**C**omprehensive **L**ong-term **E**nvironmental **A**ction **N**avy

CONTRACT NUMBER N62467-94-D-0888

05JAX0030

# Record of Decision
## for
# Operable Unit 7, Potential Source of Contamination 46 Defense Reutilization and Marketing Office Revision 2

## Naval Air Station Jacksonville
## Jacksonville, Florida

## Contract Task Order 0242

## September 2005


Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

# RECORD OF DECISION
# OPERABLE UNIT 7, POTENTIAL SOURCE OF CONTAMINATION 46
# DEFENSE REUTILIZATION AND MARKETING OFFICE
# REVISION 2

## NAVAL AIR STATION JACKSONVILLE
## JACKSONVILLE, FLORIDA

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

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

**Submitted by:**
**Tetra Tech NUS, Inc.**
**661 Andersen Drive**
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**Pittsburgh, Pennsylvania 15220**

**CONTRACT NUMBER N62467-94-D-0888**
**CONTRACT TASK ORDER 0242**

**September 2005**

**PREPARED UNDER THE SUPERVISION OF:**

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**TASK ORDER MANAGER**
**TETRA TECH NUS, INC.**
**JACKSONVILLE, FLORIDA**

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**DEBRA M. HUMBERT**
**PROGRAM MANAGER**
**TETRA TECH NUS, INC.**
**PITTSBURGH, PENNSYLVANIA**

**PROFESSIONAL CERTIFICATION**

Record of Decision
Defense Reutilization and Marketing Office
Naval Air Station Jacksonville, Jacksonville, Florida

This Record of Decision was prepared under the direct supervision of the undersigned geologist using geologic and hydrogeologic principles standard to the profession at the time the report was prepared in general conformance with the Requirements of Chapter 62-770, Florida Administrative Code. If conditions are determined to exist that differ from those described, the undersigned geologist should be notified to evaluate the effects of additional information on the assessment described in this report. This report was developed specifically for the referenced site and should not be construed to apply to any other site.

Mark C. Peterson

Mark Peterson, P.G.
Florida License Number PG-1852

9/9/05

Date

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**APPENDICES**



## TABLES



## FIGURES

## ACRONYMS

| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| bls | Below Land Surface |
| BEI | Bechtel Environmental, Inc. |
| BHC | Benzene Hexachloride |
| C | Carcinogen |
| CFR | Code of Federal Regulations |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liabilities Act |
| CH2M Hill | CH2M HILL Constructors, Inc. |
| COCs | Chemicals of Concern |
| CSFs | Cancer Slope Factors |
| cy | Cubic Yard |
| DCE | Dichloroethene |
| DDD | Dichlorodiphenyldichloroethane |
| DDE | Dichlorodiphenyldichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| DOE | Department of Energy |
| DRMO | Defense Reutilization and Marketing Office |
| ERA | Ecological Risk Assessment |
| FAC | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| FFA | Federal Facility Agreement |
| FFS | Focused Feasibility Study |
| FS | Feasibility Study |
| ft | Feet (or Foot) |
| GCTLs | Groundwater Cleanup Target Levels |
| HHRA | Human Health Risk Assessment |
| HI | Hazard Index |
| HLA | Harding Lawson Associates |
| HSWA | Hazardous and Solid Waste Amendments of 1984 |
| ICR | Incremental Cancer Risk |
| LUCs | Land Use Controls |
| μg/kg | Micrograms per kilogram |
| μg/L | Micrograms per Liter |
| MCLs | Maximum Contaminant Levels |
| mg/kg | Milligrams per Kilogram |

**ACRONYMS (Continued)**

| | |
|---|---|
| mg/L | Milligrams per Liter |
| MNA | Monitored Natural Attenuation |
| N | Noncarcinogen |
| NA | Not Applicable |
| NAS | Naval Air Station |
| Navy | United States Department of the Navy |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NL | Not Listed |
| NPL | National Priorities List |
| NPW | Net Present Worth |
| O&M | Operation and Maintenance |
| OSHA | Occupational Safety and Health Act |
| OU | Operable Unit |
| PAHs | Polynuclear Aromatic Hydrocarbons |
| PCBs | Polychlorinated Biphenyls |
| pCi/g | Picocuries per Gram |
| PPE | Personal Protective Equipment |
| PRE | Preliminary Risk Evaluation |
| PRGs | Preliminary Remediation Goals |
| PSC | Potential Source of Contamination |
| RAD | Radiological |
| RAOs | Remedial Action Objectives |
| RBC | Risk-Based Criteria |
| RCRA | Resource Conservation and Recovery Act |
| RfDs | Reference Doses |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| sat | Soil Saturation Limit |
| SCTLs | Soil Cleanup Target Levels |
| SDWA | Safe Drinking Water Act |
| SMCLs | Secondary Maximum Contaminant Levels |
| SPLP | Synthetic Precipitant Leaching Procedure |
| SQAG | Sediment Quality Assessment Guideline |
| SWMU | Solid Waste Management Unit |
| TAL | Target Analyte List |

**ACRONYMS (Continued)**

| | |
|---|---|
| TBC | To Be Considered |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TSD | Treatment, Storage, and Disposal |
| TtNUS | Tetra Tech NUS, Inc. |
| UCL | Upper Confidence Limit |
| USACHPPM | United States Army Center for Health Promotion and Prevention Medicine |
| USEPA | United States Environmental Protection Agency |
| VOCs | Volatile Organic Compounds |

# 1.0 DECLARATION OF THE RECORD OF DECISION

## 1.1 SITE NAME AND LOCATION

Potential Source of Contamination (PSC) 46 [Operable Unit (OU) 7] consists of the contaminated soil/sediment, groundwater, and surface water at the Defense Reutilization and Marketing Office (DRMO) at Naval Air Station (NAS) Jacksonville [United States Environmental Protection Agency (USEPA) Identification Number FL 6170024412]. NAS Jacksonville occupies 3,896 acres on the western bank of the St. Johns River in southeastern Duval County, Florida. PSC 46 is located at the southwestern corner of NAS Jacksonville across Highway 17 from the remainder of the installation.

## 1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedial action for PSC 46 at NAS Jacksonville. The selected remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) §300]. This decision document was prepared in accordance with the USEPA decision document guidance (USEPA, 1999). This decision is based on the Administrative Record for the site. The United States Department of the Navy (Navy) and USEPA Region 4 issue this ROD (jointly) with the approval of the NAS Jacksonville Partnering Team, which includes the USEPA, the Navy, and the Florida Department of Environmental Protection (FDEP).

## 1.3 ASSESSMENT OF THE SITE

The response actions selected in this ROD are necessary to protect the public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment and/or of pollutants or contaminants from this site that may present an imminent and substantial endangerment to public health or welfare.

## 1.4 DESCRIPTION OF THE SELECTED REMEDY

This ROD describes the final selected remedy for PSC 46. A Remedial Investigation (RI) Human Health Risk Assessment (HHRA), an Ecological Risk Assessment (ERA) Focused Feasibility Study (FFS), and Proposed Plan have also been approved for PSC 46. The selected remedy eliminates unacceptable exposures to polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and radium-226 in soil and sediment and chlorinated solvents and arsenic in groundwater. The selected

remedy for PSC 46 includes excavation of soil/sediment in storm water ditches; monitored natural attenuation (MNA) for groundwater; and restriction of site access through land use controls (LUCs) to prevent exposure to surface soil, prevent any residential reuse activities, and prevent extraction or consumption of groundwater from taking place at this location. LUCs include both institutional controls and engineering controls. The selected remedy was determined based on evaluation of the site conditions, site-related risks, future land use, applicable or relevant and appropriate requirements (ARARs), and Remedial Action Objectives (RAOs).

Final RODs have been approved for OU 1 through OU 4. The ROD for OU 5 is pending approval. An RI has been completed, and a feasibility study (FS) is in progress at OU 6. An RI/FS has been approved for OU 7. An RI/FS is being performed for OU 8.

The major components of the selected remedy are as follows:

- LUCs will be monitored, implemented, reported on, and maintained by the Navy for PSC 46 to ensure that the site continues to operate as an industrial area. The LUCs will be maintained until the concentrations of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. The objectives of the LUCs will be to

  - Prevent non-industrial development (i.e., prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds) of PSC 46 until acceptable risk levels or cleanup target levels are achieved.
  - Ensure no construction on or excavation of the contaminated soil without special handling and disposal procedures for the soil [the special procedures shall include at a minimum obtaining a dig permit that has been reviewed by the station's environmental division using Occupation Safety and Health Act (OSHA)-trained employees where appropriate and use of the proper analyses and facilities for soil disposal].
  - Prevent drilling, excavation, or any activity which would interfere with the remedial or monitoring systems.
  - Ensure no withdrawal of and/or use of the groundwater without FDEP/USEPA concurrence until cleanup levels are met.
  - Ensure any workers that might potentially be exposed to the contaminated soil or groundwater at this site are properly trained.
  - Maintain paving in areas with soil contamination above residential risk levels in order to lmit the potential for exposure to contaminated soils.
  - Warning signs will be placed on fencing controlling access to LUC areas.

The administrative measures (e.g., environmental review of all NAS Jacksonville construction projects) associated with the LUC for PSC 46 will be included in the LUC Remedial Design document, which contains the LUC implementation measures that the station will take to achieve the above-listed objectives. Once prepared, the LUC Remedial Design is a primary document under the Federal Facilities Agreement (FFA) and is enforceable. The Navy or another party to be designated by the Navy as set out in the LUC Remedial Design shall be responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUCs.

- Contaminated sediment in the storm water ditches and soils within the facility will be excavated and disposed off site.

- Groundwater will be monitored to evaluate decreases in contaminant concentrations that may result from naturally occurring processes.

- If natural attenuation and LUCs are shown to be insufficient, another remedial approach will be evaluated and may be implemented.

- Contingency actions may be performed if natural attenuation does not effectively reduce groundwater contaminants.

The Navy will prepare (in accordance with USEPA guidance) and submit to the USEPA and FDEP a Remedial Design, as well as all other post-ROD documents as specified in the FFA dated November 14, 1990, and in the Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions (Navy, 2003). Contingency actions, if required, will be documented in an appropriate CERCLA Document.

## 1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, is cost effective, and complies with Federal and State requirements that are legally applicable or relevant and appropriate to remedial action. The nature of the selected remedy for PSC 46 is such that ARARs will eventually be met through excavation and disposal of sediment, through LUCs for soil, and through MNA for groundwater.

Due to the wide variety of contaminant types present, excavation and offsite disposal was the only remedy that could adequately address the risks posed at the site. Limited in extent and concentration, impacts to shallow groundwater are believed to be the result of shallow soil contamination. Low levels of contamination in groundwater should be reduced to below risk-based thresholds after removal of the source material.

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at this site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment. Although the selected remedy does not provide for treatment as a principal element, reduction of soil and groundwater contaminant concentrations are expected over time due to dispersion, advection, and adsorption processes. Because this remedy would result in soil and groundwater with contaminant concentrations above levels that allow for unlimited use and unrestricted exposure, a review will be conducted every 5 years after the initiation of remedial actions to assure that human health and the environment are being protected by the remedial action being implemented.

## 1.6 DATA CERTIFICATION CHECKLIST

The information required to be included in the ROD is summarized on Table 1-1. The information on Table 1-1 is presented in Section 2.0: Decision Summary of this ROD. Additional information, if required, can be found in the Administrative Record for PSC 46.

Preliminary Remediation Goals (PRGs) were established for commercial/industrial property use. Information regarding the methods used to address source materials constituting the principal threats can be found on Table 1-1.

## 1.7 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

E W Dobson Jr

9 Sept. 2005

Captain E. W. Dobson, Jr.
Commanding Officer
NAS Jacksonville

Date

Alan Farmer

9/22/05

Winston A. Smith
Director
Waste Management Division
USEPA Region 4

Date

**Table 1-1**
**Data Certification Checklist**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Information | ROD Reference |
|---|---|
| Chemicals of Concern (COCs) and their concentrations. | Section 2.8.1, pg. 2-39; Table 2-10, pg. 2-40 |
| Baseline risk represented by the COCs. | Section 2.6, pg. 2-32 |
| Methods to address source materials | Section 2.9, pg. 2-39 |
| PRGs established for the COCs. | Section 2.8.1, pg. 2-39; Table 2-10, pg. 2-40 |
| Current and reasonably anticipated future land and groundwater use scenarios used for risk assessment. | Section 2.5.3, pg. 2-32 |
| Potential land and groundwater uses available at the site as a result of the selected remedy. | Section 2.11.4, pg. 2-52 |
| Estimated capital, operation and maintenance (O&M), and total present worth costs of selected remedy. Discount rate used and timeframe over which these costs are projected. | Section 2.11.3, 2-52 |
| Key factors which lead to the selection of the remedy. | Section 2.11.1, pg. 2-46; Table 2-9, pg. 2-38 |

# 2.0 DECISION SUMMARY

## 2.1 SITE NAME, LOCATION, AND DESCRIPTION

NAS Jacksonville (USEPA Identification Number FL 6170024412) as shown on Figure 2-1 occupies 3,896 acres on the western bank of the St. Johns River in the southeastern part of Duval County, Florida. NAS Jacksonville operates under Resource Conservation and Recovery Act (RCRA) Permit Number 0072437-005-HF issued on November 19, 2001. The permit addresses Hazardous and Solid Waste Amendments of 1984 (HSWA) requirements for NAS Jacksonville. The DRMO yard is identified as Solid Waste Management Unit (SWMU)/PSC 46, and the final remedy for the DRMO yard will be included in the RCRA permit by a permit modification to be approved by the FDEP.

NAS Jacksonville was commissioned in 1940 to provide facilities for pilot training and a Navy Aviation Trades School for ground crewmen. The area of the site more than doubled during World War II in order to provide support for military operations during the war. Since 1951, the facility has been used for training pilots and ground crewmen while also supporting operational carrier squadrons. In November 1989, NAS Jacksonville was added to the National Priorities List (NPL).

DRMO (OU 7, PSC 46), as illustrated on Figure 2-2, is an outparcel located across Roosevelt Boulevard from the southwestern portion of the NAS Jacksonville property. It is a relatively flat parcel surrounded on all sides by a chain link fence and razor wire. Its approximate dimensions are 650 feet (ft) wide on the southern edge, 1,500 ft long, and 120 ft wide on the northern edge. In map view, these dimensions approximate a wedge-shaped tract with the long dimension oriented north to south. With the exception of a grass area covering approximately 6,000 square ft in the south central portion of the property, the site is either paved or covered with buildings. Please refer to Figure 2-3 for a detailed view of site features.

The surface soil and sediment at PSC 46 is contaminated with metals (including aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, and vanadium), PAHs [including benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; dibenzo(a,h)anthracene; indene(1,2,3-cd)pyrene; dieldrin; Aroclor 1254; Aroclor 1260; and radium-226]. The groundwater is contaminated with vinyl chloride; 1,1-dichloroethene (DCE); and arsenic. Concentrations of these contaminants are greater then FDEP industrial soil cleanup target levels (SCTLs) and groundwater cleanup target levels (GCTLs).

For the FFA, the site was designated as PSC 46. In 2001, the site was designated OU 7 for tracking purposes in the NPL system by the USEPA.

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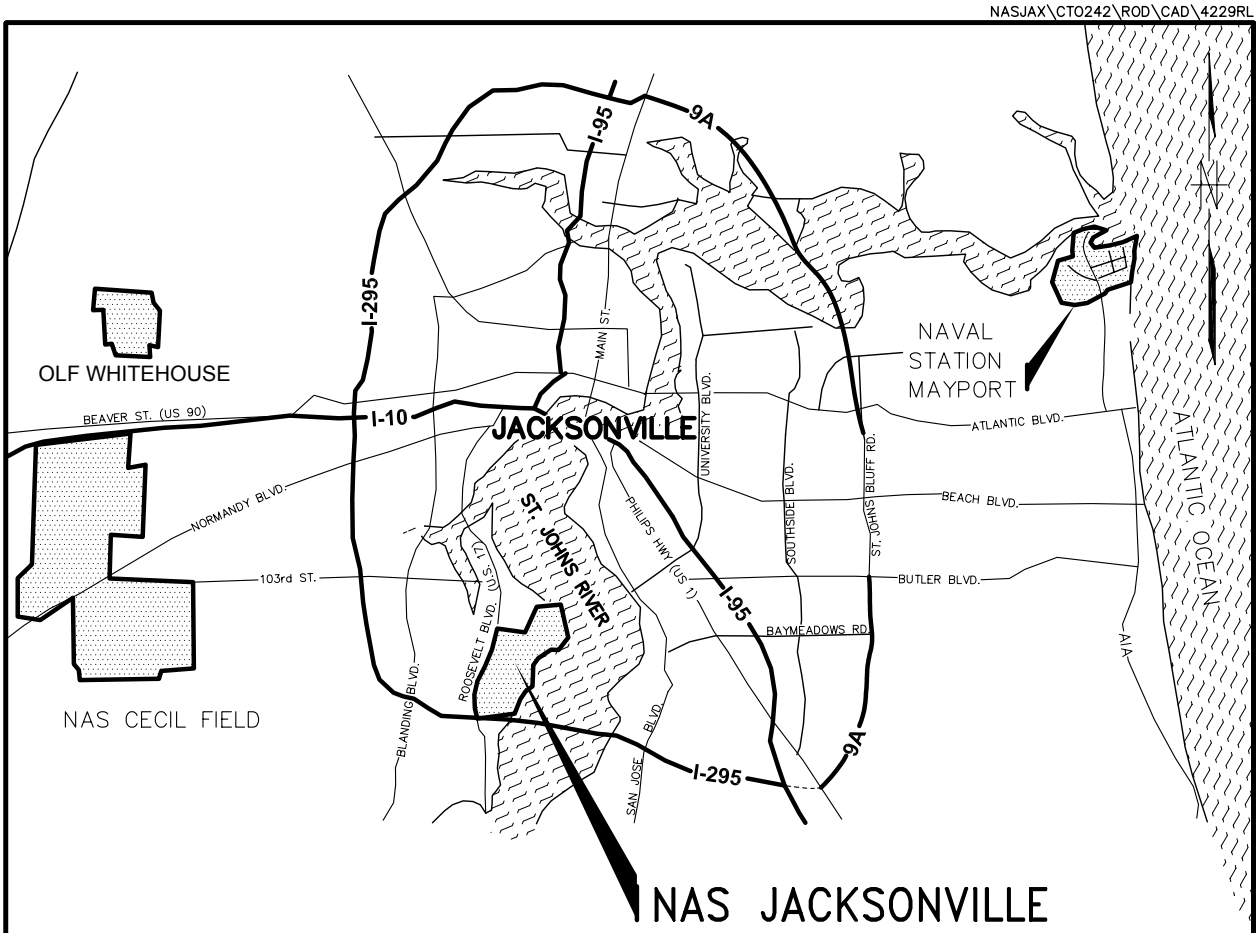


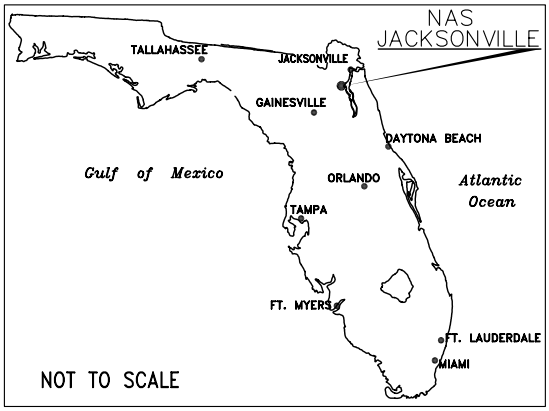


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APPROXIMATE SCALE IN FEET

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| CHECKED BY DATE | | | APPROVED BY DATE |
| COST/SCHED–AREA | | | APPROVED BY DATE |
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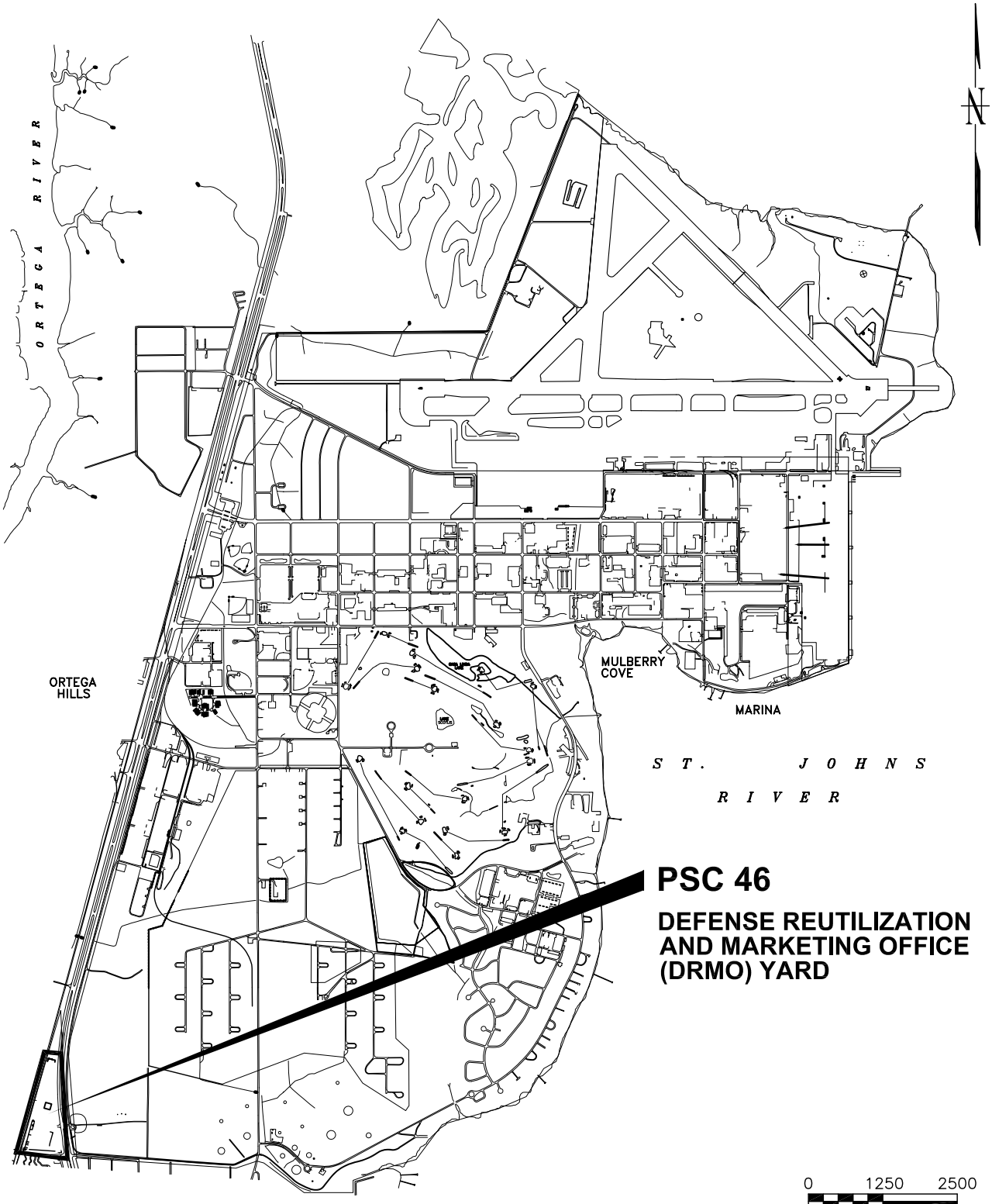


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| DRAWN BY LLK DATE 10/16/03 | NAVFAC | SITE LOCATION MAP<br>OU7, PSC 46<br>RECORD OF DECISION<br>NAS JACKSONVILLE<br>JACKSONVILLE, FLORIDA | CONTRACT NO. 4229 |
| CHECKED BY DATE | | | APPROVED BY DATE |
| COST/SCHED–AREA | | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 2–2 REV. 0 |

