N00207.AR.002548
NAS JACKSONVILLE
5090.3a

SAMPLING EVENT REPORT FOR POTENTIAL SOURCE OF CONTAMINATION 9 (PSC9) OLD DISPOSAL AREA EAST OF THE FUEL FARM NAS JACKSONVILLE FL

7/1/1999

HARDING LAWSON ASSOCIATES

SAMPLING EVENT REPORT

POTENTIAL SOURCE OF CONTAMINATION 9
OLD DISPOSAL AREA EAST OF THE FUEL FARM

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No.: N62467-89-D-0317/040

Prepared by:

Harding Lawson Associates
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Dana Gaskins, Engineer-in-Charge

July 1999

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/040 are complete and accurate and comply with all requirements of this contract.

DATE: July 8, 1999

NAME AND TITLE OF CERTIFYING OFFICIAL: Phylissa Miller
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Alexander Olis, Ph.D., CPSS
Project Technical Lead

(DFAR 252.227-7036)

JX-PSC9 SER
PMW 07 99

TABLE OF CONTENTS

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

TABLE OF CONTENTS (Continued)

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

APPENDICES

LIST OF FIGURES

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AWQC	ambient water quality criteria
BAF	bioaccumulation factor
BEI	Bechtel Environmental, Inc.
BHC	benzene hexachloride
bls	below land surface
CLP	Contract Laboratory Program
CompuChem	CompuChem Environmental Corporation
COPC	chemical of potential concern
EDS	Environmental Data Services
ERA	ecological risk assessment
FDEP	Florida Department of Environmental Protection
GGC	groundwater guidance concentration
HLA	Harding Lawson Associates
IAS	Initial Assessment Study
LOAEL	lowest observed adverse effects level
LUC	land-use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
NAS	Naval Air Station
NFESC	Naval Facilities Engineering Service Center
NOAEL	no observable adverse effects level
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/ℓ	picocuries per liter
PDE	potential dietary exposure
PEL	probable effect level
ppb	parts per billion
PSC	potential source of contamination
QA/QC	quality assurance and quality control

GLOSSARY (Continued)

RBC	risk-based concentration
RI	remedial investigation
RTV	reference toxicity value
SCG	soil cleanup goal
SER	sampling event report
SFF	site foraging frequency
SQAG	sediment quality assessment guideline
SSW	Site Screening Workplan
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TEL	threshold effects limit
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yds^3	cubic yards

1.0 INTRODUCTION

Harding Lawson Associates (HLA), under contract to the Department of Navy (Contract No. N62467-89-D-0317, Task Order No. 040) is submitting this Sampling Event Report (SER) for Potential Source of Contamination (PSC) 9, Old Disposal Area East of the Fuel Farm at Naval Air Station (NAS) Jacksonville, Jacksonville, Florida. PSC 9 is located east of the Fuel Farm between Catapult Road and the St. Johns River (Figures 1-1 and 1-2). The Old Disposal Area was identified as a PSC during the Initial Assessment Study (IAS) (Fred C. Hart Associates, Inc., 1983). According to the IAS report, the site contained garbage, construction debris, and a few 55-gallon drums that were disposed of from 1977 to 1978. The IAS report stated that high chromium concentrations in soil samples previously collected and analyzed indicated that industrial waste such as chromium sludge could have been disposed of in this area.

This SER summarizes the methods and the results of the field investigation and transmits the field and analytical data.

1.1 PURPOSE AND SCOPE. The purpose of the sampling event at PSC 9 was to gather sufficient information to support the next phase of the Remedial Response Decision System process. The scope of the sampling event at PSC 9, detailed in the Site Screening Workplan (SSW) (ABB Environmental Services, Inc. [ABB-ES], 1997), included the following:

- Collection of up to nine soil samples. Five surface soil samples will be collected from 0 to 1 foot, and the remaining four samples will be collected during downgradient monitoring well installation.
- Installation of three "micro" monitoring wells to collect groundwater. Two wells will be downgradient, and the remaining well will be located upgradient to observe what may be introduced from other sources not related to PSC 9.
- Collection of one surface water and one sediment sample from the unlined drainage ditch along the south side of site.
- Laboratory analysis of the soil, groundwater, surface water and sediment samples for U.S. Environmental Protection Agency (USEPA) target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls (PCBs), target analyte list (TAL) inorganics, and radiological parameters (gross alpha and beta).

Fieldwork for the above sampling event was completed between June 5, 1997 and August 21, 1997.

Based on the analytical results of the sampling, further sampling of PSC 9 was recommended to gather supplemental data necessary for ecological risk screening. Field work for the second sampling event was completed on March 30, 1999. The scope of the additional sampling included the following:

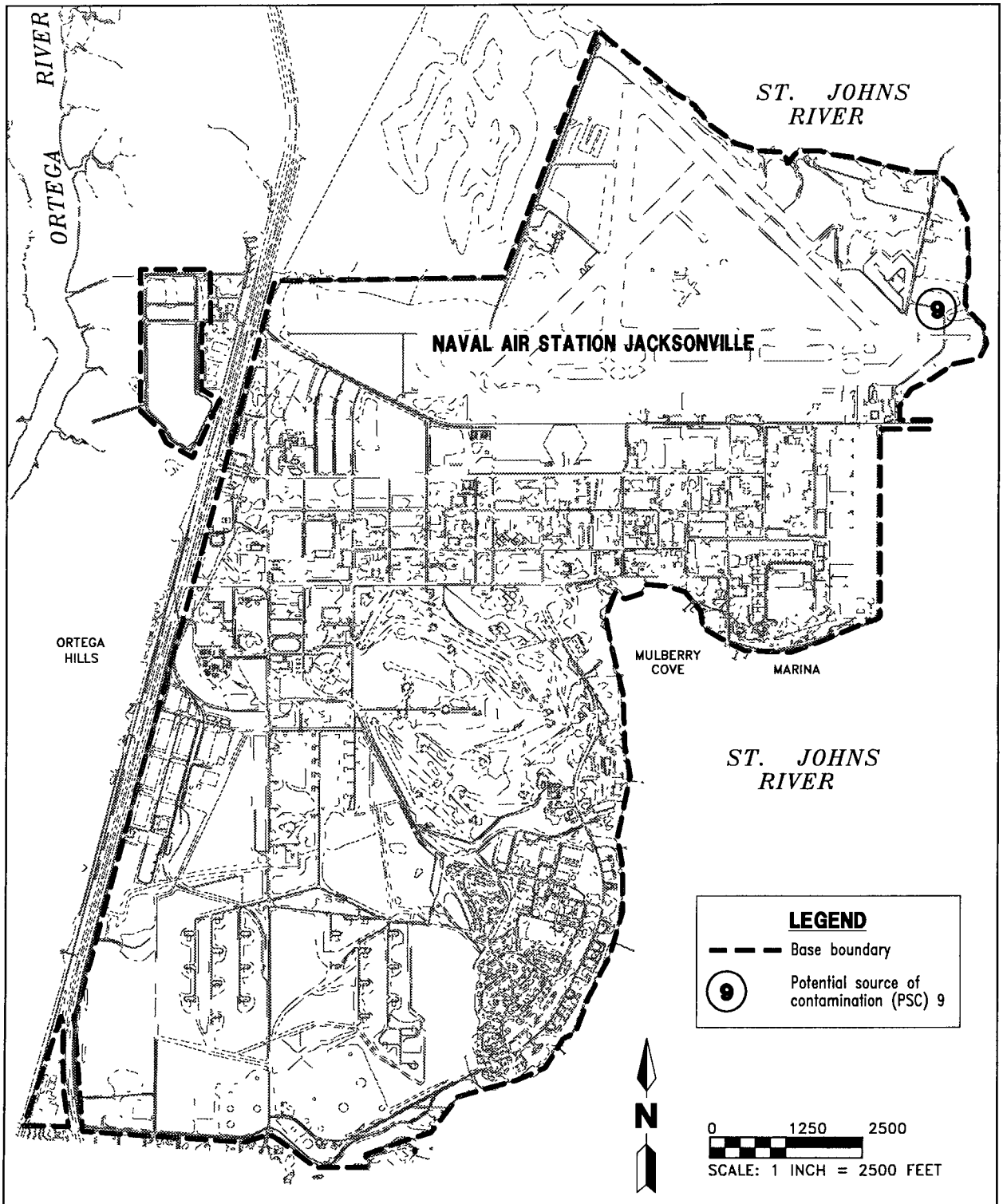

FIGURE 1-1
LOCATION OF PSC 9 AT
NAVAL AIR STATION JACKSONVILLE

K \02508\02508-09\SER\02508507.DWG, NP-VC 10/26/98 13:01 42, AutoCAD R14

SAMPLING EVENT REPORT
PSC 9

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

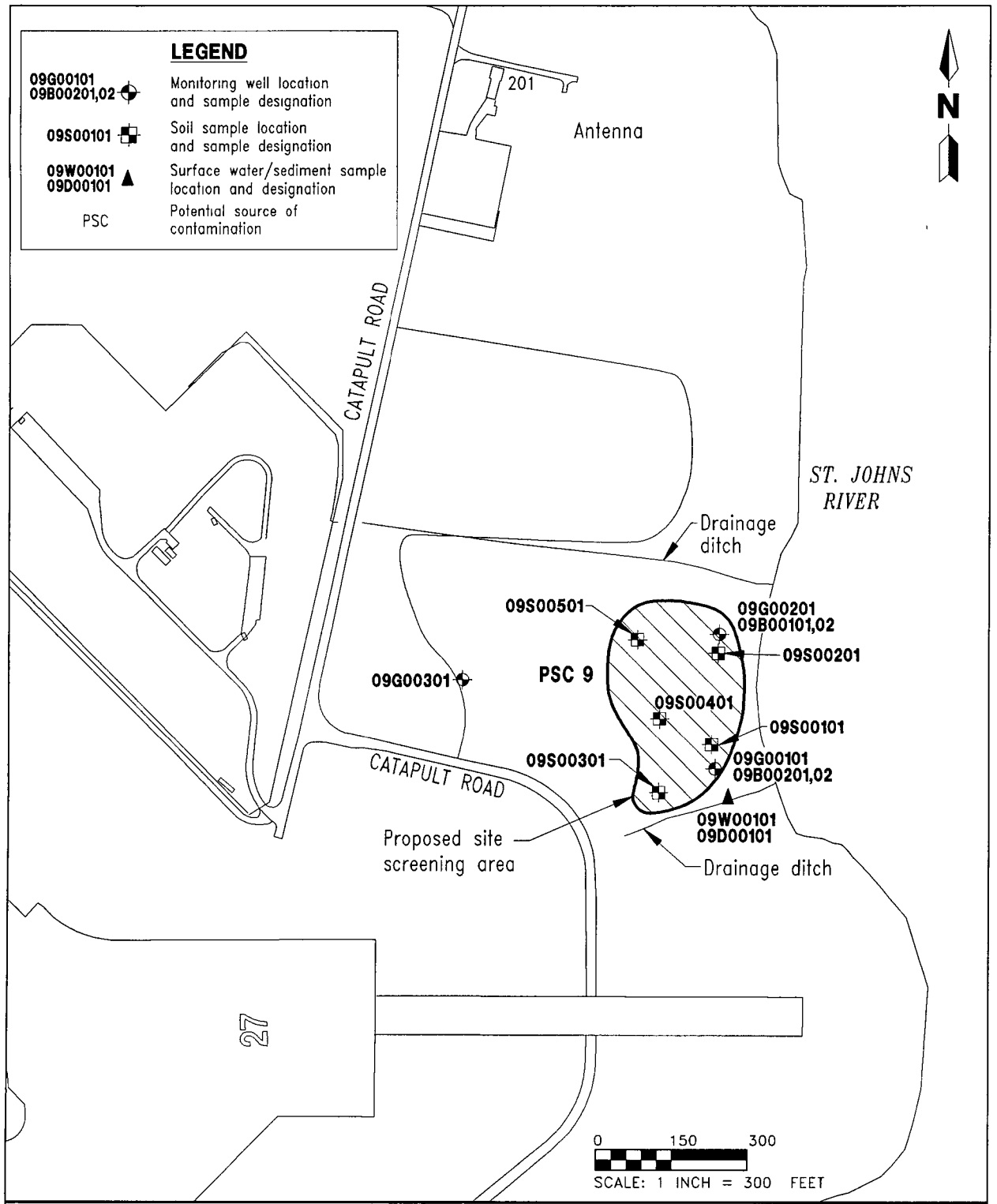

FIGURE 1-2
LOCATION OF PSC 9,
OLD DISPOSAL AREA EAST OF FUEL FARM AND SAMPLING LOCATIONS

K \02508\02508-09\SER\02508516.DWG, EJL-PDP 02/19/98 08 14 22, AutoCAD R12

SAMPLING EVENT REPORT
PSC 9

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

- Resampling of one surface soil location (09S001), and collection of one background surface soil sample. Analysis of the surface soil samples for polynuclear aromatic hydrocarbons (PAHs), TCL PCBs, and mercury, and toxicity testing using the earthworm (*Eisenia fostida*) 14-day survival test with an additional 16 days of exposure, and the 120-hour lettuce seed (*Sativa latuca*) germination test.

- Collection of two surface water samples from the unlined drainage ditch (one sample upgradient and one downgradient of surface water sample 09W00101 collected in 1997). Analysis of the surface water samples for TCL PCBs.

A tracking log showing sample and sample delivery group identifiers, relevant dates, sample depths, and parameters analyzed is included in Appendix A.

1.2 SITE DESCRIPTION AND HISTORY. PSC 9 is located near the shoreline of the St. Johns River, just north and east of the main east-west runway (Figure 1-2). The site is approximately 200 feet wide by 400 feet long and is accessible from Catapult Road. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Northern portions of PSC 9 have dense ground cover and shrubs, which also limit access to the site. The shoreline near PSC 9 is built up with concrete rubble and bricks.

During HLA's PSC reconnaissance on April 21 and 27, 1994, large pieces of concrete rubble were observed in the central part of the site. A large berm of rubble runs in a north-south direction in this area. Rusted scrap metal and pieces of polyvinyl chloride pipe were also observed.

PSC 9 is located between two drainage ditches that flow east to the St. Johns River. The site is mostly flat and gently slopes north and south toward the two drainage ditches. Groundwater flow is generally east toward the St. Johns River. The Verification Study report concluded that the St. Johns River is the discharge point for groundwater (Geraghty & Miller, Inc., 1985).

Interviews with NAS Jacksonville personnel and examination of aerial photographs revealed additional information regarding the PSC history. In a 1959 aerial photograph, PSC 9 was devoid of vegetation; a small roadway led to the site. This photograph indicates that disposal at this site could have occurred prior to 1977. According to an engineer on station, unauthorized disposal occurred at PSC 9 for an undetermined period after 1978 (Wadel, 1994a). Between 1985 and 1988, organic and possibly other materials were disposed of at PSC 9.

Concrete runway debris was placed over the entire disposal area at PSC 9 and pushed underground by bulldozers (Wadel, 1994b). According to *History of the Public Works Department and Office of the Officer in Charge of Construction*, runways on the landing field were constructed of a limerock base with a triple-surface asphalt treatment (NAS Jacksonville, 1945). The roadways were constructed with a double-surface treatment. No asbestos is known to have been disposed of at PSC 9 (Wadel, 1994a). In 1990, soil from the Wright Street project and concrete rubble were disposed of at PSC 9 (Geraghty & Miller, Inc., 1990).

An October 1951 aerial photograph shows dredge spoils being collected and drained in the area between PSC 5 and Gas Hill. The photographic evidence also suggests that this material was being transported to and used as fill at PSC 9 and the west end of the runway.

In 1997, Bechtel Environmental, Inc. (BEI) conducted a radiological survey at PSC 9 to define and remediate areas of elevated radiological contamination (BEI, 1998). A total of 540 cubic yards (yd^3) of soil were removed from 10 hot spots/area locations totalling approximately 17,000 square feet. The excavated soil was transported to PSC 26 for disposal. Radiological measurements performed after the excavated areas were backfilled indicated that residual activities are within stationwide background levels. The BEI radiological survey report is included in Appendix B.

2.0 SAMPLING APPROACH AND FIELD CHANGES

The work described herein was performed as presented in the SSW (ABB-ES, 1997). Additional sampling performed to more fully characterize the environmental conditions at PSC 9 is also described in this section.

Three micro monitoring wells, two downgradient and one upgradient, were installed at the site. Each of the wells, installed using TerraProbe℠ technology, were set at 10 feet below land surface (bls) and with 9 feet of well screen. Groundwater samples 09G00101, 09G00201, and 09G00301 were collected from the monitoring wells for laboratory analysis. One surface and three subsurface soil samples were collected during the installation of the downgradient wells. Three of these four soil samples were considered subsurface in depth (Appendix A). Five additional surface soil samples (09S00101 through 09S00501) were collected from 0 to 1 foot bls.

One surface water sample (09W00101) and one sediment sample (09D00101) were collected from the same location in the drainage ditch directly south of the site.

The soil, surface water, sediment, and groundwater samples collected for laboratory analysis were sent by overnight carrier to the subcontract laboratory, CompuChem Environmental Corp. (CompuChem), Cary, North Carolina. The samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and radiological parameters (gross alpha and gross beta).

Elevated concentrations of PAHs, cadmium, lead, and mercury were detected at sampling locations 09B00101, 09S00101, and 09S00201, and an elevated concentration of Aroclor-1254 was detected in sample 09S00101. Based on information presented in BEI's report (Appendix B), soil areas in and around sampling locations 09B00101 and 09S00201 were excavated, thereby removing the contamination found at these locations. BEI removed a total of 540 yd^3 of soil from PSC 9.

HLA recommended additional sampling at PSC 9 to gather supplemental data necessary for ecological risk screening. Field work for the second sampling event was completed on March 30, 1999, and included surface soil and surface water sampling.

A surface soil sample at the approximate location of 09S00101 and a background surface soil sample at an upgradient location were collected. Site sample 09S00102 and background sample 09SBK101 were collected on March 29, 1999 and analyzed for PAHs, PCBs, and mercury. In addition, toxicity tests were performed including the earthworm (*Eisenia fostida*) 14-day survival test with an additional 16 days of exposure, and the 120-hour lettuce seed (*Sativa latuca*) germination test. Surface water samples were collected from the drainage ditch at locations upgradient (09W00201) and downgradient (09W00301) of sample location 09W00101 to confirm the presence of Aroclor-1254 in surface water.

Toxicity tests were performed by Aquatec Biological Sciences, South Burlington, Vermont. The results of the toxicity tests are presented in Appendix C. The surface soil and surface water samples collected for laboratory analysis were sent to the subcontract laboratory, Quanterra, Inc., North Canton, Ohio.

Following the laboratory analysis all data were validated in accordance with the Naval Facilities Engineering Service Center (NFESC) Level D protocol. A summary of the detections in the soil, surface water, and groundwater analytical results is presented in Appendix D. The validated analytical results are included in Appendix E.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

3.1 JULY AND AUGUST 1997 SAMPLING ACTIVITY. Field samples and associated quality assurance and quality control (QA/QC) samples were collected and analyzed according to USEPA Contract Laboratory Program (CLP) and NFESC requirements by a NFESC-certified laboratory, CompuChem Laboratories, following CLP analytical and deliverable requirements. The analytical data packages, submitted by sample delivery groups, were independently validated by a subcontract data validation company, Environmental Data Services (EDS), Concord, New Hampshire, in accordance with validation requirements contained in NFESC document *Navy Installation Restoration Laboratory Quality Assurance Guide* (NFESC, 1996). Other documents used in the data validation and review include the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, 1994a), and the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA, 1994b).

A detailed QA/QC evaluation can be found in the EDS report (EDS, 1997), which summarizes the results of the data quality assessment according to the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters for the entire site screening activity. The EDS report was issued as Appendix B of the SSW. The generated analytical data were found to be acceptable according to the PARCC criteria, with less than 5 percent of the data requiring qualification (primarily estimated "J" qualifier).

3.2 MARCH 1999 SAMPLING ACTIVITY. Field samples and an associated rinsate blank were collected and analyzed according to USEPA CLP and NFESC requirements by an NFESC certified laboratory, Quanterra, Inc. (North Canton, Ohio), following CLP analytical and deliverable requirements. PAH analysis was performed using USEPA SW846 Method 8310. Toxicity tests were performed based on methods described in Method 600/R-94/025 (USEPA, 1994c).

The analytical data package was independently validated by a subcontract data validation company, EDS, in accordance with validation requirements contained in the documents cited in Section 3.1. The EDS validation report is included in Appendix F.

4.0 ANALYTICAL RESULTS

The analytical results in each sampled media are discussed in the following sections. As mentioned in Chapter 1.0, the IAS report indicated possible sludge disposal at PSC 9 based on the high chromium concentrations found in soil samples previously collected. Since PSC 9 was identified as a PSC because of the suspected sludge disposal in the area, this discussion includes a comparison of analytical results in surface soil and subsurface soil at PSC 9 to the sludge sample collected at PSC 50, the former East Side Wastewater Treatment Plant Sludge Disposal Area.

4.1 ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES. Seven surface soil samples and one background surface soil sample were collected. Appendix C presents a summary of the parameters detected in surface soil samples. The complete validated analytical data are included in Appendix D.

Based on information presented in BEI's report (Appendix B), several soil areas, including the two surface soil sampling locations 09B00101 and 09S00201 were excavated and remediated, at depths ranging from one to three feet below land surface. The excavated material was transported to PSC 26 for disposal. Since the contamination found at these locations has been effectively remediated, the following discussion of analytical results are limited to the remaining five surface soil samples collected at PSC 9 (surface soil samples 09S00101, 09S00101, 09S00301, 09S00401, and 09S00501).

4.1.1 Volatile Organic Compounds Acetone was detected in two surface soil samples, at concentrations of 30 and 33 micrograms per kilogram (μg/kg). These detections are considered artifacts of laboratory or decontamination procedures.

4.1.2 Semivolatile Organic Compounds Fourteen SVOCs, primarily consisting of PAHs, were detected in the six surface soil samples analyzed. Benzo(a)pyrene was detected in three samples at concentrations ranging from 85 to 860 μg/kg versus the Florida Department of Environmental Protection (FDEP) residential soil cleanup goal (SCG) of 100 μg/kg. Based on the visual findings, the detected PAHs are directly related to the disposal of asphalt-containing rubble at PSC 9.

4.1.3 Pesticides and Polychlorinated Biphenyls Twelve pesticides and a PCB compound (Aroclor-1254) were detected in surface soil samples. All detected concentrations did not exceed their respective FDEP residential SCGs.

4.1.4 Inorganic Parameters Eighteen inorganic parameters were identified in surface soil. All detected concentrations did not exceed their respective FDEP residential SCGs.

4.1.5 Radiological Parameters Gross alpha measurements ranged from -0.57 picocuries per gram (pCi/g) to 4.06 pCi/g and gross beta ranged from 6.07 pCi/g to 12.87 pCi/g.

4.2 ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES. Appendix C presents a summary of the parameters detected in the three subsurface soil samples collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.2.1 Volatile Organic Compounds Acetone was detected in one subsurface soil sample at 15 µg/kg. This detection is considered an artifact of laboratory or decontamination procedures.

4.2.2 Semivolatile Organic Compounds Four PAH compounds, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene, were detected in one subsurface soil sample (09B00201).

4.2.3 Pesticides and Polychlorinated Biphenyls Eight pesticide compounds and one PCB compound (Aroclor-1254) were detected in subsurface soil samples. The pesticide detections are all below 1 µg/kg. Aroclor-1254 was detected in two subsurface samples at 11 and 36 µg/kg.

4.2.4 Inorganic Parameters Nineteen inorganic parameters were identified in the three subsurface soil samples analyzed. Antimony and cadmium were detected in only one sample (09B00201), and beryllium was detected only in sample 09B00102. All other inorganic detections were detected in all three samples analyzed.

4.2.5 Radiological Parameters Gross alpha measurements ranged from -2.94 to 18.79 pCi/g and gross beta ranged from 5.04 to 15.31 pCi/g.

4.3 ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES. Appendix C presents a summary of the parameters detected in groundwater samples collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.3.1 Volatile Organic Compounds Methylene chloride was detected in one groundwater sample at 21 micrograms per liter (µg/ℓ). This detection is considered an artifact of laboratory or decontamination procedures.

4.3.2 Semivolatile Organic Compounds No SVOCs were detected in the groundwater samples analyzed.

4.3.3 Pesticides and Polychlorinated Biphenyls One pesticide compound, dieldrin, was detected in the two downgradient groundwater samples (09G00101 and 09G00201) at 0.005 µg/ℓ and 0.09 µg/ℓ. However, the detections are below the FDEP groundwater guidance concentrations (GGC) of 0.1 µg/ℓ.

4.3.4 Inorganic Parameters Eighteen inorganic parameters were detected in the groundwater samples analyzed. Aluminum, iron, and manganese were detected at concentrations exceeding both their FDEP GGCs and Federal maximum contaminant level (MCL) secondary standards. Aluminum was detected at 200 µg/ℓ, iron at 300 µg/ℓ, and manganese at 50 µg/ℓ. Exceedances of secondary standards were observed in the three groundwater samples analyzed and may be related to the suspended solids naturally present in groundwater. Antimony and lead were detected at concentrations exceeding both their FDEP GGC and Federal MCL primary standards. Antimony was detected at 6 µg/ℓ and lead at 50 µg/ℓ. Exceedances of the primary standards were detected in only one sample (09G00301).

4.3.5 Radiological Parameters Gross alpha, ranging from 2.79 picocuries per liter (pCi/ℓ) to 7.41 pCi/ℓ, and gross beta, ranging from 8.79 pCi/ℓ to 19.53 pCi/ℓ, were detected in all three groundwater samples.

4.4 ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES. Appendix C presents a summary of the parameters detected in three surface water samples collected at PSC 9. Only one surface water sample was analyzed for the full suite of TCL and TAL parameters. The remaining two surface water samples were analyzed for TCL pesticides and PCBs only. The complete validated analytical data are included in Appendix D.

4.4.1 Volatile Organic Compounds No VOCs were detected in one surface water sample analyzed.

4.4.2 Semivolatile Organic Compounds One SVOC, di-n-butylphthalate at 2 $\mu g/\ell$, was detected in one surface water sample at a concentration slightly below the Florida surface water standard of 3 $\mu g/\ell$. This compound detection is considered a laboratory artifact.

