection depths were based on OVA readings. Subsurface soil samples for laboratory analysis were collected from samples containing both high and low OVA readings to avoid sampling bias. Sampling soil borings in the vadose zone were terminated based on two or more consecutive samples containing zero ppm readings from the OVA. At each site, one soil boring was completed to the water table regardless of OVA readings.

**4.5.1 Subsurface Soil Sample Results, Crash Crew Training Area Sites** The following sections summarize the detected concentrations of chemical analytes from subsurface soil samples collected at Sites 17 and 18 soil borings.

**4.5.1.1 Site 17, Crash Crew Training Area (A)** Tables 4-28 and 4-29 summarize the detected concentrations of organic compounds and inorganic analytes, respectively, at Site 17. Sample locations are presented on Figure 2-7.

TCL VOCs. Three VOCs (acetone, 2-butanone or methyl ethyl ketone [MEK], and 4-methyl-2-pentanone) were detected in subsurface soil samples collected from soil borings at the site. Both acetone and 2-butanone (or MEK) were detected above the CRQLs. Acetone was qualified as estimated because acetone was detected in laboratory blank samples. Concentrations of 4-methyl-2-pentanone were qualified as estimated because they were detected below CRQLs.

TCL SVOCs. Two SVOCs (di-n-butylphthalate and diethylphthalate) were detected in 2 of 18 subsurface soil samples retrieved from soil borings at Site 17. Both detected concentrations were below the CRQLs for these analytes and, therefore, were qualified as estimated.

Pesticides and PCBs. Two pesticide compounds (4,4'-DDT and 4,4'-DDE) were detected in the 5- to 7-foot bls interval sample collected from soil boring 17 SB6 at a concentration of 19.0 and 6.5 $\mu$g/kg, respectively. Detected concentrations for these compounds were greater than the CRQLs. PCB compounds were not detected in subsurface soil samples from Site 17.

Total Petroleum Hydrocarbons (TPHs). TPHs were detected in four subsurface samples from soil borings 17SB1, 17SB2, and 17SB9 at concentrations ranging from 2.5 to 66.2 mg/kg. TPHs were detected at Site 17 only at burn pit D and surface location I (airplane carcass). The highest concentration (66 mg/kg) was reported

# Table 4-28
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 17 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17SB1-5-7 | 17SB1-15-17 | 17SB2-5-7 | 17SB2-10-12 | 17SB3-10-12 | 17SB4-5-7 | 17SB4-10-12 | 17SB5-5-7 | 17SB5-5-7A[1] | 17SB5-10-12 | 17SB5-20-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 |
| Lab Sample No. | 34925003 | 34925004 | 34925005 | 34925006 | 34823005 | 34823003 | 34823004 | 34926001 | 34926002 | 34925001 | 34925002 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | | | | | |
| Acetone | 11 J | 29 J | 47 | 18 | -- | -- | -- | -- | -- | 19 | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | 18 J | 23 J | -- | -- |
| 4-Methyl-2-pentanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | | |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | 94 J | -- | -- | -- | -- |
| Di-n-butylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | | |
| | 66.2 | -- | 5.5 | 2.5 | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-28 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 17 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17SB6-5-7 | 17SB6-10-12 | 17SB7-5-7 | 17SB7-15-17 | 17SB8-5-7 | 17SB8-10-12 | 17SB9-10-12 |
|---|---|---|---|---|---|---|---|
| Collect Date | 07-JAN-93 | 07-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34823001 | 34823002 | 34906006 | 34906007 | 34906008 | 34906009 | 34815018 |
| **TCL VOCs (μg/kg)** | | | | | | | |
| Acetone | -- | -- | 26 J | 14 J | 82 J | 11 J | 130 J |
| 2-Butanone | 34 | -- | -- | -- | -- | -- | -- |
| 4-Methyl-2-pentanone | 4 J | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | | |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- |
| Di-n-butylphthalate | -- | -- | -- | -- | -- | 310 J | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | | |
| 4,4'-DDE | 6.5 J | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | 19 | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | |
| | -- | -- | -- | -- | -- | -- | 3.1 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
mg/kg = milligrams per kilogram.

## Table 4-29
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 17 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17SB1-5-7 | 17SB1-15-17 | 17SB2-5-7 | 17SB2-10-12 | 17SB3-10-12 | 17SB4-5-7 | 17SB4-10-12 | 17SB5-5-7 | 17SB5-5-7A[1] | 17SB5-10-12 | 17SB5-20-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 |
| Lab Sample No. | 34925003 | 34925004 | 34925005 | 34925006 | 34823005 | 34823003 | 34823004 | 34926001 | 34926002 | 34925001 | 34925002 |
| Aluminum | 33,200 | 24,600 | 55,200 | 26,000 | 5,800 | 10,000 | 4,550 | 3,940 J | 21,100 J | 7,650 | 1,180 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 8 | 5.5 | 2.2 J | 6.2 | 2.1 J | 0.5 J | 1.3 J | 2.1 J | 3.3 | 2.2 J | 0.43 J |
| Barium | 14.3 J | 5.8 J | 10 J | 4.1 J | 2.4 J | 4.8 J | 2.5 J | 5.3 J | 8.3 J | 3.8 J | 0.32 J |
| Beryllium | 0.28 J | 0.15 J | 0.45 J | 0.21 J | -- | -- | -- | -- | -- | 0.13 J | -- |
| Cadmium | -- | -- | -- | -- | -- | 0.75 J | -- | -- | -- | -- | -- |
| Calcium | 87.9 J | 41.3 J | 85.9 J | 21.8 J | 79.7 J | 156 J | 80.8 J | -- | -- | 159 J | 7.6 J |
| Chromium | 27.9 | 15.9 | 45.4 | 18.8 | 9.3 | 26.3 | 10.3 | 23.7 J | 35.1 J | 10.6 | 1.2 J |
| Cobalt | 0.83 J | -- | 0.57 J | -- | -- | -- | -- | -- | 1 J | -- | -- |
| Copper | 6.7 | 4.3 J | 9.9 | 5 J | 2.6 J | 6.3 | 3.2 J | 4.3 J | 7.9 J | 7.8 | -- |
| Iron | 22,300 | 13,200 | 39,100 | 17,800 | 10,400 | 29,300 | 11,900 | 25,500 | 43,400 | 12,400 | 742 |
| Lead | 44.7 | 3.4 | 7.8 | 5.2 | 2.9 | 2.6 | 2.8 | 4.4 J | 6.8 J | 3.5 | 0.18 J |
| Magnesium | 177 J | 96.4 J | 186 J | 79.9 J | 33.6 J | 84.8 J | 37.6 J | -- | -- | 111 J | -- |
| Manganese | 40.6 | 15.1 | 32.4 | 20.1 | 12.4 | 27.9 | 13.1 | 15.6 | 30 | 42.6 | 1.5 J |
| Mercury | -- | -- | 0.03 J | -- | -- | -- | 0.03 J | 0.03 J | 0.02 J | -- | -- |
| Nickel | 4.1 J | 2.8 J | 4.2 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | 1,180 | -- | -- | -- | 96.9 J | 53.6 J | -- | 222 J | -- | -- | -- |
| Selenium | 4 | 1.5 | 2.3 | 4.5 | -- | -- | -- | 0.59 J | 345 J | 1.1 J | -- |
| Silver | 0.71 J | -- | 1.3 J | 0.69 J | -- | -- | -- | 0.86 J | 0.87 J | 0.78 J | -- |
| Sodium | 19.9 J | -- | 49.7 J | 23.5 J | 184 J | 207 J | 204 J | 30.2 J | -- | -- | -- |
| Vanadium | 57.6 | 36.4 | 100 | 47.3 | 27.7 | 74 | 31.2 | 68 J | 91.8 J | 37.8 | 1.6 J |
| Zinc | 6.8 | 3.3 J | 5.8 | 3.2 J | 4.3 J | 8.9 | 4.8 | -- | 5.3 J | 1.9 J | 0.52 J |
| Cyanide | 0.51 J | 0.52 J | 0.51 J | 0.52 J | -- | -- | -- | -- | -- | 0.51 J | 0.46 J |

See notes at end of table.

## Table 4-29 (Continued)
## Summary Analytical Results for Inorganic Analytes Detected in Subsurface Soil Samples from Site 17 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 17SB6-5-7 | 17SB6-10-12 | 17SB7-5-7 | 17SB7-15-17 | 17SB8-5-7 | 17SB8-10-12 | 17SB9-5-7 | 17SB9-10-12 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 07-JAN-93 | 07-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34823001 | 34823002 | 34906006 | 34906007 | 34906008 | 34906009 | 34815017 | 34815018 |
| Aluminum | 9,250 | 3,730 | 45,000 | 1,540 | 53,300 | 19,000 | 7,800 | 6,220 |
| Antimony | -- | -- | 8 J | -- | -- | -- | 7 J | -- |
| Arsenic | 0.71 J | 0.68 J | 2.4 J | 1.1 J | 6.4 | 3.1 J | 3 | 1.8 J |
| Barium | 3.9 J | 1.5 J | 7.2 J | -- | 10.5 J | 3.8 J | 3 J | 3.6 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | 2.5 | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 147 J | 64.9 J | 16.9 J | 14.2 J | -- | -- | -- | -- |
| Chromium | 50.5 | 4.8 | 45.8 | 2.3 | 46.1 | 12.8 | 24.3 | 19.9 |
| Cobalt | 1.6 J | -- | 4.2 J | -- | 4.4 J | 0.64 J | 2.1 J | 0.92 J |
| Copper | 22.7 | 3.7 J | 1.4 J | 1.1 J | 5.4 J | 2.3 J | -- | -- |
| Iron | 89,800 | 6,240 | 50,700 | 1,330 | 48,400 | 10,500 | 31,600 | 22,200 |
| Lead | 8.3 | 0.92 | 6.9 | 0.8 J | 8.5 | 2.7 | 8 | 5.4 |
| Magnesium | 45.5 J | 18.3 J | 115 J | 9.4 J | 187 J | 64.7 J | 30.7 J | 27.1 J |
| Manganese | 226 | 78.2 | 76.9 | 7 | 41.5 | 28.7 | 24.4 | 15 |
| Mercury | 0.04 J | -- | -- | -- | -- | -- | 0.02 J | 0.03 J |
| Nickel | 3.1 J | -- | 3.1 J | -- | 6.9 J | 3.9 J | -- | -- |
| Potassium | 437 J | -- | 319 J | -- | 736 J | -- | -- | -- |
| Selenium | -- | -- | 0.64 J | 0.91 J | 3.4 | 0.61 J | 0.65 J | -- |
| Silver | 1.3 J | -- | 1 J | -- | 1.4 J | -- | 1.2 J | 0.81 J |
| Sodium | 185 J | 168 J | -- | -- | 16.4 J | -- | -- | -- |
| Vanadium | 105 | 15.7 | 99.3 | 3.1 J | 95.7 | 27.8 | 82 | 60.5 |
| Zinc | 18.9 | 2.9 J | 1.6 J | 0.81 J | 3.3 J | 1.7 J | -- | -- |
| Cyanide | -- | -- | 0.66 J | 0.43 J | 0.45 J | 0.46 J | 0.53 J | 0.48 J |

[1] The A in the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilogram (mg/kg).
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

in soil boring 17SB1 located at pit area I. The detected concentrations are presented in graphic form in Figure 4-3.

TAL Metals and (Total) Cyanide. Twenty-three inorganic analytes were detected in subsurface soil samples from Site 17. Seven of the analytes (aluminum, arsenic, chromium, iron, lead, manganese, and vanadium) were detected in all samples. Only aluminum, arsenic, cadmium, chromium, iron, lead, manganese, vanadium, and zinc were detected at concentrations exceeding the CRDLs. Concentrations of remaining inorganic analytes were qualified as estimated because they were below the CRDLs.

**4.5.1.2 Site 18, Crash Crew Training Area (B)** Table 4-30 presents a summary of detected concentrations for organic compounds in subsurface soil samples at Site 18. The sample locations are presented in Figure 2-8.

TCL VOCs. Four VOCs (acetone, 2-butanone, 4-methyl-2-pentanone, and xylenes [total]) were detected in the subsurface soil samples retrieved from the eight borings drilled. The four VOCs were reported at concentrations above the CRQLs. Acetone was detected in subsurface soil samples from pits A, C, D, E, G, and I and in one of the two soil borings in the drainage pathway draining burn pit E. Concentrations are reported to range from 20 µg/kg to 230 µg/kg. All reported concentrations of 2-butanone and 4-methyl-2 pentanone were qualified as estimated during the data validation process. Xylenes (total) were detected in subsurface soil samples 18SB4-10-12, 18SB6-10-12, and 18SB-6-10-12A (duplicate sample) and 18SB8-10-12 collected from burn pits D and F, respectively.

TCL SVOCs. Eight SVOCs (phenol, 4-methylphenol, naphthalene, 2-methylnaphthalene, dimethylphthalate, dibenzofuran, fluorene, and phenanthrene) were detected in subsurface soil samples collected at Site 18. The highest concentrations of PAHs (4-methylnaphthalene, 2-methylnaphthalene, and phenanthrene) were detected at pit D, 18SB6-15-17. Two of the SVOCs (naphthalene and 2-methylnaphthalene) were detected at pit F. The PAHs 2-methylnaphthalene, fluorene, and phenanthrene were detected at pit F from sample 18SB8-10-12. SVOCs other than PAHs were detected at concentra-tions below the CRQLs and were qualified as estimated.

Pesticides and PCBs. Three pesticide compounds (4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) were detected in subsurface soil samples at Site 18. Each pesticide was detected above the CRQLs and qualified as estimated. 4,4'-DDD was detected in samples from location "I", and 4,4'-DDT and 4,4'-DDE were detected in samples from burn pit "E". PCBs were not detected in soil boring samples from Site 18.

TPHs. TPHs were detected in 17 of 24 subsurface soil samples collected at Site 18. Samples with detected concentrations of TPHs were collected from seven soil borings drilled in burn pits A, D, E, F, and G and the runoff pathway from pit E (Figure 4-4). TPH concentrations detected ranged from 2.4 to 7,190 mg/kg.

TAL Metals and (Total) Cyanide. Twenty-one inorganic analytes were detected in subsurface soil samples from Site 18. Six analytes (aluminum, barium, chromium, iron, manganese, and vanadium) were detected in all 26 samples analyzed from the site. Inorganic analytes detected above CRDLs include aluminum, arsenic, chromium, iron, lead, manganese, potassium, vanadium, and cyanide. All remaining metals were reported at concentrations less than CRDLs and, therefore, were qualified as estimated (Table 4-31).

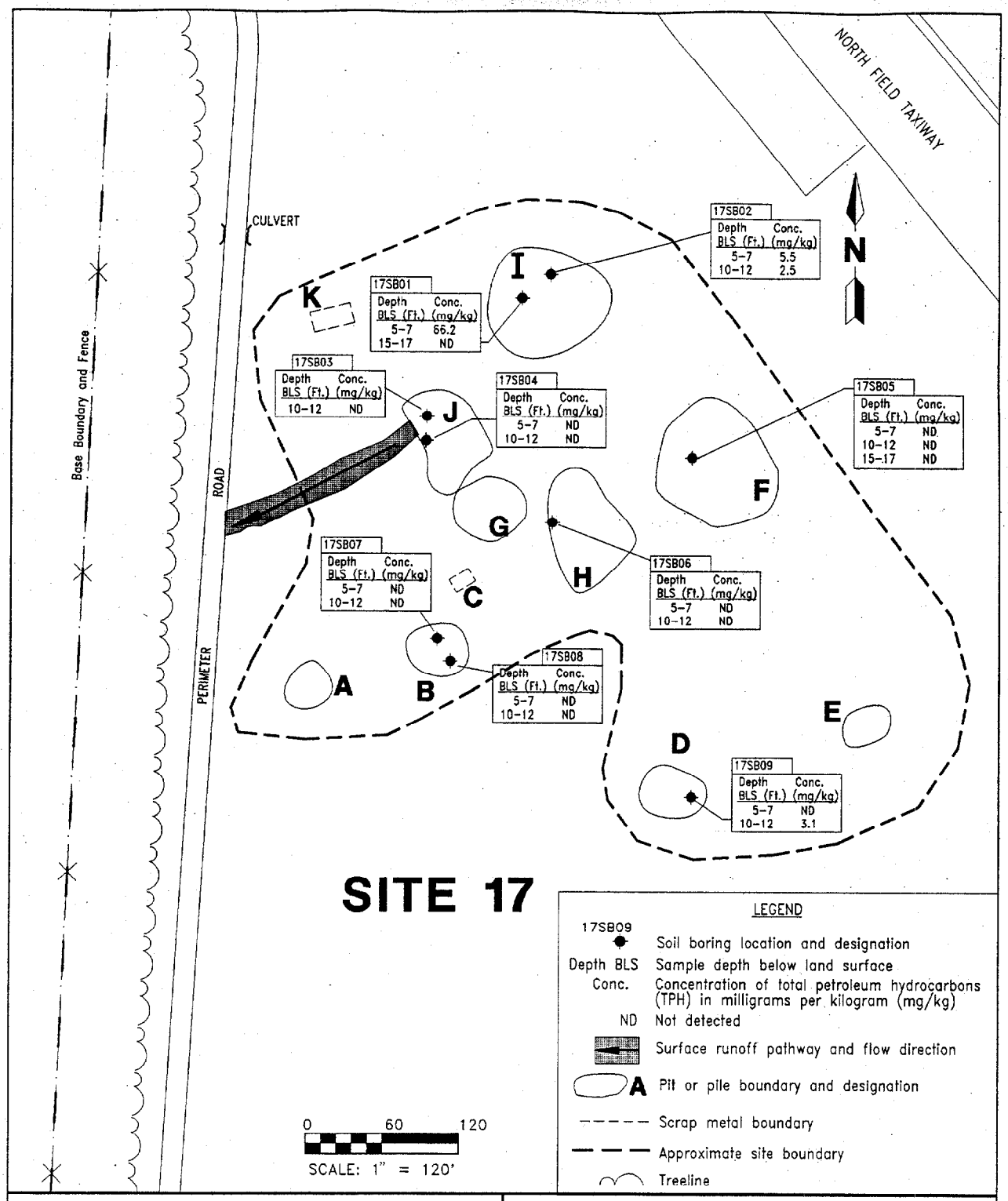


**FIGURE 4-3**
**TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS AT SITE 17**

WHITING/7560-16/TEC-MEM3/NORTHEST/KP-SB/05-23-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

## Table 4-30
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB1-5-7 | 18SB1-10-12 | 18SB2-5-7 | 18SB2-10-12 | 18SB2-15-17 | 18SB2-20-22 | 18SB4-5-7 | 18SB4-10-12 | 18SB4-15-17 | 18SB4-25-27 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34807015 | 34807016 | 34807017 | 34807018 | 34807019 | 34807020 | 34815001 | 34815002 | 34815003 | 34815004 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | | | | |
| Acetone | 58 | 26 | 24 | -- | -- | 77 | -- | -- | -- | 210 |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Methyl-2-pentanone | -- | -- | -- | -- | -- | -- | -- | 3 J | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | -- | -- | 16 | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | |
| Phenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Methylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | 720 | 1,100 | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | 970 | 1,700 | 3,100 | -- |
| Dimethylphthalate | -- | 40 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzofuran | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | 79 J | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | 4.1 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | 2.3 | -- | 3.6 | 2,660 | 298 | 4.9 | 544 | 1,250 | 612 | 41.2 |

See notes at end of table.

## Table 4-30 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB4-35-37 | 18SB4-40-42 | 18SB6-5-7 | 18SB6-10-12 | 18SB6-10–12A[1] | 18SB6-15-17 | 18SB6-20-22 | 18SB7-5-7 | 18SB7-15-17 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 06-JAN-93 | 06-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34815005 | 34815006 | 34807001 | 34807002 | 34807003 | 34807004 | 34807005 | 34807007 | 34807006 |
| **TCL VOCs (μg/kg)** | | | | | | | | | |
| Acetone | -- | -- | -- | -- | -- | 20 | 10 J | -- | 150 |
| 2-Butanone | -- | -- | 21 J | -- | -- | -- | -- | -- | -- |
| 4-Methyl-2-pentanone | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | 8,700 | 5,600 J | -- | -- | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | | | | |
| Phenol | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Methylphenol | -- | -- | 110 J | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | 230 J | 16,000 J | 14,000 J | 680 | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | 830 | 37,000 J | 29,000 J | -- | -- | -- | -- |
| Dimethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzofuran | -- | -- | -- | -- | 850 J | 63 J | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | 570 J | -- | -- | -- | -- |
| Phenanthrene | -- | -- | 42 J | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | | | | |
| 4,4'-DDE | -- | 5.5 J | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | 21 J | -- | -- | | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | |
| | -- | -- | 901 | 5,420 | 7,190 | 311 | 2.4 | 42.4 | 7.3 |

See notes at end of table.

## Table 4-30 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB8-5-7 | 18SB8-10-12 | 18SB8-15-17 | 18SB9-5-7 | 18SB9-15-17 | 18SB10-5-7 |
|---|---|---|---|---|---|---|
| Collect Date | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 05-JAN-93 | 05-JAN-93 | 04-JAN-93 |
| Lab Sample No. | 34797002RE | 34799002 | 34799003 | 34807013 | 34807014 | 34799001 |
| **TCL VOCs (μg/kg)** | | | | | | |
| Acetone | -- | -- | -- | -- | 93 | 230 J/[1]130 |
| 2-Butanone | 6 J[2] | -- | -- | -- | -- | -- |
| 4-Methyl-2-pentanone | 6 J[2] | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | 800 J | -- | -- | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | |
| Phenol | 100 J[2] | -- | -- | -- | -- | -- |
| 4-Methylphenol | 280 J[2] | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | 910 | 170 J | -- | -- | -- |
| Dimethylphthalate | -- | -- | -- | -- | -- | -- |
| Dibenzofuran | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | 56 J | -- | -- | -- | -- |
| Phenanthrene | -- | 58 J | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | |
| | 126 | 671 | 535 | 31.7 | 10.3 | -- |

[1] The A in the sample locator indicates a duplicate sample.
[2] Results generated from re-extraction and reanalysis of sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.
mg/kg = milligrams per kilogram.

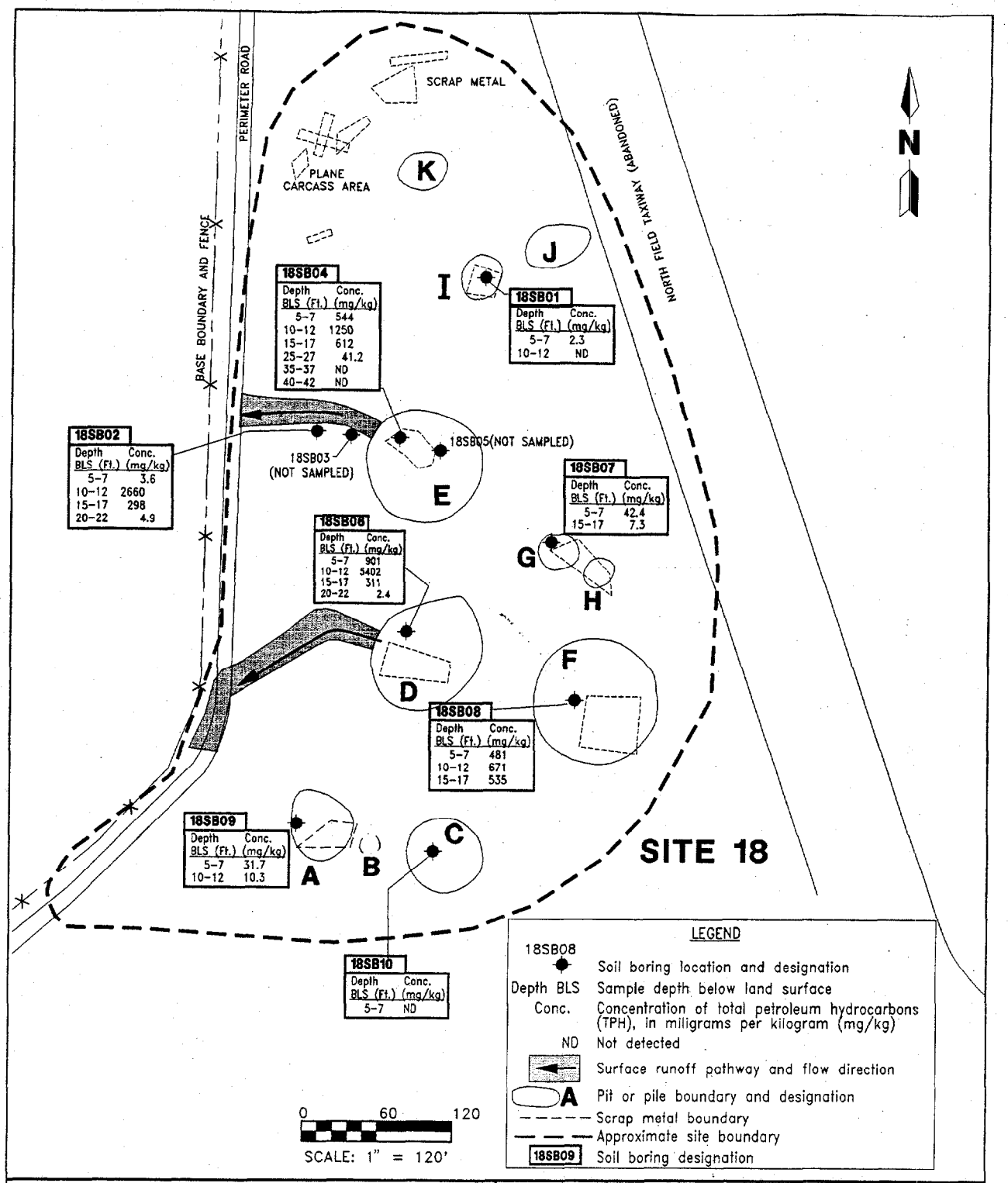


**FIGURE 4-4**
**TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS IN SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS AT SITE 18**

WHITING/7560-16/TEC-MEM3/SITE18/KP-SB/5-11-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

## Table 4-31
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB1-5-7 | 18SB1-10-12 | 18SB2-5-7 | 18SB2-10-12 | 18SB2-15-17 | 18SB2-20-22 | 18SB4-5-7 | 18SB4-10-12 | 18SB4-15-17 | 18SB4-25-27 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34807015 | 34807016 | 34807017 | 34807018 | 34807019 | 34807020 | 34815001 | 34815002 | 34815003 | 34815004 |
| Aluminum | 1,940 | 3,290 | 947 | 6,280 | 1,640 | 2,010 | 2,330 | 1,830 | 1,170 | 1,360 |
| Arsenic | 1.1 J | 1.6 J | 0.6 J | 1.6 J | 0.63 J | 1.2 J | 0.66 J | 0.78 J | 0.56 J | 0.5 J |
| Barium | 4.7 J | 4 J | 2 J | 3.2 J | 1 J | 2.1 J | 7.1 J | 2.5 J | 1.6 J | 4.1 J |
| Beryllium | -- | 0.09 J | -- | -- | -- | -- | 0.06 J | -- | -- | -- |
| Calcium | 52.4 J | 43.3 J | -- | -- | -- | 14.7 J | 58.2 J | -- | -- | -- |
| Chromium | 1.6 J | 2.9 | 1.7 J | 5.2 | 2.2 | 2.7 | 3.5 | 2 J | 2.3 | 2.9 |
| Cobalt | 0.6 J | 0.71 J | -- | 0.89 J | 0.86 J | -- | -- | -- | -- | -- |
| Copper | 0.47 J | 2.8 J | 0.36 J | 1.6 J | 0.82 J | -- | 7 | -- | -- | -- |
| Iron | 1,640 | 3,130 | 810 | 4,140 | 1,200 | 1,890 | 2,410 | 1,490 | 933 | 431 |
| Lead | 1.4 | 1.7 | 0.45 J | 0.85 | -- | 0.67 | 3.8 | 1.5 | 0.97 | 2 |
| Magnesium | 44.6 J | 30.1 J | 23.4 J | 52.5 J | 16.5 J | 11.1 J | 151 J | 39 J | 19.9 J | 16.5 J |
| Manganese | 14.8 | 18.4 | 8.3 | 11.1 | 4.6 | 7.1 | 16.7 | 6.4 | 2.8 J | 1.6 J |
| Mercury | 0.04 J | 0.05 | -- | -- | -- | -- | 0.02 J | -- | -- | -- |
| Nickel | 2.9 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | -- | -- | -- | 119 J | -- | -- | 109 J | -- | 110 J | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 2.9 J | 6.2 J | 1.4 J | 11 | 3.3 J | 7.9 J | 4.3 J | 3.6 J | 2.3 J | 4.6 J |
| Zinc | 2.1 J | 2.1 J | 1.1 J | 2.4 J | 0.78 J | 0.65 J | 4.5 | 2 J | 2.3 J | 0.67 J |
| Cyanide | 0.52 J | 0.6 J | 0.75 J | 0.5 J | 0.55 J | 0.27 J | 0.7 J | 0.49 J | 0.56 J | 0.57 J |

See notes at end of table.

## Table 4-31 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB4-35-37 | 18SB4-40-42 | 18SB6-5-7 | 18SB6-10-12 | 18SB6-10-12A[1] | 18SB6-15-17 | 18SB6-20-22 | 18SB7-5-7 | 18SB7-15-17 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 06-JAN-93 | 06-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34815005 | 34815006 | 34807001 | 34807002 | 34807003 | 34807004 | 34807005 | 34807007 | 34807006 |
| Aluminum | 382 | 11,100 | 4,530 | 2,630 | 860 | 1,000 | 1,020 | 4,680 | 2,010 |
| Arsenic | -- | 2 J | 1.2 J | 0.65 J | 0.58 J | -- | -- | 0.9 J | 0.65 J |
| Barium | 1.2 J | 33.3 J | 5.2 J | 2.1 J | 0.72 J | 0.66 J | 0.46 J | 4.7 J | 0.55 J |
| Beryllium | -- | 0.14 J | -- | -- | -- | -- | -- | 0.07 J | -- |
| Calcium | -- | 141 J | 180 J | 9.4 J | -- | -- | -- | 7.3 J | -- |
| Chromium | 1.2 J | 39.7 | 6.2 | 3.2 | 1.4 J | 1.4 J | 1.8 J | 4.5 | 2.7 |
| Cobalt | -- | -- | 0.71 J | -- | -- | -- | -- | 0.61 J | -- |
| Copper | -- | 3 J | 4.1 J | 1.7 J | 1.2 J | -- | 0.42 J | 1.7 J | -- |
| Iron | 225 | 4,360 | 4,570 | 1,590 | 528 | 633 | 558 | 3,020 | 1,250 |
| Lead | 0.34 J | 14.5 | 4.9 | 1.8 | 1.6 | 0.63 | 0.3 J | 1.6 | 1.4 |
| Magnesium | -- | 300 J | 99.2 J | 39.5 J | 12.9 J | 8.9 J | -- | 73.6 J | -- |
| Manganese | 0.44 J | 7.3 | 63 | 6.4 | 2.8 J | 1.1 J | 0.77 J | 22.1 | 2.4 J |
| Mercury | -- | 0.1 J | -- | -- | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | 2.7 J | -- |
| Potassium | -- | 823 J | 873 J | 471 J | 211 | 189 J | -- | -- | -- |
| Selenium | -- | 1.1 J | -- | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | -- | 25.6 J | 29.8 J | 13.3 J | -- | -- | -- | -- | -- |
| Vanadium | 1.2 J | 39.9 | 14.1 | 6.9 J | 2.0 J | 2.4 J | 2.5 J | 8.4 J | 4.3 J |
| Zinc | 1 J | 2.3 J | 1.4 J | 1.6 J | 0.73 J | 1.1 J | 1.2 J | 2.9 J | 0.63 J |
| Cyanide | 0.53 J | 0.7 J | 0.44 J | 0.43 J | 0.42 J | 0.44 J | 0.38 J | 0.41 J | 0.42 J |

See notes at end of table.

## Table 4-31 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 18 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 18SB8-5-7 | 18SB8-5-7A[1] | 18SB8-10-12 | 18SB8-15-17 | 18SB9-5-7 | 18SB9-15-17 | 18SB10-5-7 |
|---|---|---|---|---|---|---|---|
| Collect Date | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 05-JAN-93 | 05-JAN-93 | 04-JAN-93 |
| Lab Sample No. | 34797001 | 34797002 | 34799002 | 34799003 | 34807013 | 34807014 | 34799001 |
| Aluminum | 10,000 J | 3,660 J | 2,480 | 8,460 | 5,910 | 1,430 | 2,560 |
| Arsenic | 3.5 J | 2.9 J | 1 J | 1.7 J | 3 | 0.57 J | 2.2 J |
| Barium | 7.6 J | 5.9 J | 4.7 J | 5.6 J | 7.8 J | 0.8 J | 4.7 J |
| Beryllium | 0.09 J | 0.09 J | -- | -- | 0.07 J | -- | -- |
| Calcium | -- | -- | 17.6 J | 21.5 J | 9.9 J | 14.6 J | 35.1 J |
| Chromium | 7.9 | 3.8 | 8.6 | 9.5 | 4.9 | 1.6 J | 10.4 |
| Cobalt | 1 J | 0.53 J | -- | 0.92 J | 0.88 J | -- | -- |
| Copper | -- | -- | 0.5 J | 1.1 J | 1.4 J | 0.56 J | 0.8 J |
| Iron | 8,620 J | 4,190 J | 4,000 | 7,610 | 4,640 | 873 | 5,350 |
| Lead | 4.8 J | 3.7 | 4.7 | 2.9 | 11.1 | 1 | 5.1 |
| Magnesium | -- | -- | 19.2 J | 52.3 J | 87.6 J | -- | 26.1 J |
| Manganese | 18 | 8.9 | 2.9 J | 15.5 | 23.2 | 2 J | 16.2 |
| Mercury | -- | -- | -- | -- | -- | 0.05 | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- |
| Potassium | 1,150 | 1,220 | 1,230 | 841 J | 312 J | 202 J | 637 J |
| Selenium | 1.4 J | 1 J | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | 0.57 J | -- | -- | -- |
| Sodium | -- | -- | 17.6 J | 16.3 J | -- | -- | -- |
| Vanadium | 21.5 | 11.9 | 15.8 | 23.3 | 10.3 J | 3.2 J | 23.9 |
| Zinc | -- | -- | 0.58 J | 13.1 | 3.1 J | 0.93 J | 0.84 J |
| Cyanide | -- | -- | 0.41 J | 0.41 J | 3.3 | 0.51 J | 0.43 J |

[1] The A in the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

4.5.2 Subsurface Soil Sample Results, Industrial Area Sites The following sections present summaries of the detected chemical analytes detected in subsurface soil samples at Sites 3, 6, 29, 30, 32, and 33.

**4.5.2.1 Site 3, Underground Waste Solvent Storage Area** Organic compounds detected at Site 3 are summarized in Table 4-32. Sample locations are presented on Figure 2-13.

TCL VOCs. Three VOCs (acetone, 2-butanone, and TCE) were detected in subsurface soil samples collected from soil borings 3SB1 through 3SB7. Acetone was detected in 12 of 33 subsurface soil samples at concentrations ranging from 1 to 100 μg/kg. Acetone was detected in subsurface soil samples collected from soil borings 3SB3, 3SB4, and 3SB6 near Building 2941 (Figure 2-13). 2-Butanone was detected once at 6 μg/kg. TCE was detected in four subsurface soil samples at estimated concentrations ranging from 2 to 3 μg/kg.

TCL SVOCs. Ten SVOCs were detected in subsurface soil samples from soil borings completed at Site 3. Phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene were only detected in the 1- to 2-foot bls sample from soil boring 3SB9. BEHP was detected in the soil boring 3SB2 sample collected from the 1- to 2-foot bls interval at an estimated concentration of 37.0 μg/kg. Diethylphthalate was detected in a duplicate sample pair from soil boring 3SB8.

Pesticides and PCBs. Seven pesticide compounds were detected in the subsurface soil samples retrieved from soil borings completed at Site 3. However, two of the compounds (4,4'-DDE and 4,4'-DDT) were detected at concentrations below CRQLs and were qualified as estimated. Dieldrin and 4,4'-DDD were detected in four samples each. Alpha-Chlordane, gamma-Chlordane, and heptachlor epoxide were only detected in a single sample (3SB1-0-2). PCBs were not detected in subsurface soil samples from Site 3.

TPHs. TPHs were detected in 7 of 33 subsurface soil samples collected at this site. The TPH concentrations ranged from 4.9 to 27.8 mg/kg. TPH was detected in samples collected within 7 feet of the land surface. Detected concentrations of TPHs at Site 3 are presented on Figure 4-5. Borings 3SB7, 3SB8, 3SB9, and 3SB10, which were installed around the abandoned waste oil tank, had a single TPH detection at the 0- to 2-foot bls interval.

TAL Metals and (Total) Cyanide. Table 4-33 presents a summary of the inorganic analytes detected in the Site 3 soil boring samples. Twenty-three inorganic analytes were detected in subsurface soil samples from Site 3. Two of the analytes (aluminum and iron) were detected in all 33 samples analyzed. Ten of the TAL metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, selenium, vanadium, and zinc) were detected above the CRDLs. Concentrations of the remaining metals detected were reported at concentrations below the CRDLs and were qualified as estimated. Reported concentrations of 13 analytes were qualified as estimated in 1 or more samples during the data validation process. Cyanide (total) was detected in 16 of the 33 samples; however, only 1 of the samples (3SB-10-12) was reported at a concentration above the CRDL.

## Table 4-32
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples Collected from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB1-0-2 | 3SB1(1-2) | 3SB1-5-7 | 3SB1-15-17 | 3SB1-25-27 | 3SB2-10-12A[1] | 3SB2-1-2 | 3SB2-5-7 | 3SB2-10-12 | 3SB2-10-12A[1] | 3SB3-0-2 | 3SB3-5-7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34938001 | 34938001 | 34938002 | 34938003 | 34939001 | 34836004 | 34836001 | 34836002 | 34836003 | 34836004 | 34848004 | 34848003 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | | | | | | |
| Acetone | -- | -- | -- | -- | -- | -- | -- | 7 J | 3 J | 1 J | 100 | 90 |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6 J | -- |
| Trichloroethene | -- | 2 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | | | |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | 0.98 J | 37 J | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | | | |
| Heptachlor epoxide | 26 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | 9.8 | -- | 26 | -- | -- | -- | 0.9 J | -- | -- | -- | 44 | -- |
| 4,4'-DDE | 2.9 J | -- | -- | -- | -- | -- | 0.5 J | -- | -- | -- | 3.4 J | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.2 | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | 0.9 J | -- | -- | -- | -- | -- |
| alpha-Chlordane | 10 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | 17 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | |
| | 11.5 | -- | 16.6 | -- | -- | -- | 27.8 | -- | -- | -- | 7.6 | -- |

See notes at end of table.

## Table 4-32 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples Collected from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB3-10-12 | 3SB4-0-2 | 3SB4-5-7 | 3SB4-10-12 | 3SB5-1-2 | 3SB5-5-7 | 3SB5-10-12 | 3SB6-1-2 | 3SB6-5-7 | 3SB6-10-12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 |
| Lab Sample No. | 34848002 | 34848007 | 34848006 | 34848005 | 34833008 | 34833009 | 34833010 | 34906001 | 34906002 | 34906003 |
| **TCL VOCs (µg/kg)** | | | | | | | | | | |
| Acetone | 59 | 16 | 23 | 69 | -- | -- | -- | -- | 15 J | 13 J |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | 3 J | 3 J | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | -- | -- | -- | -- | 11.6 | 4.9 | -- | -- | -- | -- |

See notes at end of table.

## Table 4-32 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples Collected from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB6-15-17 | 3SB6-25-27 | 3SB6-70-72 | 3SB6-70-72A[1] | 3SB6-100-102 | 3SB6-100-102A[1] | 3SB7-10-12 | 3SB8-10-12 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 27-JAN-93 | 08-JAN-93 |
| Lab Sample No. | 34906004 | 34906005 | 34909001 | 34909002 | 34906010 | 34906011 | 35015001 | 34833007 |
| **TCL VOCs (µg/kg)** | | | | | | | | |
| Acetone | 22 J | 23 J | 12 J | -- | 14 J | 14 J | 11 J | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | 2 J | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)-phthalate | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | 9.6 J | -- | -- | -- | -- | 5 J | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | 5 J | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-32 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples Collected from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB8-15-17 | 3SB8-15-17A[1] | 3SB9-1-2 | 3SB9-5-7 | 3SB9-15-17 | 3SB9-30-32 | 3SB10-10-12 | 3SB10-15-17 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 |
| Lab Sample No. | 34834001 | 34834002 | 34833003 | 34833004 | 34833005 | 34833006 | 34833001 | 34833002 |
| **TCL VOCs (μg/kg)** | | | | | | | | |
| Acetone | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | | | |
| Diethylphthalate | -- | 97 J | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | 48 J | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | 220 J | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | 180 J | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | 98 J | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | 130 J | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | 84 J | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | 81 J | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | 40 J | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | | | |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethene | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethane | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-Dichlorodiphenyltrichloroethane | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | |
| | -- | -- | 11.5 | -- | -- | -- | -- | -- |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = The associated numerical value is an estimated quantity.
mg/kg = milligrams per kilogram.

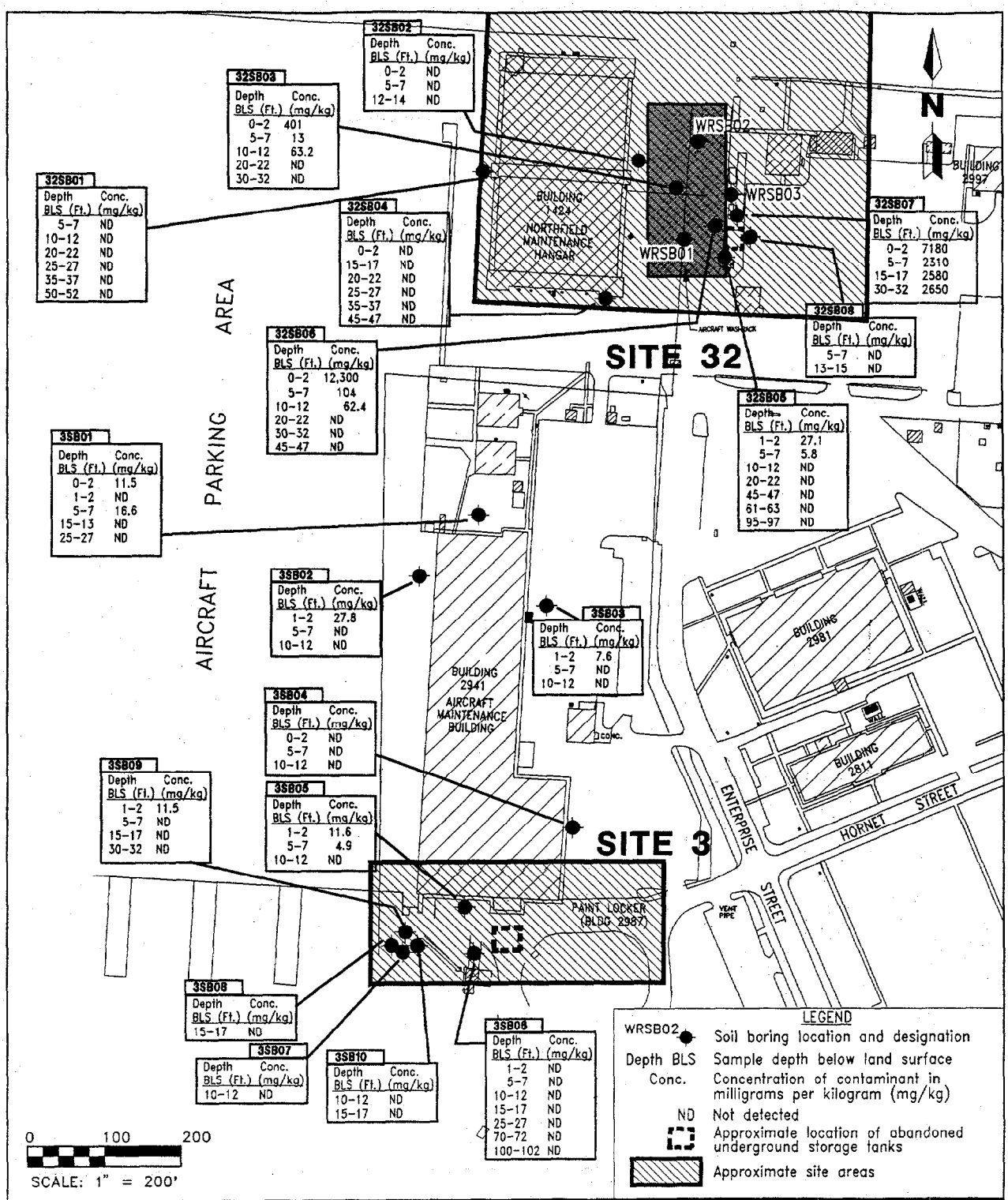


**FIGURE 4-5**
**SITES 3 AND 32,**
**TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS FOR SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS AT THE NORTH FIELD**

WHITING/7560-16/TEC-MEM3/FIG-12/KP-SB/5-11-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3,**
**SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

## Table 4-33
## Summary Analytical Results for Inorganic Analytes in Subsurface Soil Samples from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB1-0-2 | 3SB1-5-7 | 3SB1-15-17 | 3SB1-25-27 | 3SB1-25-27A[1] | 3SB2-1-2 | 3SB2-5-7 | 3SB2-10-12 | 3SB2-10-12A[1] | 3SB3-0-2 | 3SB3-5-7 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34938001 | 34938002 | 34938003 | 34939001 | 34939002 | 34836001 | 34836002 | 34836003 | 34836004 | 34848004 | 34848003 |
| Aluminum | 8,990 | 26,700 | 4,640 | 1,280 | 406 J | 9,940 | 26,300 | 2,130 | 1,780 J | 21,500 | 20,400 |
| Arsenic | 5.5 | 7.7 | 1.9 J | 0.29 J | 0.45 J | 3.5 | 6.8 | 0.62 J | -- | 3.2 | 0.96 J |
| Barium | 8.7 J | 8.7 J | 10.6 J | 2.2 J | -- | 6.5 J | 8.8 J | 1.4 J | 1.3 | 14.9 J | 4.2 J |
| Beryllium | 0.09 J | -- | -- | -- | -- | -- | 0.07 J | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.72 J | 0.61 J |
| Calcium | 636 J | 258 J | 195 J | 25.7 J | 8.7 J | 412 J | 243 J | 13.7 J | 10.7 J | 1,130 | 214 J |
| Chromium | 9.6 | 37.2 | 4.6 | 1.8 J | -- | 12.7 | 34.5 | 4.3 | 3.6 | 42.7 | 27.6 |
| Cobalt | 1.3 J | 3.2 J | 0.96 J | -- | -- | 1.2 J | 2.6 J | -- | -- | 1.6 J | -- |
| Copper | 9.6 | 2 J | 2.7 J | -- | -- | 1.4 J | 1 J | -- | 3.4 J | 9.6 | 7.3 |
| Iron | 7,540 | 28,900 | 2,210 | 1,220 | 673 | 12,900 | 32,600 | 5,010 | 4,380 | 12,700 | 29,500 |
| Lead | 14.5 | 6.6 | 1.3 J | -- | -- | 5.8 | 4.4 | 1.1 | 0.94 | 5.6 | 3.2 |
| Magnesium | 207 J | 84.9 J | 74.8 J | 22.6 J | 10.9 J | 61.3 J | 85.9 J | 20.5 J | 17.3 J | 218 J | 33 J |
| Manganese | 72.8 | 20.8 | 8.4 | 2.6 J | -- | 25 | 15.2 | 7.9 | 7.5 | 61.1 | 8 |
| Mercury | 0.02 J | 0.02 J | -- | -- | -- | 0.03 J | 0.1 | 0.02 J | 0.03 J | 0.04 J | 0.04 J |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | 15.7 | -- |
| Potassium | -- | 172 J | 332 J | -- | -- | 146 J | 152 J | 151 J | -- | 152 J | 92.8 J |
| Selenium | 2.7 | 3.3 | -- | 1.7 J | 1.2 J | 1 J | 1.9 | -- | -- | -- | -- |
| Silver | 0.57 J | 1.8 J | -- | -- | -- | 1 J | 2.1 J | 0.98 J | 0.55 J | -- | -- |
| Sodium | -- | -- | -- | -- | -- | -- | 12.7 J | -- | -- | 212 J | 187 J |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 19.8 | 76.6 | 14.4 | 10.1 J | 10 J | 33.9 | 77.2 | 15.4 | 14.5 | 34 | 60.5 |
| Zinc | 10.2 | 1.8 J | 0.64 J | 2.9 J | -- | 1.5 J | -- | -- | -- | 9.6 | 7.4 J |
| Cyanide | 0.51 J | 0.53 J | 0.5 J | 0.48 J | -- | 0.47 J | 0.48 J | 2.6 | 0.52 J | -- | -- |

See notes at end of table.

## Table 4-33 (Continued)
## Summary Analytical Results for Inorganic Analytes in Subsurface Soil Samples from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB3-10-12 | 3SB4-0-2 | 3SB4-5-7 | 3SB4-10-12 | 3SB5-1-2 | 3SB5-5-7 | 3SB5-10-12 | 3SB6-1-2 | 3SB6-5-7 | 3SB6-10-12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 |
| Lab Sample No. | 34848002 | 34848007 | 34848006 | 34848005 | 34833008 | 34833009 | 34833010 | 34906001 | 34906002 | 34906003 |
| Aluminum | 8,850 | 5,200 | 12,500 | 13,400 | 20,400 | 14,100 | 38,300 | 5,180 | 59,600 | 41,000 |
| Arsenic | 1.5 J | 0.58 J | 1.3 J | 1.5 J | 1.7 J | 2.8 | 1.2 J | 1.1 J | 16 | 1.8 J |
| Barium | 2.5 J | 9.7 J | 11 J | 4.2 J | 16.2 J | 10.4 J | 8.7 J | 8.9 J | 13.5 J | 6.8 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | 0.06 J | 0.09 J | -- |
| Cadmium | -- | -- | -- | -- | 0.36 J | 0.31 J | 0.79 J | -- | -- | -- |
| Calcium | 183 J | 1,380 | 245 J | 131 J | 385 J | 265 J | 180 J | 261 J | 64.9 J | -- |
| Chromium | 10 | 3.7 | 12.1 | 15.3 | 15.4 | 11.2 | 36.1 | 4.4 | 37.9 | 29.7 |
| Cobalt | -- | 1.7 J | -- | -- | -- | -- | -- | 1 J | 2.2 J | 1.9 J |
| Copper | 4.2 J | 3.2 J | 3.9 J | 4.7 J | 8.5 | 5.4 J | 11.1 | 7.3 | 8.3 | 4.6 J |
| Iron | 9,220 | 3,060 | 8,910 | 12,300 | 10,300 | 8,970 | 29,700 | 2,730 | 20,400 | 25,000 |
| Lead | 2 | 3 | 1.8 | 1.9 | 4.4 | 3.8 | 3.1 | 1.5 J | 4.3 | 3.5 |
| Magnesium | 35.3 J | 104 J | 66.6 J | 55.4 J | 177 J | 109 J | 117 J | 226 J | 265 J | 92.4 J |
| Manganese | 12.1 | 151 | 4.2 | 12.3 | 67.7 | 39.4 | 12.5 | 36 | 21.7 | 22.6 |
| Mercury | -- | 0.04 J | 0.04 J | -- | 0.06 | 0.04 J | 0.05 J | -- | -- | -- |
| Nickel | 2.1 J | 2.2 J | 2.3 J | 2.8 J | 2.2 J | -- | 2.8 J | -- | 5 J | 4.3 J |
| Potassium | 55.6 J | 99.4 J | 98.8 J | 73.2 J | 175 J | 116 J | 175 J | -- | 190 J | -- |
| Selenium | -- | -- | 0.13 J | -- | 0.41 J | 0.5 J | 0.51 J | 1.7 | 1.7 | 1 J |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 161 J | 172 J | 163 J | 214 J | 171 J | 189 J | 206 J | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 27.5 | 7 J | 24.9 | 36.8 | 26.4 | 22.7 | 72.5 | 6.7 J | 56.3 | 64.8 |
| Zinc | 3.3 J | 3.9 J | 4.4 J | 5 J | 12.2 | 7.3 | 11.1 | 3.6 J | 7.5 | 2.3 J |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | 0.41 J | 0.51 J | 0.53 J |

See notes at end of table.

## Table 4-33 (Continued)
## Summary Analytical Results for Inorganic Analytes in Subsurface Soil Samples from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB6-15-17 | 3SB6-25-27 | 3SB6-70-72 | 3SB6-70-72A[1] | 3SB6-100-102 | 3SB6-100-102A[1] | 3SB7-10-12 | 3SB8-10-12 | 3SB8-15-17 | 35B8-15-17A1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 18-JAN-93 | 27-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 |
| Lab Sample No. | 34906004 | 34906005 | 34909001 | 34909002 | 34906010 | 34906011 | 35015001 | 34833007 | 34834001 | 34834002 |
| Aluminum | 12,300 | 1,160 | 214 J | 487 J | 3,030 | 3,250 | 5,640 | 21,500 | 2,250 J | 5,320 J |
| Arsenic | 2.6 J | 1.5 J | 0.96 J | 1.1 J | 1.3 J | 1.3 J | 4.8 | 1.1 J | 1.2 J | 1.4 J |
| Barium | 18.3 J | 1.5 J | -- | -- | 34.7 J | 14.5 J | 4.3 J | 4.3 J | 5.8 J | 8.6 J |
| Beryllium | -- | -- | -- | -- | 0.06 J | -- | 0.13 J | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | 0.39 J | -- | -- |
| Calcium | 29.1 J | 13.7 J | -- | -- | 142 J | 136 J | -- | 233 J | 116 J | 146 J |
| Chromium | 9.6 | 3.3 | 0.9 J | 1.8 J | 6.2 | 6.5 | 9.6 | 25.9 | 3.3 | 5.8 |
| Cobalt | -- | -- | -- | -- | -- | -- | 0.87 J | -- | -- | -- |
| Copper | 2.7 J | 0.36 J | -- | -- | 1.6 J | 2.1 J | 2.1 J | 7.9 | 2.4 J | 3.4 J |
| Iron | 4,610 | 784 | 245 J | 222 J | 2,100 | 2,240 | 9,630 | 20,800 | 2,840 | 4,750 |
| Lead | 3.2 | 0.67 J | -- | -- | 2 J | 2.9 | 4.5 | 3.1 | 2.4 | 2.6 |
| Magnesium | 142 J | 8.4 J | -- | -- | 89.2 J | 91.5 J | 72.8 J | 54 J | -- | 80.7 J |
| Manganese | 12.5 | 2.4 J | -- | -- | 2.5 J | 3.5 J | 4.6 | 9.7 | 4.5 | 6.3 |
| Mercury | -- | -- | -- | 1.4 J | -- | -- | 0.06 | 0.04 J | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | 2.1 J | -- | -- |
| Potassium | 377 J | -- | -- | -- | 271 J | 310 J | -- | 123 J | -- | -- |
| Selenium | 0.67 J | 0.8 J | -- | 0.77 J | 2.2 | 2.1 | 4.9 | 0.73 J | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 15.7 J | -- | -- | -- | -- | -- | -- | 189 J | 214 J | 214 J |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 22.6 | 5.4 J | -- | -- | 15.1 | 15.6 | 29 | 55 | 13.7 | 18.8 |
| Zinc | 2.2 J | 3.9 J | -- | -- | 3.3 J | 8.0 | -- | 6.2 | 2.3 J | 4.3 J |
| Cyanide | 0.47 J | 0.45 J | -- | -- | 0.55 J | 0.53 J | 0.59 J | 0.19 J | -- | -- |

See notes at end of table.

## Table 4-33 (Continued)
## Summary Analytical Results for Inorganic Analytes in Subsurface Soil Samples from Site 3 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 3SB9-1-2 | 3SB9-5-7 | 3SB9-15-17 | 3SB9-30-32 | 3SB10-10-12 | 3SB10-15-17 |
|---|---|---|---|---|---|---|
| Collect Date | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 | 08-JAN-93 |
| Lab Sample No. | 34833003 | 34833004 | 34833005 | 34833006 | 34833001 | 34833002 |
| Aluminum | 4,380 | 26,300 | 6,700 | 803 | 6,290 | 5,880 |
| Arsenic | 0.9 J | 0.78 J | 1.1 J | -- | 1.4 J | 0.82 J |
| Barium | 6.4 J | 16.4 J | 4.4 J | 1.3 J | 3.2 J | 8.2 J |
| Beryllium | -- | -- | -- | -- | -- | -- |
| Cadmium | 0.59 J | 0.31 J | -- | -- | 0.34 J | -- |
| Calcium | 392 J | 429 | 178 J | 71.6 J | 250 J | 224 J |
| Chromium | 3.2 | 23.5 | 8.2 | -- | 15.8 | 11.2 |
| Cobalt | -- | -- | -- | -- | -- | -- |
| Copper | 3.8 J | 8.6 | 5.5 J | 0.96 J | 7.3 | 6.6 |
| Iron | 2,590 | 15,500 | 7,160 | 86.1 | 15,400 | 10,700 |
| Lead | 3.8 | 2.6 | 2.5 | 0.6 J | 3.3 | 2.4 |
| Magnesium | 80.6 J | 157 J | 59.5 J | 23.6 J | 45.1 J | 106 J |
| Manganese | 104 | 13.2 | 6.5 | 0.88 J | 9.4 | 5.9 |
| Mercury | -- | 0.07 J | 0.03 J | -- | -- | 0.04 J |
| Nickel | 1.7 J | 3.4 J | -- | -- | -- | -- |
| Potassium | 93 J | 142 J | 116 J | 79.5 J | 53.2 J | 102 J |
| Selenium | -- | -- | 0.7 J | 0.31 J | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- |
| Sodium | 165 J | 217 J | 192 J | 158 J | 195 J | 211 J |
| Thallium | 0.15 J | -- | -- | -- | -- | -- |
| Vanadium | 5.9 J | 38.9 | 25.2 | 0.88 J | 42 | 29.7 |
| Zinc | 4 J | 8.5 | 3 J | 1.8 J | 4.4 J | 4.2 J |
| Cyanide | -- | -- | -- | -- | 0.19 J | -- |

[1] The A in the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilogram (mg/kg).
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.

4.5.2.2 **Site 32, North Field Maintenance Hangar Area** Detected concentrations of organic compounds are summarized in Table 4-34. Sample locations are presented in Figure 2-13.

TCL VOCs. Six VOCS (methylene chloride, acetone, 2-butanone, toluene, TCE, and xylenes) were detected in subsurface soil samples collected from Site 32 borings. Acetone, 2-butanone, toluene, and xylenes were detected at concentrations above the CRQLs. Acetone was detected in 31 of 41 samples. The three highest concentrations of acetone were reported in samples collected from soil boring 32SB3, located in the aircraft washrack area. 2-Butanone was detected in 6 of 41 soil samples. The highest concentrations of 2-butanone were reported in soil samples collected from soil boring 32SB5, in the depth interval of 45 to 63 feet bls. Toluene and xylenes were detected only in samples collected from boring 32SB7. Toluene was present at 1,100 $\mu$g/kg in the soil sample from the sampling interval 15 to 17 feet bls and xylenes were present at 11,000 and 770 $\mu$g/kg in the soil samples from the 15 to 17 and 30 to 32-foot bls sampling intervals, respectively. Reported concentrations of TCE were qualified as estimated because they were detected below the CRQLs.

TCL SVOCs. Thirteen SVOCs were detected in 9 of 41 subsurface soil samples collected from Site 32. All but three SVOCs (naphthalene, 2-methylnaphthalene, and fluorene) were reported at concentrations below the CRQLs and were qualified as estimated. Reported concentration of naphthalene, 2-methylnaphthalene, and fluorene were above CRQLs in soil samples collected from borings 32SB3, 32SB6, and 32SB7. Naphthalene concentrations were reported in the range of 1,100 to 21,000 $\mu$g/kg. 2-Methylnaphthalene concentrations were reported in the range from 810 to 27,000 $\mu$g/kg and fluorene was reported at 980 $\mu$g/kg.

Pesticides and PCBs. Two pesticide compounds and a PCB compound were detected in 2 of 41 subsurface soil samples collected at Site 32. 4,4'-DDD and 4,4'-DDE were detected in the same sample from soil boring 32SB7 at estimated concentrations below the CRQLs. The PCB Aroclor-1254 was detected at an estimated concentration of 160 $\mu$g/kg in a sample (32SB6-0-2) collected from an interval of 0 to 2 feet bls.

Total Petroleum Hydrocarbons (TPHs). TPHs were detected in 13 of 41 subsurface soil samples collected at Site 32. Detected concentrations ranged from 2.0 to 12,300 mg/kg. The highest detected TPH concentrations at Site 32 were in samples from soil borings 32SB3, 32SB5, 32SB6, and 32SB7. This area is topographically downgradient of the waste oil tank and within the aircraft washrack area. The two highest concentrations were detected in samples collected from the 0- to 2-foot bls interval from soil borings 32SB6, and 32SB7.

Boring 32SB7, which was completed to a maximum depth of 32 feet bls, had TPH concentrations detected at each sample interval. Detected concentrations of TPHs are presented in Figure 4-5.

TAL Metals and (Total) Cyanide. Table 4-35 summarizes the detected concentrations of inorganic analytes reported in subsurface soil samples from Site 32. Twenty-three inorganic analytes were detected in subsurface soil samples. Aluminum and lead were detected in each sample analyzed. All inorganic analytes with the exception of 11 parameters (aluminum, arsenic, chromium, copper, iron, lead, manganese, selenium, vanadium, zinc, and cyanide) were detected below the CRDLs and were qualified as estimated. The highest concentrations of metals detected

## Table 4-34
## Summary Analytical Results for Detected Organic Compounds in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
*Technical Memorandum No. 3, Soil Assessment*
NAS Whiting Field, Milton, Florida

| Locator | 32SB1-1-2 | 32SB1-5-7 | 32SB1-10-12 | 32SB1-15-17 | 32SB1-15-17A[1] | 32SB1-20-22 | 32SB1-25-27 | 32SB1-35-37 | 32SB1-35-37A[1] | 32SB1-50-52 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 10-JAN-93 | 10-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34836005 | 34836008 | 34836009 | [2]34837001 | [2]34831002 | 34848016 | 34846009 | 34848017 | 34848018 | 34846010 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | | | | |
| Methylene chloride | -- | -- | -- | 3 J | 4 J | -- | -- | -- | -- | -- |
| Acetone | -- | 2 J | -- | 3 J | 8 J | 65 | 34 | 69 | 44 | 44 |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | | -- | -- | -- | -- | -- |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | |
| 2,4-Dimethylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrosodiphenyl-amine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)-phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | -- | -- | -- | -- | | -- | -- | -- | -- | -- |
| Di-n-octylphthalate | -- | -- | -- | -- | | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-34 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB2-0-2 | 32SB2-5-7 | 32SB2-12-14 | 32SB3-0-2 | 32SB3-0-2A[1] | 32SB3-5-7 | 32SB3-10-12 | 32SB3-20-22 | 32SB3-30-32 | 32SB4-0-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 09-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34836010 | 34846006 | 34846008 | 34846002 | 34846003 | 34846001 | 34846004 | 34846005 | 34848001 | 34848008 |
| **TCL VOCs (µg/kg)** | | | | | | | | | | |
| Methylene Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acetone | 3 J | 110 | 130 | 200 | 150 | 170 | 230 | 110 | 58 | 18 |
| 2-Butanone | -- | -- | -- | -- | -- | 6 J | 8 J | -- | -- | -- |
| Trichloroethene | 1 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | 11 J | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| 4-Dimethylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | 1,700 | 1,400 | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | 810 | 620 | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrosodiphenyl-amine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | 120 J | 63 J | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | 53 J | -- | 39 J | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | 36 J | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | -- | 39 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Di-n-octylphthalate | -- | 40 J | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| 4,4'-DDE | | | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | -- | -- | -- | 401 | -- | 13 | 63.2 | -- | -- | -- |

See notes at end of table.

## Table 4-34 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB4-15-17 | 32SB4-20-22 | 32SB4-20-22A[1] | 32SB4-25-27 | 32SB4-35-37 | 32SB4-45-47 | 32SB5-1-2 | 32SB5-5-7 | 32SB5-10-12 | 32SB5-20-22 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 |
| Lab Sample No. | 34848009 | 34848010 | 3484011 | 34848012 | 34848013 | 34848014 | 34925008 | 34925009 | 34925011 | 34925010 |
| **TCL VOCs (µg/kg)** | | | | | | | | | | |
| Methylene Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acetone | 55 | 100 | 58 | 48 | 53 | 33 | -- | -- | 34 | 20 |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | 4 J | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| 2,4-Dimethylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrosodiphenylamine[1] | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Di-n-octylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| | -- | -- | -- | -- | 2 | -- | 27.1 | 5.8 | -- | -- |

*See notes at end of table.*

## Table 4-34 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB5-45-47 | 32SB5-45-47A[1] | 32SB5-61-63 | 32SB5-95-97 | 32SB6-0-2 | 32SB6-5-7 | 32SB6-5-7A[1] | 32SB6-10-12 | 32SB6-20-22 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 19-JAN-93 | 12-JAN-93 | 20-JAN-93 | 20-JAN-93 | 12-JAN-93 | 11-JAN-93 | 11-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34925012 | 34846012 | 34938007 | 34938008 | 34846016 | 34847001 | 34847002 | 34846014 | 34846015 |
| **TCL VOCs (µg/kg)** | | | | | | | | | |
| Methylene Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acetone | 22 J | 95 | 57 J | 35 J | -- | 54 J | 75 | 75 | 47 |
| 2-Butanone | 13 J | -- | 50 J | -- | -- | -- | 3 J | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | |
| 2,4-Dimethylphenol | -- | -- | -- | -- | 1,500 J | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | 2,500 J | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | 15,000 | 52 J | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | 1,400 | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | 2,600 J | -- | -- | -- | -- |
| N-Nitroso-di-n-phenylamine | -- | -- | -- | -- | 1,600 J | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | 5,100 J | 59 J | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | 1,200 J | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | 600 J | -- | 73 J | -- | -- | -- |
| Di-n-octylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | 160 J | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | |
| | -- | -- | -- | -- | 12,300 | 104 | -- | 62.5 | -- |

See notes at end of table.

## Table 4-34 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB6-30-32 | 32SB6-45-47 | 32SB6-45-47A[1] | 32SB7-0-2 | 32SB7-5-7 | 32SB7-15-17 | 32SB7-30-32 | 32SB8-5-7 | 3SSB8-13-15 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 20-JAN-93 | 20-JAN-93 | 20-JAN-93 | 21-JAN-93 | 21-JAN-93 | 21-JAN-93 |
| Lab Sample No. | 34846013 | 34846011 | 34846012 | 34938004 | 34938005 | 34938006 | 34956001 | 34956004 | 34956005 |
| **TCL VOCs (μg/kg)** | | | | | | | | | |
| Methylene chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acetone | 49 | 72 | 95 | 15 J | -- | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Toluene | -- | -- | -- | -- | -- | 1,100 J | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | 11,000 | 770 J | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | | | | |
| 2,4-Dimethylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | 7,200 | 21,000 | 1,100 | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | 2,300 | 27,000 | 2,600 | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | 980 | 220 J | -- | -- |
| N-Nitrosodiphenylamine | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | 340 J | 79 J | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | 53 J | -- | -- | -- |
| Carbazole | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | 40 J | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Di-n-octylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | | | | |
| 4,4'-DDE | -- | -- | -- | 0.69 J | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | 2.2 J | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | |
| | -- | -- | -- | 7,180 | 2,310 | 2,580 | 2,650 | -- | -- |

[1] The A in the sample locator indicates a duplicate sample.
[2] Data not validated.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
DDE = dichlorodiphenyldichloroethene.
DDD = dichlorodiphenyldichloroethane.
mg/kg = milligrams per kilogram.

## Table 4-35
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB1-1-2 | 32SB1-5-7 | 32SB1-10-12 | 32SB1-15-17 | 32SB1-15-17A[1] | 32SB1-20-22 | 32SB1-25-27 | 32SB1-35-37 | 32SB1-35-37A[1] |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 09-JAN-93 | 09-JAN-93 | 09-JAN-93 | 12-JAN-93 | 10-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34836005 | 34836008 | 34836009 | 01090001 | 01090002 | 34848016 | 34846009 | 34848017 | 34848018 |
| Aluminum | 11,000 | 2,630 | 4,450 | 2,410 | 3,120 | 277 | 376 | 379 | 6.9 J |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 0.76 J | 0.91 J | -- | -- | -- | -- | -- | -- | -- |
| Barium | 11.1 J | 5.5 J | 6 J | 5.6 | 5.9 | 0.47 J | 1.1 J | 0.06 J | -- |
| Beryllium | 0.06 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 0.4 J |
| Calcium | 257 J | 42.6 J | 32 J | 28.6 | 25.5 | 93.1 J | 77.9 J | 82.6 J | -- |
| Chromium | 22.5 | 4.3 | 4.3 | 4.6 | 4.2 | -- | 0.91 J | 1.1 J | -- |
| Cobalt | 1.1 J | 1 J | 0.53 J | -- | -- | -- | -- | -- | -- |
| Copper | 1.6 J | 0.71 J | 0.98 J | 0.49 | 1.1 | 0.85 J | 1.1 J | 0.8 J | -- |
| Iron | 9,290 | 5,520 | 7,120 | 3,540 | 1,970 | 121 | 232 | 176 | -- |
| Lead | 2.8 | 3.1 | 2 | 2.0 | 2.1 | 0.6 J | 0.38 J | 0.42 J | 0.43 J |
| Magnesium | 81.7 J | 59 J | 60.9 J | 52.0 | 65.6 | 15.4 J | 24.6 J | 13.1 J | 20 J |
| Manganese | 37.4 | 8.2 | 6.7 | 4.3 | 4.7 | 0.86 J | 1.7 J | 1.8 J | -- |
| Mercury | 0.03 J | 0.03 J | 0.02 J | 0.02 | -- | 0.04 J | 0.03 J | 0.04 J | 0.06 J |
| Nickel | 3.9 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | 198 J | 281 J | 320 J | 242 | 412 | 41.9 J | 72.3 J | 54.2 J | 75.7 J |
| Selenium | -- | 1.2 | -- | -- | -- | -- | -- | -- | -- |
| Silver | 0.69 J | 0.89 J | 0.96 J | 0.91 | 0.91 | -- | -- | -- | -- |
| Sodium | -- | 75.6 J | 76.8 J | 19.7 | 20.1 | 160 J | 184 J | 166 J | -- |
| Vanadium | 25.3 | 18.7 | 28.3 | -- | 12.5 | 0.53 J | 1.4 J | 0.56 J | 0.5 J |
| Zinc | 1.9 J | 0.52 J | -- | 0.42 | 0.8 | 2.1 J | 2.8 J | 2 J | -- |
| Cyanide | 0.58 J | 0.51 J | 0.55 J | 0.48 | 0.68 | -- | -- | -- | -- |

See notes at end of table.