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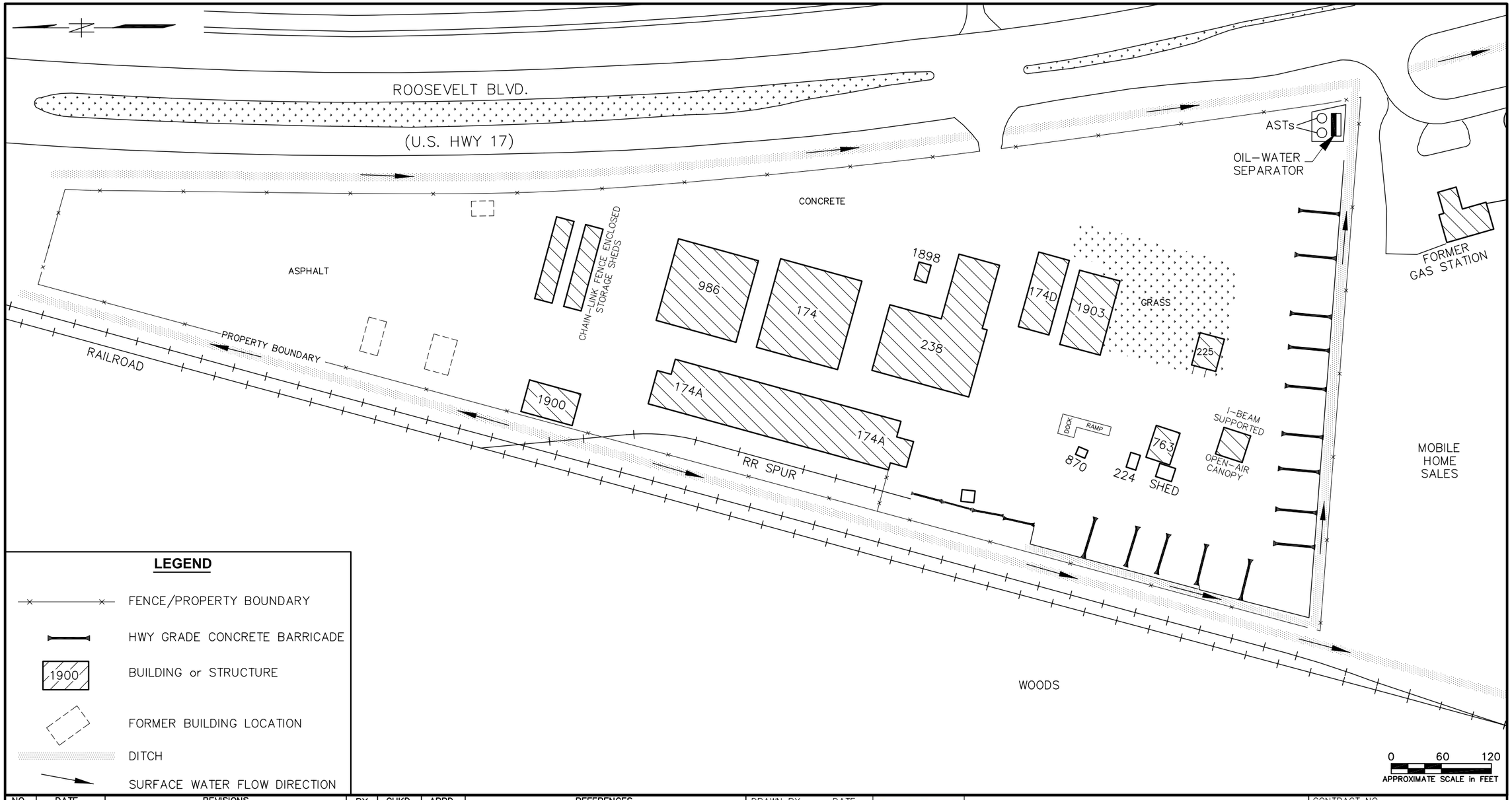


**LEGEND**

- FENCE/PROPERTY BOUNDARY
- HWY GRADE CONCRETE BARRICADE
- 1900 — BUILDING or STRUCTURE
- FORMER BUILDING LOCATION
- DITCH
- SURFACE WATER FLOW DIRECTION

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
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DRAWN BY DATE: LLK 10/16/03
CHECKED BY DATE:
COST/SCHED–AREA:
SCALE: AS NOTED

SITE PLAN
OU7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE:
APPROVED BY DATE:
DRAWING NO. FIGURE 2–3
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

## 2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

In 1991, NAS Jacksonville personnel observed that storm water from adjacent storage areas drained into storm water ditches. In 1994, sludge from an oil/water separator was found to be a characterisitc hazardous waste. Harding Lawson Associates (HLA) performed site screening for chemical constituents at PSC 46 in 1997. A radiological (RAD) survey was conducted in June 1998 by the United States Army Center for Health Promotion and Prevention Medicine (USACHPPM) (USACHPPM, 1998). A follow-up study was performed by Bechtel Environmental, Inc. (BEI) (BEI, 1998) in 1998.

The storm drainage is linked to the oil/water separator via an outfall from the oil/water separator to the southern drainage ditch at the southeastern corner of the site. Sludge removed from the oil/water separator was disposed of at a licensed disposal facility. Although the oil/water separator is connected to the ditch, it is not believed to be a primary source of contamination found in the ditches. Contaminants found in the ditches include PCBs, PAHs, metals, and RAD constituents. These contaminants have resulted from historic operation of the site, which included airplane decommissioning activities, smelting, and materials storage.

NAS Jacksonville, USEPA Identification Number FL6 170 024 412, operates under RCRA Post Closure Permit Number 0072437-005-HF issued on November 19, 2001. The FDEP is the lead agency for this permit. The permit addresses post closure requirements for three surface impoundments, Building 101, and a landfill at Hangar 1000. The permit also addresses HSWA requirements for NAS Jacksonville. The DRMO yard is identified as SWMU/PSC 46.

NAS Jacksonville was placed on the NPL by the USEPA in November 1989. An FFA for NAS Jacksonville was signed by the FDEP, USEPA, and the Navy in 1990. Following the listing of NAS Jacksonville on the NPL and the signing of the FFA, remedial response activities at the facility have been completed under CERCLA authority. PSC 46 is 1 of 55 PSCs that have been identified.

### 2.2.1 PSC 46 History

The PSC 46 site was developed in 1939 by the United States Army (HLA, 1999). The site first served as a decommissioning facility for used aircraft. In the late 1940s, the site was adapted for its current use as the DRMO. The DRMO's mission is to provide a means for the disposal of surplus government equipment, supplies, and scrap materials. Materials are stored within the fenced yard prior to sale to the public.

### 2.2.2 Site Investigations

The following investigations and studies have been conducted in and around PSC 46:

- 1997 – HLA performed site screening for chemical constituents at PSC 46 in 1997. Groundwater, surface water, surface soil, and sediment samples were collected for fixed-base laboratory analyses. Results are documented in a Sampling Event Report dated July 1999 (HLA, 1999).

- June 1998 – A RAD survey, conducted in June 1998 by the USACHPPM (USACHPPM, 1998), disclosed areas of elevated radiation exposure in surface soils.

- 1998 – A follow-up study by BEI (BEI, 1998) confirmed three distinct areas of elevated radiation exposure.

- March 2001 – RI field activities were conducted at PSC 46. Thirty-seven soil samples were collected and analyzed for pesticides, PCBs, and Target Analyte List (TAL) metals, with selected samples analyzed for volatile organic compounds (VOCs) and PAHs. Thirteen samples were analyzed for RAD parameters. Seventeen samples were collected from the ditches and analyzed for pesticides, PCBs, TAL metals, and RAD parameters. Six surface water samples were collected and analyzed for VOCs, pesticides, PCBs, and TAL metals. Eight monitoring wells were installed at specified locations to define the horizontal and vertical extents of groundwater contamination. Groundwater samples were collected from all of the new PSC 46 monitoring wells and analyzed for constituents found on the VOCs, PAHs, pesticides, PCBs, TAL metals, and RAD parameters [Tetra Tech NUS, Inc. (TtNUS), 2003a].

- June 2004 – Additional evaluation of RAD impacts to the site were conducted to ensure Navy protocol is to be used in the evaluation and removal of RAD-impacted soils. A Radiological Characterization Report was prepared by Radiological Assessment Services, Inc. for CH2M HILL Constructors, Inc (CH2M Hill) (CH2M Hill, 2004).

## 2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public notices of the availability of the Proposed Plan (TtNUS, 2003b) were placed in the Metro section of the *Florida Times-Union* on August 29, 2003. A 30-day comment period was held from September 1, 2003, through September 30, 2003. The results of the RI, the HHRA, ERA, the remedial alternatives of the FFS (TtNUS, 2003a), and the preferred alternatives of the Proposed Plan (TtNUS, 2003b) were also presented and discussed at a Restoration Advisory Board meeting held in September 2003, during which comments were solicited from the community. Public comments and the

responses to these comments are presented in the Responsiveness Summary that is provided in Appendix A.

Documents pertaining to PSC 46 including the RI/FFS and Proposed Plan are available to the public at the Information Repository located at Jacksonville Public Library, Main Branch, 122 North Ocean Street, Jacksonville, Florida 32202. This ROD will become part of the Administrative Record File [NCP §300.825(a)(2)]. The Administrative Record is located at the TtNUS office located at 8640 Philips Highway, Suite 16, Jacksonville, Florida 32256.

## 2.4 SCOPE AND ROLE OF OPERABLE UNIT

The environmental concerns at NAS Jacksonville are complex. As a result, work at the 55 sites in the Installation Restoration Program has been organized into eight OUs.

This ROD is the final action for OU 7, PSC 46. Final RODs have been approved for OU 1 through OU 4. The ROD for OU 5 is pending approval. An RI has been completed and an FS is in progress at OU 6. An RI/FS has been completed for OU 7. An RI/FS is being performed for OU 8.

Investigations at PSC 46 indicated the presence of soil, sediment, and groundwater contamination from past operating practices. This contamination could pose an unacceptable human health risk if residential development occurred at the site, if uncontrolled excavation was allowed at the site, or if the groundwater was used as a potable water source.

## 2.5 SUMMARY OF SITE CHARACTERISTICS

Contaminant sources, detected concentrations, fate and transport, contaminated media, and geologic and hydrogeologic conditions of PSC 46 are discussed in Sections 2.0, 3.0, 5.0, and 6.0 of the PSC 46 RI/FFS Report (TtNUS, 2003a). These site characteristics are summarized in the following paragraphs.

### 2.5.1 Geology and Hydrogeology

The geology of PSC 46 is characterized by medium, fine, and very fine-grained unconsolidated sands present from surface to depths varying from 2 to 4 ft below land surface (bls). At most locations investigated during the RI, a gray and yellow-orange, mottled sandy clay/clayey sand underlies the surficial sand. This clayey unit ranges in thickness from 2 to 5 ft. In some locations, groundwater was perched above the clayey unit in the overlying sand. Mottled, fine grained, saturated sand underlies the clayey sand. The fine mottled sand was encountered to 35 ft bls.

The shallow aquifer at PSC 46 is composed of a layer of unconsolidated fine and medium sands to depths varying from 2 to 4 ft bls, sandy clay and/or clayey sand from the bottom of the sand layer to depths exceeding 6 ft bls, and very fine sands from the base of the clayey horizon to approximately 15 ft bls. At PSC 51, located approximately 2,000 ft east of PSC 46, the shallow (surficial) aquifer extends to a depth of approximately 50 ft bls. At PSC 46, shallow groundwater is present under unconfined conditions and is typically encountered at depths ranging from less than 2 ft bls to greater than 5 ft bls. At several boring locations investigated during RI field activities near the center of the site, groundwater was perched above the clayey unit underlying the surficial fine sands.

Based on the water level measurements taken during the RI, groundwater flows radially to the southwest, west, northwest, and north-northwest from a relative high in the central portion of the site. It is believed this is an artificial condition caused by mounding of groundwater on a shallow clay layer in the center of the site.

### 2.5.2 Nature and Extent of Contamination

#### 2.5.2.1 Surface Soil

Soil samples were collected using both a grid-based approach and a bias approach. The DRMO area was divided into 17 cells and each grid-based sample was collected from the center of each cell. The biased samples were located based on historic activities at the site.

Tables 2-1 and 2-2 present a summary of soil analytical data for the grid-based and biased samples, respectively, including maximum and 95-percent upper confidence limit (UCL) concentrations. Tables 2-1 and 2-2 also compare this analytical data to the FDEP SCTLs for direct industrial exposure, direct residential exposure, and leachability to groundwater; USEPA Region 9 Residential and Industrial PRGs; and, for inorganic analytes, to the NAS Jacksonville background values. Even though the FDEP SCTLs [Chapter 62-770, Florida Administrative Code (FAC)] are not ARARs, they were used as To Be Considered (TBC) criteria to screen the extent of soil contamination at PSC 46 per agreement by the NAS Jacksonville Partnering Team members since they are typically more conservative than USEPA soil criteria. USEPA Region III risk-based criteria (RBC) were also used to evaluate the nature and extent of soil contamination at the site. Three metal compounds (arsenic, cadmium, and cobalt) have lower residential RBCs than SCTLs. The eventual soil delineation was based on chemical concentrations exceeding residential criteria. The SCTLs are not being applied as ARARs; instead they are being used as a conservative criteria to establish LUC extents."

Antimony, arsenic, barium, chromium, copper, lead, nickel, and PCBs were detected in soil at concentrations in excess of the FDEP SCTLs for direct residential exposure. Arsenic and PCBs were

**Table 2-1**
**Grid Based Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concetnration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **VOCs (µg/kg)** | | | | | | | | | |
| 1,1-Dichloroethane | 1/4 | 54 | 45.8 | 290000 | 400 | 590000 N | 2000000 | 810000 N | NA |
| 2-Butanone | 1/4 | 8 | 4.88 | 3100000 | 17000 | 7300000 N | 21000000 | 1900000 N | NA |
| cis-1,2-DCE | 1/4 | 30 | 25.7 | 19000 | 400 | 43000 N | 130000 | 61000 N | NA |
| Toluene | 1/4 | 3 | 3.50 | 380000 | 500 | 520000 sat | 2600000 | 720000 N | NA |
| Vinyl Chloride | 1/4 | 15 | 13.1 | 30 | 7 | 150 C | 40 | 41 C | NA |
| **Pesticides/PCBs (µg/kg)** | | | | | | | | | |
| 4,4'-DDD | 3/16 | 16 | 5.58 | 4600 | 4000 | 2400 C | 18000 | 10000 C | NA |
| 4,4'-DDE | 7/16 | 30 | 8.42 | 3300 | 18000 | 1700 C | 13000 | 7000 C | NA |
| 4,4'-DDT | 1/16 | 2 | 2 | 3300 | 11000 | 1700 C | 13000 | 7000 C | NA |
| Aldrin | 1/16 | 0.7 | 0.7 | 70 | 50 | 29 C | 300 | 100 C | NA |
| Alpha-BHC | 1/16 | 0.77 | 0.77 | 200 | 0.3 | 90 C | 500 | 360 C | NA |
| Aroclor-1254 | 2/16 | 700 | 136 | 500 (6) | 17000 (6) | 220 C | 2100 (6) | 740 C | NA |
| Aroclor-1260 | 4/16 | 1800 | 334 | 500 (6) | 17000 (6) | 220 C | 2100 (6) | 740 C | NA |
| Dieldrin | 1/16 | 26 | 6.12 | 70 | 4 | 30 C | 300 | 110 C | NA |
| Endosulfan I | 1/16 | 0.62 | 0.62 | 410000 (7) | 3800 (7) | 370000 N | 6700000 (7) | 3700000 (7) N | NA |
| Endosulfan Sulfate | 1/16 | 0.8 | 0.8 | 410000 (7) | 3800 (7) | 370000 N | 6700000 (7) | 3700000 (7) N | NA |
| Gamma-BHC (Lindane) | 1/16 | 8 | 2.22 | 700 | 9 | 440 C | 2200 | 1700 C | NA |
| Gamma-Chlordane | 3/16 | 12 | 2.88 | 3100 (8) | 9600 (8) | 1600 C | 12000 (8) | 6500 (8) C | NA |
| Heptachlor Epoxide | 2/16 | 2.6 | 1.08 | 100 | 600 | 53 C | 400 | 190 C | NA |
| Methoxychlor | 4/16 | 1.1 | 1.1 | 370000 | 160000 | 310000 N | 7500000 | 3100000 N | NA |

See notes at end of table.

## Table 2-1
## Grid Based Soil Sample Results Summary
## Operable Unit 7, Potential Source of Contamination 46

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concetnration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **TAL Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 16/16 | 31700 | 6293 | 72000 | (9) | 76000 N | (9) | 36000 N | 1340 |
| Antimony | 4/16 | 36 | 6.47 | 26 | 5 | 31 N | 240 | 15 N | NA |
| Arsenic | 5/16 | 6.7 | 1.35 | 0.8 | 29 | 0.39 C | 3.7 | 0.045 C | 0.8 |
| Barium | 16/16 | 184 | 38.1 | 110 (10) | 1600 | 5400 N | 87000 | 2600 N | 11.2 |
| Beryllium | 8/16 | 2 | 0.387 | 120 | 63 | 150 N | 800 | 73 N | NA |
| Cadmium | 6/16 | 58.8 | 10.4 | 75 (10) | 8 | 37 N | 1300 | 18 N | NA |
| Calcium | 16/16 | 34700 | 12534 | NA | NA | NA | NA | NA | 2,360 |
| Chromium | 16/16 | 287 | 51.9 | 210 (11) | 38 (11) | 30 (11) C | 420 (11) | 110 (11) N | 6.6 |
| Cobalt | 5/16 | 7.5 | 1.79 | 4700 | (9) | 4700 N | 110000 | 2200 N | NA |
| Copper | 10/16 | 22500 | 3880 | 110 (10) | (9) | 2900 N | 76000 | 1400 N | 5.8 |
| Iron | 16/16 | 22400 | 4654 | 23000 | (9) | 23000 N | 480000 | 11000 N | 852 |
| Lead | 16/16 | 739 | 132 | 400 | (9) | 400 | 920 | 750 | 14.4 |
| Magnesium | 16/16 | 2770 | 554 | NA | NA | NA | NA | NA | 99.8 |
| Manganese | 16/16 | 408 | 80.2 | 1600 | (9) | 1800 N | 22000 | 880 N | 18 |
| Mercury | 7/16 | 1.1 | 0.206 | 3.4 | 2.1 | 23 N | 26 | 11 N | NA |
| Nickel | 14/16 | 140 | 24.9 | 110 (10) | 130 | 1600 N | 28000 | 730 N | 11 |
| Potassium | 16/16 | 562 | 143 | NA | NA | NA | NA | NA | NA |
| Selenium | 1/16 | 7.1 | 1.37 | 390 | 5 | 390 N | 10000 | 180 N | NA |
| Silver | 4/16 | 18 | 3.21 | 390 | 17 | 390 N | 9100 | 180 N | NA |
| Sodium | 6/16 | 29.6 | 29.6 | NA | NA | NA | NA | NA | 288 |
| Vanadium | 16/16 | 9.1 | 3.19 | 15 (10) | 980 | 550 N | 7400 | 260 N | 3.8 |
| Zinc | 16/16 | 1250 | 223 | 23000 | 6000 | 23000 N | 560000 | 11000 N | 15.2 |

See notes at end of table.

**Table 2-1**
**Grid Based Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 3 of 3

**Notes:**
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - If UCL exceeds the maximum detected concentration then the maximum detected concentration is presented.
(3) - FDEP SCTLs per Chapter 62-777, FAC (August 1999).
(4) - USEPA Region 9 PRGs, November 1, 2000 (CR = 1E-6, HI = 1).
(5) - Two times the mean concentration.
(6) - Value is for Aroclor mixtures.
(7) - Value is for Endosulfan.
(8) - Value is for Chlordane.
(9) - Contaminant is not a concern for this default exposure scenario (Chapter 62-777, FAC).
(10) - Leachability values may be derived using the SPLP Test to calculate site-specific SCTLs or may be determined using TCLP if oily wastes are present (Chapter 62-777, FAC).
(11) - Value is for Hexavalent Chromium.
N = noncarcinogen
C = carcinogen
sat = soil saturation limit
NA = not applicable
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
SPLP = Synthetic Precipitant Leaching Procedure
TCLP = Toxicity Characteristic Leaching Procedure
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane

**Table 2-2**
**Biased Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **VOCs (µg/kg)** | | | | | | | | | |
| cis-1,2-DCE | 2/10 | 58 | 19.5 | 19000 | 400 | 43000 N | 130000 | 61000 N | NA |
| Toluene | 1/10 | 9 | 4.74 | 380000 | 500 | 520000 sa | 2600000 | 720000 N | NA |
| **PAHs (µg/kg)** | | | | | | | | | |
| Benzo(a)anthracene | 1/2 | 8 | 8 | 1400 | 3200 | 620 C | 5000 | 92 C | NA |
| Benzo(a)pyrene | 1/2 | 9 | 9 | 100 | 800 | 62 C | 500 | 9.2 C | NA |
| Benzo(b)fluoranthene | 1/2 | 15 | 15 | 1400 | 1000 | 620 C | 4800 | 92 C | NA |
| Benzo(g,h,i)perylene | 3/2 | 89 | 89 | 2300000 | 32000000 | 56000 (6) N | 41000000 | 6200 (6) N | NA |
| Chrysene | 1/2 | 9 | 9 | 140000 | 77000 | 62000 C | 450000 | 9200 C | NA |
| Fluoranthene | 2/2 | 27 | 27 | 2900000 | 1200000 | 2300000 N | 48000000 | 1500000 N | NA |
| Indeno(1,2,3-cd)pyrene | 1/2 | 58 | 58 | 1500 | 28000 | 620 C | 5300 | 92 C | NA |
| Pyrene | 2/2 | 52 | 52 | 2200000 | 880000 | 2300000 N | 37000000 | 180000 N | NA |
| **Pesticides/PCBs (µg/kg)** | | | | | | | | | |
| 4,4'-DDD | 7/35 | 1200 | 105 | 4600 | 4000 | 2400 C | 18000 | 10000 C | NA |
| 4,4'-DDE | 13/35 | 3100 | 297 | 3300 | 18000 | 1700 C | 13000 | 7000 C | NA |
| 4,4'-DDT | 1/35 | 1000 | 87.4 | 3300 | 11000 | 1700 C | 13000 | 7000 C | NA |
| Alpha-BHC | 1/35 | 0.71 | 0.71 | 200 | 0.3 | 90 C | 500 | 360 C | NA |
| Alpha-Chlordane | 3/35 | 2.1 | 2.10 | 3100 (7) | 9600 (7) | 1600 (7) C | 12000 (7) | 6500 (7) C | NA |
| Aroclor-1254 | 4/35 | 170 | 25.6 | 500 (8) | 17000 (8) | 220 C | 2100 (8) | 740 C | NA |
| Aroclor-1260 | 13/35 | 1300 | 131 | 500 (8) | 17000 (8) | 220 C | 2100 (8) | 740 C | NA |
| Beta-BHC | 2/35 | 0.72 | 0.72 | 600 | 1 | 320 C | 2100 | 1300 C | NA |
| Dieldrin | 12/35 | 130 | 22.1 | 70 | 4 | 30 C | 300 | 110 C | NA |
| Endosulfan Sulfate | 1/35 | 0.91 | 0.910 | 410000 (9) | 3800 (9) | 370000 (9) N | 6700000 (9) | 3700000 (9) N | NA |

See notes at end of table.