4.4.3 Pesticides and Polychlorinated Biphenyls One pesticide (Aldrin) and one PCB compound (Aroclor-1254) were detected in the initial surface water sample collected (09W00101). The Aroclor-1254 detection at 1.6 $\mu g/\ell$ exceeded the Florida surface water standard of 0.014 $\mu g/\ell$, and may be related to the suspended solids naturally present in the surface water. However, these compounds were not detected in two surface water samples collected upgradient (sample 09W00201) and downgradient (sample 09W00301) of this initial sample. Three other pesticide compounds (alpha-benzene hexachloride [BHC], beta-BHC, and Heptachlor) were detected in the downgradient sample at low concentrations (2 to 6 parts per billion [ppb]). All detections may be related to the suspended sediments present in the surface water.

4.4.4 Inorganic Parameters Thirteen inorganic parameters were detected in one surface water sample analyzed. Only iron, detected at 2,610 $\mu g/\ell$, exceeded the Florida surface water standard of 1,000 $\mu g/\ell$.

4.4.5 Radiological Parameters Gross alpha at 2.01 pCi/ℓ and gross beta at 5.13 pCi/ℓ were detected in one surface water sample analyzed.

4.5 ANALYTICAL RESULTS FOR SEDIMENT SAMPLES. Appendix C presents a summary of the parameters detected in one sediment sample collected at PSC 9. The complete validated analytical data are included in Appendix D.

4.5.1 Volatile Organic Compounds No VOCs were detected in the sediment sample analyzed.

4.5.2 Semivolatile Organic Compounds No SVOCs were detected in the sediment sample analyzed.

4.5.3 Pesticides and Polychlorinated Biphenyls Three pesticide compounds, dieldrin, endrin, and heptachlor, were detected below 1 ppb in the sediment sample. FDEP sediment quality assessment guidelines (SQAGs) have not been determined for these compounds.

4.5.4 Inorganic Parameters Sixteen inorganic parameters were detected in the sediment sample analyzed; however, none were detected at concentrations exceeding their respective FDEP SQAGs.

4.5.5 Radiological Parameters Gross alpha at 14.26 pCi/g and gross beta at 11.04 pCi/g were detected in the sediment sample.

4.6 COMPARISON OF PSC 9 ANALYTES TO COMPONENTS OF INDUSTRIAL SLUDGE. The IAS (Fred C. Hart Associates, Inc., 1983) reported that the chromium content of the soils indicated that chromium sludge "could have been disposed of in this area." No documented disposal of industrial waste is known to have occurred. As discussed in Subsection 4.1.4 and as shown in Appendix C, no inorganic parameters in surface soil exceeded the FDEP residential SCG. These results would not be expected at an area contaminated with industrial sludge.

Further evidence that PSC 9 was not used for disposal of industrial sludge is presented in Table 4-1. As shown in Table 4-1, the analytes detected in surface and subsurface soil at PSC 9 are not similar to the known sludge that was disposed of at PSC 50. The PSC 50 sludge contained a different "fingerprint" of PAHs at PSC 9. At PSC 50, the PAHs contained significant levels of bis(2-ethylhexyl)phthalate, 1,4-dichlorobenzene, 2-methylnaphthalene, and naphthalene, and undetected levels of benzo(a)- anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and fluoranthene. PSC 9 contained detectable levels of Aroclor-1254 but nondetectable levels of Aroclor-1260, results that are opposite of those from the PSC 50 sludge. Pesticides detected in the sludge at PSC 50 included dichlorodiphenyltrichloroethane, dichlorodiphenyldichloroethene, and dichlorodiphenyldichloroethane, and were at levels indicating disposal, whereas the levels detected at PSC 9 indicated normal application of pesticides for insect control. Finally, the soils at PSC 9 contained significantly less silver, manganese, mercury, zinc, and cadmium (which would be expected in industrial waste) and significantly more calcium, magnesium, and potassium, which would be expected in local soils. The levels of radioactivity present at PSC 9 are consistent with those found at PSC 5, an area also known to contain dredge material from the St. Johns River. These levels may be indicative of naturally occurring radioactivity in the materials from the river bottom.

The analytical results, therefore, suggest that the material disposed of at PSC 9 is not consistent with industrial sludge at PSC 50 and is more like the reported construction debris, which included asphalt and dredge material. The asphalt would account for the PAH compounds found in the soil samples.

Table 4-1
Comparison of Detected Analytes in Soils at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Volatile Organic Compounds (µg/kg)			
Acetone	35	15	450
2-Butanone	ND	ND	250
Chlorobenzene	ND	ND	190
Ethylbenzene	ND	ND	20
Toluene	ND	ND	10
Xylene (total)	ND	ND	65
Semivolatile Organic Compounds (µg/kg)			
Acenaphthene	49	ND	ND
Acenaphthylene	46	ND	ND
Anthracene	ND	ND	ND
Benzo(a)anthracene	1,400	77	ND
Benzo(a)pyrene	1,400	140	ND
Benzo(b)fluoranthene	2,300	150	ND
Benzo(g,h,i)perylene	860	ND	ND
Benzo(k)fluoranthene	1,100	59	ND
bis(2-Ethylhexyl)phthalate	250	ND	2,600
Carbazole	82	ND	ND
Chrysene	1,600	99	ND
Di-*n*-butylphthalate	180	ND	ND
Dibenz(a,h)anthracene	120	ND	ND
1,4-Dichlorobenzene	ND	ND	2,500
Fluoranthene	3,200	ND	610
Fluorene	39	ND	ND
Indeno(1,2,3-cd)pyrene	750	ND	ND
2-Methylnaphthalene	ND	ND	1,800
Naphthalene	ND	ND	6,300
Phenanthrene	680	ND	840
Pyrene	2,600	ND	500

See notes at end of table

Table 4-1 (Continued)
Comparison of Detected Analytes in Soils at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Pesticides and PCBs (µg/kg)			
4,4'-DDD	51	0.71	100
4,4'-DDE	41	ND	760
4,4'-DDT	41	0 58	1,600
Aldrin	ND	0 26	ND
alpha-Chlordane	5	ND	87
Aroclor-1254	74	36	ND
Aroclor-1260	ND	ND	5,800
delta-BHC	0.47	ND	2.6
Dieldrin	11	0.94	180
Endosulfan I	1.5	ND	42
Endosulfan sulfate	2.2	1.5	ND
Endrin	1.5	0.67	ND
Endrin aldehyde	1 6	ND	ND
Endrin ketone	7.4	ND	ND
gamma-BHC (Lindane)	ND	0 19	ND
gamma-Chlordane	5 1	ND	2.7
Heptachlor	0.3	0.45	ND
Heptachlor epoxide	0.35	ND	ND
Methoxychlor	ND	ND	14

See notes at end of table.

Table 4-1 (Continued)
Comparison of Detected Analytes in Soils at PSC 9 and Sludge at PSC 50

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Analytes	Surface Soil PSC 9	Subsurface Soil PSC 9	Sludge PSC 50
Inorganic Analytes (mg/kg)			
Aluminum	4,030	4,110	3,090
Antimony	0.76	1 2	18 3
Arsenic	2.6	3.2	1 8
Barium	124	21.9	165
Beryllium	0.33	0.7	0.05
Cadmium	7.1	0.56	67.3
Calcium	35,500	58,000	10,700
Chromium	38 8	366	595
Cobalt	2 4	2.6	1.8
Copper	42.4	9.4	280
Iron	12,900	12,800	10.200
Lead	182	18.3	420
Magnesium	1,350	1,400	67 8
Manganese	73 9	107	1,100
Mercury	1 6	ND	9 1
Nickel	45.8	17.2	329
Potassium	547	814	231
Selenium	1.2	ND	1.5
Silver	6.9	ND	470
Sodium	194	593	ND
Vanadium	14.6	30.5	11.2
Zinc	151	19	940

Notes: Values presented for surface soil and subsurface soil are the maximum detected concentrations. For surface soil, the data set includes all seven surface soil samples, including the two excavated soil areas 09B00101 and 09S00201.

PSC = potential source of contamination
µg/kg = micrograms per kilogram.
ND = compound or analyte was not detected at the reporting limit.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.

5.0 RISK EVALUATION

The purpose of performing risk screening as part of the site-screening evaluation is to assist in determining whether or not the existing risk at PSC 9 (1) supports a no further action decision (with or without the implementation of land-use controls [LUCs]), (2) indicates the need for an interim remedial action, or (3) requires additional investigation to make a decision.

Risk screening involves comparing concentrations of detected analytes that are inorganic analytes to background screening levels and then comparing the concentrations of those inorganic analytes present above background screening levels and all detected organic analytes to risk-based screening concentrations (RBCs) developed by the USEPA Region III (USEPA, 1998). USEPA developed RBCs using conservative pathway-specific models. Contaminants present below the RBCs are considered to pose no or only insignificant risk. Analytes detected both above the background screening concentrations and the RBCs are considered chemicals of potential concern (COPCs). If any COPCs are identified, a more detailed risk analysis may be appropriate.

5.1 HUMAN HEALTH RISK SCREENING. Analytes were excluded as COPCs if they met the following criteria:

- the detected concentration of a contaminant did not exceed two times the arithmetic mean (with one-half the reported quantitation limit averaged for non-detections) of background concentrations;
- the detected concentration did not exceed USEPA Region III RBCs (USEPA, 1998); or
- the analyte was an essential nutrient that did not have a Region III RBC but was detected below calculated screening concentrations based on the recommended dietary allowances.

5.1.1 Surface Soil Table 5-1 presents a comparison of the maximum detected analytes in surface soil to Region III RBCs and background levels. As discussed in Section 4.1, the surface soil data set is limited to the remaining five surface soil samples since sampling locations 09B00101 and 09S00201 have been excavated. Stationwide background screening concentrations for NAS Jacksonville were established during the Operable Unit (OU) 1 remedial investigation (RI) (ABB-ES, 1996). This background data set is used for comparison because the one upgradient background soil sample (09SBK101) was only analyzed for mercury.

Only dibenz(a,h)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno-(1,2,3-cd)pyrene exceeded the USEPA Region III RBCs for residential exposure to surface soil. Because all carcinogenic PAHs are essentially formed as part of the same process, benzo(a)anthracene, benzo(k)fluoranthene, and chrysene were also selected as COPCs.

While the carcinogenic PAHs exceeded residential RBCs, only benzo(a)pyrene slightly exceeded its industrial RBCs of 780 µg/kg (Table 5-2). The exceedance of benzo(a)pyrene (860 µg/kg) was found in the location resampled as 09S00102. The earlier sample taken near 09S00102 and identified as 09S00101 contained benzo(a)pyrene at a concentration of 590 µg/kg, below the industrial RBC of 780 µg/kg.

Table 5-1
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Acetone	2/4	33	NA	7,800,000	No
Semivolatile Organic Compounds (µg/kg)					
Acenaphthylene	1/5	46	NA	ND	No
Benzo(a)anthracene	3/5	600	NA	870	Yes[1]
Benzo(a)pyrene	3/5	860	NA	87	Yes
Benzo(b)fluoranthene	3/5	890	NA	870	Yes
Benzo(g,h,i)perylene	3/5	520	NA	[2]2,300,000	No
Benzo(k)fluoranthene	3/5	780	NA	8,700	Yes[1]
bis(2-Ethylhexyl)phthalate	3/4	130	NA	46,000	No
Chrysene	3/5	590	NA	87,000	Yes[1]
Dibenz(a,h)anthracene	1/5	120	NA	87	Yes
Fluoranthene	3/5	1,100	NA	3,100,000	No
Indeno(1,2,3-cd)pyrene	3/5	940	NA	870	Yes
Phenanthrene	1/5	81	NA	[2]2,300,000	No
Pyrene	3/5	1,300	NA	2,300,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	2/5	51	NA	2,700	No
4,4'-DDE	5/5	41	NA	1,900	No
4,4'-DDT	3/5	41	NA	1,900	No
alpha-Chlordane	3/5	7.9	NA	1,800	No
Aroclor-1254	3/5	74	NA	320	No
delta-BHC	1/5	0.31	NA	[3]100	No
Dieldrin	2/5	5.3	NA	40	No
Endosulfan I	2/5	1 5	NA	470,000	No
Endrin	1/5	1.5	NA	23,000	No
Endrin aldehyde	2/5	1 6	NA	[4]23,000	No
Endrin ketone	1/5	0.39	NA	[4]23,000	No
gamma-Chlordane	4/5	6.8	NA	1,800	No
Heptachlor	1/5	0.3	NA	140	No

See notes at end of table.

Table 5-1 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg)					
Aluminum	4/4	4,030	1,340	78,000	No
Barium	4/4	14.1	11.2	5,500	No
Beryllium	4/4	0.31	ND	160	No
Cadmium	4/4	0.71	ND	78	No
Calcium	4/4	20,600	2,360	[5]1,000,000	No
Chromium	4/4	9.9	6 6	390	No
Cobalt	4/4	1.3	ND	4,700	No
Copper	4/4	6	5.8	3,100	No
Iron	4/4	6,080	852	23,000	No
Lead	4/4	88.4	24.4	400	No
Magnesium	4/4	1,230	99.8	[5]460,468	No
Manganese	4/4	50	18	1,600	No
Mercury	4/5	0 54	ND	610	No
Nickel	4/4	3.4	11	1,600	No
Potassium	4/4	547	ND	[5]1,000,000	No
Silver	2/4	2	ND	390	No
Vanadium	4/4	10.5	3.8	550	No
Zinc	4/4	24.1	15.2	23,000	No

[1] All carcinogenic polynuclear aromatic hydrocarbons were selected as COPCs because members of the class were selected.
[2] The Region III RBC for pyrene was used to screen those noncarcinogenic COPCs without RBCs
[3] The RBC for alpha-BHC was used to screen delta-BHC.
[4] The RBC for endrin was used to screen endrin aldehyde and endrin ketone
[5] The RBCs for essential nutrients are calculated based on recommended daily allowances.

Notes: USEPA = U S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not applicable.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram
ND = not detected.

Table 5-2
Comparison of Selected Compounds to Industrial Risk Screening Levels in Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte > RBC? (Yes/No)
Semivolatile Organic Compounds (µg/kg)			
Benzo(a)anthracene	600	7,800	No
Benzo(a)pyrene	860	780	Yes
Benzo(b)fluoranthene	890	7,800	No
Benzo(k)fluoranthene	780	78,000	No
Dibenz(a,h)anthracene	120	780	No
Chrysene	590	780,000	
Indeno(1,2,3-cd)pyrene	940	7,800	

Notes USEPA = U.S. Environmental Protection Agency
RBC = risk-based concentration
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram.

An industrial exposure scenario would be appropriate for PSC 9 considering its location. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Implementation of LUCs would further prevent exposure to residents who are currently prohibited access to PSC 9.

5.1.2 Subsurface Soil According to FDEP and USEPA guidance, subsurface soil is screened against an industrial exposure scenario even if a residential exposure would be appropriate for surface soil in the same location because it is assumed that residents would not be regularly exposed to subsurface soils (Table 5-3). Stationwide background screening concentrations for NAS Jacksonville were established during the OU 1 RI (ABB-ES, 1996).

No analytes in subsurface soil exceeded RBCs for industrial exposure (Table 5-3).

5.1.3 Surface Water There is no surface water within the area defined as PSC 9. However, a drainage ditch to the south of PSC 9 appears to contain flowing water only during rainfall events and normally has ankle-deep turbid water. Surface water samples were conservatively screened against the residential tap water exposure scenario, which assumes a consumption of two liters of water per day (see Table 5-4). This assumption grossly overestimates a reasonable consumption of surface water at PSC 9. The background screening concentrations were the data set used to support the OU 1 RI (ABB-ES, 1996).

Aldrin, Aroclor-1254, and alpha-BHC, detected in the initial surface water sample (09W00101), were the only compounds that slightly exceeded their respective tap water RBCs. These compounds, however, were not detected in surface water samples taken at locations upgradient and downgradient of 09W00101. There is currently no human exposure to surface water at PSC 9 because of its location. Future

Table 5-3
Comparison of Detected Compounds to Background and Risk Screening Levels in Subsurface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Acetone	1/3	15	NA	7,800,000	No
Semivolatile Organic Compounds (µg/kg)					
Benzo(a)anthracene	1/3	77	NA	7,800	No
Benzo(a)pyrene	1/3	140	NA	780	No
Benzo(b)fluoranthene	1/3	150	NA	7,800	No
Benzo(k)fluoranthene	1/3	59	NA	78,000	No
Chrysene	1/3	59	NA	780,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	1/3	0.71	NA	24,000	No
4,4'-DDT	1/3	0 58	NA	17,000	No
Aldrin	1/3	0.26	NA	340	No
Aroclor-1254	2/3	36	NA	2,900	No
Dieldrin	1/3	0.94	NA	360	No
Endosulfan sulfate	1/3	1.5	NA	[1]12,000,000	No
Endrin	1/3	0.67	NA	61,000	No
gamma-BHC (Lindane)	1/3	0.19	NA	4,400	No
Heptachlor	2/3	0.45	NA	1,300	No
Inorganic Analytes (mg/kg)					
Aluminum	3/3		6,823	2,000,000	No
Antimony	1/3	1.2	ND	31	No
Arsenic	3/3	3.2	1.48	3.8	No
Barium	3/3	21 9	20 8	140,000	No
Beryllium	1/3	0 7	0 49	4,100	No
Cadmium	1/3	0.56	ND	78	No
Calcium	3/3	58,000	668	NA	No
Chromium	3/3	366	14.1	10,000	No
Cobalt	3/3	2 6	ND	120,000	No
Copper	3/3	9.4	ND	NA	No
Iron	3/3	12,800	5,818	610,000	No
Lead	3/3	18.3	6.46	1,000	No
Magnesium	3/3	1,400	500	NA	No
Manganese	3/3	107	6 9	41,000	No

See notes at end of table

Table 5-3 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels in Subsurface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Nickel	3/3	17 2	ND	41,000	No
Potassium	3/3	814	343	NA	No
Sodium	3/3	593	ND	NA	No
Vanadium	3/3	30 5	ND	14,000	No
Zinc	3/3	19	14.5	610,000	No

[1] The risk-based concentration for endosulfan was used to screen endosulfan sulfate.

Notes: USEPA = U S Environmental Protection Agency.
COPC = chemical of potential concern
µg/kg = micrograms per kilogram.
NA = not available.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram.
ND = not detected.

Table 5-4
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Water

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region III Risk-Based Concentration (Tap Water)	Analyte COPC? (Yes/No)
Semivolatile Organic Compounds (µg/ℓ)					
Di-n-butylphthalate	1/1	2	NA	3,700	No
Pesticides and PCBs (µg/ℓ)					
Aldrin	1/3	.01	NA	.0039	Yes
Aroclor-1254	1/3	1 6	NA	.033	Yes
alpha-BHC	1/3	0022	NA	0.011	Yes
beta-BHC	1/3	0061	NA	.037	No
Heptachlor	1/3	0019	NA	.0023	No
Inorganic Analytes (µg/ℓ)					
Aluminum	1/1	2,820	ND	NA	No
Barium	1/1	19	83	2,600	No
Calcium	1/1	31,700	39,110	NA	No
Chromium	1/1	9 6	ND	180	No
Cobalt	1/1	1.1	ND	2,200	No
Iron	1/1	2,610	2,436	11,000	No
Magnesium	1/1	14,500	6,126	NA	No
Manganese	1/1	54.1	39.6	730	No
Nickel	1/1	2.8	ND	730	No
Potassium	1/1	4,590	1,792	NA	No
Sodium	1/1	85,400	20,870	NA	No
Vanadium	1/1	7.9	5.6	260	No
Zinc	1/1	20	46.4	11,000	No

Notes: The risk-based concentration indicated for chromium is from hexavalent chromium.

USEPA = U S Environmental Protection Agency.
COPC = chemical of potential concern.
µg/ℓ = micrograms per liter.
NA = not available.
PCB = polychlorinated biphenyl.
BHC = benzene hexachloride.
ND = not detected.

exposure to surface water at PSC 9 is unlikely unless land use changed to allow for residential use. Therefore, implementation of LUCs further prevents exposure to potential future residents who might use surface water for recreation.

5.1.4 Sediment Results from one sediment sample collected at PSC 9 were conservatively screened against residential RBCs and the stationwide background sediment screening concentrations. The background screening concentrations were the data set used to support the OU 1 RI (ABB-ES, 1996). No analytes in sediment exceeded RBCs for residential exposure (Table 5-5). There is little potential for human exposure to contaminated sediments under the recreational or wading scenario because the area is currently off-limits to human activities.

5.1.5 Radiological Parameters A detailed radiological investigation was performed on surface soil by BEI (BEI, 1998). Those areas containing hot spots (defined as 5 pCi/g above background) were remediated. Based on the BEI report which documented the location of hot spots and their removal, risk from radiation in surface soil at PSC 9 is considered acceptable. In groundwater, the highest detected gross alpha and gross beta readings are within the range of stationwide background detections from the OU 1 RI (ABB-ES, 1996). The maximum gross alpha level at PSC 9 was 7.41 pCi/ℓ, which is below the Federal MCL of 15 pCi/ℓ.

5.1.6 Conclusions Human health risk screening at PSC 9 indicates that contaminants found in soil, sediment, and surface water pose insignificant risks to human health under the industrial exposure scenario, which is appropriate for PSC 9 considering its location. The proximity of PSC 9 to the flight line makes it inaccessible to most people. Implementation of LUCs would further prevent exposure to residents who are currently prohibited access to PSC 9.

5.2 ECOLOGICAL RISK SCREENING. This screening-level evaluation is intended to provide an assessment of potential ecological risks associated with exposure of ecological receptors to surface soil, sediment, and surface water at PSC 9. The evaluation consists of an exposure pathway analysis (Subsection 5.2.1), a summary of the analytical results and section of COPCs (Subsection 5.2.2), an exposure and effects evaluation (Subsection 5.2.3), a risk characterization (Subsection 5.2.4), and conclusions and recommendations (Subsection 5.2.5).

5.2.1 Exposure Pathway Analysis PSC 9 is relatively flat and approximately 2 acres in size. As previously mentioned, PSC 9 is located in proximity to the flight line at NAS Jacksonville. A major portion of the site was subjected to earth-moving operations during BEI's radiological remediation activities. The site is in the process of becoming revegetated with various ruderal annual and perennial herbaceous plants and small shrubs. The northern, eastern, and southern areas are vegetated by dense shrubs. As shown in Figure 1-2, the site is located between two drainage ditches that flow east to the St. Johns River. Off-site migration of site-related surface soil constituents to the southernmost ditch is possible because the topography of PSC 9 gently slopes toward the south. Standing water is usually present in the drainage ditch; however, the presence of surface water during periods of drought is intermittent.

Exposure pathways are identified for the following four groups of ecological receptors: terrestrial wildlife (Paragraph 5.2.1.1), terrestrial plants and soil invertebrates (Paragraph 5.2.1.2), and aquatic receptors (Paragraph 5.2.1.3).

Table 5-5
Comparison of Detected Compounds to Background and Risk Screening Levels in Sediment

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Sample 09D00101	Background Screening Level	USEPA Region III Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Pesticides µg/kg				
Dieldrin	0 83	NA	40	No
Endrin	0.66	NA	23,000	No
Heptachlor	0 46	NA	140	No
Inorganic Analytes (mg/kg)				
Aluminum	6,810	1,190	78,000	No
Barium	19.2	9.8	5,500	No
Beryllium	0.54	0.48	160	No
Cadmium	0.35	0.6	78	No
Calcium	3,780	6,468	[1]1,000,000	No
Chromium	16 6	3.8	390	No
Cobalt	2 2	3.8	4,700	No
Copper	5.5	0.16	3,100	No
Iron	10,300	2,300	23,000	No
Lead	11.9	14.4	400	No
Magnesium	2,090	131	[1]460,468	No
Manganese	58 6	6.8	1,600	No
Nickel	4.6	6.2	1,600	No
Potassium	923	218	[1]1,000,000	No
Vanadium	17.8	5 2	550	No
Zinc	23	18.4	23,000	No

[1] The RBCs for essential nutrients are calculated based on recommended daily allowances.

Notes: USEPA = U S Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not available.
mg/kg = milligrams per kilogram.

5.2.1.1 **Terrestrial Wildlife** Terrestrial wildlife may be exposed to contaminants in surface soil, surface water, and contaminated food items as a result of ingestion, dermal adsorption, and inhalation of fugitive dust and volatile emissions. Because PSC 9 is located in proximity to the flight line, it is expected that only small mammals and birds would frequent the site.

There are no inhalation concerns at the site because only one VOC (acetone) was detected in the surface soil. Inhalation of fugitive dust is also not likely to be a significant exposure pathway because the vegetation at PSC 9 would limit the release of fugitive dust. Dermal adsorption is considered to be a negligible exposure pathway because the presence of fur, feathers, or chitinous exoskeleton is likely to prevent contamination from coming into direct contact with the skin (personal communication with Ted Simon, USEPA Region IV, September 1997). In addition, soil trapped in the fur or feathers is likely to be ingested during grooming or preening activities, which are evaluated as part of the indirect ingestion exposure pathway.

Although ingestion of surface water by terrestrial wildlife is a potential route of exposure, this pathway is not considered as significant due to the ephemeral nature of the ditch system.

5.2.1.2 **Terrestrial Plants and Invertebrates** Terrestrial plants and soil invertebrates may be exposed to contamination in surface soil by direct contact with and root uptake (for plants) or ingestion of soil (for invertebrates). The ingestion exposure routes include the ingestion of soil and food items containing chemicals accumulated from PSC 9 surface soil.

5.2.1.3 **Aquatic Receptors** Because surface water runoff of site-related surface soil constituents into the southernmost drainage ditch is possible, exposure pathways for aquatic receptors in the drainage ditch include direct contact with surface water and sediment. Off-site migration of site-related surface soil constituents to the southernmost ditch is possible because the topography of PSC 9 gently slopes toward the south. It should be noted that evaluation of this exposure pathway for aquatic receptors is considered as conservative given the ephemeral nature of the ditch system and potential lack of aquatic habitat during periods of drought.

