PB98-964006
EPA 541-R98-022
October 1998

EPA Superfund
Record of Decision:

Jacksonville Naval Air Station
OU 1
Jacksonville, FL
8/3/1998

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW
ATLANTA, GEORGIA 30303-8909

4WD-FFB

AUG 0 3 1998

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Captain
Commanding Officer
Naval Air Station Jacksonville
Jacksonville, Florida 32212-5000

SUBJ: Final Record of Decision
Operable Unit One
EPA ID# FL6 170 024 412

Dear Captain Turcotte:

The United States Environmental Protection Agency (EPA) has reviewed the Department of the Navy's Final Record of Decision (ROD) for Operable Unit One - Potential Sources of Contamination (PSCs) 26 and 27 at Naval Air Station Jacksonville pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended. EPA concurs with the findings and the selected remedy presented in the ROD.

Sincerely,

Richard D. Green
Director
Waste Management Division

cc: Virginia B. Wetherell, Secretary
Florida Department of Environmental Protection

Captain W. E. Lewis, USN, Commanding Officer
Southern Division Naval Facilities Engineering Command

RECORD OF DECISION

POTENTIAL SOURCES OF CONTAMINATION 26 and 27
OPERABLE UNIT 1

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

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

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

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

Dana Gaskins, Code 1857, Engineer-in-Charge

September 1997

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

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

DATE: September 17, 1997

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

NAME AND TITLE OF CERTIFYING OFFICIAL: Willard Murray, Ph.D., P.E.
Project Technical Lead

(DFAR 252.227-7036)

SOUTHERN DIVISION ★ NAVAL FACILITIES ENGINEERING COMMAND ★

The engineering evaluations and professional opinions rendered in this planning document that describe the engineering evaluation for Potential Sources of Contamination 26 and 27, Naval Air Station, Jacksonville, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document is not intended to be used as a feasibility study for Operable Unit 1 or as a design document.

Willard A. Murray 9/18/97

Willard A. Murray, P.E.

Senior Consulting Engineer
Professional Engineer No. 021672
Expires December 31, 1998

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CPC	chemicals of potential concern
DDD	dichlorodiphenyldichloroethane
ERA	ecological risk assessment
FDEP	Florida Department of Environmental Protection
HHRA	human health risk assessment
HI	hazard index
IROD	Interim Record of Decision
LNAPL	light nonaqueous-phase liquid
MCL	maximum contaminant level
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
NPDES	National Pollutant Discharge Elimination System
OU	Operable Unit
PCBs	polychlorinated biphenyls
PSC	potential source of contamination
RAO	remedial action objective
RfD	reference dose
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SVOC	semivolatile organic compound
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 DECLARATION OF THE RECORD OF DECISION

1.1 SITE NAME AND LOCATION. The site name is Operable Unit (OU) 1, which comprises Potential Sources of Contamination (PSCs) 26 (the Old Main Registered Disposal Area) and 27 (the Former Transformer Storage Area) located at the Naval Air Station (NAS) Jacksonville in Jacksonville, Florida.

1.2 STATEMENT OF BASIS AND PURPOSE. This decision document presents the selected remedial action for OU 1, NAS Jacksonville. The selected action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP). The information supporting this remedial action decision is contained in the Administrative Record for this site, which is located at the Charles D. Webb Wesconnett Branch of the Jacksonville Public Library.

The twofold purpose of the remedial action for OU 1 is to contain and control the contamination at OU 1 and to reduce the risks posed by contaminants of concern (COCs) to acceptable levels within 30 years. The U.S. Environmental Protection Agency (USEPA) and the State of Florida concur with the selected remedy.

1.3 ASSESSMENT OF THE SITE. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in the Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY. The preferred remedial action for OU 1 is Alterative 3. Alternative 3 was developed and evaluated in the Remedial Investigation and Feasibility Study (RI/FS) for OU 1 (ABB Environmental Services, Inc. [ABB-ES], 1996a). This remedy is intended to address the principal threats and risks for OU 1. This remedy is the chosen final remedy for OU 1, and includes provisions for the continued operation of the first interim remedy, light nonaqueous-phase liquid (LNAPL) removal.