## Table 4-35 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB1-50-52 | 32SB2-0-2 | 32SB2-5-7 | 32SB2-12-14 | 32SB3-0-2 | 32SB3-0-2A[1] | 32SB3-5-7 | 32SB3-10-12 | 32SB3-20-22 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 09-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34846010 | 34836010 | 34846006 | 34846008 | 34846002 | 34848018 | 34846001 | 34846004 | 34846005 |
| Aluminum | 215 | 21,900 | 14,500 | 3,920 | 5,740 | 9,280 | 10,800 | 6,070 | 1,940 |
| Antimony | -- | 6 J | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | 0.81 J | 1 J | 0.91 J | 0.71 J | 1.1 J | 1.3 J | 0.18 J |
| Barium | 0.12 J | 10.6 J | 13.1 J | 6.2 J | 7.6 J | 9.9 J | 13.7 J | 6.5 J | 3.6 J |
| Beryllium | -- | 0.12 J | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 63 J | 611 J | 308 J | 204 J | 493 J | 931 J | 155 J | 132 J | 77.8 J1 |
| Chromium | -- | 18 | 10 | 10.2 | 4.9 | 7.1 | 8.9 | 5.5 | 2.7 |
| Cobalt | -- | 1.8 J | -- | -- | -- | -- | 1.5 J | -- | -- |
| Copper | 0.79 J | 3 J | 4 J | 2.1 J | 3.1 J | 5.7 | 4.3 J | 4.2 J | 1.3 J |
| Iron | 29.8 | 13,200 | 8,950 | 4,960 | 4,160 | 5,250 | 6,130 | 3,950 | 647 |
| Lead | 0.13 J | 3.9 | 3.3 | 3 | 3 | 2.6 | 3.8 | 3.8 | 1.1 |
| Magnesium | 14.7 J | 130 J | 119 J | 52.1 J | 44.4 J | 84.4 J | 117 J | 81.5 J | 42.7 J |
| Manganese | 0.56 J | 32.9 | 39.3 | 14.4 | 91.5 | 95 | 21.2 | 6.2 | 3.5 |
| Mercury | 0.03 J | 0.03 J | 0.04 | 0.04 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 J |
| Nickel | -- | 4 J | 2 J | -- | -- | -- | 2.3 J | 2.3 J | -- |
| Potassium | 63.8 J | 273 J | 165 J | 130 J | 180 J | 210 J | 541 J | 672 J | 144 J |
| Selenium | -- | -- | 0.11 J | -- | 0.22 J | -- | -- | -- | -- |
| Silver | -- | 1.2 J | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 140 J | 13 J | 181 J | 234 J | 172 J | 159 J | 196 J | 214 J | 196 J |
| Vanadium | -- | 36.8 | 20.4 | 15.2 | 9.8 J | 13.2 | 15.5 | 15.8 | 6.6 J |
| Zinc | 2.9 J | 3.5 J | 7.5 J | 4.1 J | 3.5 J | 4.9 J | 5.6 | 2.9 J | 2.6 J |
| Cyanide | -- | 0.47 J | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-35 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB3-30-32 | 32SB4-0-2 | 32SB4-15-17 | 32SB4-20-22 | 32SB4-20-22A[1] | 32SB4-25-27 | 32SB4-35-37 | 32SB4-45-47 | 32SB5-45-47A |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 |
| Lab Sample No. | 34848001 | 34848008 | 34848009 | 34848010 | 34848011 | 34848012 | 34848013 | 34848014 | 34846012 |
| Aluminum | 640 | 6,580 | 8,900 | 951 | 1,100 | 751 | 458 | 156 | 419 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | 0.71 J | 2.1 J | -- | 0.18 J | -- | -- | -- | -- |
| Barium | 1.2 J | 10.1 J | 7 J | 2.5 J | 2.8 J | 2.1 J | 1.1 J | 0.06 J | 0.13 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | 0.26 | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 33 J | 293 J | 151 J | 98 J | 95.6 J | 96.5 J | 105 J | 91.1 J | 76.4 J |
| Chromium | 0.94 J | 5.6 | 24.6 | 1.7 J | 1.6 J | -- | 0.92 J | -- | 0.88 J |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 7.8 | 3.3 J | 5.3 J | 1.1 J | 1.4 J | 1.4 J | 0.97 J | 0.8 J | 0.77 J |
| Iron | 88.8 | 3,970 | 13,300 | 1,230 | 1,190 | 324 | 75.7 | 44.6 J | 114 |
| Lead | 0.32 J | 2.5 | 2.8 | 1.2 | 1.2 | 0.7 | 0.25 J | 0.19 J | 0.37 J |
| Magnesium | 24.5 J | 114 J | 74.6 J | 31 J | 31 J | 28.6 J | 14.7 J | 10.4 J | 18.8 J |
| Manganese | 0.87 J | 11.2 | 8.9 | 2.3 J | 2.1 J | -- | 0.21 J | -- | 3.5 |
| Mercury | 0.03 J | 0.04 J | 0.04 J | -- | -- | 0.04 J | 0.03 J | 0.05 J | 0.03 J |
| Nickel | 1.7 J | 4 J | -- | -- | -- | -- | 2.2 J | 1.8 J | -- |
| Potassium | -- | 161 J | 76.5 J | 116 J | 69.4 J | 59.4 J | 43.4 J | 54.3 J | 74 J |
| Selenium | -- | -- | 0.12 J | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 173 J | 175 J | 209 J | 162 J | 183 J | 199 J | 174 J | 157 J | 179 J |
| Vanadium | 0.6 J | 9.7 J | 50.5 | 8.4 J | 7.8 J | 2.3 J | -- | -- | 1.5 J |
| Zinc | 2.7 J | 5.1 | 5.9 J | 1.9 J | 2.5 J | 1.8 J | 1.9 J | 3.7 J | 3 J |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-35 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB5-1-2 | 32SB5-5-7 | 32SB5-10-12 | 32SB5-20-22 | 32SB5-45-47 | 32SB5-61-63 | 32SB5-95-97 | 32SB6-0-2 | 32SB6-5-7 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 19-JAN-93 | 20-JAN-93 | 20-JAN-93 | 12-JAN-93 | 11-JAN-93 |
| Lab Sample No. | 34925008 | 34925009 | 34925011 | 34925010 | 34925012 | 34938007 | 34938008 | 34846016 | 34847001 |
| Aluminum | 21,600 | 33,200 | 6,650 | 4,920 | 1,500 | 343 | 789 | 6,980 | 10,200 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 2.3 J | 2.1 J | 1.8 J | 1.6 J | 1.1 J | 0.4 J | 0.37 J | 0.46 J | 1.8 J |
| Barium | 15.9 J | 16.5 J | 6.3 J | 6.4 J | 1.3 J | 0.14 J | 1.9 J | 10.1 J | 12.7 J |
| Beryllium | 0.22 J | 0.21 J | 0.08 J | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | | 251 J | 355 J | 24.5 J | -- | 32 J | 8.2 J | 497 J | 335 J |
| Chromium | 16.1 | 26.3 | 7.4 | 5.4 | 1.4 J | 2.3 | 2 J | 8.4 | 11.2 |
| Cobalt | 0.75 J | -- | -- | -- | -- | 0.51 J | 0.88 J | 1.4 J | -- |
| Copper | 5.1 J | 7.2 | 2.1 J | 0.98 J | -- | 0.53 J | 1.3 J | 3.9 J | 5.2 J |
| Iron | 10,800 | 16,000 | 5,440 | 1,420 | 79.7 | 190 | 98.2 | 3,350 | 9,470 |
| Lead | 3.1 | 3 | 2.1 J | 1.7 | 0.42 J | 0.2 J | 1.2 J | 9.8 | 3.7 |
| Magnesium | 207 J | 243 J | 54.2 J | 53.4 J | -- | 8.7 J | 16.6 J | 131 J | 125 J |
| Manganese | 95.5 | 53.5 | 27.1 | 4.6 | 1.3 J | 1.1 J | 1.1 J | 61.4 | 20 |
| Mercury | 0.02 J | 0.02 J | -- | -- | -- | -- | -- | 0.04 | -- |
| Nickel | -- | 4.4 J | -- | -- | -- | -- | -- | 2.5 J | 1.9 J |
| Potassium | 119 J | 146 J | 223 J | 145 J | -- | -- | -- | 203 J | 315 J |
| Selenium | 3.7 | 0.97 J | 0.53 J | 0.59 J | -- | -- | 0.99 J | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | 0.77 J | -- | -- |
| Sodium | 14 J | 23.5 J | 18 J | 20.4 J | 14.9 J | -- | -- | 193 J | 197 J |
| Vanadium | 29.3 | 43.1 | 25.4 | 11.6 J | 0.95 J | 0.9 J | 1.4 J | 8.8 J | 23.2 |
| Zinc | 6.8 | 9.1 | 1.9 J | 1.1 J | 0.91 J | 3.4 J | 0.44 J | 8.5 | -- |
| Cyanide | 0.48 J | 0.56 J | 0.56 J | 0.58 J | 0.51 J | 0.4 J | 0.45 J | -- | -- |

See notes at end of table.

## Table 4-35 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB6-5-7A[1] | 32SB6-10-12 | 32SB6-20-22 | 32SB6-30-32 | 32SB6-45-47 | 32SB6-45-47A[1] | 32SB7-0-2 | 32SB7-5-7 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 11-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 12-JAN-93 | 20-JAN-93 | 20-JAN-93 |
| Lab Sample No. | 34847002 | 34846014 | 34846015 | 34846013 | 34846011 | 34864012 | 34938004 | 34938006 |
| Aluminum | 13,900 | 26,100 | 245 | 429 | 369 | 419 | 9,970 | 14,700 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 1.7 J | 3.3 | -- | -- | 0.2 J | -- | 2.8 | 2.7 |
| Barium | 16.7 J | 14.7 J | 0.12 J | 0.12 J | 1.1 J | 0.13 J | 11.1 J | 18.7 J |
| Beryllium | -- | -- | -- | -- | -- | -- | 0.09 J | 0.11 J |
| Cadmium | -- | 0.44 J | -- | -- | -- | -- | -- | -- |
| Calcium | 502 J | 138 J | 62.7 J | 57.2 J | 83.9 J | 76.4 J | 277 J | 168 J |
| Chromium | 12.9 | 24 | -- | 1.3 J | 1.5 J | 0.88 J | 9.3 | 14.7 |
| Cobalt | -- | -- | -- | -- | -- | -- | 1.5 J | 2.5 J |
| Copper | 7.8 | 8.4 | 0.75 J | 0.79 J | 1.2 J | 0.77 J | 4.7 J | 3.6 J |
| Iron | 9,630 | 12,100 | 82 | 64.8 | 102 | 114 | 5,100 | 7,250 |
| Lead | 3.3 | 3.4 | 0.23 J | 0.19 J | 0.61 J | 0.37 J | 30.7 | 3.5 |
| Magnesium | 264 J | 234 J | 19.9 J | 12.6 J | 21.3 J | 18.8 J | 147 J | 284 J |
| Manganese | 29.5 | 10.7 | 0.51 J | 0.82 J | 2.4 J | 3.5 | 71 | 48.1 |
| Mercury | -- | 0.04 | 0.03 | 0.03 | 0.03 J | 0.03 J | -- | -- |
| Nickel | 2.2 J | 2.8 J | -- | -- | -- | -- | 2.8 J | 4.7 J |
| Potassium | 382 J | 474 J | 70.1 J | 81.7 J | 84.5 J | 74 J | 257 J | 331 J |
| Selenium | -- | 0.23 J | -- | -- | -- | -- | -- | 1.4 |
| Silver | -- | -- | -- | -- | -- | -- | -- | 0.7 J |
| Sodium | 180 J | 235 J | 155 J | 164 J | 205 J | 179 J | 21.3 J | 24.1 J |
| Vanadium | 24.3 | 42.4 | 0.59 J | -- | 1.4 J | 1.5 J | 13.7 | 19.2 |
| Zinc | 11.8 | 8.5 | 1.8 J | 1.5 J | 3.4 J | 3 J | 10.6 | 6.4 |
| Cyanide | -- | -- | -- | -- | -- | -- | 0.46 J | 0.52 J |

See notes at end of table.

## Table 4-35 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Samples from Site 32 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 32SB7-15-17 | 32SB7-30-32 | 32SB8-5-7 | 32SB8-13-15 |
|---|---|---|---|---|
| Collect Date | 20-JAN-93 | 21-JAN-93 | 21-JAN-93 | 21-JAN-93 |
| Lab Sample No. | 34938005 | 34938006 | 34956001 | 34956005 |
| Aluminum | 2,780 | 302 | 5,470 | 1,630 |
| Antimony | -- | -- | -- | -- |
| Arsenic | 1.8 J | 0.41 J | 2.5 | 1.2 J |
| Barium | 4.4 J | 0.43 J | 10.9 J | 3.8 J |
| Beryllium | 0.07 J | -- | 0.15 J | -- |
| Cadmium | -- | -- | -- | -- |
| Calcium | 11.6 J | -- | 63 J | 18.8 J |
| Chromium | 2.9 | 0.87 J | 4.3 | 1.2 J |
| Cobalt | 0.99 J | -- | 0.69 J | -- |
| Copper | 0.85 J | 0.64 J | 1.6 J | 0.64 J |
| Iron | 1,600 | 77.4 | 3,950 | 448 |
| Lead | 2.1 J | 0.45 J | 3.8 | 2.8 |
| Magnesium | 43.5 J | -- | 67.2 J | 41.5 J |
| Manganese | 2.3 J | 0.47 J | 18.1 | 3.5 |
| Mercury | -- | -- | -- | 0.02 J |
| Nickel | -- | -- | -- | -- |
| Potassium | 191 J | -- | -- | -- |
| Selenium | -- | 1.5 | 2.2 | -- |
| Silver | -- | -- | -- | -- |
| Sodium | 30 J | -- | -- | -- |
| Vanadium | 9.3 J | 0.69 J | 9.3 J | 5.1 J |
| Zinc | 0.6 J | -- | 1.8 J | -- |
| Cyanide | 0.49 J | 0.49 J | 0.41 J | 0.46 J |

[1] The A in the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.

above CRDLs were reported in samples collected from borings 32SB5, 32SB6, and 32SB7, typically from samples collected at depths less than 12 feet bls. Cyanide was detected in some samples below the CRDL and, in others, above the CRDL.

**Washrack Investigation.** Results of the TCL VOCs, TCL SVOCs, and total chromium analyses of the North Field Washrack soil boring samples are presented in Table 4-36. Sample locations are presented in Figure 2-13.

TCL VOCs. The eight VOCs detected at the North Field washrack were acetone, methylene chloride, 1,2-DCE, PCE, TCE, ethylbenzene, toluene, and xylenes. TCE, 1,2-DCE, and methylene chloride were detected at concentrations below CRQLs and were qualified as estimated. Chlorinated solvents TCE and 1,2-DCE were detected in samples from WRSB01.

TCL SVOCs. Five SVOCs (naphthalene, 2-methylnaphthalene, dibenzofuran, fluorene, and BEHP) were detected in the 12 subsurface soil samples retrieved from the soil borings. Naphthalene and 2-methylnaphthalene were detected above the CRQLs in all samples analyzed. However, some of the concentrations were qualified as estimated during the data validation process. Dibenzofuran, BEHP, and fluorene detections were at concentrations less than the CRQLs and were qualified as estimated. The highest concentrations of naphthalene and 2-methylnaphthalene were associated with soil boring WRSB01. Concentrations of the two compounds decreased with sampling depth.

TAL Metals and (Total) Cyanide. Total chromium was detected in each sample. The highest concentrations of chromium were detected in samples collected from soil boring WRSB01.

**4.5.2.3 Site 6, South Transformer Oil Disposal Area** Concentrations of target analytes detected in subsurface soil samples at Site 6 are summarized in Table 4-37. Sample locations are presented in Figure 2-14.

TCL VOCs. Four VOCs (1,1-DCE, 1,2-DCE [total], 2-butanone, and TCE) were detected in the subsurface soil samples. Concentrations of 1,1-DCE, 1,2-DCE (total), and 2-butanone were qualified as estimated because they were detected below CRQLs. 1,1-DCE and 1,2-DCE (total) were both reported in a single sample (6SB3-117-119). TCE was also detected at concentrations above the CRQL (73 $\mu$g/kg) in sample 6SB3-117-119. 2-Butanone was reported in one sample (6SB4-0-2).

TCL SVOCs. Nineteen SVOCs were detected in subsurface soil samples from Site 6. Eleven SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(a)fluoranthene, benzo(k)-fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, chrysene, fluoranthene, phenanthrene, pyrene, and BEHP) were detected above the CRQLs. SVOCs reported above CRQLs were detected in samples from boring 6SB3 collected at the 0- to 2-foot and 5- to 7- foot bls intervals.

Acenaphthene, anthracene, butylbenzylphthalate, carbazole, dibenz(a,h)anthracene, dibenzofuran, fluorene, and BEHP were detected at concentrations below the CRQLs and were qualified as estimated. The detected SVOCs, with the exception of dibenzofuran, butylbenzylphthalate, and bis(2-ethylhexyl)phthalate, are PAHs.

## Table 4-36
## Summary Analytical Results for Detected Analytes in Subsurface Samples from Site 32 (Wash Rack) Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | WRSB01(5-7) | WRSB01(5-7)D[1] | WRSB01(10-12) | WRSB02(5-7) | WRSB02(10-12) | WRSB03(5-7) | WRSB03(10-12) |
|---|---|---|---|---|---|---|---|
| Collect Date | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 |
| Lab Sample No. | 94015010 | 94015011 | 94015012 | 94015015 | 94015016 | 94015019 | 94015020 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | |
| Methylene chloride | -- | 610 J | 250 J | -- | 160 J | 160 J | 170 J |
| Acetone | 2,000 J | -- | 1,000 J | -- | 1,500 J | 2,000 J | 2,100 J |
| 1,2-Dichloroethene (total) | 430 J | -- | 290 J | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- |
| Tetrachloroethene | -- | 1,700 | 1,300 J | -- | -- | -- | -- |
| Toluene | 13,000 | 11,000 | 8,100 J | -- | 260 J | -- | -- |
| Ethylbenzene | 4,900 | 5,100 | 3,700 J | -- | 790 J | 440 | -- |
| Xylenes (total) | 32,000 | 32,000 | 23,000 J | -- | 3,900 | 210 | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | |
| Naphthalene | 26,000 J | 22,000 J | 21,000 J | 8,900 | 19,000 J | 6,900 J | 1,600 J |
| 2-Methylnaphthalene | 43,000 J | 37,000 J | 37,000 J | 4,400 | 26,000 J | 24,000 J | 6,500 J |
| Dibenzofuran | -- | -- | 1,400 J | -- | -- | 1,500 J | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | 970 J | 590 J | -- | -- | -- |
| **Total Chromium (mg/kg)** | | | | | | | |
| | 20.3 | 14.1 | 13.4 | 4.8 | 13.6 | 9.5 | 7.6 |

See notes at end of table.

## Table 4-36 (Continued)
## Summary Analytical Results for Detected Analytes in Subsurface Samples from Site 32 (Wash Rack) Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | WRSB01(15-17) | WRSB01(20-22) | WRSB02(15-17) | WRSB02(20-22) | WRSB03(15-17) | WRSB03(20-22) |
|---|---|---|---|---|---|---|
| Collect Date | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 |
| Lab Sample No. | 94015017 | 94015014 | 94015017 | 94015018 | 94015021 | 94015022 |
| **TCL VOCs (μg/kg)** | | | | | | |
| Methylene chloride | 380 J | -- | -- | -- | -- | -- |
| Acetone | -- | -- | -- | 700 J | -- | -- |
| 1,2-Dichloroethene | -- | -- | -- | -- | -- | -- |
| Trichloroethene | 1,300 J | 290 J | -- | -- | -- | -- |
| Tetrachloroethene | 390 | -- | -- | -- | -- | -- |
| Toluene | 2,300 J | -- | -- | -- | -- | -- |
| Ethylbenzene | 1,700 J | 170 J | -- | -- | 150 J | -- |
| Xylenes (total) | 12,000 J | 1,600 | 480 J | 540 J | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | | |
| Naphthalene | 8,600 | 8,900 J | 3,700 | 13,000 J | 1,400 J | -- |
| 2-Methylnaphthalene | 18,000 | 23,000 J | 6,200 | 18,000 J | 5,200 J | 990 J |
| Dibenzofuran | 980 J | 1,100 J | -- | -- | -- | -- |
| Fluorene | 640 J | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- |
| **Total Chromium (mg/kg)** | | | | | | |
| | 10.0 | 1.4 J | 9.0 | 8.0 | 9.0 | 2.5 |

[1] The D in the sample locator represents a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
mg/kg = milligrams per kilogram.

## Table 4-37
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 6 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 6SB1-5-7 | 6SB1-15-17 | 6SB1-20-22 | 6SB2-0-2 | 6SB2-15-17 | 6SB2-20-22 | 6SB3-0-2 | 6SB3-0-2A[1] | 6SB3-5-7 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 |
| Lab Sample No. | 34587001 | 34587002 | 34587003 | 34587004 | 34587005 | 34587006 | 34597001 | 34597002 | 34595001 |
| **Target Compound List (TCL) Volatile Organic Compounds (VOCs) (micrograms per kilogram [µg/kg])** | | | | | | | | | |
| 1,1-Dichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-Dichloroethene (total) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | 120 J | 190 J | -- |
| Dibenzofuran | -- | -- | -- | -- | -- | -- | 47 J | 67 J | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | 90 J | 140 J | 57 J |
| Phenanthrene | -- | -- | -- | -- | -- | -- | 1,200 | 1,500 | 510 |
| Anthracene | -- | -- | -- | -- | -- | -- | 140 J | 160 J | 110 J |
| Carbazole | -- | -- | -- | -- | -- | -- | 260 J | 300 J | 93 J |
| Fluoranthene | -- | -- | -- | -- | -- | -- | 2,400 | 2,600 | 750 |
| Pyrene | -- | -- | -- | -- | -- | -- | 2,000 | 2,100 | 590 |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | 150 J | 260 J | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | 1,400 | 1,900 | 320 J |
| Chrysene | -- | -- | -- | -- | -- | -- | 1,700 | 2,100 | 340 J |
| bis(2-Ethylhexyl)phthalate | 54 J | -- | -- | -- | -- | -- | 1,300 | 840 | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | 2,100 | 2,000 | 290 J |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | 1,500 | 1,700 | 290 J |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | 1,600 | 1,900 | 290 J |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | 1,600 | 1,400 | 200 J |
| Dibenz(a,h)anthracene | -- | -- | -- | -- | -- | -- | 53 J | 200 J | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | 1,100 | 960 | 160 J |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | |
| Dieldrin | 13 J | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endosulfan sulfate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbons (milligrams per kilogram [mg/kg])** | | | | | | | | | |
| | NA | NA | NA | NA | NA | NA | NA | NA | NA |

See notes at end of table.

DIS. REGARD

## Table 4-37 (Continued)
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 6 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 6SB3-10-12 | 6SB3-15-17 | 6SB3-25-27 | 6SB3-60-62 | 6SB3-117-119 | 6SB4-0-2 | 6SB4-5-7 | 6SB4-10-12 | 6SB4-20-22 |
|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 |
| Lab Sample No. | 34595002 | 34595003 | 34595004 | 34595005 | 34595008 | 34587007 | 34587008 | 34587009 | 34587010 |
| **TCL VOCs (µg/kg)** | | | | | | | | | |
| 1,1-Dichloroethene | -- | -- | -- | -- | 2 J | -- | -- | -- | -- |
| 1,2-Dichloroethene (total) | -- | -- | -- | -- | 2 J | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | 4 J | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | 73 | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzofuran | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbazole | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | 38 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | 41 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo (a) anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 64 J |
| Benzo(b)fluoranthene | 38 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | 39 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenz(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | |
| Dieldrin | -- | -- | -- | -- | -- | 30 J | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethene | -- | -- | -- | -- | -- | 24 J | -- | -- | -- |
| 4,4'-Dichlorodiphenyldichloroethane | -- | -- | -- | -- | -- | 130 J | -- | -- | -- |
| Endosulfan sulfate | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1260 | -- | -- | -- | -- | -- | 600 J | -- | -- | -- |
| **Total Petroleum Hydrocarbons (mg/kg)** | NA | NA | NA | NA | NA | 3,580 | 10 | 7.1 | 24.1 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: -- = the analyte was not detected in laboratory analysis. J = the associated numerical value is an estimated quantity.

Pesticides and PCBs. Three pesticide compounds (dieldrin, 4,4'-DDD, and 4,4'-DDE) and one PCB compound (Aroclor-1260) were detected in samples collected from Site 6 in the 0- to 2-foot bls interval. Dieldrin, 4,4'-DDD, 4,4'-DDE, and Aroclor-1260 were all detected above the CRQL in sample 6SB4-0-2. Concentrations of dieldrin, 4,4'-DDD, 4,4'-DDE, and Aroclor-1260 in this sample were reported at 30 μg/kg, 130 J μg/kg, 24 J μg/kg, and 600 J μg/kg, respectively. Dieldrin was also detected above the CRQL in the sample from the 5- to 7-foot interval from soil boring 6SB1.

TPHs. Analyses for TPH was conducted only for the four samples collected from soil boring 6SB4. TPH was detected in each of the four samples. Detected TPH concentrations ranged from 7.1 to 3,580 mg/kg. Detected concentrations of TPHs are presented on Figure 4-6.

TAL Metals and (Total) Cyanide. Table 4-38 summarizes the inorganic analyte concentrations detected in subsurface soil samples collected at Site 6 soil borings. Twenty-one inorganic analytes were detected in subsurface soil samples from Site 6. Eight of these analytes (aluminum, barium, copper, iron, lead, manganese, vanadium, and zinc) were detected in all samples collected from Site 6 soil borings. Eleven of the analytes (aluminum, arsenic, chromium, copper, iron, lead, magnesium, manganese, sodium, vanadium, and zinc) were detected above the CRDLs. Concentrations of the remaining 10 TAL analytes were detected at concentrations below the CRDLs. Reported concentrations of 20 analytes were qualified as estimated in 1 or more of the samples during the data validation process.

**4.5.2.4 Site 33, Midfield Maintenance Area** Table 4-39 summarizes the concentrations of organic compounds detected in subsurface soil samples collected in Site 33 soil borings. The sample locations are presented in Figure 2-14.

TCL VOCs. Four VOCs (acetone, ethylbenzene, TCE, and xylenes) were detected in subsurface soil samples collected from Site 33. Acetone was detected in samples from 8 of the 22 sampling locations at concentrations ranging from 3 J to 150 J μg/kg. TCE was detected at a single sample location (33SB5-0-2) with a reported concentration of 48 μg/kg (duplicate sample concentration of 29 μg/kg). Ethylbenzene and xylenes were reported at concentrations of 1,500 μg/kg and 4,800 μg/kg, respectively, at sample location 33SB2-5-7. Xylene (total) concentrations were also detected in samples from 33SB2-10-12 and 33SB5-0-2A (duplicate).

TCL SVOCs. Seven SVOCs (naphthalene, 2-methylnaphthalene, fluorene, phenanthrene, pyrene, butylbenzylphthalate, and BEHP) were detected in 10 of 22 subsurface soil samples collected at Site 33. Naphthalene, 2-methylnaphthalene, and BEHP were the only SVOCs detected above CRQLs. All remaining SVOC concentrations were reported below the CRQLs and were qualified as estimated. 2-Methylnaphthalene was detected above the CRQL in two samples from borings 33-SB2 and 33-SB5, and the concentrations ranged from 2,100 to 2,500 μg/kg. Naphthalene was detected above the CRQL in one sample from soil boring 33SB2 (610 μg/kg).

Pesticides and PCBs. Six pesticide compounds (heptachlor, dieldrin, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane) were detected in subsurface soil samples collected from Site 33. All of the reported pesticide concentrations were qualified as estimated during the data validation process because they were either less than the CRQLs or the compound was present in analytical blanks. All of the detected pesticide concentrations were reported in three samples from a single

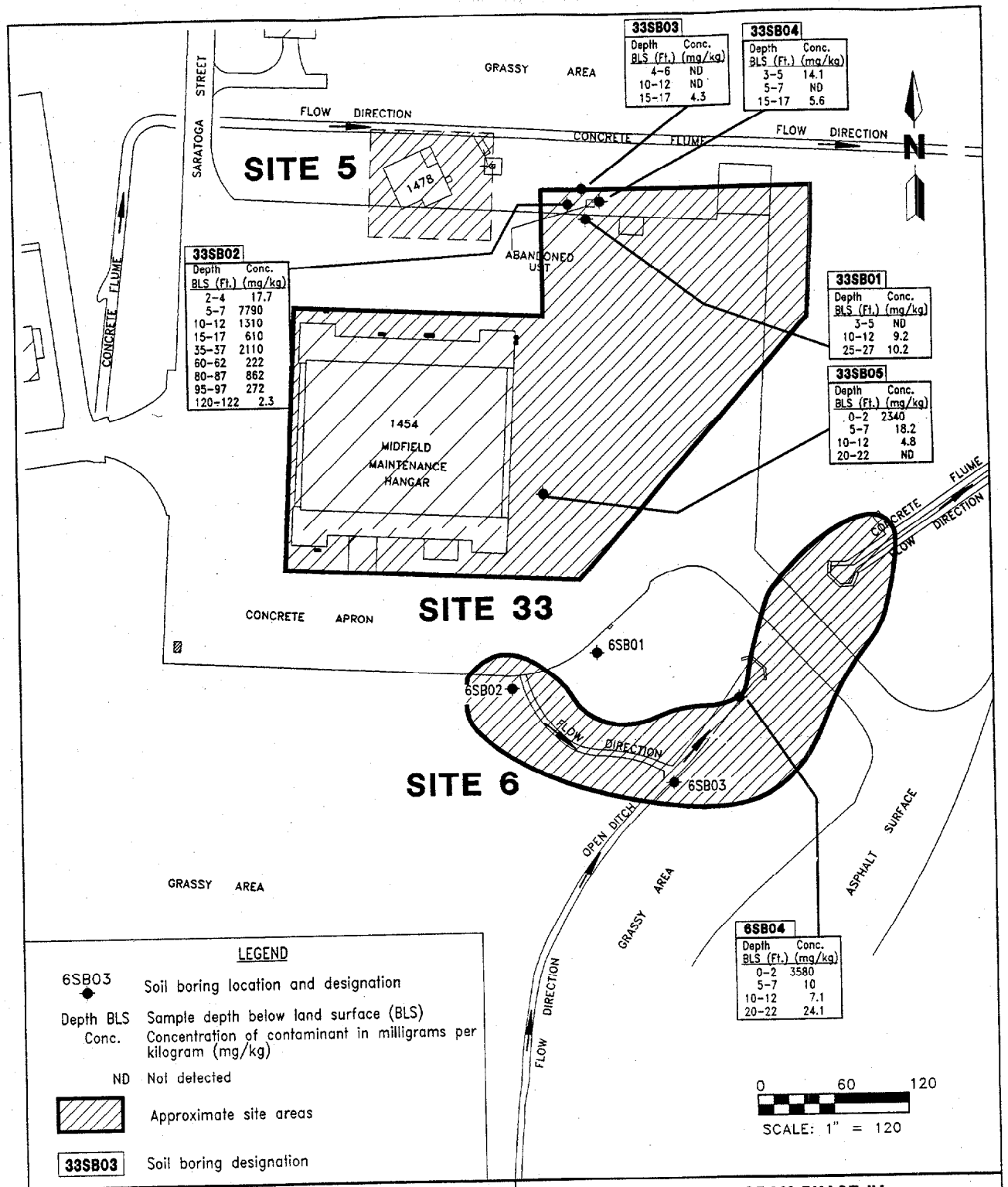


**FIGURE 4-6**
**SITES 5, 6, AND 33, TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS FOR SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS AT THE MIDFIELD**

H:\WHITING\7560-16\TEC-MEM3\FIG-2\KP-SB\5-11-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

## Table 4-38
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 6 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 6SB1-5-7 | 6SB1-15-17 | 6SB1-20-22 | 6SB2-0-2 | 6SB2-15-17 | 6SB2-20-22 | 6SB3-0-2 | 6SB3-0-2A[1] | 6SB3-5-7 | 6SB3-10-12 | 6SB3-15-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 |
| Lab Sample No. | 34587001 | 34587002 | 34587003 | 34587004 | 34587005 | 34587006 | 34597001 | 34597002 | 34595001 | 34595002 | 34595003 |
| Aluminum | 14,300 | 9,390 | 2,120 | 20,200 | 39,800 | 337 | 11,800 | 8,460 | 24,300 | 2,250 | 2,120 |
| Arsenic | 1.6 J | 1.3 J | 0.15 J | 2.1 J | 0.31 J | -- | 3.5 | 2.2 J | 0.99 J | 1.5 J | 1.1 J |
| Barium | 12.8 J | 3.8 J | 0.66 J | 19.4 J | 10.1 J | 0.41 J | 14.4 J | 13.8 J | 6 J | 2 J | 0.67 J |
| Beryllium | 0.18 J | -- | -- | 0.37 J | 0.2 J | -- | 0.25 J | 0.19 J | -- | -- | -- |
| Cadmium | 0.62 J | 0.68 J | 0.33 J | 0.75 J | 0.59 J | -- | 1.9 | 2 | 0.86 J | 0.41 J | -- |
| Calcium | 329 J | 203 J | 101 J | 500 J | 314 J | 93.1 J | 592 J | 664 J | 318 J | 248 J | 123 J |
| Chromium | 14.3 | 27.8 | 4.9 | 16.3 | 39.4 | 1.1 J | 65 J | 51.6 J | 30 | 11.5 | 3.1 |
| Cobalt | -- | -- | -- | 1.9 J | -- | -- | -- | 35.7 | -- | -- | -- |
| Copper | 5.5 J | 4.7 J | 1.6 J | 6.4 | 10.3 | 0.44 J | 9 | 10,900 | 7.2 | 1.8 J | 1.2 J |
| Iron | 12,300 | 18,900 | 4,480 | 14,800 | 17,600 | 237 | 13,300 | 202 J | 17,500 | 11,400 | 3,490 |
| Lead | 21.1 | 3.4 | 0.71 | 14.7 | 6.9 | 0.59 J | 252 J | 103 J | 19.7 | 8.2 | 1.2 |
| Magnesium | 81.8 J | 72.2 J | 15.7 J | 145 J | 143 J | 11 J | 108 J | 42.7 | 84.1 J | 24.8 J | 15.9 J |
| Manganese | 73.7 | 14.6 | 2.3 J | 180 | 13.9 | 0.77 J | 50 | 0.03 J | 27.1 | 14.2 | 3.9 |
| Mercury | -- | -- | -- | 0.04 J | -- | -- | 0.03 J | 3.1 J | -- | -- | -- |
| Nickel | 2 J | -- | -- | 2.1 J | 2.8 J | -- | 2.1 J | 0.69 J | -- | -- | -- |
| Potassium | 94.2 J | -- | -- | 130 J | 141 J | -- | -- | -- | 94.6 J | -- | 49.6 J |
| Selenium | -- | -- | -- | -- | 0.27 J | -- | -- | -- | -- | 0.16 J | -- |
| Sodium | 226 J | 218 J | 143 J | 162 J | 136 J | 150 J | 233 J | 198 J | 235 J | 247 J | 147 J |
| Thallium | 0.35 J | 0.16 J | 0.17 J | -- | -- | 0.17 J | -- | -- | 0.18 J | 0.25 J | -- |
| Vanadium | 31.9 | 53.1 | 12.9 | 38 | 56.8 | 1 J | 35.4 | 28.4 | 48.9 | 32.2 | 9.7 J |
| Zinc | 13.1 | 6.2 J | 1.8 J | 9.2 | 8.1 | 1.7 J | 58.2 | 64.3 | 15.4 | 4.5 J | 2.6 J |

See notes at end of table.

## Table 4-38 (Continued)
## Summary Analytical Results for Detected Analytes in Subsurface Soil Samples from Site 6 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 6SB3-25-27 | 6SB3-60-62 | 6SB3-117-119 | 6SB4-0-2 | 6SB4-5-7 | 6SB4-10-12 | 6SB4-20-22 |
|---|---|---|---|---|---|---|---|
| Collect Date | 05-DEC-92 | 05-DEC-92 | 05-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 | 04-DEC-92 |
| Lab Sample No. | 34595004 | 34595005 | 34595008 | 34587007 | 34587008 | 34587009 | 34587010 |
| Aluminum | 175 | 588 | 1,750 | 29,100 | 3,780 | 14,800 | 2,520 |
| Arsenic | -- | -- | 1.3 J | 3.4 | 2.1 J | 2.7 | 0.2 J |
| Barium | 0.33 J | 1.8 J | 4 J | 11.2 J | 3 J | 3.6 J | 2 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | 2.1 | -- | 0.4 J | 0.28 J |
| Calcium | 90.9 J | 159 J | 341 J | 209 J | 101 J | 153 J | 121 J |
| Chromium | -- | 1.4 J | 6.2 | 30 | 8.7 | 13.8 | 5.1 |
| Cobalt | -- | -- | -- | -- | -- | -- | -- |
| Copper | 0.66 J | 0.73 J | 3.3 | 50.5 | 2.7 J | 5 J | 2.8 J |
| Iron | 261 | 427 | 2,450 | 10,000 | 9,840 | 11,200 | 1,230 |
| Lead | 0.19 J | 1.2 | 4.1 | 18.6 | 3.9 | 3.7 | 2.1 |
| Magnesium | 10.2 J | 43 J | 86 J | 131 J | 23 J | 52.6 J | 29.2 J |
| Manganese | 1.3 J | 1.3 J | 1.4 J | 20 | 13.7 | 14.9 | 4.2 |
| Mercury | -- | -- | 0.13 | 0.13 | 0.03 J | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- |
| Potassium | -- | 60.6 J | 178 J | 121 J | 58.4 J | 97.2 J | -- |
| Selenium | -- | 0.13 J | -- | -- | -- | -- | -- |
| Sodium | 172 J | 270 J | 239 J | 197 J | 200 J | 177 J | 184 J |
| Thallium | -- | -- | -- | 0.17 J | -- | -- | -- |
| Vanadium | 1 J | 2.9 J | 12.7 | 42.2 | 28.9 | 32.5 | 5.3 J |
| Zinc | 2.4 J | 1.5 J | 2.9 J | 162 | 4.5 J | 6.1 J | 9.8 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

## Table 4-39
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB1-3-5 | 33SB1-10-12 | 33SB1-25-27 | 33SB2-2-4 | 33SB2-5-7 | 33SB2-10-12 | 33SB2-15-17 | 33SB2-35-37 | 33SB2-35-37A[1] | 33SB2-60-62 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 |
| Lab Sample No. | 34576001 | 34576002 | 34576003 | 34553001 | 34553002 | 34553003 | 34553004 | 34578001 | 34578002 | 34576004 |
| **Target Compound List (TCL) Volatile Organic Compounds (µg/kg)** | | | | | | | | | | |
| Acetone | -- | 17 J | -- | -- | -- | -- | 150 J | 14 J | -- | 40 J |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | 1,500 | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | 4,800 | 380 J | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | |
| Naphthalene | -- | -- | -- | -- | 610 | 370 J | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | 2,100 | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | 150 J | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | 240 J | 69 J | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | 40 J | -- | -- | -- | -- | -- |
| Butylbenzylphthalate | -- | -- | 37 J | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | 61 J | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | |
| Heptachlor | -- | -- | -- | 3.5 J | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | 13 J | -- | -- | -- | -- | -- | -- |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | 50 J | 3.3 J | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | 64 J | 4.7 J | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | |
| | -- | 9.2 | 10.2 | 17.7 | 7,790 | 1,310 | 610 | 2,110 | 2,980 | 222 |
| **Total Organic Carbon (TOC) (mg/kg)** | | | | | | | | | | |
| | NA | NA | NA | NA | 15,100 | NA | NA | NA | NA | NA |

See notes at end of table.

## Table 4-39 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB2-80-82 | 33SB2-95-97 | 33SB2-120-122 | 33SB3-4-6 | 33SB3-10-12 | 33SB3-15-17 | 33SB4-3-5 | 33SB4-5-7 | 33SB4-15-17 | 33SB5-0-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 02-DEC-92 | 02-DEC-92 | 02-DEC-92 | 06-DEC-92 |
| Lab Sample No. | 34576005 | 34576006 | 34576007 | 34553005 | 34553006 | 34553007 | 34566001 | 34566002 | 34566003 | 34607001 |
| **TCL VOCs (µg/kg)** | | | | | | | | | | |
| Acetone | -- | 3 J | -- | 3 J | 5 J | 35 J | -- | -- | -- | -- |
| Trichloroethene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 48 |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes (total) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 270 J |
| 2-Methyl naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2,000 |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Butylbenzyl-phthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | 2.4 J | -- | -- | 190 J | 410 J | -- | 56 J | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| Heptachlor | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-4'-DDE | -- | -- | 2.4 J | -- | -- | -- | -- | -- | -- | -- |
| 4-4'-DDT | -- | -- | 13 J | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | |
| | 862 | 27.2 | 2.3 | -- | -- | 4.3 | 14.1 | -- | 5.6 | 2,340 |
| **TOC (mg/kg)** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

See notes at end of table.

## Table 4-39 (Continued)
## Summary Analytical Results for Detected Organic Compounds in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB5-0-2A[1] | 33SB5-5-7 | 33SB5-10-15 | 33SB5-20-22 |
|---|---|---|---|---|
| Collect Date | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 |
| Lab Sample No. | 34607002 | 34607003 | 34607004 | 34607005 |
| **TCL VOCs (μg/kg)** | | | | |
| Acetone | -- | -- | -- | -- |
| Trichloroethene | 29 | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- |
| Xylenes (total) | 11 J | -- | -- | -- |
| **TCL (SVOCs) (μg/kg)** | | | | |
| Naphthalene | 350 J | -- | -- | -- |
| 2-Methylnaphthalene | 2,500 | -- | -- | -- |
| Fluorene | 68 J | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- |
| Butylbenzylphthalate | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | |
| Heptachlor | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- |
| 4,4'-DDE | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | |
| | 2,260 | 18.2 | 4.8 | -- |
| **TOC (mg/kg)** | NA | NA | NA | NA |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
DDE = Dichlorodiphenyldichloroethene.
DDT = Dichlorodiphenyltrichloroethane.
mg/kg = milligrams per kilogram.
NA = not analyzed for these samples.

soil boring. Soil samples from soil boring 33SB2 was reported to contain heptachlor, dieldrin, alpha-Chlordane, and gamma-Chlordane in samples collected less than 7 feet deep, and 4,4'-DDE and 4,4'-DDT were in a sample from the 120- to 122-foot depth. PCBs were not detected.

TPHs. TPHs were detected in 17 of 22 subsurface soil samples collected from Site 33. Concentrations ranged from 2.3 to 7,790.0 mg/kg. Detected concentrations of TPHs in each soil boring at Site 33 are presented on Figure 4-6.

Total Organic Compounds (TOC). The TOC concentration in the 5- to 7-foot bls sample interval from boring 33SB2 was detected at 15,100 mg/kg (Table 4-37).

TAL Metals and (Total) Cyanide. A summary of the detected inorganic analytes from Site 33 are summarized in Table 4-40. Twenty inorganic analytes were detected in subsurface soil samples from Site 33. Six of the analytes (aluminum, calcium, copper, iron, lead, and manganese) were detected in all 22 samples. One or more of 10 TAL metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) were detected at concentrations above the CRDLs. Concentrations of the remaining metals were detected below the CRDLs and were qualified as estimated during the data validation process.

TCLP Metals. TCLP metals present in the leached extract did not exceed regulatory concentrations (Federal Register, vol. 55, 1990) (Table 4-40).

**4.5.2.5 Site 29, Auto Hobby Shop.** Detected concentrations of all analytes in subsurface soil samples from Site 29 soil borings are summarized in Tables 4-41 and 4-42. Sample locations are presented on Figure 2-15.

TCL VOCs. Two VOCs (acetone and 2-butanone) were detected in subsurface soil samples from Site 29. Concentrations of acetone were detected in 6 of 15 subsurface soil samples at 35 to 400 μg/kg. 2-Butanone was detected in 3 of 15 subsurface soil samples at concentrations ranging from 3 to 13 μg/kg.

TCL SVOCs. Two SVOCs bis(2-ethylhexyl)phthalate and butylbenzylphthalate) were detected in subsurface soil samples collected from Site 29. Both compounds were detected in a single subsurface soil sample at concentrations of 44 and 46 μg/kg, respectively.

Pesticides and PCBs. Six pesticide compounds (dieldrin, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane) were detected in subsurface soil samples collected from Site 29. The reported concentrations (with the exception of dieldrin in sample 29SB2-12-14 and 4,4'-DDT in sample 29SB5-10-12) were detected in the 0- to 2-foot bls sample interval. 4,4'-DDD and 4,4'-DDE were detected at estimated concentrations ranging from 27.0 to 200 μg/kg and 5.0 to 27 μg/kg, respectively. 4,4'-DDT was detected in the 10- to 12-foot bls sample intervals from soil boring 29SB5 at 4.3 μg/kg. Alpha- and gamma-Chlordane were detected at estimated concentrations of 2.6 and 3.1 μg/kg, respectively. Dieldrin was detected as a single occurrence at estimated concentration of 75.0 μg/kg. PCBs were not detected in any of the Site 29 soil boring samples.

Total Petroleum Hydrocarbons (TPHs). TPHs were detected in 8 of 15 subsurface soil samples collected from Site 29. TPH concentrations ranged from 2.2 to 377.0 mg/kg. The three highest TPH concentrations among the reported concentrations

## Table 4-40
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB1-3-5 | 33SB1-10-12 | 33SB1-25-27 | 33SB2-2-4 | 33SB2-5-7 | 33SB2-10-12 | 33SB2-15-17 | 33SB2-35-37 | 33SB2-35-37A[1] | 33SB2-60-62 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 |
| Lab Sample No. | 34576001 | 34576002 | 34576003 | 34553001 | 34553002 | 34553003 | 34553004 | 34578001 | 34578002 | 34576004 |
| Aluminum | 13,700 | 29,900 | 3,190 | 9,590 | 5,610 | 8,070 | 8,920 | 616 | 233 | 575 |
| Arsenic | 0.76 J | 1.5 J | 1.2 J | 11.5 | 5.2 | 3.8 | 1.4 J | 0.43 J | -- | 0.36 J |
| Barium | 14.9 J | 9.1 J | 3.4 J | 10.8 J | 8.9 J | 4.8 J | 3.6 J | -- | -- | 0.63 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | 0.6 J | 0.88 J | 0.45 J | 0.39 J | 0.77 J | 0.65 J | 0.65 J | -- | -- | -- |
| Calcium | 374 J | 399 J | 141 J | 617 J | 655 J | 234 J | 147 J | 92.3 J | 75.1 J | 88.6 J |
| Chromium | 8.6 | 20 | 5.4 | 8.6 | 21.5 | 12.3 | 12.8 | -- | -- | 1.3 J |
| Cobalt | 1.4 J | 1.3 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 4.2 J | 6.6 | 2.1 J | 6.5 | 3.1 J | 3 J | 3.7 J | 1.3 J | 0.62 J | 0.62 J |
| Iron | 6,970 | 15,100 | 5,830 | 5,970 | 8,490 | 13,200 | 13,900 | 828 J | 324 J | 318 |
| Lead | 2.7 | 3.7 | 0.92 | 16.7 | 24.3 | 21.1 | 4.9 | 1.9 J | 1.1 J | 0.45 J |
| Magnesium | 139 J | 99 J | 25.1 J | 125 J | 58.1 J | 40.6 J | 33.9 J | -- | -- | 19 J |
| Manganese | 114 | 84.1 | 15.3 | 41.4 | 93.3 | 31.7 | 26.4 | 1.7 J | -- | 1.8 J |
| Mercury | 0.03 J | 0.03 J | -- | 0.05 J | 0.04 J | -- | -- | -- | -- | -- |
| Nickel | -- | 3.6 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | 129 J | 119 J | 82.6 J | 124 J | 90 J | 83.6 J | 77 J | -- | -- | 42.2 J |
| Selenium | 0.48 J | 0.49 J | 0.17 J | -- | -- | -- | -- | -- | -- | 0.25 J |
| Sodium | 156 J | 186 J | 179 J | 179 J | 171 J | 249 J | 202 J | 162 J | 147 J | 159 J |
| Vanadium | 17.6 | 39.6 | 16.7 | 16.3 | 17.1 | 34.5 | 37.1 | 2.4 J | 1.1 J | 1.2 J |
| Zinc | 8.5 J | 8.6 J | 4 J | 19.3 | 7.6 | 6.9 | 6.2 J | -- | -- | 4.9 J |

See notes at end of table.

## Table 4-40 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB2-80-82 | 33SB2-95-97 | 33SB2-120-122 | 33SB3-4-6 | 33SB3-10-12 | 33SB3-15-17 | 33SB4-3-5 | 33SB4-5-7 | 33SB4-15-17 | 33SB5-0-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 03-DEC-92 | 03-DEC-92 | 03-DEC-92 | 01-DEC-92 | 01-DEC-92 | 01-DEC-92 | 02-DEC-92 | 02-DEC-92 | 02-DEC-92 | 06-DEC-92 |
| Lab Sample No. | 34576005 | 34576006 | 34576007 | 34553005 | 34553006 | 34553007 | 34566001 | 34566002 | 34566003 | 34607001 |
| Aluminum | 597 | 138 | 36.8 J | 11,000 | 25,100 | 14,400 | 9,960 | 27,000 | 3,740 | 11,400 |
| Arsenic | -- | -- | -- | 1.9 J | 2.9 | 0.73 J | 0.7 J | 2.1 J | 2.6 | 2.6 |
| Barium | 0.64 J | 0.54 J | 0.45 J | 12.5 J | 3.3 J | 3.7 J | 14.3 J | 14.5 J | 2.2 J | 11.2 J |
| Beryllium | -- | -- | -- | -- | 0.13 J | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | 0.57 J | 0.52 J | 0.68 J | 0.45 J | 0.72 J | 0.5 J | 0.39 J |
| Calcium | 82.4 J | 56 J | 81.9 J | 351 J | 209 J | 284 J | 691 J | 548 J | 263 J | 720 J |
| Chromium | 2.9 | 0.85 J | 2 J | 6.9 | 16.6 | 12.8 | 6.9 | 18.5 | 10.2 | 11.9 |
| Cobalt | -- | -- | -- | 1.5 J | -- | -- | 1.8 J | 1.3 J | -- | -- |
| Copper | 0.93 J | 0.65 J | 0.54 J | 2.9 J | 4.9 J | 4.2 J | 2.9 J | 5.9 | 2.3 J | 4.7 J |
| Iron | 1,500 | 333 | 67.4 | 6,590 | 12,800 | 13,000 | 5,880 | 14,900 | 12,700 | 13,700 |
| Lead | 0.57 J | 0.29 J | 0.26 J | 3.2 | 3.3 | 3.5 | 7.5 | 4.7 | 4.8 | 6.1 |
| Magnesium | 20.1 J | 11 J | 15.1 J | 124 J | 62.2 J | 69.5 J | 95.8 J | 148 J | 24.9 J | 74.2 J |
| Manganese | 2.3 J | 1.5 J | 0.32 J | 87.7 | 24.3 | 27.7 | 169 | 46.8 | 21.8 | 93.4 |
| Mercury | -- | -- | -- | -- | -- | -- | 0.04 J | 0.03 J | -- | 0.17 |
| Nickel | -- | -- | -- | 2.7 J | -- | -- | -- | 3.8 J | -- | -- |
| Potassium | 49.1 J | -- | -- | 93.3 J | 60 J | -- | 107 J | 180 J | 43.5 J | 123 J |
| Selenium | -- | -- | -- | -- | -- | 0.22 J | 0.43 J | 0.64 J | 0.52 J | -- |
| Sodium | 163 J | 128 J | 157 J | 165 J | 193 J | 186 J | 218 J | 214 J | 217 J | 239 J |
| Vanadium | 6.7 J | 0.97 J | -- | 15.9 | 34.9 | 34.8 | 14.4 | 38.2 | 34.5 | 37.2 |
| Zinc | 4.8 J | 1.9 J | 15.4 | 5.8 J | 5.2 | 6.7 | 5.9 | 8.6 | 4 J | 6.1 J |

See notes at end of table.

## Table 4-40 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 33 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 33SB5-0-2A[1] | 33SB5-5-7 | 33SB5-10-12 | 33SB5-20-22 | 33SB2-5-7TCLP[2] |
|---|---|---|---|---|---|
| Collect Date | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 01-DEC-92 |
| Lab Sample No. | 34607002 | 34607003 | 34607004 | 34607005 | 34553002TC |
| Aluminum | 28,400 | 47,800 | 36,100 | 6,320 | NA |
| Arsenic | 2.8 | 4.9 | 0.89 J | 2.3 | -- |
| Barium | 18.1 J | 13.5 J | 7.2 J | 2.8 J | 0.4381 |
| Beryllium | -- | -- | -- | -- | NA |
| Cadmium | 0.9 J | 1 J | 0.74 J | 0.55 J | 0.0014 J |
| Calcium | 870 J | 434 J | 254 J | 100 J | NA |
| Chromium | 19 | 30.6 | 34.7 | 11.9 | 0.0055 J |
| Cobalt | 1.7 J | 1.8 J | -- | -- | NA |
| Copper | 7.4 | 11.1 | 7.8 | 3.6 J | NA |
| Iron | 14,400 | 22,300 | 20,600 | 15,100 | NA |
| Lead | 6.4 | 9.5 | 4.2 | 4.7 | 0.0897 |
| Magnesium | 204 J | 170 J | 80.3 J | 35.5 J | NA |
| Manganese | 89.7 | 60 | 31.7 | 17.9 | NA |
| Mercury | 0.07 J | 0.05 J | -- | -- | -- |
| Nickel | 3.2 J | 3.2 J | -- | -- | NA |
| Potassium | 197 J | 205 J | 154 J | 116 J | NA |
| Selenium | -- | -- | -- | -- | -- |
| Sodium | 172 J | 160 J | 248 J | 181 J | NA |
| Vanadium | 39.6 | 61.5 | 57.1 | 40.4 | NA |
| Zinc | 10.9 | 13.6 | 7.4 | 5.2 J | NA |

[1] The A in the sample locator indicates a duplicate sample.
[2] Analytes for toxicity characteristics leaching procedure (TCLP) are in milligrams per liter.

Notes: Inorganic concentrations are reported in milligrams per kilogram.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.
NA = these analytes are not included in the TCLP list of metal analytes.

## Table 4-41
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 29 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 29SB1-0-2 | 29SB1-0-2A[1] | 29SB1-5-7 | 29SB1-60-62 | 29SB1-125-127 | 29SB2-0-2 | 29SB2-12-14 | 29SB3-0-2 | 29SB3-10-12 | 29SB4-0-2 | 29SB4-5-7 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 12-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34824001 | 34824002 | 34823007 | 34823006 | 34846007 | 34815007 | 34815008 | 34815019 | 34815020 | 34815009 | 34815010 |
| **Target Compound List Volatile Organic Compounds (VOCs) (µg/kg)** | | | | | | | | | | | |
| Acetone | -- | -- | -- | -- | 33 | -- | -- | -- | 140 J | 400 J | -- |
| 2-Butanone | 3 J | -- | -- | -- | -- | -- | -- | -- | -- | 4 J | 13 |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | | | | |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | -- | 44 J | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- | -- | 46 J | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | | | | |
| Dieldrin | -- | -- | -- | -- | -- | -- | 75 J | -- | -- | -- | -- |
| 4,4'-DDE | 8.8 J | 5.0 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | 200.0 J | 110.0 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- | -- | -- | 2.6 J | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | 3.1 J | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | | |
| | 44.3 | 37.1 | -- | -- | -- | 4.2 | 2.2 | 103 | 2.2 | 377 | 16.4 |

See notes at end of table.

## Table 4-41 (Continued)
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 29 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 29SB4-15-17 | 29SB5-0-2 | 29SB5-5-7 | 29SB5-10-12 | 29SB5-15-17 |
|---|---|---|---|---|---|
| Collect Date | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34815011 | 34815013 | 34815014 | 34815015 | 34815016 |
| **TCL VOCs (μg/kg)** | | | | | |
| Acetone | -- | 35 J | 170 J | 240 J | -- |
| 2-Butanone | -- | -- | -- | -- | -- |
| **TCL SVOCs (μg/kg)** | | | | | |
| Butylbenzylphthalate | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl) phthalate | -- | -- | -- | -- | -- |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | |
| Dieldrin | -- | -- | -- | -- | -- |
| 4,4'-DDE | -- | 22 J | -- | -- | -- |
| 4,4'-DDD | -- | 27 J | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | 4.3 J | -- |
| alpha-Chlordane | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | |
| | -- | 124 | -- | -- | 4.2 |

[1] The A in the sample locator indicates a duplicate sample.

Notes: μg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
4,4'-DDD - 4,4'-dichlorodiphenyldichloroethane.
4,4'-DDE - 4,4'-dichlorodiphenyldichloroethene.
4,4'-DDT - 4,4'-dichlorodiphenyltrichloroethane.

## Table 4-42
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 29 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 29SB1-0-2 | 29SB1-0-2A[1] | 29SB1-5-7 | 29SB1-60-62 | 29SB1-125 | 29SB2-0-2 | 29SB2-12-14 | 29SB3-0-2 | 29SB3-10-12 | 29SB4-0-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 07-JAN-93 | 12-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34824001 | 34824002 | 34823007 | 34823006 | 34846007 | 34815007 | 34815008 | 34815019 | 34815020 | 34815009 |
| Aluminum | 4,310 | 4,390 | 8,710 | 347 | 73 | 15,800 | 12,700 | 16,300 | 8,360 | 10,400 |
| Antimony | -- | | -- | -- | -- | -- | 11.5 J | -- | -- | -- |
| Arsenic | 1.1 J | 0.57 J | 0.48 J | -- | 0.19 J | 2.4 | 0.87 J | 3.7 | 1.1 J | 3 |
| Barium | 7.7 J | 8.1 J | 6.2 J | 0.51 J | 0.12 J | 14.1 J | 11.7 J | 8.3 J | 8.3 J | 10.3 J |
| Beryllium | -- | -- | -- | -- | -- | | | 0.09 J | -- | -- |
| Calcium | 258 J | 247 J | 206 J | 70.3 J | 58.7 J | 156 J | -- | 481 J | -- | 242 J |
| Chromium | 4 | 4.1 | 11.2 | 2.1 J | 0.93 J | 13 | 77.5 | 16 | 9.5 | 8.4 |
| Cobalt | -- | -- | -- | -- | -- | 0.79 J | 4.1 J | 0.98 J | 1.7 J | 0.66 J |
| Copper | 3.2 J | 2.9 J | 2.7 J | 1.2 J | 1.8 J | 4.2 J | -- | 2.6 J | -- | 8.1 |
| Iron | 3,670 | 2,790 | 13,100 | 457 | 277 | 7,230 | 71,500 | 11,400 | 31,800 | 5,480 |
| Lead | 10.6 J | 6.2 J | 2 | 0.3 J | 0.17 J | 11.4 | 3.6 | 8.8 | 4.8 | 14.4 |
| Magnesium | 65.1 J | 70.6 J | 36.4 J | 14.3 J | 13 J | 182 J | 114 J | 75.5 J | 88.8 J | 131 J |
| Manganese | 91.8 | 92.6 | 15.2 | 2.4 J | 2.2 J | 28.2 | 9.5 | 21.8 | 5.9 | 45.8 |
| Mercury | -- | -- | -- | 0.04 J | 0.02 J | -- | -- | 0.02 J | 0.02 J | -- |
| Nickel | 1.9 J | 2.7 J | -- | -- | -- | 3.4 J | -- | -- | -- | 2.8 J |
| Potassium | 43.6 J | 59.9 J | 48.7 J | -- | 108 J | -- | -- | -- | 179 J | -- |
| Selenium | -- | -- | -- | -- | -- | 1 J | -- | 1.4 | -- | 1 J |
| Silver | -- | -- | -- | -- | -- | -- | 3.4 | -- | 1.3 J | -- |
| Sodium | 186 J | 159 J | 194 J | 169 J | 150 J | 23.5 J | -- | 12.9 J | -- | -- |
| Vanadium | 9 J | 6.8 J | 33.3 | 1.6 J | -- | 20.1 | 304 | 41 | 31.1 | 14.8 |
| Zinc | 6.2 | 6.5 | 4 J | 3.8 J | 13.6 | 7.1 | -- | 11.3 | -- | 6 |
| Cyanide | -- | -- | -- | -- | -- | 0.45 J | 0.66 J | 0.46 J | 0.53 J | 0.53 J |

See notes at end of table.

## Table 4-42 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 29 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 29SB4-5-7 | 29SB4-15-17 | 29SB5-0-2 | 29SB5-5-7 | 29SB5-10-12 | 29SB5-15-17 |
|---|---|---|---|---|---|---|
| Collect Date | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 | 06-JAN-93 |
| Lab Sample No. | 34815010 | 34815011 | 34815013 | 34815014 | 34815015 | 34815016 |
| Aluminum | 22,300 | 1,310 | 4,090 | 7,090 | 13,900 | 2,810 |
| Antimony | -- | -- | -- | -- | -- | -- |
| Arsenic | 2.5 | -- | 2.5 | 1.1 J | 1.1 J | 0.87 J |
| Barium | 12.6 J | 1.4 J | 7.1 J | 8.6 J | 3.2 J | 2.1 J |
| Beryllium | -- | -- | -- | -- | -- | -- |
| Calcium | 120 J | -- | 239 J | 24.5 J | -- | -- |
| Chromium | 15.6 | 1.9 J | 9.4 | 10 | 145 | 2.4 |
| Cobalt | -- | -- | 0.65 J | -- | 6.6 J | -- |
| Copper | 3.4 J | -- | 1.7 J | -- | -- | 1.9 J |
| Iron | 6,760 | 2,260 | 8,820 | 10,800 | 146,000 | 1,840 |
| Lead | 1.6 | 1.4 | 20.1 | 4 | 4.6 | 4.1 |
| Magnesium | 126 J | 16.1 J | 298 J | 31.1 J | 45.9 J | 26.9 J |
| Manganese | 30.1 | 1.6 J | 80.9 | 5.2 | 15.8 J | 2.7 J |
| Mercury | -- | -- | 0.17 | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- |
| Potassium | -- | -- | -- | -- | -- | -- |
| Selenium | 0.82 J | -- | 0.79 J | 0.9 J | -- | -- |
| Silver | -- | -- | -- | -- | 5.9 J | -- |
| Sodium | -- | -- | -- | -- | -- | -- |
| Vanadium | 23.2 | 5.5 J | 19 | 28.3 | 513 | 13.6 |
| Zinc | 4.1 J | 0.48 J | 13.5 | -- | -- | 0.48 J |
| Cyanide | 0.62 J | 0.68 J | 0.57 J | 0.5 J | 0.57 J | 0.52 J |

[1]"A" in the sample designation indicates a duplicate sample.

Notes: Inorganic concentrations are reported in micrograms per kilogram (μg/kg).
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.

were detected in samples from the 0- to 2-foot bls interval from borings 29SB3, 29SB4, and 29SB5. Detected concentrations of TPHs are presented on Figure 4-7.

TAL Metals and (Total) Cyanide. Twenty-two inorganic analytes were detected in subsurface soil samples collected from Site 29 (Table 4-42). Seven of the analytes (aluminum, barium, chromium, iron, lead, magnesium, and manganese) were detected in all of the samples. Aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, selenium, silver, vanadium, and zinc were detected above the CRDLs. The reported concentrations for 12 of the analytes (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, selenium, silver, vanadium, and zinc) were qualified as estimated during the data validation process.

**4.5.2.6 Site 30, South Field Maintenance Hangar Area** Detected concentrations of organic analytes in soil borings at Site 30 are summarized in Table 4-43. Sample locations are presented on Figure 2-15.

TCL VOCs. Three VOCs (acetone, 2-butanone, and TCE) were detected in 14 of 23 subsurface soil samples collected at Site 30. Acetone was detected in 14 of 23 subsurface soil samples. Acetone concentrations ranged from 26 to 690 μg/kg. The three highest acetone concentrations were reported in samples from soil borings 30SB1, 30SB3 and 30SB7 (μg/kg). TCE was detected in 7 of 23 subsurface soil samples. Concentrations of TCE in subsurface soil samples were in the range of 5 J to 180 J μg/kg. 2-Butanone was detected as a single occurrence in sample 30SB4-10-12 at a concentration of 6 J μg/kg.

TCL SVOCs. Twelve SVOCs were detected in subsurface soil samples from Site 30. All reported concentrations of the 12 analytes (except naphthalene and 2-methylnaphthalene) were detected below the CRQLs and were qualified as estimated. Naphthalene concentrations were above the CRQLs in samples from soil borings 30SB2 and 30SB4, reported at 1,100 and 20,000 μg/kg, respectively. 2-Methylnaphthalene was detected at a concentration (4,700 μg/kg) above the CRQL in a sample from soil boring 30SB2. Both naphthalene and 2-methylnaphthalene occurrences were from shallow samples collected within the interval from 0 to 7 feet bls.

Pesticides and PCBs. Two pesticide compounds (4,4'-DDD and dieldrin) were detected in subsurface soil samples from Site 30. 4,4'-DDD was detected at an estimated concentration of 6.3 μg/kg in the 10- to 12-foot bls sample interval from soil boring 30SB1. Dieldrin was detected at concentrations of 1.9 and 13.0 μg/kg in the 0- to 2-foot bls sample interval from boring 30SB3. Both pesticide compounds were reported at concentrations greater than the CRQLs. PCBs were not detected in subsurface soil samples at Site 30.

TPHs. TPHs were detected in 20 of 23 subsurface soil samples from Site 30. Detected concentrations ranged from 2.7 to 21,200 mg/kg. Detected concentrations of TPHs are presented in Figure 4-7.

TAL Metals and (Total) Cyanide. Detected concentrations of Site 30 inorganic analytes are summarized in Table 4-44. Twenty-two inorganic analytes were detected in subsurface soil samples from Site 30 (Table 4-44). Aluminum, chromium, iron, and vanadium were the only four inorganic analytes detected in all 23 subsurface soil samples collected from Site 30. Aluminum, arsenic, cadmium, calcium, chromium, iron, lead, manganese, mercury, selenium, silver, vanadium, and zinc were detected at concentrations above the CRDLs. Cyanide was detected in 16 of 23 samples at concentrations ranging from 0.37 to 0.55 μg/kg.

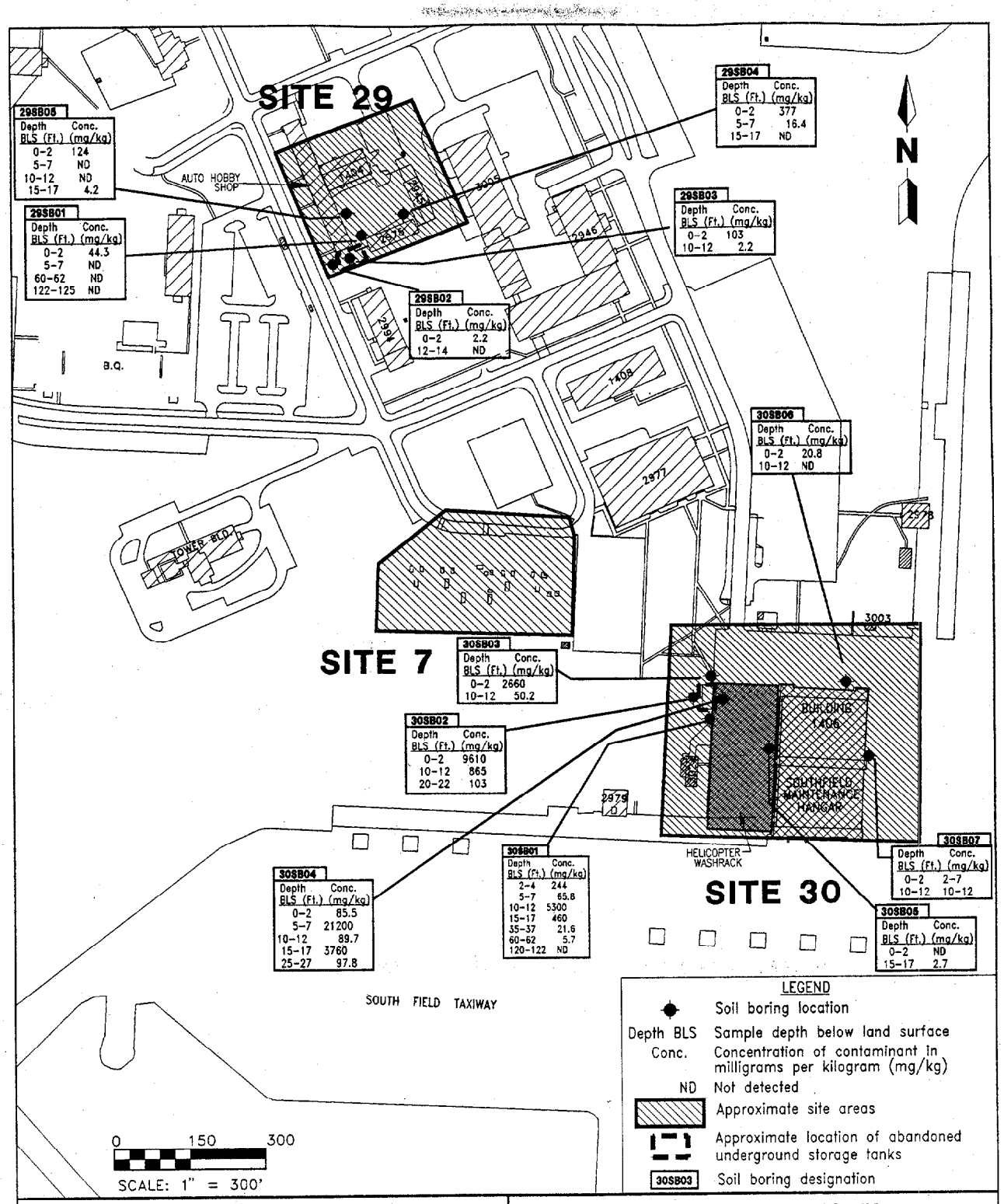


**FIGURE 4-7**
**SITES 7, 29, AND 30, TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS FOR SUBSURFACE SOIL SAMPLES FROM SOIL BORINGS AT THE SOUTH FIELD**

WHITING/7560-16/TEC-MEM3/SOUTHCTR/KP-SB/5-11-95

**RI PROGRAM PHASE IIA**
**TECHNICAL MEMORANDUM No. 3, SOIL ASSESSMENT**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

## Table 4-43
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 30 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB1-2-4 | 30SB1-2-4A[1] | 30SB1-5-7 | 30SB1-10-12 | 30SB1-15-17 | 30SB1-35-37 | 30SB1-60-62 | 30SB1-120-122 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 08-DEC-92 |
| Lab Sample No. | 34607006 | 34607007 | 34607008 | 34607009 | 34607010 | 34607013 | 34607014 | 34617001 |
| **Target Compound List (TCL) VOCs (µg/kg)** | | | | | | | | |
| Acetone | -- | -- | 64 J | 690 J | 53 J | -- | -- | -- |
| Trichloroethene | 38 | 41 | 160 | -- | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Semivolatile Organic Compounds (SVOCs) (µg/kg)** | | | | | | | | |
| 4-Methylphenol | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- |
| Dimethylphthalate | -- | -- | -- | 330 J | -- | -- | -- | -- |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)-phthalate | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | 92 J | -- | -- | -- | 150 J | -- | 2 J |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (µg/kg)** | | | | | | | | |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | 6.3 J | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | |
| | 244 | 122 | 65.8 | 5,300 | 460 | 21.6 | 5.7 | -- |

See notes at end of table.

## Table 4-43 (Continued)
## Summary Analytical Results for Detected Organic Analytes in Subsurface Soil Samples from Site 30 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB02-0-2 | 30SB02-10-12 | 30SB02-20-22 | 30SB03-0-2 | 30SB03-10-12 | 30SB04-0-2 | 30SB04-5-7 | 30SB4-10-12 | 30SB4-15-17 | 30SB4-25-27 |
|---|---|---|---|---|---|---|---|---|---|---|
| Collect Date | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34799009 | 34799010 | 34799011 | 34799007 | 34799008 | 34799012 | 34799013 | 34807008 | 34807009 | 34807010 |
| **Target Compound List (TCL) VOCs (µg/kg)** | | | | | | | | | | |
| Acetone | -- | 26 | 9 J | -- | 380 J | -- | -- | 86 | -- | 52 |
| Trichloroethene | 180 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Butanone | -- | -- | -- | -- | -- | -- | -- | 6 J | -- | -- |
| **TCL SVOCs (µg/kg)** | | | | | | | | | | |
| 4-Methylphenol | -- | 44 J | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | 4,400 J | -- | -- | 69 J | -- | -- | -- | -- | -- | -- |
| Naphthalene | 970 | -- | -- | -- | -- | -- | 20,000 | -- | -- | -- |
| Dimethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Diethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | 36 J |
| Benzo(b)fluoranthene | -- | 62 J | -- | -- | | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | 65 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | 47 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | 71 J | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | 350 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | 120 J | -- | -- | -- | -- | -- | 680 J | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 330 J | -- |
| bis(2-Ethylhexyl)phthalate | 160 J | -- | -- | -- | -- | 110 J | 830 J | -- | -- | -- |
| **TCL Pesticides and PCBs (µg/kg)** | | | | | | | | | | |
| Dieldrin | 1.9 | -- | -- | 13 J | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | 2.6 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | | | | | |
| | 9,610 | 865 | 103 | 2,660 | 50.2 | 855 | 21,200 | 89.7 | 3,760 | 97.8 |

See notes at end of table.

## Table 4-43 (Continued)
## Summary of Analytical Organic Results of Subsurface Soil Samples from Soil Borings at Site 30

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB5-0-2 | 30SB5-15-17 | 30SB6-0-2 | 30SB6-10-12 | 30SB7-0-2 | 30SB7-10-12 |
|---|---|---|---|---|---|---|
| Collect Date | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34807023 | 34807024 | 34807021 | 34807022 | 34807011 | 34807012 |
| **TCL VOCs (μg/kg)** | | | | | | |
| Acetone | 32 | 27 | 60 | 45 | – | [2]–/370 |
| Trichloroethene | 5 J | – | – | – | 30 | – |
| **TCL SVOCs (μg/kg)** | | | | | | |
| 4-Methylphenol | – | – | – | – | – | – |
| Naphthalene | – | – | – | – | – | – |
| Dimethylphthalate | – | – | – | – | – | – |
| Diethylphthalate | – | – | – | – | – | – |
| 2-Methylnaphthalene | – | – | – | – | – | – |
| Fluorene | – | – | – | – | – | – |
| Phenanthrene | – | – | – | – | – | – |
| Pyrene | – | – | – | – | – | – |
| bis(2-Ethylhexyl)phthalate | – | – | – | – | – | – |
| Benzo(b)fluoranthene | – | – | – | – | – | – |
| Benzo(a)pyrene | – | – | – | – | – | – |
| Indeno(1,2,3-cd)pyrene | – | – | – | – | – | – |
| Benzo(g,h,i)perylene | – | – | – | – | – | – |
| **TCL Pesticides and PCBs (μg/kg)** | | | | | | |
| Dieldrin | – | – | – | – | – | – |
| 4,4'-DDD | – | – | – | – | – | – |
| **Total Petroleum Hydrocarbon (mg/kg)** | | | | | | |
| | – | 2.7 | 20.8 | – | 2.7 | 4.3 |

[1] The A following the sample locator indicates a duplicate sample.
[2] Original sample extract analyzed was rejected and sample was re-extracted and reanalyzed.

Notes: μg/kg = micrograms per kilogram.
– = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
4,4'-DDD = 4,4'-dichlorodiphenyldichloroethane.
mg/kg = milligrams per kilogram.

## Table 4-44
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 30 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB1-2-4 | 30SB1-2-4A[1] | 30SB1-5-7 | 30SB1-10-12 | 30SB1-15-17 | 30SB1-35-37 | 30SB1-60-62 | 30SB1-120-122 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 06-DEC-92 | 08-DEC-92 |
| Lab Sample No. | 34607006 | 34607007 | 34607008 | 34607009 | 34607010 | 34607013 | 34607014 | 34617001 |
| Aluminum | 14,600 | 15,700 | 11,000 | 999 | 814 | 138 | 618 | 1,270 |
| Arsenic | 2.5 | 1.5 J | 1.3 J | 1 J | 0.19 J | -- | -- | -- |
| Barium | 15.8 J | 17.4 J | 17.1 J | 0.8 J | 0.51 J | 0.37 J | 0.6 J | 3.3 J |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | 0.5 J | 0.65 J | 0.4 J | -- | -- | -- | -- | 0.71 J |
| Calcium | 567 J | 548 J | 787 J | 250 J | 116 J | 118 J | 108 J | 175 J |
| Chromium | 14.6 | 15.3 | 11.1 | 2.2 J | 2.7 | 1.1 J | 1.5 J | 4.4 |
| Cobalt | -- | -- | 1.8 J | -- | -- | -- | -- | -- |
| Copper | 4.8 J | 5 J | 3.9 J | 1.9 J | 0.98 J | 0.62 J | 0.83 J | 3 J |
| Iron | 12,800 | 13,800 | 10,400 | 2,390 | 846 | 199 | 104 | 17,800 |
| Lead | 7.7 | 7.8 | 8.1 | 1.5 | 0.36 J | 0.23 J | 0.3 J | 1.4 |
| Magnesium | 180 J | 191 J | 146 J | 22.1 J | 10.4 J | 11.3 J | 13.5 J | 50.5 J |
| Manganese | 82.3 | 140 | 177 | 2.4 J | 2.4 J | 0.96 J | 1.2 J | 4.4 |
| Mercury | 0.04 J | 0.05 J | 0.04 J | -- | -- | -- | -- | -- |
| Nickel | -- | 2.3 J | -- | -- | -- | -- | -- | -- |
| Potassium | 171 J | 215 J | 97.8 J | 98.2 J | 65.9 J | 49.2 J | 83.8 J | 135 J |
| Selenium | 0.76 J | 0.15 J | 0.18 J | -- | -- | -- | -- | 0.4 J |
| Silver | 0.52 | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 201 J | 168 J | 214 J | 199 J | 172 J | 203 J | 134 J | 257 J |
| Vanadium | 34.6 | 36.2 | 27.3 | 11.5 | 3.1 J | 0.77 J | 0.87 J | 12.3 J |
| Zinc | 7.7 | 6.8 | 6.7 | 2 J | 1.9 J | 3 J | 1.4 J | 10.5 J |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- |

See notes at end of table.