5.2.2 **Summary of the Analytical Results and Selection of Contaminants of Potential Concern** This section includes a review of the analytical data and selection of COPCs. COPCs represent analytes detected in environmental media (surface soil, surface water, and sediment) that are considered in the screening-level ecological risk evaluation. Calcium, iron, magnesium, potassium, and sodium are excluded as COPCs because they are considered to be essential nutrients and not toxic (National Academy of Sciences, 1977; National Research Council, 1982; 1984). Selection of COPCs in surface soil, surface water, and sediment are discussed separately in Paragraphs 5.2.2.1, 5.2.2.2, and 5.2.2.3, respectively.

5.2.2.1 **Surface Soil** Table 5-6 presents a summary of the analytical data for surface soil including the frequency of detection, range of detected concentrations, average of detected concentrations, the background screening levels, analytical data from site-specific background location 09SBK101, the USEPA Region IV Surface Soil Screening Value (USEPA, 1998), and the selected COPCs.

Table 5-6
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)							
Acetone	2/4	30 to 33	31.5	NA	NA	NA	Yes
Semivolatile Organic Compounds (µg/kg)							
Acenaphthylene	1/5	46 to 46	46	NA	ND	NA	Yes
Benzo(a)anthracene	3/5	76 to 600	292	NA	ND	NA	Yes
Benzo(a)pyrene	3/5	85 to 860	512	NA	ND	100	Yes
Benzo(b)fluoranthene	3/5	160 to 890	640	NA	ND	NA	Yes
Benzo(g,h,i)perylene	3/5	89 to 520	340	NA	ND	NA	Yes
Benzo(k)fluoranthene	3/5	140 to 780	433	NA	ND	NA	Yes
bis(2-Ethylhexyl)phthalate	3/4	53 to 130	91	NA	ND	NA	Yes
Chrysene	3/5	75 to 590	308	NA	ND	NA	Yes
Di-n-butylphthalate	1/4	180 to 180	180	NA	ND	200	No[4]
Dibenz(a,h)anthracene	1/5	120 to 120	120	NA	ND	NA	Yes
Fluoranthene	3/5	68 to 1,100	449	NA	ND	100	Yes
Indeno(1,2,3-cd)pyrene	3/5	54 to 940	478	NA	ND	NA	Yes
Phenanthrene	1/5	81 to 81	81	NA	ND	100	No[4]
Pyrene	3/5	130 to 1,300	587	NA	ND	100	Yes
Pesticides and PCBs (µg/kg)							
4,4'-DDD	2/5	1.4 to 51	26 2	NA	1.2	2.5	Yes
4,4'-DDE	5/5	0.71 to 41	11.2	NA	3.7	2 5	Yes
4,4'-DDT	3/5	7.7 to 41	19 6	NA	1.5	2 5	Yes
alpha-Chlordane	3/5	2 to 7.9	5	NA	ND	100	No[4]
Aroclor-1254	3/5	16 to 74	38 7	NA	ND	20	Yes

See notes at end of table

Table 5-6 (Continued)
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Pesticides and PCBs (µg/kg) (Continued)							
delta-BHC	1/5	0.31 to 0 31	0.31	NA	ND	100	No[4]
Dieldrin	2/5	2.7 to 5 3	4	NA	0.37	0.5	Yes
Endosulfan I	2/5	1.1 to 1.5	1.3	NA	4.7	100	No[4]
Endrin	1/5	1.5 to 1.5	1.5	NA	ND	1.0	Yes
Endrin aldehyde	2/5	0.4 -1.6	1.0	NA	ND	100	No[4]
Endrin ketone	1/5	0.39 to 0.39	0.39	NA	ND	100	No[4]
gamma-Chlordane	4/5	0.72 to 6.8	3.8	NA	2.4	100	No[4]
Heptachlor	1/5	0.3 to 0.3	0.3	NA	0.27	100	No[4]
Inorganic Analytes (mg/kg)							
Aluminum	4/4	1,660 to 4,030	2,430	1,340	NA	50	Yes
Barium	4/4	11 4 to 14.1	12.3	11.2	NA	165	No[4]
Beryllium	4/4	0 08 to 0.31	0.17	ND	NA	1.1	No[4]
Cadmium	4/4	0 21 to 0.71	0.38	ND	NA	1.6	No[4]
Calcium	4/4	2,250 to 20,600	13,063	2,360	NA	NA	No[5]
Chromium	4/4	5.9 to 9.9	7.9	6.6	NA	0.4	Yes
Cobalt	4/4	0.46 to 1.3	1.79	ND	NA	20	No[4]
Copper	4/4	3 3 to 6	4.5	5.8	NA	40	No[4]
Iron	4/4	1,580 to 6,080	3,283	852	NA	200	No[5]
Lead	4/4	7.1 to 88.4	35.9	24.4	NA	50	Yes
Magnesium	4/4	281 to 1,230	718	99.8	NA	NA	No[5]
Manganese	4/4	29.7 to 50	37 2	18	NA	100	No[4]

See notes at end of table.

Table 5-6 (Continued)
Comparison of Detected Compounds to Background and Ecological Screening Values for Surface Soil

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Range of Detected Concentrations	Average of Detected Concentrations	Background Screening Level[1]	09BK101[2]	USEPA Region IV Surface Soil Screening Value[3]	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg) (Continued)							
Mercury	4/5	0.07 to 0 54	0 24	ND	ND	0.1	Yes
Nickel	4/4	2 to 3 4	2 6	11	NA	30	No[4]
Potassium	4/4	102 to 547	268	ND	NA	NA	No[5]
Silver	2/4	0.68 to 2	1.3	ND	NA	2.0	Yes
Vanadium	4/4	3.9 to 10.5	6 3	3.8	NA	2.0	Yes
Zinc	4/4	14.3 to 24.1	17.8	15.2	NA	50	No[4]

[1] The background screening levels are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1.
[2] Analytical data collected from location 09BK101, which is located upgradient of Potential Source of Contamination 9.
[3] USEPA Region IV Surface Soil Screening Values (USEPA, 1998).
[4] The maximum detected concentration is less than the USEPA Region IV Surface Soil Screening Value.
[5] The analyte is an essential nutrient and is not considered toxic.

Notes. USEPA = U.S Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not analyzed.
ND = not detected.
PCB = polychlorinated biphenyl.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride.
mg/kg = milligrams per kilogram

The background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface soil concentration exceeds its respective USEPA Region IV Surface Soil Screening Value (USEPA, 1998).

Surface soil constituents selected as COPCs include 1 VOC (acetone), 12 SVOCs, 5 pesticides and 1 PCB, and 6 inorganic analytes.

5.2.2.2 Surface Water Analytical results for the three surface water samples were compared to the USEPA Region IV Freshwater Screening Values (USEPA, 1998) in Table 5-7. Stationwide background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface water concentration exceeds its respective USEPA Region IV Surface Water Screening Value. (USEPA, 1998).

Surface water constituents selected as COPCs include one PCB (Aroclor-1254) and five inorganic constituents (aluminum, cobalt, iron, manganese, and vanadium).

5.2.2.3 Sediment Analytical results for the one sediment sample collected from the southernmost drainage ditch were compared to the USEPA Region IV Sediment Screening Values (USEPA, 1998) in Table 5-8. Stationwide background screening values are taken from the OU 1 remedial investigation (ABB-ES, 1996). Those analytes selected as COPCs include constituents in which the maximum detected surface water concentration exceeds its respective USEPA Region IV Sediment Screening Value (USEPA, 1998).

Sediment constituents selected as COPCs include one pesticide (heptachlor) and five inorganic constituents (aluminum, barium, beryllium, manganese, and vanadium).

5.2.3 Ecological Exposure and Effects Evaluation The ecological exposure and effects evaluations are discussed separately in Paragraphs 5.2.3.1 and 5.2.3.2, respectively.

5.2.3.1 Ecological Exposure Assessment The following sections briefly describe how contaminant exposures are estimated or measured for wildlife, terrestrial plants, and invertebrates at PSC 9 and aquatic receptors in the drainage ditch south of PSC 9.

Terrestrial Wildlife. Exposure routes for wildlife receptors include direct and indirect ingestion of soil and ingestion of food containing site-related chemicals. The actual amount of a COPC taken by a wildlife species (i.e., ingestion dose in mg/kg/day) depends on a number of factors that can be obtained from the literature to estimate a potential dietary exposure (PDE). In calculating the PDE, wildlife species considered representative of the trophic guilds at the site are identified, quantitative exposure parameters are developed, and bioaccumulation through the food chain is considered.

Wildlife species from different trophic guilds that may be present at the site were selected for the PDE model. The model uses species-specific feeding and habitat characteristics to estimate chemical exposures to wildlife species relative to their position in the food chain. As previously discussed, PSC 9 is located in proximity to the flightline; therefore it is expected that only

Table 5-7
Comparison of Detected Compounds in Surface Water to Background and Florida Surface Water Standards

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Concentration[1]	USEPA Region IV Freshwater Screening Values[2]	Analyte COPC? (Yes/No)
Semivolatile Organic Compounds (µg/ℓ)					
Di-n-butylphthalate	1/1	2	NA	9.4	No[3]
Pesticides and PCBs (µg/ℓ)					
Aldrin	1/3	.01	NA	0.3	No[3]
Aroclor-1254	1/3	1 6	NA	0.014	Yes
alpha-BHC	1/3	.0022	NA	500	No[3]
beta-BHC	1/3	0061	NA	5,000	No[3]
Heptachlor	1/3	0019	NA	0.0038	No[3]
Inorganic Analytes (µg/ℓ)					
Aluminum	1/1	2,820	ND	87	Yes
Barium	1/1	19	83	NA	No[4]
Calcium	1/1	31,700	39,110	NA	No[5]
Chromium	1/1	9.6	ND	117	No[3]
Cobalt	1/1	1.1	ND	NA	Yes
Iron	1/1	2,610	2,436	1,000	Yes
Magnesium	1/1	14,500	6,126	NA	No[5]
Manganese	1/1	54.1	39 6	NA	Yes
Nickel	1/1	2.8	ND	88	No[3]
Potassium	1/1	4,590	1,792	NA	No[5]
Sodium	1/1	85,400	20,870	NA	No[5]
Vanadium	1/1	7.9	5.6	NA	Yes
Zinc	1/1	20	46.4	59	No[3]

[1] The background screening concentrations are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1.
[2] USEPA Region IV Freshwater Screening Value (USEPA, 1998)
[3] The maximum detected concentration is less than the USEPA Region IV Freshwater Screening Value.
[4] The maximum detected concentration is less than the background screening concentration.
[5] The analyte is an essential nutrient and is not considered toxic.

Notes: USEPA = U.S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/ℓ = micrograms per liter.
NA = not available.
PCB = polychlorinated biphenyl.
BHC = benzene hexachloride.
ND = not detected.

Table 5-8
Comparison of Detected Compounds to Background and Sediment Screening Values

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Sample 09D00101	Background Screening Level[1]	USEPA Region IV Sediment Screening Values[2]	Analyte COPC? (Yes/No)
Pesticides (µg/kg)				
Dieldrin	0.83	NA	3 3	No[3]
Endrin	0.66	NA	3 3	No[3]
Heptachlor	0 46	NA	NA	Yes
Inorganic Analytes (mg/kg)				
Aluminum	6,810	1,190	NA	Yes
Barium	19.2	9 8	NA	Yes
Beryllium	0 54	0.48	NA	Yes
Cadmium	0.35	0 6	1	No[3]
Calcium	3,780	6,468	NA	No[4]
Chromium	16.6	3.8	52.3	No[3]
Cobalt	2 2	3.8	NA	No[5]
Copper	5.5	0.16	18.7	No[3]
Iron	10,300	2,300	NA	No[4]
Lead	11.9	14 4	30.2	No[3]
Magnesium	2,090	131	NA	No[4]
Manganese	58.6	6 8	NA	Yes
Nickel	4 6	6.2	42.8	No[3]
Potassium	923	218	NA	No[4]
Vanadium	17.8	5 2	NA	Yes
Zinc	23	18.4	124	No[3]

[1] The background screening levels are taken from the NAS Jacksonville Remedial Investigation and Feasibility Study for Operable Unit 1
[2] USEPA Region IV Sediment Screening Values (USEPA, 1998)
[3] The maximum detected concentration is less than the USEPA Region IV Sediment Screening Value
[4] The analyte is an essential nutrient and is not considered toxic
[5] The maximum detected concentration is less than the background screening level

Notes. USEPA = U.S. Environmental Protection Agency
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram
NA = not available.
mg/kg = milligrams per kilogram.

small mammals and birds would occur at the site. The representative wildlife species considered in the ecological risk assessment are discussed below:

- **Cotton mouse** (*Peromyscus gossypinus*). The cotton mouse represents a small mammalian herbivore that could potentially be exposed to contamination in soil and plant tissue (accumulated from the soil). The cotton mouse home range is estimated at 0.147 acres; therefore, this species could reside entirely on the site. The cotton mouse represents the small mammal herbivore community at PSC 9.

- **Short-tailed shrew** (*Blarina brevicauda*). The short-tailed shrew finds suitable habitat in forests, fields, marshes, and brush. It primarily feeds on earthworms, snails, centipedes, insects, small vertebrates, and slugs (DeGraaf and Rudis, 1986). Insectivorous species may receive relatively high chemical doses of bioaccumulating compounds as a result of their voracious appetites. The shrew represents small omnivorous mammals that may be found in the old field present at PSC 9.

- **Mourning dove** (*Zenaida macroura*). The mourning dove forages by ground-gleaning in roadsides and open fields with scattered shrubs and trees. It feeds almost entirely on seeds; however, it is also known to eat occasional insects, snails, and gravel to facilitate seed digestion (Terres, 1980). The mourning dove will nest in a variety of man-made or natural structures, and its estimated home range is 5 acres. The dove represents herbivorous avian receptors at PSC 9.

- **American woodcock** (*Scolopax minor*). The woodcock is a vermivorous (feeding primarily on earthworms) bird that inhabits areas of fertile, moist soil where earthworms are plentiful. These areas include open pastures, cultivated fields, and stream banks (DeGraaf and Rudis, 1986). The woodcock represents avian receptors found in the open field community of PSC 9.

Parameters for quantitatively evaluating exposures to wildlife include body weight, food ingestion rate, home range, and relative consumption of food items. Exposure assumptions for each of the representative wildlife species for PSC 9 are provided in Table 5-9. In addition to these parameters, the species foraging habits and bioaccumulation in food items are also considered.

The Site Foraging Frequency (SFF) is an adjustment term that accounts for the frequency a receptor feeds within the site area. The SFF is based on both the acreage of the site relative to the receptor's home range and the fraction of the year the receptor would be exposed to site-related chemicals (i.e., the exposure duration). By definition the SFF cannot exceed 1. The area of PSC 9 (approximately 2 acres) is larger than the home range for the cotton mouse and the short-tailed shrew and smaller than the home range for the mourning dove and the woodcock. Because all representative wildlife species are expected to actively forage at the site year round, it is assumed that the exposure duration for these receptors is 1.

Wildlife species may be exposed to COPCs in surface soil via incidental ingestion of soil or by ingesting prey items that have bioaccumulated these COPCs. To estimate this exposure, a PDE is estimated for all representative wildlife species for each COPC according to the equations in Table 5-10.

Table 5-9
Exposure Parameters for Representative Wildlife Species

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Representative Wildlife Species	Body Weight (kg)	Reported Diet	Assumed Diet for Exposure Assessment (% of diet)	Food Ingestion Rate (kg/day)	Water Intake Rate (ℓ/day)	Home Range (acres)
Short-tailed shrew (*Blarina brevicauda*)	0.017 [a]	Earthworms, slugs, snails, fungi, insects, and vegetation [b]	78% Invertebrates 12% Plants 10% Soil [c]	0.0024 [d]	0 0025 [e]	0.96 ± 0.09 [b]
Cotton Mouse [f] (*Peromyscus gossypinus*)	0.040 [g]	Seeds and some insects [b]	88% Plants 10% Invertebrates 2% Soils [h]	0.0049 [d]	0.0055 [e]	0.147 [i]
Mourning Dove (*Zenaida macroura*)	0.13 [j]	Seeds, some insects, weed seeds, waste grain of agriculture, occasionally takes small snails [k]	94% Plants 1% Invertebrates 5% Soil [c]	0.015 [l]	0.015 [m]	5 [k]
American woodcock (*Scolopax minor*)	0.197 [n]	Primarily earthworms and insects with some plants [b]	80% Invertebrates 10% Plants 10% Soil [h]	0.02 [l]	0.020 [m]	80.1 ± 68.2 [b]

References:
[a] Mean of means reported for male and female shrews in summer and fall (USEPA, 1993).
[b] Wildlife Exposure Factors Handbook (USEPA, 1993)
[c] Estimated soil ingestion.
[d] Calculated using the mammal equation based on body weight (Wt.) in kg. Food ingestion (kg/day) = 0 0687 x Wt $^{0\ 822}$ (kg) (USEPA, 1993).
[e] Calculated using the mammal equation based on body weight (Wt.) in kg. Water ingestion (ℓ/day) = 0 099 x Wt $^{0\ 90}$ (kg) (USEPA, 1993)
[f] Values for the deer mouse are used for the cotton mouse when not available (USEPA, 1993).
[g] Average of values for cotton mice in the southeastern U.S. (USEPA, 1993).
[h] The value for the cotton mouse was estimated from the white-footed mouse (USEPA 1993).
[i] Average for male and female deer mice, Virginia/mixed deciduous forest (USEPA, 1993).
[j] Terres (1980).
[k] DeGraaf & Rudis (1986).
[l] Calculated using the bird equation based on body weight (Wt.) in kg Food ingestion (kg/day) = 0.0582 x Wt $^{0\ 651}$ (kg) (USEPA, 1993a)
[m] Calculated using the bird equation based on body weight (Wt.) in kg Water ingestion (ℓ/day) = 0.059 x Wt $^{0\ 67}$ (kg) (USEPA, 1993a).
[n] Median of mean weights reported for adult male and female American woodcocks (USEPA, 1993a).

Notes kg = kilograms.
% = percent
kg/day = kilograms per day.
ℓ/day = liters per day
± = plus or minus.

Table 5-10
Estimation of Potential Chemical Exposures for Representative Wildlife Species

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Estimation of Chemical Exposures Related to Surface Soil

Scope. Estimates the amount (dose) of a chemical ingested and accumulated by a species via incidental ingestion of surface soil and food items containing site related chemicals.

Soil Chemical Concentration: The maximum detected concentration of the chemicals of potential concern.

Soil Exposure Concentration:

$$\underset{(mg/kg)}{Soil\ Exposure} = \left(\underset{as\ Soil}{\%\ of\ Diet} \times \underset{(mg/kg)}{Soil\ Concentration} \right)$$

Primary Prey Item Concentration (T_N)

$$\underset{(mg/kg)}{Primary\ Prey\ Item\ Concentration} = \left(BAF_{inv\ or\ plant} \times \underset{(mg/kg)}{Soil\ Concentration} \right)$$

Secondary Prey Item Concentration (T_N)*

$$\underset{(mg/kg)}{Secondary\ Prey\ Item\ Concentration} = \left(BAF_{mam\ or\ bird} \times \underset{(mg/kg)}{Tissue\ Concentration\ of\ Primary\ Prey\ Items^*} \right)$$

where: BAF = Bioaccumulation Factor or mg/kg fresh weight tissue over mg/kg dry weight soil for invertebrates and plants, and mg/kg fresh weight tissue over mg/kg fresh weight food for small mammals and small birds

* For a discussion of the weighted chemical concentration in prey items, see explanation of the PDE term below.

Total Exposure Related to Surface Soil:

$$\underset{(mg/kgBW\text{-}day)}{PDE} = \frac{[P_1 \times T_1 + \ldots + P_N \times T_N + \underset{exposure}{soil}] \times IR_{Diet} \times SFF \times ED}{BW}$$

where: PDE = potential dietary exposure (mg/kgBW-day),
P_N = percent of diet composed of food item N,
T_N = tissue concentration in food item N (mg/kg),
IR_{Diet} = food ingestion rate of receptor (kg of food or dietary item per day),
BW = body weight (kg) of receptor,
SFF = site foraging frequency (site area [acres] divided by home range [acres]), assumed to be equal to 1 for lethal exposure scenario, and
ED = exposure duration (fraction of year species is expected to occur onsite)

Notes: % = percent.
mg/kg = milligrams per kilogram.
mg/kg BW-day = milligrams per kilograms of body weight per day.
inv = invertebrate.
mam = mammal species.

Bioaccumulation factors (BAFs) are used in the wildlife exposure model to estimate the transfer of chemicals between soil and plants or soil invertebrates, and between these organisms and primary consumer species. To estimate the PDE, tissue concentrations of COPCs in prey items are estimated using BAFs for surface soil. BAFs for most receptors are extrapolated from literature values or estimated using regression equations from scientific literature.

BAFs for invertebrate and plant food items are defined as the ratio of the COPC concentration in plant or invertebrate tissue (mg chemical/kg tissue wet-weight) to the COPC concentration in surface soil (mg chemical/kg dry-weight soil). BAFs reported in the scientific literature for avian and mammalian receptors are the reported ratios of COPC concentrations in the tissues of these receptors (mg chemical/kg tissue wet-weight) to the concentrations of COPCs in their food items (mg chemical/kg tissue wet-weight). BAFs for each of the surface soil COPCs evaluated at PSC 9 are included in Table G-1 of Appendix G.

Terrestrial Plants and Invertebrates. Terrestrial plants and invertebrates may be exposed to COPCs via direct contact with and root uptake (for plants) or ingestion of COPCs (for invertebrates) measured in PSC 9 surface soil. For the purposes of the screening-level ERA for PSC 9, exposures to terrestrial plants are assumed to occur within the top one foot interval of surface soil.

Aquatic Receptors. Aquatic organisms may be exposed to COPCs in the surface water and sediment of the drainage ditch; therefore, aquatic organism exposures to COPCs in the surface water and sediment of the drainage ditch are evaluated in the screening-level ERA. As previously discussed, evaluation of this exposure pathway is considered conservative due to the intermittent nature of the ditch system. During periods of drought, it is likely that the ditch is dry and unable to provide adequate habitat for aquatic receptors.

5.2.3.2 **Ecological Effects Evaluation** The methods used for identifying and characterizing ecological effects for COPCs in surface soil, surface water, and sediment are discussed separately below.

Surface Soil. Ecological effects are evaluated for three groups of ecological receptors that may be potentially exposed to the surface soil at PSC 9. These receptors include terrestrial wildlife, terrestrial plants, and soil invertebrates.

Terrestrial Wildlife. The assessment endpoint selected for terrestrial wildlife is the survival and maintenance of small mammal and bird wildlife populations present within the area of PSC 9. Because no long-term wildlife population data are available at NAS Jacksonville, a direct measurement of this assessment endpoint is not possible. The literature-derived results of laboratory toxicity studies that relate the dose of a chemical in an oral exposure with an adverse response to growth, reproduction, or survival of a test population (avian or mammalian species) are used as a measure of the assessment endpoint. Wildlife ingestion toxicity data are presented in Appendix G, Table G-2.

Reference toxicity values (RTVs) are derived for each COPC and representative wildlife species according to the data hierarchy presented in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments,* Interim Final (USEPA, 1997). The RTV represents the highest exposure level (e.g., concentration in the diet) not shown or estimated

to produce adverse effects (e.g., reduced growth, impaired reproduction, increased mortality). For each COPC, two RTVs representing lethal and sublethal effects are selected for each representative wildlife species. Lethal effects are those that result in mortality while sublethal effects include those that impair or prevent reproduction or growth. The RTVs are assumed to be a measure of the assessment endpoints for the protection of the survival, growth, and reproduction of terrestrial wildlife populations. Lethal RTVs are developed using the following data hierarchy discussed in items 1, 2, and 3, while sublethal RTVs are derived using the methodology discussed in items 1 and 2:

1) For contaminants with well-documented adverse effects, the highest reported exposure level not resulting in significant adverse effects (i.e., a no observed adverse effect level [NOAEL]) was selected as the RTV.

2) Generally, one-tenth of the lowest observed adverse effect level (LOAEL) was selected as the RTV for analytes lacking NOAEL values. However, application of the 10-fold uncertainty factor was based on consideration of the exposure duration and the type of toxicity test. Deviations from application of the 10-fold uncertainty factor are footnoted in Table G-2 of Appendix G.

3) The lowest reported oral LD_{50} (oral dose [in mg/kg body weight-day] lethal to 50 percent of a test population) was used to derive the lethal RTV if NOAEL or LOAEL values (based on lethal effects) were not available. The lethal RTV is one-fifth of the lowest reported LD_{50} value for the species most closely related to the representative wildlife receptor. One-fifth of an oral LD_{50} value is considered to be protective against lethal effects for 99.9 percent of individuals in a test population (USEPA, 1986).

A summary of lethal and sublethal RTVs selected from the ingestion toxicity data is provided in Table G-3 of Appendix G.

Terrestrial Plants and Invertebrates. The assessment endpoints selected for terrestrial plants and soil invertebrates are survival of invertebrates and growth of terrestrial plants at PSC 9. One surface soil sample at the approximate location of 09S00101 and one background surface soil sample at an upgradient location were collected and submitted for toxicity testing. Toxicity tests were performed using the earthworm (*Eisenia fostida*) 14 and 30-day survival test, and the 120-hour lettuce seed (*Sativa latuca*) germination test. The results of the toxicity tests are summarized in Table 5-11; the full laboratory report is presented in Appendix E.

As shown in Table 5-11, survival of earthworms in the site-related sample, 09S00102 was not significantly different from the laboratory control; therefore, no adverse impacts are expected for terrestrial invertebrates.

Lettuce seed germination rates for both the site-related sample 09S00102 (50 percent) and the site background sample 09SBK101 (11 percent) were significantly different from the laboratory control sample (91 percent). It should be noted, however, that the results reported in Table 5-11 are from a retest of the experiment. The test was rerun because the percent germination in the laboratory control did not meet the acceptability criteria. The initial toxicity tests

Table 5-11
Summary of Surface Soil Toxicity Testing Results

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Sample Location	Earthworm Toxicity Test		Lettuce Seed Mean Germination (percent)
	Mean Survival on Day 14 (percent)	Mean Survival on Day 30 (percent)	
Laboratory Control	100	98	91
09S00102	100	98	50*
09SBK101 (Site Background)	98	95	11*

Note: * = Statistically significant differences from the laboratory control soil (p=0.05).

resulted in germination rates of 82 and 55 percent for samples 09S00102 and 09SBK101, respectively, while the laboratory control had only 22 percent germination. It is unclear why the site-related soils supported higher germination rates in the first round of testing as compared to the repeated tests or why the laboratory control did poorly in the initial testing. The same packet of seeds was used for both the initial and repeated toxicity tests. Germination in the site background sample 09SBK101 was consistently low for both testing events. Soil pH values for 09S00102 and 09SBK101 were reported at 8.0 and 5.8 units, respectively; therefore, differences in pH could partially account for the differences in germination rates. Vegetation at both the site-related and background locations appears to be growing normally with no evidence of stressed growth patterns. The background sample was collected near the edge of a maintained grassy field from soil that is geologically similar to that collected at PSC 9.