**Table 2-2**
**Biased Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **Pesticides/PCBs (µg/kg) (continued)** | | | | | | | | | |
| Endrin | 1/35 | 1.4 | 1.4 | 21000 | 1000 | 18000 N | 340000 | 180000 N | NA |
| Endrin Ketone | 1/35 | 0.73 | 0.73 | 21000 (10) | 1000 (10) | 18000 (10) N | 340000 (10) | 180000 (10) N | NA |
| Gamma-BHC (Lindane) | 9/35 | 0.77 | 0.77 | 700 | 9 | 440 C | 2200 | 1700 C | NA |
| Gamma-Chlordane | 3/35 | 1.3 | 1.3 | 3100 (7) | 9600 (7) | 1600 (7) C | 12000 (7) | 6500 (7) C | NA |
| Heptachlor | 1/35 | 0.62 | 0.62 | 200 | 23000 | 110 C | 900 | 380 C | NA |
| Heptachlor Epoxide | 2/35 | 62 | 11.2 | 100 | 600 | 53 C | 400 | 190 C | NA |
| Methoxychlor | 2/35 | 2.3 | 2.30 | 370000 | 160000 | 310000 N | 7500000 | 3100000 N | NA |
| **TAL Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 36/36 | 204000 | 17171 | 72000 | (11) | 76000 N | (11) | 36000 N | 1340 |
| Antimony | 13/36 | 42.6 | 3.91 | 26 | 5 | 31 N | 240 | 15 N | NA |
| Arsenic | 15/36 | 55.6 | 5.40 | 0.8 | 29 | 0.39 C | 3.7 | 0.045 C | 0.8 |
| Barium | 36/36 | 232 | 26.0 | 110 (12) | 1600 | 5400 N | 87000 | 2600 N | 11.2 |
| Beryllium | 31/36 | 1347 | 101 | 120 | 63 | 150 N | 800 | 73 N | NA |
| Cadmium | 27/36 | 254 | 21.3 | 75 (12) | 8 | 37 N | 1300 | 18 N | NA |
| Calcium | 36/36 | 71800 | 11924 | NA | NA | NA | NA | NA | 2360 |
| Chromium | 36/36 | 1240 | 101 | 210 (13) | 38 (13) | 30 (13) C | 420 (13) | 110 (13) N | 6.6 |
| Cobalt | 13/36 | 23 | 1.91 | 4700 | (11) | 4700 N | 110000 | 2200 N | NA |
| Copper | 30/36 | 24300 | 1874 | 110 (12) | (11) | 2900 N | 76000 | 1400 N | 5.8 |
| Iron | 36/36 | 86000 | 7567 | 23000 | (11) | 23000 N | 480000 | 11000 N | 852 |
| Lead | 32/36 | 1690 | 143 | 400 | (11) | 400 | 920 | 750 | 14.4 |
| Magnesium | 36/36 | 3540 | 437 | NA | NA | NA | NA | NA | 99.8 |
| Manganese | 36/36 | 2190 | 177 | 1600 | (11) | 1800 N | 22000 | 880 N | 18 |

See notes at end of table.

**Table 2-2**
**Biased Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 3 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **TAL Metals (mg/kg) (continued)** | | | | | | | | | |
| Mercury | 20/36 | 0.91 | 0.086 | 3.4 | 2.1 | 23 N | 26 | 11 N | NA |
| Nickel | 30/36 | 1200 | 93.2 | 110 (12) | 130 | 1600 N | 28000 | 730 N | 11 |
| Potassium | 34/36 | 356 | 78.4 | NA | NA | NA | NA | NA | NA |
| Selenium | 1/36 | 7.7 | 0.750 | 390 | 5 | 390 N | 10000 | 180 N | NA |
| Silver | 9/36 | 220 | 20.1 | 390 | 17 | 390 N | 9100 | 180 N | NA |
| Sodium | 22/36 | 800 | 96.1 | NA | NA | NA | NA | NA | 283 |
| Thallium | 1/36 | 0.7 | 0.366 | NA | NA | 5.2 N | NA | 2.4 N | 0.42 |
| Vanadium | 35/36 | 26.7 | 4.45 | 15 (12) | 980 | 550 N | 7400 | 260 N | 3.8 |
| Zinc | 31/36 | 7990 | 629 | 23000 | 6000 | 23000 N | 560000 | 11000 N | 15.2 |

**Notes:**
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - If UCL exceeds the maximum detected concentration then the maximum detected concentration is presented.
(3) - FDEP SCTLs per Chapter 62-777, FAC (August 1999).
(4) - USEPA Region 9 PRGs, November 1, 2000 (CR = 1E-6, HI = 1).
(5) - Two times the mean concentration.
(6) - Value is for Pyrene.
(7) - Value is for Chlordane.
(8) - Value is for Arodor mixtures.
(9) - Value is for Endosulfan.
(10) - Value is for Endrin.
(11) - Contaminant is not a concern for this default exposure scenario (Chapter 62-777, FAC).
(12) - Leachability values may be derived using the SPLP Test to calculate site-specific SCTLs or may be determined using TCLP in the event oily wastes are present (Chapter 62-777, FAC).
(13) - Value is for Hexavalent Chromium.

detected at concentrations in excess of FDEP SCTLs for direct industrial exposure. Dieldrin, alpha-benzene hexachloride (BHC), and vinyl chloride were detected at concentrations in excess of FDEP SCTLs for leachability to groundwater. The presence of these contaminants in the soil is probably due to the storage of various materials at the site.

Accordingly, these constituents were further evaluated during risk assessment to determine which would be retained as soil COCs. Exceedances of residential SCTLs and background values in soil are illustrated on Figures 2-4 and 2-5.

#### 2.5.2.2 Surface Water

Metals, alpha-chlordane, alpha-BHC, and 4-4'-DDE were detected in surface water samples at concentrations in excess of the USEPA Region 4 Fresh Water Screening values, FDEP Class III Surface Water Criteria, or background values.

Table 2-3 presents a summary of surface water analytical data, including minimum and maximum detected concentrations. Table 2-3 also compares this analytical data to the USEPA Region 4 Fresh Water Screening values, FDEP Class III Surface Water Criteria, and background values.

Accordingly, these constituents were further evaluated during risk assessment to determine which would be retained as surface water COCs. Exceedances of USEPA Region 4 Fresh Water Screening values, FDEP Class III Surface Water Criteria, and background values in surface water are illustrated on Figure 2-6.

#### 2.5.2.3 Sediment/Ditch

Samples were collected from the ditch around the DRMO. Samples collected from the dry areas were designated as soil samples, and samples collected from under water were designated as sediment samples. Arsenic, cadmium, chromium, copper, PCBs, and PAHs were detected at concentrations in excess of the FDEP SCTLs for direct residential exposure for soil. Arsenic, chromium, lead, PCBs, and PAHs were detected at concentrations in excess of FDEP SCTLs for direct industrial exposure for soil. Alpha-BHC was detected at a concentration in excess of FDEP SCTL for leachability to groundwater. 4,4'-DDD and 4,4'-DDE were detected at concentrations exceeding USEPA Sediment Quality Assessment Guidelines (SQAG) values. The presence of these contaminants in the ditches is probably due to the storage of various materials at the site.

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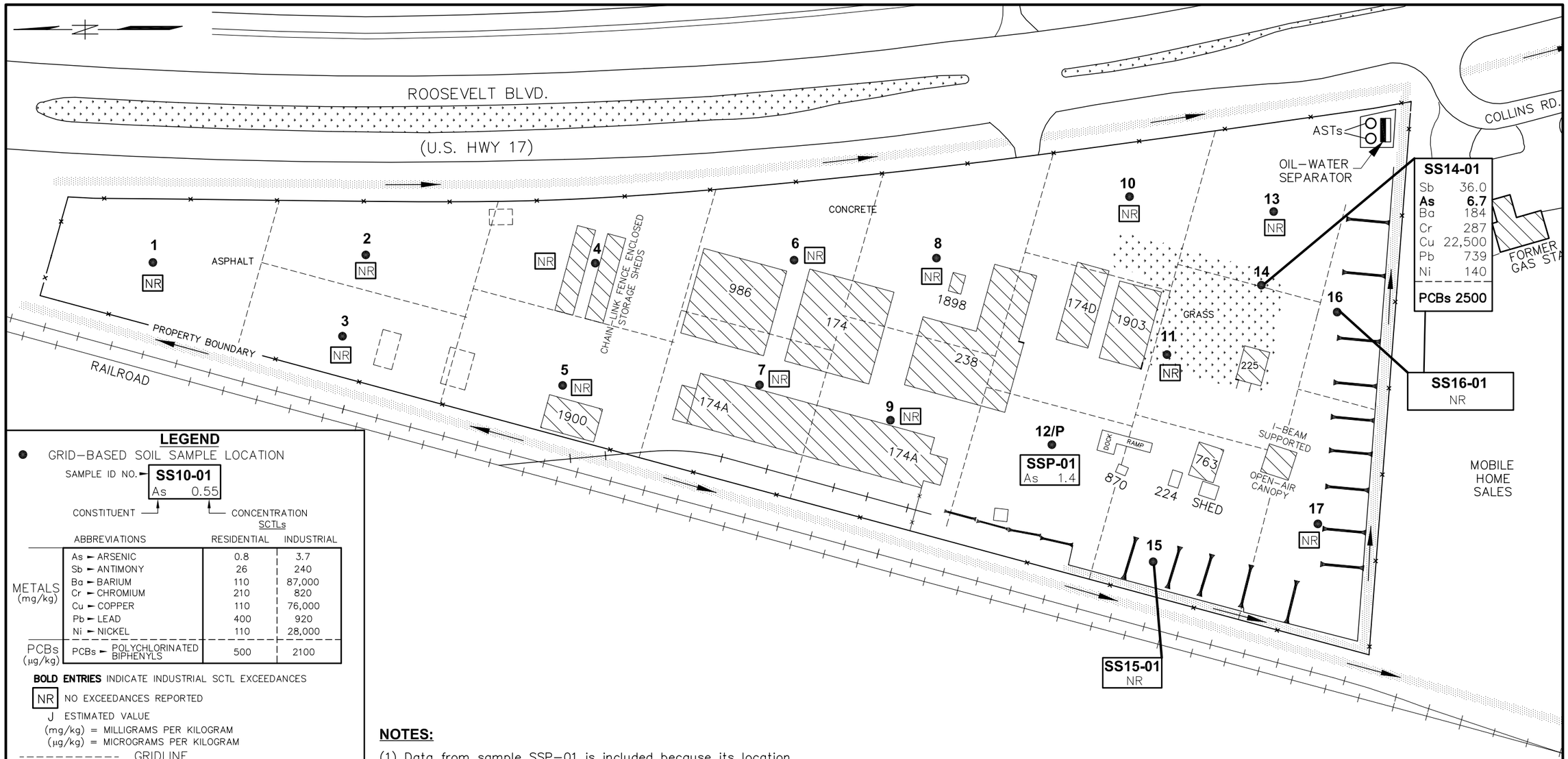


**LEGEND**

GRID–BASED SOIL SAMPLE LOCATION

SAMPLE ID NO. — **SS10-01** As 0.55

CONSTITUENT — CONCENTRATION

| ABBREVIATIONS | | SCTLs RESIDENTIAL | SCTLs INDUSTRIAL |
|---|---|---|---|
| METALS (mg/kg) | As ⊢ ARSENIC | 0.8 | 3.7 |
| | Sb ⊢ ANTIMONY | 26 | 240 |
| | Ba ⊢ BARIUM | 110 | 87,000 |
| | Cr ⊢ CHROMIUM | 210 | 820 |
| | Cu ⊢ COPPER | 110 | 76,000 |
| | Pb ⊢ LEAD | 400 | 920 |
| | Ni ⊢ NICKEL | 110 | 28,000 |
| PCBs (µg/kg) | PCBs ⊢ POLYCHLORINATED BIPHENYLS | 500 | 2100 |

**BOLD ENTRIES** INDICATE INDUSTRIAL SCTL EXCEEDANCES

NR NO EXCEEDANCES REPORTED

J ESTIMATED VALUE

(mg/kg) = MILLIGRAMS PER KILOGRAM

(µg/kg) = MICROGRAMS PER KILOGRAM

GRIDLINE

FENCE/PROPERTY BOUNDARY

DITCH

SURFACE WATER FLOW DIRECTION

**NOTES:**

(1) Data from sample SSP–01 is included because its location was used as a biased and grid–based (cell #12) sampling point

(2) PCBs reported in SS14–01 = sum of Aroclor–1254 (700 µg/kg) and Aroclor–1260 (1800 µg/kg)

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY LLK DATE 10/16/03

CHECKED BY DATE

COST/SCHED–AREA

SCALE AS NOTED

NAVFAC

CHEMICAL CONCENTRATIONS EXCEEDING FDEP SCTLs IN GRID–BASED SOIL SAMPLES
OU7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 2–4 REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

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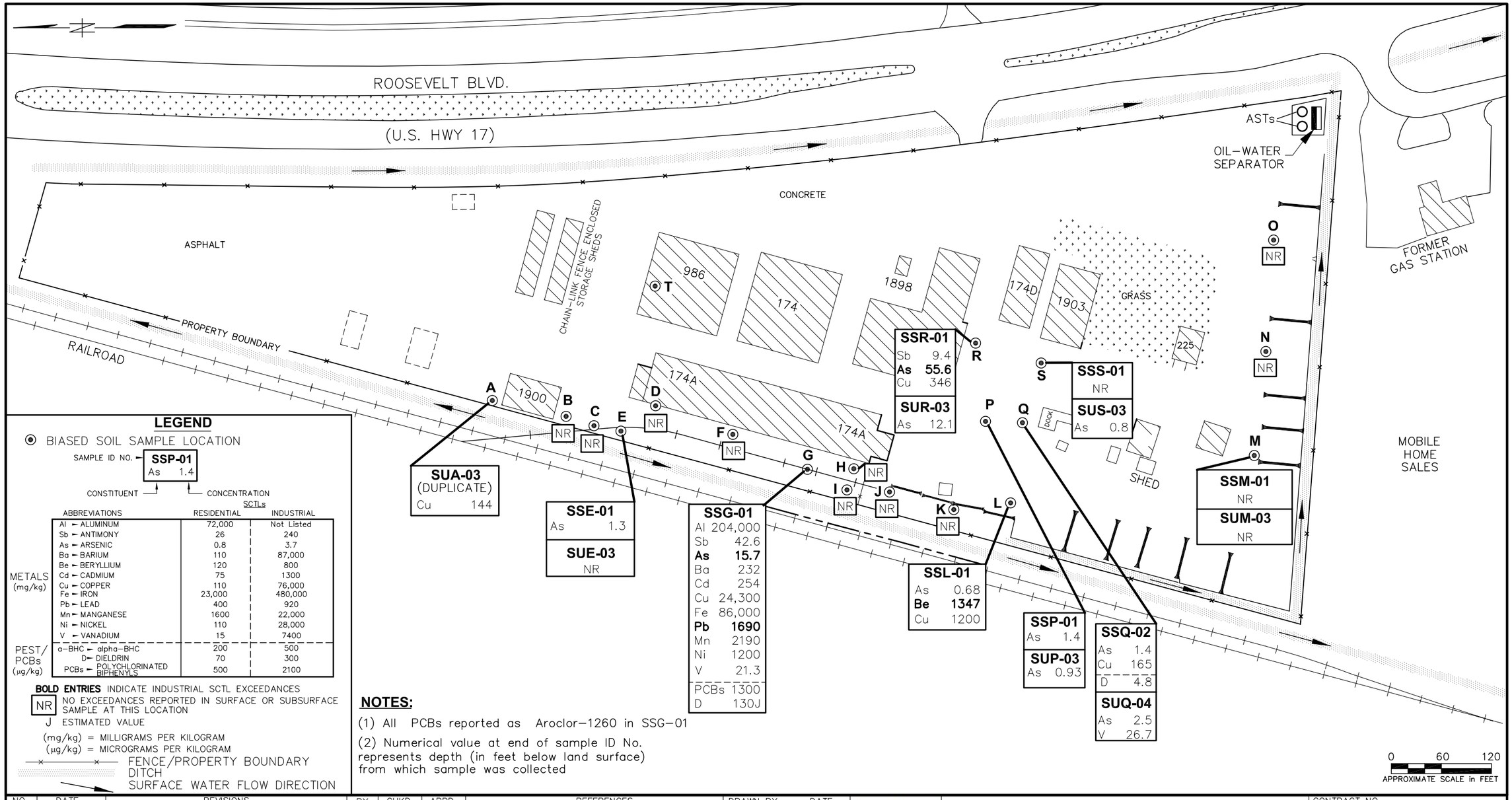


## LEGEND

◉ BIASED SOIL SAMPLE LOCATION

SAMPLE ID NO. – **SSP-01** As 1.4 (CONSTITUENT – CONCENTRATION)

| | ABBREVIATIONS | SCTLs RESIDENTIAL | SCTLs INDUSTRIAL |
|---|---|---|---|
| METALS (mg/kg) | Al – ALUMINUM | 72,000 | Not Listed |
| | Sb – ANTIMONY | 26 | 240 |
| | As – ARSENIC | 0.8 | 3.7 |
| | Ba – BARIUM | 110 | 87,000 |
| | Be – BERYLLIUM | 120 | 800 |
| | Cd – CADMIUM | 75 | 1300 |
| | Cu – COPPER | 110 | 76,000 |
| | Fe – IRON | 23,000 | 480,000 |
| | Pb – LEAD | 400 | 920 |
| | Mn – MANGANESE | 1600 | 22,000 |
| | Ni – NICKEL | 110 | 28,000 |
| | V – VANADIUM | 15 | 7400 |
| PEST/ PCBs (µg/kg) | a–BHC – alpha–BHC | 200 | 500 |
| | D – DIELDRIN | 70 | 300 |
| | PCBs – POLYCHLORINATED BIPHENYLS | 500 | 2100 |

**BOLD ENTRIES** INDICATE INDUSTRIAL SCTL EXCEEDANCES

NR NO EXCEEDANCES REPORTED IN SURFACE OR SUBSURFACE SAMPLE AT THIS LOCATION

J ESTIMATED VALUE

(mg/kg) = MILLIGRAMS PER KILOGRAM

(µg/kg) = MICROGRAMS PER KILOGRAM

FENCE/PROPERTY BOUNDARY

DITCH

SURFACE WATER FLOW DIRECTION

## NOTES:

(1) All PCBs reported as Aroclor–1260 in SSG–01

(2) Numerical value at end of sample ID No. represents depth (in feet below land surface) from which sample was collected

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY LLK DATE 10/16/03

CHECKED BY DATE

COST/SCHED–AREA

SCALE AS NOTED

NAVFAC

CHEMICAL CONCENTRATIONS EXCEEDING FDEP SCTLs IN BIASED SOIL SAMPLES
OU7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 2–5 REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

**Table 2-3**
**Surface Water Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 2

| Chemical | Frequency of Detection | Range of Detection | | Surface Water Screening Level [1] | | FDEP Class III Surface Water Criteria | Background Screening Concentration |
|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Freshwater | Saltwater | | |
| **VOCs (µg/L)** | | | | | | | |
| Chloromethane | 4/6 | 0.6 | 3 | NA | NA | <470.8[5] | NA |
| Bromomethane | 2/6 | 1 | 1 | NA | NA | 35 | NA |
| Acetone[3] | 6/6 | 2 | 23 | 1500 | NA | 1692 | NA |
| Carbon Disulfide[3] | 1/6 | 0.6 | 0.6 | 0.92 | NA | 105 | NA |
| Methylene Chloride[3] | 1/6 | 0.6 | 0.6 | 1930 | NA | <1580[5] | NA |
| 2-Butanone[3] | 1/6 | 5 | 5 | 14000 | NA | 120000 | NA |
| **Pesticides (µg/L)** | | | | | | | |
| alpha - BHC | 2/6 | 0.02 | 0.021 | 500 | 1400 | 0.0116 | NA |
| gamma - BHC (Lindane) | 2/6 | 0.02 | 0.021 | 0.08 | NA | 0.080 | NA |
| gamma - Chlordane | 2/6 | 0.011 | 0.011 | 0.0043 | 0.016 | 0.0043 | NA |
| 4,4'-DDE | 1/6 | 0.000033 | 0.000033 | 10.5 | 0.14 | 0.0006 | NA |
| 4,4'-DDD | 1/6 | 0.025 | 0.025 | 0.0064 | 0.025 | 0.003 | NA |
| Endosulfan I | 1/6 | 0.01 | 0.01 | 0.056 | 0.0087 | 0.056 | NA |
| Endosulfan Sulfate | 1/6 | 0.018 | 0.018 | 0.056 | 0.0087 | NL | NA |
| **Metals (µg/L)** | | | | | | | |
| Aluminum[4] | 6/6 | 206 | 19100 | 87 | NA | 13 | 211 |
| Antimony | 6/6 | 2.6 | 35.4 | 160 | NA | 4300 | NA |
| Arsenic | 5/6 | 1.2 | 41.6 | 190 | 36 | 50 | 1.6 |
| Barium | 6/6 | 31 | 536 | 4 | NA | 91.3 | 41.5 |
| Beryllium | 5/6 | 0.14 | 1.2 | 0.53 | NA | 0.13[5] | NA |
| Cadmium[4] | 6/6 | 2.2 | 207 | 0.66[2] | 9.3 | 0.66[2] | 0.73 |
| Calcium | 6/6 | 33900 | 200000 | NA | NA | NL | 19555 |
| Chromium | 6/6 | 1.7 | 174 | 11 | 50 | 11 | NA |
| Cobalt | 4/6 | 0.55 | 36.9 | 23 | NA | NL | NA |
| Copper | 6/6 | 6 | 1490 | 6.54[2] | 2.9 | 5.16[2] | 3.8 |
| Iron | 6/6 | 550 | 75200 | 1000 | NA | 1000 | 1218 |
| Lead | 6/6 | 1.6 | 1140 | 1.32[2] | 8.5 | 1.32[2] | 3.3 |
| Magnesium | 6/6 | 1735 | 17700 | NA | NA | NL | 3063 |
| Manganese | 6/6 | 17 | 1820 | 120 | NA | NL | 19.8 |
| Mercury | 4/6 | 0.04 | 0.98 | 0.012 | 0.024 | 0.012 | NA |
| Nickel | 6/6 | 4.3 | 217 | 87.71[2] | 8.3 | 29.02[2] | NA |
| Potassium | 6/6 | 1520 | 6340 | NA | NA | NL | 896 |
| Selenium | 3/6 | 1 | 3.8 | 5 | 71 | 5 | NA |
| Silver | 4/6 | 1.2 | 49 | 0.012[2] | 0.23 | 0.07 | NA |
| Sodium | 6/6 | 3100 | 15500 | NA | NA | NL | 10435 |
| Vanadium | 6/6 | 1 | 56.8 | 20 | NA | NL | 2.8 |
| Zinc | 6/6 | 19.7 | 4890 | 58.91[2] | 86 | 66.6[2] | 23.2 |

See notes at end of table.