## Table 4-44 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 30 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB02-0-2 | 30SB02-10-12 | 30SB02-20-22 | 30SB03-0-2 | 30SB03-10-12 | 30SB04-0-2 | 30SB04-5-7 | 30SB4-10-12 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 04-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34799009 | 34799010 | 34199011 | 34799007 | 34799008 | 34799012 | 34799013 | 34807008 |
| Aluminum | 8,190 | 965 | 127 | 18,000 | 5,000 | 12,000 | 6,550 | 15,900 |
| Arsenic | 4 | 2.2 J | -- | 4.5 | 1.1 J | 5.2 | 0.67 J | 2.1 J |
| Barium | 13.1 J | 1.2 J | -- | 12 J | 2.7 J | 10 J | 8.4 J | 4.5 J |
| Beryllium | 0.08 J | -- | -- | -- | -- | 0.09 J | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | 0.95 | -- | -- |
| Calcium | 606 J | 156 J | 34.4 J | 473 J | 131 J | 137 J | 190 J | 99.5 J |
| Chromium | 17.2 | 0.93 J | 0.63 J | 20.6 | 5.1 | 14.8 | 9.5 | 15.6 |
| Cobalt | 1.6 J | -- | -- | 1.8 J | -- | 2 J | 1 J | 1.2 J |
| Copper | 1.1 J | -- | 0.6 J | 2.2 J | 1.1 J | 1.8 J | 1.1 J | 4.4 J |
| Iron | 13,800 | 1,770 | 113 | 18,500 | 5,520 | 16,300 | 12,400 | 13,900 |
| Lead | 26.2 | 2.1 | 0.27 J | 9.3 | 2.2 | 66 | 22 | 4 |
| Magnesium | 112 J | 14 J | -- | 237 J | 31.7 J | 61.2 J | 36 J | 56.6 J |
| Manganese | 146 | 1.9 J | 0.29 J | 23.2 | 7.5 | 15.9 | 26.3 | 10 |
| Mercury | 0.03 J | -- | -- | 0.02 J | -- | -- | 0.03 J | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | -- | -- | -- | 122 J | -- | 202 J | -- | -- |
| Selenium | 2.1 | -- | -- | 1.7 | -- | 2.1 | -- | 0.97 J |
| Silver | 0.9 J | -- | -- | 0.89 J | 0.67 J | 0.77 J | 0.94 J | -- |
| Sodium | -- | -- | 33.9 J | -- | -- | -- | -- | -- |
| Vanadium | 37.4 | 7.2 J | 0.73 J | 55 | 21.4 | 44.6 | 32.6 | 39.7 |
| Zinc | 1.6 J | -- | 2.5 J | 2.5 J | 0.64 J | 3.1 J | 1.2 J | 0.86 J |
| Cyanide | 0.48 J | 0.53 J | 0.51 J | 0.44 J | 0.37 J | 0.49 J | 0.51 J | 0.45 J |

*See notes at end of table.*

## Table 4-44 (Continued)
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 30 Soil Borings

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 30SB4-15-17 | 30SB4-25-27 | 30SB5-0-2 | 30SB5-15-17 | 30SB6-0-2 | 30SB6-10-12 | 30SB7-0-2 | 30SB7-10-12 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 | 05-JAN-93 |
| Lab Sample No. | 34807009 | 34807010 | 34807023 | 34807024 | 34807021 | 34807022 | 34807011 | 34807012 |
| Aluminum | 115 | 105 | 12,200 | 2,720 | 12,600 | 3,230 | 12,200 | 5,720 |
| Arsenic | -- | -- | 2.8 | 2 J | 4.4 | 8.6 | 3.3 | 6 |
| Barium | 0.2 J | -- | 22.3 J | 1.8 J | 20.4 J | 4.7 J | 26.1 J | 6.8 J |
| Beryllium | -- | -- | 0.13 J | -- | 0.14 J | -- | 0.13 J | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 139 J | 16.5 J | 1,850 | -- | 262 J | -- | 976 J | 65.4 J |
| Chromium | 1.5 J | 1.7 J | 12.1 | 4.4 | 10.5 | 7.5 | 8.4 | 15.4 |
| Cobalt | -- | -- | 2.3 J | -- | 4.4 J | 2.3 J | 2.4 J | 1.9 J |
| Copper | 4.6 J | 0.75 J | 2.5 J | 0.48 J | 1.4 J | -- | 2.7 J | -- |
| Iron | 231 | 114 | 11,100 | 4,500 | 12,700 | 19,800 | 8,250 | 15,900 |
| Lead | -- | -- | 16 | 1.9 | 9.5 | 9.4 | 7.4 | 7.1 |
| Magnesium | 70.7 J | -- | 126 J | 8.9 J | 87.2 J | 43.9 J | 110 J | 49.7 J |
| Manganese | 0.7 J | -- | 558 | 9 | 336 | 88.1 | 898 | 26.7 |
| Mercury | -- | -- | 0.06 | 0.04 J | 0.04 J | 0.02 J | 0.05 J | 0.02 J |
| Nickel | -- | -- | 3 J | -- | -- | -- | 3.3 J | -- |
| Potassium | -- | -- | 127 J | -- | -- | -- | 185 J | -- |
| Selenium | -- | -- | -- | -- | 1.4 | 1.8 | 1.9 | 3.1 |
| Silver | -- | -- | -- | -- | -- | 0.84 J | -- | -- |
| Sodium | -- | -- | 14.3 J | -- | -- | -- | 13.7 J | -- |
| Vanadium | 0.99 J | 1.1 J | 29.3 | 12.4 | 33 | 40.4 | 21.1 | 43.9 |
| Zinc | 2.3 J | 0.56 J | 4.6 | 0.5 J | 2.2 J | -- | 4.1 J | 0.88 J |
| Cyanide | 0.48 J | 0.48 J | 0.53 J | 0.46 J | 0.55 J | 0.53 J | 0.6 J | 0.52 J |

[1] The A following the sample locator indicates a duplicate sample.

Notes: Inorganic concentrations are reported in milligrams per kilograms.
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.

4.6 RESULTS OF INVESTIGATIONS TO SUPPORT NO FURTHER ACTION DECISION AT SITES 2 AND 12. The following sections present detected concentrations of TAL analytes from a soil boring from Site 2 and eight surface soil samples collected from Site 12. These samples were collected and analyzed as a confirmatory study, in an effort to support an NFA decision for Sites 2 and 12.

4.6.1 Site 2 Table 4-45 summarizes the analytical results for TCL and TAL analytes detected in subsurface soil samples collected at Site 2. Sample locations are presented on Figure 2-1.

TCL VOCs. TCL VOCs were not detected in the subsurface soil samples collected from soil borings at Site 2.

TCL SVOCs. Three SVOCs (2-methylnaphthalene, bis(2-ethylhexyl)phthalate, and phenanthrene) were detected in three of seven samples collected from a soil boring drilled at the site. Concentrations of these SVOCs were detected below CRQLs and were qualified as estimated.

Pesticides and PCBs. Four pesticide compounds (dieldrin, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane) and one PCB compound (Aroclor-1260) were detected in five of seven subsurface soil samples collected from one soil boring at the site. The detected concentrations were below CRQLs and were qualified as estimated.

TAL Metals and (Total) Cyanide. Eighteen inorganic analytes were detected in the subsurface soil samples from Site 2. Ten of the analytes (aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, sodium, and vanadium) were detected in all seven of the samples. Two of the analytes (aluminum and iron) were detected at concentrations above CRDLs. Ten analytes (arsenic, barium, beryllium, cadmium, copper, magnesium, nickel, potassium, silver, and sodium) were detected below CRDLs and were qualified as estimated. Six analytes (calcium, chromium, lead, manganese, vanadium, and zinc) were detected at concentrations that were above CRDLs in some cases and below CRDLs in others. All concentrations detected below CRDLs were qualified as estimated during the data validation process.

4.6.2 Site 12 Detected concentrations of analytical results for soil samples collected at Site 12 are summarized in Table 4-46. Locations of soil samples are presented on Figure 2-4. Twenty TAL metals were detected in soil samples collected at Site 12. Ten TAL metals were detected at concentrations exceeding CRDLs. One TAL metal (barium) was detected below CRDLs and was qualified as estimated. The highest detected concentrations of metals above the CRDLs were collected from mounds "A" and "C" (samples 1 and 5). These analyte concentrations were compared with twice the background mean concentrations for Troup loamy sand. Lead concentrations from three samples exceeded twice the background average for lead. Lead concentrations ranged from 3.8 to 29.9 mg/kg (Table 4-46).

# Table 4-45
## Summary Analytical Results for Detected Analytes in Subsurface Soil Samples from Site 2 Soil Boring

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 2SB01(0-2) | 2SB01(0-2)A[1] | 2SB01(10-12) | 2SB01(15-17) | 2SB01(20-22) | 2SB01(5-7) | 2SB01(50-52) | 2SB01(65-70) |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 31-JUL-93 | 31-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 | 30-JUL-93 |
| Lab Sample No. | 94016001 | 94016002 | 94015005 | 94015006 | 94015007 | 94015004 | 94015008 | 94015009 |
| **Target Compound List (TCL) Semivolatile Organic Compounds (SVOC) (µg/kg)** | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | 810 J | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | 520 J | -- | -- | -- | -- | -- |
| bis(2-ethylhexyl)-phthalate | 90 J | 120 J | -- | -- | -- | -- | -- | -- |
| **TCL Pesticides and Polychlorinated Biphenyls (PCBs) (µg/kg)** | | | | | | | | |
| Dieldrin | 13 J | 10 J | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | 3.9 J | 3.4 J | -- | -- | -- | -- | -- | -- |
| alpha-Chlordane | -- | -- | 3.3 J | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | 3.1 J | -- | -- | -- | -- | -- |
| Aroclor-1260 | -- | -- | 320 J | 31 J | -- | -- | -- | -- |
| **Target Analyte List (TAL) Metals** | | | | | | | | |
| Aluminum | 5,000 | 5,950 | 2,380 | 2,090 | 525 | 3,760 | 63 | 221 |
| Arsenic | 0.91 J | 0.73 J | 0.37 J | 0.25 J | 0.13 J | 0.54 J | -- | -- |
| Barium | 8.2 J | 8.5 J | 3.7 J | 10.4 J | 1.5 J | 7.4 J | 0.54 J | 0.67 J |
| Beryllium | -- | -- | -- | 0.15 J | -- | -- | 0.11 J | -- |
| Cadmium | -- | -- | 0.24 J | 0.22 J | -- | 0.17 J | 0.24 J | -- |
| Calcium | 1,040 J | 923 J | 687 J | 8,060 | 269 J | 1,820 | 118 J | 135 J |
| Chromium | 4.9 | 5.8 | 3 | 1.9 J | 1.9 J | 3.6 | 1 J | 1.4 J |
| Copper | -- | -- | 1.6 J | 1.1 J | 0.83 J | 1.8 J | 0.43 J | 0.61 J |
| Iron | 2,990 | 3,470 | 1,750 | 775 | 669 | 2,170 | 256 | 325 |
| Lead | 18.9 | 12.7 | 2.6 | 1.9 | 0.73 | 4.9 | 0.25 J | 0.36 J |
| Magnesium | 115 J | 142 J | 78.8 J | 134 J | 26.3 J | 261 J | 16.4 J | 14.6 J |
| Manganese | 61.5 | 56.4 | 10.8 | 53.5 | 3.4 | 31.6 | 1.7 J | 1.8 J |
| Nickel | -- | 1.7 J | -- | -- | -- | -- | -- | -- |
| Potassium | -- | -- | 104 J | 343 J | 153 J | 138 J | 154 J | 90.3 J |
| Silver | -- | -- | -- | -- | -- | -- | 0.42 J | -- |
| Sodium | 164 J | 171 J | 137 J | 197 J | 149 J | 154 J | 114 J | 153 J |
| Vanadium | 9.2 J | 10.5 J | 6.5 J | 2.7 J | 3.5 J | 7 J | 0.68 J | 1.2 J |
| Zinc | -- | 12 | 4.4 J | 4.1 J | 2 J | 5 J | 3.1 J | 2.2 J |

[1] The A following the sample locator indicates a duplicate sample.

Notes: µg/kg = micrograms per kilogram.
-- = the analyte was not detected in laboratory analysis.
J = the associated numerical value is an estimated quantity.
mg/kg = milligrams per kilogram.

## Table 4-46
## Summary Analytical Results for Detected Inorganic Analytes in Subsurface Soil Samples from Site 12 Mounds and Ground Interface

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Locator | 12-SS-1 | 12-SS-2 | 12-SS-3 | 12-SS-4 | 12-SS-5 | 12-SS-6 | 12-SS-7 | 12-SS-8 |
|---|---|---|---|---|---|---|---|---|
| Collect Date | 20-JUL-93 | 30-JUL-93 | 20-JUL-93 | 20-JUL-93 | 20-JUL-93 | 20-JUL-93 | 20-JUL-93 | 20-JUL-93 |
| Lab Sample No. | 94009003 | 94009004 | 94009005 | 94010001 | 94009006 | 94009007 | 94009008 | 94009009 |
| Aluminum | 7,430 | 12,400 | 12,100 | 11,400 J | 16,500 | 11,200 | 8,370 | 11,700 |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 0.74 J | 0.7 J | 1.2 J | 1 J | 1.9 J | .76 J | .53 J | 1.6 J |
| Barium | 18.8 J | 15.3 J | 11.5 J | 8.9 J | 12.2 J | 11.5 J | 12.2 J | 13.4 J |
| Beryllium | 0.24 J | -- | -- | | 0.13 J | -- | -- | -- |
| Cadmium | 0.16 J | -- | 0.3 J | 0.25 J | 0.31 J | 0.34 J | -- | 0.2 J |
| Calcium | 5,960 | 666 J | 760 J | 2,760 | 603 J | 875 J | 542 J | 954 J |
| Chromium | 5.8 | 12.5 | 12.3 | 9.2 | 13.1 | 10.3 | 6 | 10.7 |
| Cobalt | 1.1 | 1.2 J | 1.5 J | -- | -- | 1.1 J | 1.1 J | 1.6 J |
| Copper | 5.9 | 6.5 | 6 | 4.7 J | 7.2 | 5.3 J | 4 J | 5.8 |
| Iron | 3,780 | 5,920 | 5,810 | 6,550 J | 8,920 | 6,890 | 4,030 | 6,100 |
| Lead | 29.9 | 4.3 | 14.5 | 8.8 | 11.3 | 10.1 | 0.6 | 0.6 |
| Magnesium | 1,130 | 197 J | 231 J | 169 J | 157 J | 141 J | 132 J | 180 J |
| Manganese | 222 | 190 | 111 | 82.5 | 74.9 | 121 | 179 | 146 |
| Mercury | 0.04 J | 0.04 J | -- | -- | -- | 0.03 J | -- | 0.03 J |
| Nickel | 1.6 | -- | 2.7 J | 2.4 J | 1.9 J | -- | 2.3 J | 3.3 J |
| Potassium | 232 J | 203 J | 202 J | -- | 155 J | 162 J | 178 J | 177 J |
| Selenium | 0.24 J | 0.2 J | 0.17 J | -- | 0.19 J | 0.16 J | -- | 0.27 J |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | 225 J | 177 J | 179 J | 221 J | 169 J | 187 J | 187 J | 169 J |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 10.4 J | 16.1 | 15.5 | 16 | 22.9 | 19.3 | 10.3 J | 17.6 |
| Zinc | 9.6 J | 9.2 J | 11.5 | 12.6 J | 10.5 | 8.7 J | 5.8 J | 12.5 |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- |

Notes: Concentrations are reported in milligrams per kilogram (mg/kg).
J = the associated numerical value is an estimated quantity.
-- = the analyte was not detected in laboratory analysis.

## 5.0 SUMMARY AND CONCLUSIONS

**5.1 SITE 1, NORTHWEST DISPOSAL AREA**. The field investigative program included: a geophysical survey, collection and analyses of three surface soil samples, excavation of one test pit, and collection and analysis of one subsurface soil sample from the test pit.

- The geophysical survey results do not suggest the presence of any subsurface disposal areas at the site. One surface anomaly was identified; however, the source was determined to be a steel rebar.

- Three surface soil samples were collected at Site 1. One VOC (xylene [total]) and one pesticide compound (dieldrin) were detected in the surface soil samples. No PCB compounds were detected in the surface soil sample. Seventeen inorganic analytes were detected and five of these (cadmium, chromium, iron, mercury, and potassium) exceeded background screening criteria.

- One test pit was excavated and one subsurface soil sample was collected at Site 1. No solid waste materials were encountered in the test pit. One VOC (acetone) was detected in the subsurface soil samples. Sixteen inorganic analytes were detected. Mercury was the only inorganic target analyte that exceeded the background screening criteria.

**5.2 SITE 2, NORTHWEST OPEN DISPOSAL AREA (LANDFILL)**. The field investigation program included: completion of a soil boring to a depth of 70 feet bls and collection of seven subsurface soil samples and analyses for TCL and TAL analytes.

- VOCs were not detected in the subsurface soil samples. Three SVOCs, four pesticide compounds, and a PCB were detected.

- Eighteen inorganic analytes were detected in the subsurface soil samples; however, subsurface background samples have not been collected to assess whether the concentrations are anthropogenic or represent the waste disposal activities.

**5.3 SITE 9, WASTE FUEL DISPOSAL PIT**. The geophysical survey did not suggest the presence of any anomalies indicating disposal areas or pits. No surface or subsurface soil samples were collected at Site 9.

**5.4 SITE 10, SOUTHEAST OPEN DISPOSAL AREA (A)**. The field investigative program included: a geophysical survey, collection and analyses of five surface soil samples, excavation of five test pits, and collection and analyses of three subsurface soil samples from the test pits.

- Interpretation of the geophysical survey results indicated the presence of a subsurface disposal area covering approximately 4 acres at the site.

- Five surface soil samples were collected at Site 10. One VOC, 11 SVOCs, 1 pesticide compound, and 2 PCB compounds were detected in surface soil

samples. Eighteen inorganic analytes were detected. Thirteen of the analytes (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, mercury, nickel, vanadium, and zinc) were detected at concentrations that exceed the background screening criteria.

- Five test pits were excavated and three subsurface soil samples were collected at Site 10. Materials encountered in the test pit excavation included construction debris and mechanical parts. Five VOCs, eight SVOCs, and five pesticide compounds were detected in subsurface soil samples. Twenty-three inorganic analytes were detected in the subsurface soil samples and 15 of these analytes were detected at concentrations that exceed background screening criteria.

5.5 SITE 11, SOUTHEAST OPEN DISPOSAL AREA (B). The field investigative program included: a geophysical survey, collection and analyses of five surface soil samples and a duplicate, excavation of three test pits, and collection and analyses of three subsurface soil samples from the test pits.

- Interpretation of geophysical survey results suggests the presence of a subsurface disposal area covering approximately 4 acres at the site.

- Five surface soil samples (and a duplicate) were collected at Site 11. No VOC, pesticide, or PCB compounds were detected in surface soil samples. Thirteen SVOCs were detected. Twenty inorganic analytes were detected in the surface soil samples and 11 analytes (arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, potassium, silver, and zinc) were detected at concentrations that exceed the background screening criteria.

- Three test pits were excavated and three subsurface soil samples were collected at Site 11. Construction debris was encountered at depths of 2 to 7 feet bls. Three VOCs, one SVOC, five pesticide compounds, and two PCB compounds were detected in subsurface soil samples. Nineteen inorganic analytes were detected in the subsurface soil samples and 11 of the analytes (arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, mercury, vanadium, and zinc) were detected at concentrations that exceed the background screening criteria.

5.6 SITE 12, TETRAETHYL LEAD SLUDGE DISPOSAL AREA. The field investigative program included collection and analyses of eight soil samples at the interface of mounds and the ground surface.

- Twenty inorganic analytes were detected in the soil samples. Detected concentrations of only one of the analytes (maximum concentration of lead at 29.9 mg/kg) exceeded the background screening criteria (11.9 mg/kg).

5.7 SITE 13, SANITARY LANDFILL. The field investigative program included: a geophysical survey, collection and analyses of five surface soil samples, excavation of five test pits, and collection and analyses of three subsurface soil samples from test pits.

- Interpretation of geophysical survey results suggests the presence of a subsurface disposal area with a series of trenches covering approximately 6 acres at the site.

- Five surface soil samples were collected at Site 13. No TCL VOC, pesticide, or PCB compounds were detected in the surface soil samples. Three SVOCs were detected in surface soil samples. Eighteen inorganic analytes were detected. Seven inorganic analytes (aluminum, arsenic, calcium, chromium, iron, silver, and vanadium) were detected at concentrations that exceed the background screening criteria.

- Domestic solid wastes were the only type of material encountered during the excavation of the test pits. Seven VOCs and five SVOCs were detected in subsurface soil samples. No pesticide or PCB compounds were detected in the subsurface soil samples. Twenty-one inorganic analytes were detected and eight of these (aluminum, arsenic, chromium, iron, mercury, potassium, vanadium, and cyanide) exceeded the background screening criteria.

**5.8 SITE 14, SHORT-TERM SANITARY LANDFILL.** The field investigative program included: a geophysical survey, collection and analyses of three surface soil samples, excavation of three test pits, and collection and analyses of two subsurface soil samples from test pits.

- Interpretation of geophysical survey results suggests the presence of metallic debris buried in a trench covering approximately 1 acre at the site.

- Three surface soil samples were collected at Site 14. One VOC and two SVOCs were detected in surface soil samples. No pesticide or PCB compounds were detected in the surface soil samples. Sixteen TAL inorganic analytes were detected. Five of the analytes (arsenic, cadmium, chromium, iron, and vanadium) were detected at concentrations exceeding the background screening criteria.

- Three test pits were excavated and two subsurface soil samples were collected at Site 14. Material encountered during test pit excavations included domestic solid waste and aircraft parts. Three VOCs and three SVOCs were detected in a single sample. No pesticide or PCB compounds were detected in the subsurface soil samples. Nineteen TAL inorganic analytes were detected in the subsurface soil samples. Six of the analytes (arsenic, cadmium, chromium, iron, mercury, and vanadium) were detected at concentrations exceeding the background screening criteria.

**5.9 SITE 15, SOUTHWEST LANDFILL.** The field investigative program included: a geophysical survey, collection and analyses of 5 surface soil samples and a duplicate, excavation of 10 test pits, and collection and analyses of 5 subsurface soil samples from test pits.

- Interpretation of geophysical survey results indicated the presence of buried ferromagnetic debris in a series of trenches covering approximately 15 acres at the site.

- Five surface soil samples were collected at Site 15. One VOC and one SVOC were detected in surface soil samples. No pesticide or PCB compounds were detected in the surface soil samples. Fifteen inorganic analytes were detected. Two inorganic analytes (copper and lead) exceeded the background screening criteria.

- Ten test pits were excavated and five subsurface soil samples were collected at Site 15. Material encountered during test pit excavations included construction debris, metallic debris, and aircraft parts. Three VOCs, seven SVOCs, one pesticide compound, and one PCB were detected in subsurface soil samples. Detected concentrations of the PCB Aroclor-1242 was of 2,200 $\mu$g/kg. Twenty-one inorganic analytes were detected and five of these (cadmium, lead, mercury, potassium, and cyanide) were detected at concentrations exceeding the background screening criteria.

**5.10 SITE 16, OPEN DISPOSAL AND BURNING AREA**. The field investigative program included: a geophysical survey, collection and analyses of 3 surface soil samples, excavation of 10 test pits, and collection and analyses of 5 subsurface soil samples from test pits.

- Interpretation of geophysical survey results indicated the presence of two disposal areas covering approximately 10 acres at the site.

- Three surface soil samples were collected at Site 16. One VOC, one SVOC, and three pesticide compounds were detected in surface soil samples. No PCB compounds were detected in the surface soil samples. Nineteen inorganic analytes were detected. Reported concentrations for eight of the analytes (barium, calcium, copper, iron, lead, potassium, silver, and zinc) exceeded the background screening criteria.

- Ten test pits were excavated and five subsurface soil samples were analyzed from Site 16. Material encountered during test pit excavations included metallic debris, concrete rubble, aircraft parts, and one piece of a flare. Seven VOCs, eleven SVOCs, and four pesticide compounds were detected in subsurface soil samples. No PCB compounds were detected in the subsurface soil samples. Twenty-one inorganic analytes were detected in the subsurface soil samples. Reported concentrations of 14 analytes (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, mercury, potassium, silver, vanadium, and zinc) exceeded the background screening criteria.

**5.11 SITE 31, SLUDGE DRYING BEDS AND DISPOSAL AREAS**. The field investigative program included: collection of 24 surface soil samples including 8 samples from Site 31A; 8 samples from combined areas Sites 31B, 31C, and 31D; and 8 samples from combined areas Sites 31E and 31F.

- Ten VOCs, three SVOCs, and five pesticides, and one PCB compound were detected in surface soil samples. Twenty three inorganic analytes were detected and concentrations of 15 of these analytes (barium, beryllium, cadmium, calcium, chromium, copper, cyanide, iron, lead, magnesium, manganese, mercury, selenium, silver, and zinc) exceeded the background screening criteria.

**5.12 SITE 17, CRASH CREW TRAINING AREA**. The field investigative program included the collection of 34 surface soil samples including 28 from the burn pits, 4 from dirt mounds, and 1 each from the stained area and airplane debris area. In addition, 10 soil borings were drilled into the vadose zone of the sand-and-gravel aquifer. The soil borings were located in the burn pits, a drainage pathway, and stained surface soil area. Eighteen subsurface soil samples were collected from the soil borings.

- Thirty-four surface soil samples were collected at Site 17. Seven VOCs and four SVOCs were detected in surface soil samples collected at Site 17. No pesticide or PCB compounds were detected in surface soil samples. TPH was detected in samples from the burn pits and drainage pathways.

- Twenty inorganic analytes were detected in surface soil samples. Concentrations of 13 analytes (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, nickel, potassium, vanadium, and zinc) exceeded the background screening criteria. TCLP analyses for metals analytes indicated the presence of barium, cadmium, chromium, lead, and mercury in the sample extract. None of the detected concentrations exceed TCLP regulatory criteria (Federal Register, vol. 55, no. 126, 1990).

- Eight subsurface soil samples were collected from soil borings at Site 17. Three VOCs, two SVOCs, two pesticide compounds, and TPHs were detected in subsurface soil samples collected from burn pits and airplane debris locations. No PCB compounds were detected in subsurface soil samples. Twenty inorganic analytes were detected. Nine of these analytes (aluminum, arsenic, cadmium, chromium, iron, lead, manganese, vanadium, and zinc) were detected above the CRDLs. Background samples have not been collected or identified for the subsurface soil samples.

**5.13 SITE 18, CRASH CREW TRAINING AREA**. The field investigative program included the collection of 47 surface soil samples. In addition, 10 soil borings were drilled into the vadose zone of the sand-and-gravel aquifer. Twenty-four subsurface soil samples were collected from the soil borings in the burn pits and drainage pathway from pit D.

- Forty-seven surface soil samples were collected at Site 18. Seven VOCs, 11 SVOCs, and TPHs were detected in surface soil samples collected from the burn pits, diesel tank area, stressed vegetation area, and airplane carcass area. No pesticide or PCB compounds were detected in surface soil samples. TPH was detected in samples from the burn pits and the drainage pathway. 2-Butanone was detected in samples analyzed by TCLP. Concentrations of metals in the sample extracts were less than the TCLP regulatory criteria.

- Twenty-two inorganic analytes (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, silver, sodium, thallium, vanadium, and zinc) were detected in surface soil samples at Site 18. The inorganic analytes detected, except sodium, were reported in one or more samples at concentrations exceeding the background screening criteria. Analyses of surface soil samples by TCLP for metals indicate the presence of cadmium, chromium, lead, and mercury in the sample extract. Only cadmium exceeded the TCLP regulatory concentration criteria of 1.0 mg/ℓ.

- Twenty-four subsurface soil samples were collected from the soil borings at Site 18. Four VOCs, eight SVOCs, three pesticide compounds, and TPHs were detected in subsurface soil samples from the burn pits (pits D, E, and F). No PCB compounds were detected in the subsurface soil samples. Twenty-one inorganic analytes were detected in subsurface soil samples. Background samples have not been collected or identified for the subsurface soil samples.

**5.14 SITE 3, THE UNDERGROUND WASTE SOLVENT STORAGE TANK**. Ten soil borings were drilled and 33 subsurface soil samples were collected around Building 2941, the abandoned underground waste oil tank location, and the paint locker building (Building 2987). A soil gas survey was also conducted at the site.

- Results of a soil gas survey indicate the presence of the following groups of target organic compounds: BTEX, PCE, cycloalkanes, and naphthalenes at potential source areas.
- Three VOCs, 10 SVOCs, 7 pesticide compounds, and TPHs were detected in the subsurface soil samples collected from the soil borings drilled at Site 3. TPHs were present in 4 of 10 soil borings at depths less than 7 feet bls. Twenty-three inorganic analytes were detected in subsurface soil samples. Background samples have not been collected or identified for the subsurface soil samples.

**5.15 SITE 32, NORTH FIELD MAINTENANCE HANGER**. Eleven soil borings were drilled and 53 subsurface soil samples collected around Building 1424 (the North Field Maintenance Hangar), the abandoned underground tank location, and the aircraft washrack facility. A soil gas survey also was conducted at the site.

- Results of a soil gas survey suggest the presence of the following groups of target organic compounds: BTEX, PCE, TCE, cycloalkanes, and naphthalenes at potential source areas.
- Six VOCs, 13 SVOCs, 2 pesticide compounds, 1 PCB compound, and TPHs were detected in the subsurface soil samples collected from the soil borings. TPHs were detected around the washrack and the abandoned tank localities and the highest concentrations occurred in subsurface sample intervals between 0 and 2 feet bls. However, TPHs were detected as deep as 32 feet bls. Twenty-three inorganic analytes were detected in the subsurface soil samples.

**5.16 SITE 6, SOUTH TRANSFORMER OIL DISPOSAL AREA**. Four soil borings were drilled and 17 subsurface soil samples collected. The soil borings were installed around the drainage ditches at the southeast corner of Building 1454 (the Midfield Maintenance Hangar). A soil gas survey was also conducted at the site.

- Results of a soil gas survey conducted suggest the presence of cycloalkanes and naphthalenes soil gas anomalies at potential source areas.
- Four VOCs, 19 SVOCs, 3 pesticide compounds, 1 PCB compound, and TPHs were detected in subsurface soil samples collected from the soil borings. Twenty-one inorganic analytes were also detected in the subsurface soil samples. Background samples have not been collected or identified for the subsurface soil samples.

**5.17 SITE 33, MIDFIELD MAINTENANCE HANGER**. Five soil borings were drilled and 22 subsurface soil samples collected. The soil borings were installed around the location of an abandoned waste oil tank near Building 1454 and one boring was associated with a soil gas anomaly. A soil gas survey was also conducted at the site.

- Results of a soil gas survey conducted suggest the presence of the following groups of target organic compounds: BTEX, PCE, TCE, cycloalkanes, and naphthalenes at potential source areas.

- Four VOCs, seven SVOCs, six pesticide compounds, and TPHs were detected in the subsurface soil samples collected from the soil borings at Site 33. No PCB compounds were detected in the subsurface soil samples. The pesticide compounds were all detected from one boring that was located in a grass-covered area on the site. Twenty inorganic analytes were also detected in the subsurface soil samples. Background samples have not been collected or identified for the subsurface soil samples. None of the metal concentrations analyzed by TCLP exceeded the TCLP regulatory criteria.

**5.18 SITE 29, THE AUTO HOBBY SHOP**. Five borings were drilled and 15 subsurface soil samples collected. The soil borings were drilled around the location of an abandoned waste oil tank near Buildings 2975 and 1404. A soil gas survey was also conducted at the site.

- Results of a soil gas survey conducted suggest the presence of the following groups of target organic compounds: BTEX, PCE, and cycloalkanes, and naphthalenes at potential source areas.

- Two VOCs, two SVOCs, six pesticide compounds, and TPHs were detected in the subsurface soil samples collected from the soil borings at Site 29. Twenty-two inorganic analytes were detected in the subsurface soil samples. No PCB compounds were detected in subsurface soils samples. Background samples have not been collected or identified for the subsurface soil samples.

**5.19 SITE 30, SOUTH FIELD MAINTENANCE HANGER**. Seven soil borings were drilled and 23 subsurface soil samples collected. The soil borings were drilled around the location of an abandoned waste oil and solvent tank, Building 1406, and the helicopter washrack areas. A soil gas survey was also conducted at the site.

- Results of a soil gas survey conducted suggest the presence of the following groups of target organic compounds: BTEX, PCE, TCE, cycloalkanes, and naphthalenes at potential source areas.

- Three VOCs, 12 SVOCs, 2 pesticide compounds, and TPHs were detected in the subsurface soil samples collected from the soil borings at Site 30. Twenty-two inorganic analytes were also detected in the subsurface soil samples. No PCB compounds were detected in subsurface soil samples. Background samples have not been collected or identified for the subsurface soil samples.

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# APPENDIX A

# GEOPHYSICAL SURVEY

# TECHNICAL REPORT
# GEOPHYSICAL SURVEY

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

## STATEMENT OF WORK NO. 050
## NAVY CLEAN - DISTRICT I
## CONTRACT NO. N62467-89-D-0317

## FEBRUARY 1993

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010

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**DEPARTMENT OF THE NAVY**
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 190010
NORTH CHARLESTON, S.C. 29419-9010

PLEASE ADDRESS REPLY TO THE COMMANDING OFFICER, NOT TO THE SIGNER OF THIS LETTER.
REFER TO:
5090
Code 1859

FEB 16 1993

Florida Department of Environmental Regulation
Attn: Mr. Jorge R. Caspary
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subj: GEOPHYSICAL SURVEY - FINAL TECHNICAL REPORT
REMEDIAL INVESTIGATION - PHASE IIA
NAVAL AIR STATION (NAS), WHITING FIELD, MILTON, FLORIDA

Dear Mr. Caspary:

Southern Division, Naval Facilities Engineering Command, is pleased to submit the subject document on behalf of Naval Air Station (NAS), Whiting Field, Milton, Florida.

If you have any questions or concerns, please contact Ms. Kim Queen, Code 1859, at (803) 743-0341.

Sincerely,

J. B. MALONE, P.E.
Head, Installation Branch
Restoration I Branch

Encl:
(1) Geophysical Survey - Final Technical Report, NAS Whiting Field

**DEPARTMENT OF THE NAVY**
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 190010
NORTH CHARLESTON, S.C. 29419-9010

PLEASE ADDRESS REPLY TO THE COMMANDING OFFICER, NOT TO THE SIGNER OF THIS LETTER.
REFER TO: 5090
Code 1859

FEB 16 1993

U. S. Environmental Protection Agency
Region IV
Attn: Mr. Robert Pope
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Subj: GEOPHYSICAL SURVEY - FINAL TECHNICAL REPORT
REMEDIAL INVESTIGATION - PHASE IIA
NAVAL AIR STATION (NAS), WHITING FIELD, MILTON, FLORIDA

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J. B. MALONE, P.E.
Head, Installation R
Restoration I Bra

Encl:
(1) Geophysical Survey - Final Technical Report, NAS Whiting Field

# TECHNICAL REPORT
# GEOPHYSICAL SURVEY

## REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

## PHASE II-A

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

**UIC: N60508**

**Contract No. N62467-89-D-0317**

**Prepared by:**

**ABB Environmental Services, Inc.**
**2590 Executive Center Circle, East**
**Tallahassee, Florida 32301**

**Prepared for:**

**Department of the Navy, Southern Division**
**Naval Facilities Engineering Command**
**2155 Eagle Drive**
**North Charleston, South Carolina 29418**

**Kim Queen, Code 1859, Engineer-in-Charge**

**February 1993**

# EXECUTIVE SUMMARY

This technical report describes the methodology and presents results and conclusions of the geophysical survey investigation conducted at the Naval Air Station (NAS) Whiting Field, Milton, Florida. The geophysical survey was one of nine field investigative tasks that comprise the Remedial Investigation (RI). The objective of the RI is to address any identified risks posed by toxic or hazardous chemicals present as a result of past waste disposal practices or spills at the facility. The entire Remedial Investigation/ Feasibility Study (RI/FS) program is being conducted at NAS Whiting Field in accordance with the Navy's Installation Restoration Program.

Geophysical surveys were completed at seven former disposal sites at NAS Whiting Field. The sites included:

- Site 1, Northwest Disposal Area,
- Site 10, Southeast Open Disposal Area A,
- Site 11, Southeast Open Disposal Area B,
- Site 13, Sanitary Landfill,
- Site 14, Short Term Sanitary Landfill,
- Site 15, Southwest Landfill, and
- Site 16, Open Disposal and Burning Area.

The purpose of the geophysical survey was to investigate the lateral and vertical extent of the waste disposal areas, identify subsurface features that may act as plume migration pathways, locate buried metallic and nonmetallic objects, and characterize landfill materials. The surveys were conducted from May 26, 1992, through June 14, 1992, and included electromagnetic induction, magnetometry, and direct current resistivity geophysical methods.

The interpreted results of the geophysical survey identified and mapped the lateral boundaries of all investigated disposal areas except Site 1. No subsurface anomalies were detected at Site 1. In addition to identifying primary disposal areas, numerous isolated metallic and non-metallic anomalies were identified and mapped. The vertical extent of the landfills was not determined nor were any contaminant plumes or possible plume migration pathways detected. A detailed summary of the geophysical results including the geophysical methods used, the results of each individual geophysical method, and the interpretation of the geophysical results is presented in Table ES-1 of this Technical Report.

The anomalies identified by the geophysical survey will be verified later by test pitting activities conducted at each of the disposal sites and the complete data set will be used to direct additional investigations at NAS Whiting Field.

## Table ES-1
## Summary of Geophysical Survey

Geophysical Survey, Technical Report
RI/FS Phase II-A, NAS Whiting Field
Milton, Florida

| Site No. | Site Name and Type | Results | | | Interpretation |
|---|---|---|---|---|---|
| | | Magnetometer | EM-31 Conductivity | EM-31 Inphase | |
| 1 | Northwest Disposal Area (landfill) | No anomalies | Flat across the site | Flat across the site | No landfill boundaries can be interpreted. |
| 10 | Southeast Open Disposal Area (A) (landfill) | One large scale anomaly with two isolated point features. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill is interpreted in the southern portion with definite lateral boundaries. |
| 11 | Southeast Open Disposal Area (B) (landfill) | One large scale anomaly with three isolated low amplitude anomalies. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill is interpreted with definite lateral boundaries. |
| 13 | Sanitary Landfill (landfill) | Two linear feature anomalies with a shorter parallel feature and a localized high amplitude anomaly. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill interpreted with a series of trenches.<br><br>Greatest concentration of ferromagnetic metals in the southwestern corner. |
| 14 | Short-Term Sanitary Landfill (landfill) | Single linear feature anomaly trending east-west. | Consistent with magnetometer data. | Consistent with conductivity data. | Indicates signatures of metallic debris buried in trench with definite boundaries. |
| 15 | Southwest Landfill (landfill) | A feature with highest amplitude anomaly in the northern portion.<br><br>Five bands of linear feature anomalies trending southwest-northeast.<br><br>Extended low magnitude anomaly in the eastern portion. | Consistent with magnetometer data. | Consistent with conductivity data. | High degree of buried ferromagnetic debris in the northern portion.<br><br>Parallel trenches of landfill in the central portion.<br><br>Large area of landfill in the eastern portion with defined boundaries. |
| 16 | Open Disposal and Burning Area (landfill) | Two regions of extended anomalies surrounded by natural field strength.<br><br>Scattered point feature anomalies trending away from the site in the easterly direction. | Consistent with magnetometer data. | Consistent with conductivity data. | Two landfill cells with definite boundaries. |

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## GLOSSARY

| | |
|---|---|
| ABB-ES | ABB Environmental Services, Inc. |
| BGI | Blackhawk Geosciences, Inc. |
| bls | below land surface |
| DC | direct current |
| EM | electromagnetic induction |
| GPR | ground penetrating radar |
| MAG | Magnetometer |
| MD | metal detector |
| mmho/m | millimhos per meter |
| NAS | Naval Air Station |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SOUTHNAVFAC-ENGCOM | Southern Division, Naval Facilities Engineering Command |

# 1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) is conducting the Phase II-A Remedial Investigation and Feasibility Study (RI/FS) at Naval Air Station (NAS) Whiting Field located in Milton, Florida. The RI/FS is being conducted under contract number N62467-89-D-0317.

A two-phased approach has been adopted for achieving the objectives of the RI/FS. The Phase I investigation, including subsurface geologic explanations and the sampling and analysis of surface and near surface soil, groundwater, surface water, and sediments, was carried out from December 1990 through April 1992. RI/FS Phase II is scheduled to be conducted in two parts: A and B. The Phase II-A RI field program was initiated in May 1992 with the Geophysical Survey.

The Geophysical Survey was the first field event completed in a series of tasks scheduled for the RI/FS Phase II-A program. This technical report summarizes the results and presents data gathered during the geophysical survey. A similar report will be prepared for the soil gas survey. These technical reports, along with the supporting technical memoranda, will form the basis for identifying data gaps for Phase II-B and preparing the RI report for NAS Whiting Field.

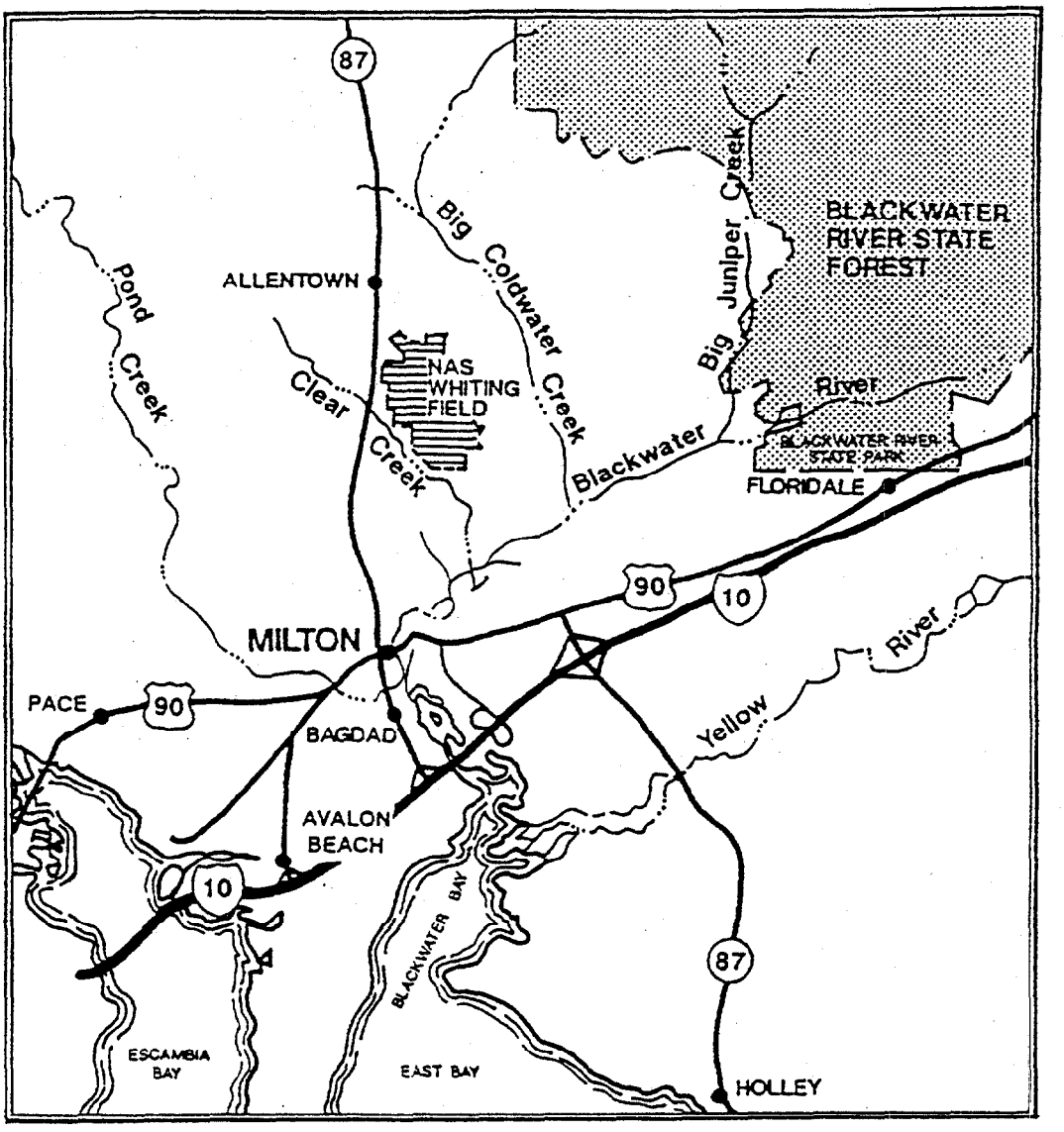
NAS Whiting Field is located in Florida's northwest coastal area approximately 7 miles north of Milton and 20 miles northeast of Pensacola (Figure 1-1). NAS Whiting Field presently consists of two air fields separated by an industrial area and covers approximately 2,560 acres in Santa Rosa County. Figure 1-2 presents the installation layout.

## 1.1 REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) PROGRAM.

**1.1.1 Purpose** The purpose of the RI/FS Program at NAS Whiting Field is to identify a range of remedial alternatives which address any identified risks to public health and the environment posed by toxic or hazardous chemicals present as a result of past waste disposal practices or spills. To achieve this objective, the RI must collect data sufficient to assess the nature and distribution of chemicals associated with each site. The data collected in the RI will be used in the FS to screen, evaluate, and select remedial alternatives to provide permanent, feasible solutions to environmental contamination problems at NAS Whiting Field.

**1.1.2 Scope of RI Phase II-A Field Program** The RI Phase II-A field program activities include the following:

- geophysical surveys,
- soil gas surveys,
- soil borings and test pits,
- surface and subsurface soil sampling,
- surface water and sediment sampling,
- monitoring well installation and groundwater sampling,
- location surveys, and
- ecological and public health surveys.




SCALE IN MILES

0 5

Florida

SITE MAP

N

MAP LOCATION

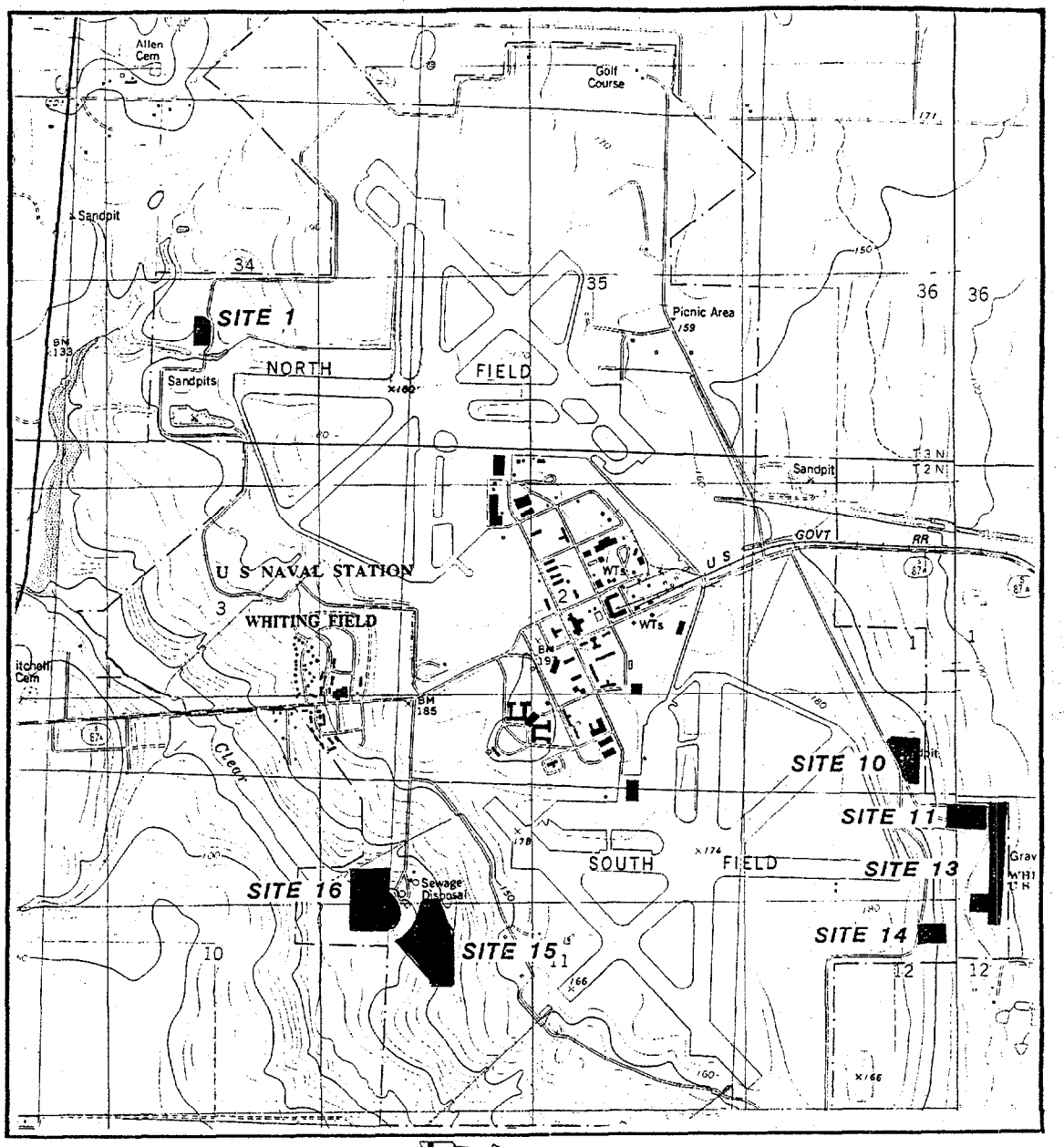
SOURCE: ABB ENVIRONMENTAL SERVICES, INC. 1991

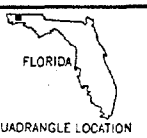
FIGURE 1-1

FACILITY LOCATION MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




QUADRANGLE LOCATION

**LEGEND**

**GEOPHYSICAL SURVEY SITE BOUNDRIES**

N

0 2000 4000 Feet

**SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992**

**FIGURE 1-2**

**INSTALLATION LAYOUT**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

A summary of RI Phase II-A activities is presented in Section 7.0 of Technical Memorandum No. 6 (ABB-ES, 1992c). Procedures for RI Phase II-A field explorations, including sampling and analysis, are found in Volumes I and III of the RI/FS Phase I Workplan (Jordan, 1990).

**1.2 GEOPHYSICAL SURVEYS.** Geophysical surveys at NAS Whiting Field were conducted during the period of May 26, 1992, through June 14, 1992. These geophysical surveys provide data that identify exploration locations to be investigated in the subsequent events of the Phase II-A RI. Geophysical surveys were performed at seven disposal areas (Sites 1, 10, 11, 13, 14, 15, and 16).

**1.2.1 Purpose** The purpose of the geophysical surveys at NAS Whiting Field was to investigate the lateral and vertical extent of waste disposal areas, identify subsurface structures that may act as preferential pathways for plume migration, locate buried metallic or nonmetallic objects that may indicate potential source areas, and to characterize landfill materials. In addition, geophysical methods were used to screen for possible underground utility lines, fuel distribution lines, and other obstructions that may interfere with subsurface explorations.

**1.2.2 Scope** Subsurface geophysical techniques proposed in the Technical Memorandum No. 6 for geophysical survey at NAS Whiting Field include the following:

- electromagnetic induction (EM),
- ground penetrating radar (GPR), and
- metal detector (MD).

However, after initial reconnaissance of the survey sites and detailed discussions with the personnel from Blackhawk Geosciences, Inc. (BGI), Golden, Colorado, a subcontracted geophysical consultant, a comprehensive plan was proposed using the following techniques:

- electromagnetic induction (EM),
- magnetometer (MAG),
- metal detector (MD), and
- direct current (DC) resistivity meter.

Although metal detecting techniques were proposed in the scope of the geophysical survey, these techniques were not incorporated during this phase of fieldwork. Metal detecting instruments will be used during later site mobilizations to screen for possible underground utility lines, fuel distribution lines, or other buried obstructions prior to drilling operations and other subsurface explorations.

Geophysical surveys were conducted at the seven known disposal areas/landfill areas at NAS Whiting Field. Table 1-1 presents both the proposed scope of work and the actual work completed at each of the sites.

**1.3 SHALLOW LITHOLOGY AT STUDY AREAS.** The limitations in the application of various geophysical methods are basically controlled by the characteristics of subsurface material, the ability of the corresponding signal to propagate through various materials without significant loss of information, and the extent of

**Table 1-1**
**Scope of Geophysical Survey**

Geophysical Survey Technical Report
RI/FS Phase II-A, NAS Whiting Field
Milton, Florida

| Site No. | Site Name and Type | Location | Survey Area | |
|---|---|---|---|---|
| | | | Proposed | Actual |
| 1 | Northwest Disposal Area (landfill) | North Field, west side | 5 acres | 1 acre |
| 10 | Southeast Open Disposal Area (A) (landfill) | South Field, southeast area | 4 acres | 6 acres |
| 11 | Southeast Open Disposal Area (B) (landfill) | South Field, southeast area | 3 acres | 5 acres |
| 13 | Sanitary Landfill (landfill) | South Field, southeast area | 4 acres | 8 acres |
| 14 | Short-Term Sanitary Landfill (landfill) | South Field, southeast area | 3 acres | 3 acres |
| 15 | Southwest Landfill (landfill) | South Field, southwest area | 15 acres | 13 acres |
| 16 | Open Disposal and Burning Area (landfill) | South Field, southwest area | 10 acres | 16 acres |

background noise. In order to better rationalize the effectiveness of the various methods, it is necessary to correlate the geologic information of the study areas with the behavior principles of various signals used in geophysical surveys. The relevant information extracted from Technical Memorandum No. 1 and 2 (ABB-ES, 1992a and 1992b) is presented in this section.

The lithology at NAS Whiting Field generally consists of sands and gravels with interbedded silt and clay layers, suggesting a low to moderate energy fluvial depositional environment. The sands ranged from very fine to coarse in grain size, with moderate to very high densities, and were poorly graded. The gravels were typically encountered in thicknesses of less than 1 foot or in "little to trace" amounts intermixed with coarse sands.

Clay and silt layers were found at variable depths throughout NAS Whiting Field. Commonly clays occurred with varying amounts of silts and sands. Table 1-2 presents the subsurface lithology from land surface to 30 feet below land surface (bls) at the study areas (30 feet is generally the maximum depth of exploration targeted for this investigation).

Because of the existing geological conditions including the prevalence of clay lenses throughout the study areas, GPR techniques were not incorporated in the NAS Whiting Field geophysical surveys. The electromagnetic radiation generated by the GPR instruments are rapidly attenuated in high clay content and saturated soils. The high attenuation produces a weak return signal strength which translates to decreased depth of penetration. In place of GPR techniques, terrain conductivity (EM) systems were used during the NAS Whiting Field geophysical surveys. The electromagnetic induction waves generated by terrain conductivity instruments are of lower microwave energy and are therefore not as rapidly attenuated by high clay content in area soils.

**Table 1-2**
**Lithology at Study Areas**

Geophysical Survey Technical Report
RI/FS Phase II-A, NAS Whiting Field
Milton, Florida

| Site No. | Classification | Lithology (up to 30 ft bls) |
|---|---|---|
| Site 1 | Northwestern Disposal Area | Mostly sand, and random occurrence of clay and silty clay |
| Sites 10, 11, 13, and 14 | Southeast Disposal Areas | Clay, clayey sand, silt layers, silt and clay layers encountered more frequently than other sites |
| Sites 15 and 16 | Southwest Disposal Areas | Clay and clayey sand layers |

Notes: ft bls = feet below land surface.

## 2.0 DESCRIPTION OF SURFACE GEOPHYSICAL METHODS

Geophysical methods generally work on the principles of propagation of electromagnetic waves, electromagnetic induction, and use of the earth's magnetic field. These methods provide insight into subsurface conditions. The primary applications for the geophysical methods employed at NAS Whiting Field are to:

- locate and map buried waste and disposal trenches and
- locate and map man-made structures such as landfill boundaries, cables, drums and buried foundations.

Typically, multiple geophysical techniques are used when conducting an investigation so that individual anomalies detected by one method can be confirmed by a separate technique. Four surface geophysical methods were included in the scope of geophysical survey at NAS Whiting Field:

- electromagnetic induction (EM),
- direct current (DC) resistivity,
- magnetometer (MAG), and
- metal detector (MD).

The following sections describe the methodology and field procedures for each of the techniques and presents the rationale for choosing an appropriate technique. A complete copy of the raw data generated during the geophysical surveys is presented in Appendix A.

2.1 ELECTROMAGNETIC (EM) INDUCTION. Terrain conductivity refers to the relative ability of the earth to conduct electricity. Terrain conductivity can be measured using EM ground conductivity meters. As some types of leachate can alter the electrical properties of soil pore waters and groundwater, this technique can be useful in tracing ionic fractions of leachate plumes. In addition, EM instruments can detect buried metallic objects (by measuring the inphase response) and can determine changes in soil composition. These features can provide data for determining the limits of waste disposal areas or landfills.

2.1.1 Theory An EM transmitter and receiver are used with the EM technique. A primary EM field is created by passing alternating current through a coil of wire, and antenna of the transmitter. The EM field passes through the subsurface and induces a flow of EM current proportional to the combined conductivity of groundwater, sediment, and rock. The current flow induces a secondary EM field of the same frequency as the primary field but of different phase and direction. The primary and secondary EM fields are measured as a change in the potential induced in the receiver coil. The apparent conductivity of the subsurface is calculated within the receiver unit and is reported in millimhos per meter (mmhos/m). As shown on Figure 2-1, various buried objects induce changes in the apparent conductivity reported on the EM instruments. Through training, a geophysist is able to interpret apparent conductivity response and make judgements concerning the locations and types of buried materials.

The EM instrument employed in the geophysical surveys at NAS Whiting Field was the Geonics EM-31. There are two components of induced magnetic field measured by the EM-31. The first is the quadrature-phase component which indicates the ground conductivity measurement. The second is the inphase component used

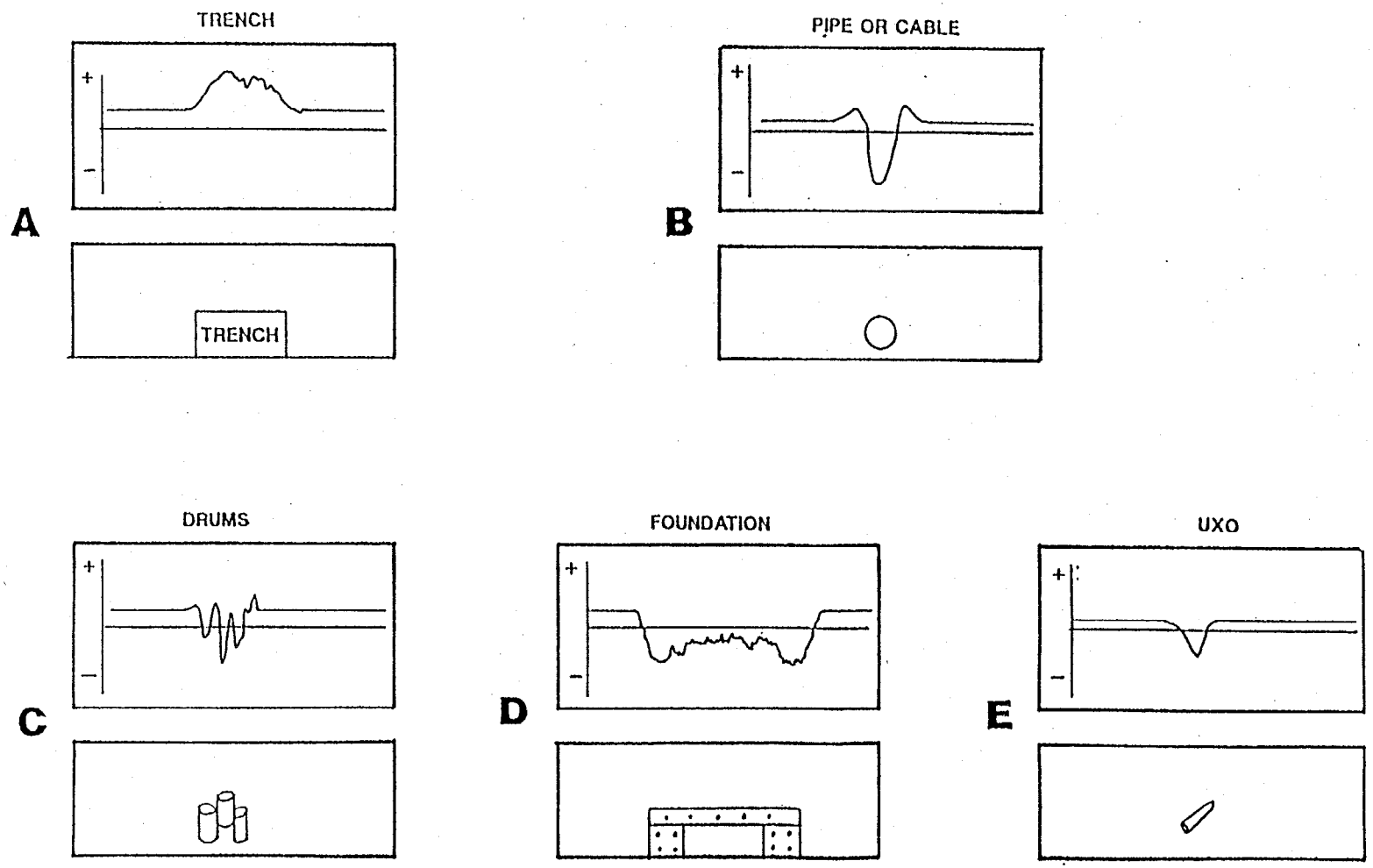



FIGURE 2-1

PRINCIPLE OF ELECTROMAGNETIC INDUCTION AS APPLIED TO GEOPHYSICAL SURVEY

SOURCE: U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY

TECHNICAL REPORT
GEOPHYSICAL SURVEY

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primarily for calibration purposes; however, this component is significantly more sensitive to large metallic objects and, hence, may be used to locate buried metal objects. By changing the separation distance or the orientation of the EM instrument coils, the effective exploration depth of the instrument can be changed to affect the depth of exploration. The separation distance, in the case of the EM-31, ~~is fixed~~ at 12 feet; however, the coil orientation can be changed. The two coil orientations considered for this investigation are horizontal-dipole and vertical-dipole configurations. A horizontal-dipole is a pair of magnetic poles that are parallel with the earth's surface. In the horizontal-dipole configuration, the two coils are placed on their edge,perpendicular to the earth's surface and coplanar. The electrical nature of the shallow subsurface is measured by use of this configuration. The effective depth of measurement typically is three fourths of the coil separation distance (approximately 9 feet). A vertical-dipole is a pair of magnetic poles that are perpendicular to the earth's surface. In the vertical-dipole configuration, the two coils are placed flat on the ground and co-planar. The deep subsurface, about 1 to 1-1/2 times the coil separation distance (approximately 18 feet), is measured by use of vertical-dipole configuration.

**2.1.2 Field Procedure** A Geonics EM-31 transmitter and receiver were used for investigation at NAS Whiting Field. The data were collected on and adjacent to the seven waste disposal sites. Initially, a single base line was established at each survey area either in a due north-south or east-west direction. Parallel lines spaced at either 20 feet or 40 feet intervals were then surveyed and staked in the survey area. Data typically were collected at stations located at 10-foot intervals along each of the staked lines. The lateral boundaries of the study area were interpreted on a real time basis. At the end of each field day, EM-31 data were processed through a portable computer, data sets were gridded, contoured, and plotted, and preliminary interpretations were made. Based on these interpretations, additional base lines and stations were added to the grid until either the recovered data indicated complete coverage of the investigation area had been accomplished or physical barriers at the site limited continuation. The EM-31 was used in the vertical-dipole mode in order to gain maximum depth of exploration (1 to 1-1/2 times the distance between receiver and transmitter). Station locations were determined by pace and compass methods.

Data were collected with caution in areas of apparent interference from buildings, pipelines, overhead or underground wires, sheet piles, or metal guard rails. Interferences such as these adversely affect EM measurements. Comments were recorded where sources of interference may have been affecting the instruments. Local observed geology soil type, land use, and any other local features that could influence the apparent-conductivity readings were noted during data collection to aid in interpreting the data. At stations where there is suspected interference, the conductivity values were double-checked by rotating the instrument orientation 90 degrees from the first measurement and recording the apparent conductivity. Consistent readings at both orientations would indicate a single homogeneous unit underlying the station. Where the values were inconsistent, it was possible that the difference was the result of an isolated, highly-conductive material or object not representative of the subsurface lithology.

## 2.2 DIRECT CURRENT (DC) RESISTIVITY METER.

**2.2.1 Theory** Resistivity methods are used in conjunction with the terrain conductivity methods in order to obtain information regarding the depth of various conductive materials. Resistivity is a fundamental electrical property of rock materials related to their lithology, porosity, water content, and water quality. The determination of the subsurface distribution of resistivity from measurements on the surface yields useful information on the structure or composition of the buried formation. In resistivity methods, current is driven into the ground by galvanic contacts (such as steel probes). Four-electrode arrays are used at the surface, one pair (current pair) for introducing current into the earth, and the second pair (potential pair) for measurement of the potential associated with the current. The potential drop ratio from station to station gives the information on the resistivity variation. The depth of exploration is linearly related to the separation distance of the electrodes.

The concept behind this method is to determine the apparent resistivity at different exploration depths, and to compute from these measurements the true resistivity stratification of the ground. Because a large resistivity contrast is expected between fill and native materials, the depth of fill can be inferred from the resistivity stratification.

Various electrode configurations are available for DC resistivity soundings. The choice of the method to use is generally determined by specific data objectives and site conditions. The two most commonly used sets of surface configurations for the current and potential electrodes are the Wenner array and the Schlumberger array. In the Wenner configuration, the spacings between adjacent electrodes are kept constant with the potential electrodes at the center of the array and the current electrodes on the outside of the array. In the Schlumberger configuration, the separation of the inner potential electrodes are maintained at less than 1/3 of the half distance between the outer current electrodes.

**2.2.2 Field Procedures** To calculate the depth of fill, DC resistivity soundings with the Wenner array were tested. The Wenner array configuration was selected because, in general, it is less influenced by near surface variations in conductivity (including metal materials near potential electrodes) than the Schlumberger array. Data gathered during the magnetometer and EM-31 surveys indicated the potential for interference due to surface metallic materials.

A total of 4 Wenner array DC resistivity soundings were made at two of the seven investigation areas (Site 13 and Site 16) at NAS Whiting Field. Two soundings were conducted at Site 13 and two soundings at Site 16.

## 2.3 MAGNETOMETER.

**2.3.1 Theory** A magnetometer measures the intensity of the earth's magnetic field. Magnetometers are used to locate buried ferro-metallic objects by detecting the distortions in the earth's magnetic field caused by such materials. Magnetometers are not sensitive to non-ferrous metal such as aluminum, brass, and copper. A magnetometer provides a greater depth of detection than a metal detector and can generally detect smaller targets than EM systems. The earths magnetic field strength is measured either as total field strength (gammas) or as the gradient of field strength (gammas/ft).

The most commonly used magnetometers in environmental geophysical work are fluxgate and proton precession magnetometers. A fluxgate magnetometer measures a component of the earth's magnetic field (usually the vertical component). It utilizes an iron core coil which undergoes changes in its level of magnetic saturation in response to variations in the earth's magnetic field. Changes in saturation level are proportional to variations in the earth's magnetic field strength (Dobrin, 1976). A proton precession magnetometer utilizes the precession of spinning protons to measure the earth's magnetic field. These magnetometers incorporate a sensor containing a hydrocarbon fluid surrounded by a coil of wire. The coil is energized momentarily and creates a magnetic field which aligns the protons in the fluid with the magnetic axis of the coil. Once the current is removed, the protons reorient themselves in the direction of the earth's magnetic field. In the process of reorientation, protons generate a signal whose frequency is proportional to the total intensity of the earth's magnetic field (Breiner, 1973).

**2.3.2 Field Procedure** An EDA Omni-IV total fluxgate magnetometer was used for investigations at NAS Whiting Field. The data were collected on and adjacent to all seven waste disposal sites described in Chapter 1. In order to maintain the consistency in the data obtained between various geophysical methods the same grid developed for EM-31 survey was employed for this survey. Also similar to the EM-31 investigation, data were processed on a real time basis. Daily entry and evaluation of the data on a portable computer aided in the determination of complete coverage of the sites and preliminary interpretations of the data. The total field recorded by a magnetometer includes the intensity of earth's magnetic field, cultural magnetic noise, and the influence of nearby buried ferrous metal. In order to account for the time-variable changes in the earth's magnetic field, a base station magnetometer (a second stationary magnetometer) was used. The second magnetometer was used to correlate and minimize any errors due to slow natural changes of the earth's field with time (Breiner, 1973).

**2.4 METAL DETECTOR**. The use of metal detecting instruments proposed for this investigation was deferred and will be used to screen buried drums and metal objects prior to subsurface exploration activities (i.e., test pitting and drilling operations). Since a metal detector can detect both ferrous and non-ferrous metal, these can also be used before drilling at selected sites to screen for possible underground utility lines, fuel distribution lines, or other obstructions that could interfere with the completion of subsurface explorations and to prevent damage to underground equipment. Metal detectors operate on the induction principle similar to the EM method. However, metal detectors do not measure electrical conductivity as do EM systems.

## 3.0 RESULTS AND INTERPRETATION

3.1 GENERAL: There are four elements of exploration included in the scope of geophysical surveys at NAS Whiting Field. These elements include: determination of lateral boundaries of each disposal area, identification of the type and location of fill materials, investigation for potential high conductivity leachate plumes, and determination of the depth of fill material. The lateral boundaries of disposal areas, the type and location of fill material, and identification of leachate plumes were interpreted using the EM-31 and total magnetic field data. The depth of fill material was investigated using the DC resistivity soundings.

DC resistivity soundings with Wenner array were tested for calculating the depth of disposal areas. Calculation of depth is based on the depth versus resistivity curve generated by the DC resistivity soundings. The feasibility of interpreting DC resistivity sounding was tested at the end of EM-31 and Magnetometer surveys. Two test units (Site 13 and Site 16) were selected for this study. Figure 3-1 shows the apparent resistivity curve for sounding WENN13-2. This sounding was recorded over undisturbed ground at Site 13, well away from the landfill. The experimental data measured at different electrode spacings are indicated by points. The solid line represents the best fit computed model curve for the two layer resistivity stratification shown on the right of the figure. This model shows high resistivities throughout the section. An example of Wenner soundings over the landfills are given in Figures 3-2 and 3-3. The interpretation of this data is shown in Table 3-1 below.