Aquatic Receptors. Literature values that relate the concentration of a contaminant with an effect level (derived from data for adverse growth, reproduction, or survival effects of a test population) were used to measure adverse effects to aquatic receptors. Aquatic organism effects from exposure to surface water and sediment of the drainage ditch were evaluated as described below.

Surface water RTVs selected for comparison to surface water exposure concentrations include the State of Florida Class III Freshwater Quality Standards (Florida Legislature, 1996), and Federal Chronic Ambient Water Quality Criteria (AWQC) (USEPA, 1991).

Sediment benchmarks selected for comparison to detected sediment concentrations include the State of Florida SQAGs Threshold Effects Limit (TEL) and Probable Effect Limit (PEL) values (MacDonald, 1994).

5.2.4 **Risk Characterization** This subsection discusses how risks are characterized for ecological receptors exposed to contamination in surface soil, surface water, and sediment. A comparison of exposure information with the appropriate concentration-response toxicity data is the basis for the risk characterization.

5.2.4.1 **Surface Soil** Potential risks associated with exposure to COPCs in surface soil at PSC 9 are discussed separately for wildlife, terrestrial plants, and soil invertebrates. Risks to wildlife are characterized by comparing PDE

concentrations (based on maximum exposure concentrations) for each surface soil COPC with its respective RTV (estimated threshold dose for toxicity). Risks for terrestrial plants and soil invertebrates are evaluated based on the surface soil toxicity testing results.

Terrestrial Wildlife. Risks for the representative wildlife species associated with ingestion and bioaccumulation of COPCs in surface soil and prey items are quantitatively evaluated using Hazard Quotients (HQs). HQs are calculated for each COPC by dividing the PDE concentration by the selected lethal and sublethal RTV. Hazard Indices (HIs) are determined for each receptor by summing the HQs for all COPCs. When the estimated PDE is less than the RTV (i.e., the HQ less than 1), it is assumed that chemical exposures are not associated with adverse effects to receptors and risks to wildlife populations are unlikely to be significant. For instance, if the PDE calculated using the maximum detected concentration is less than the lethal RTV, then it is assumed that adverse effects to the survival of wildlife populations (e.g., reduction in population size) are unlikely to occur. Similarly, if the maximum PDE is less than the sublethal RTV, then it is assumed that adverse effects to wildlife populations related to growth and reproduction are unlikely to occur. When an HI is greater than 1, a discussion of the ecological significance of the HQs comprising the HI is completed and risks from exposure to the average concentration of COPCs are evaluated.

This hazard ranking scheme evaluates potential ecological effects to individual organisms and does not evaluate potential population-wide effects. Contaminants may cause population reductions by affecting birth and mortality rates, immigration, and emigration (USEPA, 1989). In many circumstances, lethal or sublethal effects may occur to individual organisms with little population- or community-level impacts; however, as the number of individual organisms experiencing toxic effects increases, the probability that population effects will occur also increases. The number of affected individuals in a population presumably increases with increasing HQ or HI values; therefore, the likelihood of population-level effects occurring is generally expected to increase with higher HQ or HI values.

HQs and HIs based on lethal and sublethal RTVs are calculated for each COPC and each representative wildlife species. Tables G-4 through G-9 of Appendix G present the HQ and HI calculations for PSC 9. A summary of risks to representative wildlife receptors is provided in Table 5-12.

Summary HIs for representative wildlife species exposed to maximum detected concentrations of COPCs for lethal effects are less than 1; therefore risks are not predicted for these receptors (i.e., bioaccumulating chemicals are not sufficiently high to reduce survivability in small mammal and bird wildlife populations at PSC 9).

The sublethal HIs for the short-tailed shrew exceed 1 based on the maximum (HI = 12) and average (HI = 6.6) exposure concentrations. Aluminum is the primary risk driver. Aluminum was detected in all four surface soil samples at concentrations ranging from 1,660 to 4,030 mg/kg. The distribution of aluminum in the soil at PSC 9 indicates that a localized area of elevated concentrations may be present. Aluminum was detected at a maximum concentration of 4,030 mg/kg at sample location 09S00101 as compared to detected concentrations ranging from

Table 5-12
Summary of HIs for Terrestrial Wildlife at PSC 9[1]

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Ecological Receptor	Lethal Effects HIs (maximum exposure)	Sublethal Effects HIs (maximum exposure)	Sublethal Effects HIs (average exposure)	Primary Risk Contributors
Cotton mouse	0.003	1 3	0.76	aluminum
Short-tailed shrew	0.23	12	6.6	aluminum
Mourning dove	0.0075	0.95	0.43	NA
American woodcock	0.0004	0.027	0.013	NA

[1] The information is a summary of the HIs presented in Tables G-4 through G-9 of Appendix G.

Notes: HI = hazard index
NA = not applicable.

1,660 to 2,480 mg/kg at the other three sampling locations. As previously discussed in Section 1.2, the surface soil at PSC 9 originates from dredged spoils or sediment from the St. Johns River. Sediment from coastal areas in Florida contains an abundance of naturally-occurring aluminum, due to the presence of aluminosilicate clay minerals in the earth's crust (Schropp, 1988). Therefore, the presence of aluminum in the surface soil of PSC 9 may be the result of naturally-occurring aluminum that is present in the sediment of the St. Johns River. Aluminum was detected at concentrations ranging from 407 to 14,100 mg/kg in sediment samples collected from the St. Johns River east of OU 3 (HLA, 1998). Given the high concentrations of naturally-occurring aluminum in the sediment of the St. Johns River, it is likely that concentrations detected in the PSC 9 surface soil are not site-related.

The sublethal HI for the cotton mouse slightly exceeds one (HI = 1.3) based on exposure to maximum detected concentrations; however, the HI value is less than one based on exposure to the average concentration of COPCs in the surface soil. Because the maximum exposure HI value for the cotton mouse only slightly exceeds 1, population-level sublethal impacts to the mouse and other herbivorous small mammals are expected to be unlikely. Sublethal risks are also not predicted for small birds because the HI values for the mourning dove and woodcock are well below 1, based on maximum exposure concentrations.

In summary, exposure of small insectivorous mammals to aluminum in the surface soil at PSC 9 may cause a reduction in the growth and reproduction of these receptors. It is likely, however, that the presence of aluminum in the surface soil at PSC 9 is not site-related, but related to naturally-occurring aluminum present in dredged spoils that have been transferred to the site.

Terrestrial Plants and Soil Invertebrates. Based on the results of the soil toxicity testing, risks are not predicted for soil invertebrates exposed to the surface soil at PSC 9.

The results of the lettuce seed germination toxicity test show that germination rates for both the site-related sample 09S00102 (50 percent) and the background

sample 09SBK101 (11 percent) were significantly different from the laboratory control sample (91 percent). As previously discussed in Paragraph 5.2.3.2, this test was rerun because the laboratory control sample in the initial toxicity test did not meet the acceptability criteria. In the initial test, germination rates in samples 09S00102 and 09SBK101 were 82 and 55 percent, respectively, while the laboratory control had only 22 percent germination. It is unclear why the site-related sample supported higher germination rates in the first round of testing as compared to the second round or why the laboratory control did poorly in the initial testing. The results of the lettuce seed germination toxicity tests are inconclusive due to the variability in test results for the site-related and laboratory control samples. However, vegetation at PSC 9 appears to be growing normally with no evidence of stressed growth patterns. Given the lack of stressed vegetation at PSC 9, risks are not predicted for terrestrial plants exposed to the surface soil at PSC 9.

5.2.4.2 **Surface Water** Risks for aquatic receptors from exposure to surface water in the drainage ditch south of PSC 9 were characterized based on a comparison of concentrations of surface water COPCs with aquatic toxicity benchmarks including chronic Federal freshwater AWQC (USEPA, 1991) and the State of Florida Class III Fresh Surface Water Quality Standards (Florida Legislature, 1996). The comparison of detected concentrations of COPCs to aquatic toxicity benchmark values at the three surface water sampling locations 09W00101, 09W00201, and 09W00301 is provided in Table 5-13.

Aquatic toxicity benchmarks are unavailable for several of the surface water COPCs at PSC 9 including aluminum, cobalt, manganese, and vanadium. Aroclor-1254 and iron were detected above their respective aquatic toxicity benchmark values. The Aroclor-1254 detection at location 09W00101 of 1.6 $\mu g/\ell$, however, was not confirmed by surface water samples taken at the upgradient and downgradient locations. Due to its low solubility in water, it is likely that the detection was related to suspended particulates present in the shallow turbid surface water of the ditch system at PSC 9. The iron detection is only slightly higher than the stationwide background screening concentration and may also be related to suspended particulates in surface water. Given the ephemeral nature of the ditch system and the distribution of COPCs in the surface water, risks for aquatic receptors are not predicted.

5.2.4.3 **Sediment** Risks for aquatic receptors exposed to COPCs in the sediment of the drainage ditch were characterized based on comparison of concentrations of COPCs in sediment relative to FDEP coastal sediment assessment PEL and TEL values (MacDonald, 1994). FDEP PEL and TEL values are not available for any of the sediment COCPs, which include heptachlor, aluminum, barium, beryllium, manganese, and vanadium. Given the lack of aquatic toxicity information for these constituents, it is not possible to evaluate risks associated with exposure to these constituents in the sediment. However, as previously stated, the ditch system south of PSC 9 is intermittent, unable to provide adequate habitat for aquatic receptors during periods of drought. Therefore, the presence of aquatic receptors in the ditch system is questionable and potential impacts associated with exposure to COPCs in the sediment is unlikely.

5.2.4 Conclusions Potential risks for ecological receptors were evaluated for COPCs in surface soil, surface water, and sediment at PSC 9.

Table 5-13
Comparison of Surface Water COPCs with Aquatic Toxicity Benchmarks[1]

Sampling Event Report
Potential Source of Contamination 9
Old Disposal Area East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

COPC	Detected Concentration			FDEP Class III Fresh Water Quality Standards ($\mu g/\ell$)[2]	AWQC ($\mu g/\ell$)[3]
	09W00101	09W00201	09W00301		
Pesticides and PCBs ($\mu g/\ell$)					
Aroclor-1254	1.6	ND	ND	0.014	0.014
Inorganic Analytes ($\mu g/\ell$)					
Aluminum	2,820	NA	NA	NSC	NSC
Cobalt	1.1	NA	NA	NSC	NSC
Iron	2,610	NA	NA	1,000	1,000
Manganese	54.1	NA	NA	NSC	NSC
Vanadium	7.9	NA	NA	NSC	NSC

[1] Only those analytes selected as COPCs in Table 5-7 are presented.
[2] FDEP, Chapter 63-302, Florida Administrative Code, Freshwater Surface Water Quality Standards (Florida Legislature, 1996)
[3] Chronic Freshwater Federal AWQC (USEPA, 1991)

Notes: FDEP = Florida Department of Environmental Protection.
$\mu g/\ell$ = micrograms per liter.
AWQC = Ambient Water Quality Criteria.
ND = not detected.
NA = not available.
NSC = no screening concentration

Risks associated with exposures to COPCs in surface soil were evaluated for small mammals and birds based on a model that estimates the amount of contaminant exposure obtained via diet and incidental ingestion of surface soil.

Comparison of estimated doses for wildlife species with reference toxicity doses representing thresholds for lethal and sublethal effects is the basis of the wildlife risk evaluation.

Exposure of small insectivorous mammals to aluminum in the surface soil at PSC 9 may cause a reduction in the growth and reproduction of these receptors. It is likely, however, that the presence of aluminum in the surface soil at PSC 9 is not site-related, but related to naturally-occurring aluminum present in dredge spoils from the St. Johns River that have been transferred to the site. No other lethal or sublethal risks were predicted for small herbivorous mammals or birds at PSC 9.

Risks for terrestrial plants and soil invertebrates were evaluated based on the results of site-specific toxicity testing of the PSC 9 surface soil. The results of the lettuce seed germination toxicity tests are inconclusive due to the variability in test results for the site-related and laboratory control samples. However, vegetation at PSC 9 appears to be growing normally with no evidence of stressed growth patterns. Given the lack of stressed vegetation at PSC 9, risks are not predicted for terrestrial plants exposed to the surface soil at PSC 9. Risks are also not predicted for soil invertebrates because the results of the toxicity test indicate high survival rates for earthworms exposed to surface soil from PSC 9.

Risks for aquatic receptors in the drainage ditch south of PSC 9 were characterized based on a comparison of COPC exposure concentrations with aquatic toxicity benchmarks. Benchmark values were not available for many of the surface water and sediment COPCs; therefore qualitative evaluations of the ditch system as well as the distribution of COPCs in surface water and sediment were used to characterize risks. Given the distribution of contaminants and the ephemeral nature of the ditch system, risks are not predicted for aquatic receptors that may be present in the ditch south of PSC 9.

6.0 REFERENCES

ABB Environmental Services, Inc (ABB-ES). 1996. *Remedial Investigation and Feasibility Study, Operable Unit 1*. Prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), North Charleston, South Carolina (March).

ABB-ES. 1997. *Naval Installation Restoration Program Plan, Naval Air Station, Jacksonville, Florida, Volume 3, Site Screening Workplan*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

Bechtel Environmental, Inc. 1998. *PSC 9 Final Radiological Survey Report for Completion of Remediation Activities at the Naval Air Station, Jacksonville, Florida* (January).

Environmental Data Services, Inc. 1997. PARCC Criteria Evaluation Report - Final. Prepared for Harding Lawson Associates (HLA), Orange Park, Florida (December).

DeGraaf, R.M., and D.D. Rudis. 1986. *New England Wildlife: Habitat, Natural History, and Distribution*. General Technical Report NE-108. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. Washington, D.C.

Florida Legislature. 1996. Surface Water Quality Standards; Chapter 62-302, Florida Administrative Code (FAC); Tallahassee, Florida.

HLA. 1998. *Draft Remedial Investigation and Feasibility Study for Operable Unit 3, NAS Jacksonville*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

Fred C. Hart Associates, Inc. 1983. *Initial Assessment Study, Naval Air Station Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (March).

Geraghty & Miller. 1985. *Verification Study, Assessment of Potential Ground-Water Pollution at Naval Air Station Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (December).

Geraghty & Miller. 1990. NAS Jacksonville Site Visit Check-off Sheet, Site Number 9, Old Disposal Area. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (January 23).

MacDonald Environmental Sciences Ltd. 1994. *Development of an Approach to the Assessment of Sediment Quality in Florida Coastal Waters*. Prepared for the Florida Department of Environmental Protection. Tallahassee, Florida (November).

Naval Air Station Jacksonville, Jacksonville, Florida. 1945. *History of the Public Works Department and Office of the Officer in Charge of Construction*. (January 10).

Naval Facilities Engineering Service Center. 1996. *Navy Installation Restoration Laboratory Quality Assurance Guide*. (February).

National Academy of Sciences. 1977. "Drinking Water and Health: Safe Drinking Water Committee." Washington, D.C.

National Research Council (NRC). 1982. Nutrient Requirements of Minks and Foxes," Second Revised Edition: Subcommittee on Furbearer Nutrition, National Academy Press, Washington, D.C.

NRC. 1984. "Nutrient Requirements of Beef Cattle: Subcommittee in Beef Cattle Nutrition," National Academy Press, Washington, D.C.

Schropp, S.J. and H.L. Windom. 1988. A Guide to the Interpretation of Metal Concentrations in Estuarine Sediments. Prepared for the Florida Department of Environmental Regulation, Coastal Zone Management Section (April).

Terres, J. 1991. *Audubon Encyclopedia of North American Birds*. New York: Alfred Knopf, Inc.

U.S. Environmental Protection Agency (USEPA). 1986. Hazard Evaluation Division Procedure: Ecological Risk Assessment; Office of Pesticide Programs; EPA/9-85-001; Washington, D.C.

USEPA. 1989. "Risk Assessment Guidance for Superfund: Environmental Evaluation Manual. Volume 2. EPA/540/1-89/002. Washington, D.C. (December)

USEPA. 1991. Water Quality Criteria Summary; Washington, D.C.; May 1, 1991.

USEPA. 1993. Wildlife Exposure Factors Handbook. Vols. I and II. EPA/600/R-93/187a,b. Office of Research and Development. Washington D.C. (December).

USEPA. 1994a *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Washington, D.C. (February).

USEPA. 1994b. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Washington, D.C. (February).

USEPA, 1994c. *Protocols for Short-Term Toxicity Screening of Hazardous Waste Sites*, USEPA/600/3-88/029.

USEPA. 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final Draft." Environmental Response Team, Edison, NJ, 1997.

USEPA, 1998. USEPA Region IV memorandum entitled, "Ecological Risk Assessment at Military Bases" (December 22).

USEPA, 1998. *USEPA Region III Risk-Based Concentrations*. Philadelphia, Pennsylvania (April 15).

Wadel, Michael. 1994a. Interview with Michael Wadel, Engineer, Resident Officer in Charge of Construction (ROICC), NAS Jacksonville, Jacksonville, Florida, by Andrea Donlon, ABB-ES. Wakefield, Massachusetts (April 29).

Wadel, Michael. 1994b. Interview with Michael Wadel, Engineer, ROICC, NAS Jacksonville, Jacksonville, Florida, by Susan Davis, ABB-ES. Arlington, Virginia (July 1).

Will, M.E., and G.W. Suter, 1995a. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants*: 1995 Revision; Oak Ridge National Laboratory, Environmental Sciences Division; Oak Ridge, Tennessee (September).

Will, M.E., and G.W. Suter, 1995b. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes*; Oak Ridge National Laboratory, Environmental Sciences Division; Oak Ridge, Tennessee (September).

APPENDIX A

OFF-SITE SAMPLE TRACKING LOG

Appendix A

PSC 8
OFFSITE SAMPLE TRACKING LOG
SITE SCREENING, NAS JACKSONVILLE

SDG	SAMPLE ID	SAMP DATE	UDEPTH (ft bls)	LDEPTH (ft bls)	MATRIX	TAL_MET	TCL VOC	TCL SVOC	TCL PESTPCB	DRFL	TAT	DSTV	DRFV
00013	08D00101	5/29/97	NA	NA	sediment	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08D00201	5/28/97	NA	NA	sediment	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08D00201MS	5/28/97	NA	NA	sediment		X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08D00201MSD	5/28/97	NA	NA	sediment		X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08D00301	5/29/97	NA	NA	sediment	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00101	5/20/97	0	1	soil	X	X	X	X	6/23/97	34	6/23/97	7/22/97
00013	08S00102	5/20/97	2	3	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00201	5/21/97	0	1	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00202	5/21/97	1	2	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00301	5/22/97	0	1	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00302	5/21/97	1	2	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00401	5/21/97	0	1	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00402	5/21/97	2	3	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00501	5/22/97	0	1	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00013	08S00502	5/22/97	1	2	soil	X	X	X	X	6/27/97	29	6/27/97	7/24/97
00012	08W00101	5/29/97	NA	NA	surface water	X	X	X	X	6/26/97	28	6/26/97	7/22/97
00012	08W00201	5/28/97	NA	NA	surface water	X	X	X	X	6/26/97	28	6/26/97	7/22/97
00012	08W00301	5/29/97	NA	NA	surface water	X	X	X	X	6/26/97	28	6/26/97	7/22/97

NOTES:

SDG	Sample Delivery Group (defined group of 20 samples or less collected not more than 14 days of each other
SAMPLE ID	Sample Identifier
SAMP DATE	Date of Sample Collection
UDEPTH, LDEPTH	Depths, upper (UDEPTH) and lower (LDEPTH)
MATRIX	Media Sampled
TAL_MET	Target Analyte List Metals
TCL VOC	Target Compound List Volatile Organics
TCL SVOC	Target Compound List Semivolatile Organics
TCL PESTPCB	Target Compound List Pesticides and Polychlorinated Biphenyls
DRFL	Date Package Received from Laboratory
TAT	Turnaround Time (days)
DSTV	Date Package Sent to Validators
DRFV	Date Package Received from Validators

APPENDIX B

VALIDATED ANALYTICAL DATA SHEETS

Appendix B-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00101		08S00201		08S00301		08S00401		08S00501		08S00202		08S00302		08S00502	
Sampling Date	5/20/97		5/21/97		5/22/97		5/21/97		5/22/97		5/21/97		5/21/97		5/22/97	
Volatile Organics, ug/kg																
1,1,1-Trichloroethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,1,2,2-Tetrachloroethane	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
1,1,2-Trichloroethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,1-Dichloroethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,1-Dichloroethene	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,2-Dichloroethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,2-Dichloroethene (total)	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
1,2-Dichloropropane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
2-Butanone	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
2-Hexanone	11	UJ	11	UJ	12	U	14	UJ	16	U	13	UJ	11	UJ	15	U
4-Methyl-2-pentanone	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Acetone	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Benzene	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Bromodichloromethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Bromoform	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Bromomethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Carbon disulfide	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Carbon tetrachloride	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Chlorobenzene	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Chloroethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Chloroform	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Chloromethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
cis-1,3-Dichloropropene	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Dibromochloromethane	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Ethylbenzene	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Methylene chloride	1	J	11	U	12	U	14	U	16	U	13	U	2	J	15	U
Styrene	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Tetrachloroethene	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Toluene	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
trans-1,3-Dichloropropene	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Trichloroethene	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Vinyl chloride	11	U	11	U	12	U	14	U	16	U	13	U	11	U	15	U
Xylene (total)	11	U	11	U	12	U	14	UJ	16	U	13	U	11	U	15	U
Semivolatile Organics, ug/kg																
1,2,4-Trichlorobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
1,2-Dichlorobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
1,3-Dichlorobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U

Appendix B-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00101		08S00201		08S00301		08S00401		08S00501		08S00202		08S00302		08S00502	
Sampling Date	5/20/97		5/21/97		5/22/97		5/21/97		5/22/97		5/21/97		5/21/97		5/22/97	
1,4-Dichlorobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,2'-oxybis(1-Chloropropane)	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,4,5-Trichlorophenol	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
2,4,6-Trichlorophenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,4-Dichlorophenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,4-Dimethylphenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,4-Dinitrophenol	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
2,4-Dinitrotoluene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2,6-Dinitrotoluene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2-Chloronaphthalene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2-Chlorophenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2-Methylnaphthalene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2-Methylphenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
2-Nitroaniline	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
2-Nitrophenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
3,3'-Dichlorobenzidine	360	UJ	370	U	380	U	460	U	520	U	420	U	360	U	500	U
3-Nitroaniline	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
4,6-Dinitro-2-methylphenol	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
4-Bromophenyl-phenylether	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
4-Chloro-3-methylphenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
4-Chloroaniline	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
4-Chlorophenyl-phenylether	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
4-Methylphenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
4-Nitroaniline	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
4-Nitrophenol	890	U	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
Acenaphthene	360	U	370	U	59	J	460	U	520	U	420	U	360	U	500	U
Acenaphthylene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Anthracene	360	U	370	U	140	J	460	U	520	U	420	U	360	U	500	U
Benzo(a)anthracene	360	U	370	U	860		460	U	520	U	420	U	59	J	500	U
Benzo(a)pyrene	360	U	370	U	1500		460	U	520	U	420	U	100	J	500	U
Benzo(b)fluoranthene	360	U	370	U	2900	J	460	U	57	J	420	U	120	J	59	J
Benzo(g,h,i)perylene	360	U	370	U	520		460	U	520	U	420	U	77	J	500	U
Benzo(k)fluoranthene	360	U	370	U	3000	J	460	U	59	J	420	U	130	J	61	J
bis(2-Chloroethoxy)methane	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
bis(2-Chloroethyl)ether	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
bis(2-Ethylhexyl)phthalate	54	J	75	J	380	U	250	J	79	J	59	J	410		500	U
Butylbenzylphthalate	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Carbazole	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U

Appendix B-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00101		08S00201		08S00301		08S00401		08S00501		08S00202		08S00302		08S00502	
Sampling Date	5/20/97		5/21/97		5/22/97		5/21/97		5/22/97		5/21/97		5/21/97		5/22/97	
Chrysene	360	U	370	U	1000		460	U	520	U	420	U	66	J	500	U
Di-n-butylphthalate	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Di-n-octylphthalate	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Dibenz(a,h)anthracene	360	U	370	U	150	J	460	U	520	U	420	U	360	U	500	U
Dibenzofuran	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Diethylphthalate	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Dimethylphthalate	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Fluoranthene	360	U	370	U	1100		460	U	520	U	420	U	360	U	500	U
Fluorene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Hexachlorobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Hexachlorobutadiene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Hexachlorocyclopentadiene	360	UJ	370	UJ	380	UJ	460	UJ	520	UJ	420	UJ	360	UJ	500	UJ
Hexachloroethane	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Indeno(1,2,3-cd)pyrene	360	U	370	U	470		460	U	520	U	420	U	55	J	500	U
Isophorone	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
N-Nitroso-di-n-propylamine	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
N-Nitrosodiphenylamine (1)	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Naphthalene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Nitrobenzene	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Pentachlorophenol	890	UJ	920	U	970	U	1100	U	1300	U	1100	U	900	U	1300	U
Phenanthrene	360	U	370	U	150	J	460	U	520	U	420	U	360	U	500	U
Phenol	360	U	370	U	380	U	460	U	520	U	420	U	360	U	500	U
Pyrene	360	U	370	U	1600		460	U	520	U	420	U	56	J	500	U
Pesticides/PCB, ug/kg																
4,4'-DDD	3 6	U	3 6	U	12	J	4 6	U	8	J	4 2	U	3 5	UJ	5 1	U
4,4'-DDE	2 6	J	5	J	240		1	J	7 1		1 6	J	3 4	J	12	
4,4'-DDT	6 5	U	3 6	U	280	J	22	J	6 5	J	4 2	UJ	12	J	21	J
Aldrin	3 6	U	0 54	J	1 6	J	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U
alpha-BHC	1 8	U	1 9	U	2	U	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U
alpha-Chlordane	0 25	J	1 8	J	14	J	1 7	J	1 4	J	2 2	U	0 34	J	2 8	J
Aroclor-1016	36	U	36	U	39	U	46	U	51	U	42	U	35	U	51	U
Aroclor-1221	72	U	74	U	79	U	92	U	100	U	85	U	72	U	100	U
Aroclor-1232	36	U	36	U	39	U	46	U	51	U	42	U	35	U	51	U
Aroclor-1242	36	U	36	U	39	U	46	U	51	U	42	U	35	U	51	U
Aroclor-1248	36	U	36	U	39	U	46	U	51	U	42	U	35	U	51	U
Aroclor-1254	36	U	36	U	39	U	46	U	51	U	42	U	35	U	51	U
Aroclor-1260	36	U	220		39	U	50		230		11	J	35	U	190	
beta-BHC	1 8	U	1 9	U	2	U	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U