**Table 2-3**
**Surface Water Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
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Jacksonville, Florida
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**Notes:**
(1) - Based on Region IV Water Management Division, Water Quality Standards Unit's Screening List, unless otherwise noted.
(2) - Hardness dependent. Table value assumes hardness (mg/L as $CaCO_3$) in freshwater = 50.
(3) - Oak Ridge National Laboratory(ORNL), Secondary Chronic Value (SCV).
(4) - Background values for aluminum and cadmium are for dissolved metals.
(5) - Annual average.
NL - not listed
µg/L = micrograms per liter
mg/L = milligrams per liter

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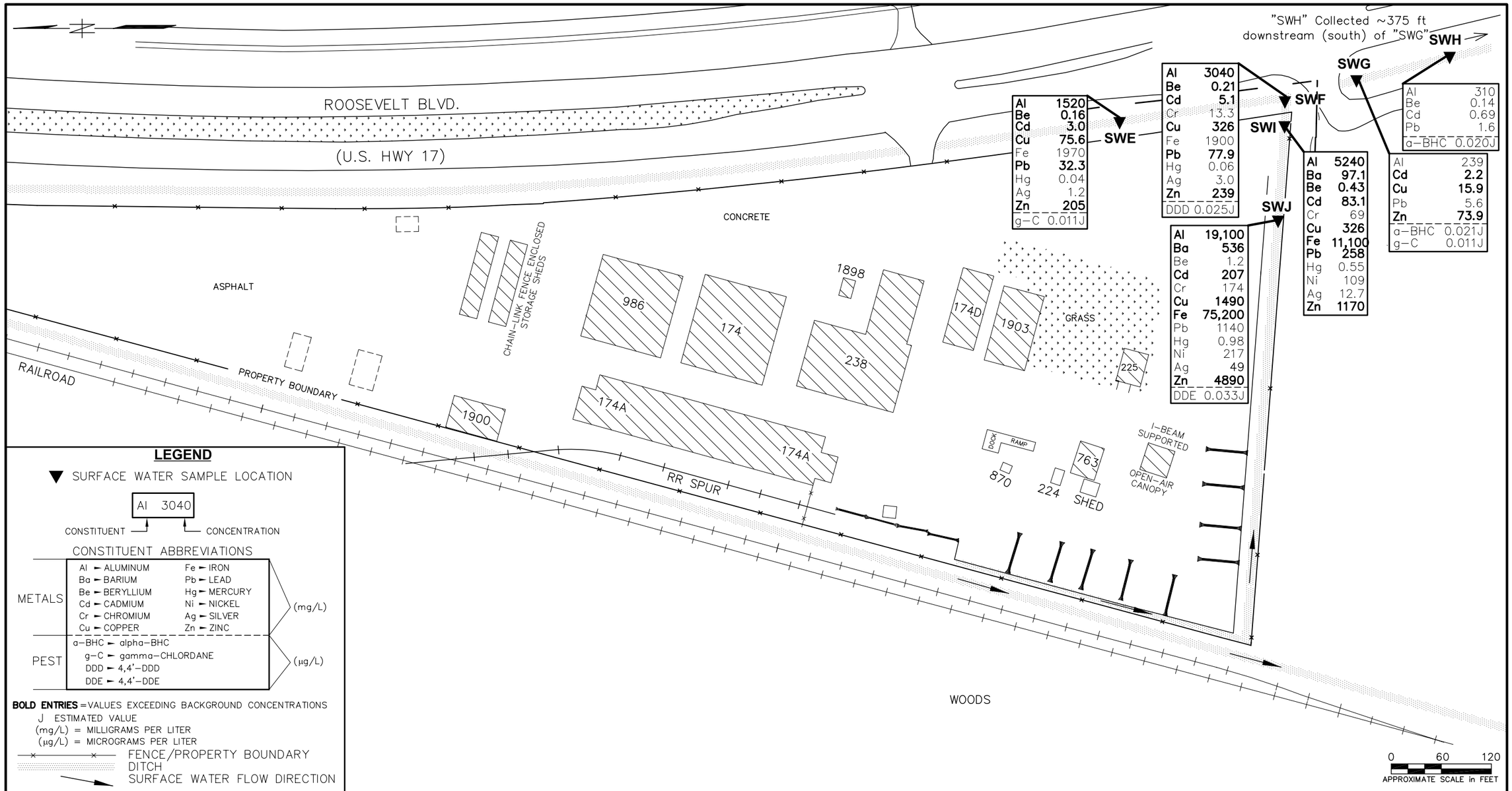


## LEGEND

▼ SURFACE WATER SAMPLE LOCATION

Al 3040
CONSTITUENT — CONCENTRATION

CONSTITUENT ABBREVIATIONS

| | | | |
|---|---|---|---|
| METALS | Al – ALUMINUM | Fe – IRON | (mg/L) |
| | Ba – BARIUM | Pb – LEAD | |
| | Be – BERYLLIUM | Hg – MERCURY | |
| | Cd – CADMIUM | Ni – NICKEL | |
| | Cr – CHROMIUM | Ag – SILVER | |
| | Cu – COPPER | Zn – ZINC | |
| PEST | a-BHC – alpha-BHC | | (µg/L) |
| | g-C – gamma-CHLORDANE | | |
| | DDD – 4,4'-DDD | | |
| | DDE – 4,4'-DDE | | |

**BOLD ENTRIES** = VALUES EXCEEDING BACKGROUND CONCENTRATIONS
J ESTIMATED VALUE
(mg/L) = MILLIGRAMS PER LITER
(µg/L) = MICROGRAMS PER LITER

FENCE/PROPERTY BOUNDARY
DITCH
SURFACE WATER FLOW DIRECTION

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY LLK DATE 10/16/03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

NAVFAC

CHEMICAL CONCENTRATIONS EXCEEDING CURRENT REGULATORY CRITERIA IN SURFACE WATER SAMPLES
OU 7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-6
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

Tables 2-4 and 2-5 present a summary of perimeter ditch soil and sediment analytical data, respectively, including maximum and 95-percent UCL concentrations. Tables 2-4 and 2-5 also compare this analytical data to the FDEP SCTLs for direct industrial exposure; direct residential exposure; and leachability to groundwater, SQAGs, USEPA Region 9 Residential and Industrial PRGs, and for inorganic analytes to the NAS Jacksonville background values.

Accordingly, these constituents were further evaluated during risk assessment to determine which would be retained as sediment COCs. Exceedances of residential SCTLs, SQAGs, and background values in sediment are illustrated on Figures 2-7 and 2-8.

#### 2.5.2.4 Groundwater

Aluminum; iron; manganese; lead; antimony; arsenic; cadmium; thallium; vanadium; vinyl chloride; and 1,1-DCE were detected in unfiltered groundwater samples from shallow monitoring wells at concentrations in excess of the FDEP GCTLs. The presence of these contaminants in the groundwater is probably due to the storage of various materials at the site. No contaminants were detected at concentrations greater than GCTLs in any of the samples from the deep monitoring wells.

Table 2-6 presents a summary of unfiltered groundwater analytical data, including maximum and 95-percent UCL concentrations. Table 2-6 also compares this analytical data to the FDEP GCTLs, USEPA Maximum Contaminant Level (MCLs), USEPA Region 9 Residential PRGs, and, for inorganic analytes, to the NAS Jacksonville background values. It should be noted that concentrations of inorganics were typically greater in unfiltered samples compared to filtered samples and suggests that inorganics are associated with suspended solids in the samples.

Accordingly, these constituents were further evaluated during the risk assessment to determine which would be retained as groundwater COCs. Exceedances of GCTLs and background values in groundwater are illustrated on Figure 2-9. The extent of the plume is about 0.13 acres.

#### 2.5.2.5 Radiological Survey

A RAD assessment was performed on soil, surface water, and groundwater. Radium was detected in soil samples at concentrations exceeding the USEPA guidance value of 5 picocuries per gram (pCi/g) (CFR 192). Radium-226 and gross alpha measurements from two groundwater samples exceeded the FDEP GCTLs. No criteria were exceeded in samples of surface water.

**Table 2-4**
**Perimeter Ditch Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **PAHs (µg/kg)** | | | | | | | | | |
| 2-Methylnaphthalene | 4/11 | 53 | 53 | 80000 | 6100 | 56000 N | 270000 | 19000 N | NA |
| Acenaphthylene | 1/11 | 720 | 720 | 1100000 | 27000 | 3700000 (6) N | 11000000 | 29000000 (6) N | NA |
| Anthracene | 1/11 | 560 | 560 | 18000 | 2500000 | 22000000 N | 260000000 | 100000000 N | NA |
| Benzo(a)anthracene | 11/11 | 4700 | 1535 | 1400 | 3200 | 620 C | 5000 | 2100 C | NA |
| Benzo(a)pyrene | 9/11 | 4300 | 1717 | 100 | 800 | 62 C | 500 | 210 C | NA |
| Benzo(b)fluoranthene | 11/11 | 8600 | 3181 | 1400 | 1000 | 620 C | 4800 | 2100 C | NA |
| Benzo(g,h,i)perylene | 11/11 | 3200 | 1297 | 2300000 | 32000000 | 2300000 (7) N | 41000000 | 29000000 (7) N | NA |
| Benzo(k)fluoranthene | 11/11 | 5500 | 2126 | 15000 | 25000 | 6200 C | 52000 | 21000 C | NA |
| Chrysene | 11/11 | 11000 | 3678 | 140000 | 77000 | 62000 C | 450000 | 210000 C | NA |
| Dibenzo(a,h)anthracene | 5/11 | 1400 | 1106 | 100 | 30000 | 62 C | 500 | 210 C | NA |
| Fluoranthene | 10/11 | 22000 | 6897 | 2900000 | 1200000 | 2300000 N | 48000000 | 22000000 N | NA |
| Indeno(1,2,3-CD)pyrene | 9/11 | 2800 | 1383 | 1500 | 28000 | 620 C | 5300 | 2100 C | NA |
| Naphthalene | 1/11 | 36 | 36 | 40000 | 1700 | 56000 N | 270000 | 19000 N | NA |
| Phenanthrene | 9/11 | 5800 | 1833 | 2000000 | 250000 | 2300000 (7) N | 30000000 | 29000000 (7) N | NA |
| Pyrene | 11/11 | 15000 | 5284 | 2200000 | 880000 | 2300000 N | 37000000 | 29000000 N | NA |
| **Pesticides/PCBs (µg/kg)** | | | | | | | | | |
| 4,4'-DDE | 5/11 | 140 | 52.9 | 3300 | 18000 | 1700 C | 13000 | 7000 C | NA |
| 4,4'-DDT | 1/11 | 23 | 8.44 | 3300 | 11000 | 1700 C | 13000 | 7000 C | NA |
| Alpha-BHC | 6/11 | 5 | 2.82 | 200 | 0.3 | 90 C | 500 | 360 C | NA |
| Aroclor-1254 | 3/11 | 1500 | 555 | 500 | 17000 (8) | 220 C | 2100 (8) | 740 C | NA |
| Aroclor-1260 | 11/11 | 2100 | 907 | 500 | 17000 (8) | 220 C | 2100 (8) | 740 C | NA |
| Delta-BHC | 1/11 | 2.1 | 2.1 | 22000 | 200 (9) | 90 C | 500 (9) | 360 (9) C | NA |
| Endosulfan Sulfate | 1/11 | 1.9 | 1.9 | 410000 | 3800 (10) | 370000 N | 6700000 (10) | 3700000 (10) N | NA |

See notes at end of table.

**Table 2-4**
**Perimeter Ditch Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **Pesticides/PCBs (µg/kg) (continued)** | | | | | | | | | |
| Gamma-BHC (Lindane) | 2/11 | 0.93 | 0.93 | 700 | 9 | 440 C | 2200 | 1700 C | NA |
| Gamma-Chlordane | 2/11 | 1.1 | 1.1 | 3100 (11) | 9600 (11) | 1600 (11) C | 12000 (11) | 6500 (11) C | NA |
| Heptachlor | 1/11 | 1.6 | 1.6 | 200 | 23000 | 110 C | 900 | 380 C | NA |
| Heptachlor Epoxide | 7/11 | 27 | 10.7 | 100 | 600 | 53 C | 400 | 190 C | NA |
| Methoxychlor | 1/11 | 41 | 26.3 | 370000 | 160000 | 310000 N | 7500000 | 3100000 N | NA |
| **TAL Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 11/11 | 152000 | 49408 | 72000 | (12) | 76000 N | (12) | 36000 N | 1340 |
| Antimony | 10/11 | 45.8 | 21.2 | 26 | 5 | 31 N | 240 | 15 N | NA |
| Arsenic | 9/11 | 12.1 | 5.90 | 0.8 | 29 | 0.39 C | 3.7 | 0.045 C | 0.8 |
| Barium | 11/11 | 302 | 158 | 110 (13) | 1600 | 5400 N | 87000 | 2600 N | 11.2 |
| Beryllium | 11/11 | 5.5 | 1.82 | 120 | 63 | 150 N | 800 | 73 N | NA |
| Cadmium | 11/11 | 88.8 | 44.0 | 75 (13) | 8 | 37 N | 1300 | 18 N | NA |
| Calcium | 11/11 | 80000 | 40797 | NA | NA | NA | NA | NA | 2360 |
| Chromium | 11/11 | 971 | 319 | 210 | 38 | 30 C | 420 (14) | 110 (14) N | 6.6 |
| Cobalt | 11/11 | 14 | 6.67 | 4700 | (12) | 4700 N | 110000 | 2200 N | NA |
| Copper | 11/11 | 17200 | 5242 | 110 (13) | (12) | 2900 N | 76000 | 1400 N | 5.8 |
| Iron | 11/11 | 52800 | 20832 | 23000 | (12) | 23000 N | 480000 | 11000 N | 852 |
| Lead | 11/11 | 1240 | 554 | 400 | (12) | 400 | 920 | 750 | 14.4 |
| Magnesium | 11/11 | 9100 | 3466 | NA | NA | NA | NA | NA | 99.8 |
| Manganese | 11/11 | 1560 | 570 | 1600 | (12) | 1800 N | 22000 | 880 N | 18 |
| Mercury | 10/11 | 1.6 | 0.628 | 3.4 | 2.1 | 23 N | 26 | 11 N | NA |
| Nickel | 11/11 | 559 | 188 | 110 (13) | 130 | 1600 N | 28000 | 730 N | 11 |
| Potassium | 11/11 | 863 | 313 | NA | NA | NA | NA | NA | NA |

See notes at end of table.

**Table 2-4**
**Perimeter Ditch Soil Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 3 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | FDEP SCTLs Leachability[3] | USEPA Region 9 PRGs Residential[4] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **TAL Metals (mg/kg) (continued)** | | | | | | | | | |
| Selenium | 5/11 | 7.1 | 3.02 | 390 | 5 | 390 N | 10000 | 180 N | NA |
| Silver | 9/11 | 28.3 | 14.3 | 390 | 17 | 390 N | 9100 | 180 N | NA |
| Sodium | 10/11 | 385 | 219 | NA | NA | NA | NA | NA | 288 |
| Thallium | 1/11 | 0.59 | 0.445 | NA | NA | 5.2 N | NA | 2.4 N | 0.42 |
| Vanadium | 11/11 | 20.7 | 12.5 | 15 (13) | 980 | 550 N | 7400 | 260 N | 3.8 |
| Zinc | 11/11 | 3430 | 1552 | 23000 | 6000 | 23000 N | 560000 | 11000 N | 15.2 |

**Notes:**
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - If UCL exceeds the maximum detected concentration then the maximum detected concentration is presented.
(3) - FDEP SCTLs per Chapter 62-777, FAC (August 1999).
(4) - USEPA Region 9 PRGs, November 1, 2000 (CR = 1E-6, HI = 1).
(5) - Two times the mean concentration.
(6) - Value is for Acenaphthene.
(7) - Value is for Pyrene.
(8) - Value is for Aroclor mixtures.
(9) - Value is for alpha-BHC.
(10) - Value is for Endosulfan.
(11) - Value is for Chlordane.
(12) - Contaminant is not a concern for this default exposure scenario (Chapter 62-777, FAC).
(13) - Leachability values may be derived using the SPLP Test to calculate site-specific SCTLs or may be determined using TCLP in the event oily wastes are present (Chapter 62-777, FAC).
(14) - Value is for Hexavalent Chromium.

## Table 2-5
## Sediment Sample Results Summary
## Operable Unit 7, Potential Source of Contamination 46

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | USEPA Region 9 PRGs Residential[5] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[5] | SQAGs (mg/kg)[4] | Background Screening Concentration[6] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **PAHs (µg/kg)** | | | | | | | | | |
| Benzo(a)anthracene | 6/7 | 580 | 301 | 1400 | 620 C | 5000 | 2100 C | 330 | NA |
| Benzo(a)pyrene | 7/7 | 700 | 387 | 100 | 62 C | 500 | 210 C | 330 | NA |
| Benzo(b)fluoranthene | 7/7 | 1300 | 797 | 1400 | 620 C | 4800 | 2100 C | NA | NA |
| Benzo(g,h,i)perylene | 7/7 | 800 | 512 | 2300000 | 2300000 (7) N | 41000000 | 29000000 (7) N | NA | NA |
| Benzo(k)fluoranthene | 7/7 | 530 | 328 | 15000 | 6200 C | 52000 | 21000 C | NA | NA |
| Chrysene | 7/7 | 930 | 551 | 140000 | 62000 C | 450000 | 210000 C | 330 | NA |
| Dibenzo(a,h)anthracene | 7/7 | 250 | 147 | 100 | 62 C | 500 | 210 C | 330 | NA |
| Fluoranthene | 7/7 | 1200 | 808 | 2900000 | 2300000 N | 48000000 | 22000000 N | 330 | NA |
| Fluorene | 1/4 | 110 | 110 | 2200000 | 2600000 N | 28000000 | 26000000 N | NA | NA |
| Indeno(1,2,3-cd)pyrene | 7/7 | 500 | 346 | 1500 | 620 C | 5300 | 2100 C | NA | NA |
| Phenanthrene | 7/7 | 700 | 374 | 2000000 | 2300000 (7) N | 30000000 | 29000000 (7) N | NA | NA |
| Pyrene | 7/7 | 1400 | 814 | 2200000 | 2300000 N | 37000000 | 29000000 N | 330 | NA |
| **Pesticides/PCBs (µg/kg)** | | | | | | | | | |
| 4,4'-DDD | 6/7 | 230 | 128 | 4600 | 2400 C | 18000 | 7000 C | 3.3 | NA |
| 4,4'-DDE | 5/7 | 17 | 13.2 | 3300 | 1700 C | 13000 | 7000 C | 3.3 | NA |
| Alpha-BHC | 1/4 | 1.8 | 1.80 | 200 | 90 C | 500 | 360 C | NA | NA |
| Aroclor-1248 | 2/7 | 260 | 152 | 500 (8) | 220 C | 2100 (8) | 740 C | NA | NA |
| Aroclor-1254 | 6/7 | 2000 | 925 | 500 (8) | 220 C | 2100 (8) | 740 C | NA | NA |
| Aroclor-1260 | 7/7 | 1300 | 643 | 500 (8) | 220 C | 2100 (8) | 740 C | NA | NA |
| Dieldrin | 1/7 | 3.3 | 3.30 | 70 | 30 C | 300 | 110 C | 3.3 | NA |
| Endrin Ketone | 1/4 | 5.7 | 5.67 | 21000 (9) | 18000 (9) N | 340000 (9) | 180000 (9) N | NA | NA |
| Gamma-BHC | 1/4 | 2.2 | 2.20 | 700 | 440 C | 2200 | 1700 C | 3.3 | NA |
| Heptachlor | 4/7 | 6.6 | 3.87 | 200 | 110 C | 900 | 380 C | NA | NA |

See notes at end of table.

## Table 2-5
## Sediment Sample Results Summary
## Operable Unit 7, Potential Source of Contamination 46

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | USEPA Region 9 PRGs Residential[5] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[5] | SQAGs (mg/kg)[4] | Background Screening Concentration[6] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **Pesticides/PCBs (µg/kg) (continued)** | | | | | | | | | |
| Heptachlor Epoxide | 1/4 | 3.8 | 3.58 | 100 | 53 C | 400 | 190 C | NA | NA |
| **TAL Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 7/7 | 19800 | 11159 | 72000 | 76000 N | (10) | 36000 N | NA | 1190 |
| Antimony | 4/7 | 15.6 | 8.60 | 26 | 31 N | 240 | 15 N | 12 | 9.2 |
| Arsenic | 7/7 | 9.8 | 4.97 | 0.8 | 0.39 C | 3.7 | 0.045 C | 7.24 | 1.26 |
| Barium | 7/7 | 191 | 92.6 | 110 (10) | 5400 N | 87000 | 2600 N | NA | 9.8 |
| Beryllium | 5/7 | 1.3 | 0.727 | 120 | 150 N | 800 | 73 N | NA | 0.48 |
| Cadmium | 7/7 | 199 | 87.9 | 75 (10) | 37 N | 1300 | 18 N | 1 | 0.6 |
| Calcium | 7/7 | 67500 | 40740 | NA | NA | NA | NA | NA | 6468 |
| Chromium | 7/7 | 206 | 99.5 | 210000 (11) | 30 (11) C | 420 (11) | 110 (11) N | 52.3 | 3.8 |
| Cobalt | 7/7 | 21 | 9.44 | 4700 | 4700 N | 110000 | 2200 N | NA | 3.8 |
| Copper | 7/7 | 940 | 468 | 110 | 2900 N | 76000 | 1400 N | 18.7 | 7 |
| Iron | 7/7 | 29500 | 14357 | 23000 | 23000 N | 480000 | 11000 N | NA | 2300 |
| Lead | 7/7 | 694 | 335 | 400 | 400 | 920 | 750 | 30.2 | 14.4 |
| Magnesium | 7/7 | 3340 | 1662 | NA | NA | NA | NA | NA | 131 |
| Manganese | 7/7 | 241 | 116 | 1600 | 1800 N | 22000 | 880 N | NA | 6.8 |
| Mercury | 3/7 | 1.1 | 0.500 | 3.4 | 23 N | 26 | 11 N | 0.13 | 0.1 |
| Nickel | 7/7 | 250 | 112 | 110 (10) | 1600 N | 28000 | 730 N | 15.9 | 6.5 |
| Potassium | 7/7 | 666 | 345 | NA | NA | NA | NA | NA | 218 |
| Selenium | 1/7 | 10 | 4.40 | 390 | 390 N | 10000 | 180 N | NA | 0.42 |
| Silver | 7/7 | 35.1 | 16.2 | 390 | 390 N | 9100 | 180 N | 2 | NA |
| Sodium | 3/7 | 341 | 356 | NA | NA | NA | NA | NA | 498 |

See notes at end of table.

## Table 2-5
## Sediment Sample Results Summary
## Operable Unit 7, Potential Source of Contamination 46

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 3 of 3

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP SCTLs Residential[3] | USEPA Region 9 PRGs Residential[5] | FDEP SCTLs Industrial[3] | USEPA Region 9 PRGs Industrial[5] | SQAGs (mg/kg)[4] | Background Screening Concentration[6] |
|---|---|---|---|---|---|---|---|---|---|
| | | Maximum Detected | Normal UCL[2] | | | | | | |
| **TAL Metals (mg/kg) (continued)** | | | | | | | | | |
| Vanadium | 7/7 | 46 | 23.5 | 15 (10) | 550 N | 7400 | 260 N | NA | 5.2 |
| Zinc | 7/7 | 2770 | 1274 | 23000 | 23000 N | 560000 | 11000 N | 124 | 18.4 |

**Notes:**
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - If UCL exceeds the maximum detected concentration, then the maximum detected concentration is presented.
(3) - FDEP SCTLs per Chapter 62-777, FAC (August 1999).
(4) - USEPA Region IV Waste Management Division sediment screening values for hazardous waste sites.
(5) - USEPA Region IX PRGs, November 1, 2000 (CR = 1E-6, HI = 1).
(6) - Two times the mean concentration.
(7) - Value is for Pyrene.
(8) - Value is for Aroclor mixtures.
(9) - Value is for Endrin.
(10) - Contaminant is not a concern for this default exposure scenario (Chapter 62-777, FAC).
(11) - Value is for Hexavalent Chromium.