**Table 3-1**
**Interpretation of Resistivity Stratification in Terms of Landfill Depth**

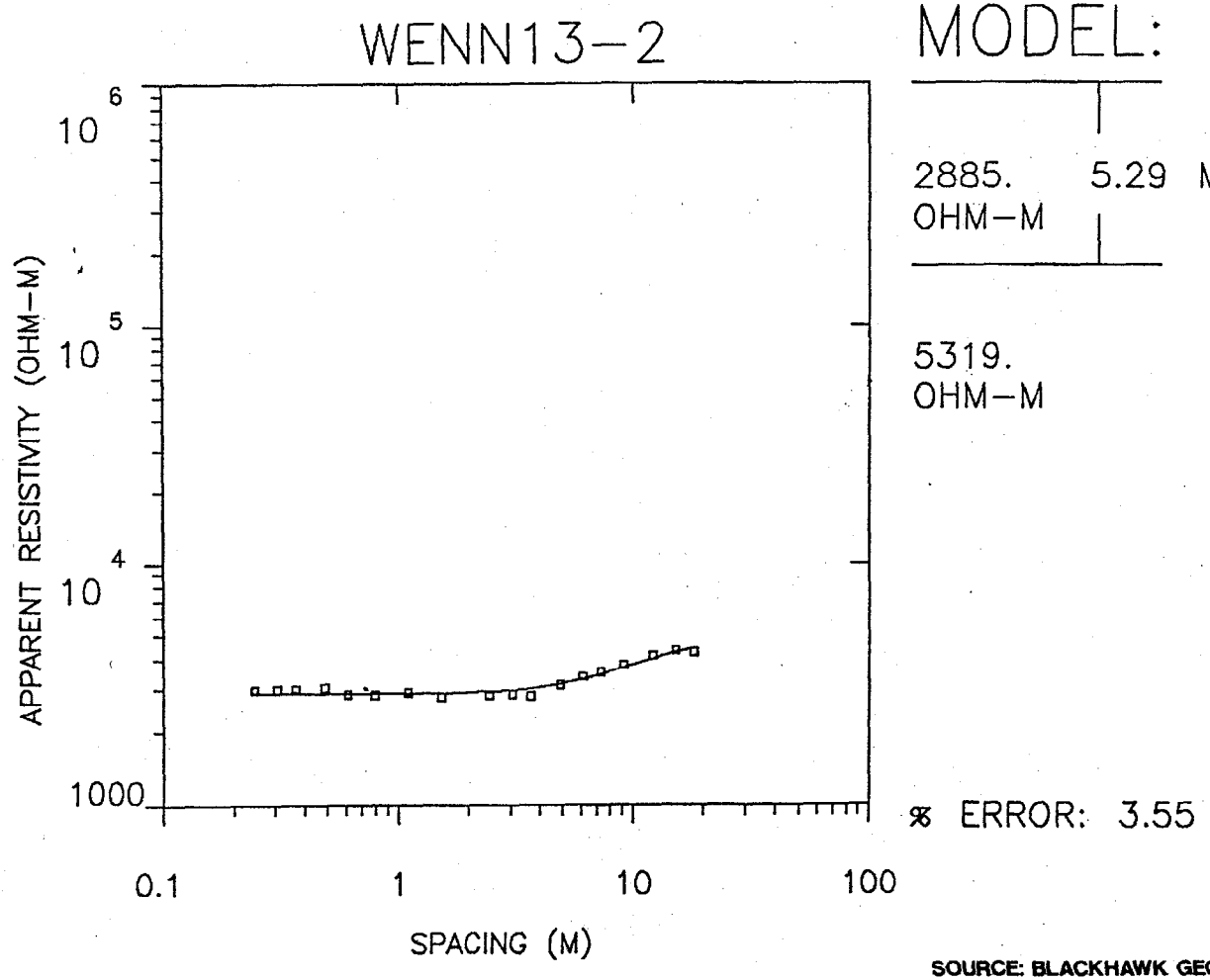
Geophysical Survey, Phase II-A
NAS Whiting Field
Milton, Florida

| Layer No. | Resistivity Range (ohm-m) | Interpretation |
|---|---|---|
| 1 | >400 | Surface cap |
| 2 | 1 to 50 | Landfill material |
| 3 | 1,000 | Native soil below fill |

A major limitation of DC Resistivity inversions is that the solution is not unique, so that a range of resistivities and thicknesses will yield the same model curve. It has been shown that equivalence is particularly large for a thin conductive layer (landfill) overlying a highly resistive section (native soil). In such a situation, only the conductance of the landfill can be determined. Conductance(s) of strata is defined as the ratio of the thickness, h, and resistivity, $\rho$

$$S = \frac{h}{\rho} \qquad (1)$$

Moreover, conductance can best be determined at electrode spacings greater than several times the thickness of fill. The section of the curve on the right ascending branch, at large electrode spacings, is called the S-asymptote, and its theoretical slope for a thin conductive layer overlying a highly-resistive

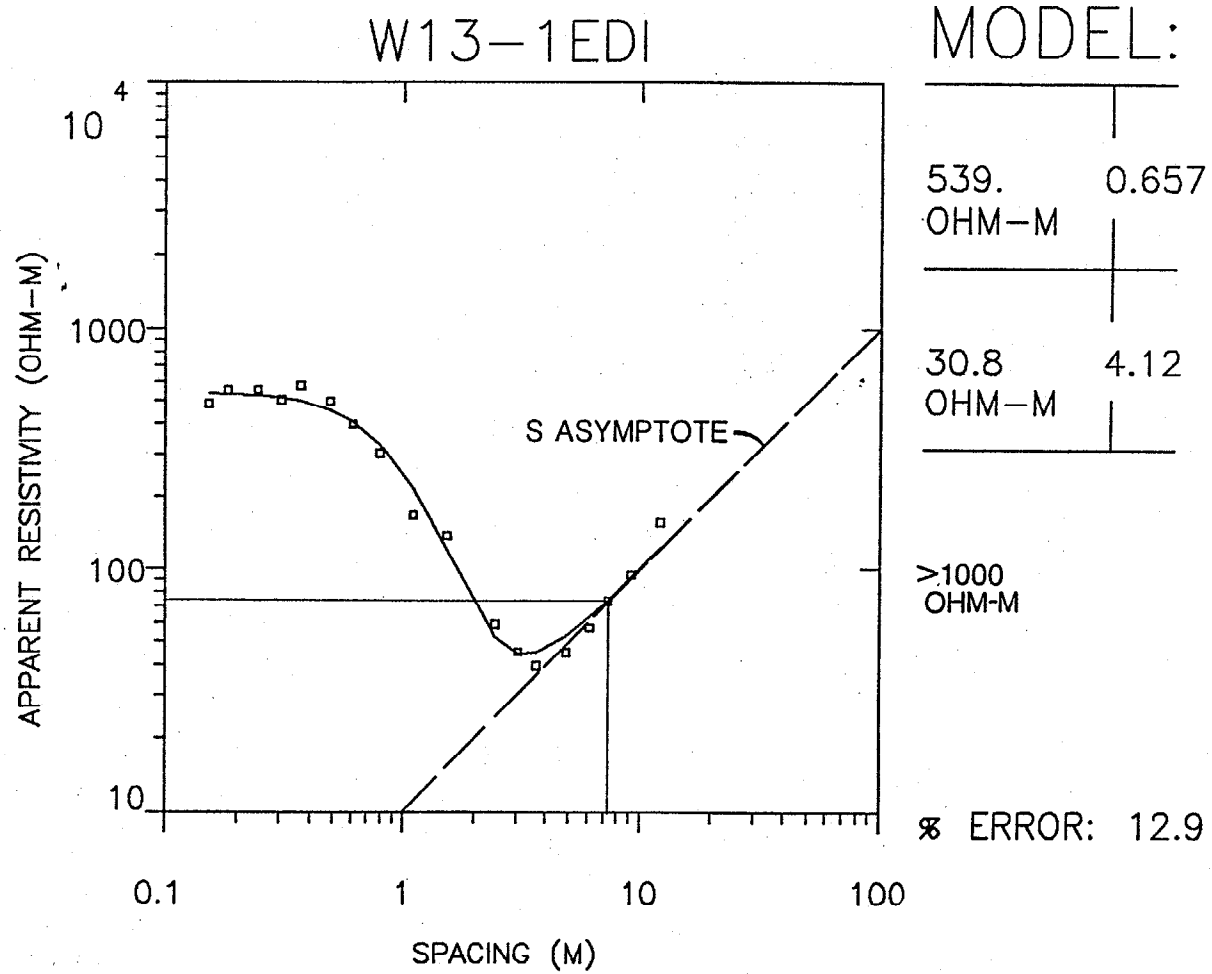



SOURCE: BLACKHAWK GEOSCIENCES, INC., 1992

**FIGURE 3-1**
**DC SOUNDING OVER**
**UNDISTURBED GROUND, SITE 13**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

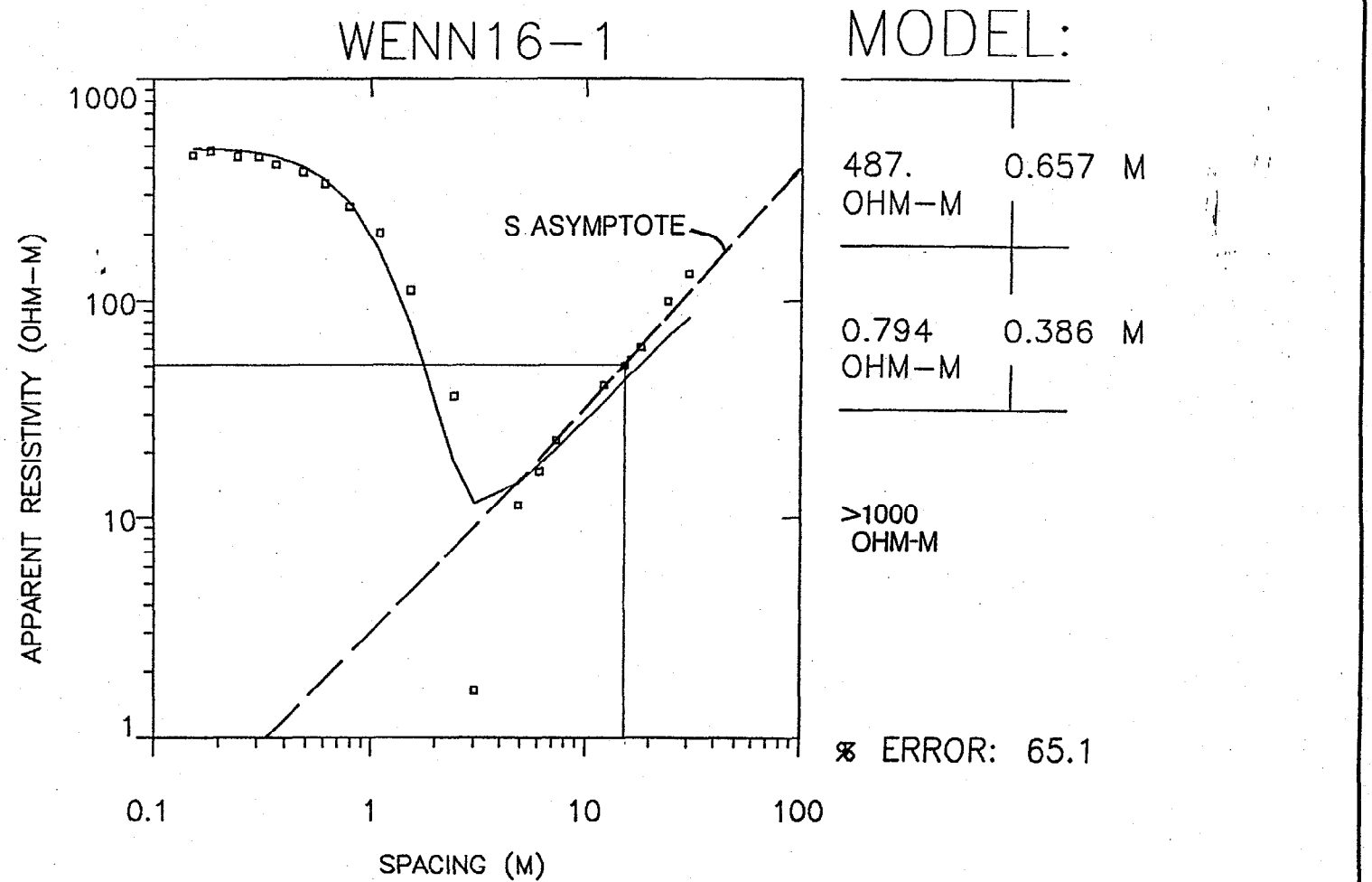



SOURCE: BLACKHAWK GEOSCIENCES, INC., 1992

**FIGURE 3-2**
**D C SOUNDING OVER**
**LANDFILLED TRENCH, SITE 13**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**




SOURCE: BLACKHAWK GEOSCIENCES, INC., 1992

**FIGURE 3-3**
**DC SOUNDING EAST-WEST TRENDING ARRAY, SITE 16**

**TECHNICAL REPORT GEOPHYSICAL SURVEY**

**NAS WHITING FIELD MILTON, FLORIDA**

section is 45°. The asymptote is shown on both Figures 3-2 and 3-3. The conductance, $\rho$, for points on the S-asymptote is given by

$$S=1.38\frac{a}{\rho a} \qquad (2)$$

where (a) is the electrode spacing for a point on the S-asymptote and $\rho a$ the apparent resistivity at that point. It is evident from Equation 1 that h and $\rho$ cannot be separately determined without making certain assumptions. For example, by assuming values of 50 ohm-m (20 millimhos/m) and 20 ohm-m (50 mmhos/m) for the fill material (both are consistent with EM-31 readings at different portions of the landfills), depth of fill can be computed. This is done on Table 3-2 for DC soundings.

**Table 3-2**
**Computation of Depth of Fill**

Geophysical Survey, Phase II-A
NAS Whiting Field
Milton, Florida

| Sounding No. | $\rho$(ohm-m) | a(m) | S(mhos) | Depth of Fill (ft) | |
|---|---|---|---|---|---|
| | | | | $\rho$=50 ohm-m | $\rho$=2 ohm-m |
| W13-1ED1 | 73.15 | 7.32 | .138 | 22.5 | 9.05 |
| WENNI16-1 | 50.14 | 15.2 | .419 | 68.7 | 27.5 |

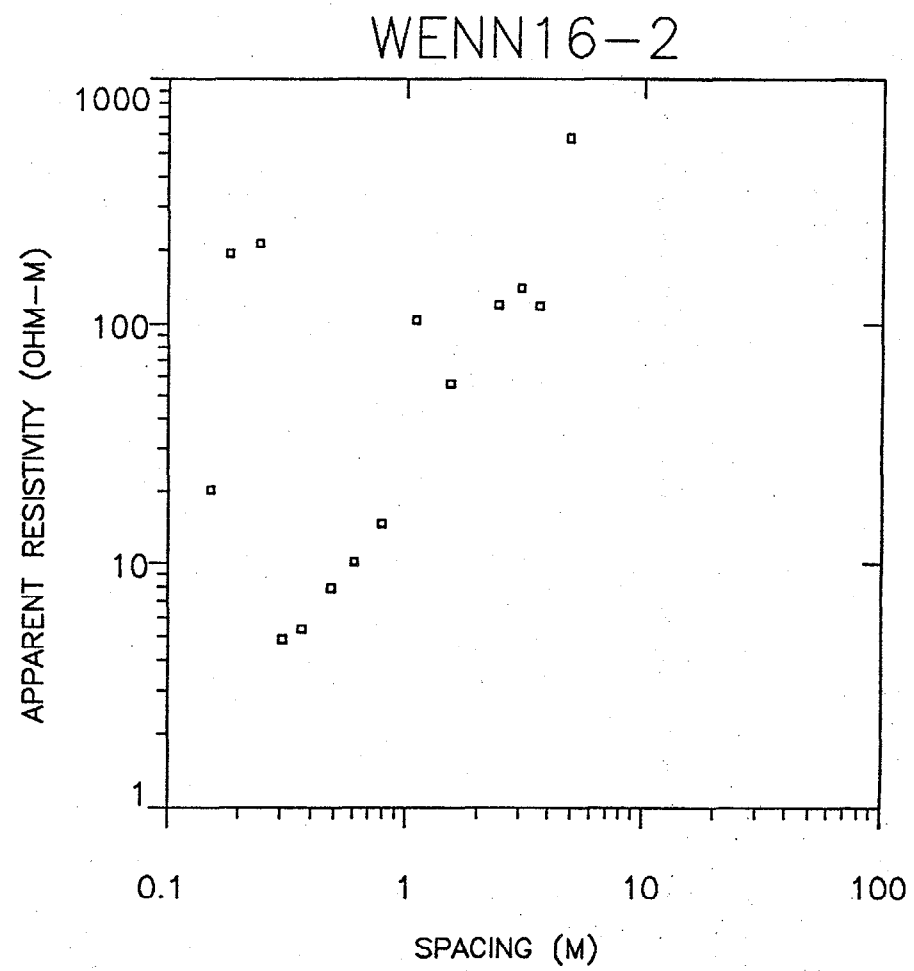
Equation 1 shows that in order to calculate the thickness of fill, the resistivity of the fill material ($\rho$) must be assigned a value, and Table 3-2 shows how drastically the calculated depths are affected by different resistivity values for the fill. The resistivity of fill encountered at NAS Whiting Field varied both from site to site and across individual landfills. If resistivity of fill changes laterally at a site, depth calculations will be greatly affected.

The resistivity of the fill is affected not only by the type of material in the fill, but also by the amount of metal in the fill. Metallic objects have extremely low resistivity (resistivity of iron $9.71\times10^{-8}$ ohm-m). The low resistivity of metal not only affects resistivity of fill, but causes noise in the sounding curve when electrodes are placed near buried metal. Figure 3-4 shows a sounding that is so affected by noise that physical modeling of this data set would be meaningless.

Because of the problems associated with changes in resistivity for the fill at the NAS Whiting Field sites, Blackhawk Geosciences, Inc., decided that the depth of fill at these sites could not be accurately determined, and this phase of the geophysical surveying was discontinued.

## 3.2 SITE-SPECIFIC SURVEYS.

3.2.1 Site 1, Northwest Disposal Area Site 1 is located just west of the perimeter patrol road and north of the "E" drainage ditch (see Figure 1-2). Survey grid was established with survey lines running due east-west. The spacing between survey lines was 40 feet, and the survey lines were staked with labeled




SOURCE: BLACKHAWK GEOSCIENCES, INC., 1992

**FIGURE 3-4**
**DC SOUNDING EAST-WEST TRENDING ARRAY, SITE 16**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

stakes or flagging every 50 feet. EM-31 and total magnetic measurements were taken at 10-foot intervals along the survey lines (see Figure 3-5).

The site is bordered on the east and south by an earthen berm, and the entire site is covered with slash pines. Well WHF-1-1 lies at grid coordinates 15S, 124W. Concrete reinforcing bars were present on the surface at grid coordinates 200N, 20W.

Magnetics. As shown on Figure 3-6, no significant magnetic anomalies were found on the total magnetic field contour. The magnetic field seems to be very slightly decreasing from the northeast corner of the site (50,520 gammas) to the southwest corner of the site (50,350 gammas). Low amplitude anomalies (<50 gammas) were present along the grid line 200N at Stations 20E and 60E.

Electromagnetics. The EM-31 conductivity and inphase data sets are both flat across the site and no geophysical anomalies were interpreted based on these data sets (see Figures 3-7 and 3-8, respectively).

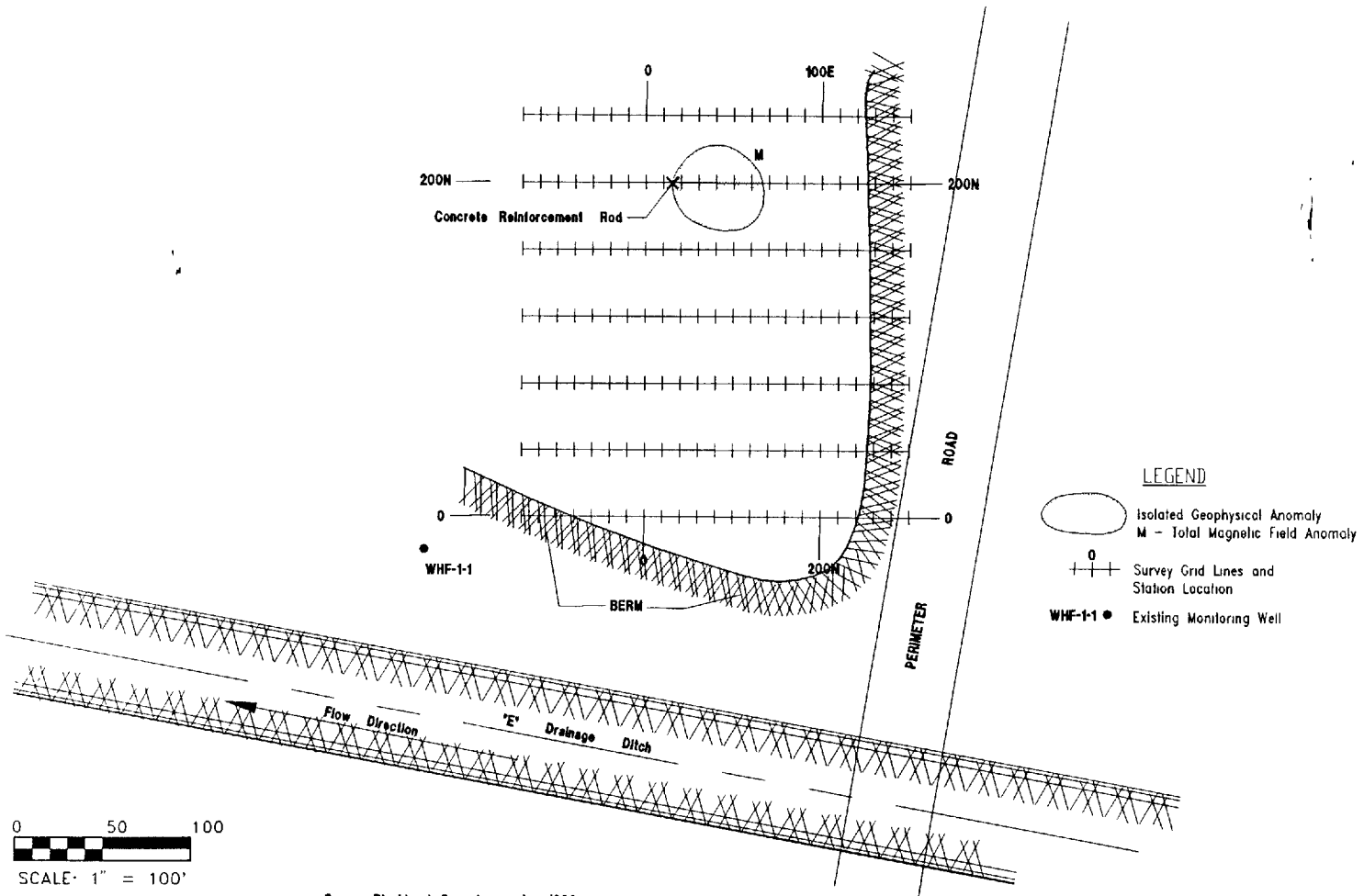
Results. Interpretations of the geophysical data sets are shown in Figure 3-5. On Figure 3-6, the magnetic low on the southwestern corner of the grid is interpreted to be caused by erosion barriers and the iron bar reinforcement in the concrete drainage ditch. It is therefore not included on the anomaly summary map (Figure 3-5). The anomalies along the line 200N occur close to the concrete reinforcing rods present on the surface, and this anomaly is interpreted to be associated with these rods. From the lack of significant geophysical anomalies, landfill boundaries could not be identified. It is inferred that only limited landfill activities occurred at this location. However, it is possible that disposal materials were restricted to fill dirt or concrete rubble which yielded 2W in similar conductivities to the native materials and therefore was not identified during the geophysical survey.

**3.2.2 Site 10, Southeast Open Disposal Area** Site 10 lies east of perimeter road on the east side of NAS Whiting Field (see Figure 1-2). Several piles of construction rubble were present on site 10, and a ponded area was present on the northeastern portion of the grid. A survey line spacing of 40 feet was used at Site 10, with station intervals of 10 feet. Well WHF-10-1 lies at grid coordinates 36S, 272E (see Figure 3-9).

Magnetics. As shown on Figure 3-10, the large scale total magnetic anomalies at this site extend from approximately grid coordinates 150S to 260N, and from Station 40W to 200E. A low amplitude anomaly is present at grid coordinates 440N, 90W.

Electromagnetics. Figures 3-11 and 3-12 show an apparent anomalous area in the southern portion of the conductivity and inphase grids. This area extends roughly from 260N to 100S, and from 30W to 190E. Station 480N, 130E shows an anomalous value on both data sets. Along line 280N, between 100W and 10W, there is a low amplitude, linear feature indicated on the inphase EM-31 data (Figure 3-12).

Results. The landfill disposal area shown in Figure 3-9 was based on all three geophysical method data sets (total magnetic field, EM conductivity and EM inphase). The northern and southern edges of this area also correspond to the piles of construction rubble on the surface. The amplitude of the feature on the

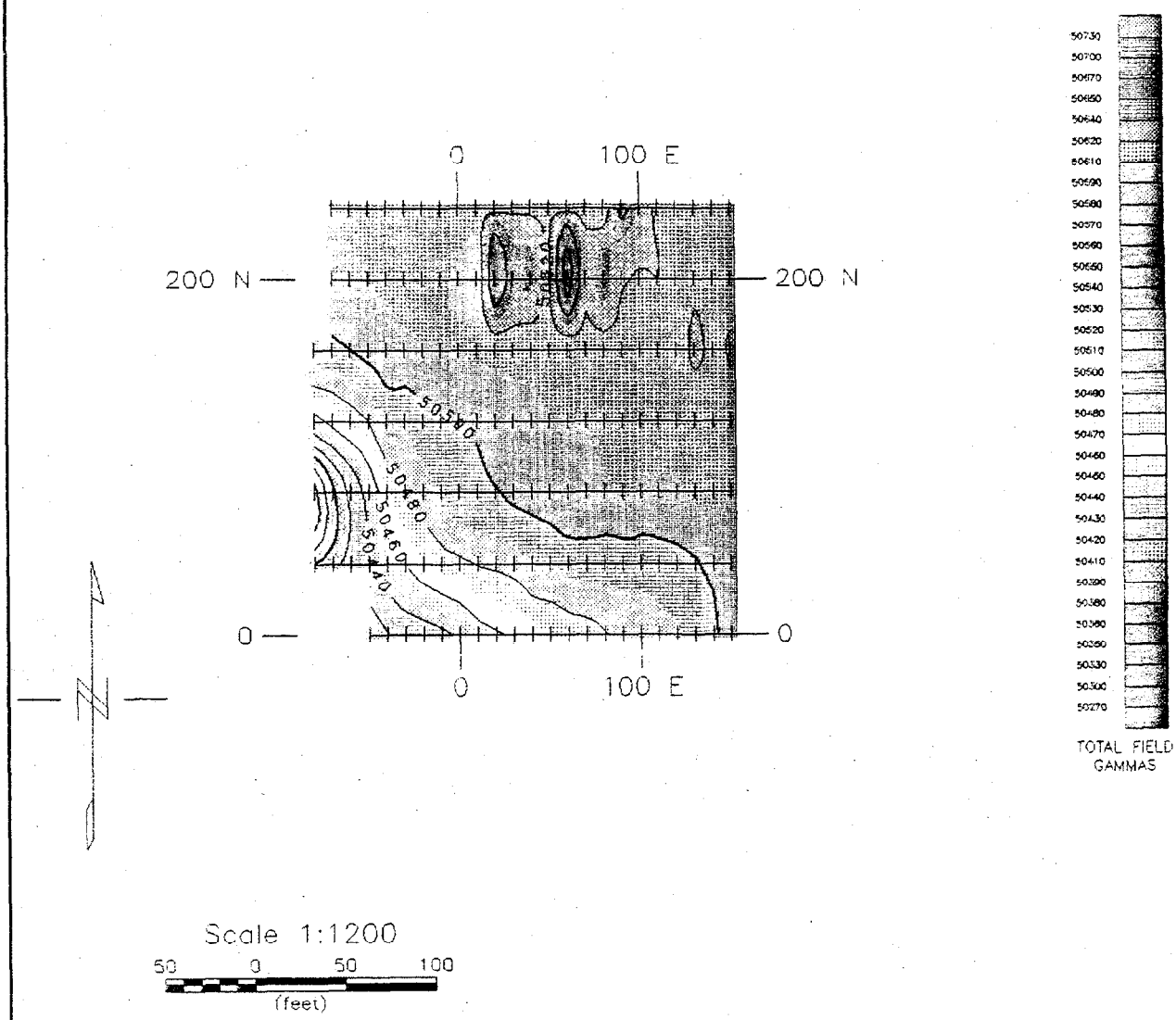



Source: Blackhawk Geosciences, Inc. 1992

**FIGURE 3-5**
**SITE 1**
**GEOPHYSICAL SURVEY GRID LINES AND INTERPRETED ANOMALY LOCATIONS**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-6

SITE 1
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

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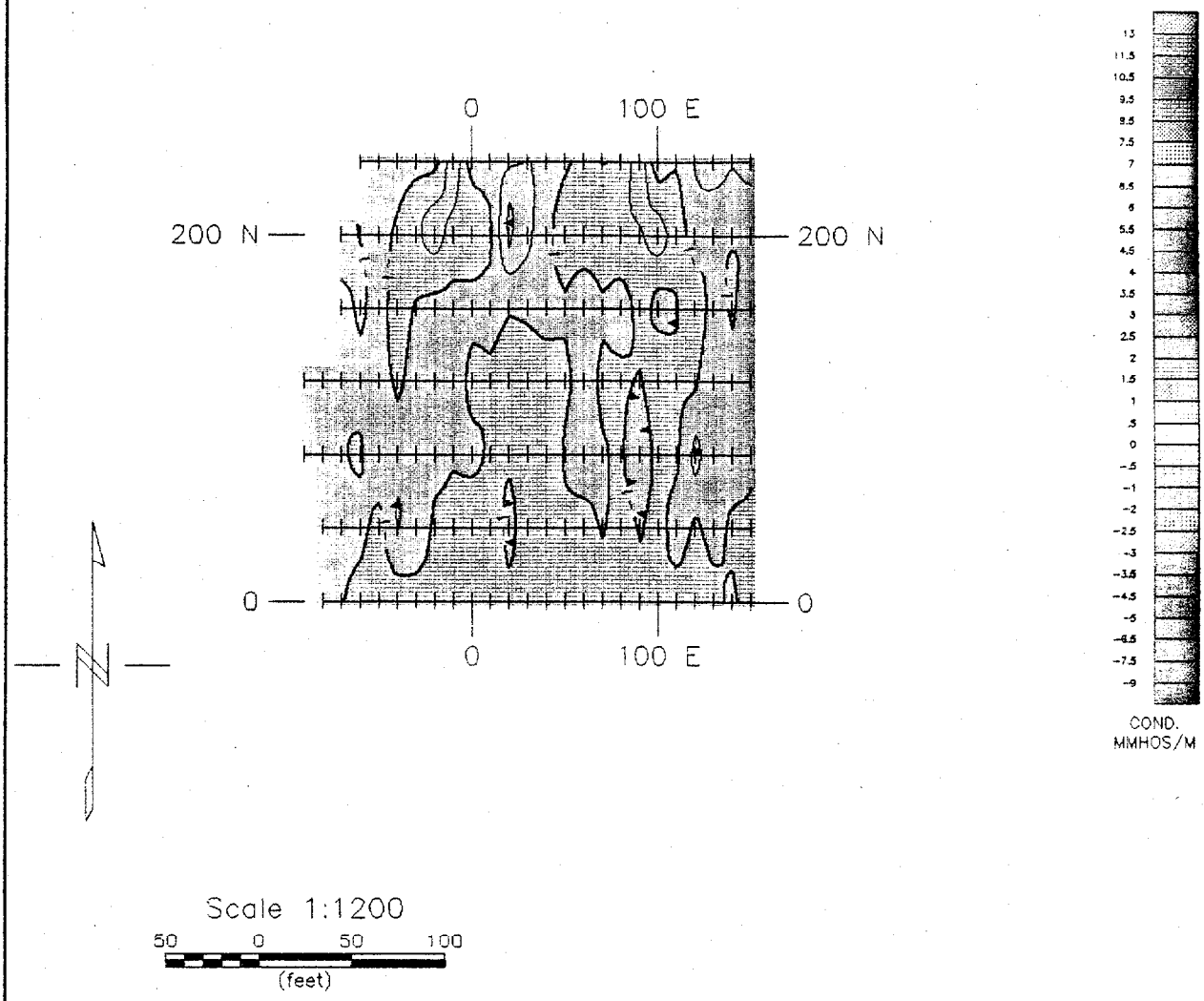
MILTON, FLORIDA



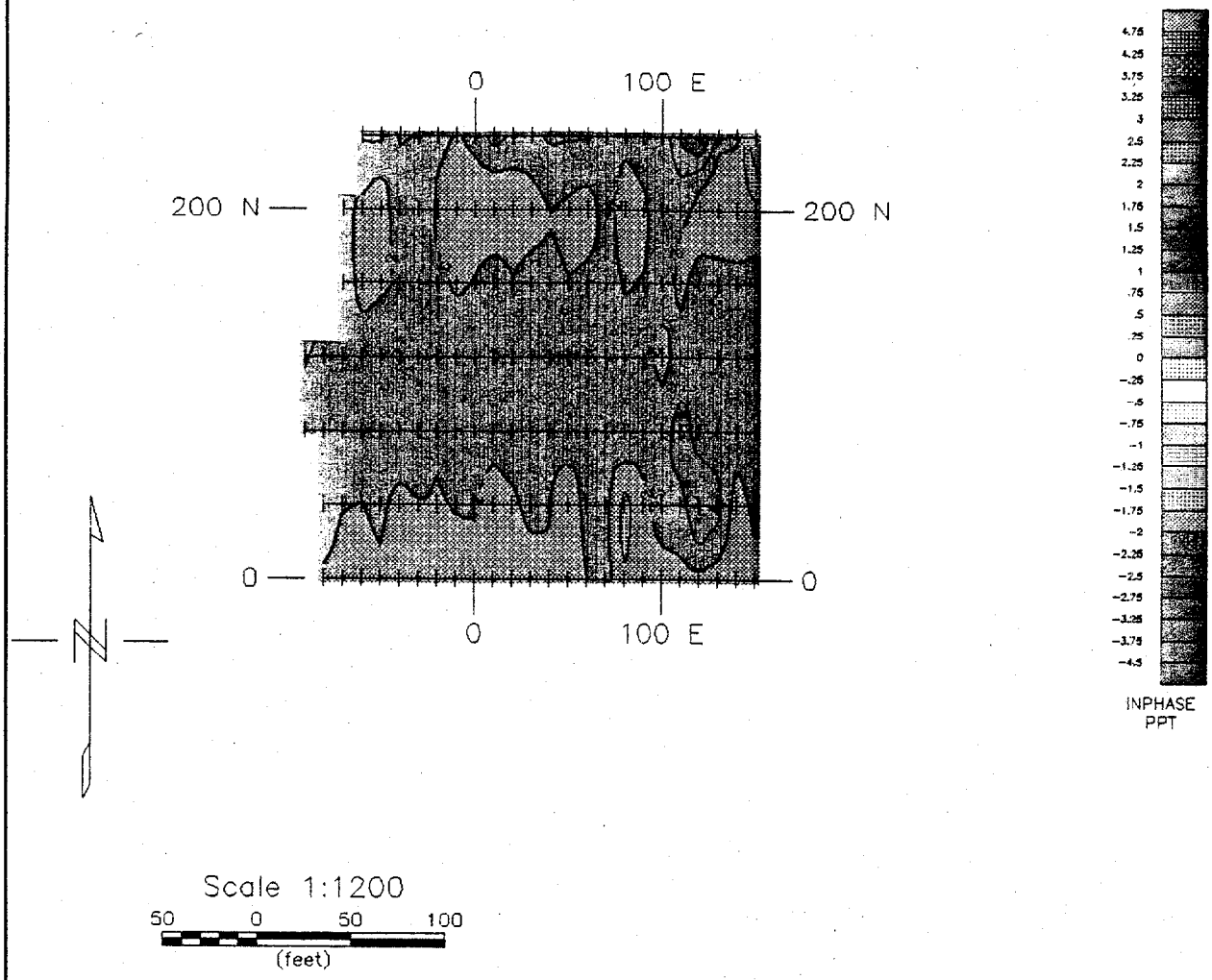

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-7

SITE 1
EM-31 CONDUCTIVITY
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



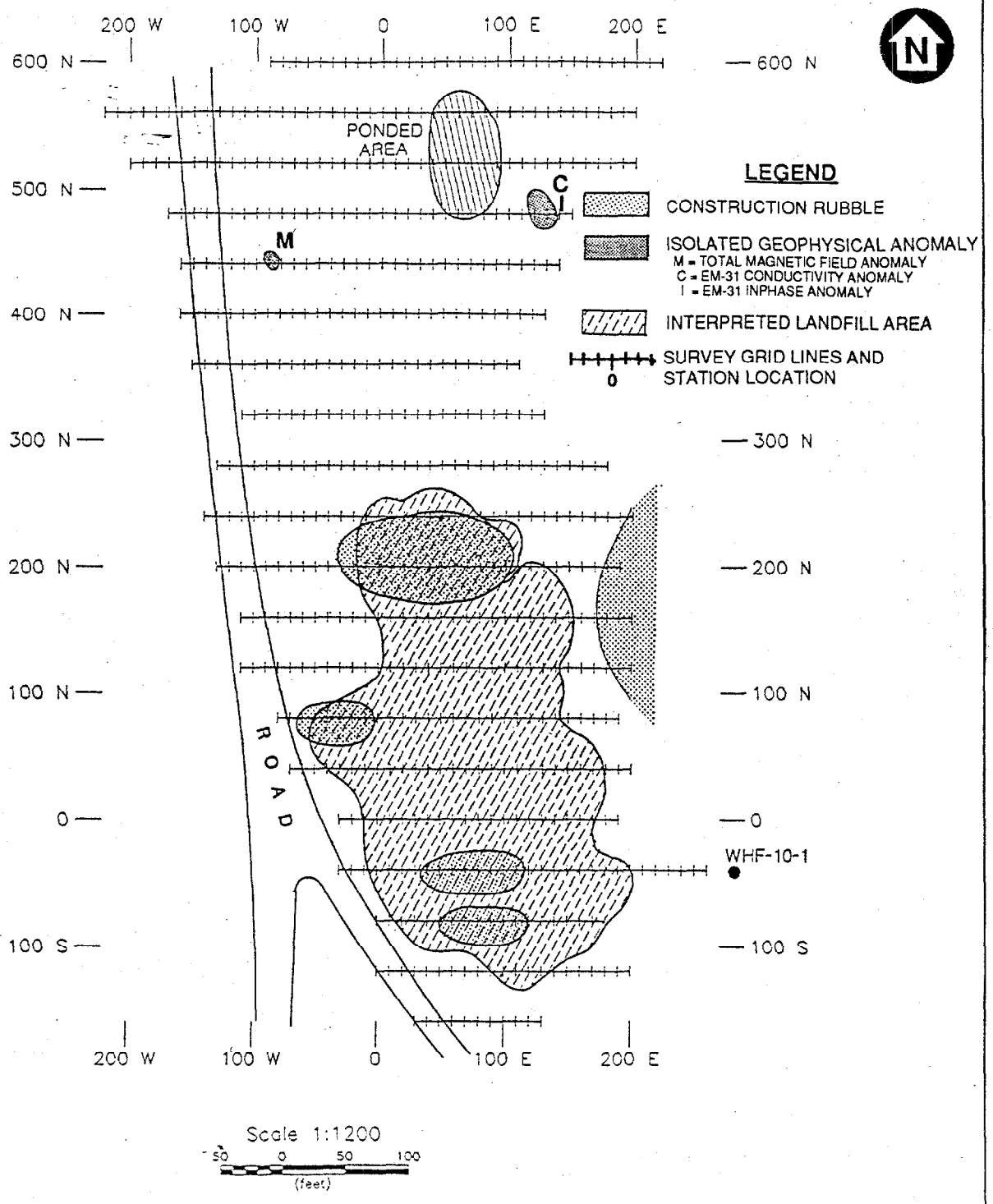

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-8

SITE 1
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



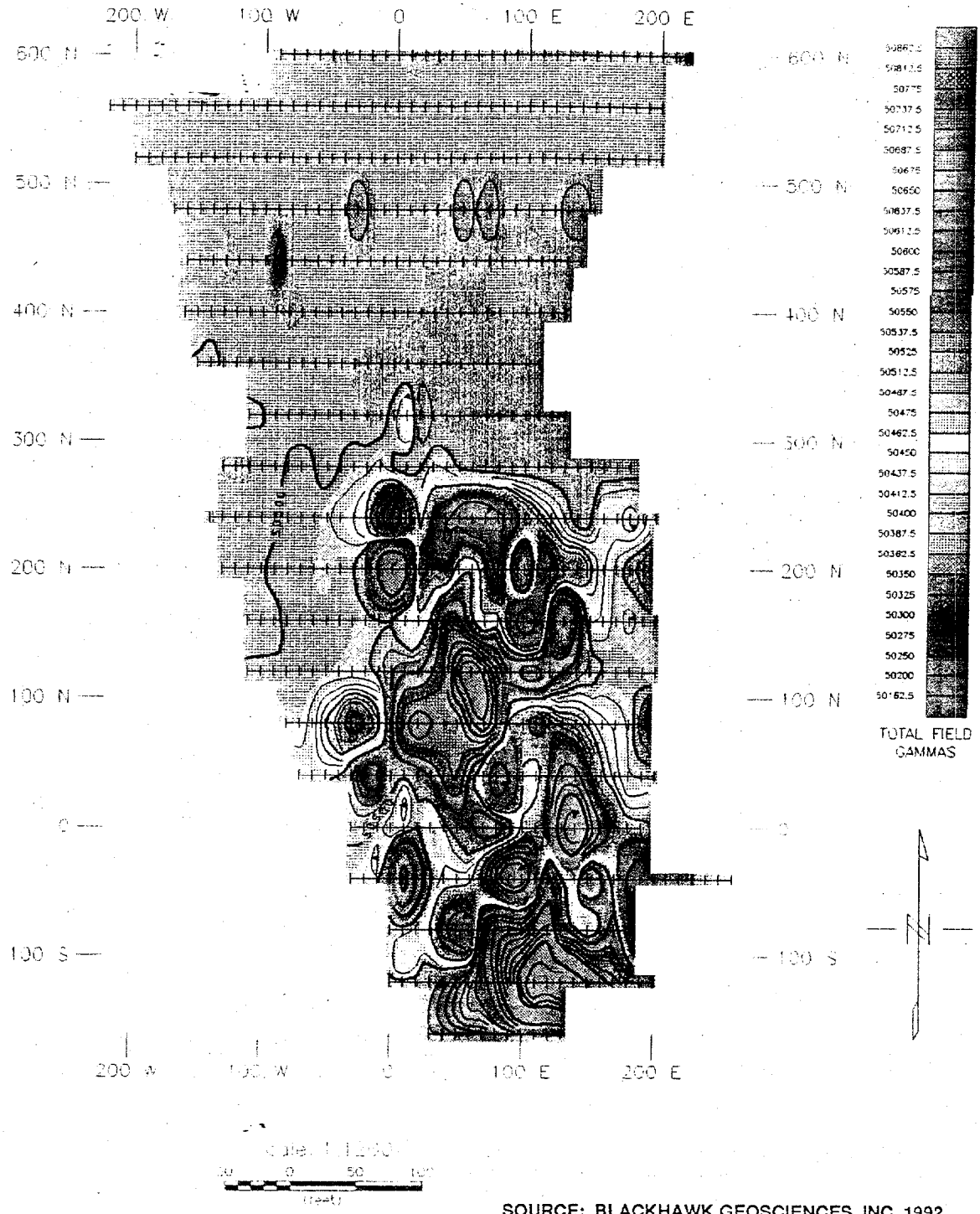

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992

FIGURE 3-9

**SITE 10**
**GEOPHYSICAL SURVEY AND**
**INTERPETED ANOMALY LOCATIONS**

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



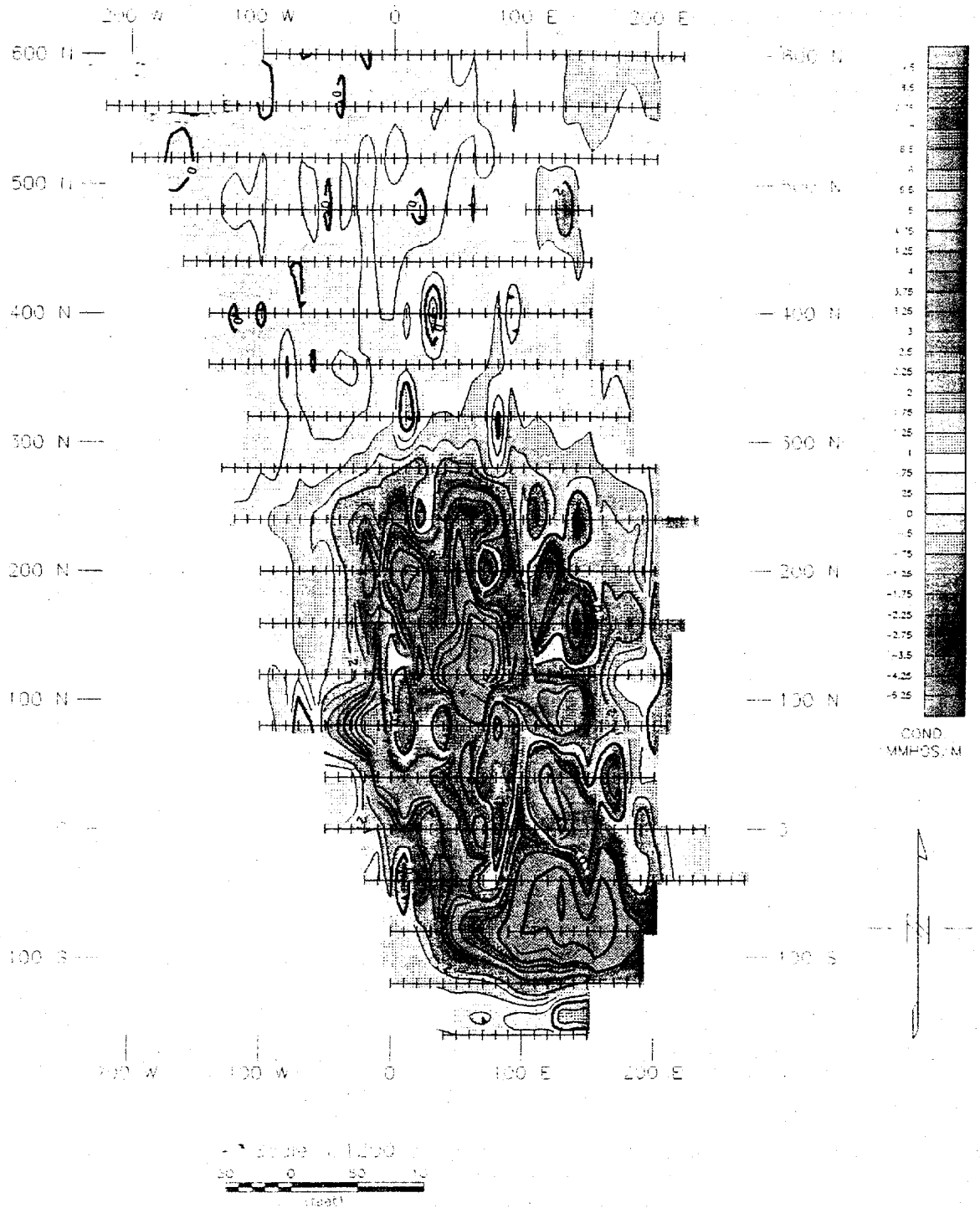

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-10

SITE 10
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-11

SITE 10
EM-31 CONDUCTIVITY
ISOPLETH MAP

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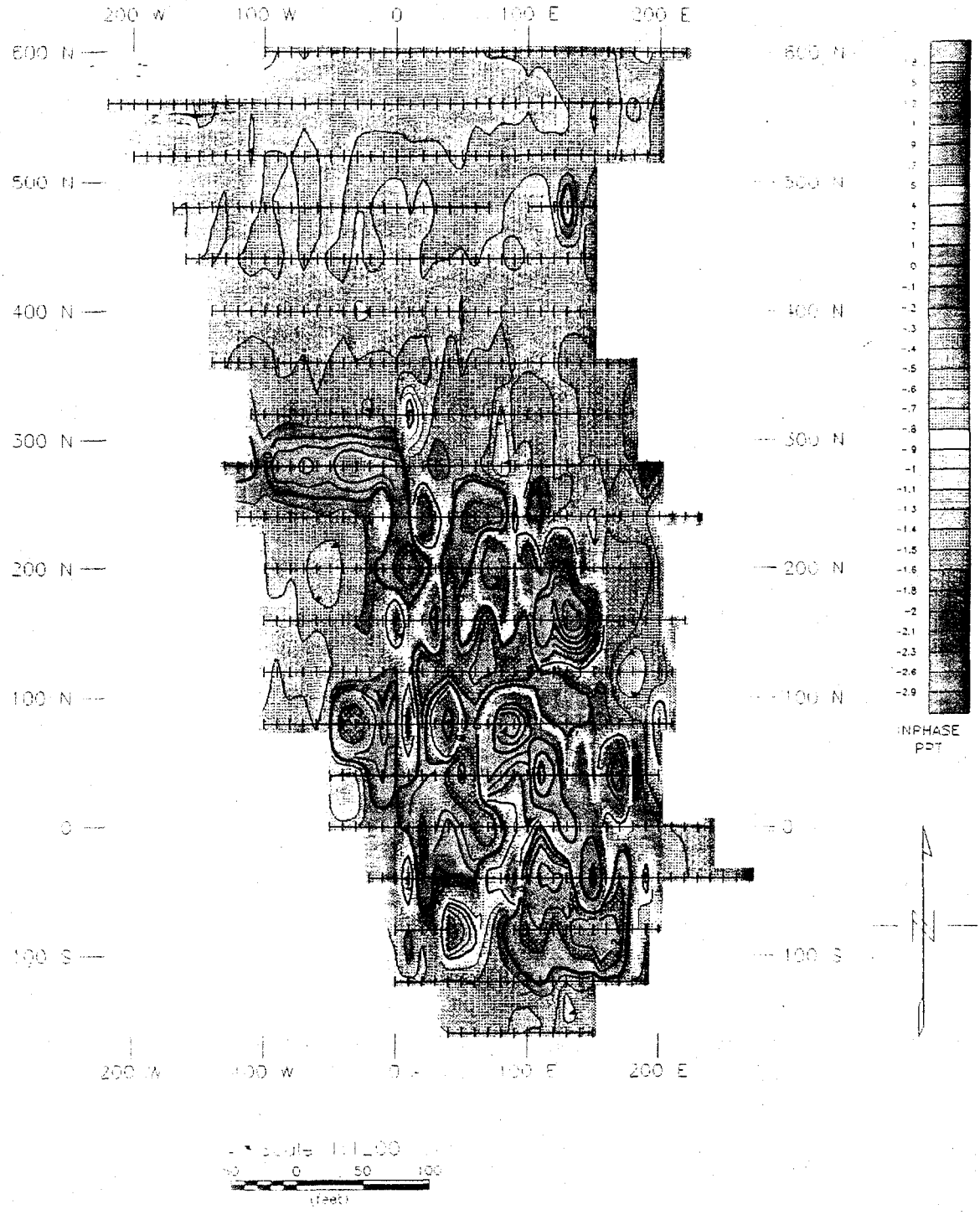
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-12

SITE 10
EM-31 INPHASE
ISOPLETH MAP

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NAS WHITING FIELD
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inphase data between 100W and 10W along line 280N is too low to be interpreted as associated with the landfill. The anomalies at Stations 440N, 90W (total magnetics data set) and 480N, 130E (EM-31 inphase data set) are interpreted to be caused by isolated metallic objects lying at or near the surface at these locations.

**3.2.3 Site 11, Southeast Open Disposal Area** Site 11 is located in the southeastern portion of the NAS Whiting Field and near the eastern property line (see Figure 1-2). Survey lines running north-south were established at 40-foot intervals. Survey stations were located at a spacing of 10 feet. Well WHF-12-1 is located at grid coordinates 270S, 612W (see Figure 3-13).

Magnetics. The anomalous region of the magnetic data lies between grid coordinates 20S and 330S, and 560W and 20E (see Figure 3-14). Three localized anomalies are present at grid point 70S, 560W; grid point 50N, 200W; and grid point 40S, 0W.

Electromagnetics. As shown on Figure 3-15, the EM conductivity data set clearly indicates the outline of the anomalous region between grid coordinates 30S and 320S and 540W and 20E. The anomalous area on the inphase data (Figure 3-16), although not as readily apparent, lies roughly within the same boundaries. A localized anomaly is present at grid point 30S, 0W in the inphase data set.

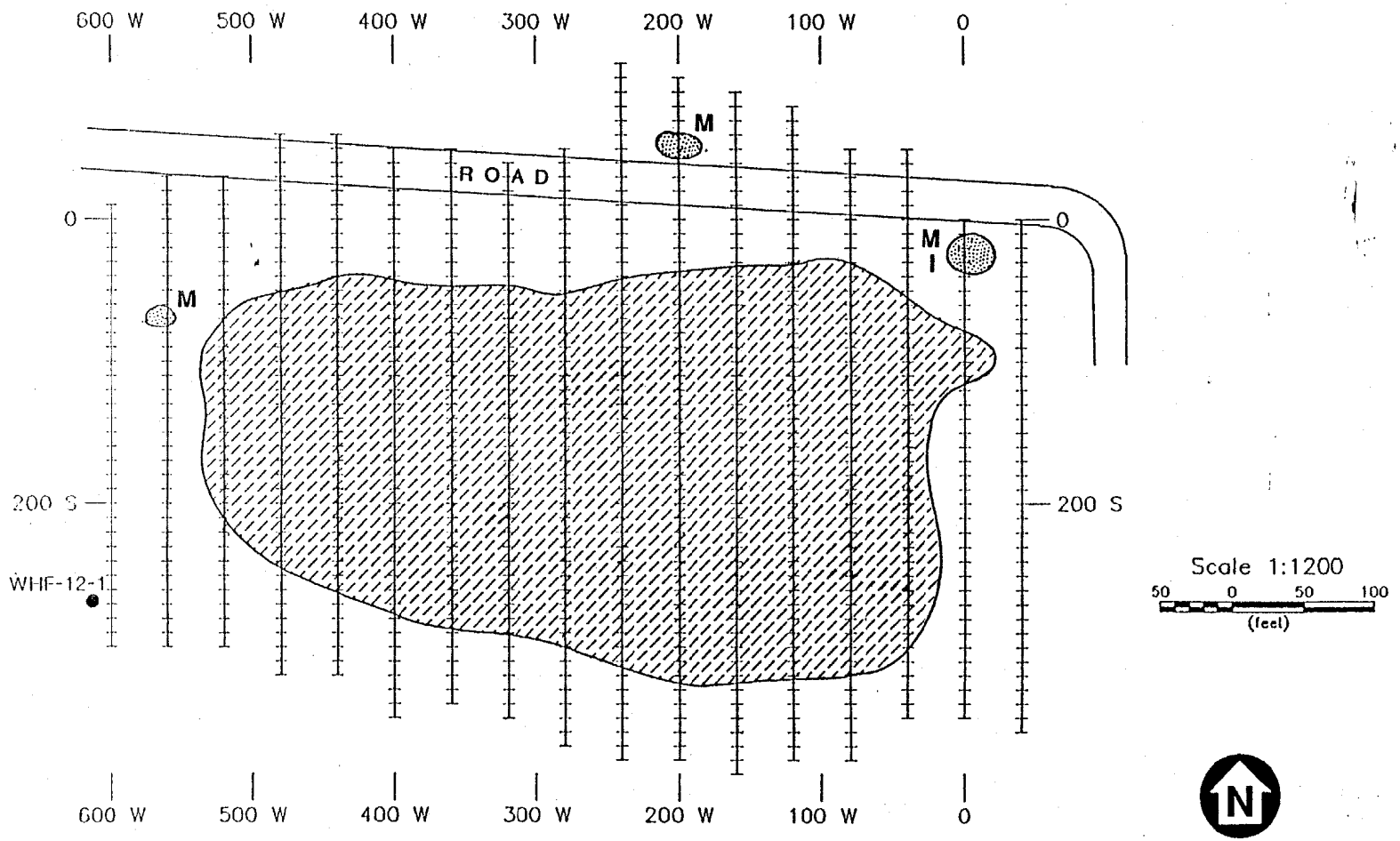
Results. The interpretation made from the total magnetic, EM-31 conductivity, and EM-31 inphase data sets is shown in Figure 3-13. All three data sets were interpreted to confirm a well defined, high contrast landfill boundary as indicated. Three geophysical total magnetic anomalies lying outside the interpreted landfill boundaries were identified at grid point 70S, 560W; grid point 50N, 200W; and grid point 30S, 0W. The last total magnetic anomaly located at grid point 30S, 0W was also confirmed by the EM-31 inphase data set. These anomalies are interpreted to be caused by ferromagnetic metal lying at or near the surface at these locations.

**3.2.4 Site 13, Sanitary Landfill** Site 13 is located on the eastern property line of the south field, and a road runs north-south along the axis of the site. The geophysical survey location map for Site 13 is shown in Figure 1-2. Survey lines were established at two different intervals running due east-west. A 20-foot line spacing was used on the lines from 0N to 1200N, and line spacing of 40 feet was used from lines 120S to 0N and lines 1200N to 1800N (see Figure 3-17). Stations were located at 10-foot intervals along each of the survey lines. This site is mostly open, with the exception of the area between 200W to 400W, and 80N to 240N, which was covered with slash pines.

Magnetics. The total magnetic field data is presented in Figure 3-18. The data shows two linear features which trend roughly north-south from approximately 80S to 1600N, with a shorter parallel feature between 700N to 1100N.

There is an anomaly of very high magnitude between 100N to 180N, and 270W to 200W. To the north, west, and south of this are other high magnitude total magnetic anomalies. At 1720N, 30E there is an isolated magnetic anomaly.

Electromagnetics. As shown on Figure 3-19, the EM-31 conductivity data shows a linear conductivity high running from approximately 80S to 1640N along 40W. Another ridge of high conductivity parallels this to the west from 740N to 1200N.




LEGEND

ISOLATED GEOPHYSICAL ANOMALY
M = TOTAL MAGNETIC FIELD ANOMALY
C = EM-31 CONDUCTIVITY ANOMALY
I = EM-31 INPHASE ANOMALY

INTERPRETED LANDFILL AREA

SURVEY GRID LINES AND
0 STATION LOCATION

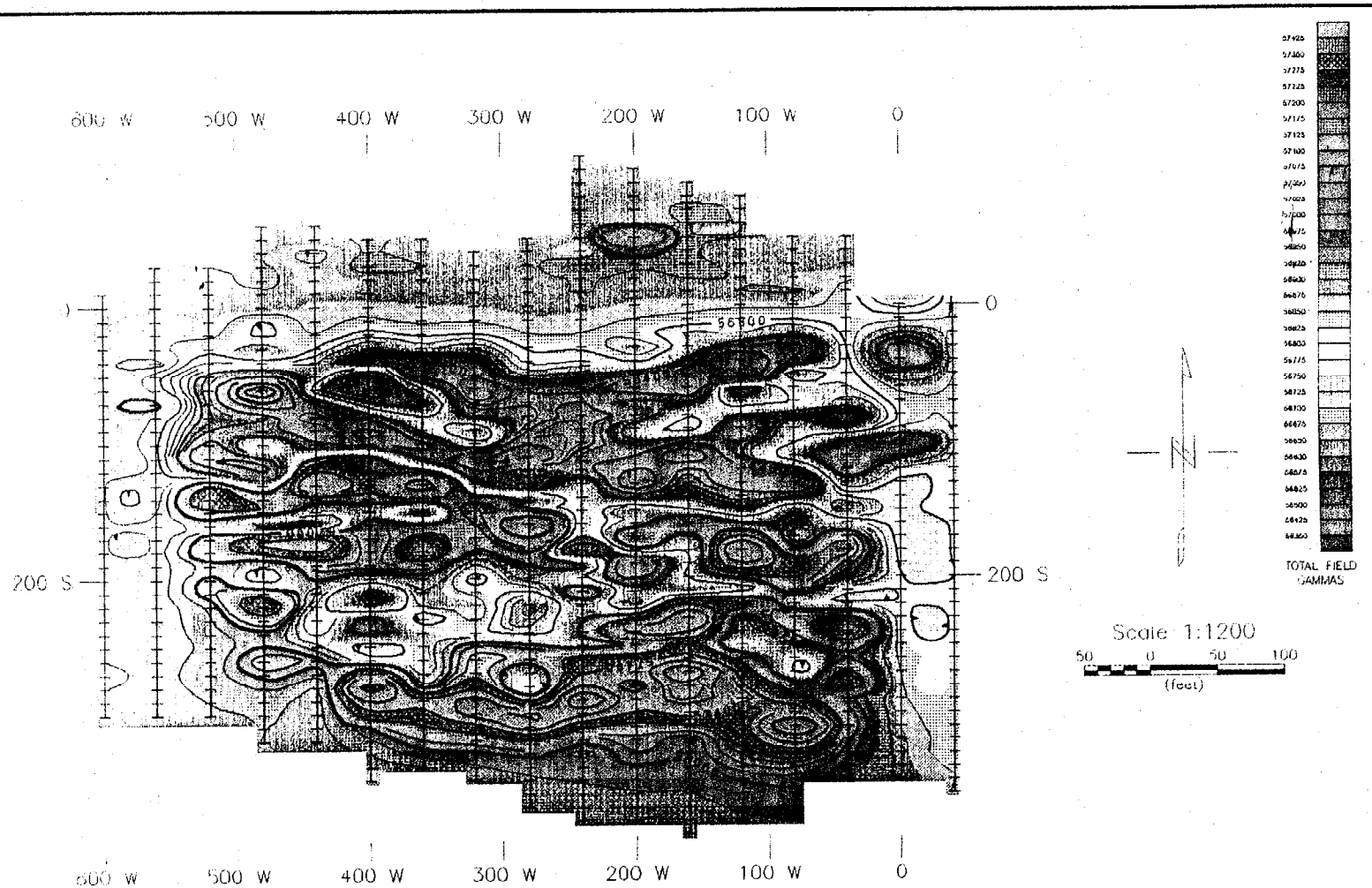
SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992

FIGURE 3-13

SITE 11
GEOPHYSICAL SURVEY GRID LINES
AND INTERPETED ANOMALY LOCATIONS

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



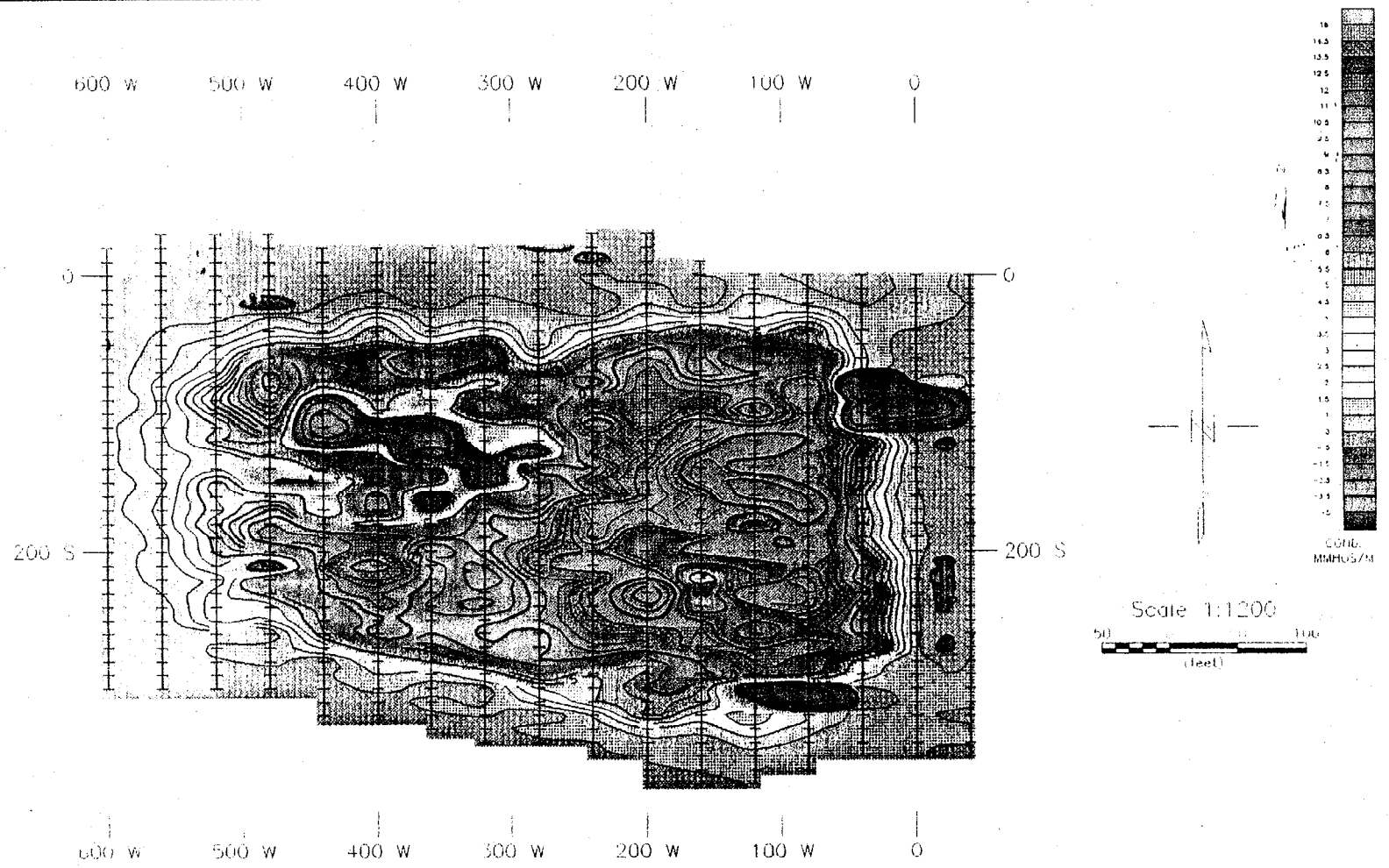

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-14

SITE 11
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



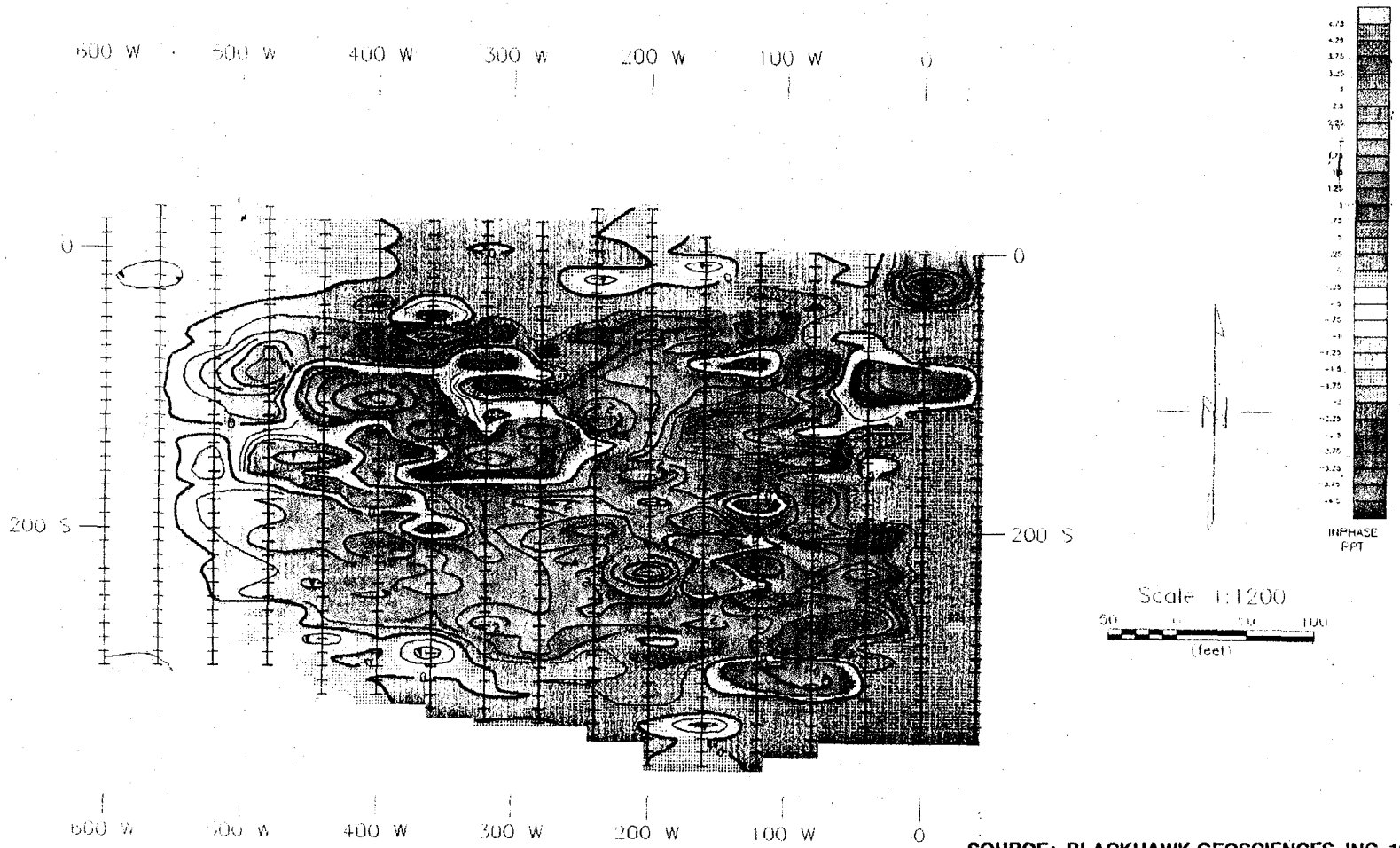

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-15

SITE 11
EM-31 CONDUCTIVITY
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



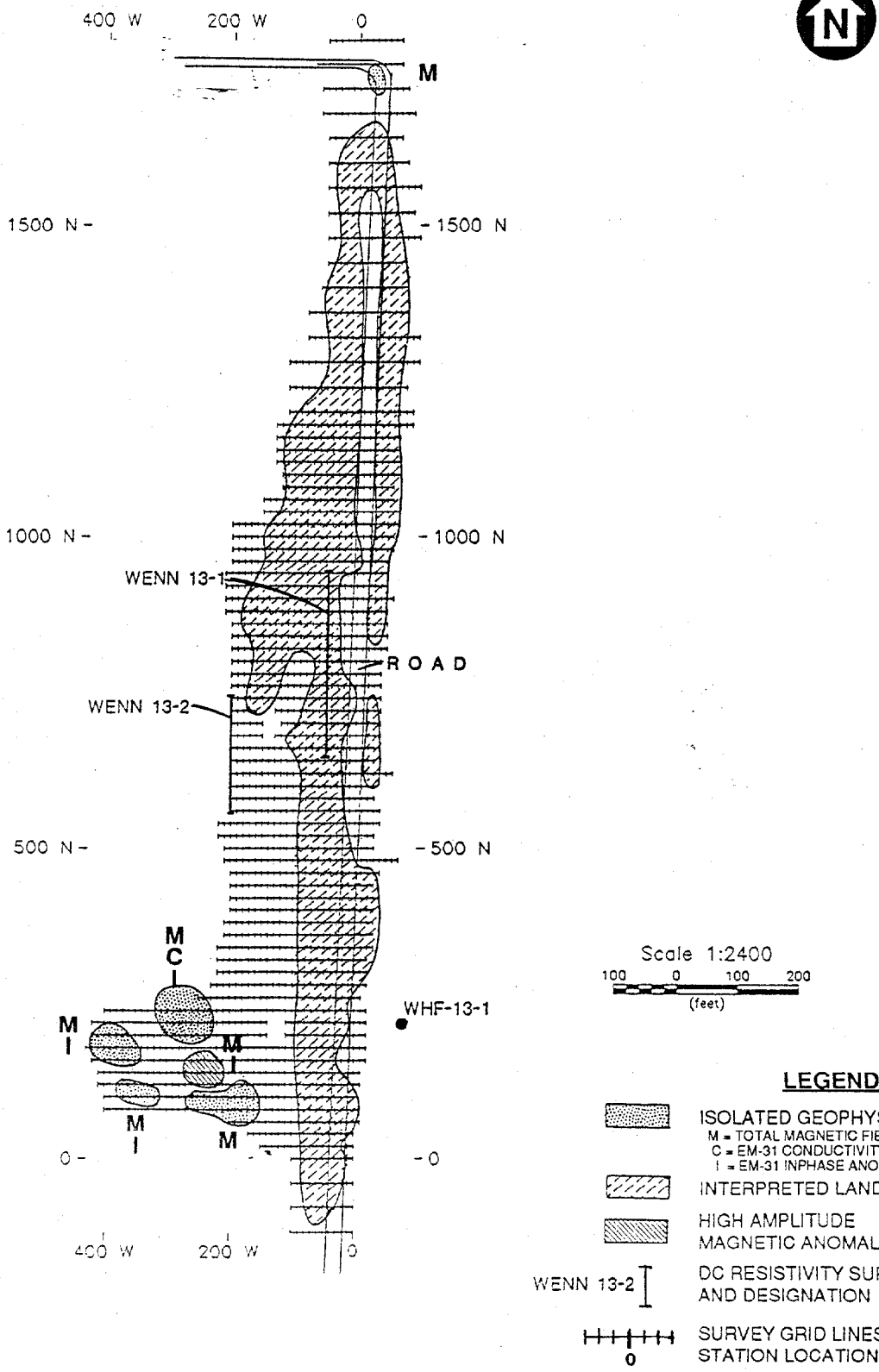

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-16

SITE 11
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



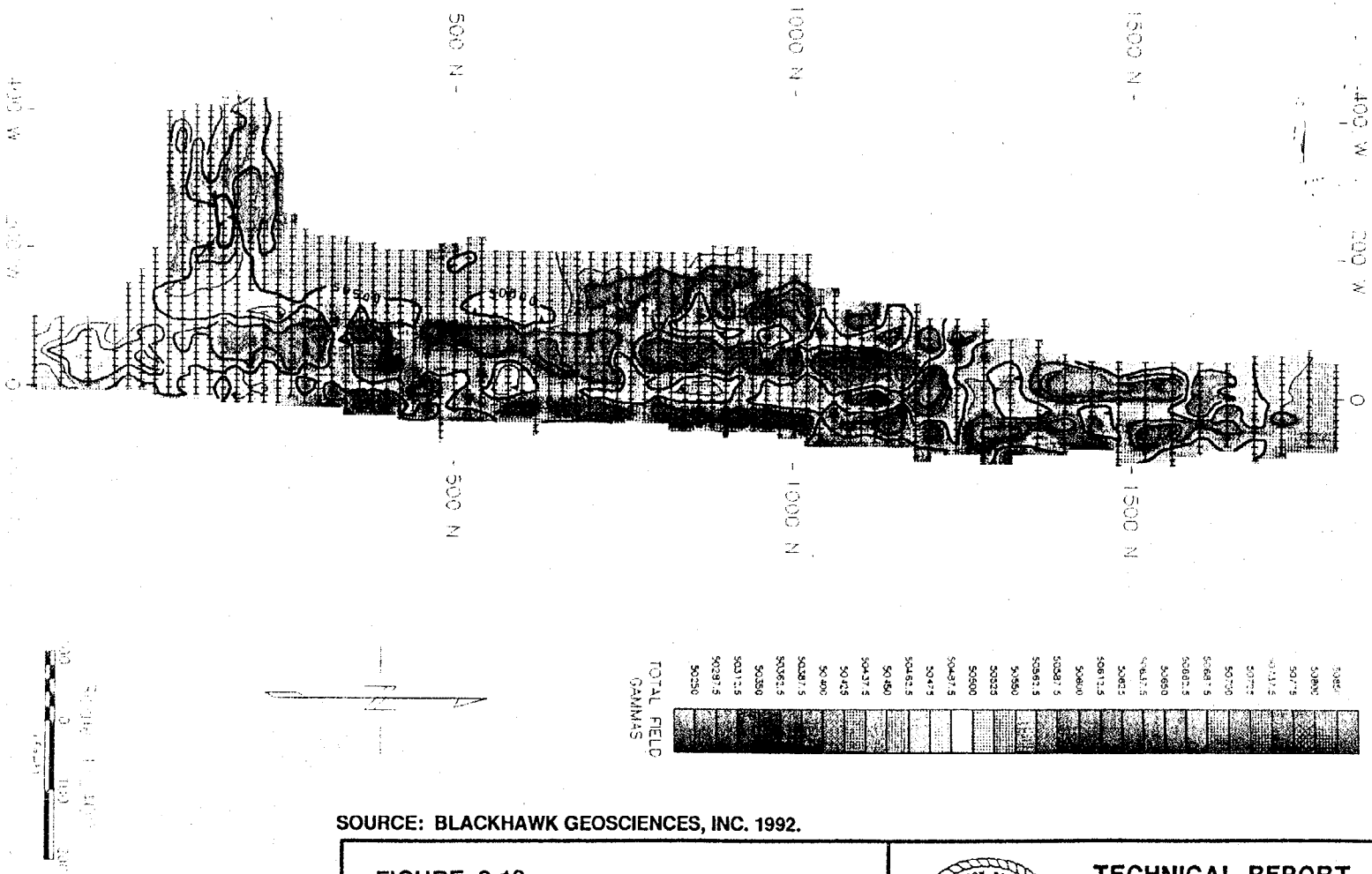

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

FIGURE 3-17

SITE 13
GEOPHYSICAL SURVEY GRID LINES
AND INTERPETED ANOMALY LOCATIONS

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992



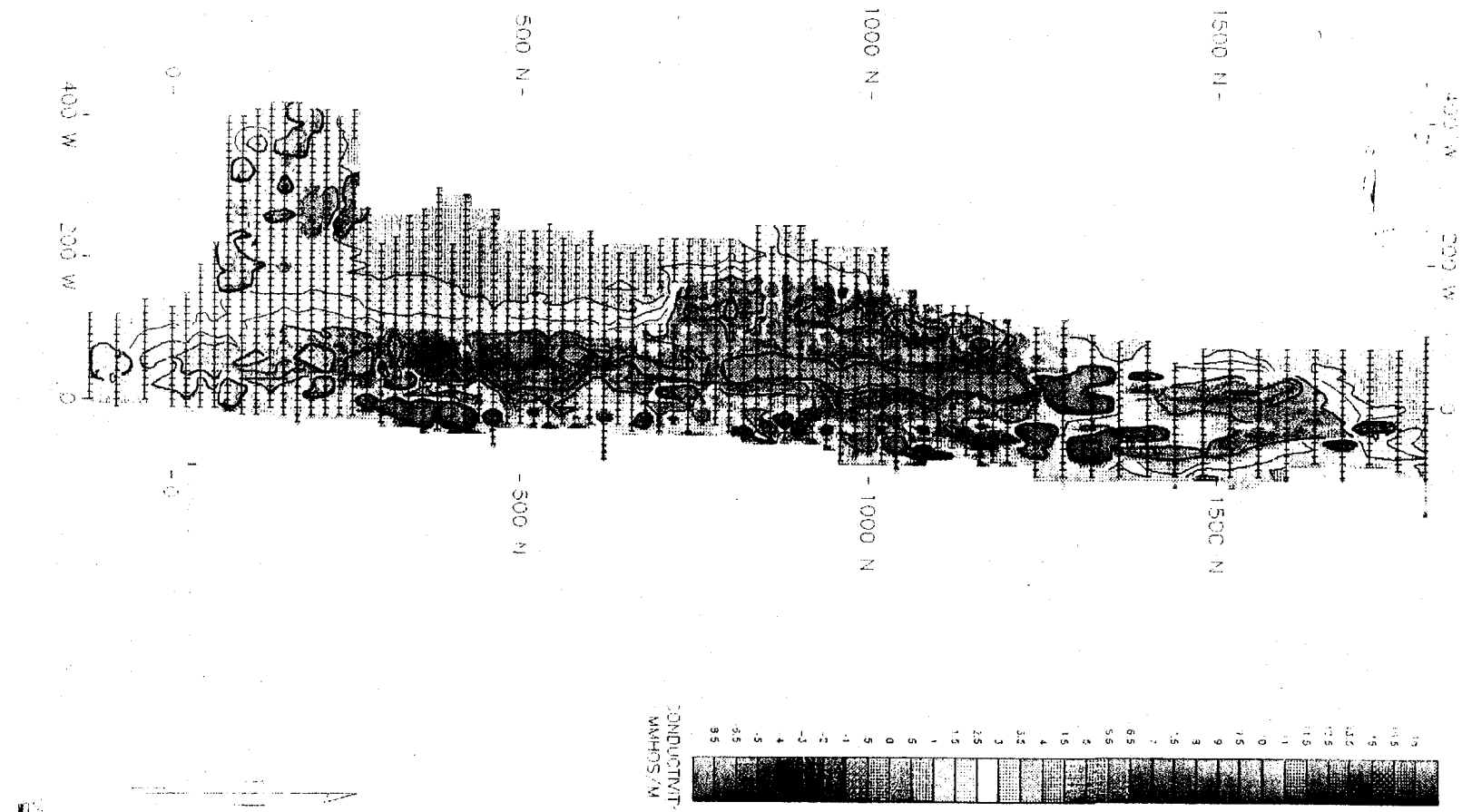

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-18

SITE 13
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-19

SITE 13
EM-31 CONDUCTIVITY
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

The area between 80N to 240N, and 200W to 400W, shows scattered localized anomalies. The EM-31 inphase data set for Site 13 shows inphase anomalies consistent with those of the conductivity data (Figure 3-20).