Appendix B-1

Summary of Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00101		08S00201		08S00301		08S00401		08S00501		08S00202		08S00302		08S00502	
Sampling Date	5/20/97		5/21/97		5/22/97		5/21/97		5/22/97		5/21/97		5/21/97		5/22/97	
delta-BHC	0 12	J	1 9	U	1 2	J	0 14	J	2 6	U	0 58	J	1 8	U	0 75	J
Dieldrin	0 49	J	33		180	J	4 6	U	5 8	J	1 5	J	14		7 5	J
Endosulfan I	1 8	U	1 9	U	2	U	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U
Endosulfan II	3 6	U	3 6	U	6 9	J	4 6	U	5 1	U	4 2	U	3 5	UJ	7 6	J
Endosulfan sulfate	3 6	U	0 88	J	3 3	J	0 36	J	2 4	J	4 2	U	3 5	U	5 1	U
Endrin	3 6	U	1 1	J	6 4	J	4 6	U	0 31	J	4 2	U	0 25	J	5 1	U
Endrin aldehyde	0 25	J	3 6	U	3 9	U	0 76	J	5	J	4 2	U	3 5	U	6	J
Endrin ketone	3 6	U	3 6	U	11	J	4 6	U	5 1	U	4 2	U	3 5	U	5 1	U
gamma-BHC (Lindane)	1 8	U	1 9	U	2	U	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U
gamma-Chlordane	0 47	J	6 5	J	57	J	0 27	J	2	J	0 07	J	1 2	J	1 9	J
Heptachlor	1 8	U	1 9	U	19	J	2 3	U	2 6	U	2 2	U	1 8	U	2 6	U
Heptachlor epoxide	0 13	J	0 46	J	13	J	0 28	J	1 5	J	2 2	U	1 5	J	2 1	J
Methoxychlor	18	UJ	19	U	3	J	23	UJ	26	U	22	UJ	18	UJ	26	U
Toxaphene	180	U	190	U	200	U	230	U	260	U	220	U	180	U	260	U
Inorganics, mg/kg																
Aluminum	913		3830	J	2880	J	16200	J	15100	J	2750	J	829	J	16300	J
Antimony	0 52	UJ	0 54	UJ	0 57	UJ	0 67	UJ	0 75	UJ	0 62	UJ	0 52	UJ	0 74	UJ
Arsenic	0 61	U	0 63	U	1 6	U	7		5 2		0 91	J	0 61	U	6 7	
Barium	7 2	J	33 3	J	26 2	J	40 9	J	33 9	J	16 5	J	7 1	J	41 7	J
Beryllium	0 13	U	0 57	J	0 29	U	0 63	J	0 5	J	0 32	J	0 09	U	0 48	J
Cadmium	0 63	J	1 2		0 83	J	4 5		1 5	J	0 1	U	0 13	U	1 3	J
Calcium	17900		176000		49400		3280		1740		9180		33900		695	J
Chromium	3 6		15 7		7 3		61 6		59		6 8		3 6		66 7	
Cobalt	0 2	J	0 47	J	0 68	J	2 3	J	2	J	1	J	0 23	J	2 1	J
Copper	4	J	10 9		19 6		27 9		28 5		2 6	J	4 1	J	28 3	
Iron	969	J	2280	J	3050	J	26700	J	24500	J	3870	J	1040	J	25100	J
Lead	14 1		114		44 3		62 7		60 7		11 6		26 1		66 1	
Magnesium	350	J	2690		786	J	1730		1790		573	J	289	J	1730	
Manganese	18 3	J	138		67 6		78 3		154		19 2		8		91 9	
Mercury	0 05	U	0 1	J	0 06	U	0 62		0 52		0 06	U	0 05	U	0 54	
Nickel	2 5	J	4 6	J	2 8	J	10 5	J	9 7	J	2 3	J	2	J	8 3	J
Potassium	120	J	312	J	279	J	1060	J	1220	J	313	J	95 7	J	1020	J
Selenium	0 93	U	1 1	U	1	U	5 3		4 1		1 2	U	0 93	U	4 2	
Silver	0 15	U	0 16	U	0 17	U	1 4	J	1 3	J	0 18	U	0 23	J	1 5	J
Sodium	288	U	414	U	409	U	472	U	626	J	310	U	336	U	516	U
Thallium	1 2	U	2 7	U	1 3	U	1 5	U	1 7	U	1 4	U	1 2	U	1 7	U
Vanadium	4	J	11		10	J	35		30		7	J	3	J	33	
Zinc	9 9	J	96	J	24	J	79 7	J	65 4	J	9 5	J	7	J	67 7	J

Appendix B-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00102		08S00402	
Sampling Date	5/20/97		5/21/97	
Volatile Organics, ug/kg				
1,1,1-Trichloroethane	12	U	13	U
1,1,2,2-Tetrachloroethane	12	U	13	U
1,1,2-Trichloroethane	12	U	13	U
1,1-Dichloroethane	12	U	13	U
1,1-Dichloroethene	12	U	13	U
1,2-Dichloroethane	12	U	13	U
1,2-Dichloroethene (total)	12	U	13	U
1,2-Dichloropropane	12	U	13	U
2-Butanone	12	U	13	U
2-Hexanone	12	UJ	13	UJ
4-Methyl-2-pentanone	12	U	13	U
Acetone	12	U	13	U
Benzene	12	U	13	U
Bromodichloromethane	12	U	13	U
Bromoform	12	U	13	U
Bromomethane	12	U	13	U
Carbon disulfide	12	U	13	U
Carbon tetrachloride	12	U	13	U
Chlorobenzene	12	U	13	U
Chloroethane	12	U	13	U
Chloroform	12	U	13	U
Chloromethane	12	U	13	U
cis-1,3-Dichloropropene	12	U	13	U
Dibromochloromethane	12	U	13	U
Ethylbenzene	12	U	13	U
Methylene chloride	3	J	1	J
Styrene	12	U	13	U
Tetrachloroethene	12	U	13	U
Toluene	12	U	13	U
trans-1,3-Dichloropropene	12	U	13	U
Trichloroethene	12	U	13	U
Vinyl chloride	12	U	13	U
Xylene (total)	12	U	13	U
Semivolatile Organics, ug/kg				
1,2,4-Trichlorobenzene	400	U	420	U
1,2-Dichlorobenzene	400	U	420	U
1,3-Dichlorobenzene	400	U	420	U

Appendix B-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00102		08S00402	
Sampling Date	5/20/97		5/21/97	
1,4-Dichlorobenzene	400	U	420	U
2,2'-oxybis(1-Chloropropane)	400	U	420	U
2,4,5-Trichlorophenol	1000	U	1100	U
2,4,6-Trichlorophenol	400	U	420	U
2,4-Dichlorophenol	400	U	420	U
2,4-Dimethylphenol	400	U	420	U
2,4-Dinitrophenol	1000	U	1100	U
2,4-Dinitrotoluene	400	U	420	U
2,6-Dinitrotoluene	400	U	420	U
2-Chloronaphthalene	400	U	420	U
2-Chlorophenol	400	U	420	U
2-Methylnaphthalene	400	U	420	U
2-Methylphenol	400	U	420	U
2-Nitroaniline	1000	U	1100	U
2-Nitrophenol	400	U	420	U
3,3'-Dichlorobenzidine	400	U	420	U
3-Nitroaniline	1000	U	1100	U
4,6-Dinitro-2-methylphenol	1000	U	1100	U
4-Bromophenyl-phenylether	400	U	420	U
4-Chloro-3-methylphenol	400	U	420	U
4-Chloroaniline	400	U	420	U
4-Chlorophenyl-phenylether	400	U	420	U
4-Methylphenol	400	U	420	U
4-Nitroaniline	1000	U	1100	U
4-Nitrophenol	1000	U	1100	U
Acenaphthene	400	U	420	U
Acenaphthylene	400	U	420	U
Anthracene	400	U	420	U
Benzo(a)anthracene	400	U	420	U
Benzo(a)pyrene	400	U	420	U
Benzo(b)fluoranthene	47	J	420	U
Benzo(g,h,i)perylene	400	U	420	U
Benzo(k)fluoranthene	48	J	420	U
bis(2-Chloroethoxy)methane	400	U	420	U
bis(2-Chloroethyl)ether	400	U	420	U
bis(2-Ethylhexyl)phthalate	400	U	420	U
Butylbenzylphthalate	400	U	420	U
Carbazole	400	U	420	U

Appendix B-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00102		08S00402	
Sampling Date	5/20/97		5/21/97	
Chrysene	400	U	420	U
Di-n-butylphthalate	400	U	420	U
Di-n-octylphthalate	400	U	420	U
Dibenz(a,h)anthracene	400	U	420	U
Dibenzofuran	400	U	420	U
Diethylphthalate	400	U	420	U
Dimethylphthalate	400	U	420	U
Fluoranthene	400	U	420	U
Fluorene	400	U	420	U
Hexachlorobenzene	400	U	420	U
Hexachlorobutadiene	400	U	420	U
Hexachlorocyclopentadiene	400	UJ	420	UJ
Hexachloroethane	400	U	420	U
Indeno(1,2,3-cd)pyrene	400	U	420	U
Isophorone	400	U	420	U
N-Nitroso-di-n-propylamine	400	U	420	U
N-Nitrosodiphenylamine (1)	400	U	420	U
Naphthalene	400	U	420	U
Nitrobenzene	400	U	420	U
Pentachlorophenol	1000	U	1100	U
Phenanthrene	400	U	420	U
Phenol	400	U	420	U
Pyrene	400	U	420	U
Pesticides/PCB, ug/kg				
4,4'-DDD	59		4 2	UJ
4,4'-DDE	18		4 2	U
4,4'-DDT	4	U	4 2	U
Aldrin	2 1	U	0 1	J
alpha-BHC	2 1	U	2 2	U
alpha-Chlordane	2 1	U	2 2	U
Aroclor-1016	40	U	42	U
Aroclor-1221	81	U	85	U
Aroclor-1232	40	U	42	U
Aroclor-1242	40	U	42	U
Aroclor-1248	40	U	42	U
Aroclor-1254	40	U	42	U
Aroclor-1260	40	U	42	U
beta-BHC	2 1	U	2 2	U

Appendix B-2

Summary of Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08S00102		08S00402	
Sampling Date	5/20/97		5/21/97	
delta-BHC	2 1	U	2 2	U
Dieldrin	4	U	0 53	J
Endosulfan I	0 46	J	2 2	U
Endosulfan II	4	U	4 2	U
Endosulfan sulfate	0 56	J	4 2	U
Endrin	4	U	0 36	J
Endrin aldehyde	0 39	J	4 2	U
Endrin ketone	4	U	4 2	U
gamma-BHC (Lindane)	2 1	U	0 06	J
gamma-Chlordane	0 24	J	2 2	U
Heptachlor	2 1	U	2 2	UJ
Heptachlor epoxide	2 1	U	2 2	U
Methoxychlor	21	U	22	U
Toxaphene	210	U	220	U
Inorganics, mg/kg				
Aluminum	308	J	8120	J
Antimony	0 58	UJ	0 61	UJ
Arsenic	0 68	U	1 8	J
Barium	16 3	J	26 2	J
Beryllium	0 06	U	0 92	J
Cadmium	0 14	U	0 1	U
Calcium	1340		6410	
Chromium	1 7	J	18 8	
Cobalt	0 22	U	5 5	J
Copper	1 9	J	5 9	J
Iron	938	J	13300	J
Lead	38 6		10 4	
Magnesium	42 8	J	3150	
Manganese	8 5		132	
Mercury	0 06	U	0 11	J
Nickel	1 3	J	6 8	J
Potassium	59 9	U	1100	J
Selenium	1	U	1 1	U
Silver	0 17	U	0 18	U
Sodium	318	U	944	J
Thallium	1 3	U	1 4	U
Vanadium	1	J	17	
Zinc	22 9	J	23 5	J

Appendix B-3

Summary of Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08D00101		08D00201		08D00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Volatile Organics, ug/kg						
1,1,1-Trichloroethane	17	U	38	U	120	U
1,1,2,2-Tetrachloroethane	17	UJ	38	UJ	120	UJ
1,1,2-Trichloroethane	17	U	38	U	120	U
1,1-Dichloroethane	17	U	38	U	120	U
1,1-Dichloroethene	17	U	38	U	120	U
1,2-Dichloroethane	17	U	38	U	120	U
1,2-Dichloroethene (total)	17	U	38	U	120	U
1,2-Dichloropropane	17	U	38	U	120	U
2-Butanone	17	UJ	38	UJ	120	UJ
2-Hexanone	17	UJ	38	UJ	120	UJ
4-Methyl-2-pentanone	17	UJ	38	UJ	120	UJ
Acetone	42	J	38	UJ	120	UJ
Benzene	17	U	38	U	120	U
Bromodichloromethane	17	U	38	U	120	U
Bromoform	17	U	38	U	120	U
Bromomethane	17	U	38	U	120	U
Carbon disulfide	17	U	38	U	120	U
Carbon tetrachloride	17	U	38	U	120	U
Chlorobenzene	17	U	38	U	120	U
Chloroethane	17	U	38	U	120	U
Chloroform	17	U	38	U	120	U
Chloromethane	17	U	38	U	120	U
cis-1,3-Dichloropropene	17	U	38	U	120	U
Dibromochloromethane	17	U	38	U	120	U
Ethylbenzene	17	U	38	U	120	U
Methylene chloride	17	U	38	U	64	J
Styrene	17	U	38	U	120	U
Tetrachloroethene	17	U	38	U	120	U
Toluene	17	U	38	U	120	U
trans-1,3-Dichloropropene	17	UJ	38	UJ	120	UJ
Trichloroethene	17	U	38	U	120	U
Vinyl chloride	17	U	38	U	120	U
Xylene (total)	17	U	38	U	120	U
Semivolatile Organics, ug/kg						
1,2,4-Trichlorobenzene	570	U	1300	U	4100	U
1,2-Dichlorobenzene	570	U	1300	U	4100	U

Appendix B-3

Summary of Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08D00101		08D00201		08D00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
1,3-Dichlorobenzene	570	U	1300	U	4100	U
1,4-Dichlorobenzene	570	U	1300	U	4100	U
2,2'-oxybis(1-Chloropropane)	570	U	1300	U	4100	U
2,4,5-Trichlorophenol	1400	U	3200	U	10000	U
2,4,6-Trichlorophenol	570	U	1300	U	4100	U
2,4-Dichlorophenol	570	U	1300	U	4100	U
2,4-Dimethylphenol	570	U	1300	U	4100	U
2,4-Dinitrophenol	1400	U	3200	U	10000	U
2,4-Dinitrotoluene	570	U	1300	U	4100	U
2,6-Dinitrotoluene	570	U	1300	U	4100	U
2-Chloronaphthalene	570	U	1300	U	4100	U
2-Chlorophenol	570	U	1300	U	4100	U
2-Methylnaphthalene	570	U	1300	U	4100	U
2-Methylphenol	570	U	1300	U	4100	U
2-Nitroaniline	1400	U	3200	U	10000	U
2-Nitrophenol	570	U	1300	U	4100	U
3,3'-Dichlorobenzidine	570	U	1300	U	4100	U
3-Nitroaniline	1400	U	3200	U	10000	U
4,6-Dinitro-2-methylphenol	1400	U	3200	U	10000	U
4-Bromophenyl-phenylether	570	U	1300	U	4100	U
4-Chloro-3-methylphenol	570	U	1300	U	4100	U
4-Chloroaniline	570	U	1300	U	4100	U
4-Chlorophenyl-phenylether	570	U	1300	U	4100	U
4-Methylphenol	570	U	1300	U	4100	U
4-Nitroaniline	1400	U	3200	U	10000	U
4-Nitrophenol	1400	U	3200	U	10000	U
Acenaphthene	570	U	1300	U	4100	U
Acenaphthylene	570	U	1300	U	4100	U
Anthracene	570	U	1300	U	4100	U
Benzo(a)anthracene	180	J	1300	U	4100	U
Benzo(a)pyrene	210	J	1300	U	4100	U
Benzo(b)fluoranthene	430	J	1300	U	4100	U
Benzo(g,h,i)perylene	120	J	1300	U	4100	U
Benzo(k)fluoranthene	450	J	1300	U	4100	U
bis(2-Chloroethoxy)methane	570	U	1300	U	4100	U
bis(2-Chloroethyl)ether	570	U	1300	U	4100	U
bis(2-Ethylhexyl)phthalate	310	J	1300	U	4100	U

Appendix B-3

Summary of Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08D00101		08D00201		08D00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Butylbenzylphthalate	570	U	1300	U	4100	U
Carbazole	570	U	1300	U	4100	U
Chrysene	200	J	1300	U	4100	U
Di-n-butylphthalate	570	U	1300	U	4100	U
Di-n-octylphthalate	570	U	1300	U	4100	U
Dibenz(a,h)anthracene	570	U	1300	U	4100	U
Dibenzofuran	570	U	1300	U	4100	U
Diethylphthalate	570	U	1300	U	4100	U
Dimethylphthalate	570	U	1300	U	4100	U
Fluoranthene	320	J	1300	U	4100	U
Fluorene	570	U	1300	U	4100	U
Hexachlorobenzene	570	U	1300	U	4100	U
Hexachlorobutadiene	570	U	1300	U	4100	U
Hexachlorocyclopentadiene	570	UJ	1300	UJ	4100	UJ
Hexachloroethane	570	U	1300	U	4100	U
Indeno(1,2,3-cd)pyrene	110	J	1300	U	4100	U
Isophorone	570	U	1300	U	4100	U
N-Nitroso-di-n-propylamine	570	U	1300	U	4100	U
N-Nitrosodiphenylamine (1)	570	U	1300	U	4100	U
Naphthalene	570	U	1300	U	4100	U
Nitrobenzene	570	U	1300	U	4100	U
Pentachlorophenol	1400	U	3200	U	10000	U
Phenanthrene	91	J	1300	U	4100	U
Phenol	570	U	1300	U	4100	U
Pyrene	310	J	1300	U	4100	U
Pesticides/PCB, ug/kg						
4,4'-DDD	5 7	U	13	U	41	U
4,4'-DDE	2 3	J	7 8	J	41	U
4,4'-DDT	1 1	J	2 4	J	3 9	J
Aldrin	2 9	U	6 5	U	21	U
alpha-BHC	2 9	U	6 5	U	21	U
alpha-Chlordane	5 4		6 5	U	21	U
Aroclor-1016	57	U	130	U	410	U
Aroclor-1221	120	U	260	U	830	U
Aroclor-1232	57	U	130	U	410	U
Aroclor-1242	57	U	130	U	410	U
Aroclor-1248	57	U	130	U	410	U

Appendix B-3

Summary of Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08D00101		08D00201		08D00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Aroclor-1254	57	U	130	U	410	U
Aroclor-1260	62		130	U	410	U
beta-BHC	2 9	U	6 5	U	21	U
delta-BHC	2 9	U	6 5	U	4 4	J
Dieldrin	2 9	J	1 5	J	41	U
Endosulfan I	2 9	U	6 5	U	21	U
Endosulfan II	1	J	13	U	41	U
Endosulfan sulfate	5 7	U	13	U	5 7	J
Endrin	0 47	J	13	U	41	U
Endrin aldehyde	5 7	U	13	U	3 8	J
Endrin ketone	5 7	U	13	U	41	U
gamma-BHC (Lindane)	2 9	U	6 5	U	21	U
gamma-Chlordane	12		1 8	J	21	U
Heptachlor	0 27	J	6 5	U	21	U
Heptachlor epoxide	0 52	J	6 5	U	21	U
Methoxychlor	29	U	12	J	34	J
Toxaphene	290	U	650	U	2100	U
Inorganics, mg/kg						
Aluminum	1630	J	5080	J	5690	J
Antimony	0 83	UJ	1 9	UJ	6 3	UJ
Arsenic	1 9	J	2 2	U	7 4	J
Barium	17 3	J	31 9	J	40 3	J
Beryllium	0 13	U	0 59	J	0 92	J
Cadmium	0 61	J	5		9 8	J
Calcium	3790		6140		12200	J
Chromium	5 8		190		133	
Cobalt	0 41	J	1 4	J	2 4	U
Copper	6 7	J	16 3	J	43 9	J
Iron	13500	J	14800	J	25900	J
Lead	25 3		48		60 7	
Magnesium	263	J	1520	J	2440	J
Manganese	20 2		46 4		143	
Mercury	0 13	J	0 26	J	0 93	J
Nickel	3 3	J	13	J	19 5	J
Potassium	106	J	677	J	1010	J
Selenium	1 5	U	3 3	U	13 8	
Silver	0 24	U	1 6	J	2 4	J

Appendix B-3

Summary of Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08D00101		08D00201		08D00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Sodium	381	U	1580	J	4930	J
Thallium	1 9	U	33 5	U	14 5	U
Vanadium	5 7	J	16 9	J	32 7	J
Zinc	123	J	43 6	J	131	J

Appendix B-4

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08W00101		08W00201		08W00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Volatile Organics, ug/L						
1,1,1-Trichloroethane	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U
1,2-Dichloroethene (total)	6	J	10	U	10	U
1,2-Dichloropropane	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U
Acetone	9	J	16	J	10	U
Benzene	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U
Chlorobenzene	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U
Methylene chloride	10	U	10	U	10	U
Styrene	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U
Toluene	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U
Trichloroethene	10		10	U	10	U
Vinyl chloride	10	U	10	U	10	U
Xylene (total)	10	U	10	U	10	U
Semivolatile Organics, ug/L						
1,2,4-Trichlorobenzene	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U

Appendix B-4

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08W00101		08W00201		08W00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
1,4-Dichlorobenzene	10	U	10	U	10	U
2,2'-oxybis(1-Chloropropane)	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U	10	U
2-Chloronaphthalene	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U
2-Methylnaphthalene	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U
2-Nitroaniline	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U
3-Nitroaniline	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U
4-Methylphenol	10	U	10	U	10	U
4-Nitroaniline	25	U	25	U	25	U
4-Nitrophenol	25	UJ	25	U	25	U
Acenaphthene	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U
Benzo(a)anthracene	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U
Carbazole	10	U	10	U	10	U

Appendix B-4

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08W00101		08W00201		08W00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
Chrysene	10	U	10	U	10	U
Di-n-butylphthalate	10	U	10	U	10	U
Di-n-octylphthalate	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U
Dibenzofuran	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U
Dimethylphthalate	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U
N-Nitroso-di-n-propylamine	10	U	10	U	10	U
N-Nitrosodiphenylamine (1)	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U
Nitrobenzene	10	U	10	U	10	U
Pentachlorophenol	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U
Phenol	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U
Pesticides/PCB, ug/L						
4,4'-DDD	0 1	U	0 1	U	0 1	U
4,4'-DDE	0 1	U	0 1	U	0 0065	J
4,4'-DDT	0 0067	J	0 0093	J	0 0074	J
Aldrin	0 05	U	0 05	U	0 05	U
alpha-BHC	0 0052	J	0 05	U	0 05	U
alpha-Chlordane	0 05	U	0 05	U	0 05	U
Aroclor-1016	1	U	1	U	1	U
Aroclor-1221	2	U	2	U	2	U
Aroclor-1232	1	U	1	U	1	U
Aroclor-1242	1	U	1	U	1	U
Aroclor-1248	1	U	1	U	1	U
Aroclor-1254	1	U	1	U	1	U
Aroclor-1260	1	U	1	U	1	U
beta-BHC	0 05	U	0 05	U	0 05	U

Appendix B-4

Summary of Surface Water Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sample ID	08W00101		08W00201		08W00301	
Sampling Date	5/29/97		5/28/97		5/29/97	
delta-BHC	0 0086	J	0 0097	J	0 0073	J
Dieldrin	0 1	U	0 0064	J	0 0038	J
Endosulfan I	0 05	U	0 05	U	0 05	U
Endosulfan II	0 1	U	0 1	U	0 015	J
Endosulfan sulfate	0 1	U	0 1	U	0 1	U
Endrin	0 1	U	0 1	U	0 1	U
Endrin aldehyde	0 1	U	0 1	U	0 1	U
Endrin ketone	0 1	U	0 1	U	0 1	U
gamma-BHC (Lindane)	0 05	U	0 05	U	0 05	U
gamma-Chlordane	0 05	U	0 05	U	0 05	U
Heptachlor	0 05	U	0 05	U	0 05	U
Heptachlor epoxide	0 05	U	0 05	U	0 05	U
Methoxychlor	0 5	U	0 5	U	0 5	U
Toxaphene	5	U	5	U	5	U
Inorganics, ug/L						
Aluminum	207	U	189	U	161	U
Antimony	2 4	U	2 4	U	2 4	U
Arsenic	2 8	U	2 8	U	2 8	U
Barium	39 6	J	17 8	J	21 8	J
Beryllium	0 2	U	0 2	U	0 2	U
Cadmium	0 4	U	0 92	U	0 4	U
Calcium	83100		38200		66300	
Chromium	1 5	J	2 9	J	3 6	J
Cobalt	0 9	U	0 9	U	0 9	U
Copper	4 5	J	4 8	J	3 6	J
Iron	11100		2160		3630	
Lead	2 2	J	2 2	U	2 2	U
Magnesium	9010		5770		13300	
Manganese	131		117		417	
Mercury	0 1	U	0 1	U	0 1	U
Nickel	2 3	J	1 7	J	2 3	J
Potassium	1860	J	3360	J	5580	
Selenium	4 3	U	4 3	U	4 3	U
Silver	0 7	U	0 7	U	0 7	U
Sodium	23100		20100		52100	
Thallium	5 5	U	5 5	U	5 5	U
Vanadium	2	J	2	J	1	J
Zinc	56 5		29 4		27 3	