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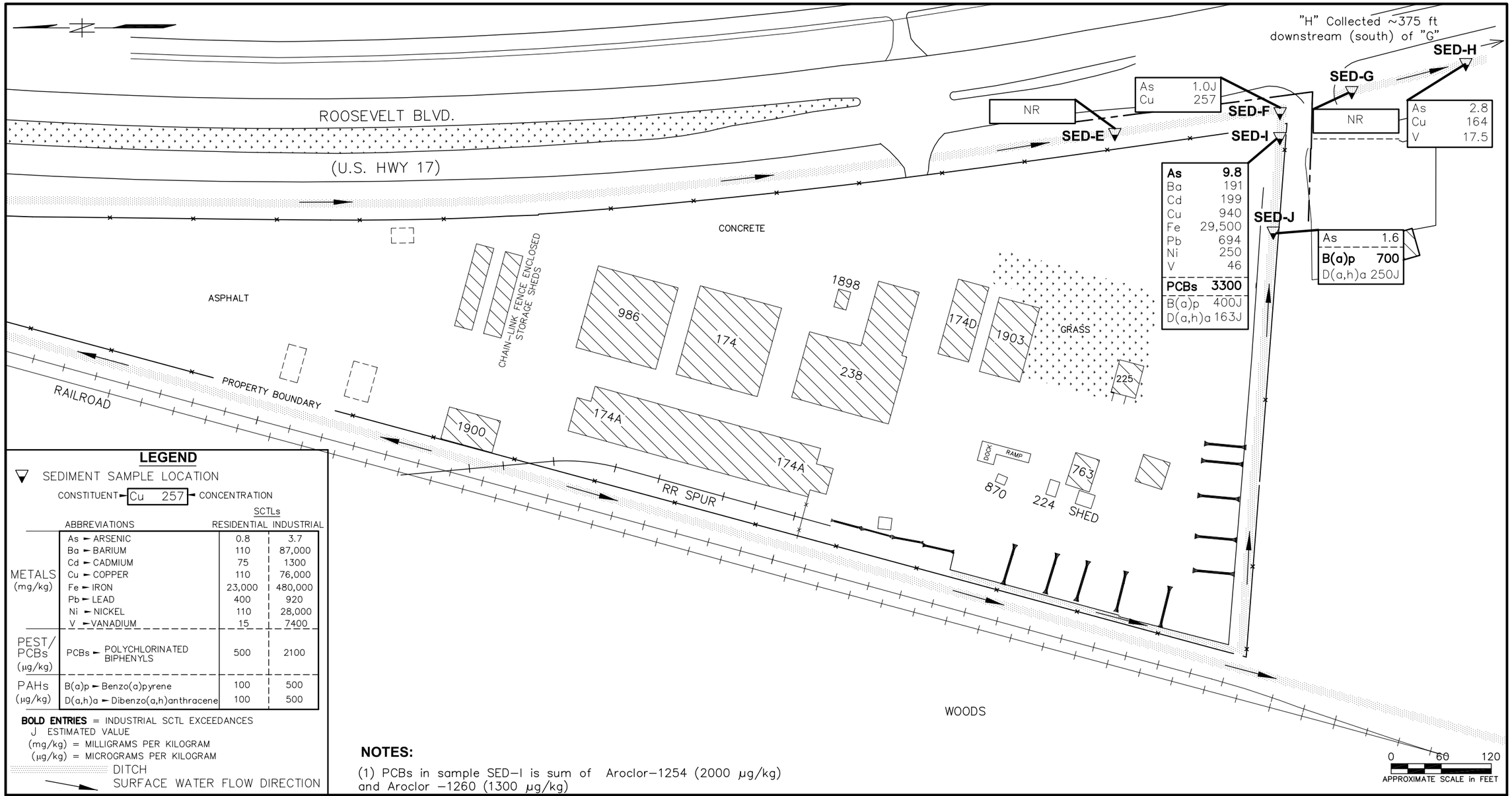


## LEGEND

▽ SEDIMENT SAMPLE LOCATION

CONSTITUENT ► Cu 257 ◄ CONCENTRATION

| | ABBREVIATIONS | SCTLs RESIDENTIAL | SCTLs INDUSTRIAL |
|---|---|---|---|
| METALS (mg/kg) | As ► ARSENIC | 0.8 | 3.7 |
| | Ba ► BARIUM | 110 | 87,000 |
| | Cd ► CADMIUM | 75 | 1300 |
| | Cu ► COPPER | 110 | 76,000 |
| | Fe ► IRON | 23,000 | 480,000 |
| | Pb ► LEAD | 400 | 920 |
| | Ni ► NICKEL | 110 | 28,000 |
| | V ► VANADIUM | 15 | 7400 |
| PEST/ PCBs (µg/kg) | PCBs ► POLYCHLORINATED BIPHENYLS | 500 | 2100 |
| PAHs (µg/kg) | B(a)p ► Benzo(a)pyrene | 100 | 500 |
| | D(a,h)a ► Dibenzo(a,h)anthracene | 100 | 500 |

**BOLD ENTRIES** = INDUSTRIAL SCTL EXCEEDANCES
J ESTIMATED VALUE
(mg/kg) = MILLIGRAMS PER KILOGRAM
(µg/kg) = MICROGRAMS PER KILOGRAM
DITCH
SURFACE WATER FLOW DIRECTION

**NOTES:**

(1) PCBs in sample SED-I is sum of Aroclor-1254 (2000 µg/kg) and Aroclor -1260 (1300 µg/kg)

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY DATE: LLK 10/16/03
CHECKED BY DATE:
COST/SCHED-AREA:
SCALE: AS NOTED

CHEMICAL CONCENTRATIONS EXCEEDING FDEP SCTLs IN SEDIMENT SAMPLES
OU 7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-7
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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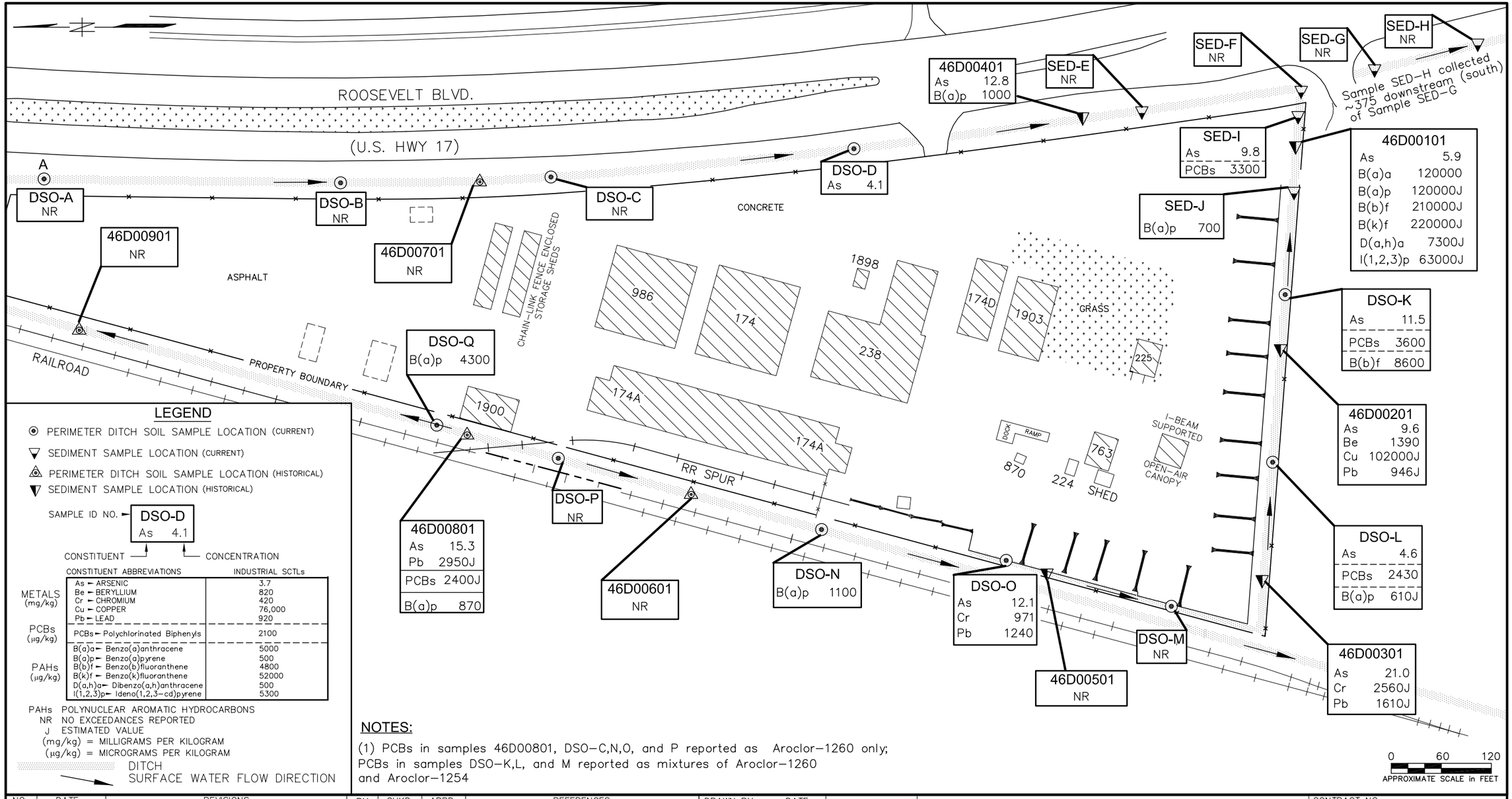


## LEGEND

- PERIMETER DITCH SOIL SAMPLE LOCATION (CURRENT)
- SEDIMENT SAMPLE LOCATION (CURRENT)
- PERIMETER DITCH SOIL SAMPLE LOCATION (HISTORICAL)
- SEDIMENT SAMPLE LOCATION (HISTORICAL)

SAMPLE ID NO. → DSO-D As 4.1 ← CONCENTRATION
CONSTITUENT ←

| | CONSTITUENT ABBREVIATIONS | INDUSTRIAL SCTLs |
|---|---|---|
| METALS (mg/kg) | As – ARSENIC | 3.7 |
| | Be – BERYLLIUM | 820 |
| | Cr – CHROMIUM | 420 |
| | Cu – COPPER | 76,000 |
| | Pb – LEAD | 920 |
| PCBs (µg/kg) | PCBs – Polychlorinated Biphenyls | 2100 |
| PAHs (µg/kg) | B(a)a – Benzo(a)anthracene | 5000 |
| | B(a)p – Benzo(a)pyrene | 500 |
| | B(b)f – Benzo(b)fluoranthene | 4800 |
| | B(k)f – Benzo(k)fluoranthene | 52000 |
| | D(a,h)a – Dibenzo(a,h)anthracene | 500 |
| | I(1,2,3)p – Ideno(1,2,3-cd)pyrene | 5300 |

PAHs POLYNUCLEAR AROMATIC HYDROCARBONS
NR NO EXCEEDANCES REPORTED
J ESTIMATED VALUE
(mg/kg) = MILLIGRAMS PER KILOGRAM
(µg/kg) = MICROGRAMS PER KILOGRAM

DITCH
SURFACE WATER FLOW DIRECTION

## NOTES:

(1) PCBs in samples 46D00801, DSO-C,N,O, and P reported as Aroclor-1260 only; PCBs in samples DSO-K,L, and M reported as mixtures of Aroclor-1260 and Aroclor-1254

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY LLK DATE 10/16/03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

CURRENT AND HISTORICAL
CHEMICAL CONCENTRATIONS EXCEEDING
INDUSTRIAL CRITERIA IN PERIMETER DITCH SOIL SAMPLES
OU 7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-8
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

**Table 2-6**
**Groundwater Sample Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Analyte | Frequency of Detection[1] | Screening Concentration | | FDEP GCTLs[3] | USEPA MCLs | USEPA Region 9 PRGs Residential[4] | Background Screening Concentration[5] |
|---|---|---|---|---|---|---|---|
| | | Maximum Detected* | Normal UCL[2] | | | | |
| **VOCs (µg/L)** | | | | | | | |
| Chloromethane | 1/6 | 4 | 3.25 | 2.7 | NA | 1.2 C | NA |
| Vinyl Chloride | 1/6 | 1 | 1 | 1 | 2 | 0.15 C | NA |
| Bromomethane | 4/6 | 2 | 2 | 9.8 | NA | 3.9 N | NA |
| 1,1-Dichloroethene | 1/6 | 0.9 | 0.9 | 7 | 7 | 0.054 C | NA |
| Acetone | 2/6 | 4 | 4 | 700 | NA | 1600 N | NA |
| Carbon Disulfide | 2/6 | 2 | 2 | 700 | NA | 360 N | NA |
| Methylene Chloride | 0/6 | 0 | | 5 | 5 | 8.9 C | NA |
| 1,1-Dichloroethane | 1/6 | 5 | 5 | 70 | NA | 590 N | NA |
| cis-1,2-Dichloroethene | 2/6 | 5 | 3.82 | 70 | 70 | 43 N | NA |
| 1,2-Dichloroethane | 1/6 | 1 | 1 | 3 | 5 | 0.35 C | NA |
| Trichloroethene | 1/6 | 0.4 | 0.4 | 3 | 5 | 2.8 C | NA |
| **TAL Metals (µg/L)** | | | | | | | |
| Aluminum | 6/6 | 32800 | 22672 | 200 | NA | 76000 N | 147318 |
| Antimony | 3/6 | 44 | 23 | 6 | 6 | 15 N | 43 |
| Arsenic | 5/6 | 115 | 59 | 50 | 50 | 0.045 C | 13.2 |
| Barium | 6/6 | 244 | 229 | 2000 | 2000 | 5400 N | 616 |
| Beryllium | 6/6 | 1.8 | 1.128 | 4 | 4 | 150 N | 8.2 |
| Cadmium | 3/6 | 26.8 | 16.173 | 5 | 5 | 18 N | 8.2 |
| Calcium | 6/6 | 87100 | 66967 | NA | NA | NA | 59066 |
| Chromium | 6/6 | 40.1 | 29.9 | 100 | 100 | 30 C | 208 |
| Cobalt | 6/6 | 3.4 | 3.11 | 420 | NA | 4700 N | 22.6 |
| Copper | 5/6 | 398 | 212.13 | 1000 | 1300 | 1400 N | 40.4 |
| Iron | 6/6 | 17050 | 12841 | 300 | NA | 23000 N | 68292 |
| Lead | 5/6 | 46.9 | 33 | 15 | 15 | 15 | 45.8 |
| Magnesium | 6/6 | 18300 | 11693 | NA | NA | NA | 19316 |
| Managanese | 6/6 | 317 | 224 | 50 | NA | 1800 N | 204 |
| Nickel | 6/6 | 18.3 | 13.5 | 100 | NA | 1600 N | 74.8 |
| Potassium | 6/6 | 5170 | 4261 | NA | NA | NA | 9038 |
| Selenium | 4/6 | 2.1 | 1.67 | 50 | 50 | 390 N | 13.8 |
| Silver | 2/6 | 2.4 | 1.35 | 100 | NA | 180 N | 9.4 |
| Sodium | 6/6 | 43800 | 27274 | 160000 | NA | NA | 24626 |
| Thallium | 1/6 | 2.4 | 2 | 2 | 2 | 2.4 N | 11.4 |
| Vanadium | 6/6 | 69.8 | 43.6 | 49 | NA | 550 N | 294 |
| Zinc | 6/6 | 684 | 402.9 | 5000 | NA | 11000 N | 173.2 |
| **Pesticides (µg/L)** | | | | | | | |
| 4,4'-DDE | 2/6 | 0.04 | 0.04 | 0.1 | NA | 1.7 C | NA |
| Dieldrin | 1/6 | 0.018 | 0.018 | 0.005 | NA | 0.03 C | NA |
| 4,4'-DDD | 1/6 | 0.032 | 0.032 | 0.1 | NA | 2.4 C | NA |
| gamma-Chlordane | 1/6 | 0.012 | 0.012 | 2 | 2 | 1.6[7] C | NA |

Notes:
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - If UCL exceeds the maximum detected concentration, then the maximum detected concentration is presented.
(3) - FDEP GCTLs per Chapter 62-777, FAC (August 1999).
(4) - USEPA Region 9 PRGs, November 1, 2000 (CR = 1E-6, HI = 1).
(5) - Two times the mean concentration.
(6) - Value is for Hexavalent Chromium.
(7) - Value is for Chlordane.
* = All values are from unfiltered samples.

ROOSEVELT BLVD.

(U.S. HWY 17)

ASPHALT

RAILROAD

PROPERTY BOUNDARY

CHAIN-LINK FENCE ENCLOSED STORAGE SHEDS

986

174

1898

238

174D

1903

GRASS

225

1900

174A

174A

RR SPUR

870

224

763

SHED

I-BEAM SUPPORTED OPEN-AIR CANOPY

ASTs

FORMER GAS STATION

MOBILE HOME SALES

WOODS

**MW-1**

| | 2/28/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **808** | **438** | 180 |
| Fe | **5390** | **2530** | **2400** |

**MW-5**

| | 2/28/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **32,800** | **3460** | **3060** |
| Fe | **9890** | 225 | 33.8 |
| Pb | **21.8** | 1.1B | 0.65B |
| V | **69.8** | 2.5B | 1.8B |

**MW-7**

| | 3/02/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **240** | **21,400** | 76.8B |
| Sb | **44** | **24.8** | **37.7** |
| Cd | **14** | **29.2** | 0.6 |
| Fe | **2950** | **35,300** | **20,500** |
| MN | **239** | **258** | **217** |
| D | **0.018J** | <0.10 | NS |

**MW-2**

| | 3/01/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **6420** | **648** | 152 |
| Cd | **26.8** | **5.5** | **6.5** |
| Fe | **2310** | **2240** | **2140** |
| Pb | **29.2** | **30.2** | **15.8** |
| Mn | **317** | **110** | **120** |
| CM | **4J** | <5 | NS |

**MW-4** **MW-8**

| | 3/01/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **24,400** | **12,000** | 34.1B |
| Fe | **11,400** | **5890** | **2440** |
| Pb | **46.9** | **24.8** | 0.68B |
| Mn | **60.7** | 41.6 | 24.3 |
| VC | **1J** | **2J** | NS |
| 1,1-DCE | **7** | **8** | NS |

**MW-9** **MW-3**

| | 2/28/01 | 12/12/01 | |
|---|---|---|---|
| | TOTAL | TOTAL | FILTERED |
| Al | **3500** | 181 | 110 |
| As | **117** | **167** | **162** |
| Fe | **17,600** | **22,600** | **22,300** |
| Mn | **71.5** | 49.2 | 49.1 |
| Tl | **2.4** | <1.58 | <1.58 |

## LEGEND

- CONVENTIONAL SHALLOW MONITORING WELL
- CONVENTIONAL DEEP MONITORING WELL
- SHALLOW MICROWELL (DPT)

Al 808
Fe 5390

CONSTITUENT — CONCENTRATION ( g/L)

CONSTITUENT ABBREVIATIONS

| | | | | |
|---|---|---|---|---|
| METALS | Al | ALUMINUM | Pb | LEAD |
| | Sb | ANTIMONY | Mn | MANGANESE |
| | As | ARSENIC | Tl | THALLIUM |
| | Cd | CADMIUM | V | VANADIUM |
| | Fe | IRON | | |
| PEST | D | DIELDRIN | | |
| VOCs | CM | CHLOROMETHANE | | |
| | VC | VINYL CHLORIDE | | |
| | DCE | DICHLOROETHENE | | |

J = ESTIMATED VALUE
B = CONTAMINANT ALSO REPORTED IN METHOD BLANK
NS = NO SAMPLE ANALYZED
(µg/L) = MICROGRAMS PER LITER

BOLD VALUES EXCEED FDEP GCTLs

FENCE/PROPERTY BOUNDARY
DITCH
SURFACE WATER FLOW DIRECTION

0 60 120
APPROXIMATE SCALE in FEET

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY DATE: LLK 10/16/03
CHECKED BY DATE:
COST/SCHED-AREA:
SCALE: AS NOTED

NAVFAC

CHEMICAL CONCENTRATIONS EXCEEDING FDEP GCTLs IN GROUNDWATER SAMPLES
OU 7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE:
APPROVED BY DATE:
DRAWING NO. FIGURE 2-9
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

Tables 2-7 and 2-8 presents a summary of soil and groundwater analytical data, respectively, including minimum and maximum detected concentrations. Tables 2-7 and 2-8 also compare the analytical data to the NAS Jacksonville background values and radiological criteria.

Accordingly, these constituents were further evaluated during risk assessment to determine which would be retained as COCs. Exceedances of radiological criteria in all media are illustrated on Figures 2-10 and 2-11.

### 2.5.3 Current and Potential Future Site Uses

PSC 46 continues to be used as the DRMO facility and is expected to remain that way in the future. This operation is industrial in nature. There are no current or future planned uses of shallow groundwater. Site RAOs support industrial risk exposure; therefore, potential future uses for PSC 46 must be limited to commercial or industrial exposure land use unless the levels of soil and groundwater contamination meet unrestricted use and exposure criteria.

## 2.6 SUMMARY OF SITE RISKS

### 2.6.1 Human Health Risk Assessment

The objective of a HHRA is to characterize the risks associated with potential exposures to site related constituents. The HHRA is being conducted as a Preliminary Risk Evaluation (PRE). The human health PRE is a screening level evaluation of potential risks from site constituents to human receptors at the site. While a site may have numerous hypothetical receptors, as a site screening tool it is common to use the most sensitive human receptor for risk calculations. Therefore, the industrial receptor was selected to evaluate current land use and the residential receptor was used to evaluate potential risks if land use at the site changes in the future. Media evaluated in the human health PRE included soil, sediment, and groundwater.

The PRE is a screening-level evaluation of potential risks from site constituents to human receptors at the site. The risks calculated in a PRE are derived by a comparison of exposure concentrations to SCTLs, GCTLs, or PRGs, whichever is appropriate. These criteria are derived using default exposure assumptions established by the FDEP for SCTLs and GCTLs and the USEPA for PRGs. Because there are no deviations between the Navy and the regulatory agencies regarding those exposure assumptions or pathways defined by the regulatory agencies for residential and industrial exposures, this approach was used to streamline the risk evaluation.

**Table 2-7**
**Soil Sample Radionuclide Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Analyte | Frequency of Detection[1] | Maximum Detected | Minimum Detected | Background Screening Concentration[3] |
|---|---|---|---|---|
| **Radionuclides (pCi/g)** | | | | |
| Total Radium[2] | 13/13 | 92.70 | 1.00 | NL[3] |
| Radium 226 | 13/13 | 98.50 | 1.43 | NL |
| Radium 228 | 11/13 | 3.00 | 0.00 | 2 |
| Total Uranium | 13/13 | 2.71 | 0.14 | NL |
| Uranium 234 | 13/13 | 1.68 | 0.08 | 4.6 |
| Uranium 235 | 11/13 | 0.08 | 0.00 | NL |
| Uranium 238 | 13/13 | 1.19 | 0.04 | 4.6 |
| Total Thorium | 13/13 | 1.14 | 0.08 | NL |
| Thorium 228 | 8/13 | 0.40 | 0.00 | NL |
| Thorium 230 | 13/13 | 0.44 | 0.04 | NL |
| Thorium 232 | 12/13 | 0.37 | 0.01 | 2.2 |

Notes:
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - Total radium has a 1.3 pCi/g background subtracted.
(3) - Applicable limits are as follows: Total Radium - 5 pCi/g.

**Table 2-8**
**Groundwater Sample Radionuclide Results Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Analyte | Frequence of Detection[1] | Maximum Detected | Minimum Detected | FDEP GTCLs[2] |
|---|---|---|---|---|
| **Radionuclides (pCi/g)** | | | | |
| Gross Alpha | 6/6 | 34.30 | 4.60 | 15[2] |
| Gross Beta | 6/6 | 24.10 | 3.78 | NL |
| Total Radium | 6/6 | 9.40 | 2.26 | 5 |
| Total Uranium | 6/6 | 6.86 | 0.18 | 21 |
| Uranium 234 | 6/6 | 3.65 | 0.05 | NL |
| Uranium 235 | 2/6 | 0.18 | 0.00 | NL |
| Uranium 238 | 6/6 | 3.03 | 0.13 | NL |
| Total Thorium | 6/6 | 1.11 | 0.17 | NL |
| Thorium 228 | 6/6 | 0.37 | 0.03 | NL |
| Thorium 230 | 6/6 | 0.51 | 0.10 | NL |
| Thorium 232 | 6/6 | 0.24 | 0.02 | NL |

**Notes:**
(1) - Duplicates were counted as one sample in determining frequency of detection.
(2) - Gross Alpha standard is from 40 CFR 40 141.15. Other values are FDEP GCTLs.