Results. The interpreted landfill boundary is shown in Figure 3-17. The landfill appears to be a series of trenches approximately 1,750 feet long, and approximately 250 feet wide at its widest point. The trench boundaries were confirmed by all three geophysical data sets.

In the area between 80N to 240N and 20W to 400W, there are high amplitude magnetic anomalies. In this same area, the EM-31 conductivity data appears to be close to that of the background. Where there are conductivity anomalies, there are also inphase anomalies, which indicates that changes in conductivity are likely to be caused by buried metallic materials. The general character of the conductivity and total magnetic signatures in this area leads to the interpretation that large amounts of ferromagnetic metals were buried in this area. The greatest concentration of ferromagnetic metals in this area is interpreted to lie along line 140N between Stations 270W and 230W. An anomaly at grid point 1720N, 30E is present on both total magnetic and EM-31 conductivity data sets, and is believed to be caused by buried metal materials.

**3.2.5 Site 14, Short-Term Sanitary Landfill** Site 14, is located in the south-eastern portion of the station and is near Site 13 (see Figure 1-2). The site is covered with slash pines. The survey lines at Site 14 run north-south and were surveyed with a line interval of 40 feet and a station interval of 10 feet. Well WHF-14-1 lies at grid coordinates 175S, 37W (see Figure 3-21).

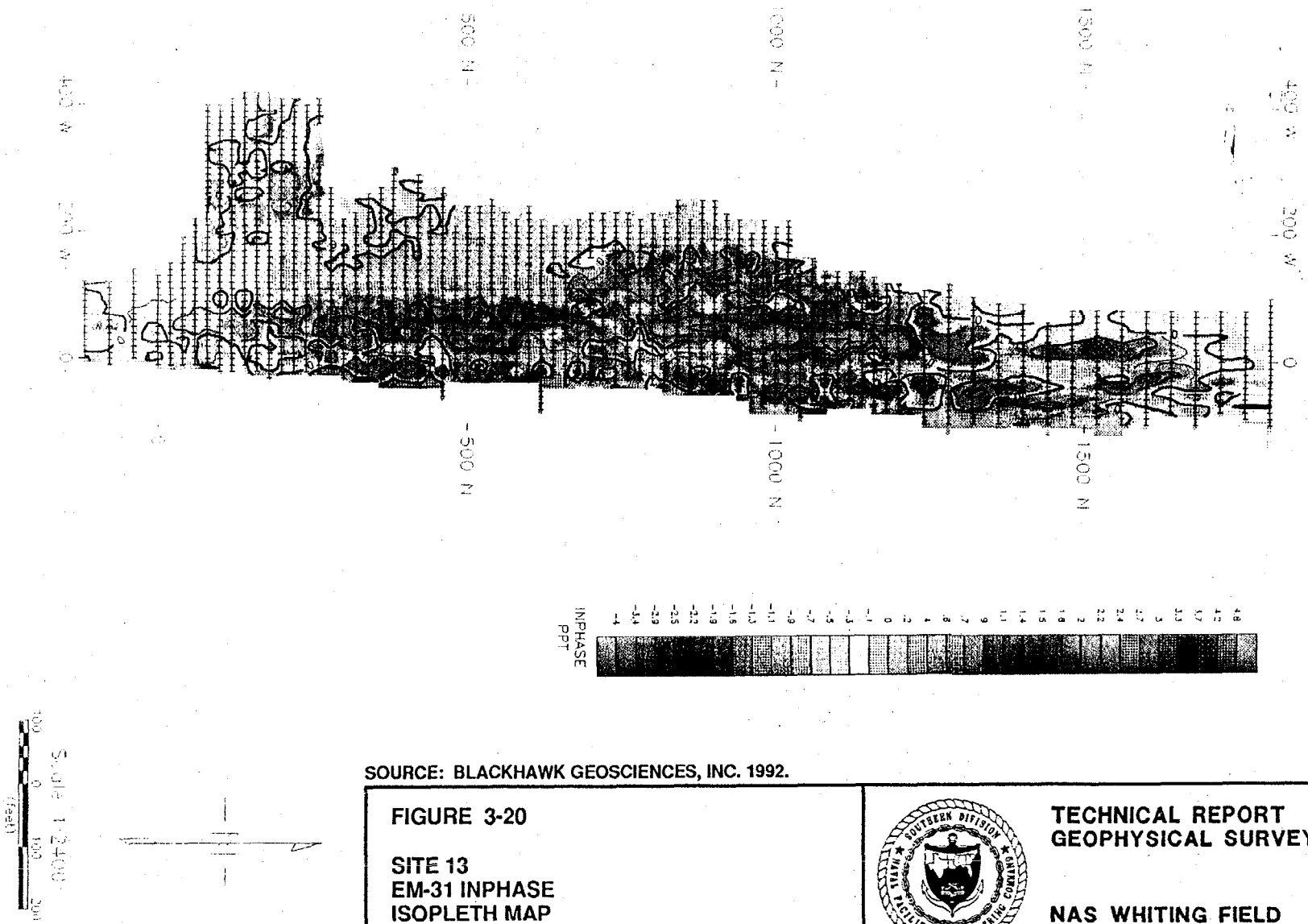
Magnetics. As shown on Figure 3-22, the total magnetic field data set indicates an anomaly that runs east-west along 180S from approximately 420W to 100W. A separate localized, low amplitude anomaly is present at grid coordinates 90S, 400W.

Electromagnetics. The EM-31 conductivity data (Figure 3-23) and inphase data (Figure 3-24) sets show a large scale anomaly centered along grid line 180S approximately 320 feet long and 60 feet wide.

Results. The anomalies on the total magnetic, EM-31 conductivity, and EM-31 inphase data sets all show signatures characteristic of fill containing metallic debris. The interpreted landfill area is shown in Figure 3-21, as is the isolated, low amplitude anomaly at 90S, 400W identified in both the total magnetic and EM-31 conductivity data sets.

**3.2.6 Site 15, Southwest Landfill** Site 15 is located southeast of the wastewater treatment plant in the southwestern portion of the station (see Figure 1-2). The survey lines at Site 15 were established in a east-west direction at 40-foot intervals with a station interval of 10 feet along each line. Monitoring well WHF-15-1 lies at 350N, 317W on the survey grid (see Figure 3-25).

Magnetics. As shown on Figure 3-26, there are three separate anomalous trends on the total magnetic data set. The feature with the highest magnitude lies between 800N to 1000N and 100W to 300E. In the center of the grid, there are five parallel bands of anomalous magnetic values tending north-northeast from approximately 40N to 760N. The third anomalous region is in the eastern part of



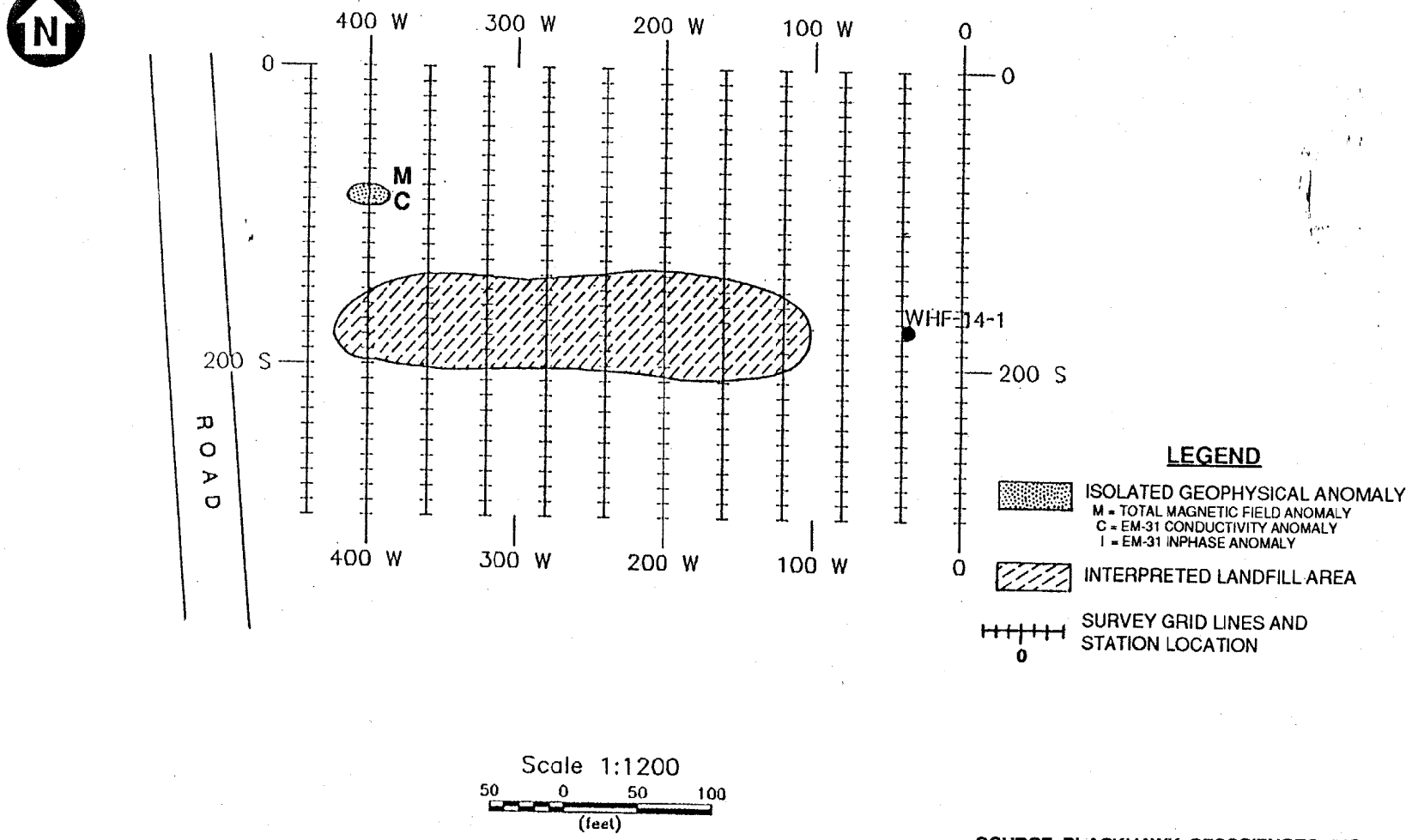

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-20

SITE 13
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



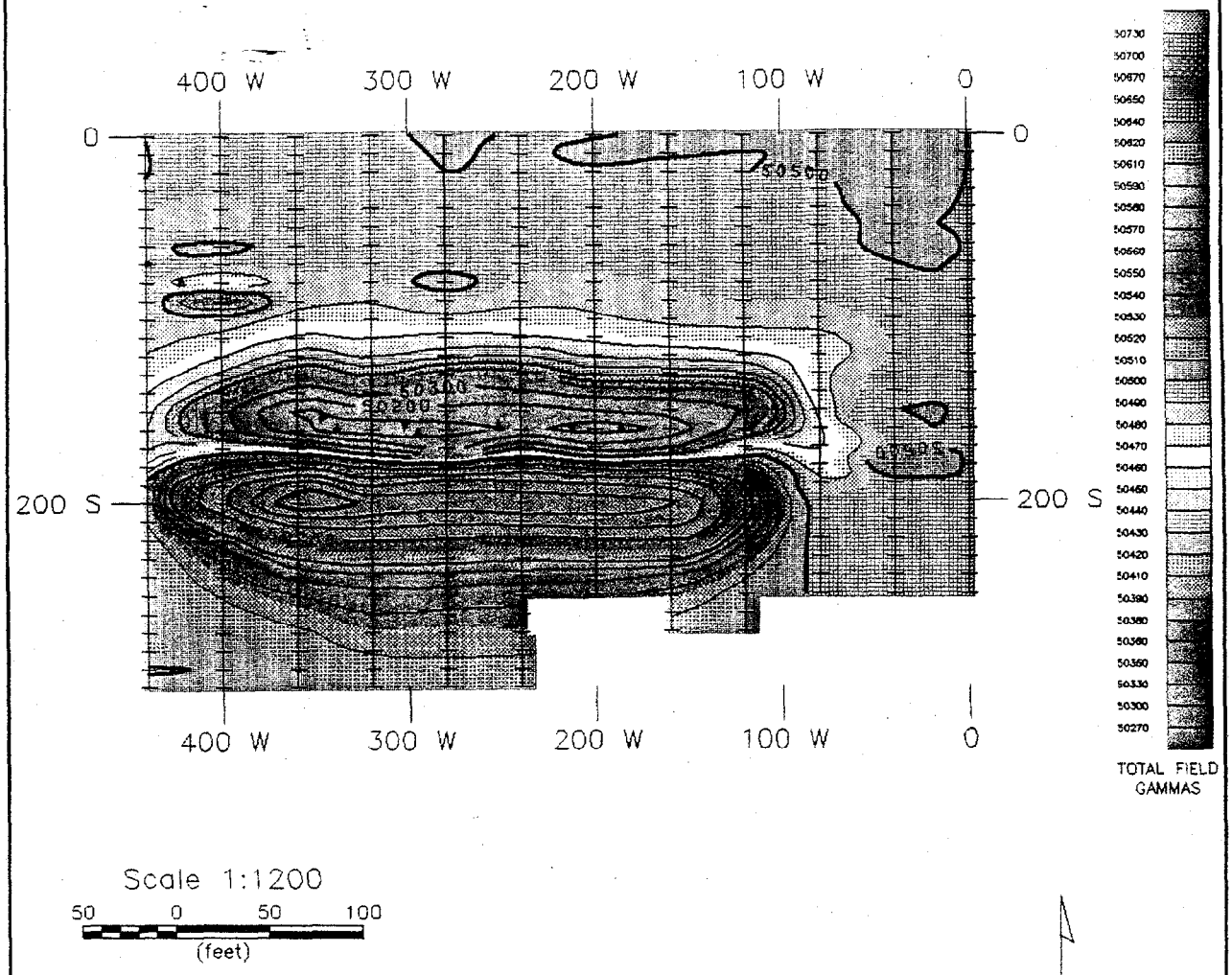

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992

FIGURE 3-21

SITE 14
GEOPHYSICAL SURVEY GRID LINES
AND INTERPETED ANOMALY LOCATIONS

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



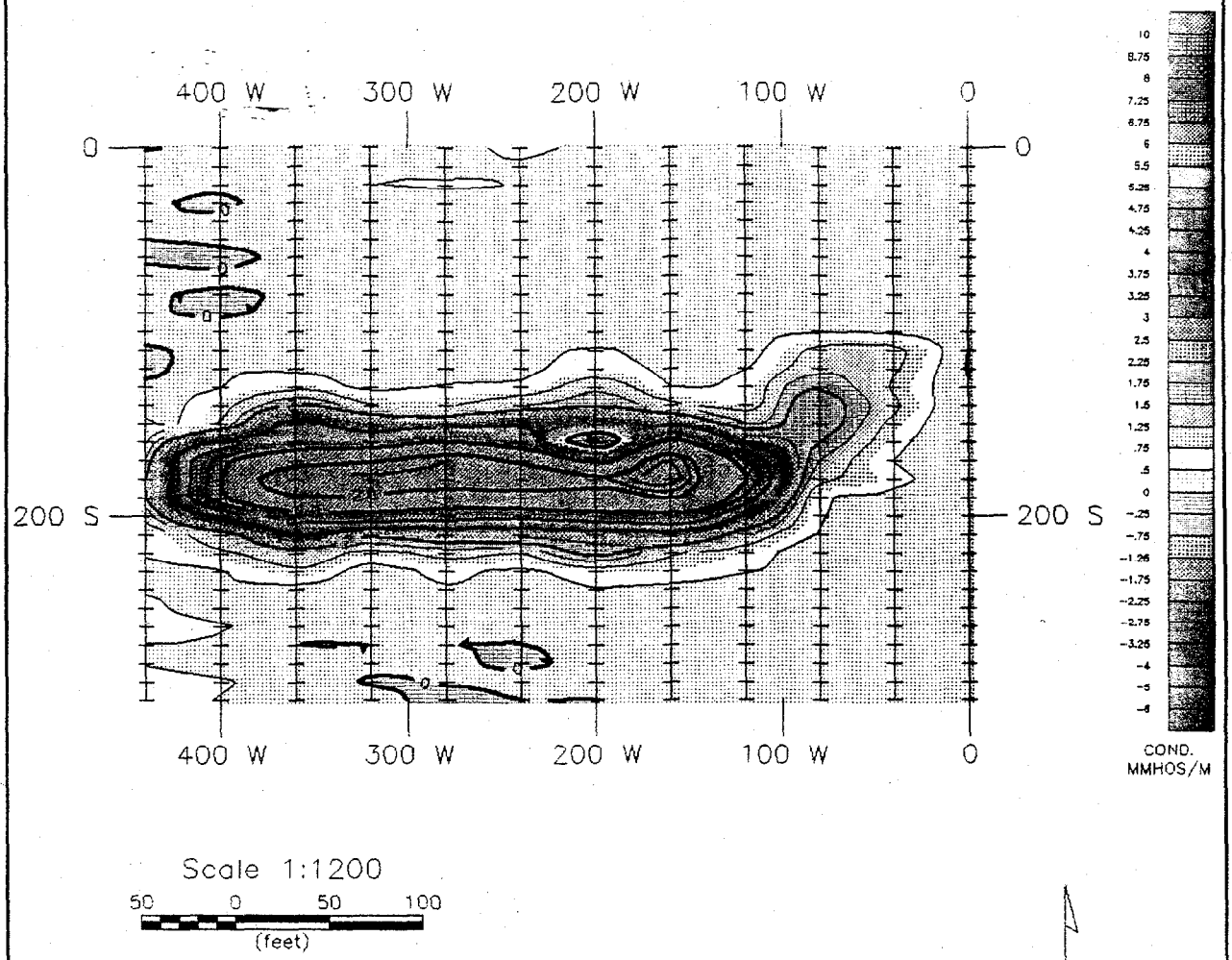

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-22

SITE 14
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



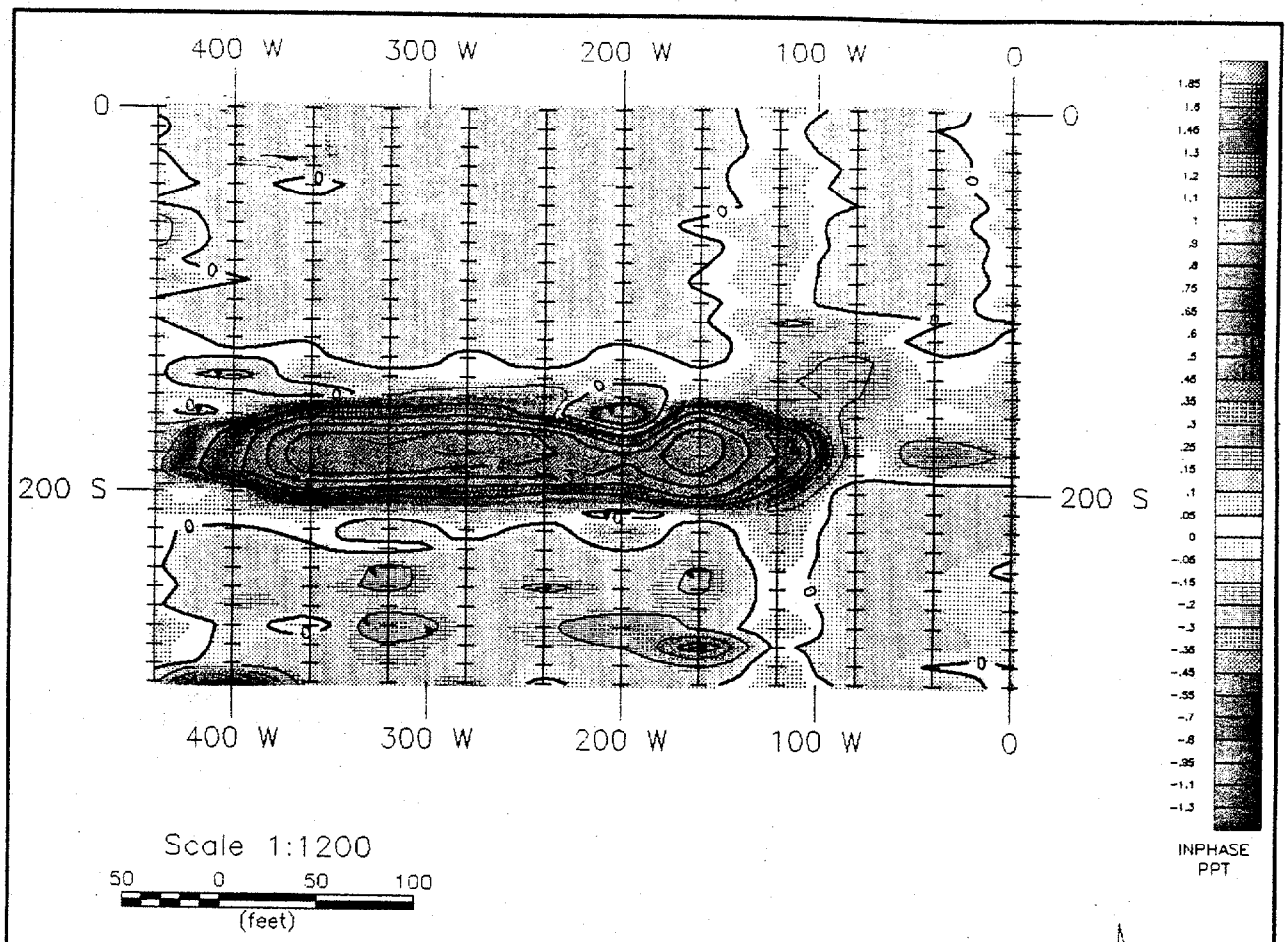

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-23

SITE 14
EM-31 CONDUCTIVITY
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



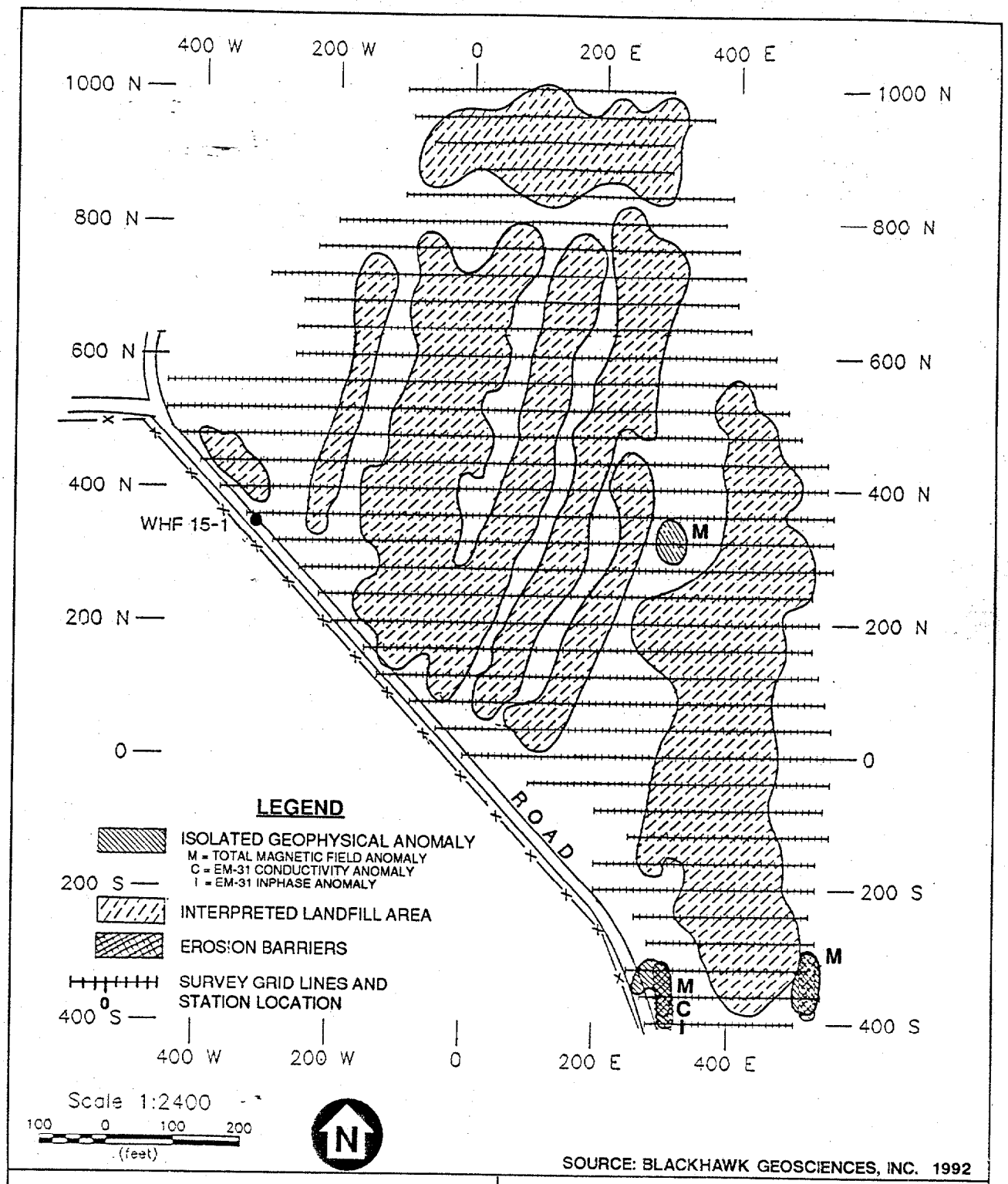

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-24

SITE 14
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



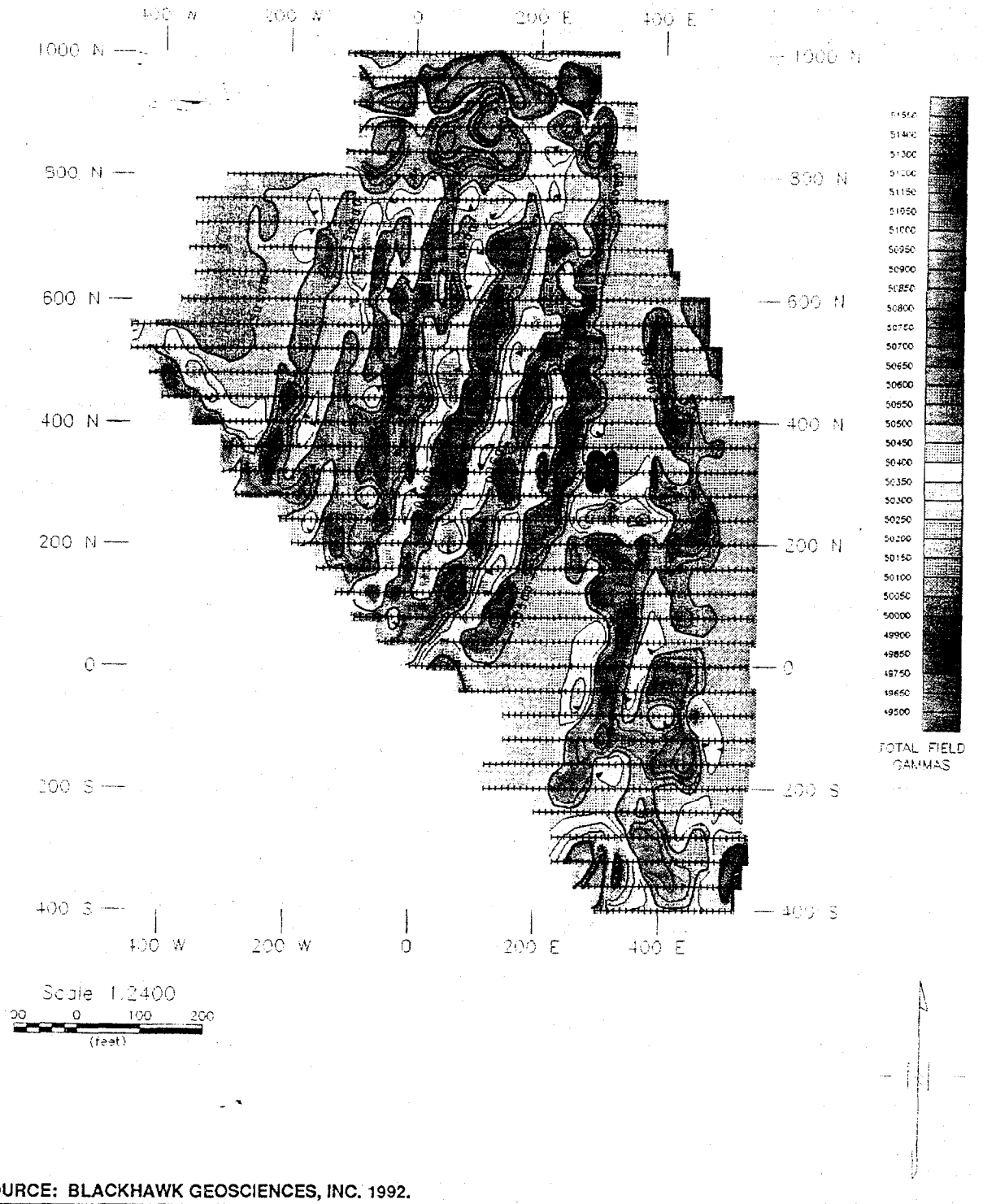

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992

FIGURE 3-25

**SITE 15**
**GEOPHYSICAL SURVEY GRID LINES AND INTERPETED ANOMALY LOCATIONS**

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-26

SITE 15
TOTAL MAGNETIC FIELD
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

the grid, located between 360S to 560N. Three small-scale anomalies occur at grid point 320N, 310E; grid point 360S, 520E; and grid point 360S, 290E.

Electromagnetics. The EM-31 conductivity (Figure 3-27) and EM-31 inphase data sets (Figure 3-28) show anomalous values in the same trends that were apparent on the total magnetic field data set. One anomaly present on both EM-31 induction data sets, which is not evident on the total magnetic field data, extends from 480N, 360W to 400N, 310W.

Results. The interpreted landfill areas for Site 15 are shown on Figure 3-26. The landfill area on the northern portion of the grid registered very high total magnetic field values, which indicate a high degree of buried ferromagnetic metal. The central portion of the grid has features which appear to be parallel landfilled trenches. On the eastern side of the grid is a large landfill approximately 1,000 feet long and 150 feet wide.

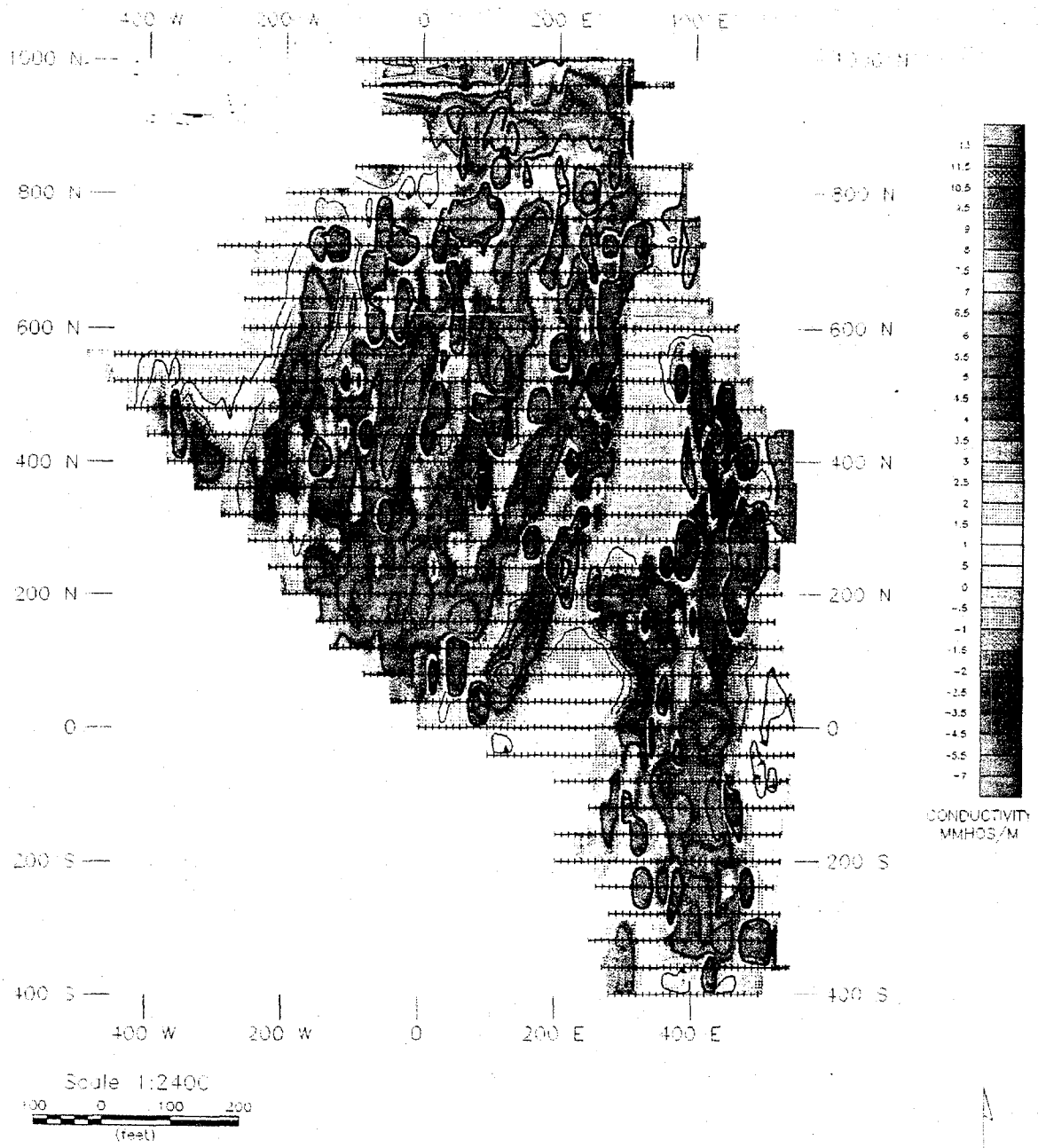
Of the three isolated high amplitude total magnetic anomalies, the two on the southern edge (grid point 360S, 520E and grid point 360S, 290E) coincide with the location of metal erosion barriers, and the anomaly at grid point 320N, 310E is interpreted to be associated with buried metals.

**3.2.7 Site 16, Open Disposal and Burning Area** Site 16 is located east of Clear Creek and west of the wastewater treatment plant (see Figure 1-2). The survey lines run north-south with a spacing of 40 feet, and a station spacing of 10 feet along the lines. At two areas on the site, discarded tanks were lying on the ground, and these areas are shown on the base map in Figure 3-29. Because of the fence running along grid line 0E, no EM-31 induction data could be collected along this line.

Magnetics. As indicated on Figure 3-30, the total magnetic field data set shows two major anomalies. These anomalies trend east-west and are centered around grid point 80S, 240E and grid point 400S, 120E. In addition to these major anomalies, many smaller anomalies are evident on the grid. Of note are the two large-scale anomalies located on the northern end of grid line 680E.

Electromagnetics. The EM-31 conductivity data plot shown on Figure 3-31 indicates two distinct areas of anomalous conductivities: one in the northern portion of the grid, and the second in the southern portion. The large, high conductivity area centered around grid point 50S, 260E was the area selected for DC Resistivity testing. The EM-31 inphase data (Figure 3-32) indicates anomalies consist with the EM-31 conductivity data. Both EM-31 induction plots show several small anomalies occur within the grid area but outside the main body of the large-scale anomalies.

Results. Two main landfill features were interpreted from the EM and total magnetic data sets (see Figure 3-30). The landfill interpreted in the northern portion of the grid is approximately 400 feet by 350 feet, and the interpreted landfill to the south is of more irregular shape with approximate dimensions of 370 feet by 550 feet. The western edge of both landfills are interpreted to extend to the fence, which constitutes the limit of the survey area. The presence of the chain-link fence along grid line 0E precluded the use of EM induction methods along this line, so the western boundary of these landfills can only be inferred. To the east of the interpreted southern landfill, several small geophysical anomalies exist. These are interpreted to be caused by random



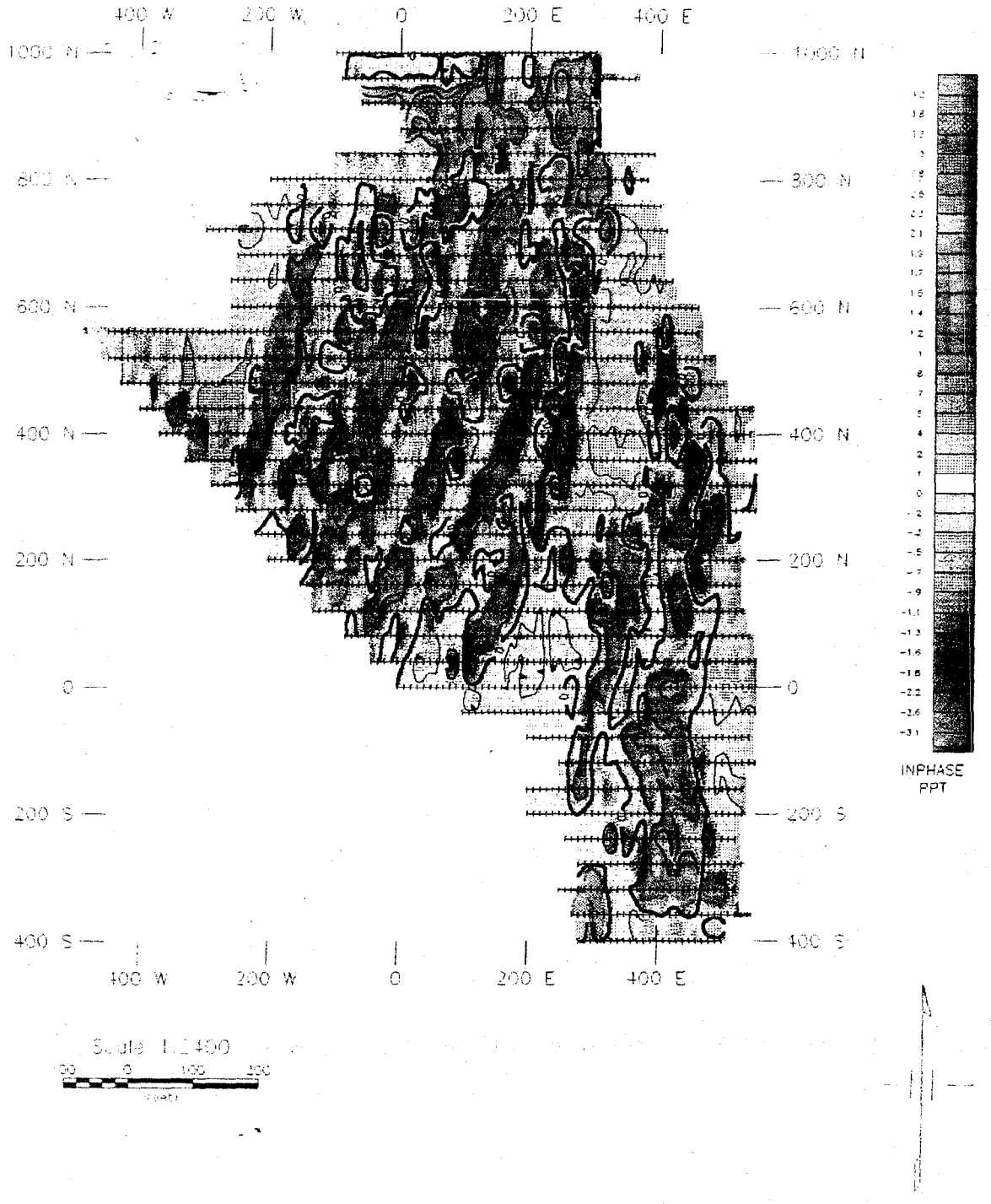

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-27

SITE 15
EM-31 CONDUCTIVITY
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA



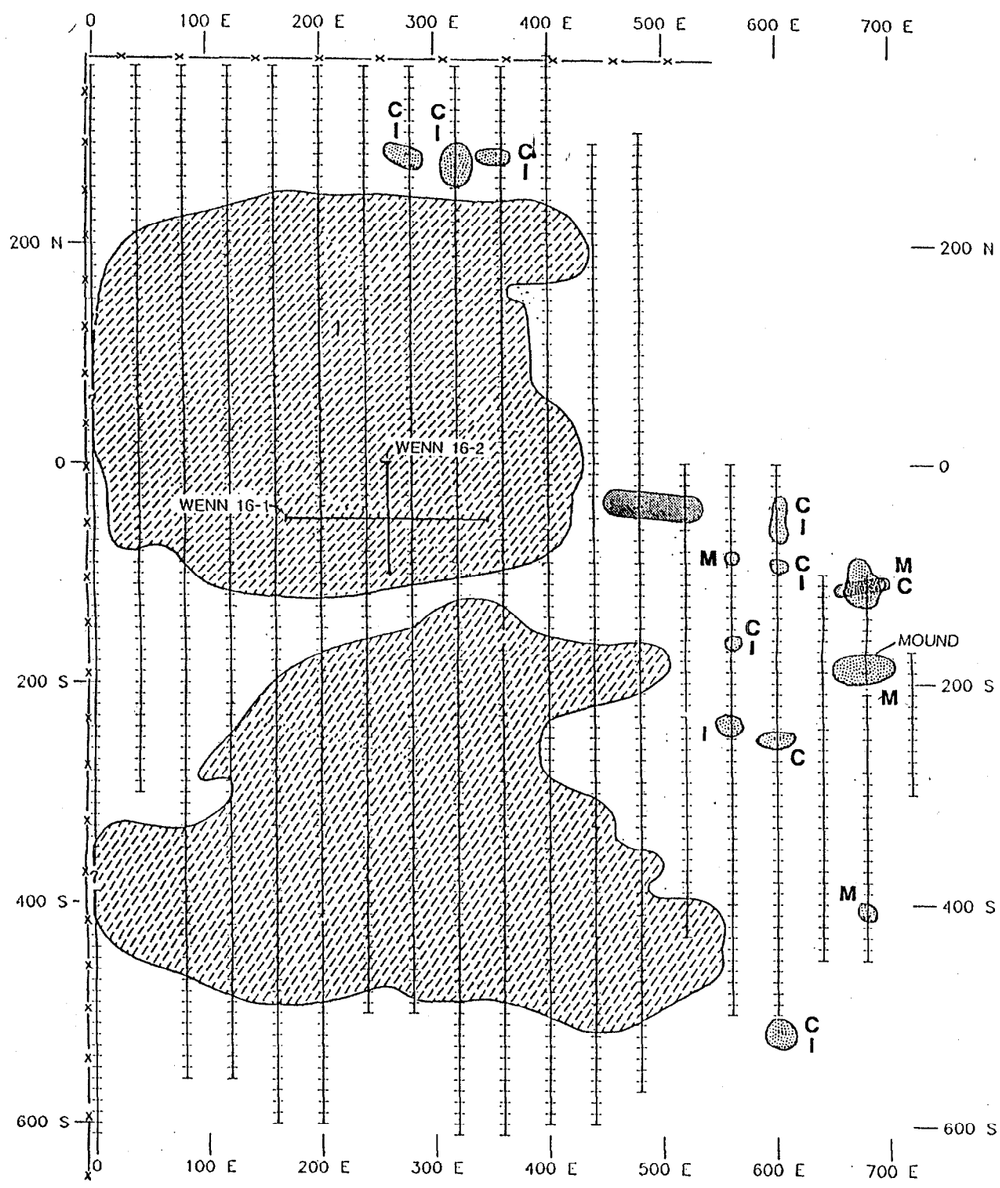

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

FIGURE 3-28

SITE 15
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA




Scale 1:1200

50 0 50 100

(feet)

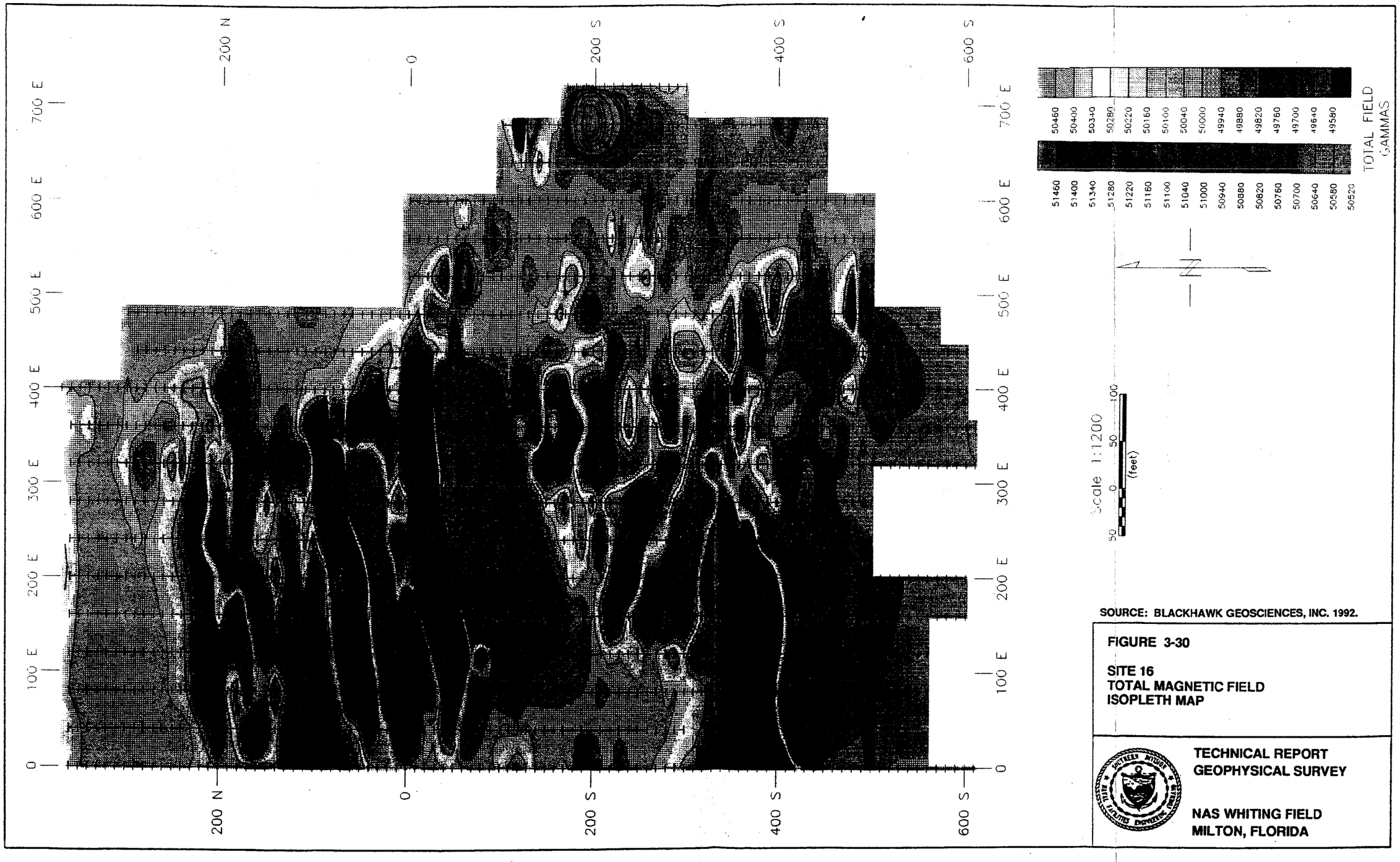
FIGURE 3-29

SITE 16
GEOPHYSICAL SURVEY GRID LINES
AND INTERPETED ANOMALY LOCATIONS

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

00235EB32



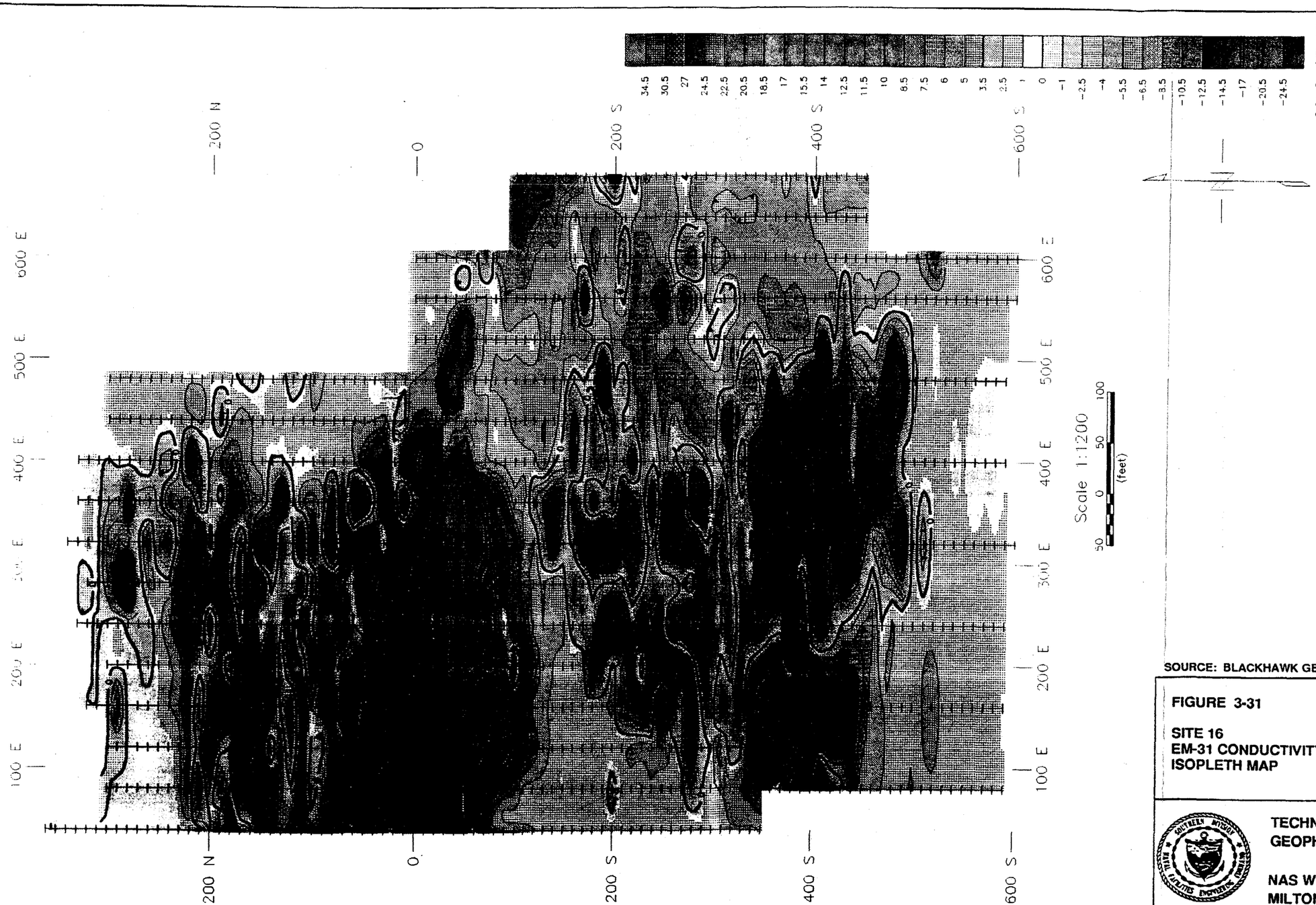

SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

**FIGURE 3-30**

**SITE 16**
**TOTAL MAGNETIC FIELD**
**ISOPLETH MAP**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**




SOURCE: BLACKHAWK GEOSCIENCES, INC. 1992.

**FIGURE 3-31**

**SITE 16**
**EM-31 CONDUCTIVITY**
**ISOPLETH MAP**

**TECHNICAL REPORT**
**GEOPHYSICAL SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

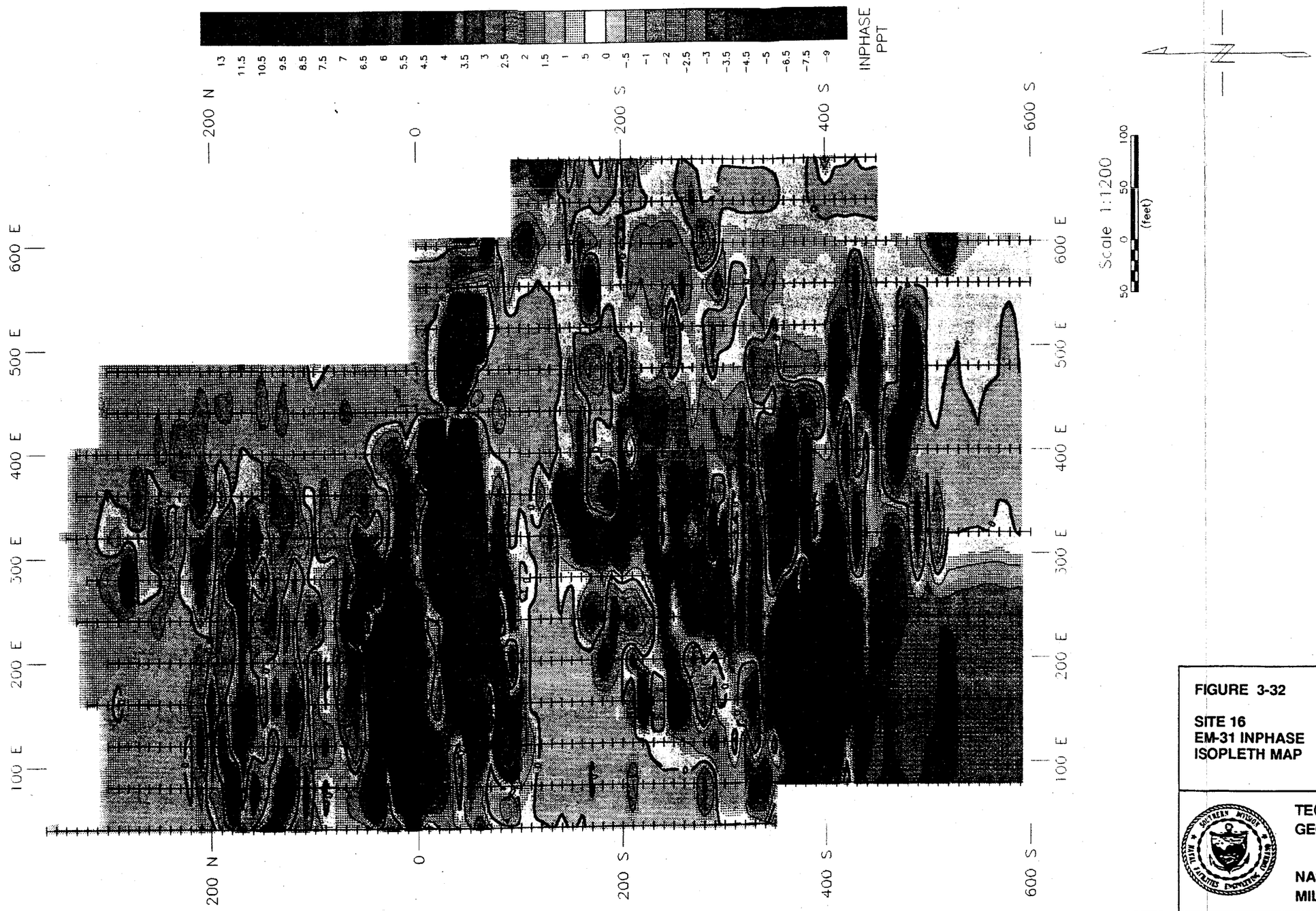



FIGURE 3-32

SITE 16
EM-31 INPHASE
ISOPLETH MAP

TECHNICAL REPORT
GEOPHYSICAL SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

disposal, rather than controlled landfilling. Previously excavated large tanks are present at the site. The mound located at grid point 680E, 190S was associated with a very high amplitude total magnetic anomaly, and an EM-31 conductivity anomaly. This suggests that a pit may have been dug at this location, filled with ferromagnetic metal materials, and subsequently covered with soil. This survey grid was extended to the east three times while attempting to encompass all isolated anomalies within the grid. However, the random distribution of these anomalies did not indicate relevance to primary landfilling activities at Site 16, and therefore their locations and distribution were determined to be outside the scope of this project. Therefore, the survey was discontinued beyond these anomalies.

## 4.0 SUMMARY AND CONCLUSIONS

The objectives of the geophysical surveys at NAS Whiting Field were to characterize landfill materials, define the lateral and vertical extent of landfill boundaries, and to identify potential plume migration pathways. The first objectives, to characterize landfill materials and determine the lateral extent of the boundaries was accomplished with the use of the EM-31 induction tool and an EDA OMNI-IV total magnetometer. The objective of determining the vertical extent of fill at each site was not met due to resistivity variations in the landfill materials. The variable resistivities were believed to be caused by the nature of the fill material and the presence of a high metal content. These factors precluded the selection of a single value for the depth versus the resistivity curve generated by the DC sounding. Because the depth of fill measurement is largely dependent on an accurate resistivity measurement, confidence in the calculated solutions could not be obtained. Finally, no preferential plume migration pathways were identified at any of the sites.

A summary of the geophysical results and interpretations for each of the sites investigated is presented in Table 4-1. In addition, a site-by-site narrative summary of the overall findings is presented below.

**Site 1.** No landfill like structure was interpreted to exist. One isolated geophysical anomaly was noted.

**Site 10.** One landfill cell was interpreted at this site. Two small, low amplitude anomalies were present on the northern portion of the grid.

**Site 11.** This site contained a single interpreted landfill area. Three isolated geophysical anomalies were also interpreted.

**Site 13.** One landfill feature was interpreted at this site. Several additional isolated geophysical anomalies were interpreted. The anomalies located on the western portion of the grid appear to be associated with large amounts of buried ferromagnetic metal.

**Site 14.** One landfill feature was interpreted, along with one low amplitude isolated anomaly.

**Site 15.** Two large landfill cells were interpreted at this site, as well as what appears to be a series of filled trenches in the central and western portions of the grid.

**Site 16.** This site contained two interpreted filled areas, one in the northern portion of the grid and one in the southern portion. Several localized geophysical anomalies existed, most of which lie in the eastern portion of the grid.

As indicated on Table 4-1 and discussed above, the lateral boundaries of each of the investigated disposal areas, with the exception of one, Site 1, the Northwest Disposal Area, have been delineated and mapped. In addition to the primary disposal areas, numerous isolated metallic and non-metallic anomalies have been

## Table 4-1
## Summary of Geophysical Survey

Geophysical Survey, Technical Report
RI/FS Phase II-A, NAS Whiting Field
Milton, Florida

| Site No. | Site Name and Type | Results | | | Interpretation |
|---|---|---|---|---|---|
| | | Magnetometer | EM-31 Conductivity | EM-31 Inphase | |
| 1 | Northwest Disposal Area (landfill) | No anomalies | Flat across the site | Flat across the site | No landfill boundaries can be interpreted. |
| 10 | Southeast Open Disposal Area (A) (landfill) | One large scale anomaly with two isolated point features. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill is interpreted in the southern portion with definite lateral boundaries. |
| 11 | Southeast Open Disposal Area (B) (landfill) | One large scale anomaly with three isolated low amplitude anomalies. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill is interpreted with definite lateral boundaries. |
| 13 | Sanitary Landfill (landfill) | Two linear feature anomalies with a shorter parallel feature and a localized high amplitude anomaly. | Consistent with magnetometer data. | Consistent with conductivity data. | Landfill interpreted with a series of trenches.<br><br>Greatest concentration of ferromagnetic metals in the southwestern corner. |
| 14 | Short-Term Sanitary Landfill (landfill) | Single linear feature anomaly trending eastwest. | Consistent with magnetometer data. | Consistent with conductivity data. | Indicates signatures of metallic debris buried in trench with definite boundaries. |
| 15 | Southwest Landfill (landfill) | A feature with highest amplitude anomaly in the northern portion.<br><br>Five bands of linear feature anomalies trending southwest-northeast.<br><br>Extended low magnitude anomaly in the eastern portion. | Consistent with magnetometer data. | Consistent with conductivity data. | High degree of buried ferromagnetic debris in the northern portion.<br><br>Parallel trenches of landfill in the central portion.<br><br>Large area of landfill in the eastern portion with defined boundaries. |
| 16 | Open Disposal and Burning Area (landfill) | Two regions of extended anomalies surrounded by natural field strength.<br><br>Scattered point feature anomalies trending away from the site in the easterly direction. | Consistent with magnetometer data. | Consistent with conductivity data. | Two landfill cells with definite boundaries. |

identified and mapped. However, the vertical extent of the landfills was not determined by the geophysical survey. Further, the interpreted data did not indicate the presence of contaminant plumes or possible subsurface preferential pathways for contaminant migration at any of the sites.

Anomalies identified during the geophysical survey will be verified by test pitting activities conducted at each of the disposal areas and the complete geophysical data set will be used to direct additional RI/FS investigation activities at NAS Whiting Field.