Appendix B-1, B-2, B-3, and B-4 Notes for Analytical Results Tables

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Sample ID = Sample Identifier
Lab ID = Laboratory identifier

Units

mg/kg	milligram per kilogram
ug/kg	microgram per kilogram
ug/L	microgram per liter

The following standard validation qualifiers have the following definitions

U	The analyte/compound was analyzed for but was not detected above the reported sample quantitation limit The number preceding the U qualifier is the reported sample quantitation limit
J	The analyte/compound was positively identified and the associated numerical value is an estimated concentration of the analyte/compound in the sample For most detected analytes and compounds, the J qualifier is also used to indicate that the reported concentration is below the contract required detection or quantitation limit
UJ	The analyte/compound was not detected above the reported sample quantitation limit The reported quantitation limit, however, is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte/compound in the sample

APPENDIX C

SUMMARY OF DETECTIONS IN ANALYTICAL RESULTS

Appendix C-1

Summary of Detections in Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Surface Soil						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Volatile Organic Compounds (ug/kg)						
Methylene chloride	2/8	1 - 2	11 - 16	1.5	5.4	2
Semivolatile Organic Compounds (ug/kg)						
Acenaphthene	1/8	59 - 59	360 - 520	59	194	59
Anthracene	1/8	140 - 140	360 - 520	140	204	140
Benzo(a)anthracene	2/8	59 - 860	360 - 520	460	279	860
Benzo(a)pyrene	2/8	100 - 1,500	360 - 520	800	364	1,500
Benzo(b)fluoranthene	4/8	57 - 2,900	360 - 520	784	493	2,900
Benzo(g,h,i)perylene	2/8	77 - 520	360 - 520	299	239	520
Benzo(k)fluoranthene	4/8	59 - 3,000	360 - 520	813	507	3,000
Chrysene	2/8	66 - 1,000	360 - 520	533	298	1,000
Dibenz(a,h)anthracene	1/8	150 - 150	360 - 520	150	206	150
Fluoranthene	1/8	1,100 - 1,100	360 - 520	1,100	324	1,100
Indeno(1,2,3-cd)pyrene	2/8	55 - 470	360 - 520	263	230	470
Phenanthrene	1/8	150 - 150	360 - 520	150	206	150
Pyrene	2/8	56 - 1,600	360 - 520	828	371	1,600
bis(2-Ethylhexyl)phthalate	6/8	54 - 410	360 - 520	155	171	410
Pesticides/PCBs (ug/kg)						
4,4'-DDD	2/8	8 - 12	3.5 - 13	10	4	12
4,4'-DDE	8/8	1 - 240	9 - 13	34.1	34.1	240
4,4'-DDT	5/8	6 5 - 280	3.6 - 13	68.3	43.6	280
Aldrin	2/8	0.54 - 1 6	1 8 - 5	1.1	1.2	1.6
Aroclor-1260	5/8	11 - 230	35 - 130	140	94.5	230
Dieldrin	7/8	0.49 - 180	4 - 13	34.6	30.6	180
Endosulfan II	2/8	6.9 - 7 6	3.5 - 13	7.3	3.4	7.6
Endosulfan sulfate	4/8	0 36 - 3.3	3.5 - 13	1.7	1.9	3.3
Endrin	4/8	0 25 - 6.4	3.6 - 13	2	2.1	6.4
Endrin aldehyde	4/8	0.25 - 6	3 5 - 13	3	2.5	6
Endrin ketone	1/8	11 - 11	3.5 - 10	11	3.2	11
Heptachlor	1/8	19 - 19	1.8 - 5	19	3.3	19
Heptachlor epoxide	7/8	0 13 - 13	2 1 - 7	2.7	2.5	13
Methoxychlor	1/8	3 - 3	18 - 50	3	9.9	3

Appendix C-1

Summary of Detections in Surface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Surface Soil						
Chemical	**Frequency of Detects**	**Range of Detects**	**Reported Detection Limits**	**Average (Detects)**	**Average (All)**	**Maximum Detected**
alpha-Chlordane	7/8	0.25 - 14	2.1 - 7	3.2	2.9	14
delta-BHC	5/8	0.12 - 1.2	1 8 - 6	0.56	0.74	1.2
gamma-Chlordane	8/8	0.07 - 57	4 - 7	8 7	8.7	57
Inorganics (mg/kg)						
Aluminum	8/8	829 - 16,300	31 8 - 46.1	7,350	7,350	16,300
Arsenic	4/8	0 91 - 7	0 61 - 8.8	5	2 7	7
Barium	8/8	7 1 - 41.7	0.43 - 0.63	25.9	25.9	41.7
Beryllium	5/8	0.32 - 0 63	0.09 - 0 63	0.5	0.35	0 63
Cadmium	6/8	0.63 - 4 5	0.1 - 1 2	1.7	1.3	4 5
Calcium	8/8	695 - 176,000	15 8 - 22.9	36,512	36,512	176,000
Chromium	8/8	3.6 - 66.7	1 9 - 2.8	28	28	66.7
Cobalt	8/8	0 2 - 2.3	1 9 - 2.8	1.1	1 1	2.3
Copper	8/8	2 6 - 28.5	1.3 - 1.9	15.7	15 7	28.5
Iron	8/8	969 - 26,700	31.4 - 45.4	10,939	10,939	26,700
Lead	8/8	11.6 - 114	4.8 - 6 9	50	50	114
Magnesium	8/8	289 - 2,690	13.8 - 20.1	1,242	1,242	2,690
Manganese	8/8	8 - 154	0 22 - 0.31	71.9	71.9	154
Mercury	4/8	0 1 - 0.62	0.054 - 0.16	0 45	0 24	0.62
Nickel	8/8	2 - 10.5	2.8 - 4.1	5.3	5 3	10.5
Potassium	8/8	95.7 - 1,220	60 - 86.8	552	552	1,220
Selenium	3/8	4.1 - 5.3	0 93 - 13.5	4 5	2	5.3
Silver	4/8	0 23 - 1.5	0 15 - 2.2	1 1	0 6	1.5
Sodium	1/8	626 - 626	288 - 690	626	250	626
Vanadium	8/8	3 1 - 35.2	1.7 - 2.5	16.8	16 8	35 2
Zinc	8/8	7 - 96	0 65 - 0.94	44.9	44.9	96

Appendix C-2

Summary of Detections in Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Subsurface Soil						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Volatile Organic Compounds (ug/kg)						
Methylene chloride	2/2	1 - 3	12 - 13	2	2	3
Semivolatile Organic Compounds (ug/kg)						
Benzo(b)fluoranthene	1/2	47 - 47	400 - 420	47	129	47
Benzo(k)fluoranthene	1/2	48 - 48	400 - 420	48	129	48
Pesticides/PCBs (ug/kg)						
4,4'-DDD	1/2	59 - 59	4.2 - 10	59	30 6	59
4,4'-DDE	1/2	18 - 18	4 2 - 10	18	10 1	18
Aldrin	1/2	0 095 - 0 095	2 1 - 5	0 1	0 57	0 1
Dieldrin	1/2	0 53 - 0.53	4 - 10	0 53	1.3	0 53
Endosulfan I	1/2	0 46 - 0.46	2 2 - 5	0 46	0.78	0.46
Endosulfan sulfate	1/2	0 56 - 0 56	4.2 - 10	0.56	1.3	0.56
Endrin	1/2	0.36 - 0 36	4 - 10	0.36	1 2	0 36
Endrin aldehyde	1/2	0.39 - 0 39	4 2 - 10	0.39	1 3	0.39
gamma-BHC (Lindan	1/2	0 056 - 0 056	2 1 - 5	0.06	0.55	0.06
gamma-Chlordane	1/2	0 24 - 0.24	2 2 - 5	0 24	0.67	0 24
Inorganic Compounds (mg/kg)						
Aluminum	2/2	308 - 8,120	35 8 - 37.6	4,214	4,214	8,120
Arsenic	1/2	1 8 - 1.8	0.68 - 7 2	1.8	1 1	1.8
Barium	2/2	16 3 - 26 2	0.49 - 0 51	21 3	21 3	26 2
Beryllium	1/2	0.92 - 0 92	0 06 - 0.51	0.92	0 48	0 92
Calcium	2/2	1,340 - 6,410	17 8 - 18 7	3,875	3,875	6,410
Chromium	2/2	1 7 - 18 8	2.2 - 2 3	10 3	10 3	18.8
Cobalt	1/2	5 5 - 5 5	0 22 - 2 3	5.5	2 8	5 5
Copper	2/2	1.9 - 5 9	1 5 - 1 5	3 9	3 9	5 9
Iron	2/2	938 - 13,300	35 3 - 37.1	7,119	7,119	13,300
Lead	2/2	10.4 - 38.6	5 4 - 5 6	24.5	24 5	38 6
Magnesium	2/2	42.8 - 3,150	15.6 - 16 4	1,596	1,596	3,150
Manganese	2/2	8 5 - 132	0.24 - 0 26	70 3	70.3	132
Mercury	1/2	0 11 - 0.11	0 06 - 0 13	0.11	0 07	0.11
Nickel	2/2	1 3 - 6 8	3 2 - 3 3	4 1	4 1	6 8
Potassium	1/2	1,100 - 1,100	59 9 - 70 8	1,100	565	1,100

Appendix C-2

Summary of Detections in Subsurface Soil Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Subsurface Soil						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Sodium	1/2	944 - 944	318 - 563	944	552	944
Vanadium	2/2	1 - 16 7	1.9 - 2	8.9	8.9	16 7
Zinc	2/2	22 9 - 23 5	0.73 - 0 77	23.2	23.2	23 5

Appendix C-3

Summary of Detections in Surface Water Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Surface Water						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Volatile Organic Compounds (ug/L)						
1,2-Dichloroethene (total)	1/3	6 - 6	10 - 10	6	5 3	6
Acetone	2/3	9 - 16	10 - 10	12 5	10	16
Trichloroethene	1/3	10 - 10	10 - 10	10	6.7	10
Pesticides/PCBs (ug/L)						
4,4'-DDE	1/3	0.0065 - 0 0065	0.1 - 0 1	0 01	0 04	0 01
4,4'-DDT	3/3	0 0067 - 0 0093	0 1 - 0.1	0.01	0 01	0 01
Dieldrin	2/3	0 0038 - 0 0064	0 1 - 0.1	0 01	0 02	0.01
Endosulfan II	1/3	0.015 - 0.015	0 1 - 0 1	0 02	0.04	0 02
alpha-BHC	1/3	0 0052 - 0 0052	0 05 - 0 05	0 01	0.02	0 01
delta-BHC	3/3	0.0073 - 0.0097	0.05 - 0 05	0.01	0.01	0 01
Inorganics (ug/L)						
Barium	3/3	17 8 - 39.6	0.2 - 0.2	26.4	26.4	39 6
Calcium	3/3	38,200 - 83,100	7 3 - 7.3	62,533	62,533	83,100
Chromium	3/3	1 5 - 3 6	0 9 - 0.9	2 7	2.7	3.6
Copper	3/3	3 6 - 4 8	0.6 - 0 6	4.3	4.3	4 8
Iron	3/3	2,160 - 11,100	14.5 - 14 5	5,630	5,630	11,100
Lead	1/3	2.2 - 2.2	2.2 - 2 2	2 2	1 5	2 2
Magnesium	3/3	5,770 - 13,300	6.4 - 6.4	9,360	9,360	13,300
Manganese	3/3	117 - 417	0 1 - 0.1	222	222	417
Nickel	3/3	1 7 - 2 3	1 3 - 1.3	2 1	2.1	2 3
Potassium	3/3	1,860 - 5,580	27 7 - 27.7	3,600	3,600	5,580
Sodium	3/3	20,100 - 52,100	220 - 220	31,767	31,767	52,100
Vanadium	3/3	1 - 2.4	0 8 - 0.8	1 7	1 7	2.4
Zinc	3/3	27 3 - 56 5	0 3 - 0.3	37 7	37 7	56 5

Appendix C-4

Summary of Detections in Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sediment						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Volatile Organic Compounds (ug/kg)						
Acetone	1/3	42 - 42	17 - 120	42	40.3	42
Methylene chloride	1/3	64 - 64	17 - 120	64	30.5	64
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	1/3	180 - 180	560 - 4,100	180	960	180
Benzo(a)pyrene	1/3	210 - 210	560 - 4,100	210	970	210
Benzo(b)fluoranthene	1/3	430 - 430	560 - 4,100	430	1,043	430
Benzo(g,h,i)perylene	1/3	120 - 120	560 - 4,100	120	940	120
Benzo(k)fluoranthene	1/3	450 - 450	560 - 4,100	450	1,050	450
Chrysene	1/3	200 - 200	560 - 4,100	200	967	200
Fluoranthene	1/3	320 - 320	560 - 4,100	320	1,007	320
Indeno(1,2,3-cd)pyrene	1/3	110 - 110	560 - 4,100	110	937	110
Phenanthrene	1/3	91 - 91	560 - 4,100	91	930	91
Pyrene	1/3	310 - 310	560 - 4,100	310	1,003	310
bis(2-Ethylhexyl)phthalat	1/3	310 - 310	560 - 4,100	310	1,003	310
Pesticides/PCBs (ug/kg)						
4,4'-DDE	2/3	2.3 - 7.8	14 - 41	5.1	10.2	7.8
4,4'-DDT	3/3	1 1 - 3.9	14 - 100	2.5	2.5	3.9
Aroclor-1260	1/3	62 - 62	130 - 410	62	111	62
Dieldrin	2/3	1 5 - 2.9	14 - 41	2.2	8.3	2.9
Endosulfan II	1/3	1 - 1	13 - 41	1	9.3	1
Endosulfan sulfate	1/3	5.7 - 5.7	5.7 - 100	5.7	5	5.7
Endrin	1/3	0 47 - 0.47	13 - 41	0 47	9.2	0.47
Endrin aldehyde	1/3	3 8 - 3.8	5.7 - 100	3.8	4.4	3.8
Heptachlor	1/3	0.27 - 0.27	6.5 - 21	0.27	4.7	0.27
Heptachlor epoxide	1/3	0 52 - 0.52	6.5 - 21	0 52	4.8	0.52
Methoxychlor	2/3	12 - 34	29 - 530	23	20.2	34
alpha-Chlordane	1/3	5.4 - 5.4	6.5 - 21	5.4	6.4	5.4
delta-BHC	1/3	4.4 - 4.4	2.9 - 53	4.4	3	4.4
gamma-Chlordane	2/3	1.8 - 12	7 - 21	6.9	8.1	12
Inorganics (mg/kg)						
Aluminum	3/3	1,630 - 5,690	50 9 - 387	4,133	4,133	5,690

Appendix C-4

Summary of Detections in Sediment Analytical Results
TAL Metals and TCL Organics

PSC 8, Vacant Lot East of the Fuel Farm
Naval Air Station, Jacksonville
Jacksonville, FL

Sediment						
Chemical	Frequency of Detects	Range of Detects	Reported Detection Limits	Average (Detects)	Average (All)	Maximum Detected
Arsenic	2/3	1.9 - 7 4	2.2 - 73.7	4.7	3.5	7.4
Barium	3/3	17.3 - 40 3	0.69 - 5.3	29.8	29.8	40.3
Beryllium	2/3	0.59 - 0 92	0 13 - 5.3	0 76	0 53	0.92
Cadmium	3/3	0 61 - 9 8	1 4 - 10.5	5 1	5 1	9.8
Calcium	3/3	3,790 - 12,200	25.3 - 192	7,377	7,377	12,200
Chromium	3/3	5.8 - 190	3 1 - 23.7	110	110	190
Cobalt	2/3	0.41 - 1.4	2 4 - 7	0.9	1	1.4
Copper	3/3	6.7 - 43.9	2.1 - 15.8	22.3	22 3	43 9
Iron	3/3	13,500 - 25,900	50.2 - 382	18,067	18,067	25,900
Lead	3/3	25.3 - 60.7	7.6 - 57.9	44.7	44.7	60 7
Magnesium	3/3	263 - 2,440	22.1 - 168	1,408	1,408	2,440
Manganese	3/3	20.2 - 143	0.35 - 2.6	69.9	69 9	143
Mercury	3/3	0.13 - 0.93	0 17 - 1 3	0.44	0 44	0.93
Nickel	3/3	3 3 - 19 5	4.5 - 34 2	11 9	11.9	19.5
Potassium	3/3	106 - 1,010	95.8 - 729	598	598	1,010
Selenium	1/3	13 8 - 13 8	1 5 - 113	13.8	5.4	13 8
Silver	2/3	1.6 - 2.4	0.24 - 18.4	2	1.4	2.4
Sodium	2/3	1,580 - 4,930	381 - 5,790	3,255	2,234	4,930
Vanadium	3/3	5.7 - 32.7	2.8 - 21	18.4	18 4	32.7
Zinc	3/3	43.6 - 131	1 - 7 9	99.2	99 2	131

APPENDIX D

DERIVATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS OF ESSENTIAL NUTRIENTS FOR HUMAN HEALTH CHEMICAL OF POTENTIAL CONCERN SELECTION

DERIVATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS FOR COPC SELECTION

Certain inorganics (calcium, iron, magnesium, potassium, and sodium) that are present as naturally occurring constituents in soil and groundwater are required in limited intakes to maintain normal human physiological functions and are therefore considered essential nutrients. The Risk Assessment Guidance for Superfund (RAGS), Volume I, Part A, regarding the treatment of essential nutrients in selection of human health contaminants of potential concern (COPCs), states that essential nutrients need not be quantitatively evaluated in a public health risk assessment if they are: 1) present at low concentrations (only slightly above background); and 2) toxic only at doses much higher than those which might be related to exposure at the site (U.S. Environmental Protection Agency [USEPA], 1989a). In this report, "only slightly above background" is interpreted to mean that the arithmetic mean of the site concentrations is less than two times the arithmetic mean of the background concentrations. The focus of this section of the document is the technical approach for determining that an analyte is "toxic only at doses higher than those associated with exposures at the site" and a mechanism for making that determination by employing soil and groundwater screening concentrations. The screening concentrations are used to streamline the process and to eliminate the need to calculate essential nutrient doses as part of COPC selection at every site. If the maximum concentration of an essential nutrient does not exceed the appropriate screening concentration shown below, the essential nutrient is considered non-toxic. Essential nutrients are not retained as COPCs if they are detected at concentrations that are either consistent with background or do not exceed the screening concentrations.

Currently, no published essential nutrient screening concentrations for use in risk assessment COPC selection are available. Therefore, HLA has derived surface soil and groundwater screening concentrations of essential nutrients that, when contacted in accordance with the exposure assumptions described below, are not expected to result in adverse health effects. The screening concentrations for groundwater and surface soil are presented in Table D-1. The essential nutrient concentrations in surface soil and groundwater are to be compared directly to the nutrient screening concentrations for the purposes of COPC selection.

Table D-1
Essential Nutrient Screening Concentrations
for Surface Soil and Groundwater

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Essential Nutrient	Surface Soil Screening Concentration (mg/kg)	Groundwater Screening Concentration ($\mu g/\ell$)
Calcium	[1]1,000,000	1,055,398
Iron	47,824	13,267
Magnesium	460,468	118,807
Potassium	[1]1,000,000	297,016
Sodium	[1]1,000,000	396,022

[1] Actual calculated screening concentration is greater than 1,000,000 mg/kg (Table D-5), indicating that this essential nutrient would not be present at toxic levels in surface soil.

As described below, screening concentrations for surface soil and groundwater represent conservative screening concentrations for other media. These surface soil and groundwater screening concentrations are used to screen sediment, subsurface soil, sludge, and surface water, respectively.

DOCUMENTATION OF SURFACE SOIL AND GROUNDWATER SCREENING CONCENTRATIONS. The essential nutrient toxicity screening concentrations were derived in two steps: first, a "non-toxic" dose was identified for each essential nutrient; second, the soil and groundwater concentrations associated with the "non-toxic" doses were calculated using standard residential exposure assumptions. The details of the derivation of the screening values are presented below.

Identification of non-toxic doses The identification of doses which are not toxic is often accomplished by identifying Reference Doses (RfDs) which are published by USEPA. These RfDs represent doses, including a margin of safety, to which even sensitive subpopulations could be exposed for a lifetime without adverse non-carcinogenic effects. Because no RfDs for calcium, iron, magnesium, potassium, or sodium are available in the Integrated Risk Information System (IRIS) (USEPA, 1998) or the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997), other published non-toxic doses were sought out. Recommended Dietary Allowances (RDAs) prepared by the Food and Nutrition Board (FNB) of the National Research Council (NRC, 1989) have been selected here to represent non-toxic doses.

RDAs are defined by the FNB as "the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons." It is assumed here that, because the RDA represents a requirement for good nutrition, it also represents a dose that is non-toxic. Although some essential nutrients (arsenic for example) have been classified as carcinogens, none of the five nutrients discussed here have been classified as carcinogens. The available RDA data for calcium, iron, magnesium, potassium and sodium are presented in Table D-2. From this data set, RDAs for children were preferentially selected to coincide with the child exposure scenario. RDAs were converted from units of mg/day to units of mg/kg/day by dividing the RDA by the child resident body weight of 15 kg (USEPA, 1991). Dermal RDAs were developed by adjusting the oral RDA to compensate for the oral absorption efficiency in a manner similar to that presented in Appendix A of RAGS, Volume I, Part A (USEPA, 1989).

Calculation of screening concentrations Risk-based screening concentrations for essential nutrients were derived by estimating concentrations in soil and groundwater that correspond to the RDAs for a residential exposure scenario. When the dose is equal to the RDA, the hazard quotient for the situation would equal one. Risk calculation spreadsheets have been used to assist in the calculation of the screening concentrations. When the concentration of an essential nutrient and the associated hazard quotient are known, only a simple calculation is needed to identify the concentration associated with a hazard quotient of one. An arbitrary nutrient concentration has been entered into risk spreadsheets to derive associated hazard quotient values as shown in Tables D-3 and D-4. Once that information was available, the equality was used to calculate screening soil concentration with the target hazard quotient equal to one.

Screening groundwater concentrations were calculated in a similar manner.

Table D-2
Recommended Dietary Allowances[1]

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Nutrient	RDA	Age (years)	Oral Absorption (%)	Typical Dietary Intake (mg/day)	Toxicity Threshold (mg/day)	Oral RDA (mg/kg/day)[2]	Dermal RDA (mg/kg/day)[3]
Calcium	800 (mg/day)	1 to 10	40	743 (average of all ages)	NA	53.3	21.2
	1200 (mg/day)	11 to 24		1,179	NA		
	800 (mg/day)	>24		743 (average of all ages); 530 (women ages 35-50)	>2,500		
Iron	10 (mg/day)	1 to 20	10-15	10 to 15	25 to 75 (NOAEL); 3,000 (lethal)	0.67	0.067
	15 (mg/day)	>20		10 to 15	25 to 75 (NOAEL); 14,000 (lethal)		
Magnesium	6 (mg/kg/day)	1 to 15	50	193 (age 1 to 5)	NA	6	3
	4.5 (mg/kg/day)	>15		207 to 329	NA		
Potassium	15 to 20 (mg/kg/day)	1 to 10	90	1,500	NA	15	13 5
	1,600 to 2,000 (mg/day)	>20		2,500	18,000 (hyperkalemia)		
Sodium	300 (mg/day)	2 to 5	[4]90	NA	NA	20	18
	500 (mg/day)	Adult		1,800 to 5,000	2,400 (intake not to be exceeded)		

[1] All data are from the National Resource Council (1989)
[2] Adjusted oral RDA calculated by dividing the RDA (mg/kg) by the bodyweight of a child ages 1-6 (15 kg) (USEPA, 1991); RDAs provided in mg/kg/day were not modified
[3] Adjusted dermal RDA calculated by multiplying the oral RDA by the oral absorption efficiency (USEPA, 1989b).
[4] Oral absorption data not available; value for potassium used as a surrogate based on physio-chemical similarities.

Notes: % = percent.
RDA = recommended daily allowance
mg/day = milligrams per day.
mg/kg = milligrams per kilogram.
mg/kg/day = milligrams per kilogram per day.