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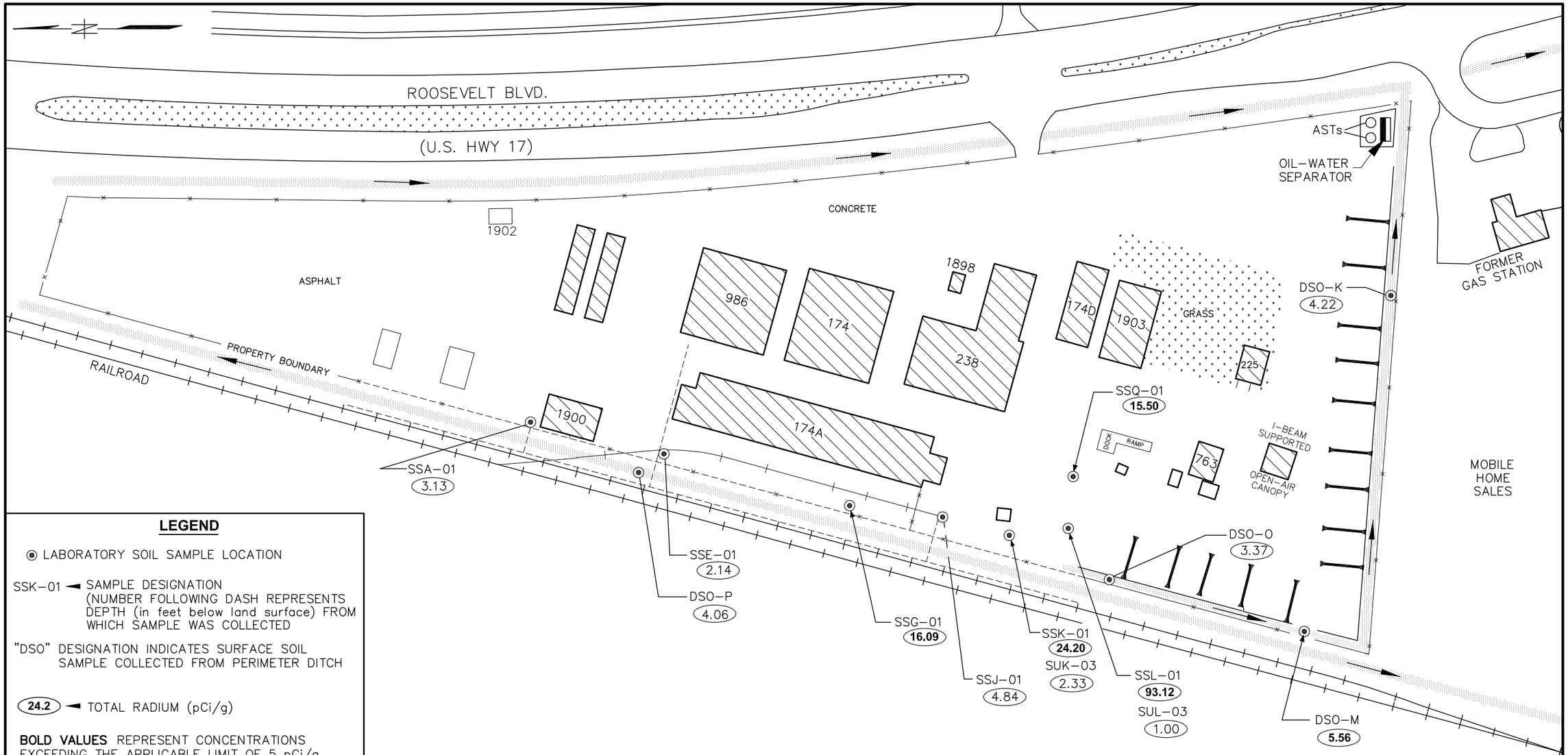


## LEGEND

◉ LABORATORY SOIL SAMPLE LOCATION

SSK–01 ◄ SAMPLE DESIGNATION (NUMBER FOLLOWING DASH REPRESENTS DEPTH (in feet below land surface) FROM WHICH SAMPLE WAS COLLECTED

"DSO" DESIGNATION INDICATES SURFACE SOIL SAMPLE COLLECTED FROM PERIMETER DITCH

(24.2) ◄ TOTAL RADIUM (pCi/g)

**BOLD VALUES** REPRESENT CONCENTRATIONS EXCEEDING THE APPLICABLE LIMIT OF 5 pCi/g FOR TOTAL RADIUM

DITCH
SURFACE WATER FLOW DIRECTION

**NOTE:**

All radionuclide exceedances were reported on surface soils.
No exceedances were reported on subsurface soil samples.

0 60 120
APPROXIMATE SCALE in FEET

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
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| | | | | | | |

DRAWN BY DATE: LLK 10/16/03
CHECKED BY DATE:
COST/SCHED–AREA:
SCALE: AS NOTED

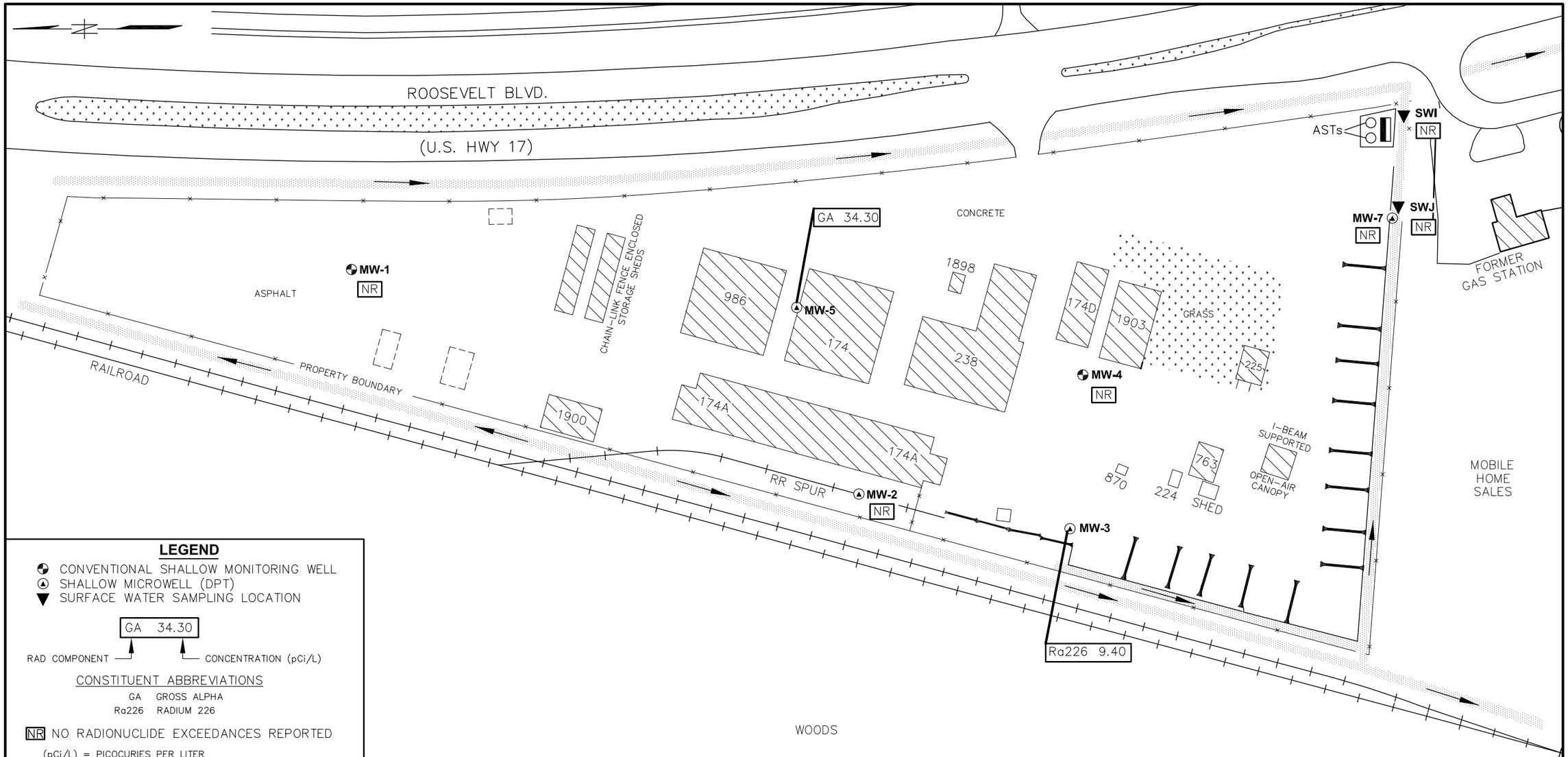
NAVFAC

TOTAL RADIUM CONCENTRATIONS IN LABORATORY SOIL SAMPLES
OU7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2–10
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

NASJAX\CTO242\ROD\CAD\4229RGAD301




## LEGEND

- CONVENTIONAL SHALLOW MONITORING WELL
- SHALLOW MICROWELL (DPT)
- SURFACE WATER SAMPLING LOCATION

GA 34.30

RAD COMPONENT — CONCENTRATION (pCi/L)

CONSTITUENT ABBREVIATIONS

GA GROSS ALPHA
Ra226 RADIUM 226

NR NO RADIONUCLIDE EXCEEDANCES REPORTED

(pCi/L) = PICOCURIES PER LITER

FENCE/PROPERTY BOUNDARY

DITCH

SURFACE WATER FLOW DIRECTION

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
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| | | | | | | |

DRAWN BY LLK DATE 10/16/03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

NAVFAC

RADIONUCLIDE CONCENTRATIONS EXCEEDING CURRENT REGULATORY CRITERIA IN GROUNDWATER AND SURFACE WATER SAMPLES
OU7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-11
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

For the PRE, risks and hazard quotients were calculated for each medium using the maximum observed concentrations and the 95-percent UCL concentrations for both industrial use and residential use. The cancer risks were calculated by creating ratios between the exposure concentrations (maximums and UCLs) and the criteria multiplied by a factor of $1 \times 10^{-6}$. This factor is used because the SCTLs, GCTLs, and PRGs for carcinogens correspond to a risk of $10^{-6}$. The hazard quotients were calculated by creating ratios between the exposure concentrations and the criteria. Because the criteria correspond to a hazard quotient of one, the ratio itself is the hazard quotient.

All incremental cancer risk (ICR) values are with in the USEPA acceptable risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$. However, only one ICR value (grid soil samples, 95-percent UCL, industrial scenario) is less than the FDEP target risk level of $1 \times 10^{-6}$. Similarly, most of the hazard Index (HI) calculations are greater than 1.0. Table 2-9 summarizes the risk calculations for all of the scenarios.

### 2.6.2 Ecological Risk Assessment

An ERA was performed as part of the RI to estimate the potential impacts of contaminants on the environment, such as various plant and animal life. The results of the ERA showed that contamination in soils, sediments, and surface water should not pose a significant risk to wildlife. This finding was due to the poor quality of habitat present and the lack of a connection of the storm water ditches to a surface water body. The ERA concluded that if the site use of PSC 46 remains unchanged, further action is not necessary.

## 2.7 REMEDIAL ACTION OBJECTIVES

The following RAOs were established for soil, sediment, and groundwater at PSC 46:

- Prevent unacceptable risk from exposure to soil and sediment with concentrations of metals (aluminum, arsenic, antimony, barium, beryllium, cadmium, chromium, copper, lead, nickel, iron, manganese, and vanadium), PAHs, PCB, and radium-226 greater than the FDEP residential SCTLs and concentrations of arsenic greater than the background value (TtNUS, 2003a).

- Prevent unacceptable risk from ingestion of groundwater with concentrations of vinyl chloride; 1,1-DCE; and arsenic greater than both FDEP GCTLs and NAS Jacksonville Background Concentrations (TtNUS, 2003a).

- Reduce concentrations of vinyl chloride; 1,1-DCE; and arsenic in groundwater to less than the FDEP GCTLs and NAS Jacksonville Background Concentrations (TtNUS, 2003a).

**Table 2-9**
**Human Health Risk Assessment Summary**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Media | Receptor | COC[1, 2] | Cancer Risk[3] Maximum | Cancer Risk[3] 95-Percent UCL | HI[4] Maximum | HI[4] 95-Percent UCL |
|---|---|---|---|---|---|---|
| Soil (grid samples) | Industrial | As | 3.50E-06 | 9.50E-07 | 1.3 | 0.2 |
| Soil (grid samples) | Residential | Aroclor-1254, Aroclor-1260, As, Sb, Ba, Cr, Cu, Fe, Ni | 1.40E-05 | 3.20E-06 | 214 | 37 |
| Soil (biased samples) | Industrial | As, Be, Cr | 1.70E-05 | 1.70E-06 | 5.7 | 0.5 |
| Soil (biased samples) | Residential | Aroclor-1260, dieldrin, As, Al, Sb, Ba, Be, Cd, Cr, Cu, Fe, Mn, Ni, V | 7.70E-05 | 7.80E-06 | 267 | 21 |
| Ditch samples | Industrial | BaP, BbF, DahA, Aroclor-1260, As, Cr | 2.00E-05 | 9.30E-06 | 3.1 | 1.1 |
| Ditch samples | Residential | BaA, BaP, BbF, DahA, I123cdP, Aroclor-1254, Aroclor-1260, As, Al, Sb, Ba, Cd, Cr, Cu, Fe, Mn, Ni, V | 9.10E-05 | 4.30E-05 | 179 | 57 |
| Sediment | Industrial | BaP, As | 6.80E-06 | 3.60E-06 | 0.9 | 0.4 |
| Sediment | Residential | BaP, DahA, Aroclor-1254, Aroclor-1260, As, Ba, Cd, Cu, Fe, Ni, V | 3.10E-05 | 1.60E-05 | 21 | 10 |
| Groundwater | Residential | Vinyl chloride, 1,1-DCE, As | 3.00E-05 | 3.00E-05 | 0.9 | 0.9 |

**Notes:**
(1) BaA – benzo(a)anthracene, BaP – benzo(a)pyrene, BbF – benzo(b)fluoranthene, DahA – Dibenzo(a,h)anthracene, I123cdP – Indeno(123-cd)pyrene.
(2) Cancer risk and/or HI of individual COC based on the most conservative exposure concentration exceeds 1.0E-06 or 1.0, respectively.
(3) Acceptable cancer risks have been established by the FDEP (1.0E-06) and USEPA (1.0E-04).
(4) The FDEP and USEPA have established an acceptable HI at 1.0.

The remedy documented in this ROD will achieve these RAOs.

## 2.8 PRELIMINARY REMEDIAL GOALS

A PRG is the target concentration to which a COC must be reduced within a particular medium of concern to achieve one or more of the established RAOs. PRGs are developed to ensure that contaminant concentration levels left on site are protective of human and ecological receptors. For PSC 46, PRGs were established based on the following criteria:

- Protection of human health from direct exposure to contaminated soil, sediment, and groundwater.
- Compliance with ARARs and, to the extent practicable, satisfaction of TBC criteria.

### 2.8.1 Soil, Sediment, and Groundwater PRGs

The soil, sediment, and groundwater PRGs for various COCs and chemicals of potential concern are presented in Table 2-10.

## 2.9 DESCRIPTION OF REMEDIAL ALTERNATIVES

This section provides a narrative of each alternative evaluated for the remediation of soil and groundwater at PSC 46. The sediment remediation is included with the soil remediation. For further information on the remedial alternatives, refer to the RI/FFS (TtNUS, 2003a) and the Proposed Plan (TtNUS, 2003b).

Due to the wide array of contaminants found in soils/sediment at the site, the potential remedial alternatives are very limited. The NAS Jacksonville Partnering Team agreed to limit detailed analysis of the potential remedies in the FFS to only those methods that were technically feasible. A review was conducted outside of the FFS to evaluate if newer technologies may be available to treat the wide array of contaminants, which include metals, PAHs, PCBs, and radium 226. Only one technology (chemical fixation) was identified that held promise. The NAS Jacksonville Partnering Team contacted the vendor of this technology to determine if this method warranted evaluation in the FFS. Based on vendor input, the method was disregarded and the NAS Jacksonville Partnering Team decided to limit the FFS to those methods discussed in the following sections.

Summaries of the treatment alternatives evaluated in the FFS are described in the following sections. The remedy selected for this ROD is presented in Section 2.10. As part of the FFS, each of the following alternatives was evaluated for compliance with related ARARs. Section 10.0 of the FFS presents a complete list of these ARARs. It should be noted that the ARARs presented in Section 2.11 of this ROD are specific to the selected remedy.

**Table 2-10**
**COCs and PRGs**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| COCs | Range of Detections | Background Screening Values | PRGs[1] Residential/Industrial |
|---|---|---|---|
| **COCs for Soil (mg/kg)** | | | |
| Aluminum | 45.4 – 152,000 | 1340 | 72,000 |
| Arsenic | 0.26 – 55.6 | 0.8 | 0.8/3.7 |
| Antimony | 0.39 – 45.8 | NL | 26 |
| Barium | 1.4 – 302 | 11.2 | 110 |
| Beryllium | 0.02 – 1347 | NL | 120/800 |
| Cadmium | 0.04 – 254 | NL | 75 |
| Chromium | 0.44 – 1240 | 6.6 | 210[2]/820[2] |
| Copper | 0.11 – 24,300 | 5.8 | 110 |
| Lead | 0.87 – 1690 | 14.4 | 400/920 |
| Nickel | 0.08 – 1200 | 11 | 110 |
| Iron | 92.6 – 86,000 | 852 | 23,000 |
| Manganese | 3.2 – 2190 | 99.8 | 1,600 |
| Vanadium | 0.37 – 46 | 3.8 | 15 |
| Dieldrin | 0.64J – 103J | NL | 70 |
| Benzo(a)anthracene | 7J – 4700 | NL | 1,400 |
| Benzo(a)pyrene | 9J – 4300 | NL | 100/500 |
| Benzo(b)fluoranthene | 15J – 8600 | NL | 1,400/4,800 |
| Indeno(1,2,3-cd)pyrene | 58 – 2800 | NL | 1,500 |
| Dibenzo(a,h)anthracene | 15J – 1400 | NL | 100 |
| Arochlor 1254 | 4.9J – 2000 | NL | 500 |
| Arochlor 1260 | 4.9J – 2100 | NL | 500/2,100 |
| Radium 226 | 1.43 – 93.9 | NL | 5 piC/g[3] |
| **COCs for Groundwater (µg/L)** | | | |
| Vinyl Chloride | 1J – 2J | NL | 1 |
| 1,1-DCE | 0.6J – 8 | NL | 7 |
| Arsenic | 1.4 – 167 | 13.2 | 10[4] |

**Notes:**
[1] Chapter 62-777, FAC, Residential and Industrial direct exposure SCTLs for soil and GCTLs for groundwater.
[2] Based upon value for hexavalent chromium.
[3] Based upon site specific RAD analysis at DRMO and as agreed upon by the NAS Jacksonville Partnering Team.
[4] Proposed value.
J = estimated

### 2.9.1 Soil Remedial Alternatives

Two remedial alternatives were analyzed for PSC 46 soil. This ROD has selected Soil Alternative 2: Excavation, Disposal, and Land Use Controls to address contaminants in soil. The alternatives evaluated, as described in the FFS and summarized in Table 2-11, are as follows.

**Soil Alternative 1: No Action**

The law requires the evaluation of the No Action alternative to provide a baseline for comparison with other alternatives. Under this alternative, no remedial activities would occur to remove soil and sediment contamination, and no controls would be implemented to reduce exposure by human receptors. Although PAHs and other organic compounds would attenuate naturally, the metals probably would not, and no periodic monitoring would be performed to evaluate contamination reduction or to verify that no contaminant migration is occurring.

This alternative would not protect human health because risks from exposure to contaminated soil would continue to exist. Tables 2-1 and 2-2 present maximum and 95-percent UCL contaminant concentrations compared to applicable residential, industrial, and leachability criteria. This alternative would not achieve the soil RAOs or comply with ARARs. There would be no reduction of contaminant mobility and reduction in toxicity and volume would occur only through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

**Soil Alternative 2: Excavation, Disposal, and LUCs**

Soil contaminated with concentrations of COCs above secondary PRGs (i.e., FDEP direct exposure industrial SCTLs) would be excavated. The contaminated soil includes the storm water ditches and radiologically contaminated soil. The entire area to be excavated corresponds to a volume of approximately 1,625 cubic yards (cy) excavated material. Pre-excavation sampling would be conducted in order to verify the extent of contamination and determine whether the soil should be disposed as non-hazardous, hazardous, or radiologically contaminated. Following excavation, the excavated areas would be backfilled with clean fill and regraded to achieve desired surface elevations. Areas excavated due to radiological contamination will have a final status survey conducted prior to backfilling. It should be noted that the storm water ditches will be excavated as a maintenance activity.

**Table 2-11**
**Summary of Comparative Evaluation of Soil Remedial Alternatives**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Evaluation Criteria | Alternative 1: No Action | Alternative 2: Excavation, Disposal, and Institutional Controls |
|---|---|---|
| Overall Protection of Human Heath and the Environment | Would not provide protection of human health and the environment because there would be no reduction of risk to human and ecological receptors. The threat of soil COCs migrating to groundwater would remain. | Would provde protection of human health and the environment by reducing risks from exposure to soil contaminated above PRGs through excavation and disposal. LUCs would prevent residential development. |
| Compliance with ARARs and TBCs: | | |
| Chemical-Specific: | Would not comply. | Would comply. |
| Location-Specific: | Would not comply. | Would comply. |
| Action-Specific: | Would not comply. | Would comply. |
| Long-Term Effectiveness and Permanence | Would have very limited long-term effectiveness and permanence since all contaminants would remain on site. Any long-term effectiveness would not be known since monitoring would not occur. | Would provide long-term effectiveness and permanence. Risks to soil contaminated above PRG levels would be effectively mitigated through excavation and disposal. Prevention of residential development and unauthorized excavation would provide long-term effectiveness and permanence. |
| Reduction of Mobility, Toxicity, and Volume through Treatment | Would not achieve reduction of toxicity, mobility, or volume of contaminants through treatment, but may achieve some reduction through natural processes. | Would not achieve a reduction of mobility, toxicity, and volume through treatment. However, a reduction of mobility would occur with the disposal of contaminated soil at disposal facilities. |
| Short-term Effectiveness | Would not result in short-term risks to site workers or adversely impact the surrounding community, but would also not achieve RAOs. | Would result in a significant risk of exposure to site workers to contaminated soil during excavation and disposal activities. This risk would be reduced through the use of appropriately trained workers, wearing of appropriate PPE, and the compliance with health and safety procedures. The RAOs would be achieved immediately upon implementation. PRGs would be attained in approximately 3 months. |
| Implementability | Would be simple to implement since no action would occur. | Would more difficult to implement since contaminated soil would have to be excavated and transported off site. Transportation of soil would occur over long distances. LUCs would be easy to implement. |
| Costs: | | |
| Capital | $0 | $1,177,000 |
| NPW of O&M | $0 | $472,000 |
| NPW | $0 | $1,649,000 |

**Notes:**
NPW = net present worth
PPE = personal protective equipment

LUCs would be implemented to eliminate or reduce the potential for unacceptable human health and ecological risk as a result of exposure to contaminated soil by preventing future residential development of the property and by requiring pavement be maintained to prevent exposure to soils exceeding health risk based levels. The current LUCs program at NAS Jacksonville would be amended to include DRMO.

This alternative would protect human health because it would permanently remove some contaminated soil from the site and, thus, prevent unacceptable risk from exposure under the current or future land use scenario. This alternative would achieve the soil RAO and comply with ARARs through removal, treatment, and disposal. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 1,625 cy of soil would be irreversibly and permanently removed from the site. In addition, maintaining paved areas will prevent exposure to impacted soils. There would be significant short-term risks associated with excavation of the contaminated soil and the off-base transportation of the excavated soil. However, these risks would be addressed through appropriate engineering controls and health and safety procedures. The activities for this alternative would be easy to implement.