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# APPENDIX A

# GEOPHYSICAL SURVEY RAW DATA

# APPENDIX B

# FIELD LOGS FOR TEST PITS

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT I-01 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RI / **TOT DPTH:** 11.5FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND – reddish brown, loamy. | | SC | | |
| 5 | | 0 | | SAND – tan, very fine to fine, no visible signs of waste or debris. | | SP | | |
| | | 0 | | SAND – tan to white, very fine to fine, moist. | | | | |
| 10 | | 0 | | SAND – tan to white, very fine to fine, moist. | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 10-01 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - loamy. | | SP | | |
| | | 0 | | FILL - concrete rubble, asphalt. | | FILL | | |
| 5 | | 0 | | CLAYEY SAND - brick red. | | SC | | |
| | | 0 | 5 | SAND - yellowish orange, very fine to fine. | | SP | | |
| | | 5 | | SAND - tan, very fine to fine. | | | | |
| 10 | | N/A | | SAND - white, very fine to fine. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 10-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** B,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 4FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAY SAND - brick red. | | SC/FILL | | |
| | | 0-500 | 0-250 | FILL/ SILTY SAND - concrete rubble, asphalt, wooden log, burned wood, car parts, green liquid (? antifreeze) | | SP/FILL | | |
| 5 | | | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 10-03 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 9FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 10-30 | 1 | CLAY SAND - brick red. | | SC | | |
| | | 1-2 | 1-2 | CLAYEY SAND - olive green, burned debris, metal can, grass. | | FILL | | |
| | | | 10-20 | FILL - burned wood, hay, plastic, metal cans, foam-like insulation or packing material. | | | | |
| | | 500-1000 | | | | | | |
| 5 | | 0-5 | 0-5 | CLAYEY SAND - olive green, burned debris, hay, metal cans. | | SC/FILL | | |
| | | | | SAA | | | | |
| | | N/A | | | | | | |
| | | | 3000 | SAA | | | | |
| | | 5000 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 10-04 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 9FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 50 | | SAND – reddish brown, fine to medium. | | SP | | |
| | | 30 | 30 | CLAYEY SAND – olive green, burned debris, moist to saturated, rooting material, shingles. | | SC/FILL | | |
| | | 0 | | SAND – tan, fine to very fine. | | SP | | |
| 5 | | 0-50 | | CLAYEY SAND – brick red, very fine to fine. | | SC | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 10-05 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 9.5FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAY SAND - brick red. | | SC | | |
| | | 500-1000 | | CLAYEY SAND - olive green, burned debris, metal cans, electric wires, carboard. | | SC/FILL | | |
| 5 | | 50-70 | 10 | SAA | | | | |
| | | 5 | 5 | FILL - SAA, crushed metal. | | | | |
| | | 300 | 200 | CLAYEY SAND - olive green. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 11-01 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/7/92 | **COMPLTD:** 10/7/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 2 | 2 | SAND - tan to brown, very fine to fine. | | SP | | |
| | | 2 | 2 | FILL - concrete rubble, asphalt. | | RUBBLE | | |
| 5 | | 0 | | FILL - burned wood, asphalt layer, coke bottle, aluminum. | | | | |
| | | 0 | | CLAYEY SAND - olive green, visibly clean layer. | | SC | | |
| | | 0 | | CLAYEY SAND - brick red, visibly clean layer. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 11-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - dark brown to tan, very fine to fine. | | SP | | |
| | | 0 | | CLAYEY SAND - tan. | | SC | | |
| | | 0 | | FILL - concrete, steel cable, brick tiles. | | RUBBLE | | |
| 5 | | 0 | | CLAYEY SAND - brick red. | | SC/RUBBLE | | |
| | | 1 | 1 | CLAYEY SAND - brick red, crush metal can. | | | | |
| 10 | | 0 | | SANDY CLAY - tan to yellow. | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 11-03 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - loamy, very fine to fine. | | SP | | |
| | | 10-20 | 10 | ASH - burned debris, white ash, crushed metal, styrofoam or insulation material. | | RUBBLE | | |
| | | | | FILL - burned debris. | | | | |
| | | N/A | | | | | | |
| 5 | | | | CLAYEY SAND - olive green. | | SC/RUBBLE | | |
| | | 20 | | | | | | |
| | | | 3-10 | CLAYEY SAND - SAA. | | | | |
| | | 300 | | | | | | |
| | | | 5 | | | | | |
| | | 10 | | | | | | |
| 10 | | | | | | | | |
| | | | | FILL - new layer, burned debris, top wall of 55 gal. drum, soil saturated, seeping liquid, FID did not indicate higher reading. | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 13-01 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/6/92 | **COMPLTD:** 10/6/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 4FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND - reddish orange | | SC | | |
| | | 0 | | CLAY - dark olive green, wood. | | CL/FILL | | |
| | | 0 | | CLAY - SAA, metal cans, paper, plastic. | | | | |
| | | 0-5 | 2 | CLAY - brick red, hard metal form. | | | | |
| 5 | | | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 13-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/6/92 | **COMPLTD:** 10/6/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12.5FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND - bright red. | | SC | | |
| | | 0 | | CLAYEY SAND - SAA. | | | | |
| 5 | | 0 | | CLAYEY SAND - SAA. | | | | |
| 10 | | 0 | | SAND - yellowish orange, very fine to fine. | | SP | | |
| | | 0 | | SAND - tan to white. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 13-03 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND - brick red, very fine to fine. | | SC | | |
| | | 0 | | CLAYEY SAND - tan to white. | | | | |
| | | 0 | | FILL - paper, broken glass, plastic. | | FILL | | |
| | | | | CLAYEY SAND - olive green, very fine to fine, newspaper Nov. 8, '82. | | SC/FILL | | |
| | | 0 | | CLAYEY SAND - brick red, metal & aluminum cans, plastic, newspaper. | | | | |
| | | 0 | | CLAYEY SAND - olive green, very fine to fine, clean layer. | | | | |
| 5 | | 5 | 5 | CLAYEY SAND - brick red, rubber innertube. | | | | |
| | | 0 | | SECOND LAYER OF GARBAGE. | | | | |
| | | 0 | | CLAYEY SAND - olive green. | | | | |
| | | 0 | | CLAYEY SAND - brick red. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 13-04 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND - brick red. | | SC | | |
| | | 0 | | CLAY - olive green, construction rubble, asphalt, boulders. | | CL/FILL | | |
| | | 0 | | CLAYEY SAND - brick red. | | SC | | |
| 5 | | 0 | | CLAYEY SAND - SAA. | | | | |
| | | 1 | | CLAYEY SAND - SAA. | | | | |
| | | 0 | | CLAYEY SAND - SAA. | | | | |
| | | 0 | | CLAYEY SAND - SAA. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 13-05 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/6/92 | **COMPLTD:** 10/6/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 10FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 100 | SAND - tan, very fine to fine. | | SP | | |
| | | 100 | | CLAYEY SAND - brick red. | | SC | | |
| | | 0 | | | | | | |
| | | 0 | | FILL - paper plastic, styrofoam, spoons, bottles. | | FILL | | |
| 5 | | | | | | | | |
| | | 0 | | SANDY CLAY - tan, clean layer. | | SC | | |
| | | N/A | | | | | | |
| 10 | | 0 | | SANDY CLAY - tan. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 14-01 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 11.5FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - yellowish orange, very fine to fine. | | SP | | |
| | | | 1-200 | CLAYEY SAND - brick red, very fine to fine. | | SC | | |
| 5 | | 1-200 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 14-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12.5FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 20 | | CLAYEY SAND - brick red, very fine to fine. | | SC | | |
| | | 0 | | CLAYEY SAND - SAA, newspaper, bottles. | | SC/FILL | | |
| | | 50 | 50 | CLAY - dark green to black, plastic, municipal garbage. | | CL/FILL | | |
| 5 | | N/A | | CLAYEY SAND - reddish brown, plastic, newspaper, aluminum, flight trainer's handbook. | | SC/FILL | | |
| 10 | | 400 | | GARBAGE LAYER - 90% municipal waste, air craft parts. | | FILL | | |
| | | | 20 | SANDY CLAY - olive green. | | SC | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-1A (840N, 240W) |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** | **COMPLTD:** |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | | | SAND - reddish orange, fine to medium. | | SP | | |
| | | | 0 | SAND - light tan, fine to medium. | | | | |
| | | | 0 | SAND - black solid coloring, very fine to fine. | | | | |
| 5 | | | 0 | SAND - reddish orange, very fine to fine. | | | | |
| 10 | | | 0 | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-1B |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** | **COMPLTD:** |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | | 0 | SAND - reddish orange, fine to medium.<br>SAND - light tan to reddish orange. | | SP | | |
| | | | 0 | | | SP/TRASH | | |
| | | | 5-20 | SAND - reddish orange, metal debris, aircraft communication cables, steel cables, rusted buckets, domestic trash, aircraft debris. | | | | |
| 5 | | | ~50 | FILL - metal debris, black stained soil, innertube of tire, rubber gloves. | | | | |
| | | | 100 | SAND - light brown, trash layer at 7'. | | | | |
| | | 100 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/2/92 | **COMPLTD:** 10/2/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 20 | 5 | SAND - reddish orange, very fine to fine, oil filter, airlogs, aluminum, soda bottles. | | SP | | |
| | | | | SAND - black stained, municipal garbage, rubber, bottles, metal debris | | | | |
| | | 1000 | 1000 | SAND - SAA, liquid wax, plastic, burned and decayed material, nozzles of fire extinguishers, trashbags. | | SP/TRASH | | |
| | | 100 | 100 | | | | | |
| 5 | | | | SAND - SAA, beer cans, spray cans, oil filters, rubber, wood, wind socks. | | | | |
| | | 5 | | | | | | |
| | | | | SAND - SAA, car parts, baseball bats. | | | | |
| | | 0-50 | | | | | | |
| 10 | | 500 | 500 | SAND - SAA, liquid wax. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-03A |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/2/92 | **COMPLTD:** 10/2/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | SP | | |
| | | 0 | | FILL - reddish orange, very fine to fine, oil filter, airlogs, aluminum, soda bottles. | | SP/TRASH | | |
| | | 0 | | SAND - reddish orange, garbage, plastic, bottles. | | | | |
| | | | | SAND - tan to reddish orange, very fine to fine, natural soil. | | | | |
| | | N/A | | SAND - tan, very fine to fine, municipal garbage, nylon fibers, carpet fibers, banger cord (shock absorbers). | | | | |
| | | | | CLAYEY SAND - bright sand, very fine to fine, natural soil. | | SC | | |
| 5 | | 0 | | | | | | |
| | | | 50 | CLAYEY SAND - SAA. | | | | |
| | | 50 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-03B |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/2/92 | **COMPLTD:** 10/2/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | SP | | |
| | | 0-10 | | TOP SOIL - natural top soil.<br>ORGANICS - decayed organic matter, municipal garbage, bottle caps. | | OL | | |
| | | N/A | | SAND - yellowish orange, very fine to fine, cans and bottles. | | SP/TRASH | | |
| 5 | | | | | | | | |
| | | N/A | | SAND - gray stained, plastic, aluminum foil, metal debris. | | | | |
| | | FLUC | | ASH - gray, rubber, flashlight, umbrella, aluminum debris. | | ASH/TRASH | | |
| 10 | | N/A | | FILL - gray soil, garbage layer continous beyond this point, lubrilatar supply head of aircraft, aircraft communication cables. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 15-4 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/3/92 | **COMPLTD:** 10/3/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | | | SAND - reddish brown, very fine to fine, fill material. | | SP | | |
| | | | | SAND - tan, very fine to fine, municipal garbage, metal debris, cans, spark plug, uniform shoes, plastic bottles. | | SP/TRASH | | |
| | | | 10 | SAND - SAA, fill material. | | SP/TRASH | | |
| 5 | | | | | | | | |
| | | | 30 | SAND - gray to tan, very fine to fine, autopart, bottle, cans, organic decomposition. | | SP/TRASH | | |
| 10 | | | 30 | SAND - gray, municipal garbage, cans. | | | | |
| | | | 50 | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 15-05 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/3/92 | **COMPLTD:** 10/3/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | SP | | |
| | | | | FILL | | SP/TRASH | | |
| | | N/A | | SAND - reddish brown, very fine to fine, garbage, plastic, bottles. | | | | |
| | | | | SAND - reddish brown, very fine to fine, SAA. | | | | |
| | | 0 | | | | | | |
| | | | | SAND - dark brown to tan, fine to very fine, fill material, garbage. | | | | |
| 5 | | | | | | | | |
| | | 0 | | | | | | |
| | | | 30 | SANDY SILT - black to gray, garbage layer ends. | | | | |
| | | 30 | | | | | | |
| 10 | | | 30 | SAND - white, very fine to fine, natural soil. | | SP | | |
| | | 400 | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-06 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/3/92 | **COMPLTD:** 10/3/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | | | SP | | |
| | | 0 | | FILL – yellowish orange sand, very fine to fine. | | SP/TRASH | | |
| | | | | SAND – gray, very fine to fine, municipal garbage, plastic, boots, bottles, cans, industrial garbage, dry cleaning material. | | | | |
| | | | | SILT – gray ash, garbage. | | SM/TRASH | | |
| 5 | | 0 | | | | | | |
| | | | | Garbage Layer – aircraft parts, motorcycle muffler, aircraft communication cables, fuel tank neck. | | | | |
| 10 | | | | MUNICIPAL GARBAGE – spray can, aircraft cleaner, melted plastic. | | | | |
| | | N/A | | INDUSTRIAL GARBAGE – aircraft parts, solvent cans with solvent, dry cleaning fluid container empty. | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 15-07 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - reddish orange, very fine to fine, fill material. | | SP | | |
| | | | 100 | SAND - tan, very fine to fine, cans, plastic bags. | | SP/TRASH | | |
| | | 100 | | | | | | |
| | | | 1000 | SAND - tan, very fine to fine, garbage, layer, steel cables. | | | | |
| 5 | | | | | | | | |
| | | 1000 | | | | | | |
| | | | | SAND - bright red, very fine to fine, garbage layer, rubber tire, plastic bags, cans, bottles, paper material dating 1972. | | | | |
| | | 0 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-08A |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - reddish orange, very fine to fine, fill material. | | SP | | |
| | | 0 | | SAND - municipal garbage layer, coffee cups, oil filter. | | SP/TRASH | | |
| | | 0 | | SAND - tan, very fine to fine, oil can empty. | | | | |
| | | 50 | 50 | SAND - dark olive green, very fine to fine, garbage layer. | | | | |
| 5 | | N/A | | FILL - yellowish orange, very fine to fine. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 15-08B |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - fill material. | | SP | | |
| | | 0 | | SAND - fine, garbage layer, base newspaper August 15, '89, cans, bottles, plastic bags. | | SP/TRASH | | |
| | | 0 | | FILL - garbage, shoes, tubes, etc. | | | | |
| 5 | | 0 | | FILL - yellowish orange, very fine to fine. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 15-09 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - fill material, reddish orange, very fine to fine. | | SP | | |
| | | 0 | | SAND - SAA. | | | | |
| | | 0 | | FILL - thin layer of plastic debris. | | SP/TRASH | | |
| 5 | | 0 | | SAND - tan, very fine to fine, trash debris. | | | | |
| | | 0 | | SAND - bright red to dark tan, grass pieces. | | | | |
| 10 | | 0 | | FILL - concrete slab, solid across pit. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 15-10 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - yellowish orange, very fine to fine, fill material. | | SP | | |
| | | 0 | | SAND - reddish orange, very fine to fine, asphalt & conconcrete pieces | | | | |
| | | | | | | SP/TRASH | | |
| | | 0 | | SAND - SAA, steel cables. | | | | |
| | | | | SAND - SAA. | | SP | | |
| 5 | | 0 | | | | | | |
| | | | | SAND - SAA. | | | | |
| | | 0 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 16-1A & B |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** | **COMPLTD:** |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | FILL - metal debris, burned material. | | FILL | | |
| | | 0 | | SAND - yellowish orange, very fine to fine, burned wood, cables, aluminum, bottles. | | SP | | |
| | | N/A | | CLAY - tan to white. | | SC | | |
| | | N/A | | | | | | |
| 5 | | | | SANDY CLAY - white, motteled red, aircraft enginge. | | | | |
| | | N/A | | | | | | |
| | | | | CLAY - white. | | | | |
| | | N/A | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | | **BORING NO.** TEST PIT 16-02 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAYEY SAND - yellowish orange. | | SC/TRASH | | |
| | | 0 | | CLAYEY SAND - charred material, broken bottles, burned products. | | | | |
| | | 35 | 25 | FILL - black burned material. | | | | |
| | | 2500 | 1000 | CLAY - white, burned material, piece of galvanized pipe, pressure valve. | | | | |
| 5 | | 0 | | CLAY - white mottled yellowish orange, fill material. | | | | |
| | | 0 | | CLAY - white, fill material. | | | | |
| 10 | | 0 | | CLAY - fill material. | | | | |
| 15 | | | | | | | | |



ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 18-03 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/4/92 | **COMPLTD:** 10/4/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** B,C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | CLAY - dark brown. | | C/TRASH | | |
| | | 0-50 | | CLAY - black charred material. | | | | |
| | | 0 | | CLAY - white. | | | | |
| | | 20000 | 5000 | CLAY - white, burned material, metal debris, cans, bottles. | | | | |
| | | 0 | | CLAY - black charred, bottles, cans, aluminum containers. | | | | |
| 5 | | 10 | | CLAY - black charred, bottles, cans, burned material. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 16-4 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/5/92 | **COMPLTD:** 10/5/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | FILL - organic material. | | OL | | |
| | | 0 | | CLAYEY SAND - tan, saturated, burned metal, cans. | | SC/TRASH | | |
| | | 1-60 | 1-60 | FILL - black burned debris, ash, metal, 10 gal. cans. | | | | |
| | | 2 | | CLAY - black burned debris, saturated, metal cans. | | | | |
| | | N/A | | CLAY - SAA, metal cans, large bundle of wire. | | | | |
| 5 | | N/A | | CLAY - SAA. | | | | |
| | | N/A | | CLAY - SAA. | | | | |
| | | 1 | | CLAY - SAA. | | | | |
| | | 1 | | CLAY - tan, saturated, fill material. | | | | |
| 10 | | N/A | | CLAY - SAA. | | | | |
| | | 0 | | CLAY - grey to tan. | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

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|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 16-05 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/5/92 | **COMPLTD:** 10/5/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | FILL - organic material, dark brown to black, clayey sand. | | OL/SC | | |
| | | 0 | | CLAYEY SAND - yellowish orange to tan. | | | | |
| | | 50-100 | 2-50 | FILL - burned debris, cans, metal , wire mesh, bottles, ash. | | SC/TRASH | | |
| | | 25 | 2-9 | FILL - burned debris. | | | | |
| | | 2 | 2 | FILL - SAA. | | | | |
| 5 | | 200 | 5-100 | FILL - SAA. | | | | |
| | | >BKG | | FILL - SAA. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | | |
|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 16-06 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/5/92 | **COMPLTD:** 10/5/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - yellowish orange, metal debris. | | SP/FILL | | |
| | | 0 | | FILL - sand w/ burned debris. | | | | |
| | | 5 | 0-2 | FILL - burned debris, metal cans, purched water. | | FILL | | |
| | | 5 | 3 | FILL - metal pieces, springs, aircraft & engine parts, steel cables. | | | | |
| | | N/A | | CLAYEY SAND - yellowish orange, dense, mixed w/ FILL. | | SC | | |
| 5 | | 2 | 2 | CLAYEY SAND - (second layer) tan, metal debris, hard, melted together. | | SC/FILL | | |
| | | 0 | | FILL - burned metal, ash, aluminum aircraft parts. | | FILL | | |
| | | 0 | | FILL - SAA. | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 18-07 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/5/92 | **COMPLTD:** 10/5/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** C,D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND – yellowish orange, very fine to fine, fill, rock, organic debris. | | SP/FILL | | |
| | | 0 | | FILL – burned debris, metal, mesh. | | | | |
| | | 5 | 5 | FILL – burned debris, metal. | | FILL | | |
| | | 0 | | FILL – SAA, aluminum, iron. | | | | |
| | | 2 | 2 | FILL – engine parts to helicopter. | | | | |
| 5 | | 50 | 50 | FILL – SAA. | | | | |
| | | 0 | | SAND – fine, clay lenses, little debris. | | SC/FILL | | |
| | | N/A | | CLAYEY SAND – tan, fine, no debris. | | SP | | |
| | | 0 | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 16-08 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/5/92 | **COMPLTD:** 10/5/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - organic debris. | | OL/FILL | | |
| | | 0 | | SAND - yellowish orange, metal debris, bottles, aluminum, hard compact material. | | SP/FILL | | |
| | | 0 | | FILL - burned debris. | | FILL | | |
| | | 0 | | FILL - SAA, jack stand, chains, concrete rubble. | | | | |
| | | N/A | | SAND FILL - yellowish orange, bottles, cans. | | SC/FILL | | |
| 5 | | 0 | | CLAYEY SAND FILL - tan, clean layer. | | | | |
| | | 0 | | SAA. | | | | |
| | | 0 | | CLAYEY SAND - reddish orange, clean layer. | | | | |
| | | 0 | | SAA | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | |
|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | **LOG of WELL:** | **BORING NO.** TEST PIT 16-09 |
| **CLIENT:** SOUTHNAVFACENGCOM | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | **DATE STARTED:** 10/6/92 | **COMPLTD:** 10/6/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** / **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM / **TOT DPTH:** 10FT. | **DPTH TO ▽** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - organic debris, ordinance piece & fuse cap. | | SP | | |
| | | 0 | | SAND - yellowish orange, metal debris. | | SP/FILL | | |
| | | 0 | | CLAY - dark brown, little metal debris. | | CL/FILL | | |
| | | 0 | | CLAYEY SAND - tan, very fine to fine, piece of pipe, bottle, flair. | | SC/FILL | | |
| 5 | | 0 | | CLAYEY SAND - light tan to yellow, very fine to fine. | | SC | | |
| | | 0 | | SANDY CLAY - white. | | | | |
| 10 | | 0 | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

| | | | |
|---|---|---|---|
| **TITLE:** Naval Air Station Whiting Field | | **LOG of WELL:** | **BORING NO.** TEST PIT 16-10 |
| **CLIENT:** SOUTHNAVFACENGCOM | | | **PROJECT NO:** RI PHASE IIA |
| **CONTRACTOR:** UXB Inc. | | **DATE STARTED:** 10/8/92 | **COMPLTD:** 10/8/92 |
| **METHOD:** BACK HOE | **CASE SIZE:** | **SCREEN INT.:** | **PROTECTION LEVEL:** D |
| **TOC ELEV.:** FT. | **MONITOR INST.:** FID,LEL,RM | **TOT DPTH:** 12FT. | **DPTH TO ∇** FT. |
| **LOGGED BY:** G. Kanchibhatla | **WELL DEVELOPMENT DATE:** N/A | | **SITE:** |

| DEPTH FT. | INTERVAL SAMPLED | TOTAL HEADSPACE (ppm) | METHANE (ppm) | SOIL/ROCK DESCRIPTION AND COMMENTS | LITHOLOGIC SYMBOL | SOIL CLASS | BLOWS/6-IN | WELL DATA |
|---|---|---|---|---|---|---|---|---|
| | | 0 | | SAND - loamy, organic, tree cuttings, pieces of ordinance with aluminum magnesium oxide. | | SP | | |
| | | 0 | | SAND - tan, very fine to fine, clean & natural. | | | | |
| | | 0 | | CLAYEY SAND - dark olive green, metal bucket. | | SC/FILL | | |
| 5 | | 0 | | CLAYEY SAND - tan to yellow, very fine to fine, clean & natural. | | | | |
| | | 0 | | CLAYEY SAND - white light olive green, clean & natural. | | SC | | |
| | | 0 | | SAND - white to gray, very fine to fine, clean & natural. | | | | |
| 10 | | 0 | | | | | | |
| 15 | | | | | | | | |

 ABB ENVIRONMENTAL SERVICES, INC.

# APPENDIX C

# SOIL GAS SURVEY

# TECHNICAL REPORT
# SOIL GAS SURVEY

## REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

## PHASE II-A

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

**Contract No. N62467-89-D-0317**

**Prepared by:**

**ABB Environmental Services, Inc.**
**2590 Executive Center Circle, East**
**Tallahassee, Florida 32301-5001**

**Prepared for:**

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29419-9010

Kim Queen, Code 1859, Engineer-in-Charge

March 1993

# EXECUTIVE SUMMARY

This technical report describes the methodology and presents results of the soil gas survey investigation conducted at the Naval Air Station (NAS) Whiting Field, Milton, Florida. The soil gas survey was one of nine field investigative tasks that comprise the Remedial Investigation (RI). The objective of the RI is to address any identified risks posed by toxic or hazardous chemicals present as a result of past waste disposal practices or spills at the facility. The entire Remedial Investigation/ Feasibility Study (RI/FS) program is being conducted at NAS Whiting Field in accordance with the Navy's Installation Restoration Program.

Soil gas surveys were completed at seven NAS Whiting Field sites. The sites, grouped as follows, included:

- Sites 3 and 32, North Field Maintenance Hangar Area;
- Sites 5, 6, and 33, Midfield Maintenance Hangar Area; and
- Sites 29 and 30, South Field Maintenance Hangar Area.

The purpose of the passive soil gas survey at NAS Whiting Field was to identify potential source areas and to determine the areal extent of soil gas contamination at the above sites.

The scope of the soil gas survey included the placement, collection, and analysis of 220 Petrex™ passive soil gas samplers at the three site groupings presented above.

Interpretation of the analytical data generated by the soil gas survey at NAS Whiting Field has resulted in the delineation of the areal extent of soil gas contamination for the compounds BTEX, PCE, TCE, and cycloalkanes and naphthalenes at the North Field, South Field, and Midfield Maintenance Hangar Study Areas. Based on this information generalizations can be made concerning areas of soil and groundwater contamination.

Table ES-1 presents the summary of soil gas survey findings at NAS Whiting Field.

## Table ES-1
## Summary of Soil Gas Survey Findings

Technical Report
Soil Gas Survey, RI Phase II-A
NAS Whiting Field, Milton, Florida

| Site Grouping | Compound Detected | Frequency of Detection | Ion Count Threshold | Location of Individual Sampling Points Exceeding the Threshold Ion Count | | | | |
|---|---|---|---|---|---|---|---|---|
| Sites 3 and 32 North Field Maintenance Hangar Area | | | | NFMH | WR | AUWOST | PLA | Building 2941 |
| | BTEX | 9 of 106 | > 100,000 | 2 | 2 | 1 | 1 | 3 |
| | PCE | 9 of 106 | > 100,000 | 4 | 3 | 1 | -- | 1 |
| | TCE | 3 of 106 | > 100,000 | 3 | -- | -- | -- | -- |
| | Cycloalkanes and Naphthalenes | 28 of 106 | > 100,000 | 7 | 9 | 1 | 6 | 5 |
| Sites 29 and 30 South Field Maintenance Hangar Area | | | | SFMH | WR | AUWOST | PLA | Auto Hobby Shop |
| | BTEX | 17 of 71 | > 100,000 | 6 | 4 | 3 | 2 | 2 |
| | PCE | 12 of 71 | > 100,000 | 3 | 2 | 2 | 2 | 3 |
| | TCE | 8 of 71 | > 100,000 | 8 | -- | -- | -- | -- |
| | Cycloalkanes and Naphthalenes | 19 of 71 | > 100,000 | 3 | 3 | 3 | 3 | 5 |
| Sites 5, 6, and 33 Midfield Maintenance Hangar Area | | | | MFMH | | AUWOST | Drainage Ditch | |
| | BTEX | 6 of 44 | > 85,000 | 6 | | -- | -- | |
| | PCE | 5 of 44 | > 10,000 | 5 | | -- | -- | |
| | TCE | 5 of 44 | > 100,000 | 5 | | 1 | -- | |
| | | 4 of 44 | > 50,000 | 4 | | 1 | -- | |
| | Cycloalkanes and Naphthalenes | 7 of 44 | > 100,000 | 7 | | -- | -- | |

Notes:
NFMH = North Field Maintenance Hangar.
WR = Wash Rack Area.
AUWOST = Abandoned Underground Waste Oil Storage Tanks.
PLA = Parking Lot Area.
BTEX = benzene, toluene, ethylbenzene, and xylenes.
PCE = tetrachloroethene.
TCE = trichloroethene.
-- = none detected.
SFMH = South Field Maintenance Hangar.
MFMH = Midfield Maintenance Hangar.

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**NAS Whiting Field, Milton, Florida**


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NAS Whiting Field, Milton, Florida


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## GLOSSARY

| | |
|---|---|
| ABB-ES | ABB Environmental Services, Inc. |
| AUWOST | Abandoned Underground Waste Oil Storage Tank |
| AVGAS | aviation gasoline |
| BTEX | benzene, toluene, ethylbenzene, and xylenes |
| °C | degrees Celsius |
| CpD-MS | Curie-point desorption - mass spectrometer |
| FID | Flame Ionization Detector |
| FS | Feasibility Study |
| MFMH | Midfield Maintenance Hangar |
| NAS | Naval Air Station |
| NERI | Northeast Research Institute |
| NFMH | North Field Maintenance Hangar |
| OVA | organic vapor analyzer |
| PCE | tetrachloroethene |
| PLA | Parking Lot Area |
| QA/QC | Quality Assurance/Quality Control |
| RI | Remedial Investigation |
| SFMH | South Field Maintenance Hangar |
| SOUTHNAV-FACENGCOM | Southern Division, Naval Facilities Engineering Command |
| SVOCs | semivolatile organic compounds |
| TCE | trichloroethene |
| TD-MS | thermal desorption-mass spectrometer |
| TD-GC/MS | thermal desorption-gas chromatograph/mass spectrometer |
| TRC | Tracer Research Corporation |
| VOCs | volatile organic compounds |
| WRA | Wash Rack Area |

# 1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) is conducting Phase II-A of a Remedial Investigation (RI) and Feasibility Study (FS) at Naval Air Station (NAS) Whiting Field located in Milton, Florida. The RI is being conducted under contract number N62467-89-D-0317.

NAS Whiting Field is located in Florida's northwest coastal area approximately 7 miles north of Milton and 20 miles northeast of Pensacola (Figure 1-1). NAS Whiting Field presently consists of two air fields separated by an industrial area and covers approximately 2,560 acres in Santa Rosa County, Florida. Figure 1-2 presents the installation layout.

A two-phased approach has been adopted for achieving the objectives of the RI. The Phase I field program was carried out by ABB-ES between December 1990 and May 1991. The Technical Memoranda that presented the findings and conclusions of Phase I and proposed exploration program for Phase II were submitted to the regulatory agencies in April 1992. The RI Phase II program is scheduled to be conducted in two parts: part A and part B. The Phase II-A RI field program was initiated in May 1992.

The soil gas survey was the second field task completed in a series of tasks scheduled for RI Phase II-A. This report summarizes the results and presents data gathered during the soil gas survey.

## 1.1 REMEDIAL INVESTIGATION (RI) PROGRAM.

**1.1.1 Purpose** The purpose of the NAS Whiting Field RI program is to identify remedial alternatives that address identified risks to public health and the environment posed by toxic or hazardous chemicals present as a result of past waste disposal practices or spills. To achieve this objective, the RI must collect data sufficient to assess the nature and distribution of chemicals that pose unacceptable risk. The data collected during the RI will be used to screen, evaluate, and select remedial alternatives to provide permanent, feasible remedial solutions to environmental contamination problems at NAS Whiting Field.

**1.1.2 Scope of RI Phase II-A Exploration Program** The RI Phase II-A exploration program includes the following:

- geophysical survey,
- soil gas survey,
- soil boring and test pit explorations,
- sampling of surface and subsurface soils,
- sampling of surface water and sediments,
- monitoring well installation and groundwater sampling,
- location survey, and
- ecological and public health surveys.

A summary of RI Phase II-A activities is presented in Section 7.0 of Technical Memorandum No. 6 (RI/FS Phase I, ABB-ES, 1992). Procedures for the RI Phase II-A field explorations, including sampling and analysis protocols, are found in

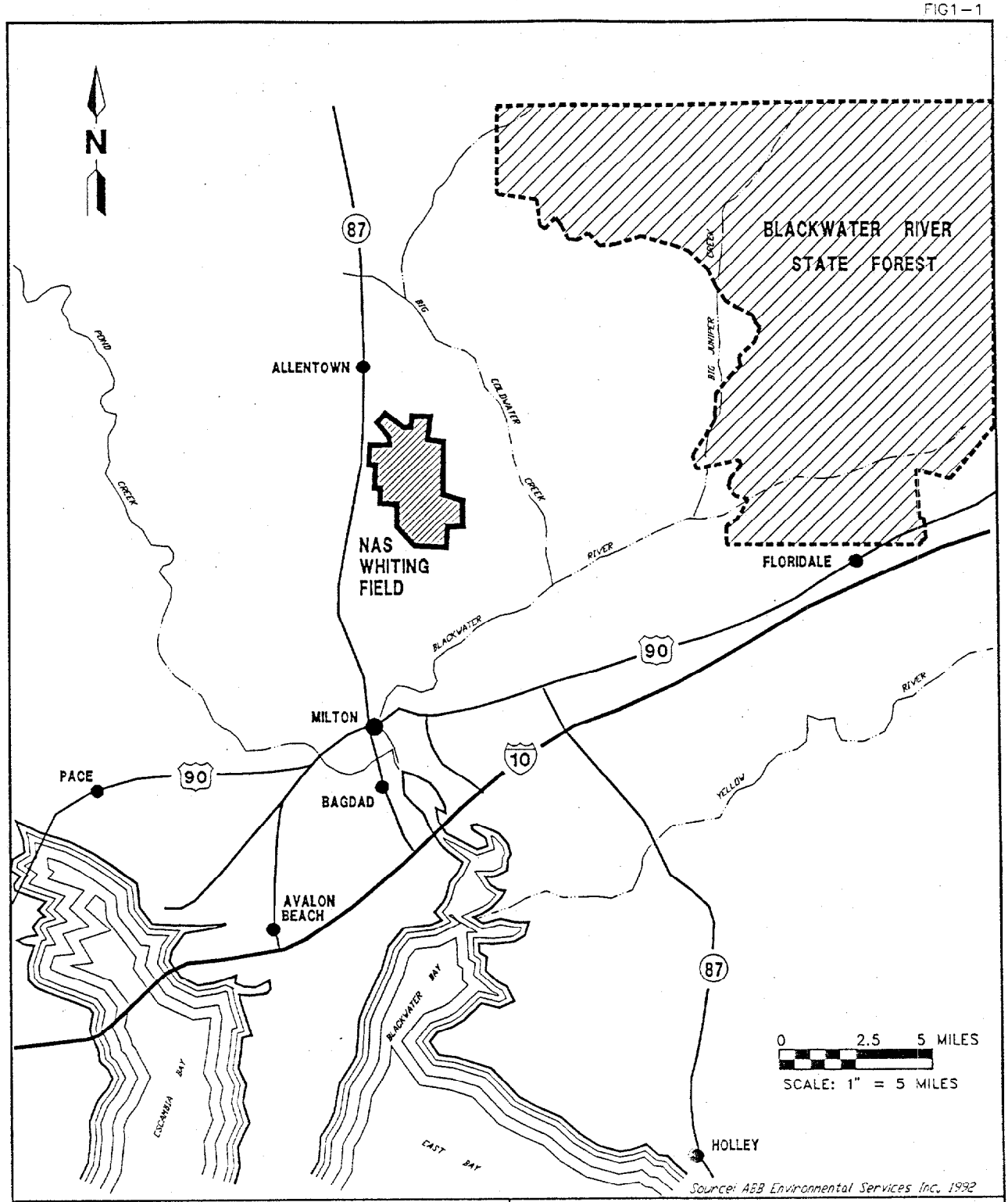



FIGURE 1-1
FACILITY LOCATION MAP

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

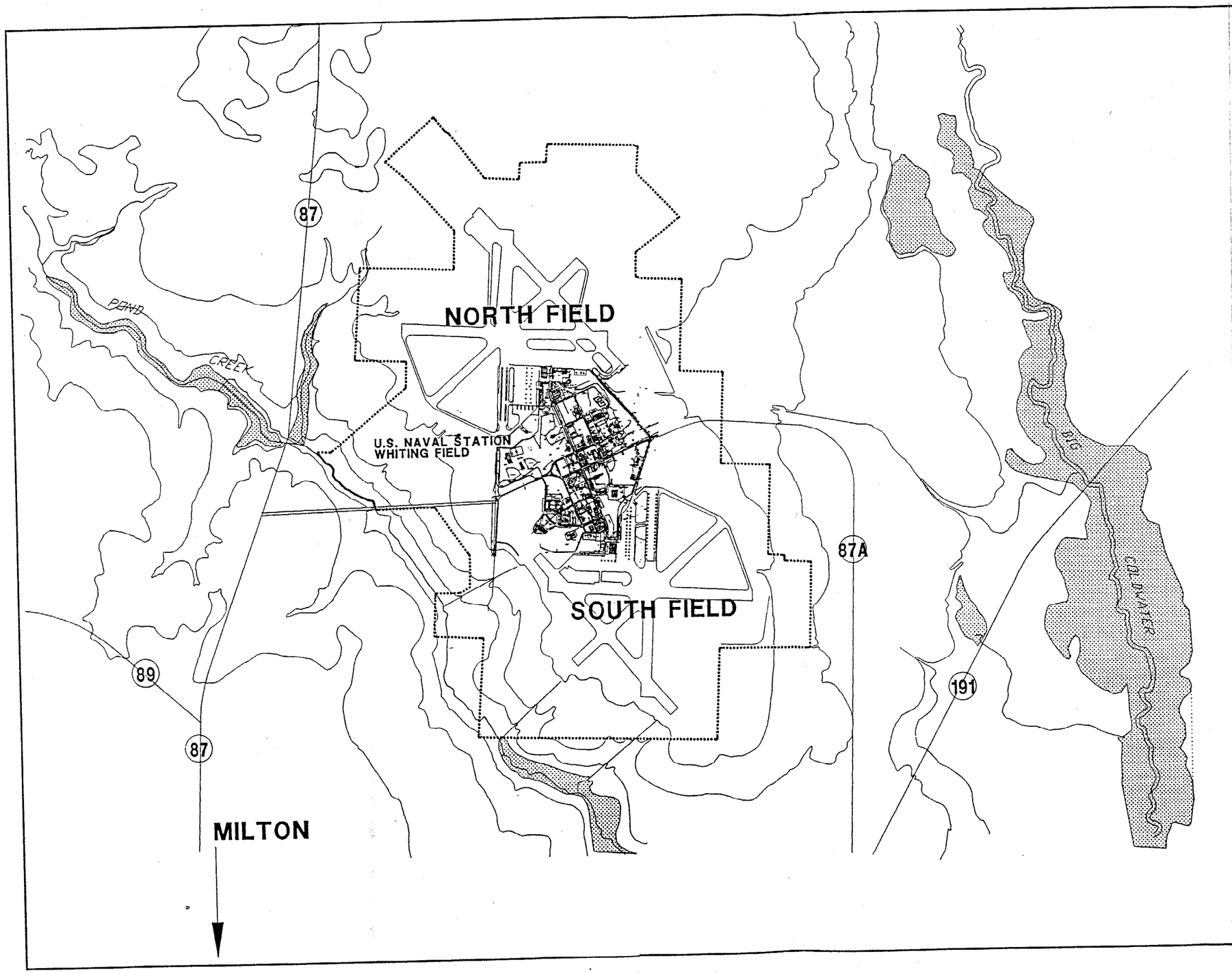



FIGURE 1-2
INSTALLATION LAYOUT

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

00235E04Z

Volumes I and II of the Phase I workplan (Jordan, 1990). Appendix A of Technical Memorandum No 6 presents the procedures for conducting a passive soil gas survey.

1.2 SOIL GAS SURVEY. The soil gas survey was conducted by Northeast Research Institute (NERI) Farmington, Connecticut, in June 1992. The passive soil gas technique was employed as a screening tool to aid delineation of areas of soil and groundwater contamination at Sites 3, 5, 6, 29, 30, 32, and 33. Table 1-1 presents a summary of the soil gas survey.

**Table 1-1**
**Summary of Soil Gas Survey**

Technical Report, Soil Gas Survey
RI/FS Phase II-A
NAS Whiting Field, Milton, Florida

| Site Number | Location | Number of Sampling Points | |
|---|---|---|---|
| | | Proposed | Actual |
| 3 and 32 | North Field Maintenance Hangar Area | 120 Points | 106 Points |
| 29 and 30 | South Field Maintenance Hangar Area and Auto Hobby Shop Area | 50 Points | 71 Points |
| 5, 6, and 33 | Midfield Maintenance Hangar Area | 50 Points | 44 Points |

1.2.1 Purpose The purpose of the passive soil gas survey at NAS Whiting Field was to identify potential source areas and to determine the areal extent of soil gas contamination at the sites listed in Table 1-1.

The presence of soil gas in the pore space of the soil is indicative of the presence of soil or groundwater contamination. Based on the results of the soil gas survey, locations for soil samples, soil borings, and monitoring wells can be identified to determine the extent of soil and groundwater contamination.

1.2.2 Scope The scope of the soil gas survey included the placement, collection, and analysis of 220 Petrex™ passive soil gas samplers at the three site groupings presented in Table 1-1. The objectives of the soil gas survey were as follows.

- The presence of volatile and semivolatile organic vapors in the pore spaces of near surface or vadose zone soils was investigated. Specific compounds included for analysis being benzene, toluene, ethylbenzene, xylenes (BTEX), tetrachloroethene (PCE), trichloroethene (TCE), and cycloalkanes and naphthalenes.

- The areal distribution of relative ion counts was mapped (ion count is defined as the total count of the number of ions of a particular compound desorbed from the soil gas probe during the thermal desorption process), the potential sources were identified and possible migration pathways of contamination were tracked.

## 2.0 DESCRIPTION OF SOIL GAS SURVEY TECHNIQUE

2.1 THEORY. Volatile organic compounds (VOCs) volatilize from contaminated soils and groundwater into the soil gas and move through soil pore spaces by molecular diffusion and advection. Their tendency to volatilize from contaminated soils and groundwater into the pore space within soils is a function of chemical concentrations in the soil and groundwater and the chemical's aqueous solubility and vapor pressure.

Contaminated soils or groundwater act as a "source" for the VOC contaminants and the aboveground atmosphere acts as a "sink". A contaminant concentration gradient is established in the soil gas that accounts for the vertical flux of the contaminants from the contaminated zone to the ground surface.

The concentration gradient in the soil gas is affected or distorted by several hydrologic and geologic variables such as clay, perched water, or other impermeable materials. The primary parameters that impede the diffusive movement of volatile contaminants in soil are pore fluids and clay layers (Tracer Research Corporation [TRC], 1984).

Soil gas emissions are generally recorded in measurable quantities from most industrial organic solvents, fuels such as gasoline and diesel, a number of pesticide compounds, and military-specific chemical agents provided they exist as contaminants in soils or are dissolved in groundwater. In general, compounds with low boiling points (less than 110 degrees Celsius [°C]) and low water solubility are found in the soil gas (TRC, 1984). Henry's law constant is the best parameter to assess the tendency of the compound to volatilize to soil gas. Henry's Law constant represents the partitioning of the chemical between water and the atmosphere. It is the ratio of concentration in air to the concentration in water after equilibrium has been reached.

Soil gas analysis provides an indirect indication of soil or groundwater contamination, and the results may be affected significantly by the environmental conditions. Because the matrix itself is not directly analyzed during a soil gas survey, the results may be construed as indicators of subsurface contamination. Soil gas methods are most practical for investigations of unconsolidated soils having high permeability (such as sandy soils). A fluctuating water table may favor the distribution of contaminants through the vadose zone; however, precipitation events may temporarily render soil gas methods ineffective. The weather conditions during the field program at NAS Whiting Field were generally dry with the occurrence of intermittent, short duration precipitation being reported for 2 days.

2.2 PETREX™ PASSIVE SOIL-GAS TECHNIQUE. The Petrex™ passive soil gas technique provides a method to collect and detect trace quantities of a broad range of VOCs and semivolatile organic compounds (SVOCs) below the ground surface. The Petrex™ sampler will continually collect these volatile compounds for the period the sampler is in place below the ground surface. During the sampling period, VOCs and SVOCs are adsorbed onto a specially treated substrate coated on a sampler wire.

The Petrex™ sampler consists of two collectors, each a ferromagnetic wire (made of nichrome) coated with an activated carbon adsorbent. The sampler wires are

typically placed in a shallow hole, 14 to 18 inches deep, within a protective glass container. The hole is then backfilled and the location is marked. The sampler is left in the ground from 1 to 30 days, depending upon the VOC loading rates. It is then retrieved and sealed for transportation back to the laboratory for analysis. The length of time the sampler is left in the ground is determined by a time sequence Petrex™ test (see Section 2.3.1).

When compared with active soil gas methods including soil gas headspace and soil gas probes, the Petrex™ soil gas method tends to provide more constant and representative data. The relatively long sampling period and the integrative nature of the passive Petrex™ sampler tends to stabilize temporary variations (i.e., short-term rain events) that could affect the overall VOC dispersion rates.

2.2.1 Analysis The standard analytical system uses a Curie-Point desorption (CpD-MS) inlet interfaced to a quadruple mass spectrometer for fast, adequately reproducible analyses. Curie-Point is defined as "the temperature at which a material loses its ability to retain magnetism," that is, changes from ferromagnetic to paramagnetic behavior. Below this temperature atoms interact so that their magnetic moments become duplicated and substances behave paramagnetically. The Curie-Point of the activated carbon used as the active ingredient on the Petrex™ wire is 300 °C (TRC, 1984).

During each analysis, all VOCs and SVOCs identified in a mass range of 30 to 240 atomic mass units (Carbon 2 to Carbon 16) are desorbed, analyzed, and stored on a computer as a composite of the VOC and SVOC compounds collected at each sampling location. These data are then downloaded onto a graphical work station where data processing and interpretation are conducted (Viellenave and Hickey, 1990).

### 2.2.2 Data Interpretation

Compound identification. Compound identification, as applicable, is based on molecular weight, compound fragmentation into ions during analysis, and isotope distribution.

Mapping Ion Counts. The process of determining the ion counts of diagnostic indicator peaks for a compound is computerized. Sample locations on a base map are digitized as X-Y coordinates, and ion counts for the detected compounds are plotted at their respective locations. This VOC ion count map represents the total accumulation of ion count for the respective sampling time of the mapped area.

Trend Analysis. Ion count distributions are computed based on frequency distribution of counts and physicochemical factors affecting the diffusion and degradation process of various components of a compound. Thus, each flux map can broadly be divided into two categories: one representing the background relative ion count range and the other an anomaly, which is higher than the background ion count.

The reported ion counts are representative of a flux that is not a measure of concentration, but represents the components at a particular sample location.

2.3 FIELD PROCEDURE. The soil gas survey at NAS Whiting Field was conducted between June 14 and June 24, 1992. Petrex™ soil gas samplers were installed at the North Field Maintenance Hangar Area (Sites 3 and 32), the South Field Maintenance Hangar Area (Sites 29 and 30), and the Midfield Maintenance Hangar Area (Sites 5, 6, and 33) located at NAS Whiting Field in Milton, Florida.

Various ground surfaces encountered during the soil gas survey included grass, bare soil, asphalt, and concrete. In order to accommodate these varying surface conditions, the Petrex™ samplers were installed using the following two methods.

- A coring shovel was used for the placement of samplers in grassy or bare soil areas. The shovel was used to create a 12- to 14-inch deep, 2-inch-diameter core in the soil. Organic vapor readings were obtained using a Porta-FID™ organic vapor analyzer (OVA) prior to installing the Petrex™ sampler in the hole. The hole was then backfilled with the excavated soil. Locations were marked with biodegradable ribbon flagging, and noted in a field log book and on a field map.

- In the case of areas capped with hard surfaces (asphalt and concrete), an 18-inch deep, 1.5-inch-diameter hole was drilled through the capping surface using an electric rotary hammer drill. The sampler was then wrapped with a galvanized steel wire, to facilitate retrieval, and placed at the bottom of the hole. A small plug of aluminum foil was then inserted 2 to 3 inches below grade, and the hole was than capped to grade with a quick-setting hydraulic cement seal.

2.3.1 Time Sequence Test Time calibration samplers were used to determine the VOC adsorption rates to the sampler from the soil gas. A set of four time calibration samplers were installed at NAS Whiting Field. These samplers were exposed for a period of 72 hours before analysis. The loading rate of the samplers depended upon the concentration and depth of contaminants, as well as the media type of the contaminant (soil or groundwater). Based on the time of exposure of 'Time Sequence Test Samplers' and the reported ion counts for BTEX, TCE, PCE, and cycloalkanes and naphthalenes, the exposure time for the samplers at each site was determined.

2.3.2 Quality Assurance/Quality Control (QA/QC) QA/QC samples used for the soil gas survey included method blanks, trip blanks, ambient air samples, and duplicate analysis samples. No compounds other than the normal atmospherics (oxygen, carbon dioxide, nitrogen, water vapor, and argon) were detected in the blank QC samples.

Method Blank. Approximately 10 percent of the total Petrex™ survey samples were collected as method blank samples. Each of the method blank samples contained three sampler wires as opposed to the regular collector containing two wires. The individual uses of each wire are as follows.

- The first wire was used for mass spectrometer's operating constants including: operating conditions prior to sample collection and instrument sensitivity during analysis. In addition, this wire may also be used to compare reproducibility between wires of a single collector.

- The second wire was used for actual thermal desorption-mass spectrometry (TD-MS) analysis.

- The third wire was retained for thermal desorption gas-chromatography/ mass spectrometry (TD-GC/MS) analysis to differentiate naturally occurring compounds from contamination-related ones.

Trip Blank. The trip blank sampler contained a single wire to check for contamination introduced during travel with each shipment group. If compounds other than normal atmospherics (oxygen, carbon dioxide, nitrogen, water vapor, and argon) were detected, then the blank count was subtracted from the survey data.

Ambient Air Samples. One sampler for each site was dedicated to obtaining an ambient air count. The sampler was exposed to ambient air for a duration of 3 to 4 seconds representing the installation period and 60 seconds representative of the retrieval period, during which the samplers would be exposed to ambient atmosphere. The exposure times were determined to be representative of the actual amount of time each of the survey samplers were potentially exposed to ambient air conditions.

No contamination except for the common atmospheric gases (carbon dioxide, oxygen, hydrogen, and nitrogen) was detected in the ambient air blanks collected at NAS Whiting Field. Masspectrograms for the analysis of ambient air blanks are attached in Appendix A.

Duplicate Sampler. All the Petrex™ samplers were provided with a duplicate wire. The function of the two wires was as follows.

- The first wire was used for actual TD-MS analysis.

- The second wire was retained for TD-GC/MS analysis to classify naturally occurring compounds from contamination-related ones.

# 3.0 RESULTS AND INTERPRETATION

The three primary study areas included in the scope of the soil gas survey at NAS Whiting Field were:

- Site 3 and Site 32 (North Field Maintenance Hangar Area),
- Site 29 and Site 30 (South Field Maintenance Hangar Area), and
- Site 5, Site 6, and Site 33 (Midfield Maintenance Hangar Area).

Target compounds selected for analysis after critical screening and consideration of site-specific aspects (such as the release history, potential by-products of volatilization of released products, etc.) include the following:

- BTEX,
- PCE,
- TCE, and
- cycloalkanes and naphthalenes.

All the ion count numbers were multiplied with a constant scale factor to simplify the ion count number and the resulting ion count was defined as the relative ion count. There were three common relative ion count distribution features observed throughout the surveyed areas. These features were based on a distinct breakdown in the continuity of spatial distribution of the relative ion count of individual sampling points on a established sampling grid. This breakdown in the continuity of ion count distribution was statistically estimated as a relative ion count at either 10,000, 85,000, or 100,000 depending on the site-specific analysis results. Original ion count results for each sampler located at the various sites included under the soil gas survey are presented in Appendix B.

The three relative ion count features referred to in the following sections of this chapter include: single point hot spots, linear feature hot zones, and extended area hot zones, as described below.

Single point hot spot: discontinuity in the distribution of ion count is significant only at one grid point, in other words all the other grid points surrounding this point have relatively low ion counts.

This type of discontinuity indicates possible occurrences of isolated spills of contaminants in the subsurface soil under investigation.

Linear feature hot zone: discontinuity in the distribution of ion count is with distinct linear boundaries and undefined ends.

This type of discontinuity indicates potential zones of contamination in either subsurface soil or groundwater and possible migration pathways of contaminants.

Extended area hot zone: discontinuity in the distribution of ion count is over multiple grid points with lateral boundaries and distinct enclosed features. However all sides may not be defined because portions may extend outside of the grid area.

This type of discontinuity indicates potential zones of contamination in either subsurface soil or groundwater.

3.1 SITE 3 AND SITE 32 (NORTH FIELD MAINTENANCE HANGAR AREA). A total of 106 soil gas samplers were installed at the North Field Maintenance Hangar Area. These samplers were placed on approximately 80-foot centers surrounding the maintenance hangar buildings at sites 3 and 32. The sample locations and numbers are shown on Figure 3-1. At Site 32 the grid extended east of the North Field Maintenance Hangar to encompass the wash rack, an area of aboveground and abandoned underground waste oil storage tanks, the current fuel transfer station, and parking areas. Towards the west, the survey extended approximately 100 feet in the airfield area.

At Site 3, the grid extended approximately 200 feet south of Building 2941 and encompassed the abandoned underground waste oil tank, the paint locker, the former underground waste solvent storage tank area, and parking areas. The grid also surrounded Building 2941 as well as the eastern parking area.

Distribution of relative ion counts for BTEX, PCE, TCE, and cycloalkanes and naphthalenes are presented in the Figures 3-2, 3-3, 3-4, and 3-5 and discussed in the following subsections. Contour intervals for these four figures have been statistically estimated as the 100,000 ion count. Any ion count above this value was considered anomalous with respect to the background and classified under one of the three types of discontinuities explained in the previous section.

3.1.1 Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) Figure 3-2 exhibits the distribution of relative ion count of BTEX, mapped for the North Field Maintenance Hangar Area survey.

Nine of the 106 sampling points at the North Field Maintenance Hangar Area showed ion counts greater than 100,000. The area covered by most of these sampling points was capped with 8- to 10-inch thick concrete. There are five single point hot spots, one linear feature hot zone, and one extended area hot zone at the North Field Maintenance Hangar Area.

Among the five single point hot spots, the two points with the greatest ion counts are located, one each, at the former underground waste solvent area and the aboveground and former underground waste oil storage tank area. The remaining single point hot spots are located on the eastern and western borders of the survey grid.

The linear feature hot zone is located east of Building 2941 (hangar building) trending west to east. The extended area hot zone is located near the wash rack east of the North Field Maintenance Hangar and west of the aboveground waste oil storage tank area.

3.1.2 Tetrachloroethene (PCE) Figure 3-3 exhibits the distribution of the PCE relative ion count mapped for the North Field Maintenance Hangar Area survey. Ten of the 106 sampling points reported ion counts greater than 100,000. There are two single point hot spots and three extended area hot zones in this area. Among the two single point hot spots, the one with the greatest ion count is located on the border of the survey grid east of Building 2941 and the other is located west of the North Field Maintenance Hangar.

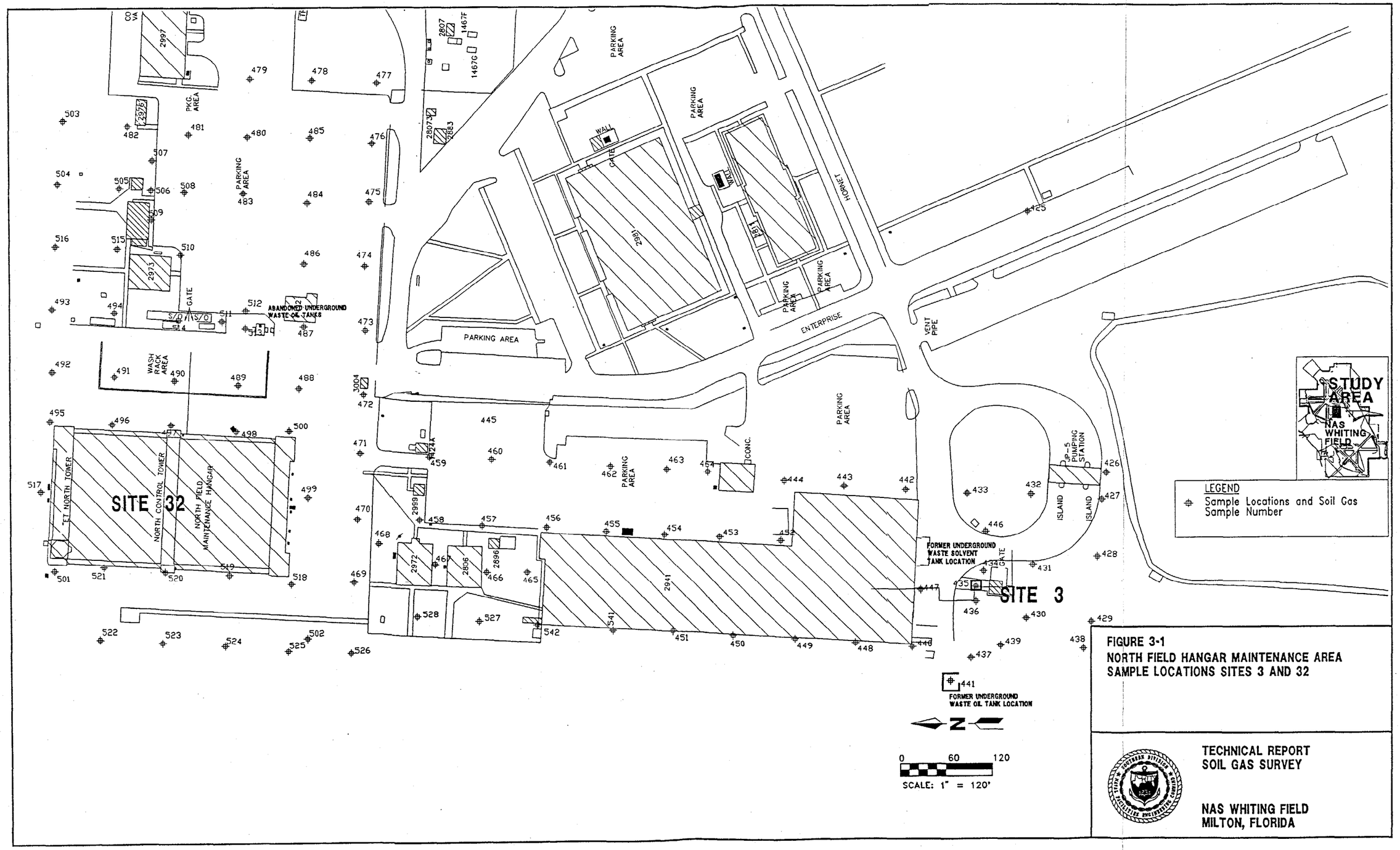



FIGURE 3-1
NORTH FIELD HANGAR MAINTENANCE AREA
SAMPLE LOCATIONS SITES 3 AND 32

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

00235EB52

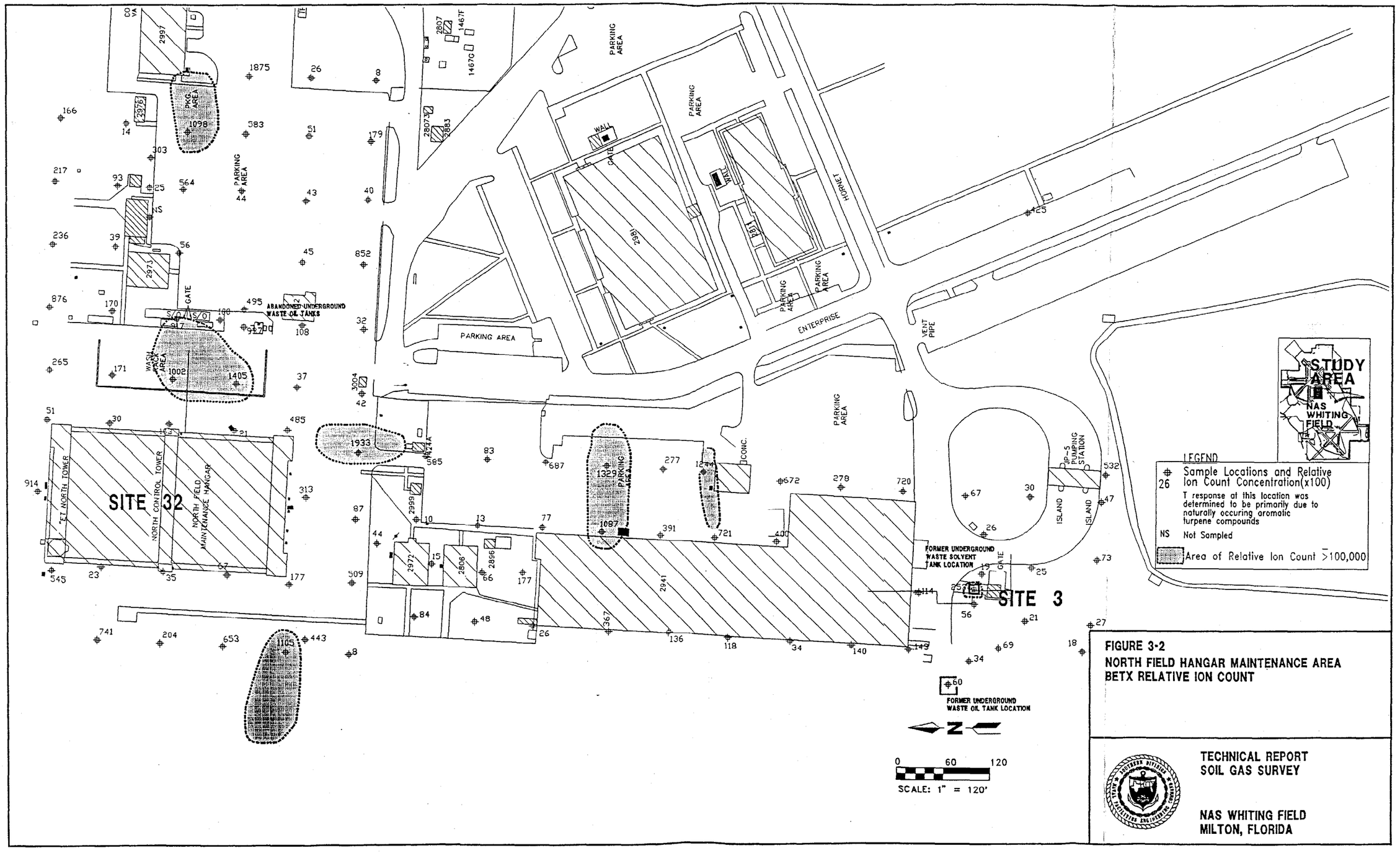



**FIGURE 3-2**
**NORTH FIELD HANGAR MAINTENANCE AREA**
**BETX RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

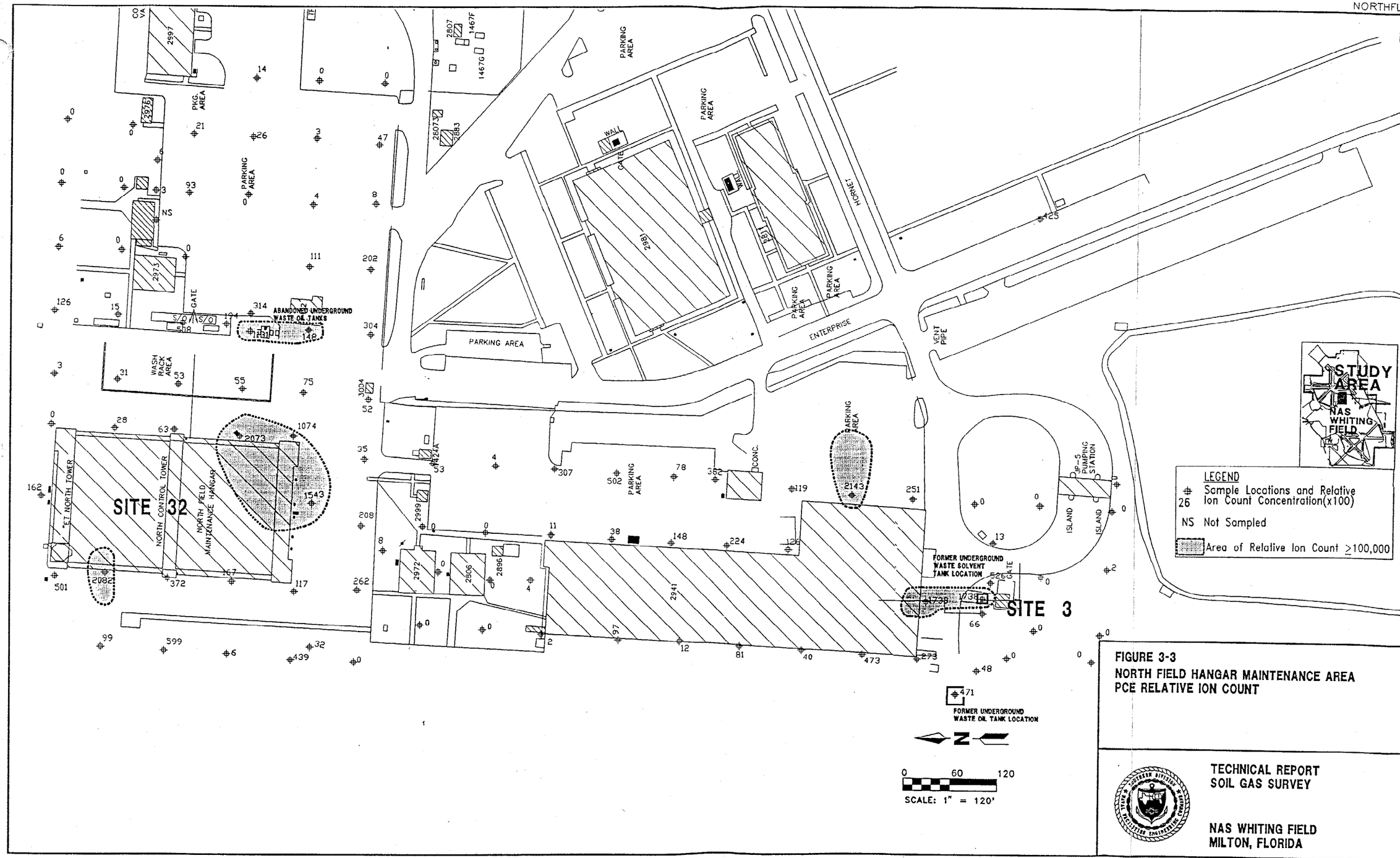



FIGURE 3-3
NORTH FIELD HANGAR MAINTENANCE AREA
PCE RELATIVE ION COUNT

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

NORTHFLD

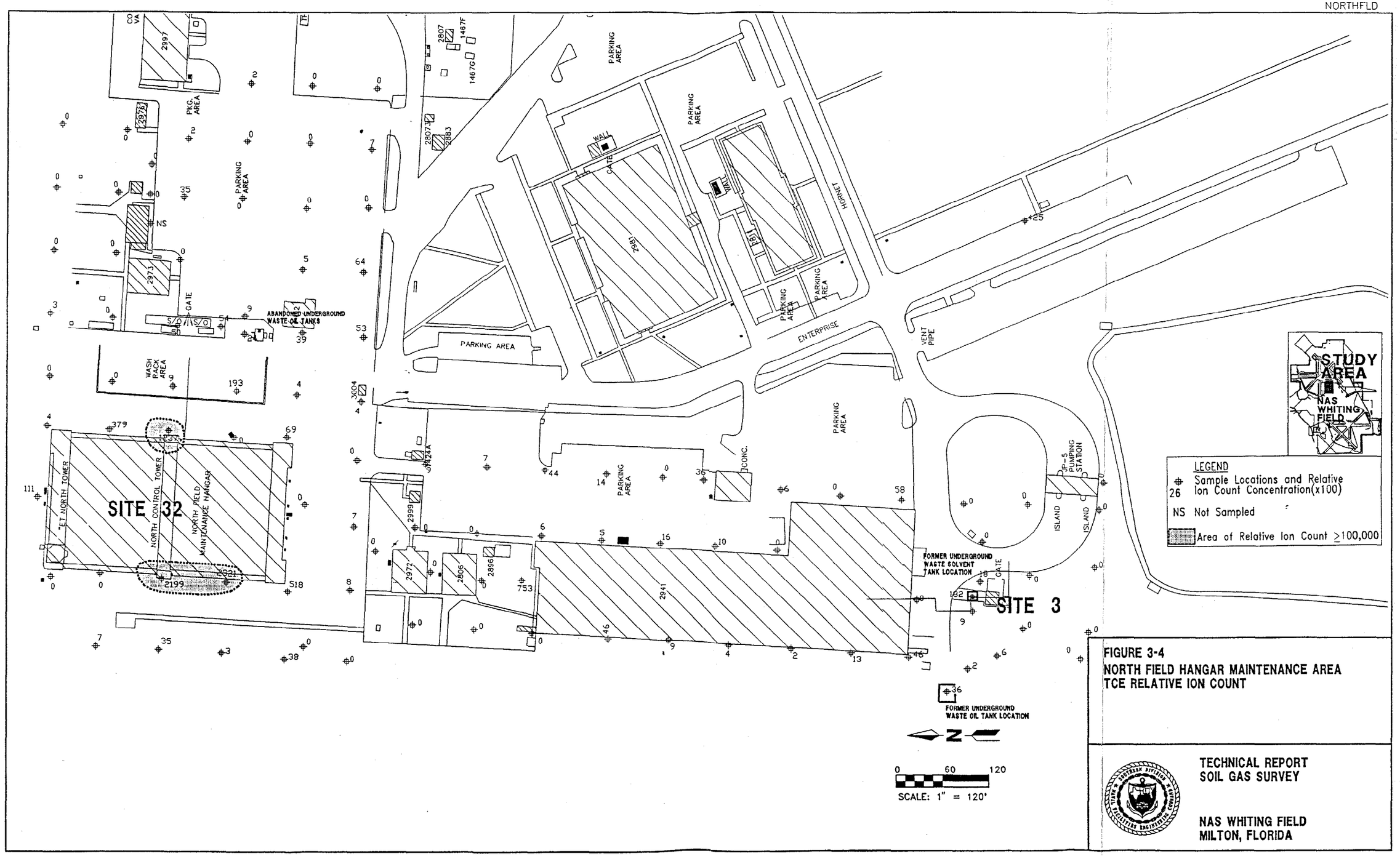



**FIGURE 3-4**
**NORTH FIELD HANGAR MAINTENANCE AREA**
**TCE RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

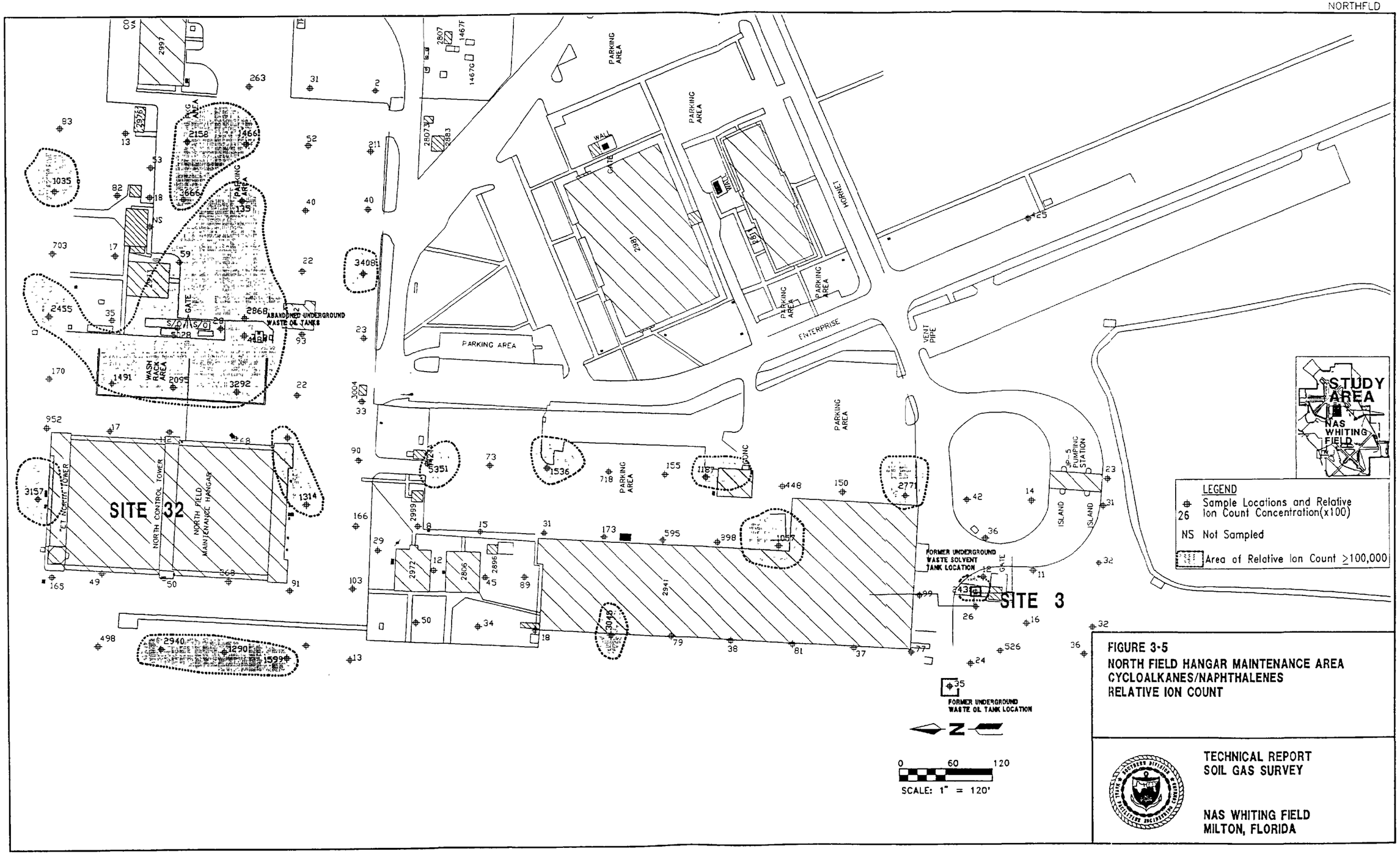



FIGURE 3-5
NORTH FIELD HANGAR MAINTENANCE AREA
CYCLOALKANES/NAPHTHALENES
RELATIVE ION COUNT

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

Among the three extended area hot zones, two are with undefined boundaries, whereas the third has been fully delineated. The boundaries of all features were not fully delineated due to the locations of onsite structures that limited sampler placement during the soil gas survey. The two undefined zones are located at the southeast corner of the North Field Maintenance Hangar and south of Building 2941 (hangar building). The zone with defined boundaries is located on the southeast corner of the wash rack and north of the aboveground and abandoned underground waste oil storage tank area.

3.1.3 Trichloroethene (TCE) Figure 3-4 exhibits the distribution of TCE relative ion count mapped for the North Field Maintenance Hangar Area. Three of 106 sampling points were reported to contain ion counts greater than 100,000. High ion count locations were indicated along the central portion of the east and west walls of the North Field Maintenance Hangar.

3.1.4 Cycloalkanes and Naphthalenes Figure 3-5 exhibits the distribution of cycloalkanes and naphthalenes relative ion count mapped for the North Field Maintenance Hangar Area. Twenty-eight of the 106 sampling point locations reported relative ion counts greater than 100,000. There are ten single point hot spots and five extended area hot zones in this area.

The single point hot spots are well distributed throughout the site; however, approximately half of them are located at the corners of facility buildings.

Among the four extended area hot zones, two zones have definite boundaries. The longest zone with the greatest ion count encompasses the wash rack area, trending north to south. The northern end of this zone is not defined. The second zone is located in the parking lot east of the wash rack. The two remaining extended area hot zones are located south and west, respectively, of the North Field Maintenance Hangar. The boundaries of zones have not been delineated due to the presence of the hangar building, which limited placement of the soil gas samplers.

3.2 SITE 29 AND SITE 30 (SOUTH FIELD MAINTENANCE HANGAR AREA). A total of 71 soil gas samplers were installed at the South Field Maintenance Hangar Area. This survey area consisted of two neighboring sites: the Auto Hobby Shop Area, Site 29; and the South Field Maintenance Hangar, Site 30. All sample locations and numbers are shown on Figures 3-6 and 3-7.

At Site 29, 11 samplers were placed within the enclosed parking area and outside perimeter of facility buildings 1404, 2945, and 2975. Four additional samplers (two in a grassy area and two through asphalt) were placed specifically at the aboveground and former underground waste oil storage tank area southwest of the parking area.

At Site 30, 56 samplers were placed on approximately 80 foot centers surrounding the South Field Maintenance Hangar and South Control Tower, Building 1406. This grid extended approximately 120 feet east of the South Control Tower Building onto the airfield, and encompassed the wash rack and the Hazardous waste storage area, located west of the South Field Maintenance Hangar. In addition, aboveground and abandoned underground waste oil tanks located west of Building 1406 and the underground diesel tank located south of the same building were also included in the grid.

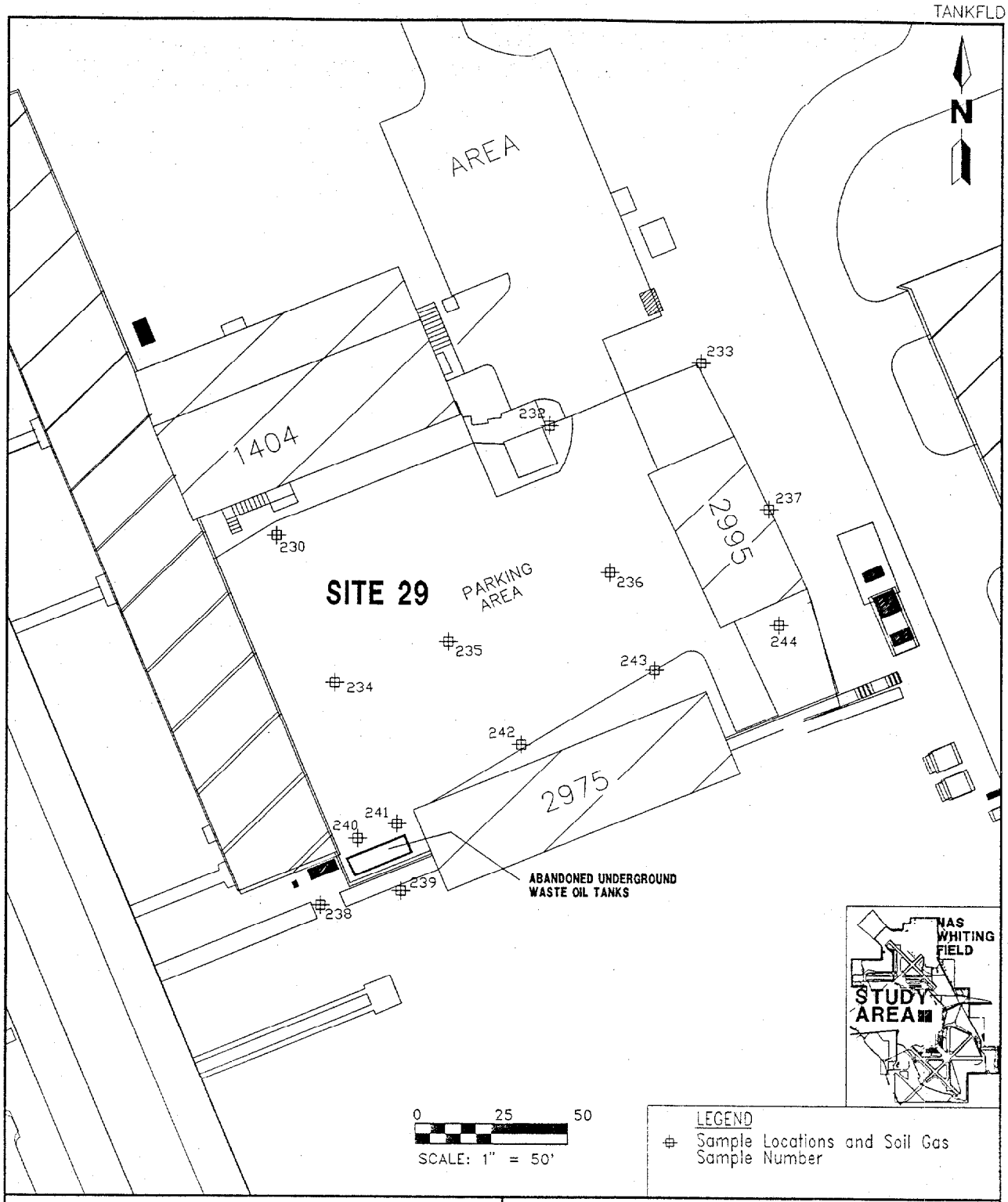



FIGURE 3-6
AUTO HOBBY SHOP - SITE 29
SAMPLE LOCATIONS

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

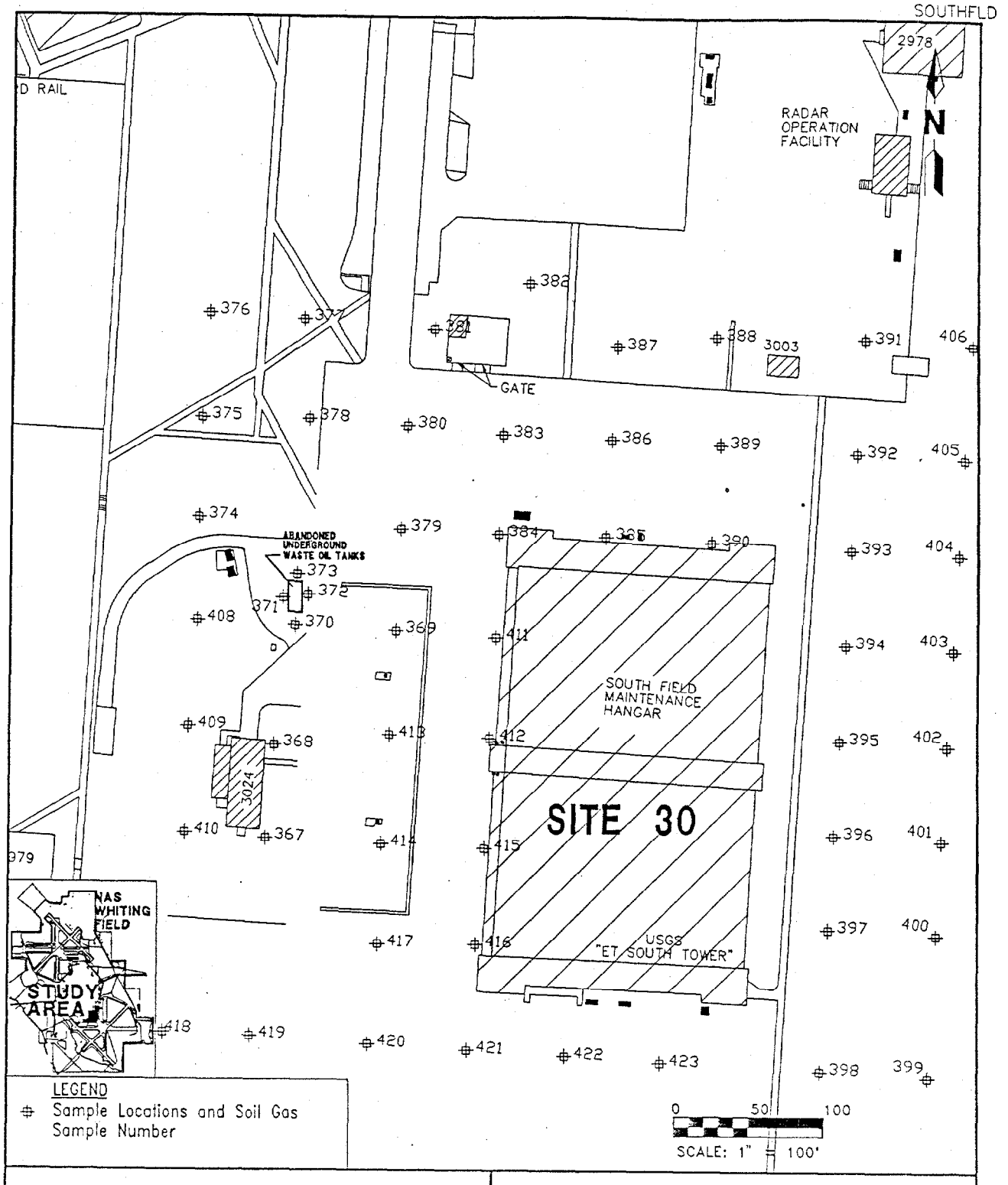



FIGURE 3-7
SOUTH FIELD HANGAR MAINTENANCE AREA
SAMPLE LOCATIONS
SITE 30

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

3.2.1 Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) Figures 3-8 and 3-9 exhibit the distribution of the BTEX relative ion count, mapped for Site 29, the Auto Hobby Shop, and Site 30, the South Field Maintenance Hangar. Fifteen of the 71 sampling points at the South Field Maintenance Hangar area have shown ion counts greater than 100,000. Most of these sampling points are located in an area capped with concrete. There are two single point hot spots and three extended area hot zones in this area.