TABLE D-3
DIRECT CONTACT WITH AND INCIDENTAL INGESTION OF SURFACE SOIL - ESSENTIAL NUTRIENTS
CHILD RESIDENT
PSC 8
NAS JACKSONVILLE

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION SOIL	CS	chemical specific	chemical-specific	
INGESTION RATE	IR	200	mg/day	USEPA, 1991
FRACTION INGESTED	FI	100%	unitless	Assumption
ADHERENCE FACTOR	AF	1	mg/cm^2-event	USEPA, 1992a
AGE-SPECIFIC SURFACE AREA	SAi	age-specific	cm^2	USEPA, 1989
ABSORPTION FRACTION	ABSd	chemical specific	unitless	USEPA, 1992b
CONVERSION FACTOR	CF	1 00E-06	kg/mg	SEE BELOW
BODY WEIGHT	BW	15	kg	USEPA, 1991
AGE-SPECIFIC BODY WEIGHT	BWi	age-specific	kg	USEPA, 1989
EXPOSURE FREQUENCY	EF	350	days/year *	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
AGE-SPECIFIC EXPOSURE DURATION	EDi	age-specific	years	Assumption
AGE-WEIGHTED SURFACE AREA [1]	$SA_{soil/adj}$	766	cm2-year/kg	Per USEPA, 1992a
DOSE ABSORBED PER EVENT	DA_{event}	chemical specific	mg/cm^2-event	Per USEPA, 1992a
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

* Units for exposure frequency are in events/year in the calculation of the dermally absorbed dose

[1] In estimating the dermally absorbed dose for children age 1 through 6, the time-weighted, bodyweight normalized surface area exposed is calculated from surface area, exposure duration, and body weight for each of 6 age periods, age 1 through 6, per USEPA, 1992

USEPA, 1989 Exposure Factors Handbook,EPA/600/8-89/043, May 1989

USEPA, 1991 Human Health Evaluation Manual, Supplemental Guidance Standard Default Exposure Factors , OSWER Directive 9285 6-03

USEPA, 1992a Dermal Exposure Assessment Principles and Applications, EPA/600/8-91/011B, January 1992 and Dermal Exposure Appendix of this document

USEPA, 1992b USEPA Region IV Guidance Memo February 10, 1992

CF = 10E-09 kg/ug for organics

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)$^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / RECOMMEDED DIETARY ALLOWANCE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CS \times IR \times FI \times CF \times EF \times ED}{BW \times AT \times 365 \text{ days/yr}}$$

INTAKE-DERMAL = (DAevent x EF / AT x 365 days/year) x SAsoil/adj

Where

SAsoil/adj = SUM (SAi x EDi / BWi)

DAevent = CS x AF x ABSd x CF

Note

For noncarcinogenic effects AT = ED

TABLE D-4
INGESTION OF GROUNDWATER AS DRINKING WATER (UNFILTERED SAMPLES) - ESSENTIAL NUTRIENTS
CHILD RESIDENT
PSC 8
NAS Jacksonville

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION WATER	CW	chemical specific	ug/liter	
INGESTION RATE	IR	0 79	liters/day	USEPA, 1989
BODY WEIGHT	BW	15	kg	USEPA, 1991
CONVERSION FACTOR	CR	0 001	mg/ug	
EXPOSURE FREQUENCY	EF	350	days/year	USEPA, 1991
EXPOSURE DURATION	ED	6	years	USEPA, 1991
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1991
NONCANCER	AT	6	years	USEPA, 1991

USEPA, 1989 Exposure Factors Handbook, Final Report, EPA/600/8-89/043, May 1989
USEPA, 1991 Human Health Evaluation Manual, Supplemental Guidance Standard Default Exposure Factors , OSWER Directive 9285 6-03

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)[1]

HAZARD QUOTIENT = INTAKE (mg/kg-day) / RECOMMENDED DIETARY ALLOWANCE (mg/kg-day)

$INTAKE_{ing} = \frac{CW \times IR \times EF \times ED \times CF}{BW \times AT \times 365 \text{ days/year}}$

NOTE
For noncarcinogenic effects AT = ED

CARCINOGENIC EFFECTS

COMPOUND [1]	WATER CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	CANCER SLOPE FACTOR (mg/kg-day)^-1	CANCER RISK INGESTION
			TOTAL CANCER RISK		0E+00

[1] Essential nutrients are not considered carcinogenic from exposure through the oral route

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION	UNITS	INTAKE INGESTION (mg/kg-day)	RECOMMENDED DIETARY ALLOWANC (mg/kg-day)	HAZARD QUOTIENT INGESTION
Calcium	5000	ug/liter	2 5E-01	5 3E+01	4 7E-03
Iron	5000	ug/liter	2 5E-01	6 7E-01	3 8E-01
Magnesium	5000	ug/liter	2 5E-01	6 0E+00	4 2E-02
Potassium	5000	ug/liter	2 5E-01	1 5E+01	1 7E-02
Sodium	5000	ug/liter	2 5E-01	2 0E+01	1 3E-02
			TOTAL HAZARD INDEX		5E-01

To derive screening concentrations that would be protective to the majority of the exposed population, the exposure assumptions for the most sensitive receptor (e.g., a child resident) were used. For groundwater, screening concentrations were based on ingestion of groundwater as drinking water. For surface soil, screening concentrations were based on ingestion of surface soil and dermal contact with surface soil. Child resident exposure to surface soil and groundwater used as drinking water is usually greater than or equal to oral and dermal exposure to media treated as soil and groundwater, respectively, for exposure assessment. Therefore, screening values for surface soil represent conservative screening values for sediment, subsurface soil, and sludge, and screening values for groundwater used as drinking water represent conservative screening values for surface water. The exposure parameters for the child resident are presented in the accompanying surface soil and groundwater screening concentration spreadsheets (Tables D-3 and D-4, respectively).

The calculated essential nutrient screening concentrations for surface soil and groundwater are presented in Table D-5. These values represent the concentrations of individual essential nutrients in media that, if contacted in accordance with the exposure parameters used to derive the screening concentration, would theoretically result in the receptor receiving his or her recommended dietary allowance of an essential nutrient solely from the contacted media. For some nutrients, the calculated screening concentrations exceed 1,000,000 mg/kg (i.e., 100%). Such concentrations indicate that no concentration of nutrient in the particular medium would result in an intake that exceeds the RDA, given the exposure assumptions on which the screening value is based. Because these screening concentrations do not take into account the additivity of exposures between media (and other dietary intakes, including food), a receptor exposed to essential nutrients that are present in multiple media at the screening concentrations would, in essence, be receiving more than his or her recommended dietary allowance of nutrient. However, data provided in Table D-2 indicate that the toxicity threshold for most essential nutrients is several times greater than the RDA; the RDA is not a toxicity threshold value. Therefore, these screening concentrations do not represent concentrations which, if exceeded, would necessarily result in deleterious effects.

Table D-5
Theoretical Essential Nutrient Screening Concentrations For Surface Soil and Groundwater

Potential Source of Contamination 8
Vacant Lot East of Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Essential Nutrient	Surface Soil Screening Concentration (mg/kg)[1]	Groundwater Screening Concentration ($\mu g/\ell$)[2]
Calcium	[3]4,070,824	1,055,398
Iron	47,824	13,267
Magnesium	460,468	118,807
Potassium	[3]1,160,864	297,016
Sodium	[3]1,547,819	396,022

[1] Surface soil screening concentrations calculated as described in text, using RDAs presented in Table D-2 and the exposure parameters and risk calculations presented in Table D-3.
[2] Surface soil screening concentrations calculated as described in text, using RDAs presented in Table D-2 and the exposure parameters and risk calculations presented in Table D-4.
[3] The calculation of a screening concentration larger than 1,000,000 mg/kg indicates that no concentration results in an intake greater than the RDA, given the standard exposure parameters.

Notes mg/kg = milligrams per kilogram
$\mu g/\ell$ = micrograms per liter.

REFERENCES

National Research Council. 1989. "Recommended Dietary Allowances, Tenth Edition." National Research Council Subcommittee on the Tenth Edition of the RDAs, Food and Nutrition Board Commission on Life Sciences. National Academy of Sciences. National Academy Press, Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 1989b. *Exposure Factors Handbook.* EPA/600/8-89/043. Washington, D.C. (May).

USEPA. 1989b. *Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A).* EPA/540/1-89/002. USEPA Office of Emergency and Remedial Response. Washington, D.C. (December).

USEPA. 1991. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.* OSWER Directive 9285.6-03. Washington, D.C.

USEPA. 1997. *Health Effects Assessment Summary Tables: FY-1997 Annual.* EPA 540-R-94-020. Office of Solid Waste and Emergency Response. Washington, D.C. (July).

USEPA. 1998. Integrated Risk Information System (IRIS). Online. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office. Cincinnati, Ohio.

APPENDIX E

TOXICITY TESTS REPORT

APPENDIX F

VALIDATION REPORTS - 1999 SAMPLING ACTIVITY

APPENDIX G

SUPPORTING INFORMATION TO ECOLOGICAL RISK SCREENING

SAMPLING EVENT REPORT

POTENTIAL SOURCE OF CONTAMINATION 8
VACANT LOT EAST OF THE FUEL FARM

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

UNIT IDENTIFICATION CODE: N00207
CONTRACT NO.: N62467-89-D-0317/040

MARCH 1999

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

SAMPLING EVENT REPORT

POTENTIAL SOURCE OF CONTAMINATION 8
VACANT LOT EAST OF THE FUEL FARM

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No.: N62467-89-D-0317/040

Prepared by:

Harding Lawson Associates
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Dana Gaskins, Engineer-in-Charge

March 1999

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/040 are complete and accurate and comply with all requirements of this contract.

DATE: March 5, 1999

NAME AND TITLE OF CERTIFYING OFFICIAL: Phylissa Miller
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Alexander C. Olis, Ph.D., CPSS
Project Technical Lead

(DFAR 252.227-7036)

TABLE OF CONTENTS

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

LIST OF FIGURES

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
BHC	benzene hexachloride
bls	below land surface
Compuchem	Compuchem Environmental Corporation
COPC	chemical of potential concern
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
EDS	Environmental Data Services
FDEP	Florida Department of Environmental Protection
FSWS	Florida Surface Water Standard
IAS	initial assessment study
LUC	land-use control
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
µg/ℓ	micrograms per liter
NAS	Naval Air Station
NFESC	Naval Facilities Engineering Service Center
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PSC	potential source of contamination
QA/QC	quality assurance and quality control
RBC	risk-based screening concentrations
SDG	sample delivery group
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Harding Lawson Associates, under contract to the Department of Navy (Contract No. N62467-89-D-0317, Task Order No. 040), is submitting this Sampling Event Report for Potential Source of Contamination (PSC) 8, the Vacant Lot East of the Fuel Farm at Naval Air Station (NAS) Jacksonville, Jacksonville, Florida (Figure 1-1). An east-west drainage ditch runs through a portion of the site (Figure 1-2). A portion of PSC 8, north of the east-west drainage ditch along Catapult Road, was used for parking obsolete fighter jets and storage of blast grit and other fine granular materials. At the present time no aircraft or granular materials are stored in this area of the site.

This Sampling Event Report summarizes the methods and the results of the field investigation and transmits the field and analytical data.

1.1 PURPOSE AND SCOPE. The purpose of the sampling event at PSC 8 was to gather sufficient information to support the next phase of the Remedial Response Decision System process (ABB Environmental Services, Inc. [ABB-ES], 1995). The scope of the sampling event at PSC 8, as detailed in the Site Screening Workplan (ABB-ES, 1997), included the items below.

- Ten soil samples were to be collected from five locations. The five locations were to be biased toward visible suspect areas, such as the diked areas and areas of sludge-like material, where possible. Five samples were to be collected from 0 to 1 foot below land surface (bls) and five samples collected from 1 to 2 feet bls.

- Three surface water and sediment samples were to be collected from the east-west drainage ditch.

- Laboratory analysis was to be performed on the soil and surface water and sediment samples for U.S. Environmental Protection Agency (USEPA) target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls (PCBs), and target analyte list (TAL) inorganics.

Fieldwork for this sampling event was completed from April 1, 1997, through April 15, 1997.

1.2 POTENTIAL SOURCE OF CONTAMINATION DESCRIPTION AND ENVIRONMENTAL SETTING. PSC 8 is a vacant lot east of Gas Hill (PSC 7) and off Catapult Road. Because PSC 8 is located near the flightline, it is inaccessible to most people on base. The eastern part of PSC 8 is densely vegetated with bamboo and other shrubbery that limits access to this part of the PSC. Remnants of an earthen berm are present around most of the eastern part of PSC 8. The site is mostly flat with gentle slopes toward the St. Johns River and the drainage ditch.

The vacant lot was identified as a PSC during the Initial Assessment Study (IAS) (Fred C. Hart Associates, Inc., 1983). The site was formerly used for parking

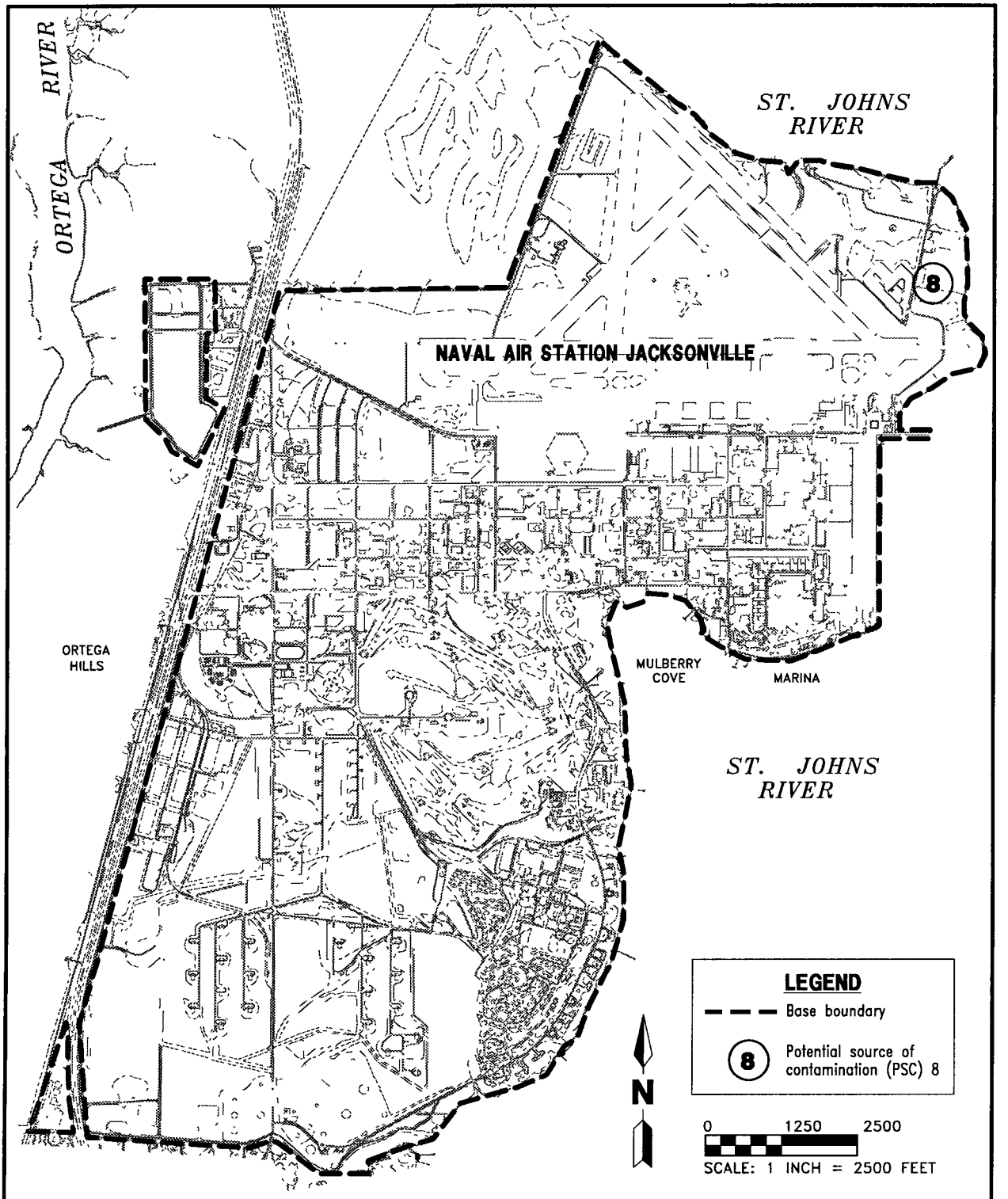

FIGURE 1-1
LOCATION OF PSC 8 AT
NAVAL AIR STATION JACKSONVILLE

K \02508\02508-09\SER\02508506.DWG, NP-VC 12/28/98 12 42.06

SAMPLING EVENT REPORT
PSC 8

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

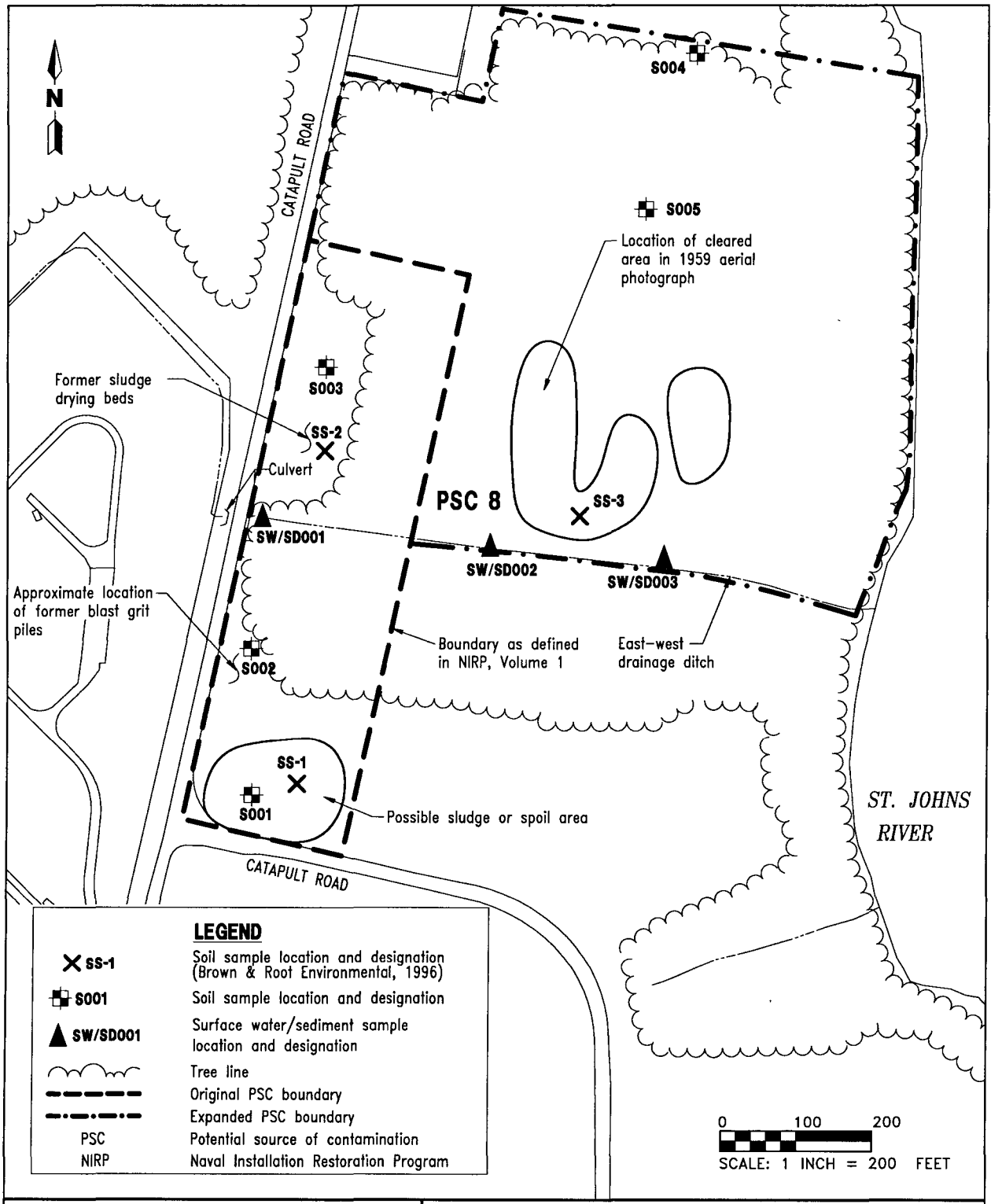

FIGURE 1-2
SAMPLING LOCATIONS AT PSC 8
VACANT LOT EAST OF THE FUEL FARM

K \02508\02508-09\SER\02508564 DWG, VC-VC 01/05/99 12 20 48, AutoCAD R14

SAMPLING EVENT REPORT
PSC 8

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

obsolete fighter jets. Site inspection during the IAS revealed four piles of blast grit and two disintegrated plastic bags of fine granular materials. This area is lined with marsten matting, which results in a flat, solid ground surface. The jets, blast grit, and other granular material have been removed from the site.

Several sources suggest a connection between PSC 8 and waste from the Old East Side Wastewater Treatment Plant (WWTP) (PSC 50). An untitled, undated set of sewer line diagrams shows a 6-inch cast iron sludge line running from the Old East Side WWTP north to the area of PSC 8 where the old jets are stored (NAS Jacksonville, undated). It is assumed that these diagrams reflect site conditions from 1955 (Wadel, 1994). It has been reported that the pipe led to sludge drying beds at PSC 8 (Gillespie, 1994).

Based on aerial photographs taken in 1951 and 1959, a large diked area was constructed east of Catapult Road sometime between those dates. NAS Jacksonville personnel have reported that during the 1950s and 1960s, sediment from a polishing pond and oxidation pond was cleared out periodically and spread out in diked areas at PSC 8. The land was then covered with fill dirt and flattened with a bulldozer (Wadel, 1994). A dry sludge-like material was observed at the surface during a pre-sampling reconnaissance of the area. The PSC boundaries were expanded to include the area where sludge-like material was observed. The polishing pond waste was also reportedly deposited south of the drainage ditch near the turn in Catapult Road (Wadel, 1994).

Larger color aerial photographs from 1981 (obtained from NAS Jacksonville Public Works) show a structure that may have been an aboveground storage tank or a small building located just south of the drainage ditch and east of Catapult Road. Three pits appear south of the structure. No information on these features was found in the literature available for PSC 8. In addition, damaged drums were reportedly observed south of the drainage along a paved area adjacent to Catapult Road. No drums are presently visible in this area.

Basewide environmental setting information, including geology, hydrogeology, and climatology, is contained in the Preliminary Characterization Summary Report (ABB-ES, 1994).

2.0 SAMPLING APPROACH AND FIELD CHANGES

The work described herein was performed as presented in the Site Screening Workplan (ABB-ES, 1997).

Prior to collecting soil samples 08S00101 and 02 in the southern-most portion of PSC 8, three observation holes were hand dug to observe the subsurface material and look for potentially buried sludge. Soil fill, along with concrete and asphalt debris, was encountered at each of the three locations. Soil samples 08S00201 and 02 were collected at the edge of the paved area south of the drainage ditch. Soil samples 08S00301 and 02 were collected through the marsten matting in the area formerly used for jet parking and storage of blasting grit. Soil samples 08S00401 and 02 and 08S00501 and 02 were collected in the area where sludge-like material was previously observed.

The original sampling depth proposed for 08S00102 and 08S00402 was 1 to 2 feet bls. During the field activity the sampling depth was changed to 2 to 3 feet bls at these locations because visual appearance of the soil indicated staining below the 2-foot level.

Three surface water and sediment samples were collected along the east-west drainageway. Samples 08W00101 and 08D00101 were collected as the background samples from the drainage ditch. Samples 08W00201 and 08D00201, and 08W00301 and 08D00301, represent downgradient conditions along the ditch. The soil and surface water and sediment sampling locations are shown on Figure 1-2.

The 10 soil samples and three surface water and sediment samples collected for laboratory analysis were sent by overnight carrier to the subcontract laboratory, Compuchem Environmental Corporation (Compuchem) (Cary, North Carolina). The samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic compounds. A sample tracking log, which includes sample and sample delivery group (SDG) identifiers, relevant dates, sample depths, and parameters analyzed is included in Appendix A. A summary of the detections in the analytical results is included in Appendix B.

Following laboratory analysis of the soil samples, all data were subjected to validation as required under the Naval Facilities Engineering Service Center (NFESC) Level D protocol. The validated analytical results are included in Appendix C of this report.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field samples and associated quality assurance and quality control (QA/QC) samples were collected and analyzed according to USEPA Contract Laboratory Program and NFESC requirements by an NFESC certified laboratory, CompuChem. The analytical data packages, submitted as SDGs, were independently validated by a subcontract data validation company, Environmental Data Services [EDS] (Concord, New Hampshire), in accordance with validation requirements contained in NFESC document *Navy Installation Restoration Laboratory Quality Assurance Guide* (NFESC, 1996). Other documents utilized in the data validation and review include the USEPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, 1994a) and the USEPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA, 1994b).

A detailed QA/QC evaluation can be found in the EDS report (EDS, 1997), which summarizes the results of the data quality assessment according to the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters for the entire site-screening activity. The EDS report was issued as Appendix B of the site-screening workplan. The generated analytical data were found to be acceptable according to the PARCC criteria, with less than 5 percent of the data requiring qualification (primarily estimated "J" qualifier).

4.0 ANALYTICAL RESULTS

4.1 ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES. Appendix B presents a summary of the parameters detected in soil samples collected at PSC 8. The complete validated analytical data are included in Appendix C.

4.1.1 Volatile Organic Compounds No site-related VOCs were detected in the soil samples analyzed. The methylene chloride detected in two samples at 1 and 3 micrograms per kilogram (μg/kg) is likely a laboratory contaminant.

4.1.2 Semivolatile Organic Compounds Eleven SVOCs were detected in the soil samples analyzed. Three of the SVOCs, benzo(a)pyrene at 1,500 μg/kg, benzo(b)-fluoranthene at 2,900 μg/kg, and dibenz(a,h)anthracene at 150 μg/kg, were detected at potentially significant levels. This sample location was in the former storage area for obsolete planes and granular materials, including blasting grit.

4.1.3 Pesticides and Polychlorinated Biphenyls Seventeen pesticide and PCB compounds were identified in soil samples analyzed. All pesticides were detected at levels consistent with basewide application of pesticides for insect and other pest control. Only dieldrin, detected in sample 08S00301 at a concentration of 180 μg/kg, was detected at potentially significant levels.

4.1.4 Inorganic Parameters Twenty-one inorganic parameters were identified in soil samples analyzed. Arsenic was detected in 5 of 10 samples ranging from 0.91 milligrams per kilogram (mg/kg) to 7 mg/kg, and beryllium was detected at concentrations ranging from 0.31 mg/kg to 0.63 mg/kg.

The highest concentrations for both of these substances occurred within the bermed area where the sludge-like material was observed at the surface.

4.2 ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES. Appendix C presents a summary of the parameters detected in subsurface soil samples collected at PSC 8. The complete validated analytical data are included in Appendix D. Soil samples were collected from two locations at 2 to 3 feet bls.

4.2.1 Volatile Organic Compounds No site-related VOCs were detected in the subsurface soil samples analyzed. The methylene chloride detected may have been a laboratory contaminant.

4.2.2 Semivolatile Organic Compounds Two SVOCs, benzo(b)fluoranthene and benzo(k)fluoranthene, were detected in the subsurface soil samples analyzed. None were detected at significant levels.

4.2.3 Pesticides and Polychlorinated Biphenyls Ten pesticides were identified in subsurface soil samples analyzed. All pesticides were detected at levels consistent with basewide application of pesticides for insect and other pest control. No PCBs were detected in subsurface soil samples.

4.2.4 Inorganic Parameters Eighteen inorganic parameters were identified in subsurface soil samples analyzed. Arsenic was detected in one of two samples at 1.8 mg/kg.

4.3 ANALYTICAL RESULTS FOR SEDIMENT SAMPLES. Appendix B presents a summary of the parameters detected in sediment samples collected at PSC 8. The complete validated analytical data are included in Appendix C.