This alternative would also protect human health because it would prevent the potential for unacceptable risk from direct exposure to contaminated soil by preventing residential development. Exposure to soil would result in residential risks that exceed Florida's target ICR level of $10^{-6}$. This alternative would achieve the soil RAO but would not comply with chemical-specific ARARs or TBCs because the 95-percent UCL for several COCs exceeds the PRG and residential SCTL. However, for the intended future land use (industrial), the site would be protective as long as LUCs are maintained. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment of the remaining contaminants, but contaminant toxicity and volume of organic compounds would be reduced through long-term natural attenuation. There would be minimal short-term risks associated with the performance of monitoring activities that would be addressed through appropriate health and safety procedures. The activities for this alternative would be easy to implement. The capital cost, O&M cost, and 30-year NPW for all components of this alternative are estimated at $1,177,000; $472,000; and $1,649,000, respectively.

### 2.9.2 Groundwater Remedial Alternatives

Two remedial alternatives were analyzed for PSC 46 groundwater. This ROD has selected Groundwater Alternative 2: Land Use Controls, Monitoring, and Natural Attenuation to address contaminants in groundwater. The alternatives evaluated, as described in the FFS and summarized in Table 2-12, are as follows.

**Table 2-12**
**Summary of Comparative Evaluation of Groundwater Remedial Alternatives**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Evaluation Criteria | Alternative 1: No Action | Alternative 2: Institutional Controls, Monitoring, Natural Attenuation |
|---|---|---|
| Overall Protection of Human Health and the Environment | Would not provide protection of human health and the environment because there would be no reduction of risk to human and ecological receptors. Migration of COCs would continue and remain undetected. | Would be protective of human health and the environment since LUCs and monitoring would provide immediate protection by restricting use of the aquifer for drinking water purposes and unauthorized future development. Natural Attenuation monitoring would verify the natural degradation processes of site COCs and monitor migration. |
| Compliance with ARARs and TBCs:<br>Chemical-Specific:<br>Location-Specific:<br>Action-Specific: | Would eventually comply with 40 CRF, Part 41, Chapter 62-520 FAC.<br>No locaton specific ARARs.<br>Would comply with 40 CFR 261, 40 CFR 265 subpart D. | Would eventualy comply with 40 CRF, Part 41, Chapter 62-520 FAC.<br>No locaton specific ARARs.<br>Would comply with 40 CFR 261, 40 CFR 265 subpart D. |
| Long-Term Effectiveness and Permanence | Would have very limited long-term effectiveness and permanence since no action would occur. Contaminant reduction or migration would remain undetected since no monitoring would occur. | Would provide ong-term effectiveness and permanence. Natural attenuation and natural processes would eventually reduce COCs concentrations to PRGs. LUCs would effectively prevent unacceptable risks from exposure to contaminated groundwater. Monitoring would effectively evaluate the progress of remediation and detect migration of COCs. |
| Reduction of Mobility, Toxicity, and Volume through Treatment | Would not reduce contaminant toxicity, mobility, or volume through treatment since no treatment would occur. | Would not reduce contaminant toxicity, mobility, or volume through treatment since no treatment would occur but would achieve reduction through natural processes. |
| Short-term Effectiveness | Would not result in short-term risks to site workers or adversely impact the surrounding community but would also not achieve RAOs. | Would result in a slight risk of exposing site workers to contaminated groundwater as a result of monitoring activities. This risk would be reduced through wearing of appropriate PPE and compliance with site-specific health and safety procedures. There would be no risk to the surrounding environment and community. RAOs would be achieved immediately upon the implementation of LUCs. PRGs would eventually be met, most likely within 5 years. |
| Implementability | Would be simple to implement since no action would occur. | Implementation of monitoring and LUCs would be simple. |
| Costs: | | |
| Capital | $0 | $23,000 |
| NPW of O&M (30 years) | $0 | $189,000 |
| NPW | $10,00 (5-year review) | $208,000 |

**Groundwater Alternative 1: No Action**

Under this alternative, no remedial activities would occur to remove groundwater contamination and no controls would be implemented to reduce exposure by human receptors. Although COCs would attenuate naturally, no periodic monitoring would be performed to evaluate the effectiveness of the No Action alternative in meeting the PRGs and preventing the potential downgradient migration.

This alternative would not protect human health because risks from direct exposure to contaminated groundwater would continue to exist. This alternative would not achieve the groundwater RAO or comply with ARARs. There would be no reduction of contaminant mobility, and reduction in toxicity and volume would occur only through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

**Groundwater Alternative 2: Land Use Controls, Monitoring, and Natural Attenuation**

Natural processes, such as dispersion, advection, and adsorption would eventually reduce the groundwater concentrations of VOCs and arsenic to their PRGs. A long-term groundwater monitoring program would be implemented to evaluate the decrease of COC concentrations in groundwater. Groundwater monitoring would also be used to detect the potential downgradient migration of COCs. LUCs would consist of limiting the use of groundwater. Regular site inspections would be conducted to verify the continued application of LUCs, and site reviews would be performed as necessary to verify the adequacy of this alternative for as long as groundwater contaminant concentrations exceed cleanup goals.

The groundwater would be monitored for chlorinated VOCs, arsenic, and other parameters to assess the effectiveness of natural attenuation. Seven wells would be used to monitor groundwater plume size, contaminant concentrations, and movement of the groundwater plume. Groundwater would be monitored by sampling it quarterly the first year, semi-annually the second year, and annually thereafter, continuing until action levels are attained. If, however, the site review indicates that an alternative should be considered, the monitoring schedule would be reconfigured, as necessary.

This alternative would protect human health because it would reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the groundwater RAO and monitoring would establish eventual compliance with ARARs through natural attenuation. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment, but contaminant toxicity and volume would be reduced through long-term natural attenuation. There would be minimal short-term risks associated with the performance of groundwater monitoring activities that would be addressed through

appropriate health and safety procedures. The activities for this alternative would be easy to implement. The capital cost, O&M cost, and 30-year NPW of this alternative are estimated at $23,000; $189,000; and $208,000, respectively.

## 2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section evaluates and compares each of the soil and groundwater remedial alternatives with respect to the nine criteria outlined in Section 300.430(e) of the NCP. These criteria are categorized as threshold, primary balancing, and modifying and are further explained in Table 2-13. A detailed analysis was performed for each alternative using the nine criteria to select a site remedy. Tables 2-11 and 2-12 present a summary comparison of these analyses for soil and groundwater, respectively.

## 2.11 SELECTED REMEDY

### 2.11.1 Summary of Rationale For Remedy Selection

The goals of the selected soil and groundwater remedies are to protect human health and the environment by eliminating, reducing, or controlling hazards posed by the site and to meet ARARs. Based upon consideration of the requirements of CERCLA; the NCP; the detailed analysis of alternatives; and USEPA, FDEP, and public comments, Soil Alternative 2 and Groundwater Alternative 2 were selected to address contamination at PSC 46.

This remedy was selected for the following reason:

- Although concentrations of COCs remaining in soil exceed the FDEP residential SCTLs or background values, they do not present an unacceptable threat to human health or the environment assuming only future industrial uses are permitted since soils above industrial levels will be removed from PSC 46.

- Excavation and removal of radiologically contaminated soil will eliminate the needs for site controls and restrictions due to radiological exposure considerations.

- Although COCs present in groundwater are at concentrations above regulatory criteria, detected concentrations are relatively low and do not present an unacceptable threat to human health or the environment under the groundwater use restrictions to be implemented as part of the selected remedy. Therefore, so long as exposure to groundwater is prevented, Groundwater Alternative 2 is considered to be adequately protective at a much more reasonable cost than active treatment.

**Table 2-13**
**Explanation of Detailed Analysis Criteria**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Criterion | Description |
|---|---|
| Threshold | **Overall Protection of Human Health and the Environment.** This criterion evaluates the degree to which each alternative eliminates, reduces, or controls threats to human health and the environment through treatment, engineering methods, or LUCs (e.g., access restrictions).<br><br>**Compliance with State and Federal Regulations.** The alternatives are evaluated for compliance with environmental protection regulations determined to be applicable or relevant and appropriate to the site conditions. |
| Primary Balancing | **Long-Term Effectiveness and Permanence.** The alternatives are evaluated based on their ability to maintain reliable protection of human health and the environment after implementation.<br><br>**Reduction of contaminant Toxicity, Mobility, and Volume Through Treatment.** Each alternative is evaluated based on how it reduces the harmful nature of the contaminants, their ability to move through the environment, and the amount of contamination.<br><br>**Short-Term Effectiveness.** The risks that implementation of a particular remedy may pose to workers and nearby residents (e.g., whether or not contaminated dust will be produced during excavation), as well as the reduction of risks that results by controlling the contaminants, are assessed. The length of time needed to implement each alternative is also considered.<br><br>**Implementability.** Both the technical feasibility and administrative ease (e.g., the amount of coordination with other government agencies needed) of a remedy, including availability of necessary goods and services, are assessed.<br><br>**Cost.** The benefits of implementing a particular alternative are weighted against the cost of implementation. |
| Modifying | **USEPA and FDEP Acceptance.** The final RI/FS and the Proposed Plan, which are placed in the Administrative Record, represent a consensus by the Navy, USEPA, and FDEP.<br><br>**Community Acceptance.** The Navy assesses community acceptance of the preferred alternative by giving the public an opportunity to comment on the remedy selection process and the preferred alternative. The Navy then responds to the comments. |

### 2.11.2 Remedy Description

The remedy consists of four major components: (1) Excavation and disposal, (2) LUCs, (3) MNA for groundwater, and (4) contingency remedy.

**Component 1: Excavation and Disposal**

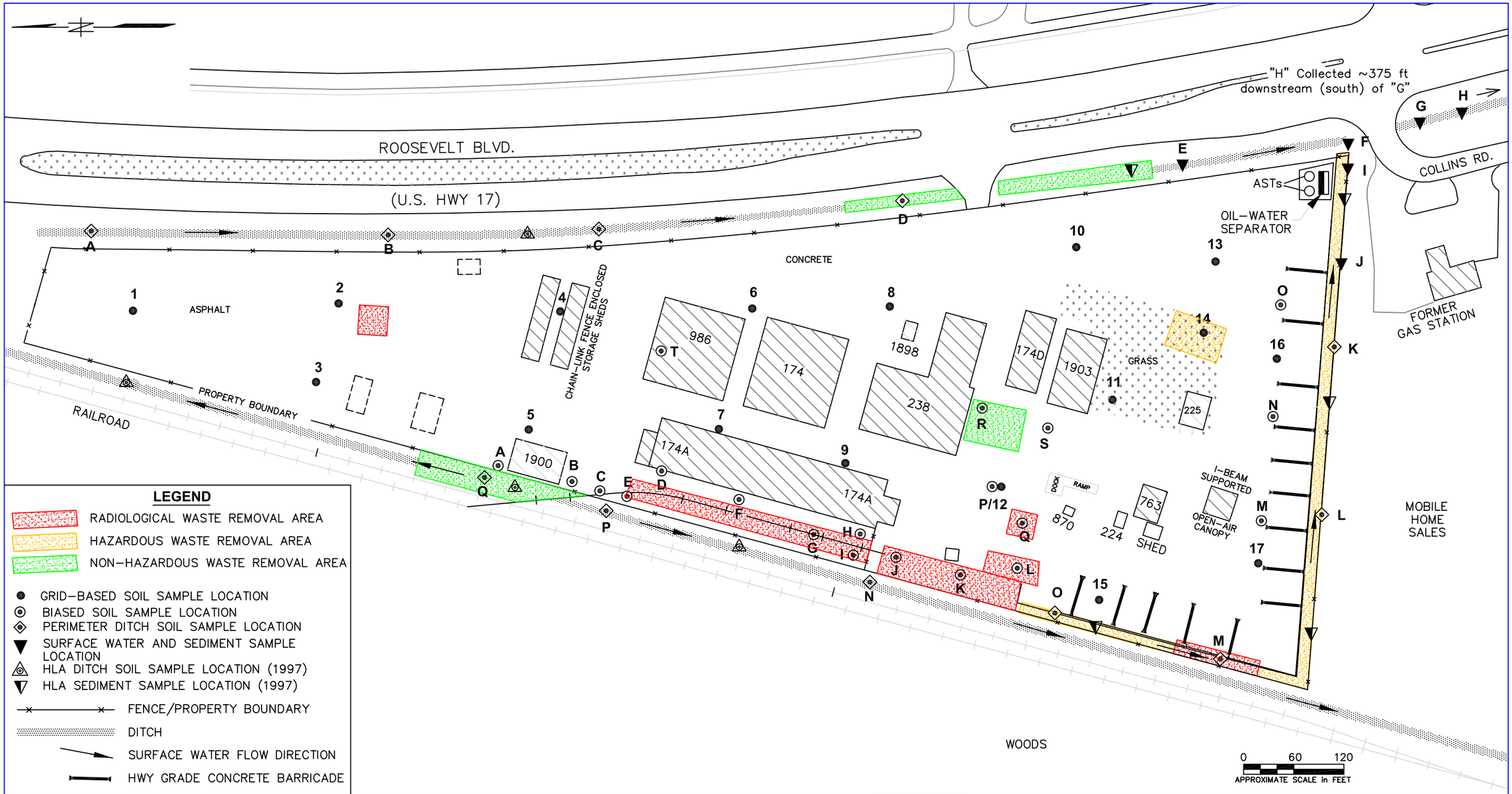
Soil contaminated with concentrations of COCs above secondary PRGs (i.e., FDEP direct exposure industrial SCTLs) would be excavated. Pre-excavation sampling would be conducted in order to verify the extent of contamination, and determine whether the soil should be disposed as non-hazardous, hazardous, and radiologically contaminated.

The areas highlighted as shown on Figure 2-12 would be excavated down to an estimated 1 ft bls, except for one area near biased soil sample R, which would be excavated to an estimated 3 ft bls. The highlighted areas on Figure 2-12 also indicate preliminary assumptions for disposal requirements of excavated soil. Excavation of the ditches would be completed as a site maintenance activity. It is anticipated that because the ditches are storm water conveyance features, they may become recontaminated in the future. The entire area to be excavated corresponds to a volume of approximately 1,625 cy excavated material. During the excavation of radiologically contaminated soil, a Certified Radiological Technician would perform soil screening to assure soil above 20 microrems per minute is excavated. Following excavation, the excavated areas would be backfilled with clean fill and regraded to achieve desired surface elevations.

Depending on its characteristics, the excavated soil would be transported to one of three off-site facilities for disposal. Soil determined to be non-hazardous based on the pre-excavation and waste profile sampling activities would be disposed of at a RCRA Subtitle D landfill. Soil determined to be hazardous based the pre-excavation and waste profile sampling activities would be disposed of at a RCRA Subtitle C landfill. Soil determined to be radiologically contaminated based on the pre-excavation and waste profile sampling activities, as well as the on-site screening, would be disposed of in a licensed Radioactive Waste Disposal Facility. Any mixed waste with RAD contaminants would go the licensed Radioactive Waste Disposal Facility. A preliminary estimate indicates approximately 589 cy of soil to be disposed of as non-hazardous waste, 319 cy of soil disposed of as hazardous waste, and 717 cy of soil disposed of as radiologically impacted waste.

**Component 2: Land Use Controls**

Soil and groundwater contamination remains at PSC 46 at concentrations that preclude unrestricted reuse; therefore, the remedy includes LUCs to prevent unacceptable risk. These LUCs will be implemented to prohibit both residential development at PSC 46 and usage of the surficial aquifer beneath the site and thereby reduce unacceptable risks from exposure to contaminated soil and/or groundwater. The boundaries of PSC 46 and the area to be covered by the LUCs will be shown in the LUC Remedial Design.




**LEGEND**

- RADIOLOGICAL WASTE REMOVAL AREA
- HAZARDOUS WASTE REMOVAL AREA
- NON-HAZARDOUS WASTE REMOVAL AREA
- GRID-BASED SOIL SAMPLE LOCATION
- BIASED SOIL SAMPLE LOCATION
- PERIMETER DITCH SOIL SAMPLE LOCATION
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- HLA DITCH SOIL SAMPLE LOCATION (1997)
- HLA SEDIMENT SAMPLE LOCATION (1997)
- FENCE/PROPERTY BOUNDARY
- DITCH
- SURFACE WATER FLOW DIRECTION
- HWY GRADE CONCRETE BARRICADE

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY LLK DATE 10/16/03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

NAVFAC

AREAS EXCEEDING INDUSTRIAL SCTLs AND RADIOLOGICAL CRITERIA
OU 7, PSC 46
RECORD OF DECISION
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NO. 4229
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-12
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

The following are the LUC performance objectives for PSC 46, and these objectives will also be incorporated into LUC mechanisms:

- Prevent non-industrial development (i.e., prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds) of PSC 46 until acceptable risk levels or cleanup target levels are achieved.
- Ensure no construction on or excavation of the contaminated soil without special handling and disposal procedures for the soil [the special procedures shall include at a minimum obtaining a dig permit that has been reviewed by the station's environmental division using Occupation Safety and Health Act (OSHA)-trained employees where appropriate and use of the proper analyses and facilities for soil disposal].
- Prevent drilling, excavation, or any activity which would interfere with the remedial or monitoring systems.
- Ensure no withdrawal of and/or use of the groundwater until cleanup levels are met.
- Ensure any workers that might potentially be exposed to the contaminated soil or groundwater at this site are properly trained.
- Maintain paving in areas with soil contamination above residential risk levels in order to lmit the potential for exposure to contaminated soils.
- Warning signs will be placed on fencing controlling access to LUC areas.

The unit specific LUC Remedial Design will provide detail and specific measures required for LUCs, which are part of the remedy. The LUCs will be maintained for as long as they are required to prevent unacceptable exposures to contaminated soil and groundwater or to preserve the integrity of the remedy. The Navy will not modify, delete, or terminate any LUC without USEPA and FDEP concurrence. The LUCs will be maintained until the concentrations of hazardous substances in the soils and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted reuse.

In order to implement the LUCs, warning signs will be placed on fencing controlling the access to the LUC areas. Site personnel will be provided with training to restrict access to areas where contaminated media remain. It should be noted these area lie beneath pavement and thus are not readily accessible. LUC inspections will be conducted per the LUC Remedial Design.

The Navy will be responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the approved LUC Remedial Design. Should this LUC remedy fail, the Navy will ensure that appropriate actions are taken to reestablish its protectiveness and may initiate legal action to either compel action by a third party(ies) and/or to recover the Navy's costs for remedying any discovered LUC violation(s).

The LUC Remedial Design will be prepared as the LUC component of the Remedial Design. In accordance with the schedule set forth in the Site Management Plan for NAS Jacksonville, the Navy shall prepare and submit to USEPA and FDEP for review and approval, a LUC Remedial Design that shall contain implementation and maintenance actions, including periodic inspections. The Navy will implement, maintain, monitor, and enforce the LUCs according to the Remedial Design.

**Component 3: Monitored Natural Attenuation**

MNA will be used as part of the selected remedy to evaluate natural attenuation of onsite contamination. Evaluation of MAN will be performed through periodic collection and analysis of groundwater samples to assess natural attenuation of groundwater contamination.

Groundwater samples will be collected from eight existing monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-8, and MW-9) (see Figure 2-9) and analyzed for chlorinated VOCs (1,1-DCE and vinyl chloride) and arsenic. Sampling frequency will be quarterly the first year, semi-annually the second year, and annually thereafter, continuing until PRGs are attained. The number of wells to be sampled, the parameters to be analyzed, and the sampling frequency may change over time dependent upon sample results and with approval by the Navy, USEPA, and FDEP. Due to the extremely low level of contaminants detected at the GCTL values, it is anticipated attenuation will occur within five years. If, however, the site review indicates that a more aggressive alternative should be considered, the monitoring schedule would be reconfigured.

**Component 4: Contingency Remedy**

Progress of the remedy will be evaluated through a review of groundwater monitoring data on an annual basis. If the results of the site review show that (1) the implemented LUCs have failed to prevent unacceptable risks from exposure to on-site soil and/or groundwater contamination; (2) contaminated groundwater has migrated to an unacceptable degree as determined by sentinel well sampling results; or (3) the COC contamination in groundwater is not attenuating as expected, then additional active remedial measures would need to be evaluated and possibly implemented. Potential contingency remedial measures could include additional excavation and off-base disposal of contaminated soil and the extraction, on-site treatment, and surface discharge of contaminated groundwater. Should a contingency remedy be required, implementation will be accomplished through another CERCLA document.

In addition to the aforementioned, due to the uncertainty in the time to reach the PRG for arsenic in groundwater, USEPA, FDEP, and the Navy agree that the Navy will conduct periodic reviews of new remedial technology(ies) that could potentially remediate such contamination in a more cost-effective manner and in a significantly shorter period of time. Such reviews could be conducted as part of any

required site review in the event that either USEPA, FDEP, or the Navy becomes aware of any such new technology(ies). Should the parties agree that a particular new technology(ies) shows the potential for significantly reducing the remediation time for residual arsenic in groundwater on a cost-effective basis, then the parties will evaluate whether the Navy should proceed to undertake an appropriate review to evaluate the practicality of implementing such a new developed remedial technology(ies).

### 2.11.3 Summary of Estimated Remedy Costs

The estimated capital cost, O&M cost, and NPW of the selected remedy are as follows:

- Capital Cost: $1,196,000
- 30-Year NPW of O&M Costs: $661,000
- 30-Year NPW: $1,857,000

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The NPW costs are based upon an annual discount rate of 7 percent. A detailed breakdown of the above estimates is provided in Appendix B.

### 2.11.4 Expected Outcomes of the Selected Remedy

The expected outcomes of the selected remedy may be summarized as follows:

- Immediately upon implementation of the remedy, PSC 46 will be environmentally safe for its intended use as an industrial facility, so long as the LUCs are in place and observed.

- Eventually, the groundwater GCTLs will be attained, and the surficial aquifer will become available for unrestricted use. It is expected that the GCTLs will be attained in about 5 years.

- Soil will require LUCs to prevent residential development and uncontrolled excavation of PSC 46. These controls will be required for as long as soil contaminant concentrations preclude unrestricted reuse.

## 2.12 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the selected remedy must be protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Due to the complex suite of contaminants, the number of alternative

treatment technologies is limited. As a result, a focused evaluation of practicable remedies was conducted. The following sections discuss how the selected remedy meets these statutory requirements.

### 2.12.1 Protection of Human Health and the Environment

The selected remedy, Soil Alternative 2 and Groundwater Alternative 2, will protect human health and the environment. Soil excavation and disposal will prevent exposure to contaminants. LUCs will prevent the future residential development of the site. Consequently, the reduced frequency of exposure associated with industrial exposure results in a reduced intake of COCs and consequently, a reduced risk. LUCs will also prohibit use of groundwater from the surficial aquifer beneath the site.

The PRE indicates that exposure to soil and groundwater associated with PSC 46 results in ICRs that fall within USEPA's target ICR range of $10^{-4}$ to $10^{-6}$ but greater than the FDEP target ICR level of $10^{-6}$. The HIs of many contaminants are greater than 1.0 for both industrial and residential exposures. However, the ICR for the residential exposure exceeds FDEP's target risk level of $10^{-6}$. Additionally, the concentrations of COCs in groundwater are greater than USEPA Region 9's tap water PRGs, the exceedance of these PRGs still triggers the need for monitoring.

### 2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy, Soil Alternative 2 and Groundwater Alternative 2, will comply with all ARARs. The ARARs that the selected remedy complies with are presented below and in more detail in Tables 2-14 through 2-19. There are no Location-Specific ARARs.

The Chemical- and Action-Specific ARARs include the following:

- Safe Drinking Water Act MCLs (40 CFR Part 141), This Chemical-Specific ARAR specifies acceptable concentration levels in groundwater that serves as a potential drinking water aquifer.

- Groundwater Classes, Standards, and Exemptions (Chapter 62-520, FAC). This Chemical-Specific ARAR designates the groundwater of the State into five classes and establishes minimum "free from" criteria (i.e., what contaminants are prohibited from being present in a particular class of aquifer).

- RCRA Regulations Identification and Listing of Hazardous Wastes (40 CFR 261). This Action-Specific ARAR establishes whether a waste is hazardous.