The two single point hot spots located at Site 30 are on the border of the survey grid to the east of the South Field Maintenance Hangar.

Among the three extended area hot zones, one is located at Site 29 in the parking lot of the Auto Hobby Shop and the other two are located at Site 30. At Site 29 the zone of high ion count is located north of Building 2975 with an undefined boundary near the building (distribution is not known beneath the building). At Site 30, the largest zone is located north and east of the South Field Maintenance Hangar extending at least 100 feet beyond the hangar foundation. However, this zone of high ion count is not defined beneath the floor of the hangar. The second zone at Site 30 is a north to south trending feature with defined boundaries at the aboveground and abandoned underground waste oil storage tank area.

3.2.2 Tetrachloroethene (PCE) Figures 3-10 and 3-11 exhibit the distribution of the PCE relative ion count, mapped for Sites 29 and 30. Eight of the 71 sampling points at these two sites were reported to contain relative PCE ion counts greater than 100,000. There are two linear feature hot zones and two extended area hot zones in this area.

The longest linear feature hot zone is located at Site 29, extending from the western edge to the eastern edge of the parking area parallel to Building 2975 (Figure 3-10). The linear feature hot zone's boundary to the west is undefined.

Among the three zones located at Site 30, the largest zone is an extended area hot zone located west of the South Field Maintenance Hangar trending northeast from the wash rack towards the maintenance hangar. This zone is not defined to the northeast near the South Field Maintenance Hangar (Figure 3-11). The second zone is a extended area hot zone located near the aboveground and abandoned underground waste oil storage tank area. The third zone is a linear feature hot zone, defined by two points, located east of the South Field Maintenance Hangar. This zone is undefined on both ends.

3.2.3 Trichloroethene (TCE) Figures 3-12 and 3-13 exhibit the distribution of TCE relative ion count mapping for Sites 29 and 30. Eight of the 71 sampling points at these two sites were reported to contain relative ion count values greater than 100,000. A single extended area hot zone was identified trending from the southwest to the northeast beneath the South Field Maintenance Hangar. This zone is not defined beneath the building.

3.2.4 Cycloalkanes and Naphthalenes Figures 3-14 and 3-15 exhibit distribution of cycloalkanes and naphthalenes relative ion count mapping for Sites 29 and 30. Twenty-one of the surveyed points from these two sites were reported to contain relative ion counts greater than 100,000. The data indicate a total of one single point hot spot, one linear feature hot zone, and three extended area hot zones at Sites 29 and 30 (Figures 3-14 and 3-15).

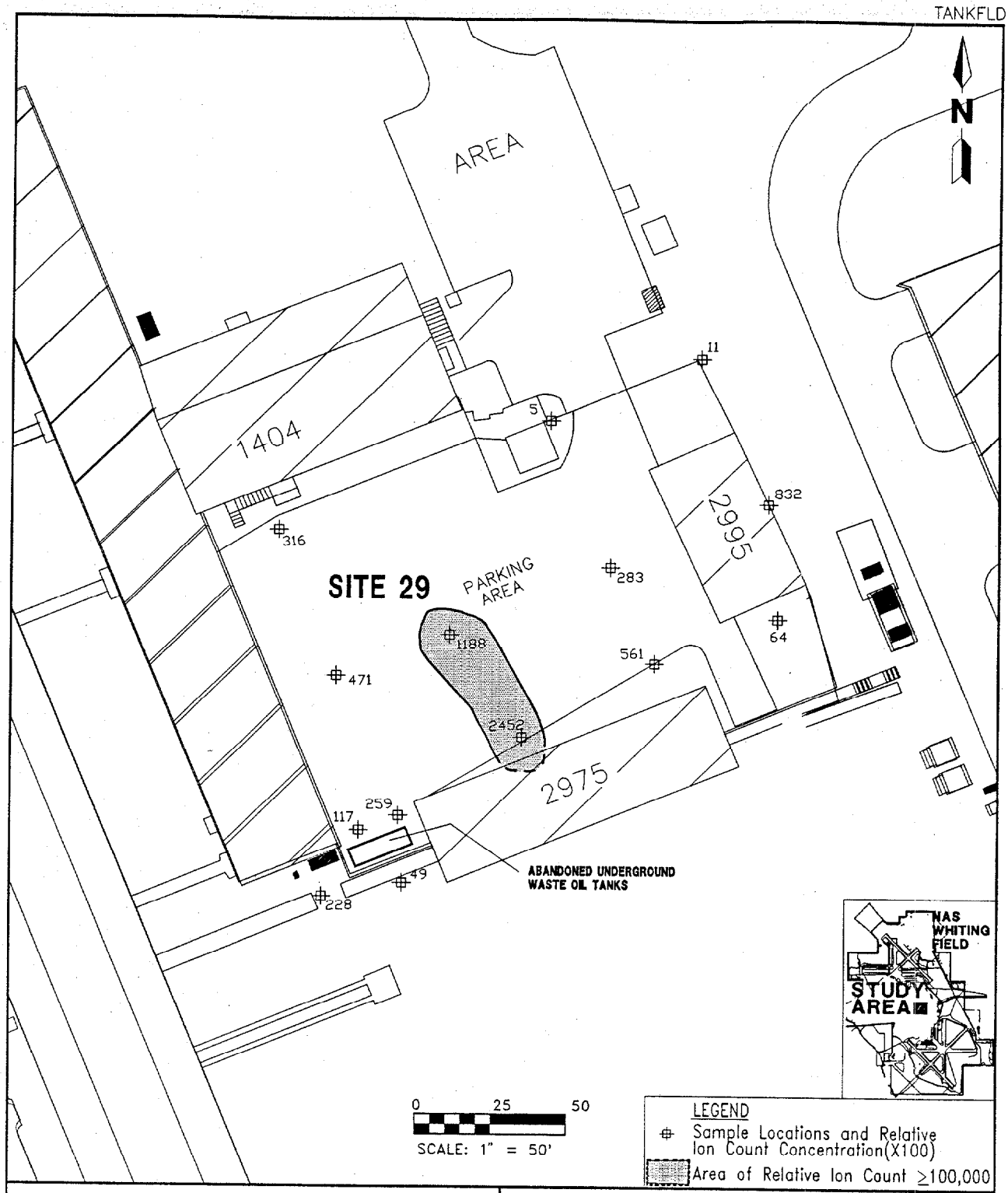



**FIGURE 3-8**
**AUTO HOBBY SHOP - SITE 29**
**BTEX RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

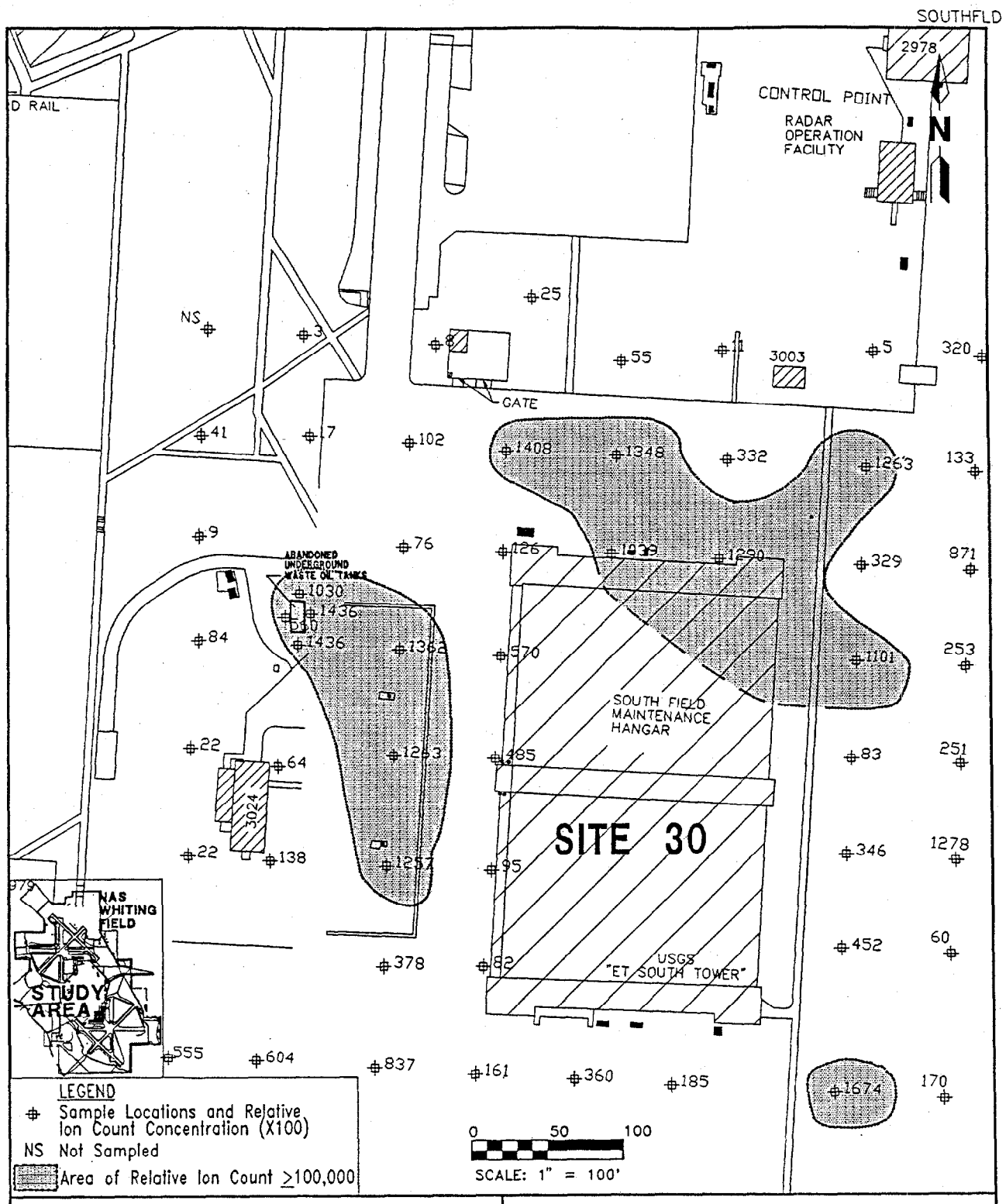



**FIGURE 3-9**
**SOUTH FIELD HANGAR MAINTENANCE AREA**
**BTEX RELATIVE ION COUNT**
**SITES 30**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

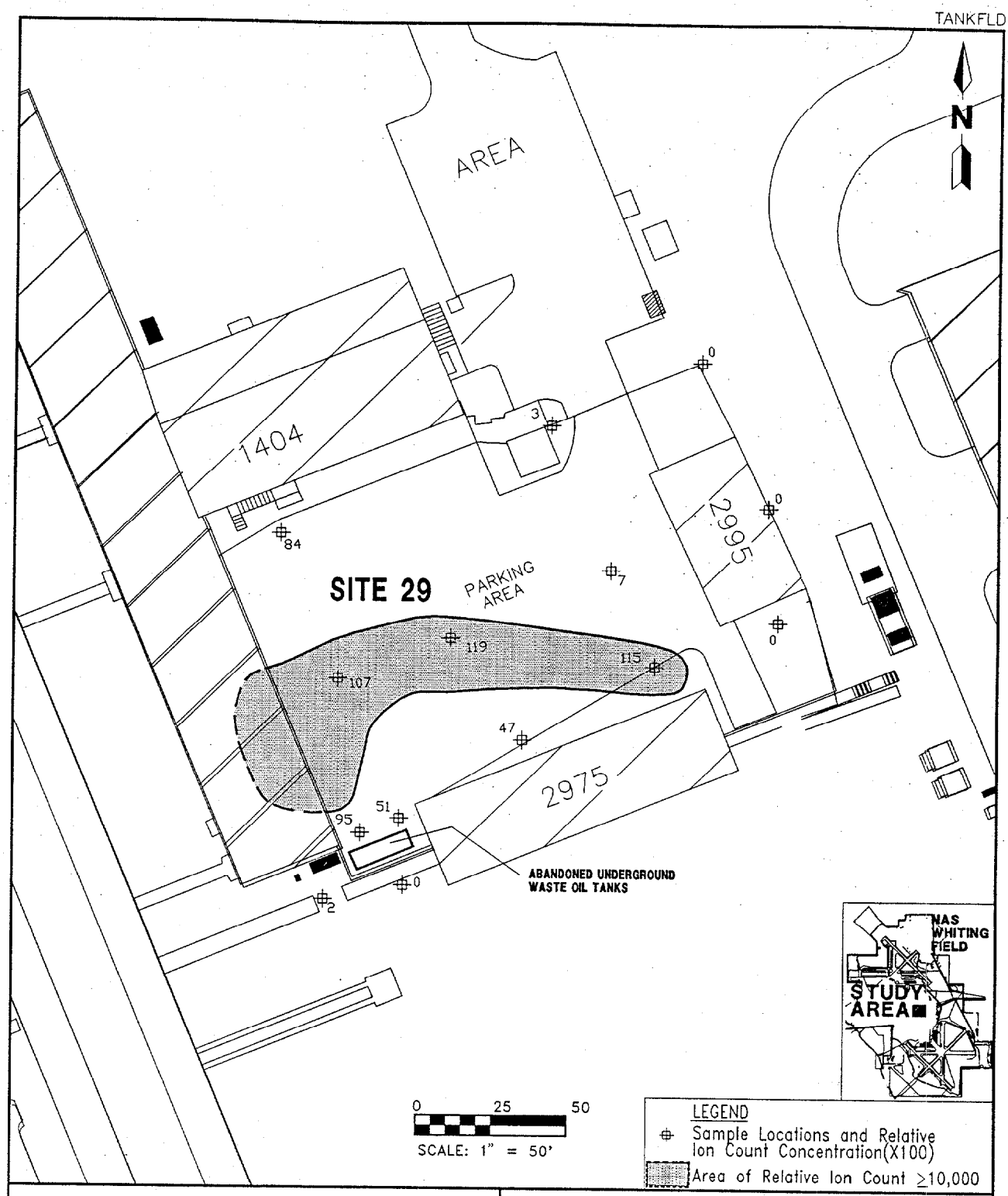



**FIGURE 3-10**
**AUTO HOBBY SHOP - SITE 29**
**PCE RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

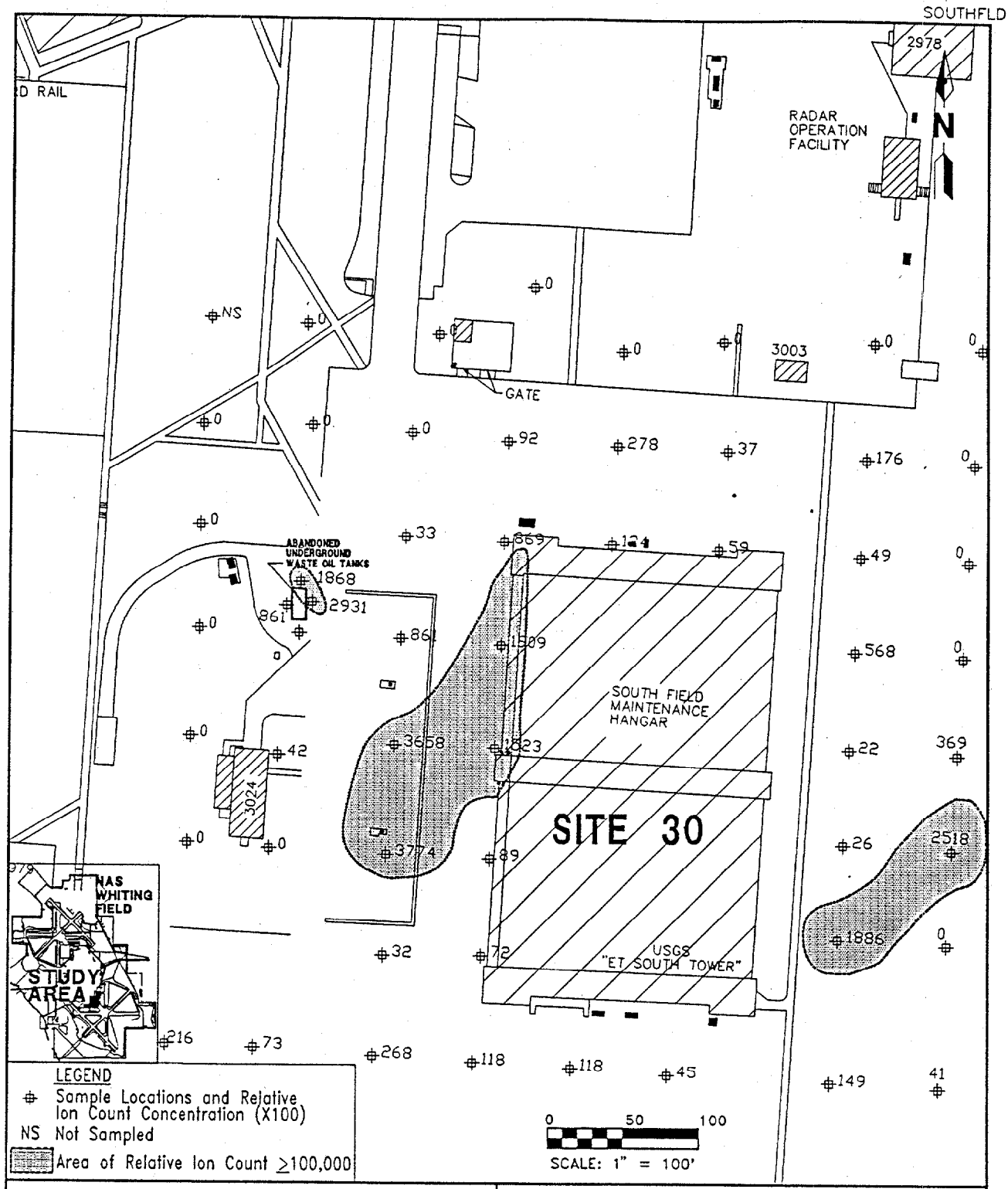



**FIGURE 3-11**
**SOUTH FIELD HANGAR MAINTENANCE AREA**
**PCE RELATIVE ION COUNT**
**SITE 30**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

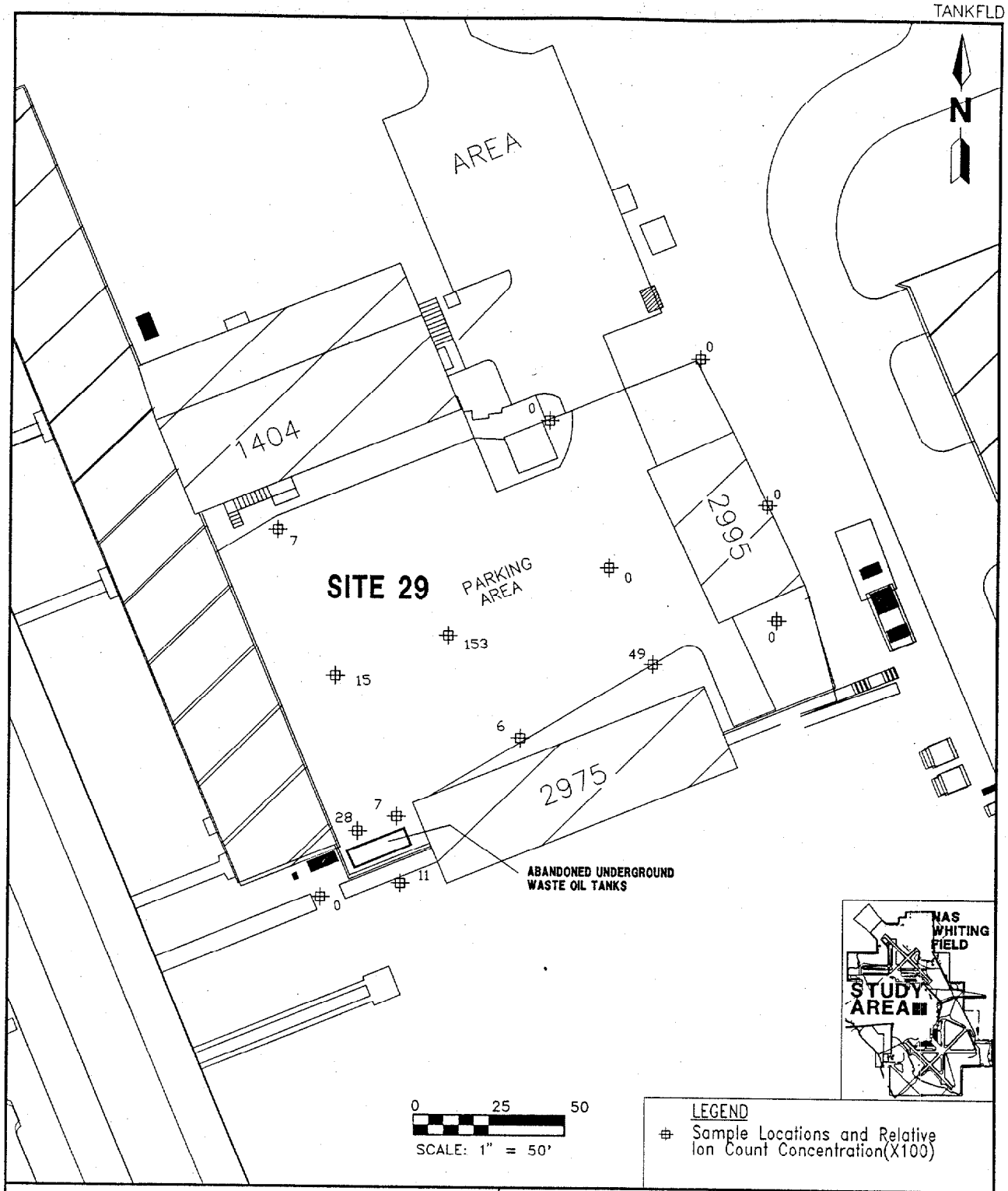



**FIGURE 3-12**
**AUTO HOBBY SHOP - SITE 29**
**TCE RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

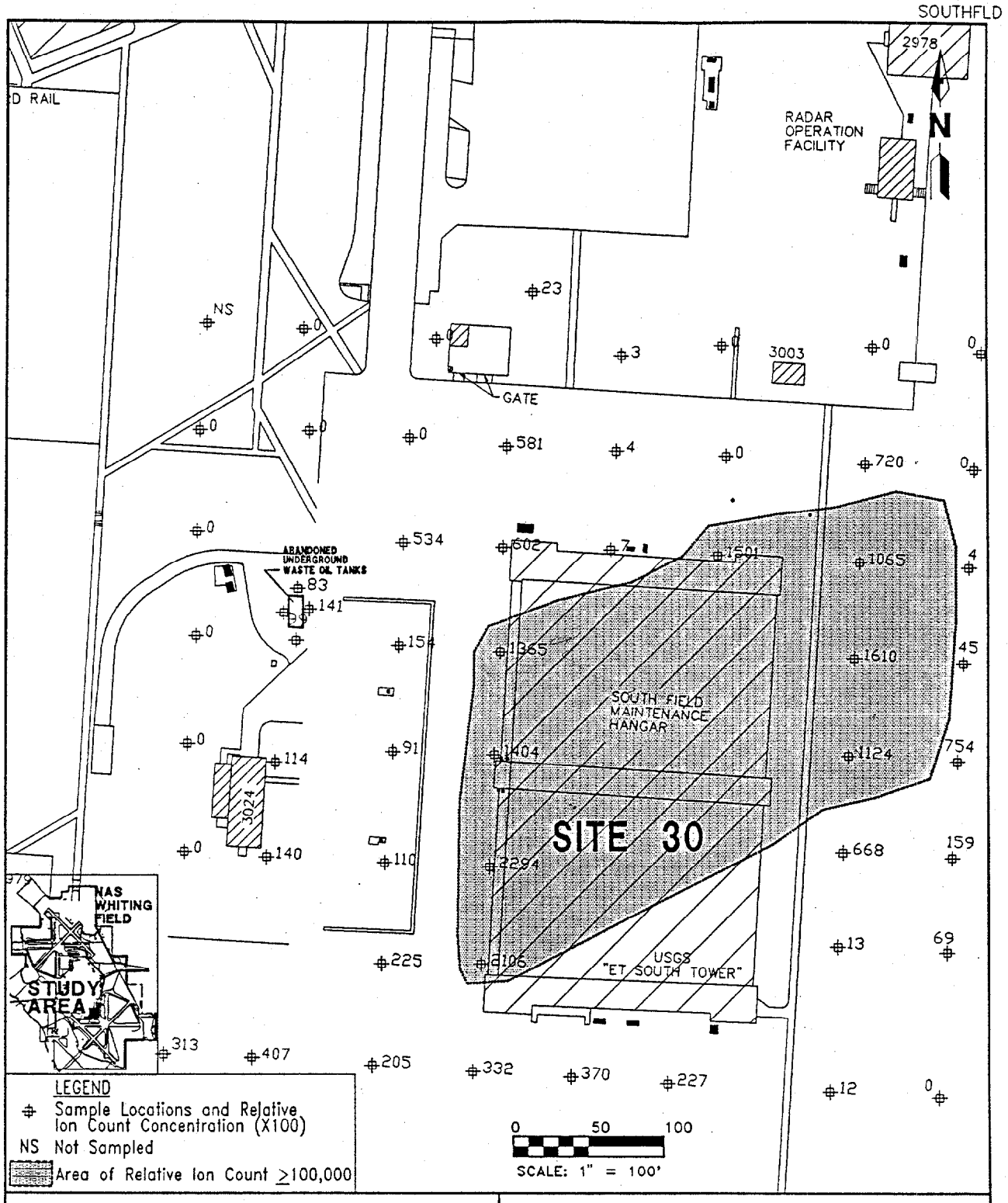



**FIGURE 3-13**
**SOUTH FIELD HANGAR MAINTENANCE AREA**
**TCE RELATIVE ION COUNT**
**SITE 30**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

TANKFLD

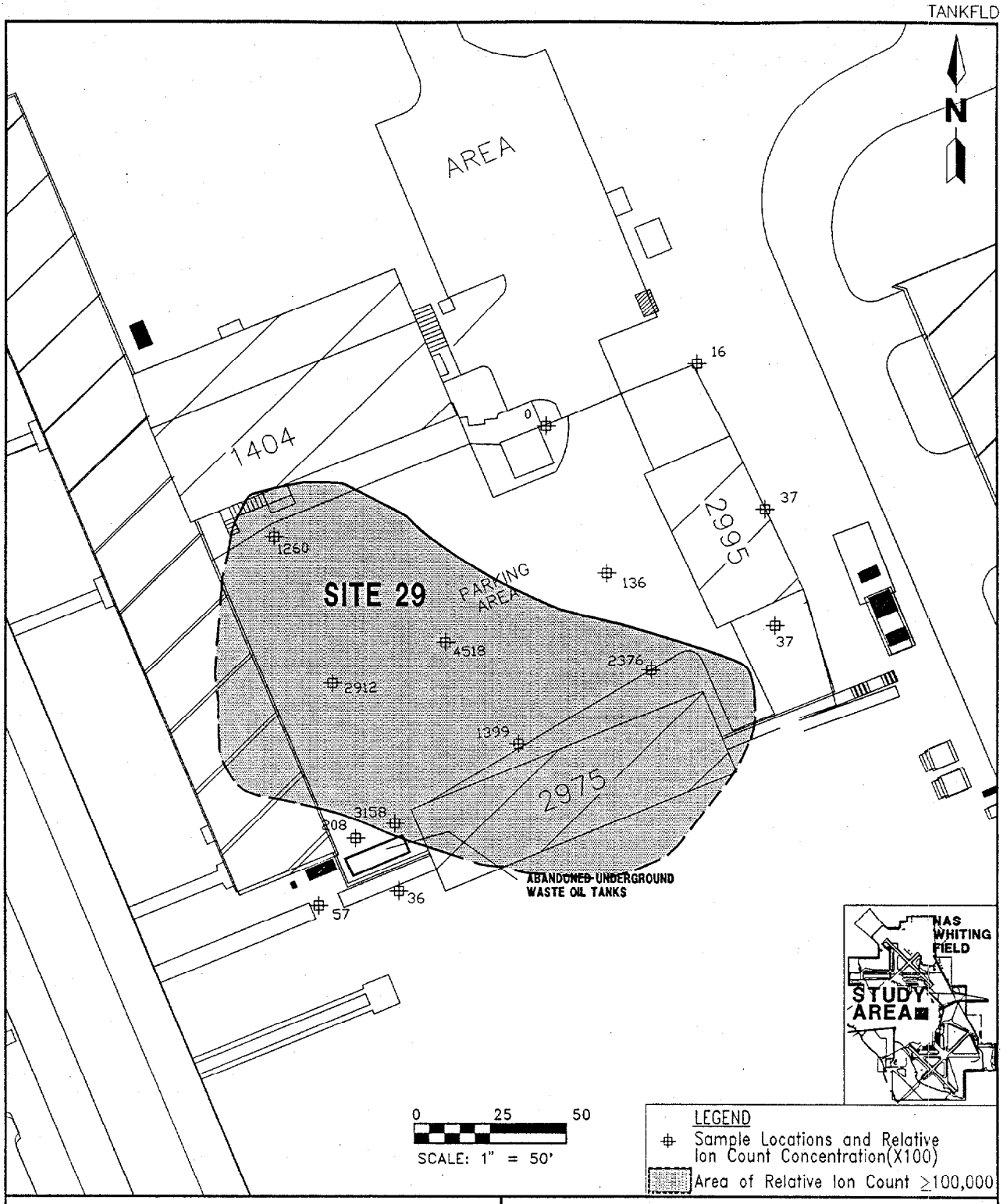



**FIGURE 3-14**
**AUTO HOBBY SHOP - SITE 29**
**CYCLOALKANES/NAPHTHALENES**
**RELATIVE ION COUNT**

**TECHNICAL REPORT**
**SOIL GAS SURVEY**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

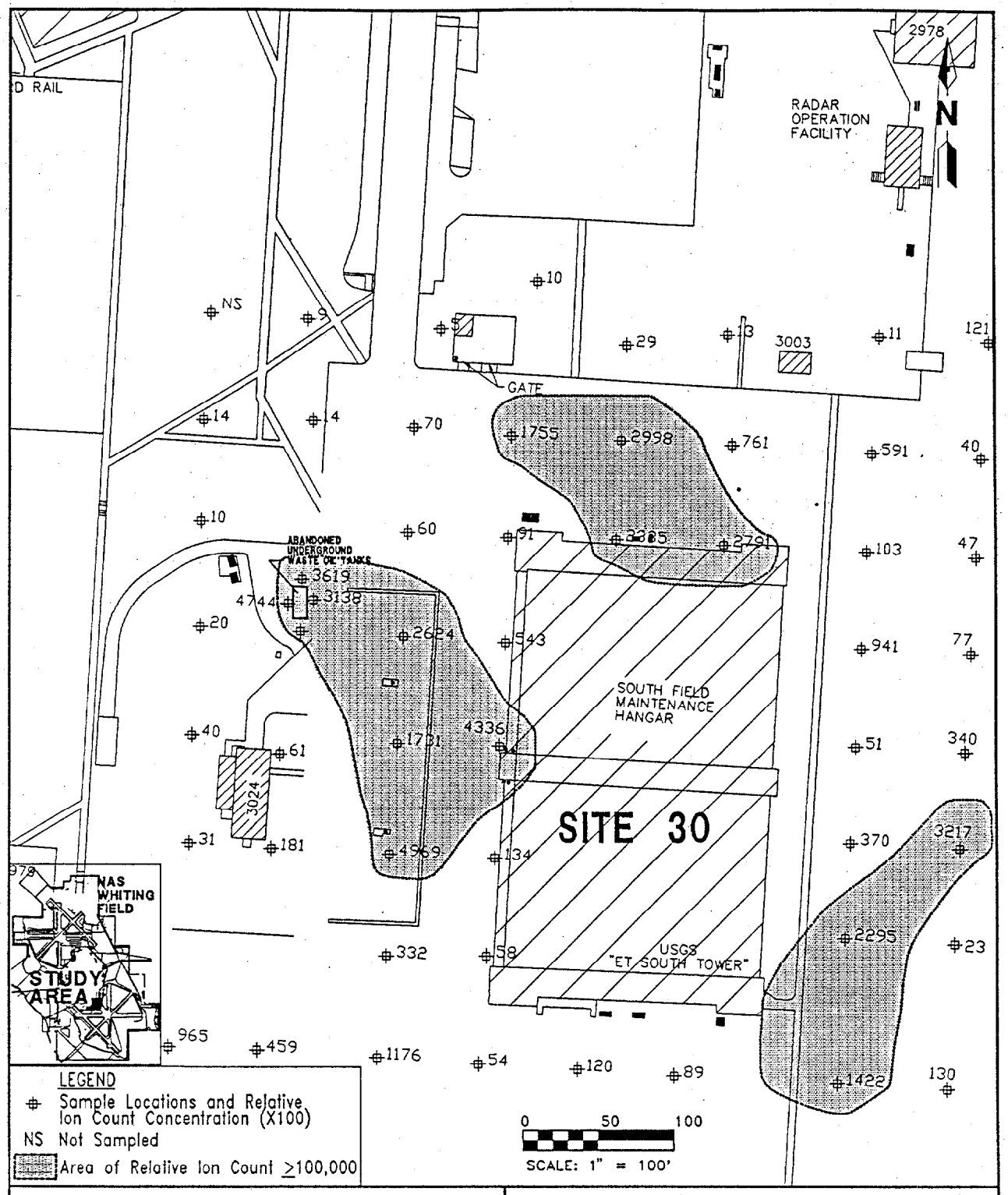



FIGURE 3-15
SOUTH FIELD HANGAR MAINTENANCE AREA
CYCLOALKANES/NAPHTHALENES
RELATIVE ION COUNT

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

The only single point hot spot is located at Site 30 on the southern border of the survey grid, southwest of the South Field Maintenance Hangar.

Among the four non-single point hot zones, the largest hot zone area is located at Site 29, trending northwest to the southeast. This large linear feature hot zone is undefined on both ends (Figure 3-14).

The remaining three zones are located at Site 30. Among these three zones, one is an extended area hot zone located near the wash rack trending southeast, away from the abandoned underground waste oil tank area. The other two have undefined boundaries. One is an extended area hot zone located north of the South Field Maintenance Hangar, which is undefined beneath the hangar. The other is a linear feature hot zone, trending southwest to northeast, located southeast of the South Field Maintenance Hangar (Figure 3-15).

3.3 SITES 5, 6, AND 33 (MIDFIELD MAINTENANCE HANGAR AREA). Sites within the boundary of the Midfield Maintenance Hangar Area soil gas grid included Site 5 (Battery Acid Shop), Site 6 (South Transformer Oil Disposal Area), and Site 33 (Midfield Maintenance Hangar). Although Sites 5 and 6 are within the soil gas survey grid, the focus of the survey was on Site 33 because of the nature of the associated wastes (i.e., solvents and fuels).

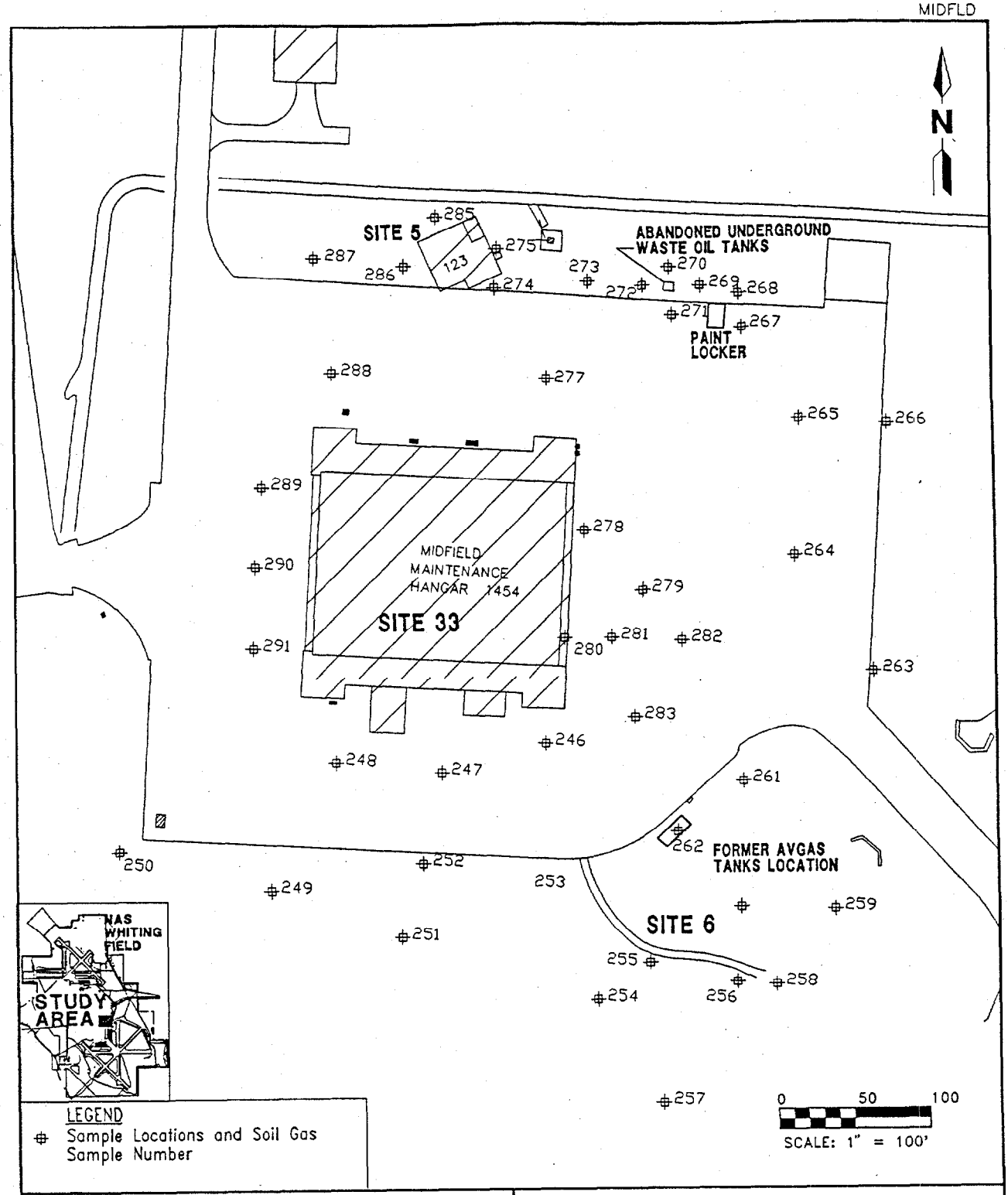
A total of 44 soil gas samplers were installed at the Midfield Maintenance Hangar Area (Figure 3-16). These samplers were placed at specific locations surrounding the Midfield Maintenance Hangar Area as well as the buildings, the installation water supply well, the former aviation gas (AVGAS) storage tank location, the abandoned underground waste oil tanks, and the drainage ditch located to the southwest. Samplers were installed with approximately 80 feet centers throughout the survey area. Sampling density was increased surrounding the aboveground and abandoned underground waste oil tanks and an area south of the hangar.

3.3.1 Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) Figure 3-17 exhibits the distribution of BTEX relative ion count mapped for the Midfield Maintenance Hangar Area survey. Six of the 44 sampling points have shown ion counts greater than 85,000. All these points were located in an area capped with concrete. There are two single point hot spots and one extended area hot zone in this area.

Among the two single point hot spots, one is located on the western border of the survey grid west of the Midfield Maintenance Hangar and the other is located northeast of the hangar building. The extended zone hot spot has defined boundaries and is located along the eastern wall of the Midfield Maintenance Hangar Area.

3.3.2 Tetrachloroethene (PCE) Figure 3-18 exhibits the distribution of PCE relative ion count mapping for the Midfield Maintenance Hangar Area survey. Seven of the 44 sampling points have shown ion counts greater than 10,000. Distribution of high ion counts is similar to that of the BTEX ion count; however, there is an additional zone of high ion counts located on the southeast corner of the Midfield Maintenance Hangar with undefined boundaries to the north and south.

3.3.3 Trichloroethene (TCE) Figure 3-19 exhibits the relative distribution of TCE ion count mapping for the Midfield Maintenance Hangar Area survey. Six of the 44 sampling points reported relative ion counts in the range of 50,000 to




LEGEND
⌖ Sample Locations and Soil Gas Sample Number

FIGURE 3-16
MIDFIELD HANGAR MAINTENANCE AREA
SAMPLING LOCATIONS
SITES 5,6, AND 33

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

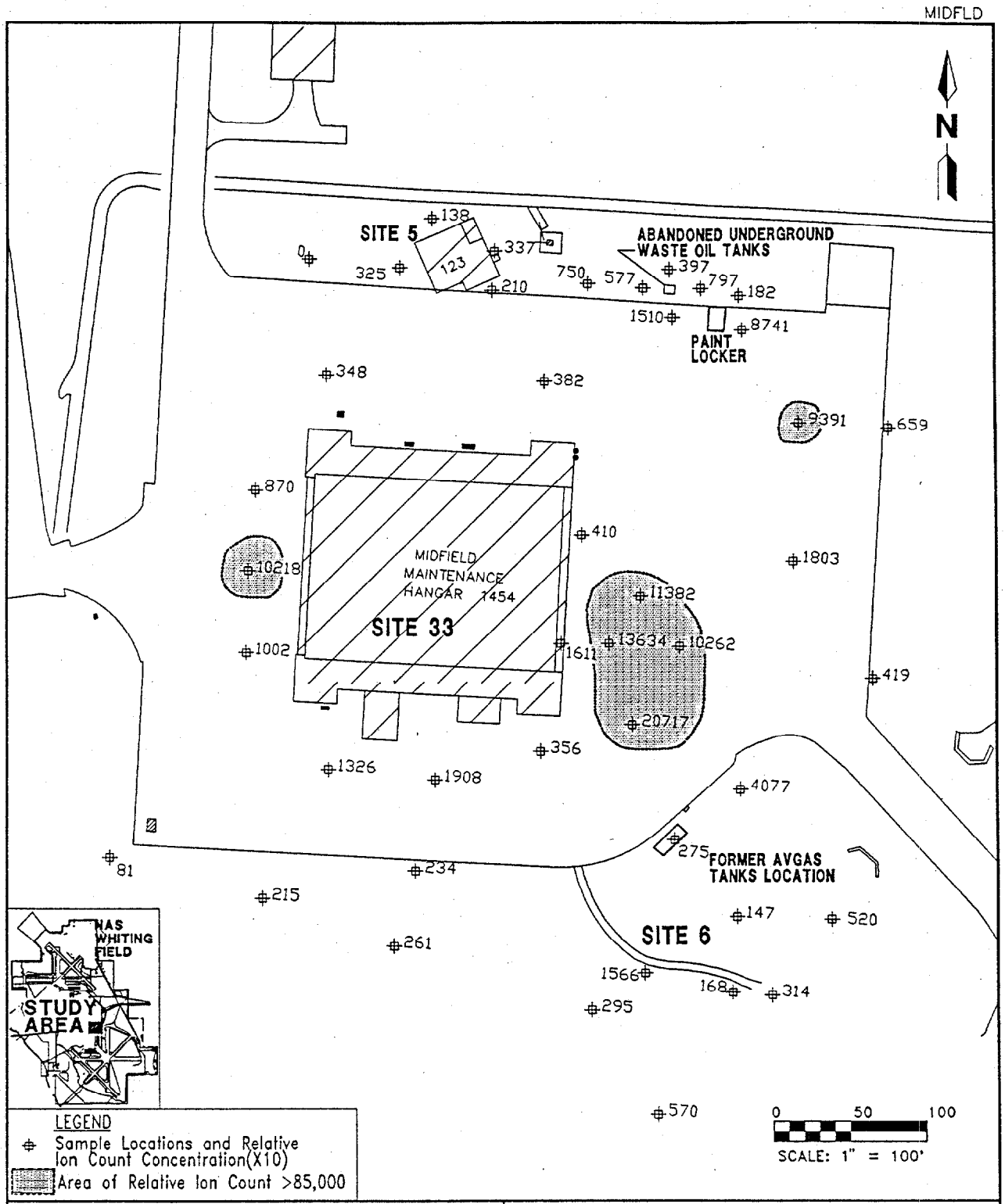



FIGURE 3-17
MIDFIELD HANGAR MAINTENANCE AREA
BTEX RELATIVE ION COUNT
SITES 5,6, AND 33

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

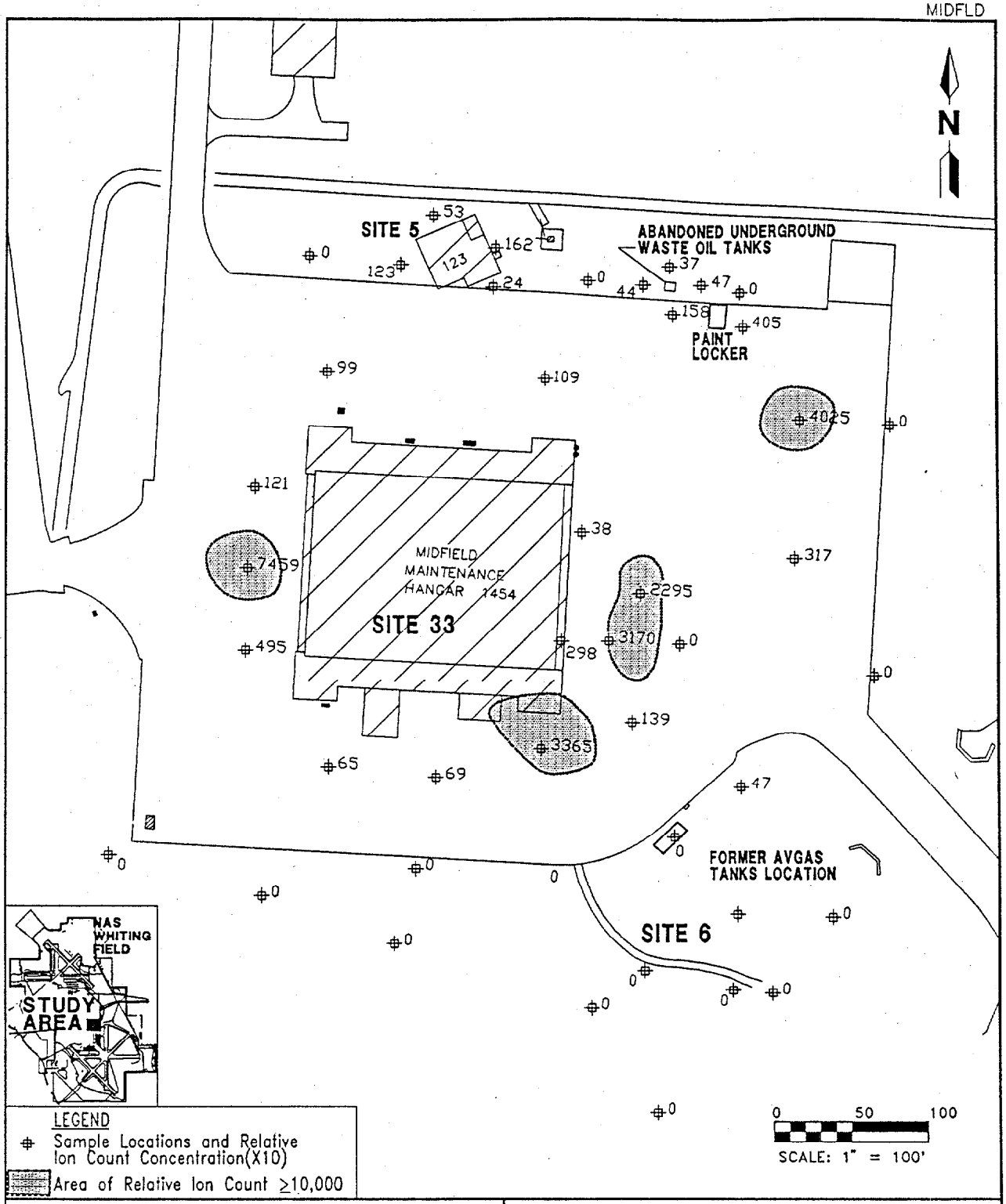



FIGURE 3-18
MIDFIELD HANGAR MAINTENANCE AREA
PCE RELATIVE ION COUNT
SITES 5,6, AND 33

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

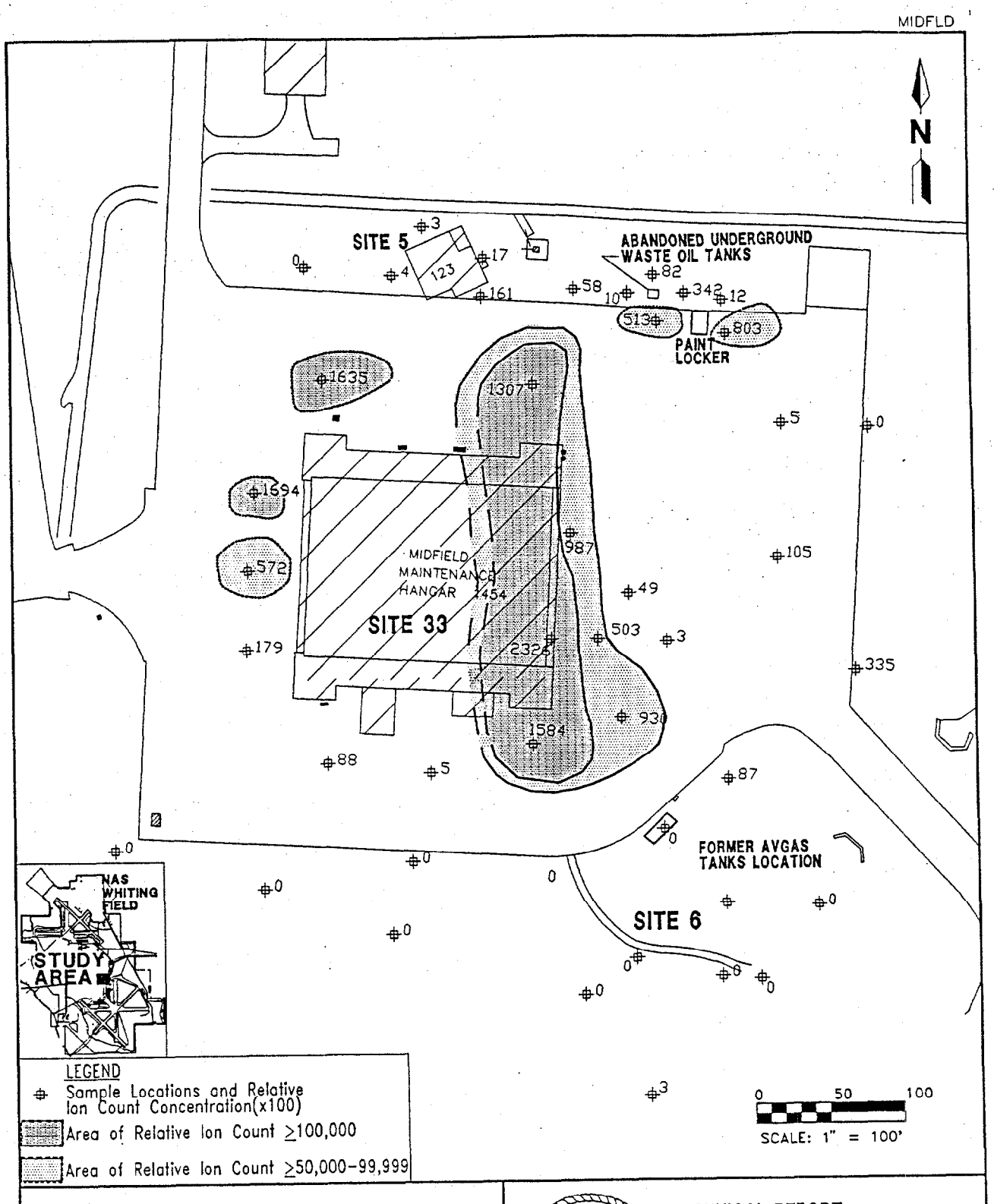



FIGURE 3-19
MIDFIELD HANGAR MAINTENANCE AREA
TCE RELATIVE ION COUNT
SITES 5,6, AND 33

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

100,000 and an additional five sampling points report relative ion counts of greater than 100,000.

The highest relative ion counts were reported at sampling locations along the east wall of the Midfield Maintenance Hangar from the southeast corner to the northeast corner. Additional single point high ion counts were documented along the west wall of the Midfield Maintenance Hangar. Although the relative ion count distribution is undefined beneath the Midfield Maintenance Hangar floor, the single point high ion count zones located west of the building and the extended area hot zone located east of the building may indicate an extended plume located beneath the entire building. There are two single point high ion count hot spots in the range of 50,000 to 100,000 near the abandoned underground waste oil tanks northeast of the Midfield Maintenance Field Hangar.

3.3.4 Cycloalkanes and Naphthalenes Figure 3-20 exhibits the distribution of cycloalkanes and naphthalenes relative ion count mapping for the Midfield Maintenance Hangar Area. Seven of 44 sampling points have shown ion counts greater than 100,000. The distribution of ion counts is similar to that of BTEX and PCE; however, there is an additional single point hot spot located in the grassy area southeast of the Midfield Maintenance Hangar.

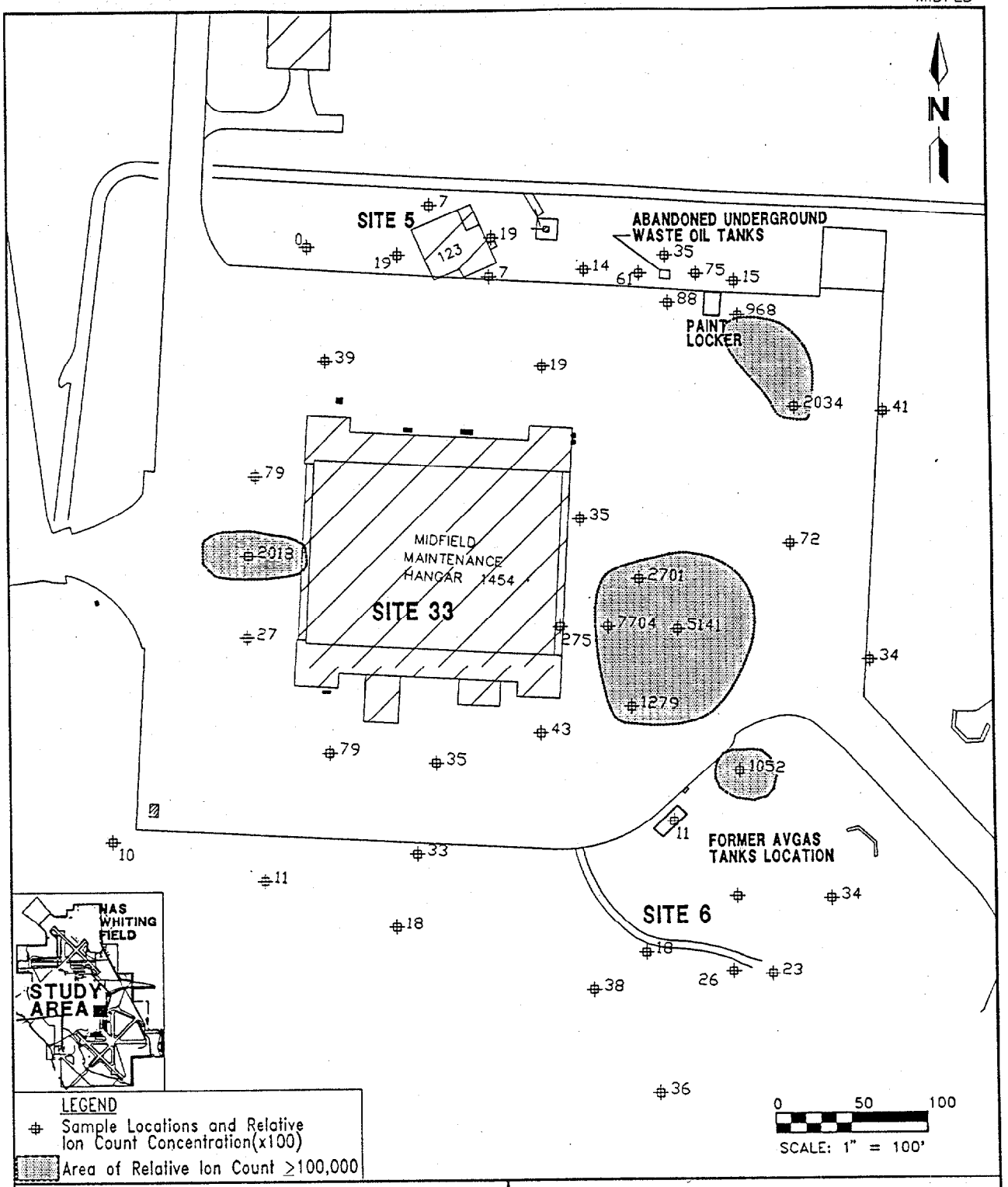



FIGURE 3-20
MIDFIELD HANGAR MAINTENANCE AREA
CYCLOALKANES/NAPHTHALENES
RELATIVE ION COUNT
SITES 5,6, AND 33

TECHNICAL REPORT
SOIL GAS SURVEY

NAS WHITING FIELD
MILTON, FLORIDA

# 4.0 SUMMARY

Interpretation of the analytical data generated by the Soil Gas Survey at NAS Whiting Field has resulted in the delineation of the aerial extent of soil gas contamination for the compounds BTEX, PCE, TCE, and cycloalkanes and naphthalenes at the North Field, South Field, and Midfield Maintenance Hangar Study Areas. Based on this information generalizations can be made concerning areas of soil and groundwater contamination. Although definitive contaminant concentrations and precise plume boundaries have not been identified due to the screening nature of the investigation, the result of this investigation will be used for determining preferred locations for subsurface soil borings and monitoring wells to be installed during later investigative phases.

Table 4-1 presents the summary of soil gas survey findings at NAS Whiting Field.

## Table 4-1
## Summary of Soil Gas Survey Findings

Technical Report
Soil Gas Survey, RI Phase II-A
NAS Whiting Field, Milton, Florida

| Site Grouping | Compound Detected | Frequency of Detection | Ion Count Threshold | Location of Individual Sampling Points Exceeding the Threshold Ion Count | | | | |
|---|---|---|---|---|---|---|---|---|
| Sites 3 and 32 North Field Maintenance Hangar Area | | | | NFMH | WR | AUWOST | PLA | Building 2941 |
| | BTEX | 9 of 106 | > 100,000 | 2 | 2 | 1 | 1 | 3 |
| | PCE | 9 of 106 | > 100,000 | 4 | 3 | 1 | -- | 1 |
| | TCE | 3 of 106 | > 100,000 | 3 | -- | -- | -- | -- |
| | Cycloalkanes and Naphthalenes | 28 of 106 | > 100,000 | 7 | 9 | 1 | 6 | 5 |
| Sites 29 and 30 South Field Maintenance Hangar Area | | | | SFMH | WR | AUWOST | PLA | Auto Hobby Shop |
| | BTEX | 17 of 71 | > 100,000 | 6 | 4 | 3 | 2 | 2 |
| | PCE | 12 of 71 | > 100,000 | 3 | 2 | 2 | 2 | 3 |
| | TCE | 8 of 71 | > 100,000 | 8 | -- | -- | -- | -- |
| | Cycloalkanes and Naphthalenes | 19 of 71 | > 100,000 | 3 | 3 | 3 | 3 | 5 |
| Sites 5, 6, and 33 Midfield Maintenance Hangar Area | | | | MFMH | | AUWOST | Drainage Ditch | |
| | BTEX | 6 of 44 | > 85,000 | 6 | | -- | -- | |
| | PCE | 5 of 44 | > 10,000 | 5 | | -- | -- | |
| | TCE | 5 of 44 | > 100,000 | 5 | | 1 | -- | |
| | | 4 of 44 | > 50,000 | 4 | | 1 | -- | |
| | Cycloalkanes and Naphthalenes | 7 of 44 | > 100,000 | 7 | | -- | -- | |

Notes: NFMH = North Field Maintenance Hangar.
WR = Wash Rack Area.
AUWOST = Abandoned Underground Waste Oil Storage Tanks.
PLA = Parking Lot Area.
BTEX = benzene, toluene, ethylbenzene, and xylenes.
PCE = tetrachloroethene.
TCE = trichloroethene.
-- = none detected.
SFMH = South Field Maintenance Hangar.
MFMH = Midfield Maintenance Hangar.

## REFERENCES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# APPENDIX D

# DATA QUALITY OBJECTIVES ASSESSMENT

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Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

APPENDIX D


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# Table D-1
## Cross Reference - SDG Numbers and Site Numbers - Surface Soil Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Reference to Data Validation | | | Number of Samples Analyzed in a given SDG | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inorganics | Organics | TPH | BKG | Site 1 | Site 10 | Site 11 | Site 13 | Site 14 | Site 15 | Site 16 | Site 17 | Site 18 | Site 31 |
| 22440 | 01/22/93 | 02/11/93 | -- | 10 | | | | | | | | | | |
| 22454 | 01/22/93 | 02/11/93 | -- | | 2 | | | | | | | | | |
| 22457 | 12/03/92 | 02/16/93 | -- | | 1 | | | | 3 | 5 | 3 | | | |
| 22462 | 01/21/93 | 12/17/93 | 01/27/93 | | | 5 | | | | | | | 3 | |
| 22481 | 01/06/93 | 12/20/93 | 12/03/92 | | | | | | | | | | 1 | |
| 22488 | 01/22/93 | 12/18/92 | 01/27/93 | | | | | | | | | | 10 | |
| 22489 | | 01/19/93 | 01/27/93 | | | | | | | | | | 2 | |
| 22495 | 02/09/93 | 02/05/93 | 01/27/93 | | | | | | | | | | 12 | |
| 22505 | 02/09/93 | 12/17/92 | 01/27/93 | | | | | | | | | 10 | | |
| 22506 | 12/03/92 | 02/16/93 | 01/27/93 | | | | | | | | | | 10 | |
| 22507 | 02/09/93 | 02/11/93 | 01/27/93 | | | | | | | | | | 9 | |
| 22514 | 01/27/93 | 12/17/92 | 01/27/93 | | | | | | | | | | | |
| 22515 | -- | 12/18/92 | -- | | | | | | | | | 12 | | 13 |
| 22516 | 12/03/92 | 01/19/93 | 01/27/93 | | | | | | | | | | | |
| 22520 | 01/22/93 | 12/18/93 | 01/27/93 | | | | | | | | | 2 | | |
| 22526 | 01/25/93 | 01/27/93 | -- | | | | 5 | 5 | | | | 10 | | |
| 22527 | 02/09/93 | 01/07/93 | -- | | | | | | | | | | | 10 |
| 22528 | 01/06/93 | 01/19/93 | -- | | | | | | | | | | | 1 |
| Total Number of Surface Soil Samples per Site | | | | 10 | 3 | 5 | 5 | 5 | 3 | 5 | 3 | 34 | 47 | 24 |

Notes: SDG = Sample Delivery Group.
BKG = background.
TPH = total petroleum hydrocarbons.

## Table D-2
## Cross Reference - SDG Numbers and Site Numbers
## Subsurface Soil Samples (Test Pits)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Reference to Data Validation | | Number of Samples Analyzed in a Given SDG | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Inorganics | Organics | Site 1 | Site 10 | Site 11 | Site 13 | Site 14 | Site 15 | Site 16 |
| 22883 | 03/10/93 | 02/08/93 | | | | | | 1 | |
| 22889 | 03/10/93 | 02/08/93 | | | | | | 2 | |
| 22891 | 03/10/93 | 02/05/93 | | | | | | 2 | 1 |
| 22897 | 01/27/93 | 02/08/93 | | | | | | | 1 |
| 22898 | 01/07/93 | 03/29/93 | | | | | | | 1 |
| 22910 | 01/20/93 | 02/16/93 | | | | | | | 2 |
| 22927 | 02/09/93 | 02/05/93 | | 2 | | 3 | | | |
| 22925 | 01/07/93 | 02/11/93 | | 1 | | | | | |
| 22935 | 02/05/93 | 02/08/93 | 1 | | 3 | | 2 | | |
| Total Number of Soil Samples | | | 1 | 3 | 3 | 3 | 2 | 5 | 5 |

Note: SDG = Sample Delivery Group.

# Table D-3
## Cross Reference - SDG Numbers and Site Numbers
## Subsurface Soil Samples (Soil Borings)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Reference to Data Validation | | | Number of Samples in a Given SDG | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inorganics | Organics | TPH | Site 3 | Site 6 | Site 17 | Site 18 | Site 29 | Site 30 | Site 32 | Site 33 |
| 34553 / 23444 | 02/18/93 | 02/11/93 | 04/29/93 | | | | | | | | 7 |
| 34566 / 23462 | 02/18/93 | 03/18/93 | | | | | | | | | 3 |
| 34576 / 23479 | 02/11/93 | 02/17/93 | | | | | | | | | 7 |
| 34578 / 23482 | 02/16/93 | 04/06/93 | 04/29/93 | | | | | | | | 1 |
| 34587 / 23480 | 02/18/93 | 02/24/93 | 05/04/93 | | 10 | | | | | | |
| 34595 | 03/19/93 | 02/24/93 | | | 6 | | | | | | |
| 34597 | 03/19/93 | 03/29/93 | | | 1 | | | | | | |
| 34607 / 23507 | 02/11/93 | 02/17/93 | 05/04/93 | | | | | | 6 | | 4 |
| 34617 / 23508 | 03/18/93 | 03/22/93 | 04/29/93 | | | | | | 1 | | |
| 34797 / 23658 | 03/19/93 | 04/28/93 | 03/25/93 | | | | 1 | | 7 | | |
| 34799 / 23659 | 04/13/93 | 03/29/93 | 05/04/93 | | | | 3 | | | | |
| 34807 / 23669 | 04/16/93 | 04/05/93 | 05/04/93 | | | | 14 | | 9 | | |
| 34815 / 23682 | 04/06/93 | 04/05/93 | 05/04/93 | | | 2 | 6 | 11 | | | |
| 34823 / 23694 | 03/25/93 | 04/12/93 | 05/04/93 | | | 5 | | 2 | | | |
| 34824 / 23693 | 04/13/93 | 03/29/93 | 04/28/93 | | | | | 1 | | | |
| 34833 / 23703 | 03/31/93 | 04/12/93 | 05/04/93 | 10 | | | | | | | |
| 34834 / 23704 | 03/31/93 | 04/12/93 | 04/28/93 | 1 | | | | | | | |
| 34836 / 23705 | 03/31/93 | 03/22/93 | 05/04/93 | 7 | | | | | | 4 | |
| 34846 / 23712 | 03/31/93 | 04/29/93 | 05/04/93 | | | | | 1 | | 13 | |
| 34847 / 23713 | 04/13/93 | 05/03/93 | 05/04/93 | | | | | | | 1 | |
| 34848 / 23714 | 04/16/93 | 04/30/93 | 05/04/93 | 6 | | | | | | 9 | |
| 34906 / 23774 | 04/13/93 | 04/12/93 | 05/10/93 | 6 | | 4 | | | | | |

See notes at end of table.

## Table D-3 (Continued)
## Cross Reference - SDG Numbers and Site Numbers
## Subsurface Soil Samples (Soil Borings)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Reference to Data Validation | | | Number of Samples in a Given SDG | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inorganics | Organics | TPH | Site 3 | Site 6 | Site 17 | Site 18 | Site 29 | Site 30 | Site 32 | Site 33 |
| 34909 / 23773 | 04/13/93 | 04/06/93 | 04/28/93 | 1 | | | | | | | |
| 34925 / 23792 | 04/13/93 | 04/29/93 | 05/04/93 | | | 6 | | | | 5 | |
| 34926 / 23793 | 04/13/93 | 04/13/93 | 04/28/93 | | | 1 | | | | | |
| 34938 / 23810 | 03/31/93 | | 05/04/93 | 3 | | | | | | 5 | |
| 34939 | 03/25/93 | 05/13/93 | | 1 | | | | | | | |
| 34956 / 23826 | 04/13/93 | 04/12/93 | 05/04/93 | | | | | | | 3 | |
| 35015 / 23894 | 03/31/93 | 05/03/93 | 05/10/93 | 1 | | | | | | | |
| Total Number Of Subsurface Soil Samples | | | | 35 | 17 | 18 | 24 | 15 | 23 | 40 | 22 |

Notes: SDG = Sample Delivery Group.
TPH = total petroleum hydrocarbons.

## Table D-4
## Precision - Surface Soil Sampling
## RPDs for Field Duplicate and MS/MSD Samples with Positive Detections

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Compound | Sample Concentration (µg/kg) | Duplicate Concentration (µg/kg) | RPD | Control Limits |
|---|---|---|---|---|---|---|
| Field Duplicates | | | | | | |
| 22481 | WHF-2A-18-SL-01 | Methylene Chloride | 64 | 20 | 105 | NEC |
| | | Acetone | 19 | 8 | 81 | NEC |
| | | Bis(2-ethylhexyl)phthalate | 700 | 1,200 | 53 | NEC |
| 22489 | WHF-2A-18-SL-10 | 2-Butanone | 36 | 35 | 3 | NEC |
| | | Toluene | 10 | 28 | 95 | NEC |
| | | Ethylbenzene | 23 | 70 | 101 | NEC |
| | | Xylenes (Total) | 160 | 430 | 92 | NEC |
| 22489 | WHF-2A-18-SL-23 | Xylene(total) | ND | 2 | NC | NEC |
| | | Fluoranthene | 3,500 | ND | NC | NEC |
| | | Pyrene | 7,700 | 6,200 | 22 | NEC |
| | | Benzo(a)anthracene | 1,300 | ND | NC | NEC |
| | | Chrysene | 1,400 | ND | NC | NEC |
| | | Bis(2-ethylhexyl)phthalate | 5,600 | 4,100 | 31 | NEC |
| | | Benzo(a)pyrene | 1,200 | ND | NC | NEC |
| 22507 | WHF-2A-18-SL-31 | Toluene | 180 | ND | NC | NEC |
| | | Ethylbenzene | 290 | ND | NC | NEC |
| | | Xylene | 1,800 | 54 | 188 | NEC |
| | | 2-Methylnaphthalene | 1,200 | ND | NC | NEC |
| | | Carbon Disulfide | ND | 11 | NC | NEC |
| | | Pyrene | MD | 730 | NC | NEC |
| 22507 | WHF-2A-18-SL-37 | Xylene | 16 | ND | NC | NEC |
| | | Bis(2-ethylhexyl)phthalate | 1,800 | 3,500 | 179 | NEC |
| **VOCs, SVOC, Pesticides/PCBs** | | | | | | |
| Field Duplicates | | | | | | |
| 22514 | WHF-2A-17-SL-17 | Xylene | 340 | ND | NC | |
| 22516 | WHF-2A-17-SL-11 | Ethylbenzene | 5,000 | 12,000 | 82 | |
| | | Xylene(total) | 30,000 | 84,000 | 95 | |
| | | Naphthalene | 1,100 | 1,700 | 43 | |
| | | 2-Methylnaphthalene | 1,400 | 1,300 | 76 | |
| | WHF-2A-17-SL-21 | Ethylbenzene | 1,100 | 510 | 73 | |
| | | Xylene(total) | 9,600 | 3,700 | 89 | |
| | | Bis(2-ethylhexyl)phthalate | 450 | ND | NC | |
| MS/MSD Pairs | | | | | | |
| 22505 and 22520 | WHF-2A-17-SL-03, and WHF-2A-17-SL-27 | Phenol | 124 | 62 | 67 | |
| | | 2-Chlorophenol | 144 | 70 | 69 | |
| | | 1,2,4-Trichlorobenzene | 109 | 0 | NC | |
| | | Acenaphthene | 0 | 86 | NC | |
| | | 4-Nitrophenol | 393 | 0 | NC | |
| 22505, and 22520 | WHF-2A-18-SL-10, and WHF-2A-18-SL-23 | Pyrene | 46 | 30 | 36 | |

See notes at end of table.

## Table D-4 (Continued)
## Precision - Surface Soil Sampling
## RPDs for Field Duplicate and MS/MSD Samples with Positive Detections

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Compound | Sample Concentration (µg/kg) | Duplicate Concentration (µg/kg) | RPD | Control Limits |
|---|---|---|---|---|---|---|
| **TAL Metals** | | | | | | |
| Field Duplicates | | | | | | |
| 22516 | WHF-2A-17-21 | Cadmium | 22 | 15 | 37 | |
| **Field Duplicate Samples** | | | | | | |
| 22481 | WHF-2A-18-SL-01 | Arsenic | 0.55 | 1.1 | 66.7 | ≤ 35 |
| | | Barium | 17.2 | 45.2 | 89.7 | |
| | | Cadmium | 22.6 | 33.7 | 39.4 | |
| | | Chromium | 16.5 | 34.3 | 70.1 | |
| | | Copper | 177 | 864 | 132 | |
| | | Iron | 1,710 | 2580 | 40.6 | |
| | | Lead | 62.6 | 96.1 | 42.2 | |
| | | Zinc | 94.2 | 174 | 59.5 | |
| | WHF-2A-18-SL-10 | Chromium | 95.7 | 10.2 | 161.5 | ≤ 35 |
| | | Copper | 65.3 | 24.9 | 89.6 | |
| | | Iron | 35,600 | 14,100 | 86.5 | |
| | | Zinc | 181 | 99.3 | 58.3 | |
| | WHF-2A-18-SL-23 | Copper | 236 | 68.6 | 109.9 | ≤ 35 |
| | | Zinc | 631 | 210 | 100.1 | |
| 22489 | WHF-2A-18-SL-10 | Arsenic | .90 | 2.2 | 83.9 | ≤ 35 |
| | | Chromium | 95.7 | 10.2 | 161.5 | |
| | | Cobalt | 4.3 | 2.2 | 64.6 | |
| | | Copper | 65.3 | 24.9 | 89.6 | |
| | | Iron | 35,600 | 14,100 | 86.5 | |
| | | Lead | 57.4 | 88.5 | 42.6 | |
| | | Manganese | 317 | 124 | 87.5 | |
| | | Mercury | 0.04 | 0.06 | 40.0 | |
| | | Nickel | 18.9 | 5.4 | 111.1 | |
| | | Zinc | 181 | 99.3 | 58.3 | |
| | WHF-2A-18-SL-23 | Aluminum | 13,200 | 4,970 | 90.6 | ≤ 35 |
| | | arsenic | 1.0 | 1.6 | 46.2 | |
| | | Calcium | 786 | 555 | 34.4 | |
| | | Chromium | 33.9 | 23.4 | 36.6 | |
| | | Copper | 236 | 68.6 | 109.9 | |
| | | Iron | 12,900 | 23,500 | 58.2 | |
| | | Magnesium | 455 | 267 | 52.1 | |
| | | Mercury | 0.25 | 0.07 | 112.5 | |
| | | Zinc | 631 | 210 | 100.1 | |
| 22506 and 22507 | WHF-2A-18-SL-31 | Aluminum | 7,100 | 13,500 | 62 | ≤ 35 |
| | | Cadmium | 3.3 | 15.6 | 130 | |
| | | Chromium | 23.2 | 43.8 | 61 | |
| | | Copper | 192 | 314 | 48 | |
| | | Nickel | 11.4 | 19.7 | 53 | |
| | | Zinc | 326 | 779 | 82 | |

See notes at end of table.