4.3.1 Volatile Organic Compounds No site-related VOCs were detected in the sediment samples analyzed.

4.3.2 Semivolatile Organic Compounds Eleven SVOCs were detected in only the upgradient sediment sample, 08D00101, immediately adjacent to Catapult Road and downgradient from the Gas Hill facility. However, none of the SVOCs were detected at concentrations exceeding their respective Florida Department of Environmental Protection (FDEP) sediment quality guidelines.

4.3.3 Pesticides and Polychlorinated Biphenyls Fourteen pesticide and PCB compounds were identified in sediment samples analyzed. The detected concentrations of dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethene (DDE) are below the FDEP sediment quality guidelines. No FDEP sediment quality guidelines have been determined for the remaining 12 detected parameters.

4.3.4 Inorganic Parameters Twenty-one inorganic parameters were identified in sediment samples analyzed. Only cadmium, detected at 9.8 mg/kg in sample 08D00301, exceeded the FDEP sediment quality guideline of 7.5 mg/kg. No FDEP sediment quality guidelines have been determined for 13 of the 21 inorganic parameters.

4.4 ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES. Appendix B presents a summary of the parameters detected in surface water samples collected at PSC 8. The complete validated analytical data are included in Appendix C.

4.4.1 Volatile Organic Compounds Trichloroethene and 1,2-dichloroethene (total) were detected in the upgradient sample, 08W00101. Trichloroethene, at 10 micrograms per liter ($\mu g/\ell$), did not exceed the Florida Surface Water Standard (FSWS) of 80.7 $\mu g/\ell$. 1,2-dichloroethene (total) was detected at 6 $\mu g/\ell$. No FSWS has been determined for 1,2-dichloroethene (total).

4.4.2 Semivolatile Organic Compounds No SVOCs were detected in the surface water samples collected.

4.4.3 Pesticides and Polychlorinated Biphenyls Six pesticide compounds (DDE, DDT, alpha-benzene hexachloride (BHC), delta-BHC, dieldrin, and endosulfan II) were detected in the surface water samples analyzed. Most of these detected pesticides are also found in the sediment samples. Due to the very low solubility characteristics of these pesticides, it is likely that the suspended particulates in the surface water may be contributing to these low levels of detections (low parts per trillion) in surface water. DDT, detected between 0.0067 $\mu g/\ell$ and 0.0093 $\mu g/\ell$ in the three samples, exceeded the FSWS of 0.00059 $\mu g/\ell$. Dieldrin, detected at concentrations of 0.0028 $\mu g/\ell$ and 0.0064 $\mu g/\ell$ in the two downgradient samples, exceeded the FSWS of 0.0019 $\mu g/\ell$. Alpha-BHC at 0.0052 $\mu g/\ell$ and endosulfan II at 0.015 $\mu g/\ell$ were detected below the FSWSs of 0.046 $\mu g/\ell$ and 0.056 $\mu g/\ell$, respectively. No FSWSs have been determined for DDE and delta-BHC.

4.4.4 **Inorganic Parameters** Thirteen inorganic parameters were identified in surface water samples analyzed. Only iron, detected between 2,160 and 11,100 $\mu g/\ell$ in the three samples, exceeded the FSWS of 1,000 $\mu g/\ell$.

5.0 RISK EVALUATION

The purpose of performing risk screening as part of the site-screening evaluation is to assist in determining whether or not the existing risk at PSC 8 (1) supports a no further action decision (with or without the implementation of land-use controls [LUCs], (2) indicates the need for an interim remedial action, or (3) requires additional investigation to make a decision. Risk screening involves comparing concentrations of detected analytes that are inorganic analytes to background screening levels and then comparing the concentrations of those inorganic analytes present above background screening levels and all detected organic analytes to risk-based screening concentrations (RBCs) developed by the USEPA Region 3 (USEPA, 1998). USEPA developed RBCs using conservative pathway-specific models. Contaminants present below the RBCs are considered to pose no or only insignificant risk. Analytes detected both above the background screening concentrations and the RBCs are considered chemicals of potential concern (COPCs). If any COPCs are identified, a more detailed risk analysis may be appropriate.

5.1 HUMAN HEALTH RISK SCREENING. Analytes were excluded as COPCs if they met the following criteria:

- the detected concentration of a contaminant did not exceed two times the arithmetic mean (with one-half the reported quantitation limit averaged for non-detections) of background concentrations;
- the detected concentration did not exceed USEPA Region 3 RBCs (USEPA, 1998); or
- the analyte was an essential nutrient that did not have a Region 3 RBC but was detected below calculated screening concentrations based on the recommended dietary allowances (Appendix D).

5.1.1 Surface Soil For PSC 8, background screening concentrations were the data set used to support the Operable Unit (OU) 1 remedial investigation (ABB-ES, 1996). Table 5-1 presents a comparison of the maximum detected analytes in surface soil to Region 3 RBCs and background levels.

Only benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, dieldrin, arsenic, and iron exceeded background screening levels (if appropriate) and the Region 3 risk-based concentrations for residential exposure to surface soil. Because all carcinogenic polycyclic aromatic hydrocarbons (PAHs) are essentially formed as part of the same process, it is considered appropriate to consider all carcinogenic PAHs COPCs even if only one of them exceeds RBCs. Although iron levels exceeded Region 3 RBCs, these values were not calculated based on an effect, but rather on a non-effect dose. Screening values calculated for iron based on the recommended dietary allowances prepared by the Food and Nutrition Board of the National Research Council (Appendix D) allow for iron concentrations of up to 47,824 mg/kg in surface soil. The maximum detected level at PSC 8 is well below this quantity.

While the PAHs, dieldrin, arsenic, and iron levels exceeded residential RBCs, only arsenic and benzo(a)pyrene levels exceeded their corresponding industrial RBCs

Table 5-1
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region 3 Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Methylene chloride	2/8	2	NA	85,000	No
Semivolatile Organic Compounds (µg/kg)					
Acenaphthene	1/8	59	NA	4,700,000	No
Anthracene	1/8	140	NA	23,000,000	No
Benzo(a)anthracene	2/8	860	NA	870	Yes[1]
Benzo(a)pyrene	2/8	1,500	NA	87	Yes
Benzo(b)fluoranthene	4/8	2,900	NA	870	Yes
Benzo(g,h,i)perylene	2/8	520	NA	[2]2,300,000	No
Benzo(k)fluoranthene	4/8	3,000	NA	8,700	Yes[1]
Chrysene	2/8	1,000	NA	87,000	Yes[1]
Dibenz(a,h)anthracene	1/8	150	NA	87	Yes
Fluoranthene	1/8	1,100	NA	3,100,000	No
Indeno(1,2,3-cd)pyrene	2/8	470	NA	870	Yes[1]
Phenanthrene	1/8	150	NA	[2]2,300,000	No
Pyrene	2/8	1,600	NA	2,300,000	No
bis(2-Ethylhexyl)phthalate	6/8	410	NA	46,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	2/8	12	NA	2,700	No
4,4'-DDE	8/8	240	NA	1,900	No
4,4'-DDT	5/8	280	NA	1,900	No
Aldrin	2/8	1.6	NA	38	Yes[3]
Aroclor-1260	5/8	230	NA	320	No
Dieldrin	7/8	180	NA	40	Yes
Endosulfan II	2/8	7.6	NA	470,000	No
Endosulfan sulfate	4/8	3 3	NA	[4]470,000	No
Endrin	4/8	6.4	NA	23,000	No
Endrin aldehyde	4/8	6	NA	[5]23,000	No
Endrin ketone	1/8	11	NA	[5]23,000	No
Heptachlor	1/8	19	NA	140	No
Heptachlor epoxide	7/8	13	NA	70	No
Methoxychlor	1/8	3	NA	39,000	No
alpha-Chlordane	7/8	14	NA	1,800	No
delta-BHC	5/8	1.2	NA	[6]100	No
gamma-Chlordane	8/8	57	NA	1,800	No

See notes at end of table.

Table 5-1 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Soil

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected Concentration	Background Screening Level	USEPA Region 3 Risk-Based Concentration (Residential)	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg)					
Aluminum	8/8	16,300	1,340	78,000	No
Arsenic	4/8	7	0 8	0.43	Yes
Barium	8/8	41.7	11 2	5,500	No
Beryllium	5/8	0.63	ND	160	No
Cadmium	6/8	4.5	ND	780	No
Calcium	8/8	176,000	2,360	[7]1,000,000	No
Chromium	8/8	66.7	6 6	390	No
Cobalt	8/8	2.3	ND	4,700	No
Copper	8/8	28.5	5.8	3,100	No
Iron	8/8	26,700	852	23,000	Yes
Lead	8/8	114	24.4	400	No
Magnesium	8/8	2,690	99 8	[7]460,468	No
Manganese	8/8	154	18	1,600	No
Mercury	4/8	0.62	ND	[7]610	No
Nickel	8/8	10.5	11	1,600	No
Potassium	8/8	1,220	ND	[7]1,000,000	No
Selenium	3/8	5.3	ND	390	No
Silver	4/8	1 5	ND	390	No
Sodium	1/8	626	288	[7]1,000,000	No
Vanadium	8/8	35.2	3.8	550	No
Zinc	8/8	96	15.2	23,000	No

[1] All carcinogenic polycyclic aromatic hydrocarbons were selected as COPCs because members of the class were selected
[2] The Region 3 RBC for pyrene was used to screen those noncarcinogenic COPCs without RBCs
[3] Aldrin was selected as a COPC because its breakdown product dieldrin was selected.
[4] The RBC for endosulfan was used to screen endosulfan sulfate
[5] The RBC for endrin was used to screen endrin aldehyde and endrin ketone.
[6] The RBC for alpha-BHC was used to screen delta-BHC.
[7] The RBCs for essential nutrients are calculated in Appendix D.

Notes PSC = potential source of contamination.
USEPA = U S. Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram.
NA = not applicable.
PCB = polychlorinated biphenyl
BHC = benzene hexachloride (common name for hexachlorocyclohexane).
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
RBC = risk-based concentration.
mg/kg = milligrams per kilogram
ND = not detected.

(see Table 5-2). An industrial exposure scenario would be appropriate for PSC 8 considering its location. PSC 8 is part of the flightline. Human receptors performing maintenance or construction could be exposed to soil contaminants via dermal contact, ingestion, or inhalation of volatile compounds. Implementation of LUCs would further prevent exposure to residents who are currently forbidden access to PSC 8.

The benzo(a)pyrene level of 1,500 µg/kg was collected from 0 to 1 foot bls at sampling location 3. The sample collected at 1 to 2 feet bls contained only 100 µg/kg benzo(a)pyrene. If these samples were averaged to obtain the concentration of benzo(a)pyrene from 0 to 2 ft bls, which is the FDEP definition of surface soil, the concentration at sampling location 3 would be 800 µg/kg, which is below the industrial RBC. As shown in Table 5-2, arsenic levels are below the RBCs calculated for arsenic for noncarcinogenic endpoints.

Table 5-2
Comparison of Selected Compounds to Industrial Risk Screening Levels in Surface Soil

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	USEPA Region 3 Risk-Based Concentration (Industrial)	Analyte > RBC? (Yes/No)
Semivolatile Organic Compounds (µg/kg)			
Benzo(a)pyrene	1,500	780	Yes
Benzo(b)fluoranthene	2,900	7,800	No
Dibenz(a,h)anthracene	150	780	No
Pesticides (µg/kg)			
Dieldrin	180	360	No
Inorganic Analytes (mg/kg)			
Arsenic (as carcinogen)	7	3.8	Yes
Arsenic (as noncarcinogen)	7	610	No
Iron	26,700	610,000	No

Notes: USEPA = U S. Environmental Protection Agency.
RBC = risk-based concentration.
µg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.

5.1.2 Subsurface Soil According to FDEP and USEPA guidance, subsurface soil is screened against an industrial exposure scenario even if a residential exposure would be appropriate for surface soil in the same location because it is assumed that residents would not be regularly exposed to subsurface soils (Table 5-3). For PSC 8, background screening concentrations were the data set used to support the OU 1 remedial investigation (ABB-ES, 1996).

No analytes in subsurface soil exceeded background screening concentrations (if appropriate) and RBCs for industrial exposure.

Table 5-3
Comparison of Detected Compounds to Background and Risk Screening Levels in Subsurface Soil

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region 3 Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/kg)					
Methylene chloride	2/2	3	NA	760,000	No
Semivolatile Organic Compounds (µg/kg)					
Benzo(b)fluoranthene	1/2	47	NA	7,800	No
Benzo(k)fluoranthene	1/2	48	NA	78,000	No
Pesticides and PCBs (µg/kg)					
4,4'-DDD	1/2	59	NA	24,000	No
4,4'-DDE	1/2	18	NA	17,000	No
Aldrin	1/2	0.1	NA	340	No
Dieldrin	1/2	0 53	NA	360	No
Endosulfan I	1/2	0.46	NA	12,000,000	No
Endosulfan sulfate	1/2	0.56	NA	[1]12,000,000	No
Endrin	1/2	0 36	NA	61,000	No
Endrin aldehyde	1/2	0.39	NA	[2]61,000	No
gamma-BHC (Lindane)	1/2	0.06	NA	4,400	No
gamma-Chlordane	1/2	0.24	NA	16,000	No
Inorganic Analytes (mg/kg)					
Aluminum	2/2	8,120	6,823	2,000,000	No
Arsenic	1/2	1.8	1.48	3 8	No
Barium	2/2	26 2	20.8	140,000	No
Beryllium	1/2	0 92	0.49	4,100	No
Calcium	2/2	6,410	668	NA	No
Chromium	2/2	18 8	14.1	10,000	No
Cobalt	1/2	5.5	ND	120,000	No
Copper	2/2	5.9	ND	NA	No
Iron	2/2	13,300	5,818	610,000	No
Lead	2/2	38.6	6 46	1,000	No
Magnesium	2/2	3,150	500	NA	No
Manganese	2/2	132	6 9	41,000	No
Mercury	1/2	0.11	ND	NA	No
Nickel	2/2	6.8	ND	41,000	No
Potassium	1/2	1,100	343	NA	No

See notes at end of table.

Table 5-3 (Continued)
Comparison of Detected Compounds to Background and Risk Screening Levels at Subsurface Soil

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region 3 Risk-Based Concentration (Industrial)	Analyte COPC? (Yes/No)
Inorganic Analytes (mg/kg) (continued)					
Sodium	1/2	944	ND	NA	No
Vanadium	2/2	16 7	ND	14,000	No
Zinc	2/2	23 5	14 5	610,000	No

[1] The RBC for endosulfan was used to screen endosulfan sulfate
[2] The RBC for endrin was used to screen endrin aldehyde and endrin ketone.

Notes: USEPA = U S Environmental Protection Agency.
COPC = chemical of potential concern.
µg/kg = micrograms per kilogram
NA = not applicable.
PCB = polychlorinated biphenyls.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
BHC = benzene hexachloride (common name for hexachlorocyclohexane).
mg/kg = milligrams per kilogram.
ND = not detected.
RBC = risk-based concentration.

5.1.3 Surface Water Surface water samples were conservatively screened against the residential tap water exposure scenario, which assumes a consumption of two liters of water per day (see Table 5-4). This assumption grossly overestimates a reasonable consumption of surface water at PSC 8. For PSC 8, background screening concentrations were the data set used to support the OU 1 remedial investigation (ABB-ES, 1996).

Trichloroethene, dieldrin, and iron were the only analytes detected above background screening levels and RBCs. The iron concentration in one sample exceeded the RBC by only 100 $\mu g/\ell$. As described above and in Appendix D, screening concentrations have been calculated for iron based on the recommended dietary allowance. The screening value for iron in drinking water is 13,267 $\mu g/\ell$. Based on this screening, the iron levels at PSC 8 are acceptable.

The trichloroethene detected in one surface water sample may be a field or laboratory artifact. Trichloroethene was not detected in the other media at PSC 8, and there is no obvious source for trichloroethene at PSC 8.

The dieldrin level in one sample (0.0064 micrograms per liter [$\mu g/\ell$]) exceeded RBCs (0.0042 $\mu g/\ell$). There is currently, however, no exposure to surface water at PSC 8 because of its location. Future exposure to surface soil at PSC 8 is unlikely unless land use were changed to allow for residential use. Therefore, implementation of LUCs further prevents exposure to potential future residents, who might use surface water for recreation.

5.2 ECOLOGICAL RISK SCREENING. An ecological risk screening was performed on sediment and surface water at PSC 8. Sediment samples were screened against FDEP sediment quality guidelines (Table 5-5), and surface water samples were screened against FSWSs (Table 5-6).

Eleven SVOCs were detected in only the upgradient sediment sample, 08D00101, immediately adjacent to Catapult Road and downgradient from the Gas Hill facility. However, none of the SVOCs were detected at concentrations exceeding their respective FDEP sediment quality guidelines. Fourteen pesticide and PCB compounds were identified in sediment samples analyzed. The detected concentrations of DDT and DDE are below the FDEP sediment quality guidelines. No FDEP sediment quality guidelines have been determined for the remaining 12 detected parameters. Twenty-one inorganic parameters were identified in sediment samples analyzed. Only cadmium, detected at 9.8 mg/kg in sample 08D00301, exceeded the FDEP sediment quality guidelines of 7.5 mg/kg. No FDEP sediment quality guidelines have been determined for 13 of the 21 inorganic parameters.

Six pesticide compounds (DDE, DDT, alpha-BHC, delta-BHC, dieldrin, and endosulfan II) were detected in the surface water samples analyzed. DDT, detected between 0.0067 $\mu g/\ell$ and 0.0093 $\mu g/\ell$ in the three samples, exceeded the FSWS of 0.00059 $\mu g/\ell$. Dieldrin, detected at concentrations of 0.0028 $\mu g/\ell$ and 0.0064 $\mu g/\ell$ in the two downgradient samples, exceeded the FSWS of 0.0019 $\mu g/\ell$. Alpha-BHC at 0.0052 $\mu g/\ell$ and endosulfan II at 0.015 $\mu g/\ell$ were detected below the FSWSs of 0.046 $\mu g/\ell$ and 0.056 $\mu g/\ell$, respectively. No FSWSs have been determined for DDE and delta-BHC Most of these detected pesticides are also found in the sediment samples. Due to the very low solubility characteristics of these pesticides, it is likely that the suspended particulates in the surface water may be contributing to these low

Table 5-4
Comparison of Detected Compounds to Background and Risk Screening Levels in Surface Water

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Frequency of Detects	Maximum Detected	Background Screening Concentration	USEPA Region 3 Risk-Based Concentration (Tap Water)	Analyte COPC? (Yes/No)
Volatile Organic Compounds (µg/ℓ)					
1,2-Dichloroethene (total)	1/3	6	NA	55	No
Acetone	2/3	16	NA	3,700	No
Trichloroethene	1/3	10	NA	1 6	Yes
Pesticides and PCBs (µg/ℓ)					
4,4'-DDE	1/3	0 0065	NA	0.2	No
4,4'-DDT	3/3	0 0093	NA	0.2	No
Dieldrin	2/3	0 0064	NA	0.0042	Yes
Endosulfan II	1/3	0.015	NA	[1]220	No
alpha-BHC	1/3	0.0052	NA	0.011	No
delta-BHC	3/3	0.0097	NA	0.052	No
Inorganic Analytes (µg/ℓ)					
Barium	3/3	39.6	83	2,600	No
Calcium	3/3	83,100	39,110	NA	No
Chromium	3/3	3 6	ND	[2]37,000/180	No
Copper	3/3	4.8	7 6	NA	No
Iron	3/3	11,100	2,436	11,000	Yes
Lead	1/3	2 2	6.6	15	No
Magnesium	3/3	13,300	6,126	NA	No
Manganese	3/3	417	39.6	730	No
Nickel	3/3	2.3	ND	730	No
Potassium	3/3	5,580	1,792	NA	No
Sodium	3/3	52,100	20,870	NA	No
Vanadium	3/3	2.4	5.6	260	No
Zinc	3/3	56.5	46 4	11,000	No

[1] The RBC for endosulfan was used to screen endosulfan sulfate.
[2] Trivalent/hexavalent chromium screening concentrations

Notes: USEPA = U.S Environmental Protection Agency
COPC = chemical of potential concern.
µg/ℓ = micrograms per liter
NA = not applicable.
PCB = polychlorinated biphenyl.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride (common name for hexachlorocyclohexane).
ND = not detected.
RBC = risk-based concentration.

Table 5-5
Comparison of Detected Compounds to Sediment Quality Criteria in Sediment

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	FDEP Sediment Quality Guidelines
Inorganic Analytes (mg/kg)		
Aluminum	5,690	NA
Arsenic	7 4	64
Barium	40.3	NA
Beryllium	0.92	NA
Cadmium	9.8	7.5
Calcium	12,200	NA
Chromium	190	240
Cobalt	1.4	NA
Copper	43 9	170
Iron	25,900	NA
Lead	60 7	160
Magnesium	2,440	NA
Manganese	143	NA
Mercury	0.93	1.4
Nickel	19.5	NA
Potassium	1,010	NA
Selenium	13 8	NA
Silver	2.4	2.5
Sodium	4,930	NA
Vanadium	32.7	NA
Zinc	131	300
Volatile Organic Compounds (µg/kg)		
Acetone	42	NA
Methylene chloride	64	NA
Semivolatile Organic Compounds (µg/kg)		
Benzo(a)anthracene	180	1,300
Benzo(a)pyrene	210	1,700
Benzo(b)fluoranthene	430	NA
Benzo(g,h,i)perylene	120	NA
Benzo(k)fluoranthene	450	NA
bis(2-Ethylhexyl)phthalate	310	NA
Chrysene	200	1,700
Fluoranthene	320	3,200
Indeno(1,2,3-cd)pyrene	110	NA

See notes at end of table.

Table 5-5 (Continued)
Comparison of Detected Compounds to Sediment Quality Criteria Sediment

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	FDEP Sediment Quality Guidelines
Semivolatile Organic Compounds (µg/kg) (continued)		
Phenanthrene	91	1,200
Pyrene	310	1,900
Pesticides and PCBs (µg/kg)		
4,4'-DDE	7 8	130
4,4'-DDT	3.9	270
alpha-Chlordane	5 4	NA
Aroclor-1260	62	NA
delta-BHC	4.4	NA
Dieldrin	2 9	NA
Endosulfan II	1	NA
Endosulfan sulfate	5.7	NA
Endrin	0.47	NA
Endrin aldehyde	3.8	NA
gamma-Chlordane	12	NA
Heptachlor	0 27	NA
Heptachlor epoxide	0.52	NA
Methoxychlor	34	NA

Notes: FDEP = Florida Department of Environmental Protection
mg/kg = milligrams per kilogram.
NA = not available.
µg/kg = micrograms per kilogram.
PCB = polychlorinated biphenyl.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride (common name for hexachlorocyclohexane).

Table 5-6
Comparison of Detected Compounds to Surface Water Standards in Surface Water

Potential Source of Contamination 8
Vacant Lot East of the Fuel Farm
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Maximum Detected Concentration	Florida Surface Water Standards
Inorganic Analytes (µg/ℓ)		
Barium	39.6	NA
Calcium	83,100	NA
Chromium	3.6	11
Copper	4.8	500
Iron	11,100	1,000
Lead	2 2	50
Magnesium	13,300	NA
Manganese	417	NA
Nickel	2.3	368
Potassium	5,580	NA
Sodium	52,100	NA
Vanadium	2 4	NA
Zinc	56.5	250
Volatile Organic Compounds (µg/ℓ)		
1,2-Dichloroethene (total)	6	NA
Acetone	16	NA
Trichloroethene	10	80.7
Pesticides (µg/ℓ)		
4,4'-DDE	0.0065	NA
4,4'-DDT	0.0093	0.00059
alpha-BHC	0.0052	0.046
delta-BHC	0 0097	NA
Dieldrin	0.0064	0.0019
Endosulfan II	0 015	0.056

Notes. µg/ℓ = micrograms per liter
NA = not available.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
BHC = benzene hexachloride (common name for hexachlorocyclohexane).

levels of detection (low parts per trillion) in surface water. Thirteen inorganic parameters were identified in surface water samples analyzed. Only iron, detected between 2,160 and 11,100 $\mu g/\ell$ in the three samples, exceeded the FSWS of 1,000 $\mu g/\ell$.

The low levels of pesticides detected in surface water and sediment are not indicative of sludge or waste from a WWTP or polishing pond. Due to the very low solubility characteristics of these pesticides, it is likely that the suspended particulates in the surface water may be contributing to these low levels of detections. The detections are likely indicative of past basewide pesticide use, rather than site related. Because there are no identified site-related pesticide sources, slight exceedances in surface water standards for some pesticides would likely dissipate over time, resulting in insignificant impacts to environmental receptors.

6.0 REFERENCES

ABB Environmental Services, Inc. (ABB-ES). 1994. *Preliminary Characterization Summary Report, Operable Unit 1, Naval Air Station (NAS) Jacksonville, Jacksonville, Florida*. Prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), North Charleston, South Carolina.

ABB-ES. 1995. *Naval Installation Restoration Program Plan Remedial Response Decision System, Appendix D, NAS Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

ABB-ES. 1996. *Remedial Investigation and Feasibility Study for Operable Unit 1, NAS Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

ABB-ES. 1997. *Site Screening Workplan, NAS Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

Environmental Data Services, Inc. 1997. *PARCC Criteria Evaluation Report - Final*. Prepared for ABB-ES. Orange Park (December).

Fred C. Hart Associates, Inc. 1983. *Initial Assessment Study, NAS Jacksonville, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (March).

Gillespie, Ralph. 1994. Former employee at NAS Jacksonville, interview with Andrea Donlon, ABB-ES. Wakefield, Massachusetts (May 24).

Naval Air Station Jacksonville. Undated. Map of underground utilities in the eastern part of the flightline area.

Navy Facilities Engineering Services Center. 1996. *Navy Installation Restoration Laboratory Quality Assurance Guide*. (February).

U.S. Environmental Protection Agency (USEPA). 1994a. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Washington, D.C. (February).

USEPA. 1994b. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Washington, D.C. (February).

USEPA. 1998. *USEPA Region 3 Risk-Based Concentrations*. Philadelphia, Pennsylvania (April 15).

Wadel, Michael. 1994. Resident Officer in Charge of Construction, NAS Jacksonville, interview with Andrea Donlon, ABB-ES. Wakefield, Massachusetts (April 29).