## Table 2-14
## Federal Chemical-Specific ARAs
## Operable Unit 7, Potential Source of Contamination 46

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| SDWA Regulations, MCLs | 40 CFR Part 141 | Relevant and Appropriate | Establishes enforceable standards for potable water for specific contaminants that have been determined to adversely affect human health. | Would be used as protective levels for groundwater or surface waters that are current or potential drinking water sources. |
| SDWA Regulations, National Secondary Drinking Water Standards (SMCLs) | 40 CFR Part 143 | TBC | Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic qualities of drinking water. | Would be used as protective levels for groundwater or surface waters that are current or potential drinking water sources. |
| Atomic Energy Act Regulations, Discharges of Radionuclices to Unrestricted Areas (Air and Water) | 10 CFR Part 20.106 | Relevant and Appropriate | Establishes maximum concentration limits for radionuclide discharges to air and water. | Would be considered where radiological material has the potential to be discharged to air or water. |
| Clean Air Act Regulations, National Emission Standards for Hazardcus Air Pollutants: Standards for Radionuclides | 40 CFR Part 61, Subparts H and I | Relevant and Appropriate | Establishes emission levels for radionuclides. | The requirements in Subpart H and I would be a requirement for airborne emissions of radionuclides during sites at non-DOE Federal facilities. However, they would not be a requirement for airborne emissions from residual contamination after cleanup. |
| USEPA Office of Drinking Water, Health Advisories | | Potential TBC | Health advisories are estimates of non-carcinogenic risk due to consumption of contaminated drinking water. | These advisories would be considered for contaminants in surface water and groundwater that is or could be used as a potable water source. |
| CSFs | | TBC | CSFs are guidance value used to evaluate the potential carcinogenic hazard caused by exposure to contaminants. | CSFs would be considered for development of human health protection PRGs for soil and groundwater at this site. |
| RfDs | | TBC | RfDs are guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants. | RfDs would be considered for development of human health protection PRGs for soil and groundwater at this site. |

**Notes:**
SDWA = Safe Drinking Water Act
SMCLs = Secondary Maximum Contaminant Levels
DOE = Department of Energy
CSFs = Cancer Slope Factors
RfDs = Reference Doses

**Table 2-15**
**State Chemical-Specific ARARS**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| Florida Drinking Water Standards | Chapter 62-550, FAC | Applicable | Rule adopts Federal primary and secondary drinking water standards and also creates additional rules to fulfill State and Federal requirements for community water distribution systems. | These regulations would be used to determine cleanup levels for groundwater that is a potential source of drinking water. |
| Florida Surface Water Quality Standards | Chapter 62-302, FAC | Potentially Applicable | Rule distinguishes surface water into five classes based on designated uses and establishes ambient water quality standards (called Florida Water Quality Standards) for listed pollutants. | Because these standards are specifically tailored to Florida waters, they should be used to establish cleanup levels rather than the Federal Ambient Water Quality Criteria. |
| Florida Groundwater classes, Standards and Exemptions | Chapter 62-520, FAC | Applicable | This rule designates the groundwater of the state into five classes and establishes minimum "free from" criteria. This rule also specifies that Classes I & II must meet the primary and secondary drinking water standards listed in Chapter 62-550, FAC. | These regulations would be used to determine cleanup levels for groundwater that is a potential source of drinking water. |
| Contaminant Cleanup Target Levels Rule | Chapter 62-777, FAC | Applicable | This document provides guidance for soil, groundwater, and surface water cleanup levels that can be developed on a site-by-site basis. | These guidelines would be used in determining cleanup goals. |

**Table 2-15**
**State Chemical-Specific ARARS**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| Florida Drinking Water Standards | Chapter 62-550, FAC | Applicable | Rule adopts Federal primary and secondary drinking water standards and also creates additional rules to fulfill State and Federal requirements for community water distribution systems. | These regulations would be used to determine cleanup levels for groundwater that is a potential source of drinking water. |
| Florida Surface Water Quality Standards | Chapter 62-302, FAC | Potentially Applicable | Rule distinguishes surface water into five classes based on designated uses and establishes ambient water quality standards (called Florida Water Quality Standards) for listed pollutants. | Because these standards are specifically tailored to Florida waters, they should be used to establish cleanup levels rather than the Federal Ambient Water Quality Criteria. |
| Florida Groundwater classes, Standards and Exemptions | Chapter 62-520, FAC | Applicable | This rule designates the groundwater of the state into five classes and establishes minimum "free from" criteria. This rule also specifies that Classes I & II must meet the primary and secondary drinking water standards listed in Chapter 62-550, FAC. | These regulations would be used to determine cleanup levels for groundwater that is a potential source of drinking water. |
| Contaminant Cleanup Target Levels Rule | Chapter 62-777, FAC | Applicable | This document provides guidance for soil, groundwater, and surface water cleanup levels that can be developed on a site-by-site basis. | These guidelines would be used in determining cleanup goals. |

**Table 2-16**
**Federal Location-Specific ARARs**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| There are no Federal Location-Specific ARARs. | | | | |

**Table 2-17**
**State Location-Specific ARARs**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| There are no State Location-Specific ARARs. | | | | |

**Table 2-18**
**Federal Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 4

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Wastes | 40 CFR Part 261 | Potentially Relevant and appropriate for on-site TSD facility and Applicable for off-site TSD facility | Defines the listed and characteristic hazardous wastes subject to RCRA. Appendix II contains the TCLP. | These regulations would apply when determining whether waste on site is hazardous, either by being listed or by exhibiting a hazardous characteristic, as described in the regulations. |
| Clean Air Act (CAA) Regulations, National Ambient Air Quality Standards (NAAQSs) | 40 CFR Part 50 | Potentially Relevant and appropriate for on-site TSD facility and Applicable for off-site TSD facility | Establishes primary (health-based) and secondary (welfare-based) air quality standards for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides emitted from a major source of air emissions. The NAAQSs form the basis for all regulations promulgated under the CAA. However, the NAAQSs themselves are non-enforceable and are not ARARs themselves. | Site remediation activities must comply with NAAQS. The principal application of these standards is during remedial activities resulting in exposures through dust and vapors. In general, emissions from CERCLA activities are not expected to qualify as a major source, and are therefore, not expected to be applicable requirements. However, the requirements may be determined to be relevant and appropriate for non-major sources with significantly similar emissions. |
| RCRA Regulations, Land Disposal Restrictions (LDRs) | 40 CFR Part 268 | Potentially Relevant and appropriate for on-site TSD facility and Applicable for off-site TSD facility | This regulation prohibits the land disposal of untreated hazardous wastes and provides criteria for the treatment of hazardous waste prior to land disposal. | Remedial actions that involve excavating, treating, and redepositing hazardous soil would comply with LDRs. |
| CAA National Emission Standards for Hazardous Air Pollutants (NESHAPs) | 40 CFR Part 61 | Potentially Applicable | NESHAPs are a set of emissions standards for specific chemicals from specific production activities. | Emissions of hazardous air pollutants would be minimized by fugitive dust control and off gas treatment if some soil was treated at a facility such as a thermal desorption facility. |

**Table 2-18**
**Federal Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 4

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| RCRA, Treatment Standards for Hazardous Debris - Thermal Desorption | 40 CFR 268.45 | Potentially Applicable | Sets treatment standards for using thermal desorption. | Any thermal desorption unit would be operated in compliance with treatment standards. |
| Air/Superfund National Technical Guidance | USEPA Guidance: EPA/450/1-89/001-EPA/450/1-89/004 | Potential TBC | This guidance describes methodologies for predicting risks due to air release at a Superfund site. | These guidance documents would be considered when risks due to air releases from fugitive dust are being evaluated. |
| Occupational Safety and Health Administration (OSHA) Regulations, General Industry Standards | 29 CFR Part 1910 | Applicable | Requires establishment of programs to assure worker health and safety at hazardous waste sites, including employee-training requirements. | These regulations would apply to all response activities. |
| OSHA Regulations, Occupational Health and Safety Regulations | 29 CFR Part 1910, Subpart Z | Potentially Applicable | Establishes permissible exposure limits for workplace exposure to a specific listing of chemicals. | Standards are applicable for worker exposure to OSHA hazardous chemicals during remedial activities. |
| OSHA Regulations, Record keeping, Reporting, and Related Regulations | 29 CFR Part 1904 | Potentially Applicable | Provides record keeping and reporting requirements applicable to remedial activities. | These requirements apply to all site contractors and subcontractors and must be followed during all site work. |
| OSHA Regulations, Health and Safety Standards | 29 CFR Part 1926 | Potentially Applicable | Specifies the type of safety training, equipment, and procedures to be used during the site investigation and remediation. | All phases of the remedial response project would be executed in compliance with this regulation. |

**Table 2-18**
**Federal Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 3 of 4

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| RCRA Regulations, Contingency Plan and Emergency Procedures | 40 CFR 264, Subpart D | Potentially Relevant and Appropriate | Outlines requirements for emergency procedures to be followed in case of an emergency. | The administrative requirements established in this rule would be met for remedial actions involving the management of hazardous waste. |
| RCRA Regulations, General Facility Standards | 40 CFR Subpart B, 264.10-264.18 | Potentially Relevant and Appropriate | Sets the general facility requirements including general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a facility located in a 100-year floodplain must be designed, constructed, and maintained to prevent washout of any hazardous wastes by a 100-year flood. | If the remedial action involves construction of an on-site treatment facility, such as a groundwater treatment facility, the substantive requirements of this rule would be applicable requirements. A permitted treatment facility must be selected for off site treatment. |
| RCRA Regulations, Miscellaneous Units | 40 CFR Part 264, Subpart X | Potentially Relevant and Appropriate | These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, and wetland that may have adverse effects on human health and the environment. | The design of proposed treatment alternatives, not specifically regulated under other subparts of RCRA, must prevent the release of hazardous constituents and future impacts on the environment. This subpart would apply to on-site construction of any treatment facility that is not previously defined under the RCRA regulation. |

**Table 2-18**
**Federal Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 4 of 4

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| RCRA Regulations, Preparedness and Prevention | 40 CFR Part 264, Subpart C | Potentially Relevant and Appropriate | Outlines requirements for safety equipment and spill control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threater human health or the environment. | Safety and communication equipment would be incorporated into all aspects of the remedial process and local authorities would be familiarized with site operations. |
| RCRA Regulations, Releases from Solid Waste Management Units (SWMUs) | 40 CFR Part 264, Subpart F | Potentially Relevant and Appropriate | Establishes the requirements for SWMUs at RCRA regulated TSD facilities. The scope of the regulation encompasses groundwater protection standards, point of compliance, compliance period, and requirements for groundwater monitoring. | These regulations would be followed for the treatment of hazardous waste. |
| RCRA Regulations, Standards for Owners and Operators of Hazardous Waste TSD Facilities | 40 CFR Part 264 | Potentially Relevant and Appropriate | Establishes minimum national standards defining the acceptable management of hazardous wastes for owners and operators of facilities that treat, store, or dispose of hazardous wastes. | If remedial actions involving management of RCRA wastes at an off-site TSD Facility or if RCRA wastes are managed on-site, the requirements of this rule would be followed. |
| RCRA Regulations, Use and Management of Containers | 40 CFR Part 264, Subpart I | Potentially Relevant and Appropriate | Sets standards for the storage of containers of hazardous waste. | This requirement would apply if a remedial alternative involves the storage of a hazardous waste (i.e. contaminated groundwater) in containers, prior to treatment. |

**Table 2-19**
**State Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 1 of 2

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| Florida Hazardous Waste Rules – October, 1993 | Chapter 62-730, FAC | Potentially Applicable | Adopts by reference sections of the Federal hazardous waste regulations and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation and disposal of hazardous wastes. | These regulations would apply if waste on site were deemed hazardous and needs to be stored, transported, or disposed of properly. |
| Florida Drinking Water Standards | Chapter 62-550, FAC | Potentially Applicable | This rule adopts Federal primary and secondary drinking water standards. | These regulations would apply to remedial activities that involve discharges to potential sources of drinking water. |
| Florida Air Pollution Rules – October, 1992 | Chapter 62-2, FAC | Potentially Relevant and Appropriate | Establishes permitting requirements for owners of operators of any source that emits any air pollutant. | These requirements are appropriate for remedial action that could result in a release of regulated contaminants to the atmosphere, such as may occur during excavation. |
| Florida Regulation of Stormwater Discharge – May 1993 | Chapter 62-25, FAC | Potentially Relevant and Appropriate | Establishes requirements for discharges of untreated stormwater to ensure protection of the surface water of the state. | Remedial actions would consider the impact of the discharge of untreated stormwater. |
| Florida Ambient Air Quality Standards – December, 1994 | Chapter 62-272, FAC | Potentially Applicable | Establishes ambient air quality standards to protect human health and public welfare. | These ambient air quality standards would be met for remedial actions involving the possible release exposure of contaminants to the atmosphere. |
| Air pollution Episodes – September, 1994 | Chapter 62-273, FAC | Potentially Relevant and Appropriate | This rule classifies an air episode as an air alert, warning or emergency and establishes criteria for determining the level of the air episode. It also establishes response requirements for each level. | These regulations would be adhered to if remedial actions involve air emissions. |

**Table 2-19**
**State Action-Specific ARARs and Guidance Materials**
**Operable Unit 7, Potential Source of Contamination 46**

Record of Decision
Naval Air Station Jacksonville
Jacksonville, Florida
Page 2 of 2

| Requirement | Citation | Status | Synopsis | Evaluation/Action to be Taken |
|---|---|---|---|---|
| Florida Water Well Permitting and Construction Requirements – March 1992 | Chapter 62-736, FAC | Applicable | Establishes minimum standards for the location, construction, repair, and abandonment of water wells. Permitting requirements and procedures are established. | The substantive requirements for permitting would be met if remedial actions involve the construction, repair, or abandonment of monitoring, extraction, or injection wells. |
| Florida Rules on Hazardous Waste Warning Signs – July 1991 | Chapter 62-736, FAC | Applicable | Requires warning signs at NPL and FDEP identified hazardous waste sites to inform the public of the presence of potentially harmful conditions. | This requirement will be met. |
| Florida Rules on Permits – November, 1994 | Chapter 62-4, FAC | Potentially Applicable | Establishes procedures for obtaining permits for sources of pollution. | These substantive requirements would be met during remediation. |

- RCRA Regulations Contingency Plan and Emergency Procedures (40 CFR 264 Subpart D). This Action-Specific ARAR establishes administrative requirements for remedial actions that involve the management of hazardous waste.

- RCRA Regulations Standards for Owners and Operators of Hazardous Treatment, Storage and Disposal (TSD) Facilities (40 CFR 264). This Action-Specific ARAR establishes standards for hazardous waste TSD facilities.

- OSHA, General Industry Standards (29 CFR Part 1910). This Action-Specific ARAR requires the establishment of programs to assure worker health and safety at hazardous waste sites.

- OSHA Occupational Safety and Health Regulations (29 CFR Part 1910, Subpart Z). This Action-Specific ARAR establishes permissible exposure limits for workplace exposure to specific chemicals.

- OSHA Recordkeeping, Reporting, and Related Regulations (29 CFR Part 1904). This Action-Specific ARAR dictates recordkeeping and reporting requirement for remedial activities.

- OSHA, Health and Safety Standards (29 CFR Part 1926). This Action-Specific ARAR specifies the type of safety training, equipment, and procedures used during remediation.

- Florida Water Well Permitting and Construction Requirement - March 1992. This Action-Specific ARAR establishes minimum standard for location, construction, repair, and abandonment of water wells.

- Florida Hazardous Waste Rules (Chapter 62-730, FAC) – This Action-Specific ARAR establishes the requirements for treatment, storage and disposal of hazardous waste.

- Florida Rules on Hazardous Waste Warning Signs (Chapter 62-730, FAC). This Action-Specific ARAR requires appropriate warning signs for public protection at NPL and FDEP hazardous waste sites.

- Drinking Water Criteria (Chapter 62-550, FAC). This Chemical-Specific ARAR provides primary and secondary drinking water quality criteria.

### 2.12.3 Other Criteria, Advisories, or Guidance To Be Considered for This Remedial Action

In implementing the selected remedy, the Navy, USEPA, and the State have agreed to consider a number of non-binding criteria that are TBCs. These include:

- SDWA Regulations, National Secondary Drinking Water Standards (SMCLs) (40 CFR 143). This Chemical-Specific TBC establishes welfare-based standards for public water systems.

- CSFs (Integrated Risk Information System). This Chemical-Specific TBC provides guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.

- RfDs (Integrated Risk Information System). This Chemical-Specific TBC provides guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants.

- Contaminant Cleanup Target Levels Rule (Chapter 62-777, FAC). This Chemical-Specific TBC provides values for soil, groundwater, and surface water cleanup.

- USEPA MNA Guidance. This provides guidance on evaluation of MNA.

### 2.12.4 Cost-Effectiveness

The selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if it costs are proportional to its overall effectiveness" [NCP §300.430(f)(1)(ii)(D)]. This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., both were protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money spent.

The estimated 30-year NPW of the selected remedy is $1,857,000.

### 2.12.5 Utilization of Permanent Solutions and Alternative Treatment Technologies

The Navy and USEPA, in conjunction with FDEP, have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at PSC 46. Of those alternatives that are protective of human health and the

environment and comply with ARARs, the Navy and USEPA, in conjunction with FDEP, have determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principle element and bias against off-site treatment and disposal and considering State and community acceptance.

### 2.12.6 Preference for Treatment as a Principal Element

Although the selected remedy does not provide for treatment as a principal element, reduction of groundwater contaminant concentrations are expected over time due to biological, dispersion, advection, and adsorption processes.

### 2.12.7 Site Review Requirement

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

## 2.13 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for PSC 46 (TtNUS, 2003b) was released for public comment on August 29, 2003. The Proposed Plan identified soil Alternative 2 and groundwater Alternative 2 as the preferred alternatives. A public meeting was held on September 9, 2003, to present and discuss the preferred alternatives. The public was invited to comment during a 30-day period extending from September 1 to September 30, 2003. No changes to the proposed remedy, as originally identified in the Proposed Plan, have been made as a result of public comments.

# REFERENCES

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FDEP (Florida Department of Environmental Protection), 1999. “Groundwater Cleanup Target Levels and Soil Cleanup Target Levels.″ FAC Chapter 62-777. August.

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Navy (Department of the Navy), 2003. “Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions.” September.

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TtNUS, 2003b. “Proposed Plan for Potential Source of Contamination 46, Naval air Station Jacksonville, Jacksonville, Florida." Prepared for the United States Navy, Naval Facilities Engineering Command, Southern Division, North Charleston, South Carolina. August.

USACHPPM (United States Army Center for Health Promotion and Prevention Medicine), 1998. “Radiological Survey." June.

USEPA (United States Environmental Protection Agency), 1999. Decision Document Guidance.

# APPENDIX A

# RESPONSIVENESS SUMMARY

**Responsiveness Summary**

Comment 1) Dr. Gail G. Gibson, Ph.D., PG, CPG, REP
gailandbettygibson@juno.com
609 San Robar Drive, Orange Park, FL 32073

"Given the available contamination data, spatial location of dwellings relative to the site, and presentation made at the OP Holiday Inn, I would agree with the cleanup proposal. Assuming excavation (S2) removes most of source of GW contamination, what is the expected timeline to begin seeing attenuation of contaminates in the groundwater plume?"

Navy Response

"The levels of GW contamination are so low in comparison to the FDEP cleanup levels that no attenuation modeling was performed. As a result, a formal timeline has not been developed. It is believed that groundwater contamination is a result of shallow soil contamination. As a result, we anticipate that removal of contaminated soils will result in rapid attenuation of the groundwater contamination. The Proposed Plan includes groundwater monitoring for a five-year period. However, should GW corrective action levels be achieved in a shorter time period, the Proposed Plan includes an exit strategy to cease monitoring prior to the completion of the five year period."

Comment 2) Mr. John Fleming
flemingjf@allvantage.com

"If we are not now dead or mutated from this problem, I think we can save ourselves a wealth of tax money and continue to ignore it as we have been. Conservative and rational spending is not only appropriate here at this time, it is demanded. I have lived here with my family nearly 25 years. We all seem to have survived this new-found problem. Let's not encourage the USEPA and FDEP by pretending that this is important to anyone associated with these organizations. They just want their existence justified. I recommend no action be taken and no further tax dollars be wasted on this problem which has only now become important. Please advise if these comments have been duly registered with authority."

Navy Response

"Your comments have been received by Naval Air Station Jacksonville and will be reviewed and may be responded to as part of the responsiveness summary in the PSC 46 Record of Decision.

Thanks for your comments and interest in our cleanup program."

# APPENDIX B

# DETAILED COST ESTIMATE OF SELECTED REMEDY

## Excavation and Disposal Cost

Estimator: RLM
Checked By:

**COST SUMMARY TABLE (COSTS ROUNDED TO THE NEAREST $1000)**

| | | | |
|---|---|---|---|
| **DIRECT COSTS** | | | |
| Pre-Excavation Characterization Sampling | | | $41,000 |
| Health and Safety Plan for Pre-Excavation Activities | | | $8,000 |
| Pre-Excavation Site Sampling Workplan | | | $7,000 |
| Summary Data Report | | | $7,000 |
| Site Preparation and Preparation Equipment | | | $15,000 |
| Health and Safety Plan | | | $8,000 |
| Site Sampling and Excavation Workplan | | | $7,000 |
| Oversight & Sampling During Excavation | | | $81,000 |
| Summary Data Report | | | $7,000 |
| Excavation of Soil | | | $37,000 |
| Characterization Sampling | | | $20,000 |
| Offsite Transport and Disposal of Non-Hazardous soils | | | $18,000 |
| Offsite Transport and Disposal of Hazardous soils | | | $77,000 |
| Offsite Transport and Disposal of Radiological soils | | | $480,000 |
| Site Restoration and Demobilization | | | $23,000 |
| **Institutional Controls** | | | |
| Prepare Deed Restrictions & LUCIPs | 1 ls | $5,000 | $5,000 |
| Subtotal | | | $841,000 |
| **Indirect Costs** | | | |
| Engineering and Design (@20%) | | | $168,200 |
| Contingency (@20%) | | | $168,200 |
| Five-Year Site Reviews (annualized for 30 years) | | | $5,000 |
| Present Worth of Five-Year Review at 7% for 30 years | | | $472,000 |
| **Total Costs for Excavation and Offsite Disposal** | | | **$1,649,400** |

Assumptions:
Onsite labor assumed to have 4 -hour radiological training.
Level D protection assumed.

**Cost Estimate/Backup:**

**Alternative 2 (Natural Attenuation Alternative, Monitoring, and Institutional Controls)**

Estimator: JDF

Checked By:

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**COST SUMMARY TABLE (costs rounded to nearest $1000)**

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| | |
|---|---|
| **DIRECT COSTS** | |
| Purchase of Equipment for Natural Attenuation Parameters Measured in Field | $2,000 |
| Institutional Controls | $5,000 |
| Total Direct Costs | $7,000 |
| **INDIRECT COSTS** | |
| Health and Safety, HASP | $8,000 |
| Engineering and Administration, SAP | $8,000 |
| Total Indirect Costs | $16,000 |
| Total Capital Costs (Direct + Indirect) | $23,000 |
| **OPERATIONS AND MAINTENANCE** | |
| Quarterly Natural Attenuation Groundwater Monitoring and reporting (first Year) | $64,000 |
| Semi-Annual Natural Attenuation Groundwater Monitoring and Reporting (second and third year) | $64,000 |
| Present Cost of Sampling for first three years | $128,000 |
| Annual Natural Attenuation Groundwater Monitoring | $7,000 |
| Annual Groundwater Reporting | $9,000 |
| Five-Year Site Reviews (annualized) | $5,000 |
| Total Administrative O&M (annual) | $21,000 |
| PRESENT WORTH OF O&M (7%, 2 yrs) | $37,968 |
| Present Cost of first three years plus present worth for years 4 and 5 | $165,968 |
| Total Capital and O&M Cost | $188,968 |
| Contingency (10%) | $19,000 |
| **TOTAL COST** | **$207,968** |