## Table D-4 (Continued)
## Precision - Surface Soil Sampling
## RPDs for Field Duplicate and MS/MSD Samples with Positive Detections

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Compound | Sample Concentration (µg/kg) | Duplicate Concentration (µg/kg) | RPD | Control Limits |
|---|---|---|---|---|---|---|
| **Field Duplicate Samples**–continued | | | | | | |
| 22506 and 22507 | WHF-2A-18-SL-37 | Cadmium | .84 | 1.4 | 50 | ≤ 35 |
| | | Cobalt | 0.95 | 0.55 | 53 | |
| | | Magnesium | 119 | 69.4 | 53 | |
| **Organics** | | | | | | |
| Field Duplicates | | | | | | |
| 22925 | 10-SS-03-02 and 10-SS-03-02A | Acetone | 280 | 190 | 38 | 35 |
| | | Carbon Disulfide | 3 | 2 | 40 | 35 |
| | | 2-Butanone | 62 | 40 | 43 | 35 |
| | | Toluene | 1 | ND | NC | 35 |
| | | Ethylbenzene | 4 | 2 | 67 | 35 |
| | | Xylene | 5 | 3 | 50 | 35 |
| | | Acenaphthene | 47 | ND | NC | 35 |
| | | Fluorene | 55 | ND | NC | 35 |
| | | Fluoranthene | 70 | 46 | 41 | 35 |
| | | Pyrene | ND | 51 | NC | 35 |
| 22927 | 13-SS-05-03 and 13-SS-05-03A | Methylene Chloride | 41 | 26 | 45 | 35 |
| | | 2-Hexane | ND | 19 | NC | 35 |
| | | Toluene | ND | 10 | NC | 35 |
| | | Xylene | ND | 12 | NC | 35 |
| | | Naphthalene | 510 | 140 | 114 | 35 |
| | | bis(2-Ethylhexyl)phthalate | 410 | ND | NC | 35 |
| 22898 | 16-SS-04-03 and 16-SS-04-03A | Methylene Chloride | 150 | 46 | 106 | 35 |
| | | Carbon Disulfide | 13 | 9 | 36.5 | 35 |
| | | Ethylbenzene | 2 | ND | NC | 35 |
| MS/MSD Pairs | | | | | | |
| 22925 | 10-SS-03-02 | 1,2,4-Trichlorobenzene | 965 | 737 | 27 | 23 |
| | | Acenaphthene | 903 | 720 | 25 | 19 |
| | | Heptachlor | 13 | 8.95 | 36 | 31 |
| 22898 | 16-SS-04-03 | Pentachlorophenol | 1166 | 690 | 49 | 47 |

Notes: SDG = Sample Delivery Group.
ND = non detect.
NC = not calculable.
NEC = No Established Criteria.
ug/kg = micro grams per kilo grams.
RPD = Relative Percent Difference.

## Table D-5
## Precision - Subsurface Soil Sampling
## RPDs for Field Duplicate and MS/MSD Samples with Positive Detections

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Analyte Type | Original Concentration | Duplicate Concentration | %RPD | QC Limits %RPD) |
|---|---|---|---|---|---|---|
| 34597 | 6SB3/03/Dup | Chromium | 65.01 | 42.73 | 41.4 | 35 |
| | | Lead | 252.34 | 99.76 | 86.7 | 35 |
| 34909 | 3SB6/70-72 | Aluminum | 213.83 | 850.85 | 119.7 | 43.2 |
| | | Iron | 245.16 | 566.36 | 79.2 | 35 |

## Table D-6
## Accuracy - Surface Soil Sampling
## Percent Recoveries for MS/MSD Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | MS/MSD Sample | Analyte | % Recovery MS/MSD* | Control Limits |
|---|---|---|---|---|
| **VOCs, SVOCs, Pesticides/PCBs** | | | | |
| 22488 | WHF-2A-18-SL-01 | 1,2,4-Trichlorobenzene | 136/110 | 38-107 |
| | | 4-Chloro-3-methylphenol | 106/100 | 26-103 |
| | | 2,4-Dinitrotoluene | 90/87 | 28-89 |
| 22505, | WHF-2A-18-SL-23 | Phenol | 124/62 | 26-90 |
| 22489 | | 2-Chlorophenol | 144/70 | 25-102 |
| 22516 | | N-Nitroso-di-n-propylamine | 171/149 | 41-126 |
| 22520 | | 1,2,4-Trichlorobenzene | 109/0 | 38-107 |
| | | 4-Chloro-3-methylphenol | 0/0 | 26-103 |
| | | Acenaphthene | 0/86 | 31-137 |
| | | 4-Nitrophenol | 393/0 | 11-114 |
| | | 2,4-Dinitrotoluene | 0/0 | 28-89 |
| | | Pentachlorophenol | 0/0 | 17-109 |
| | | Pyrene | 46/30 | 35-142 |
| 22514 | WHF-2A-17-SL-11 | Phenol | 86/96 | 26-90 |
| 22516 | | N-nitroso-di-n-propylamine | 200/207 | 41-126 |
| 22520 | | | | |
| **TAL Metals and Cyanide**[1] | | | | |
| 22457 | WHF-2A-01-SL-03 | Antimony | 33.1 | 75-125 |
| | | Chromium | 15.9 | |
| | | Lead | 74.8 | |
| 22526 | WHF-2A-11-SL-01 | Antimony | 51.3 | 75-125 |
| | | Selenium | 56.5 | |
| 22481 | WHF-2A-18-SL-01 | Antimony | 74.7 | 75-125 |
| | | Cadmium | 166.5 | |
| | | Chromium | 126.8 | |
| | | Zinc | 219.7 | |
| 22481 and 22495 | WHF-2A-18-SL-10 | Copper | 33.7 | 75-125 |
| | | Manganese | 20.5 | |
| | | Zinc | 66.3 | |
| 22481 and 22495 | WHF-2A-18-SL-23 | Antimony | 74.3 | 75-125 |
| | | Arsenic | 73.0 | |
| 22488 | WHF-2A-18-SL-03 | Antimony | 33.1 | 75-125 |
| | | Chromium | 15.9 | |
| | | Lead | 14.8 | |
| 22495 and 22507 | SUR/SL-RB-05 | Iron | 72.8 | 75-125 |
| | | Barium | 73.6 | |
| | | Lead | 168.9 | |
| 22505 | WHF-2A-18-SL-31 | Copper | 65 | 75-125 |
| | | Manganese | 58 | |
| 22516 | WHF-2A-18-SL-21(TCLP) | Mercury | 191 | 75-125 |
| 22514 | WHF-2A-17-SL-11 | Cadmium | 125.7 | 75-125 |
| | | Chromium | 164.7 | |
| | | Copper | 265.2 | |
| | | Manganese | 347.6 | |
| | | Zinc | 142.4 | |

See notes at end of table.

## Table D-6 (Continued)
## Accuracy - Surface Soil Sampling
## Percent Recoveries for MS/MSD Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | MS/MSD Sample | Analyte | % Recovery MS/MSD* | Control Limits |
|---|---|---|---|---|
| | WHF-2A-17-SL-21 | Antimony | 55.6 | 75-125 |
| | | Cadmium | 204.3 | |
| | | Chromium | 64.4 | |
| | | Copper | 154.8 | |
| | | Selenium | 38.5 | |
| | | Zinc | 71.6 | |
| | WHF-2A-17-SL-22 | Antimony | 47.4 | 75-125 |
| | | Arsenic | 68.6 | |
| | | Selenium | 33.9 | |
| | WHF-2A-17-SL-21(TCLP) | Mercury | 190.8 | 75-125 |
| 22528 | WHF-2A-31-SL-22 | Lead | 61.2 | 75-125 |

[1] Matrix spike duplicate analysis are generally not performed for inorganic analysis and therefore, only the % Recovery for the matrix spike is reported.

## Table D-7
## Accuracy - Surface Soil Sampling
## Surrogate Recoveries Out-Side QC Criteria

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Spiked Analyte | Surrogate Recovery | QC Limits |
|---|---|---|---|---|
| 22488 | 18-SL-15<br>18-SL-16 | S1/S2/S3 | Diluted Out | -- |
| 22489 | 18-SL-23 | S1/S2/S3 | Diluted Out | -- |
| 22514 | 17-SL-13R<br>17-SL-14R | S1/S2/S3 | 131/123/-<br>136/66/- | 81-117/74-<br>121/70-121 |
| 22520 | 17-SL-16R<br>17-SL-29R | S1/S2/S3 | 131/72/-<br>122/-/- | 81-117/74-<br>121/70-121 |
| 22526 | 11-SL-02<br>11-SL-02RE | S1/S2/S3<br>S1/S2/S3<br>DBC | 121/-/-<br>131/-/-<br>0 | 81-117/74-<br>121/70-121 |

Notes: S1 = Toluene-d8.
S2 = Bromofluorobenzene.
S3 = 1, 2-Dichloroethene-d4.
DBC = Dibutylchlorendate.

## Table D-8
## Accuracy - Subsurface Soil Sampling (Test Pits)
## Percent Recoveries for MS/MSD Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | MS/MSD Sample | Analyte | % Recovery MS/MSD[1] | Control Limits |
|---|---|---|---|---|
| **VOCs, SVOCs, Pesticides/PCBs** | | | | |
| 22925 | 10-SS-03-02 | 1,2,4-Trichlorobenzene | [1]46/35 | 38-107 |
| | | Acenaphthene | 41/32 | 31-137 |
| | | Heptachlor | 62/43 | 35-130 |
| 22898 | 16-SS-04-03 | Pentachlorophenol | 38/23 | 17-109 |
| **TAL Metals and Cyanide[1]** | | | | |
| 22925 | 10-SS-03-02 | Antimony | 63.7 | 75-125 |
| | | Selenium | 69.9 | 75-125 |
| 22898 | 16-SS-04-03 | Antimony | 34.5 | 75-125 |
| | | Arsenic | 68.4 | 75-125 |
| | | Chromium | 64.9 | 75-125 |
| | | Zinc | 61.0 | 75-125 |
| | | Selenium | 0.0 | 75-125 |
| | | Cyanide | 26.6 | 75-125 |

[1] Matrix spike duplicates are generally not performed for inorganic analysis and therefore, only the % Recovery for the matrix spike is reported.

Notes: Pesticides and PCB analytes were not detected in the blanks.
All data, based on initial and continuing calibrations, are acceptable for use in site characterization and risk assessment.

SDG = sample delivery group.
MS/MSD = matrix spike/matrix spike duplicates.
VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PCBs = polychlorinated biphenyls.
TAL = target analyte list.

## Table D-9
## Accuracy - Subsurface Soil Sampling (Test Pits)
## Surrogate Recoveries Out-Side QC Criteria

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Spiked Analyte | Surrogate Recovery (TCX/DBC) | QC Limits |
|---|---|---|---|---|
| 22897 | 16SS0302 | TCX/DBC | 108/59 | 60-150 |
| 22910 | 16SS0604 | TCX/DBC | 58/- | 60-150 |
| 22935 | 11SS0101 | TCX/DBC | -/151 | 60-150 |

Notes: TCX= Tetrachloro-m-xylene.
DBC= Dibutylchlorendate.
S1 = Toluene-d8.
S2 = Bromofluorobenzene.
S3 = 1, 2-Dichloroethene-d4.

## Table D-10
## Accuracy - Subsurface Soil Sampling (Soil Borings)
## Percent Recoveries for MS/MSD Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Analyte Type | %REC (MS/MSD) | QC Limits (%REC) |
|---|---|---|---|---|
| TCL VOCs | | | | |
| 34576 | 33SB2(35-37) | 2,4-Dinitrotoluene | 80/112 | 28-89 |
| 34824 | 29SB01(0-2) | 4-Nitrophenol | 120/122 | 11-114 |
| | | 2,4-Dinitrotoluene | 90/83 | 28-89 |
| | | Pentachlorophenol | 131/115 | 17-109 |
| TAL Metals and Cyanide | | | | |
| 34553 | 33SB2(35-37) | Lead | 61.5 | 75-125 |
| 34597 | 6SB3/0-3/Dup | Chromium | 129.9 | 75-125 |
| | | Selenium | 59.7 | 75-125 |
| | | Lead | | |
| 34847 | 32SB6/5-7 | Arsenic | 47.2 | 75-125 |
| | | Selenium | 48.2 | 75-125 |
| 34846 | 32SB6/5-7 | Arsenic | 47.2 | 75-125 |
| | | Selenium | 48.2 | 75-125 |
| 34926 | 17SB5/5-7 | Selenium | 70/78.1 | 75-125 |
| | | Thallium | 62/64 | 75-125 |
| 34909 | 3SB6/70-72 | Aluminum | 86.9 | 75-125 |
| | | Iron | 43.5 | 75-125 |

## Table D-11
## Accuracy - Subsurface Soil Sampling Soil Borings
## Surrogate Recoveries Out-Side QC Criteria

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Surrogate Analyte | %Recovery Observed | QC Limits % Recovery |
|---|---|---|---|---|
| 34553 | 33SB3(15-17) | DCB | 40 | 60-150 |
| | 33SSB3(4-6) | DCB | 37 | 60-150 |
| | PBLKS12-01 | DCB | 43 | 60-150 |
| | PBLKW12-05 | DCB | 43 | 60-150 |
| | 33SBFB01 | DCB | 37 | 60-150 |
| | 33SBRB01 | DCB | 20 | 60-150 |
| | 33SB2(10-12) | DCB | 19 | 60-150 |
| | 33SB2(15-17) | DCB | 28 | 60-150 |
| | 33SB2(2-4) | DCB | 40 | 60-150 |
| | 33SB2(2-4)D2 | DCB | 42 | 60-150 |
| | 33SB1(5-7) | DCB/TCX | 16/58 | 60-150 |
| | 33SB3(10-12) | DCB | 38 | 60-150 |
| 34576 | 33SBRB03 | DCB | 20 | 60-150 |
| | 33SB01(3-5) | DCB | 44 | 60-150 |
| | 33SB01(10-12) | DCB | 43 | 60-150 |
| | 33SB01(25-27) | DCB | 44 | 60-150 |
| | 33SB02(60-62) | DCB | 42 | 60-150 |
| | 33SB02(80-82) | DCB | 39 | 60-150 |
| | 33SB02(95-97) | DCB | 47 | 60-150 |
| | 22SB02(120-122) | DCB | N.A. | 60-150 |
| 34566 | 33SBRB02 | DCB | 24 | 60-150 |
| | 33SB4(3-5) | DCB | 50 | 60-150 |
| | 33SB4(5-7) | DCB | 50 | 60-150 |
| | 33SB4(15-17) | DCB | 50 | 60-150 |
| 34578 | 33SB2(35-37) | DCB | 60 | 60-150 |
| | 33SB2(35-37) | DCB | 62 | 60-150 |
| 34824 | 9SB1(0-2) | DCB | 42 | 60-150 |
| | 29SB1(0-2)A | DCB | 42 | 60-150 |
| | 29SB1(0-2)MS | DCB | 41 | 60-150 |
| | 29SB1(0-2)MSD | DCB | 42 | 60-150 |
| | 29SSB1(0-2)DC | DCB | 48 | 60-150 |
| 34617 | 30SB1(120-122) | DCB | 48 | 60-150 |
| | 30SBRB08 | DCB | 29 | 60-150 |
| 34587 | 6SB1(5-7) | DCB | 42 | 60-150 |
| | 6SB1(15-17) | DCB | 43 | 60-150 |
| | 6SB1(20-22) | DCB | 43 | 60-150 |
| | 6SB1(0-2) | DCB | 41 | 60-150 |
| | 6SB2(15-17) | DCB | 42 | 60-150 |
| | 6SB2(20-22) | DCB | 42 | 60-150 |
| | 6SB4(5-7) | DCB | 42 | 60-150 |
| | 6SB4(10-12) | DCB | 37 | 66-150 |
| | 6SB4(20-22) | DCB | 44 | 60-150 |
| | 6SB4(0-2) | DCB | 36 | 60-150 |

See notes at end of table.

## Table D-11 (Continued)
## Accuracy - Subsurface Soil Sampling Soil Borings
## Surrogate Recoveries Out-Side QC Criteria

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Surrogate Analyte | %Recovery Observed | QC Limits % Recovery |
|---|---|---|---|---|
| 34807 | 30SB6(0-2) | DCB/TCX | 41/56 | 60-150 |
| | 18SB6(5-7) | DCB/TCX | 40/56 | 60-150 |
| | 18SB6(10-12)A | DCB | 35 | 60-150 |
| | 18SB6(15-17) | DCB | 45 | 60-150 |
| | 18SB6(20-22) | DCB | 47 | 60-150 |
| | 18SB7(5-7) | DCB | 44 | 60-150 |
| | 18SB7(17-17) | DCB | 45 | 60-150 |
| | 30SB4(10-12) | DCB | 44 | 60-150 |
| | 30SB4(15-17) | DCB | 44 | 60-150 |
| | 18SB1(5-7) | DCB | 44 | 60-150 |
| 34815 | 18SB4(5-7) | DCB | 54 | 60-150 |
| | 18SB4(10-12) | DCB | 43 | 60-150 |
| | 18SB4(15-17) | DCB | 42 | 60-150 |
| | 18SB4(25-27) | DCB/TCX | 52/49 | 60-150 |
| | 18SB4(40-42) | DCB | 47/48 | 60-150 |
| 34815 | 29SB2(12-14) | DCB | 48 | 60-150 |
| | 29SB4(0-2) | DCB | 37 | 60-150 |
| | 29SB4(5-7) | DCB | 44 | 60-150 |
| | 29SB4(15-17) | DCB | 49 | 60-150 |
| | 29SB5(0-2) | DCB | 39 | 60-150 |
| | 18SB4(35-37) | DCB | 52 | 60-150 |
| | 29SB5(5-7) | DCB | 49 | 60-150 |
| | 29SB5(10-12) | DCB | 50 | 60-150 |
| | 29SB5(15-17) | DCB | 49 | 60-150 |
| 34815 | 17SB9(5-7) | DCB | 47 | 60-150 |
| | 17SB9(10-12) | DCB | 47 | 60-150 |
| | 29SB3(0-2) | DCB | 45 | 60-150 |
| | 29SB3(10-12) | DCB | 53 | 60-150 |
| | 29SB2(10-12) | DCB | 55 | 60-150 |
| 34799 | 18SB10(5-7) | DCB | 53 | 60-150 |
| | 18SB8(10-12) | DCB | 52 | 60-150 |
| | 18SB8(15-17) | DCB | 53 | 60-150 |
| | 30SB03(0-2) | DCB | 53 | 60-150 |
| | 30SB03(10-12) | DCB | 25 | 60-150 |
| | 30SB02(0-2) | DCB | 53 | 60-150 |
| | 30SB02(10-17) | DCB | 40 | 60-150 |
| | 30SB02(20-22) | DCB | 29 | 60-150 |
| | 30SB04(0-2) | DCB | 47 | 60-150 |
| | 30SB04(5-7) | DCB | 45 | 60-150 |
| 34595 | 6SB3(117-119) | DCB | 50 | 60-150 |
| | 6SB3(10-12) | DCB | 50 | 60-150 |
| | 6SB3(15-17) | DCB | 49 | 60-150 |
| | 6SB3(5-7) | DCB | 56 | 60-150 |
| | 6SB3(60-62) | DCB | 45 | 60-150 |
| | 6SB3(25-27) | DCB | 46 | 60-150 |

See notes at end of table.

## Table D-11 (Continued)
## Accuracy - Subsurface Soil Sampling Soil Borings
## Surrogate Recoveries Out-Side QC Criteria

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| SDG Number | Sample ID | Surrogate Analyte | %Recovery Observed | QC Limits % Recovery |
|---|---|---|---|---|
| 34848 | 3SB3(30-32) | DCB | 59 | 60-150 |
| | 3SB3(10-12) | DCB | None | 60-150 |
| | 3SB3(5-7) | DCB | 59 | 60-150 |
| | 3SB3(0-2) | DCB | 58 | 60-150 |
| | 3SB4(10-12) | DCB | None | 60-150 |
| | 3SB4(5-7) | DCB | None | 60-150 |
| | 3SB4(0-2) | DCB | 59 | 60-150 |
| | 32SB4(0-2) | DCB | None | 60-150 |
| | 32SB4(15-17) | DCB | None | 60-150 |
| | 32SB4(20-22) | DCB | 59 | 60-150 |
| | 32SB4(25-27) | DCB | 58 | 60-150 |
| | 32SB4(35-37) | DCB | 53 | 60-150 |
| | 32SB4(35-37)A | DCB | 58 | 60-150 |
| 34847 | All | DCB | 45-51 | 60-150 |
| 34833 | All | DCB | 40-56 | 60-150 |
| 34846 | All | DCB | 26-52 | 60-150 |
| 34823 | All | DCB | 40-47 | 60-150 |
| 34836 | All | DCB | 25-59 | 60-150 |
| 34906 | All Samples | DCB | 9-54 | 60-150 |
| 34925 | All Samples | DCB/TCX | 23-56/50-59 | 60-150 |
| 34926 | All Samples | DCB/TCX | 43-52/48-52 | 60-150 |
| 34909 | All samples | DCB | 41-48 | 60-150 |

Notes: Inorg = Inorganic Analytes.
QC = Quality Control.
N.A. = Not Available.
Org = Organic Analytes.
CCJM = C.C. Johnson and J. Malhotra.
TCX = Tetrachloro-m-xylene.
DCB = Decachlorobiphenyl.

## Table D-12
## Schedule of Field Quality Control Samples
## Surface Soil Sampling Program

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Sampling Date | Site | Total Number of Samples | TB | RB | FB | FD | MS/MSD |
|---|---|---|---|---|---|---|---|
| 08/10/92 | Background | 9 | None | None | None | 1 | None |
| 08/11/92 | 1, 10, 14, 15 and 16 | 19 | 1 | 1 | 1 | 1 | 1 |
| 08/12 - 8/14/92 | 18 | 47 | 3 | 4 | None | 3 | 4 |
| 08/15 - 8/16/92 | 17 | 34 | 3 | 2 | None | 3 | 3 |
| 08/17/92 | 31 | 13 | 1 | None | None | 1 | 1 |
| 08/18/92 | 11 and 13 | 21 | 1 | 1 | None | 2 | 1 |
| 08/19/92 | 17 | [1]1 | 1 | 1 | 1 | 2 | 2 |
| Total Number of Samples | | 143 | 10 | 9 | 2 | 12 | 12 |

[1] Sampled only for Pesticides and PCBs.

Notes: TB = Trip Blank.
RB = Rinsate Blank.
FB = Field Blank.
FD = Field Duplicate.
MS = Matrix Spike.
MSD = Matrix Spike Duplicate.

**Table D-13**
**Schedule of Field Quality Control Samples**
**Subsurface Soil Sampling Program (Test Pits)**

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Sampling Date | Site | Total Number of Samples | TB | RB | FB | FD | MS/MSD |
|---|---|---|---|---|---|---|---|
| 10/02/92 | 15 | 1 | * | - | 1 | - | - |
| 10/03/92 | 15 | 2 | 1 | 1 | - | - | - |
| 10/04/92 | 15 and 16 | 4 | 1 | 2 | - | - | - |
| 10/05/92 | 16 | 3 | * | - | - | 1 | 1 |
| 10/06/92 | 13 and 16 | 3 | 3 | 3 | - | 1 | - |
| 10/07/92 | 10 | 4 | * | - | | 1 | 1 |
| 10/08/92 | 1, 11, and 14 | 5 | 1 | 1 | - | - | 1 |
| Total Number of Samples | | 22 | 6 | 7 | 1 | 3 | 3 |

[1] Trip Blanks Not Supplied with Samples.

Notes: FB = Field Blank. TB = Trip Blank.
RB = Rinsate Blank. MS = Matrix Spike.
FD = Field Duplicate. MSD = Matrix Spike Duplicate.

## Table D-14
## Schedule of Field Quality Control Samples
## Subsurface Soil Sampling Program (Soil Borings)

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Sampling Date | Site | Total No. of Samples | TB | RB | FB | FD | MS/MSD |
|---|---|---|---|---|---|---|---|
| 12/1/92 - 12/8/92 | 6, 30, and 33 | 46 | 8 | 8 | 1 | 4 | 2 |
| 1/4/93 - 1/12/93 | 3, 17, 18, 29, 30, and 32 | 110 | 8 | 4 | - | 12 | 9 |
| 1/18/93 - 1/27/93 (*) | 3, 17, and 32 | 34 | 5 | 3 | - | 5 | 3 |
| **Total Number of Samples** | | 190 | 21 | 15 | 1 | 21 | 14 |

Notes: RB = Rinsate Blank.
TB = Trip Blank.
FB = Field Blank.
FD = Field Duplicate.
MS/MSD = Matrix Spike/Matrix Duplicate.
(*) = samples for VOCs were collected only for 5 days.

# Table D-15

## Analytical Results of Trip, Rinsate, Field, and Method Blanks - Positive Detections - Surface Soil Samples

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:17:55
TRIP BLANKS - CLP VOCS

| Lab Sample Number: | 22516005 | | | | 22462009 | | | | 22488007 | | | | 22506001 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 17-SURSL-TB7 | | | | SUR_SL-TB-02 | | | | SUR_SL-TB-03 | | | | SUR_SL-TB-04 | | | |
| Collect Date: | 16-AUG-92 | | | | 12-AUG-92 | | | | 13-AUG-92 | | | | 14-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 8 | | ug/l | 5 | 2 | J | ug/l | 5 | 2 | J | ug/l | 5 | 2 | J | ug/l | 5 |
| Acetone | 5 | J | ug/l | 10 | - | U | ug/l | 10 | 4 | J | ug/l | 10 | 7 | J | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:17:55
TRIP BLANKS - CLP VOCS

| Lab Sample Number: | 22505011 | | | | 22514009 | | | | 22515010 | | | | 22527001 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR_SL-TB-05 | | | | SUR_SL-TB-06 | | | | SUR_SL-TB-07 | | | | SUR_SL-TB-08 | | | |
| Collect Date: | 15-AUG-92 | | | | 16-AUG-92 | | | | 17-AUG-92 | | | | 18-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 5 | - | UJ | ug/l | 5 | 8 | | ug/l | 5 | 7 | | ug/l | 5 |
| Acetone | 5 | J | ug/l | 10 | 8 | J | ug/l | 10 | 5 | J | ug/l | 10 | 6 | J | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:17:55
TRIP BLANKS - CLP VOCS

| Lab Sample Number: | 22454010 | | | | 33711K07 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | SUR_SL-TB01 | | | | SL_TB-09 | | | |
| Collect Date: | 11-AUG-92 | | | | 19-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 5 | - | UJ | ug/l | 5 |
| Acetone | 10 | J | ug/l | 10 | - | UJ | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | W22454001 | | | | 22462006 | | | | 22462007 | | | | 22507004 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR/SL-RB-01 | | | | SUR/SL-RB-02 | | | | SUR/SL-RB-03 | | | | SUR/SL-RB-05 | | | |
| Collect Date: | 11-AUG-92 | | | | 12-AUG-92 | | | | 12-AUG-92 | | | | 14-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | U | ug/l | 200 | 23.2 | J | ug/l | 200 | 27.7 | J | ug/l | 200 |
| Arsenic | - | U | ug/l | 10 | 1.4 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | .68 | J | ug/l | 200 | - | U | ug/l | 200 | .8 | J | ug/l | 200 | 1 | J | ug/l | 200 |
| Calcium | 2240 | J | ug/l | 5000 | 310 | J | ug/l | 5000 | 225 | J | ug/l | 5000 | 248 | J | ug/l | 5000 |
| Chromium | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 2.8 | J | ug/l | 10 |
| Cobalt | 1.9 | J | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | 4.4 | J | ug/l | 50 |
| Copper | 2.2 | J | ug/l | 25 | 1.9 | J | ug/l | 25 | 5.9 | J | ug/l | 25 | 4.2 | J | ug/l | 25 |
| Iron | 37 | J | ug/l | 100 | 24.2 | J | ug/l | 100 | 24.4 | J | ug/l | 100 | 69.8 | J | ug/l | 100 |
| Lead | - | U | ug/l | 5 | - | U | ug/l | 5 | 2.7 | J | ug/l | 5 | 2.8 | J | ug/l | 5 |
| Manganese | 2.4 | J | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 |
| Mercury | - | U | ug/l | .2 | - | U | ug/l | .2 | - | U | ug/l | .2 | - | UJ | ug/l | .2 |
| Nickel | - | U | ug/l | 40 | - | U | ug/l | 40 | - | U | ug/l | 40 | 15.1 | J | ug/l | 40 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Silver | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 2.3 | J | ug/l | 10 |
| Sodium | 727 | J | ug/l | 5000 | 726 | J | ug/l | 5000 | 736 | J | ug/l | 5000 | 608 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Vanadium | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | 2.2 | J | ug/l | 50 |
| Zinc | 29.3 | J | ug/l | 20 | - | U | ug/l | 20 | 71.7 | | ug/l | 20 | 94 | | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | | | | - | | | | - | | | | - | | | |
| Acetone | - | | | | - | | | | - | | | | - | | | |
| Carbon disulfide | - | | | | - | | | | - | | | | - | | | |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | | - | | | | - | | | | - | | | |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | 22514010 | | | | 22514016 | | | | 22527012 | | | | 22562007 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR/SL-RB-06 | | | | SUR/SL-RB-07 | | | | SUR/SL-RB-08 | | | | SUR/SL-RB09 | | | |
| Collect Date: | 16-AUG-92 | | | | 16-AUG-92 | | | | 18-AUG-92 | | | | 19-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | 28 | J | ug/l | 200 | 27.2 | J | ug/l | 200 | - | U | ug/l | 200 | 84.6 | J | ug/l | 200 |
| Arsenic | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | .78 | J | ug/l | 200 | .91 | J | ug/l | 200 | 5 | J | ug/l | 200 | 1.1 | J | ug/l | 200 |
| Calcium | 198 | J | ug/l | 5000 | 206 | J | ug/l | 5000 | 178 | J | ug/l | 5000 | 489 | J | ug/l | 5000 |
| Chromium | - | U | ug/l | 10 | 2 | J | ug/l | 10 | 3.4 | J | ug/l | 10 | - | U | ug/l | 10 |
| Cobalt | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 |
| Copper | - | U | ug/l | 25 | - | U | ug/l | 25 | - | U | ug/l | 25 | - | U | ug/l | 25 |
| Iron | 21.6 | J | ug/l | 100 | 20.4 | J | ug/l | 100 | 40.7 | J | ug/l | 100 | 20 | J | ug/l | 100 |
| Lead | 2.2 | J | ug/l | 5 | 7.2 | | ug/l | 5 | 2.6 | J | ug/l | 5 | 1.9 | J | ug/l | 5 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 | 1.8 | J | ug/l | 15 |
| Mercury | - | U | ug/l | .2 | .1 | J | ug/l | .2 | .18 | J | ug/l | .2 | - | UJ | ug/l | .2 |
| Nickel | - | U | ug/l | 40 | - | U | ug/l | 40 | - | U | ug/l | 40 | - | U | ug/l | 40 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | 2.6 | J | ug/l | 5 | - | U | ug/l | 5 |
| Silver | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 1.7 | J | ug/l | 10 |
| Sodium | 837 | J | ug/l | 5000 | 739 | J | ug/l | 5000 | 574 | J | ug/l | 5000 | 1040 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 | 1.7 | J | ug/l | 10 | - | U | ug/l | 10 |
| Vanadium | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 |
| Zinc | - | U | ug/l | 20 | - | U | ug/l | 20 | - | U | ug/l | 20 | 11 | J | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | | | | - | | | | - | | | | - | | | |
| Acetone | - | | | | - | | | | - | | | | - | | | |
| Carbon disulfide | - | | | | - | | | | - | | | | - | | | |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | | - | | | | - | | | | - | | | |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | W22454001 | | | | 22454001 | | | | 22462006 | | | | 22462006 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR/SL-RB-01 | | | | SUR_SL-RB-01 | | | | SUR/SL-RB-02 | | | | SUR_SL-RB-02 | | | |
| Collect Date: | 11-AUG-92 | | | | 11-AUG-92 | | | | 12-AUG-92 | | | | 12-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | | | | - | U | ug/l | 200 | - | | | |
| Arsenic | - | U | ug/l | 10 | - | | | | 1.4 | J | ug/l | 10 | - | | | |
| Barium | .68 | J | ug/l | 200 | - | | | | - | U | ug/l | 200 | - | | | |
| Calcium | 2240 | J | ug/l | 5000 | - | | | | 310 | J | ug/l | 5000 | - | | | |
| Chromium | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 | - | | | |
| Cobalt | 1.9 | J | ug/l | 50 | - | | | | - | U | ug/l | 50 | - | | | |
| Copper | 2.2 | J | ug/l | 25 | - | | | | 1.9 | J | ug/l | 25 | - | | | |
| Iron | 37 | J | ug/l | 100 | - | | | | 24.2 | J | ug/l | 100 | - | | | |
| Lead | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 | - | | | |
| Manganese | 2.4 | J | ug/l | 15 | - | | | | - | U | ug/l | 15 | - | | | |
| Mercury | - | U | ug/l | .2 | - | | | | - | U | ug/l | .2 | - | | | |
| Nickel | - | U | ug/l | 40 | - | | | | - | U | ug/l | 40 | - | | | |
| Selenium | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 | - | | | |
| Silver | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 | - | | | |
| Sodium | 727 | J | ug/l | 5000 | - | | | | 726 | J | ug/l | 5000 | - | | | |
| Thallium | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 | - | | | |
| Vanadium | - | U | ug/l | 50 | - | | | | - | U | ug/l | 50 | - | | | |
| Zinc | 29.3 | J | ug/l | 20 | - | | | | - | U | ug/l | 20 | - | | | |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | | | | - | UJ | ug/l | 5 | - | | | | 2 | J | ug/l | 5 |
| Acetone | - | | | | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Carbon disulfide | - | | | | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | | 12 | | ug/l | 10 | - | | | | 9 | J | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | 22495013 | | | | 22507004 | | | | 22507004 | | | | 22507004 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR_SL-RB-04 | | | | SUR/SL-RB-05 | | | | SUR_SL-RB-05 | | | | SUR/SL-RB-05 | | | |
| Collect Date: | 13-AUG-92 | | | | 14-AUG-92 | | | | 14-AUG-92 | | | | 14-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | 56.4 | J | ug/l | 200 | 27.7 | J | ug/l | 200 | - | | | | 27.7 | J | ug/l | 200 |
| Arsenic | - | U | ug/l | 10 | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Barium | 1 | J | ug/l | 200 | 1 | J | ug/l | 200 | - | | | | 1 | J | ug/l | 200 |
| Calcium | 199 | J | ug/l | 5000 | 248 | J | ug/l | 5000 | - | | | | 248 | J | ug/l | 5000 |
| Chromium | - | U | ug/l | 10 | 2.8 | J | ug/l | 10 | - | | | | 2.8 | J | ug/l | 10 |
| Cobalt | - | U | ug/l | 50 | 4.4 | J | ug/l | 50 | - | | | | 4.4 | J | ug/l | 50 |
| Copper | 2.3 | J | ug/l | 25 | 4.2 | J | ug/l | 25 | - | | | | 4.2 | J | ug/l | 25 |
| Iron | 36.7 | J | ug/l | 100 | 69.8 | J | ug/l | 100 | - | | | | 69.8 | J | ug/l | 100 |
| Lead | - | U | ug/l | 5 | 2.8 | J | ug/l | 5 | - | | | | 2.8 | J | ug/l | 5 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 | - | | | | - | U | ug/l | 15 |
| Mercury | - | U | ug/l | .2 | - | UJ | ug/l | .2 | - | | | | - | UJ | ug/l | .2 |
| Nickel | - | U | ug/l | 40 | 15.1 | J | ug/l | 40 | - | | | | 15.1 | J | ug/l | 40 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 |
| Silver | - | U | ug/l | 10 | 2.3 | J | ug/l | 10 | - | | | | 2.3 | J | ug/l | 10 |
| Sodium | 646 | J | ug/l | 5000 | 608 | J | ug/l | 5000 | - | | | | 608 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Vanadium | - | U | ug/l | 50 | 2.2 | J | ug/l | 50 | - | | | | 2.2 | J | ug/l | 50 |
| Zinc | 68.2 | | ug/l | 20 | 94 | | ug/l | 20 | - | | | | 94 | | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 4 | J | ug/l | 5 | - | | | | - | UJ | ug/l | 5 | - | | | |
| Acetone | 6 | J | ug/l | 10 | - | | | | - | U | ug/l | 10 | - | | | |
| Carbon disulfide | 18 | | ug/l | 5 | - | | | | - | U | ug/l | 5 | - | | | |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 13 | | ug/l | 10 | - | | | | 14 | | ug/l | 10 | - | | | |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | 22507004 | | | | 22514010 | | | | 22514010 | | | | 22514016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR_SL-RB-05 | | | | SUR/SL-RB-06 | | | | SUR_SL-RB-06 | | | | SUR/SL-RB-07 | | | |
| Collect Date: | 14-AUG-92 | | | | 16-AUG-92 | | | | 16-AUG-92 | | | | 16-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | | | | 28 | J | ug/l | 200 | - | | | | 27.2 | J | ug/l | 200 |
| Arsenic | - | | | | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Barium | - | | | | .78 | J | ug/l | 200 | - | | | | .91 | J | ug/l | 200 |
| Calcium | - | | | | 198 | J | ug/l | 5000 | - | | | | 206 | J | ug/l | 5000 |
| Chromium | - | | | | - | U | ug/l | 10 | - | | | | 2 | J | ug/l | 10 |
| Cobalt | - | | | | - | U | ug/l | 50 | - | | | | - | U | ug/l | 50 |
| Copper | - | | | | - | U | ug/l | 25 | - | | | | - | U | ug/l | 25 |
| Iron | - | | | | 21.6 | J | ug/l | 100 | - | | | | 20.4 | J | ug/l | 100 |
| Lead | - | | | | 2.2 | J | ug/l | 5 | - | | | | 7.2 | | ug/l | 5 |
| Manganese | - | | | | - | U | ug/l | 15 | - | | | | - | U | ug/l | 15 |
| Mercury | - | | | | - | U | ug/l | .2 | - | | | | .1 | J | ug/l | .2 |
| Nickel | - | | | | - | U | ug/l | 40 | - | | | | - | U | ug/l | 40 |
| Selenium | - | | | | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 |
| Silver | - | | | | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Sodium | - | | | | 837 | J | ug/l | 5000 | - | | | | 739 | J | ug/l | 5000 |
| Thallium | - | | | | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Vanadium | - | | | | - | U | ug/l | 50 | - | | | | - | U | ug/l | 50 |
| Zinc | - | | | | - | U | ug/l | 20 | - | | | | - | U | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 5 | - | | | | - | UJ | ug/l | 5 | - | | | |
| Acetone | - | U | ug/l | 10 | - | | | | - | UJ | ug/l | 10 | - | | | |
| Carbon disulfide | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 | - | | | |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 14 | | ug/l | 10 | - | | | | 12 | | ug/l | 10 | - | | | |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| Lab Sample Number: | 22514016 | | | 22527012 | | | 22527012 | | | 22562007 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | WHITING | | | WHITING | | | WHITING | | |
| Locator | SUR_SL-RB-07 | | | SUR/SL-RB-08 | | | SUR_SL-RB-08 | | | SUR/SL-RB09 | | |
| Collect Date: | 16-AUG-92 | | | 18-AUG-92 | | | 18-AUG-92 | | | 19-AUG-92 | | |
| | VALUE | QUAL UNITS | DL | VALUE | QUAL UNITS | DL | VALUE | QUAL UNITS | DL | VALUE | QUAL UNITS | DL |
| **CLP METALS AND CYANIDE** | | | | | | | | | | | | |
| Aluminum | - | | | - | U ug/l | 200 | - | | | 84.6 | J ug/l | 200 |
| Arsenic | - | | | - | U ug/l | 10 | - | | | - | U ug/l | 10 |
| Barium | - | | | 5 | J ug/l | 200 | - | | | 1.1 | J ug/l | 200 |
| Calcium | - | | | 178 | J ug/l | 5000 | - | | | 489 | J ug/l | 5000 |
| Chromium | - | | | 3.4 | J ug/l | 10 | - | | | - | U ug/l | 10 |
| Cobalt | - | | | - | U ug/l | 50 | - | | | - | U ug/l | 50 |
| Copper | - | | | - | U ug/l | 25 | - | | | - | U ug/l | 25 |
| Iron | - | | | 40.7 | J ug/l | 100 | - | | | 20 | J ug/l | 100 |
| Lead | - | | | 2.6 | J ug/l | 5 | - | | | 1.9 | J ug/l | 5 |
| Manganese | - | | | - | U ug/l | 15 | - | | | 1.8 | J ug/l | 15 |
| Mercury | - | | | .18 | J ug/l | .2 | - | | | - | UJ ug/l | .2 |
| Nickel | - | | | - | U ug/l | 40 | - | | | - | U ug/l | 40 |
| Selenium | - | | | 2.6 | J ug/l | 5 | - | | | - | U ug/l | 5 |
| Silver | - | | | - | U ug/l | 10 | - | | | 1.7 | J ug/l | 10 |
| Sodium | - | | | 574 | J ug/l | 5000 | - | | | 1040 | J ug/l | 5000 |
| Thallium | - | | | 1.7 | J ug/l | 10 | - | | | - | U ug/l | 10 |
| Vanadium | - | | | - | U ug/l | 50 | - | | | - | U ug/l | 50 |
| Zinc | - | | | - | U ug/l | 20 | - | | | 11 | J ug/l | 20 |
| **CLP VOLATILES 90-SOW** | | | | | | | | | | | | |
| Methylene chloride | - | UJ ug/l | 5 | - | | | 7 | ug/l | 5 | - | | |
| Acetone | - | UJ ug/l | 10 | - | | | - | U ug/l | 10 | - | | |
| Carbon disulfide | - | U ug/l | 5 | - | | | - | U ug/l | 5 | - | | |
| **CLP SEMIVOLATILES 90-SOW** | | | | | | | | | | | | |
| Di-n-butylphthalate | 16 | ug/l | 10 | - | | | 11 | ug/l | 10 | - | | |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 17:22:28
RINSATE BLANKS

| | |
|---|---|
| Lab Sample Number: | 22562007 |
| Site | WHITING |
| Locator | SUR_SL-RB09 |
| Collect Date: | 19-AUG-92 |

| | VALUE | QUAL | UNITS | DL |
|---|---|---|---|---|
| **CLP METALS AND CYANIDE** | | | | |
| Aluminum | - | | | |
| Arsenic | - | | | |
| Barium | - | | | |
| Calcium | - | | | |
| Chromium | - | | | |
| Cobalt | - | | | |
| Copper | - | | | |
| Iron | - | | | |
| Lead | - | | | |
| Manganese | - | | | |
| Mercury | - | | | |
| Nickel | - | | | |
| Selenium | - | | | |
| Silver | - | | | |
| Sodium | - | | | |
| Thallium | - | | | |
| Vanadium | - | | | |
| Zinc | - | | | |
| **CLP VOLATILES 90-SOW** | | | | |
| Methylene chloride | - | | | |
| Acetone | - | | | |
| Carbon disulfide | - | | | |
| **CLP SEMIVOLATILES 90-SOW** | | | | |
| Di-n-butylphthalate | 10 | | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 18:02:13
FIELD BLANKS

| Lab Sample Number: | 22462008 | | | | 22562008 | | | | 22462008 | | | | 22462008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SUR/SL-FB-01 | | | | SUR/SL-FB-02 | | | | SUR/SL-FB-01 | | | | SUR_SL-FB-01 | | | |
| Collect Date: | 12-AUG-92 | | | | 19-AUG-92 | | | | 12-AUG-92 | | | | 12-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | 33.4 | J | ug/l | 200 | - | U | ug/l | 200 | - | | | |
| Antimony | - | U | ug/l | 60 | 15 | J | ug/l | 60 | - | U | ug/l | 60 | - | | | |
| Arsenic | 1.5 | J | ug/l | 10 | - | U | ug/l | 10 | 1.5 | J | ug/l | 10 | - | | | |
| Barium | 1.3 | J | ug/l | 200 | 1.1 | J | ug/l | 200 | 1.3 | J | ug/l | 200 | - | | | |
| Calcium | 799 | J | ug/l | 5000 | 325 | J | ug/l | 5000 | 799 | J | ug/l | 5000 | - | | | |
| Copper | 4.9 | J | ug/l | 25 | - | U | ug/l | 25 | 4.9 | J | ug/l | 25 | - | | | |
| Iron | 46.6 | J | ug/l | 100 | 18.3 | J | ug/l | 100 | 46.6 | J | ug/l | 100 | - | | | |
| Lead | 17.7 | J | ug/l | 5 | - | U | ug/l | 5 | 17.7 | J | ug/l | 5 | - | | | |
| Mercury | - | U | ug/l | .2 | .26 | J | ug/l | .2 | - | U | ug/l | .2 | - | | | |
| Silver | - | U | ug/l | 10 | 1.5 | J | ug/l | 10 | - | U | ug/l | 10 | - | | | |
| Sodium | 746 | J | ug/l | 5000 | 759 | J | ug/l | 5000 | 746 | J | ug/l | 5000 | - | | | |
| Zinc | 7.6 | J | ug/l | 20 | 8 | J | ug/l | 20 | 7.6 | J | ug/l | 20 | - | | | |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | | | | - | | | | - | | | | 2 | J | ug/l | 5 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | | - | | | | - | | | | 9 | J | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SURFACE SOILS - FIELD QUALITY CONTROL SAMPLES - ANALYTICAL RESULTS 18:02:13
FIELD BLANKS

| Lab Sample Number: | 22562008 | | | | 22562008 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | SUR/SL-FB-02 | | | | SUR_SL-FB-02 | | | |
| Collect Date: | 19-AUG-92 | | | | 19-AUG-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| **CLP METALS AND CYANIDE** | | | | | | | | |
| Aluminum | 33.4 | J | ug/l | 200 | - | | | |
| Antimony | 15 | J | ug/l | 60 | - | | | |
| Arsenic | - | U | ug/l | 10 | - | | | |
| Barium | 1.1 | J | ug/l | 200 | - | | | |
| Calcium | 325 | J | ug/l | 5000 | - | | | |
| Copper | - | U | ug/l | 25 | - | | | |
| Iron | 18.3 | J | ug/l | 100 | - | | | |
| Lead | - | U | ug/l | 5 | - | | | |
| Mercury | .26 | J | ug/l | .2 | - | | | |
| Silver | 1.5 | J | ug/l | 10 | - | | | |
| Sodium | 759 | J | ug/l | 5000 | - | | | |
| Zinc | 8 | J | ug/l | 20 | - | | | |
| **CLP VOLATILES 90-SOW** | | | | | | | | |
| Methylene chloride | - | | | | - | | | |
| **CLP SEMIVOLATILES 90-SOW** | | | | | | | | |
| Di-n-butylphthalate | - | | | | 12 | | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
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R = RESULT IS REJECTED AND UNUSABLE

# Table D-16

## Representativeness - Subsurface Soil Sampling - Analytical Results of Field QC Samples

# Table D-16
## Representativeness - Subsurface Soil Sampling
## Analytical Results of Field QC Samples

Remedial Investigation and Feasibility Study, Phase IIA
Technical Memorandum No. 3, Soil Assessment
NAS Whiting Field, Milton, Florida

| Analyte | Trip Blanks | | | | | | Field Blanks | Rinsate Blanks | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TB-01 | TB-02 | TB-03 | TB-05 | TB-06 | TB-07 | FB-01 | RB-01 | RB-02 | RB-03 | RB-04 | RB-05 | RB-06 | RB-07 |
| **TCL VOCs** | | | | | | | | | | | | | | |
| Acetone | -- | -- | 2 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Methylene chloride | -- | -- | -- | -- | 16 | -- | -- | -- | 7 J | -- | 2 J | -- | -- | -- |
| Toluene | -- | -- | -- | 1 J | 2 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **TCL SVOCs** | | | | | | | | | | | | | | |
| Di-n-butylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 12 J | -- | -- | -- |
| **TAL Metals** | | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | 55.6 J | -- | 29.1 J | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.2 J | -- | -- | 1.6 J |
| Barium | -- | -- | -- | -- | -- | -- | 1.1 J | -- | 2.5 J | 1.4 J | -- | -- | 0.57 J | 0.64 J |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.3 J | -- | -- | -- | -- |
| Calcium | -- | -- | -- | -- | -- | -- | 1,040 J | 229 J | 1,740 J | 305 J | 939 J | 495 J | 213 J | 891 J |
| Chromium | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.7 J | -- | -- | 3.8 J | -- |
| Iron | -- | -- | -- | -- | -- | -- | 98.2 J | 56.7 J | 53.3 J | 42.1 J | 39.4 J | 31.9 J | 31 J | 37.2 J |
| Lead | -- | -- | -- | -- | -- | -- | 1.2 J | -- | 1.4 J | 0.76 J | -- | 0.92 J | -- | 1.1 J |
| Manganese | -- | -- | -- | -- | -- | -- | 1.2 J | -- | 2.2 J | 1.4 J | -- | -- | -- | 0.16 J |
| Mercury | -- | -- | -- | -- | -- | -- | 0.17 J | 0.17 J | 0.17 J | 0.17 J | -- | -- | -- | 5.9 J |
| Sodium | -- | -- | -- | -- | -- | -- | 887 J | 826 | 930 J | 1,070 J | 762 J | 1,260 J | 781 J | 705 J |
| Zinc | -- | -- | -- | -- | -- | -- | 10 J | -- | 20.5 J | 12.6 J | -- | -- | -- | 11.6 J |

Notes: TCL VOCs = target compound list volatile organic compounds.
J = The associated numerical value is an estimated quantity.
TCL SVOCs = target compound list semivolatile organic compounds.
TAL = target analyte list.

10/31/94 SUBSURFACE SOILS - TEST PITS - FQC SAMPLES - ANALYTICAL RESULTS 16:52:32
TRIP BLANKS - CLP TCL VOCS

| Lab Sample Number: | 22889003 | | | | 22891003 | | | | 22910003 | | | | 22927004 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SSTB01 | | | | SSTB02 | | | | SS-TB-03 | | | | SSTB05 | | | |
| Collect Date: | 03-OCT-92 | | | | 04-OCT-92 | | | | 06-OCT-92 | | | | 06-OCT-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | 2 | J | ug/l | 10 | - | UJ | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | UJ | ug/l | 10 |
| Toluene | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 1 | J | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SUBSURFACE SOILS - TEST PITS - FQC SAMPLES - ANALYTICAL RESULTS 16:52:32
TRIP BLANKS - CLP TCL VOCS

| Lab Sample Number: | 22927008 | | | | 22935007 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | SSTB06 | | | | SSTB07 | | | |
| Collect Date: | 06-OCT-92 | | | | 08-OCT-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |
| Acetone | 16 | | ug/l | 10 | - | U | ug/l | 10 |
| Toluene | - | U | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SUBSURFACE SOILS - TEST PITS - FQC SAMPLES - ANALYTICAL RESULTS 16:55:32
RINSATE BLANKS

| Lab Sample Number: | 22889001 | | | | 22889001 | | | | 22891001 | | | | 22891005 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SSRB01 | | | | SSRB01 | | | | SSRB02 | | | | SSRB03 | | | |
| Collect Date: | 03-OCT-92 | | | | 04-OCT-92 | | | | 04-OCT-92 | | | | 04-OCT-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | | | | 55.6 | J | ug/l | 200 | - | U | ug/l | 200 | 29.1 | J | ug/l | 200 |
| Arsenic | - | | | | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | - | | | | - | U | ug/l | 200 | 2.5 | J | ug/l | 200 | 1.4 | J | ug/l | 200 |
| Cadmium | - | | | | - | U | ug/l | 5 | - | U | ug/l | 5 | 3.3 | J | ug/l | 5 |
| Calcium | - | | | | 229 | J | ug/l | 5000 | 1740 | J | ug/l | 5000 | 305 | J | ug/l | 5000 |
| Chromium | - | | | | - | U | ug/l | 10 | - | U | ug/l | 10 | 4.7 | J | ug/l | 10 |
| Iron | - | | | | 56.7 | J | ug/l | 100 | 53.3 | J | ug/l | 100 | 42.1 | J | ug/l | 100 |
| Lead | - | | | | - | U | ug/l | 5 | 1.4 | J | ug/l | 5 | .76 | J | ug/l | 5 |
| Manganese | - | | | | - | U | ug/l | 15 | 2.2 | J | ug/l | 15 | 1.4 | J | ug/l | 15 |
| Mercury | - | | | | .17 | J | ug/l | .2 | .17 | J | ug/l | .2 | .17 | J | ug/l | .2 |
| Nickel | - | | | | - | U | ug/l | 40 | - | U | ug/l | 40 | - | U | ug/l | 40 |
| Sodium | - | | | | 826 | J | ug/l | 5000 | 930 | J | ug/l | 5000 | 1070 | J | ug/l | 5000 |
| Zinc | - | | | | - | U | ug/l | 20 | 20.5 | J | ug/l | 20 | 12.6 | J | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | UJ | ug/l | 10 | - | | | | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | - | | | | 7 | J | ug/l | 10 | - | U | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | UJ | ug/l | 10 | - | | | | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SUBSURFACE SOILS - TEST PITS - FQC SAMPLES - ANALYTICAL RESULTS 16:55:32
RINSATE BLANKS

| Lab Sample Number: | 22910002 | | | | 22927001 | | | | 22927007 | | | | 22935006 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | SS-RB-04 | | | | SSRB05 | | | | SSRB06 | | | | SSRB07 | | | |
| Collect Date: | 06-OCT-92 | | | | 06-OCT-92 | | | | 06-OCT-92 | | | | 08-OCT-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Arsenic | 1.2 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 1.6 | J | ug/l | 10 |
| Barium | - | U | ug/l | 200 | - | U | ug/l | 200 | .57 | J | ug/l | 200 | .64 | J | ug/l | 200 |
| Cadmium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Calcium | 939 | J | ug/l | 5000 | 495 | J | ug/l | 5000 | 213 | J | ug/l | 5000 | 891 | J | ug/l | 5000 |
| Chromium | - | U | ug/l | 10 | - | U | ug/l | 10 | 3.8 | J | ug/l | 10 | - | U | ug/l | 10 |
| Iron | 39.4 | J | ug/l | 100 | 31.9 | J | ug/l | 100 | 31 | J | ug/l | 100 | 37.2 | J | ug/l | 100 |
| Lead | - | U | ug/l | 5 | .92 | J | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 | 1.1 | J | ug/l | 15 |
| Mercury | - | U | ug/l | .2 | - | U | ug/l | .2 | - | U | ug/l | .2 | .16 | J | ug/l | .2 |
| Nickel | - | U | ug/l | 40 | - | U | ug/l | 40 | - | U | ug/l | 40 | 5.9 | J | ug/l | 40 |
| Sodium | 762 | J | ug/l | 5000 | 1260 | J | ug/l | 5000 | 781 | J | ug/l | 5000 | 705 | J | ug/l | 5000 |
| Zinc | - | U | ug/l | 20 | - | U | ug/l | 20 | - | U | ug/l | 20 | 11.6 | J | ug/l | 20 |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 2 | J | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | UJ | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 12 | J | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

10/31/94 SUBSURFACE SOILS - TEST PITS - FQC SAMPLES - ANALYTICAL RESULTS 17:12:49
FIELD BLANKS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lab Sample Number: | 22889002 | | | 22889002 | | | |
| Site | WHITING | | | WHITING | | | |
| Locator | SSFB01 | | | SSFB01 | | | |
| Collect Date: | 03-OCT-92 | | | 04-OCT-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP METALS AND CYANIDE | | | | | | | | |
| Barium | - | | | | 1.1 | J | ug/l | 200 |
| Calcium | - | | | | 1040 | J | ug/l | 5000 |
| Iron | - | | | | 98.2 | J | ug/l | 100 |
| Lead | - | | | | 1.2 | J | ug/l | 5 |
| Manganese | - | | | | 1.2 | J | ug/l | 15 |
| Mercury | - | | | | .17 | J | ug/l | .2 |
| Sodium | - | | | | 887 | J | ug/l | 5000 |
| Zinc | - | | | | 10 | J | ug/l | 20 |

U = NOT DETECTED J = ESTIMATED VALUE
UJ = REPORTED QUANTITATION LIMIT IS QUALIFIED AS ESTIMATED
R = RESULT IS REJECTED AND UNUSABLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
RINSATE BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34815012 | | | | 94015K01 | | | | 34799005 | | | | 34617002 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 18SBRB02 | | | | 2-SBRB01 | | | | 30SBRB01 | | | | 30SBRB08 | | | |
| Collect Date: | 06-JAN-93 | | | | 30-JUL-93 | | | | 04-JAN-93 | | | | 08-DEC-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 1 | J | ug/l | 10 | - | UJ | ug/l | 10 | - | U | ug/l | 10 | - | UJ | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |
| Carbon disulfide | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 9 | J | ug/l | 10 | 14 | | ug/l | 10 | 10 | | ug/l | 10 | 6 | J | ug/l | 10 |
| bis(2-Ethylhexyl) phthalate | 1 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | | | | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Arsenic | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | - | U | ug/l | 200 | - | | | | - | U | ug/l | 200 | .44 | J | ug/l | 200 |
| Calcium | - | U | ug/l | 5000 | 142 | J | ug/l | 5000 | - | U | ug/l | 5000 | 112 | J | ug/l | 5000 |
| Cobalt | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 |
| Copper | - | U | ug/l | 25 | - | U | ug/l | 25 | - | U | ug/l | 25 | - | U | ug/l | 25 |
| Iron | 28.2 | J | ug/l | 100 | 10 | J | ug/l | 100 | 58.8 | J | ug/l | 100 | 4.9 | J | ug/l | 100 |
| Magnesium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | U | ug/l | 5000 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Sodium | - | U | ug/l | 5000 | 56.6 | J | ug/l | 5000 | 57 | J | ug/l | 5000 | 32.1 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Zinc | 3.2 | J | ug/l | 20 | 10.6 | J | ug/l | 20 | 3.7 | J | ug/l | 20 | - | U | ug/l | 20 |
| Cyanide | 5.2 | J | ug/l | 10 | - | U | ug/l | 10 | 3.9 | J | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
RINSATE BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34607012 | | | | 34607016 | | | | 34956003 | | | | 34848K15 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 30SBRB6 | | | | 30SBRB7 | | | | 32SBRB2 | | | | 32SBRB4 | | | |
| Collect Date: | 06-DEC-92 | | | | 06-DEC-92 | | | | 21-JAN-93 | | | | 12-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 2 | J | ug/l | 10 | 2 | J | ug/l | 10 | - | U | ug/l | 10 | - | | | |
| Acetone | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | U | ug/l | 10 | - | | | |
| Carbon disulfide | - | U | ug/l | 10 | - | U | ug/l | 10 | 11 | | ug/l | | - | | | |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 8 | J | ug/l | 10 | 5 | J | ug/l | 10 | 11 | J | ug/l | 10 | 8 | J | ug/l | 10 |
| bis(2-Ethylhexyl) phthalate | 2 | J | ug/l | 10 | - | U | ug/l | 10 | - | UJ | ug/l | 10 | 5 | J | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Arsenic | 1 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | .26 | J | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Calcium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | U | ug/l | 5000 | 118 | J | ug/l | 5000 |
| Cobalt | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 | - | U | ug/l | 50 |
| Copper | - | U | ug/l | 25 | - | U | ug/l | 25 | 2 | J | ug/l | 25 | - | U | ug/l | 25 |
| Iron | 4.9 | J | ug/l | 100 | 3.6 | J | ug/l | 100 | - | U | ug/l | 100 | 55 | J | ug/l | 100 |
| Magnesium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | U | ug/l | 5000 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 | - | U | ug/l | 15 | .97 | J | ug/l | 15 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 | .51 | J | ug/l | 5 |
| Sodium | 23.6 | J | ug/l | 5000 | 43.6 | J | ug/l | 5000 | - | U | ug/l | 5000 | 141 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | .7 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Zinc | - | U | ug/l | 20 | - | U | ug/l | 20 | - | U | ug/l | 20 | 7 | J | ug/l | 20 |
| Cyanide | - | U | ug/l | 10 | - | U | ug/l | 10 | 5.2 | J | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
RINSATE BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34848015 | | | 34566004 | | | 34553010 | | | 34576008 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | WHITING | | | WHITING | | | WHITING | | |
| Locator | 32SBRB4 | | | 33SBRB02 | | | 33SBRB1 | | | 33SBRB3 | | |
| Collect Date: | 12-JAN-93 | | | 02-DEC-92 | | | 01-DEC-92 | | | 03-DEC-92 | | |
| | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | |
| Methylene chloride | - U | ug/l | 10 | 3 J | ug/l | 10 | 3 J | ug/l | 10 | 1 J | ug/l | 10 |
| Acetone | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| Carbon disulfide | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | 7 J | ug/l | 10 | 8 J | ug/l | 10 | 7 J | ug/l | 10 |
| bis(2-Ethylhexyl) phthalate | - | | | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | | | | | |
| Aluminum | - | | | - U | ug/l | 200 | - U | ug/l | 200 | - U | ug/l | 200 |
| Arsenic | - | | | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| Barium | - | | | .44 J | ug/l | 200 | .44 J | ug/l | 200 | .8 J | ug/l | 200 |
| Calcium | - | | | - U | ug/l | 5000 | - U | ug/l | 5000 | - U | ug/l | 5000 |
| Cobalt | - | | | - U | ug/l | 50 | - U | ug/l | 50 | - U | ug/l | 50 |
| Copper | - | | | 2 J | ug/l | 25 | - U | ug/l | 25 | - U | ug/l | 25 |
| Iron | - | | | 8.6 J | ug/l | 100 | 8.4 J | ug/l | 100 | 150 | ug/l | 100 |
| Magnesium | - | | | - U | ug/l | 5000 | - U | ug/l | 5000 | 19.5 J | ug/l | 5000 |
| Manganese | - | | | - U | ug/l | 15 | - U | ug/l | 15 | 1.3 J | ug/l | 15 |
| Selenium | - | | | .59 J | ug/l | 5 | - U | ug/l | 5 | - U | ug/l | 5 |
| Sodium | - | | | 60.7 J | ug/l | 5000 | 71.4 J | ug/l | 5000 | 71.4 J | ug/l | 5000 |
| Thallium | - | | | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| Zinc | - | | | 5.9 J | ug/l | 20 | 3.6 J | ug/l | 20 | 14.7 J | ug/l | 20 |
| Cyanide | - | | | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
RINSATE BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34925007 | | | | 34836007 | | | | 34836007-1 | | | | 35015002 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 3SBRB01 | | | | 3SBRB3 | | | | 3SBRB3 | | | | 3SBRB3 | | | |
| Collect Date: | 19-JAN-93 | | | | 09-JAN-93 | | | | 09-JAN-93 | | | | 27-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | - | U | ug/l | 10 | - | UJ | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | - | UJ | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Carbon disulfide | - | U | ug/l | 10 | - | U | ug/l | 10 | - | | | | - | UJ | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | 10 | | ug/l | 10 | 9 | J | ug/l | 10 | - | | | | 6 | J | ug/l | 10 |
| bis(2-Ethylhexyl) phthalate | 38 | | ug/l | 10 | 2 | J | ug/l | 10 | - | | | | - | UJ | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | 98.1 | J | ug/l | 200 | - | | | | - | U | ug/l | 200 |
| Arsenic | 2.9 | J | ug/l | 10 | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Barium | - | U | ug/l | 200 | 2.3 | J | ug/l | 200 | - | | | | 1.4 | J | ug/l | 200 |
| Calcium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | | | | - | U | ug/l | 5000 |
| Cobalt | - | U | ug/l | 50 | - | U | ug/l | 50 | - | | | | - | U | ug/l | 50 |
| Copper | 2.2 | J | ug/l | 25 | - | U | ug/l | 25 | - | | | | 2.6 | J | ug/l | 25 |
| Iron | 73.3 | J | ug/l | 100 | 70.8 | J | ug/l | 100 | - | | | | 30.1 | J | ug/l | 100 |
| Magnesium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | | | | - | U | ug/l | 5000 |
| Manganese | .68 | J | ug/l | 15 | .81 | J | ug/l | 15 | - | | | | - | U | ug/l | 15 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 | - | | | | - | U | ug/l | 5 |
| Sodium | - | U | ug/l | 5000 | - | U | ug/l | 5000 | - | | | | - | U | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 | - | | | | - | U | ug/l | 10 |
| Zinc | 2.2 | J | ug/l | 20 | - | U | ug/l | 20 | - | | | | - | U | ug/l | 20 |
| Cyanide | 4.9 | J | ug/l | 10 | 4.4 | J | ug/l | 10 | - | | | | 6.2 | J | ug/l | 10 |

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D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
RINSATE BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34587012 | | | | 34595006 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | 6SBRB04 | | | | 6SBRB5 | | | |
| Collect Date: | 04-DEC-92 | | | | 05-DEC-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | |
| Methylene chloride | 2 | J | ug/l | 10 | 3 | J | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | 3 | J | ug/l | 10 |
| Carbon disulfide | - | U | ug/l | 10 | - | U | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | |
| Di-n-butylphthalate | 10 | | ug/l | 10 | 7 | J | ug/l | 10 |
| bis(2-Ethylhexyl) phthalate | - | U | ug/l | 10 | - | U | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Arsenic | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Barium | - | U | ug/l | 200 | - | U | ug/l | 200 |
| Calcium | - | U | ug/l | 5000 | 120 | J | ug/l | 5000 |
| Cobalt | - | U | ug/l | 50 | 6.6 | J | ug/l | 50 |
| Copper | - | U | ug/l | 25 | - | U | ug/l | 25 |
| Iron | 17.1 | J | ug/l | 100 | 16.6 | J | ug/l | 100 |
| Magnesium | - | U | ug/l | 5000 | - | U | ug/l | 5000 |
| Manganese | - | U | ug/l | 15 | - | U | ug/l | 15 |
| Selenium | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Sodium | 37.1 | J | ug/l | 5000 | 32.1 | J | ug/l | 5000 |
| Thallium | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Zinc | 3.1 | J | ug/l | 20 | 3.1 | J | ug/l | 20 |
| Cyanide | - | U | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
FIELD BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34906012 | | | | 94015K02 | | | | 34799004 | | | | 34553009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 03SBFB01 | | | | 2-SBFB01 | | | | 30SBFB01 | | | | 33SBFB1 | | | |
| Collect Date: | 18-JAN-93 | | | | 30-JUL-93 | | | | 04-JAN-93 | | | | 01-DEC-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Chloromethane | - | U | ug/l | 10 | 2 | J | ug/l | 10 | - | UJ | ug/l | 10 | - | U | ug/l | 10 |
| Methylene chloride | - | U | ug/l | 10 | - | UJ | ug/l | 10 | 2 | J | ug/l | 10 | 4 | J | ug/l | 10 |
| CLP SEMIVOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Di-n-butylphthalate | - | | | | 15 | | ug/l | 10 | 9 | J | ug/l | 10 | 10 | | ug/l | 10 |
| CLP METALS AND CYANIDE | | | | | | | | | | | | | | | | |
| Aluminum | - | | | | - | U | ug/l | 200 | 40.5 | J | ug/l | 200 | - | U | ug/l | 200 |
| Barium | - | | | | - | U | ug/l | 200 | 4.2 | J | ug/l | 200 | .44 | J | ug/l | 200 |
| Calcium | - | | | | 28.3 | J | ug/l | 5000 | 70.1 | J | ug/l | 5000 | - | U | ug/l | 1000 |
| Iron | - | | | | - | U | ug/l | 100 | 23.2 | J | ug/l | 100 | 3.3 | J | ug/l | 100 |
| Lead | - | | | | .5 | J | ug/l | 5 | - | U | ug/l | 5 | - | U | ug/l | 5 |
| Magnesium | - | | | | - | U | ug/l | 5000 | 52.1 | J | ug/l | 5000 | 15.8 | J | ug/l | 5000 |
| Sodium | - | | | | 67.6 | J | ug/l | 5000 | - | U | ug/l | 1000 | 46.4 | J | ug/l | 5000 |
| Zinc | - | | | | 1.9 | J | ug/l | 20 | - | U | ug/l | 20 | 5.6 | J | ug/l | 20 |
| Cyanide | - | | | | - | U | ug/l | 10 | 3.7 | J | ug/l | 10 | - | U | ug/l | 10 |

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J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
FIELD BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34906012 | | | | 34906K12 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | 3SB-FB-01 | | | | 3SBFB01 | | | |
| Collect Date: | 18-JAN-93 | | | | 18-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| **CLP VOLATILES 90-SOW** | | | | | | | | |
| Chloromethane | - | | | | - | | | |
| Methylene chloride | - | | | | - | | | |
| **CLP SEMIVOLATILES 90-SOW** | | | | | | | | |
| Di-n-butylphthalate | - | | | | 8 | J | ug/l | 10 |
| **CLP METALS AND CYANIDE** | | | | | | | | |
| Aluminum | - | U | ug/l | 200 | - | | | |
| Barium | - | U | ug/l | 200 | - | | | |
| Calcium | - | U | ug/l | 5000 | - | | | |
| Iron | 24.8 | J | ug/l | 100 | - | | | |
| Lead | 1.9 | J | ug/l | 5 | - | | | |
| Magnesium | - | U | ug/l | 5000 | - | | | |
| Sodium | - | U | ug/l | 5000 | - | | | |
| Zinc | 2.4 | J | ug/l | 20 | - | | | |
| Cyanide | 4.3 | J | ug/l | 10 | - | | | |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34906013 | | | | 34815021 | | | | 94015K03 | | | | 34823008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 03SBTB01 | | | | 18SBTB3 | | | | 2-SBTB01 | | | | 29SBTB4 | | | |
| Collect Date: | 18-JAN-93 | | | | 06-JAN-93 | | | | 30-JUL-93 | | | | 07-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 4 | J | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | 3 | J | ug/l | 10 |
| Acetone | - | U | ug/l | 10 | 10 | | ug/l | 10 | - | UJ | ug/l | 10 | 11 | J | ug/l | 10 |
| Chloroform | 10 | | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34799006 | | | | 34807025 | | | | 34617K03 | | | | 34607K11 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 30SBTB01 | | | | 30SBTB02 | | | | 30SBTB08 | | | | 30SBTB6 | | | |
| Collect Date: | 04-JAN-93 | | | | 05-JAN-93 | | | | 08-DEC-92 | | | | 06-DEC-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 4 | J | ug/l | 10 | 3 | J | ug/l | 10 | - | UJ | ug/l | 10 | 2 | J | ug/l | 10 |
| Acetone | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 | - | UJ | ug/l | 10 |
| Chloroform | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34607K15 | | | | 34926003 | | | | 34956002 | | | | 34846017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 30SBTB7 | | | | 32SBTB02 | | | | 32SBTB4 | | | | 32SBTB6 | | | |
| Collect Date: | 06-DEC-92 | | | | 19-JAN-93 | | | | 21-JAN-93 | | | | 12-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 2 | J | ug/l | 10 | 1 | J | ug/l | 10 | 1 | J | ug/l | 10 | - | U | ug/l | 10 |
| Acetone | - | UJ | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 |
| Chloroform | - | U | ug/l | 10 | 18 | | ug/l | 10 | 18 | | ug/l | 10 | - | U | ug/l | 10 |

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ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34846018 | | | 34566005 | | | 34576009 | | | 34553008 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | WHITING | | | WHITING | | | WHITING | | |
| Locator | 32SBTB7 | | | 33SBTB02 | | | 33SBTB03 | | | 33SBTB1 | | |
| Collect Date: | 12-JAN-93 | | | 02-DEC-92 | | | 03-DEC-92 | | | 01-DEC-92 | | |
| | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL | VALUE QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | |
| Methylene chloride | - U | ug/l | 10 | 4 J | ug/l | 10 | 6 J | ug/l | 10 | 4 J | ug/l | 10 |
| Acetone | - U | ug/l | 10 | 8 J | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |
| Chloroform | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 | - U | ug/l | 10 |

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J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34833K11 | | | | 34938009 | | | | 35015003 | | | | 34836K06 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | | WHITING | | | | WHITING | | | |
| Locator | 3SBTB05 | | | | 3SBTB3 | | | | 3SBTB5 | | | | 3SBTB6 | | | |
| Collect Date: | 08-JAN-93 | | | | 20-JAN-93 | | | | 27-JAN-93 | | | | 09-JAN-93 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | | | | | | | | | |
| Methylene chloride | 3 | J | ug/l | 10 | 1 | J | ug/l | 10 | - | U | ug/l | 10 | 5 | J | ug/l | 10 |
| Acetone | - | UJ | ug/l | 10 | - | U | ug/l | 10 | - | U | ug/l | 10 | - | UJ | ug/l | 10 |
| Chloroform | - | U | ug/l | 10 | 20 | | ug/l | 10 | 5 | J | ug/l | 10 | - | U | ug/l | 10 |

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J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D = DILUTED SAMPLE

ANALYTICAL RESULTS HITS REPORT - SUBSURFACE SOIL SAMPLING
TRIP BLANKS - NAS WHITING FIELD

| Lab Sample Number: | 34587011 | | | | 34595007 | | | |
|---|---|---|---|---|---|---|---|---|
| Site | WHITING | | | | WHITING | | | |
| Locator | 6SBTB4 | | | | 6SBTB5 | | | |
| Collect Date: | 04-DEC-92 | | | | 05-DEC-92 | | | |
| | VALUE | QUAL | UNITS | DL | VALUE | QUAL | UNITS | DL |
| CLP VOLATILES 90-SOW | | | | | | | | |
| Methylene chloride | - | U | ug/l | 10 | 2 | J | ug/l | 10 |
| Acetone | 4 | J | ug/l | 10 | - | U | ug/l | 10 |
| Chloroform | - | U | ug/l | 10 | - | U | ug/l | 10 |

U = NOT DETECTED R = RESULT IS REJECTED AND UNUABLE
J = ESTIMATED VALUE UJ = REPORTED QUANTITATION LIMIT IS ESTIMATED
D [illegible]LUTED SAMPLE