The major components of Alternative 3 are the following:

- collection of the LNAPL as described in the Interim Record of Decision (IROD) for the LNAPL source area (ABB-ES, 1994b);
- excavation of selected soils outside the landfill and selected sediments within the unnamed tributary and consolidating these spoils with the landfill soil and debris;
- installation of a cover (cap) system over the landfill soil and debris;
- natural attenuation of groundwater with contingent actions for enhanced bioremediation and tributary water collection; and

- groundwater and surface water monitoring, land-use restrictions, and 5-year reviews.

If concentrations of chemicals of concern in groundwater from monitoring wells adjacent the tributary exceed Florida surface water standards for two consecutive monitoring periods (quarters), one or more seepage meters will be installed (a device to collect groundwater as it directly enters surface water), and water samples will be collected and analyzed. If the concentrations of chemicals of concern in these samples still exceed Florida surface water standards, then an additional "contingent action," would be implemented:

- collection of surface water from the tributary with onsite treatment and discharge.

If, at the end of 5 years of operation of the original remedial action, it is determined that the chosen groundwater remediation technique (natural attenuation) will not achieve Federal and State maximum contaminant levels (MCLs) for COCs within 30 years, a second contingent action would be implemented:

- injection of carbon source and nutrients into the groundwater through a series of trenches to enhance natural biodegradation.

Implementing these remedial actions at OU 1 will reduce the current and future risks associated with contaminants present at the OU. The Navy estimates that these remedial actions will cost $4.2 million, which includes direct, indirect, and operation and maintenance costs ($7.3 million if both contingent actions are implemented). The estimated cleanup time is 30 years.

1.5 STATUTORY STATEMENT. This remedial action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements (ARARs), and is cost effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for the site and includes implementing the presumptive remedy for landfills and intrinsic bioremediation (i.e., natural attenuation) for groundwater.

Because this remedy will result in hazardous substances remaining onsite, a review will be conducted within 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

1.6 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY

Captain R.D. Whitmire Commanding Officer, NAS Jacksonville	23 Sept 97 Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION. NAS Jacksonville is located in Duval County, Florida, on the western bank of the St. Johns River (Figure 2-1). OU 1 is located in the southern part of the installation (Figure 2-2). The official mission of NAS Jacksonville is to provide facilities, service, and managerial support for the operation and maintenance of naval weapons and aircraft to operating forces of the U.S. Navy as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission include operation of fuel storage facilities, performance of aircraft maintenance, maintenance and operation of engine repair facilities and test cells for turbojet engines, and support of special weapons systems.

OU 1 comprises PSC 26, the Old Main Registered Disposal Area, and PSC 27, the Former Transformer Storage Area. Within the forested area south of OU 1, a tributary (referred to as the "unnamed tributary") flows approximately 2,500 feet south from OU 1 to the St. Johns River (Figure 2-3).

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES. OU 1 was used by NAS Jacksonville personnel for a variety of disposal purposes. Reportedly, the land at PSC 26 (approximately 40 acres) was used for disposal of discarded vehicles, household and sanitary waste, liquid industrial waste such as oil and solvents, and demolition and construction debris. Beginning in approximately 1940, materials were sometimes burned in open pits or trenches. Pits and trenches were then covered with soil. Between 1940 and 1950, low-level radioactive wastes (consisting of radium-226 and radium-228 paint waste and luminescent dials) were also disposed of at PSC 26. Disposal of liquid wastes continued until 1978, when LNAPL was discovered in the subsurface north of Child Street. PSC 26 was officially closed as a disposal area on January 15, 1979.

The land at PSC 27 (less than 1 acre) was used to store transformers during an unknown period of time. Reportedly, vandalism in 1978 caused transformer oil containing polychlorinated biphenyls (PCBs) to spill onto the ground surface. The amount of oil spilled was unknown. At that time, the Navy removed the transformers and PCB-contaminated soil and transported them off-site for disposal.

OU 1 has undergone several phases of investigations and remedial actions since 1973. Table 2-1 presents a summary of those activities.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION. The RI/FS Report for OU 1 and the Proposed Plan (ABB-ES, 1996a; 1996b) were completed and released to the public in March 1996 and July 1996, respectively. These documents, and other Installation Restoration program information, are available for the public's review in the Information Repository and Administrative Record. The repository is maintained at the Charles D. Webb Wesconnett Branch of the Jacksonville Public Library in Jacksonville, Florida. The notice of availability of these documents was published in The Florida Times Union in July 1996. This news release presented information on the proposed remedial action at OU 1 and solicited comments on the proposed cleanup.

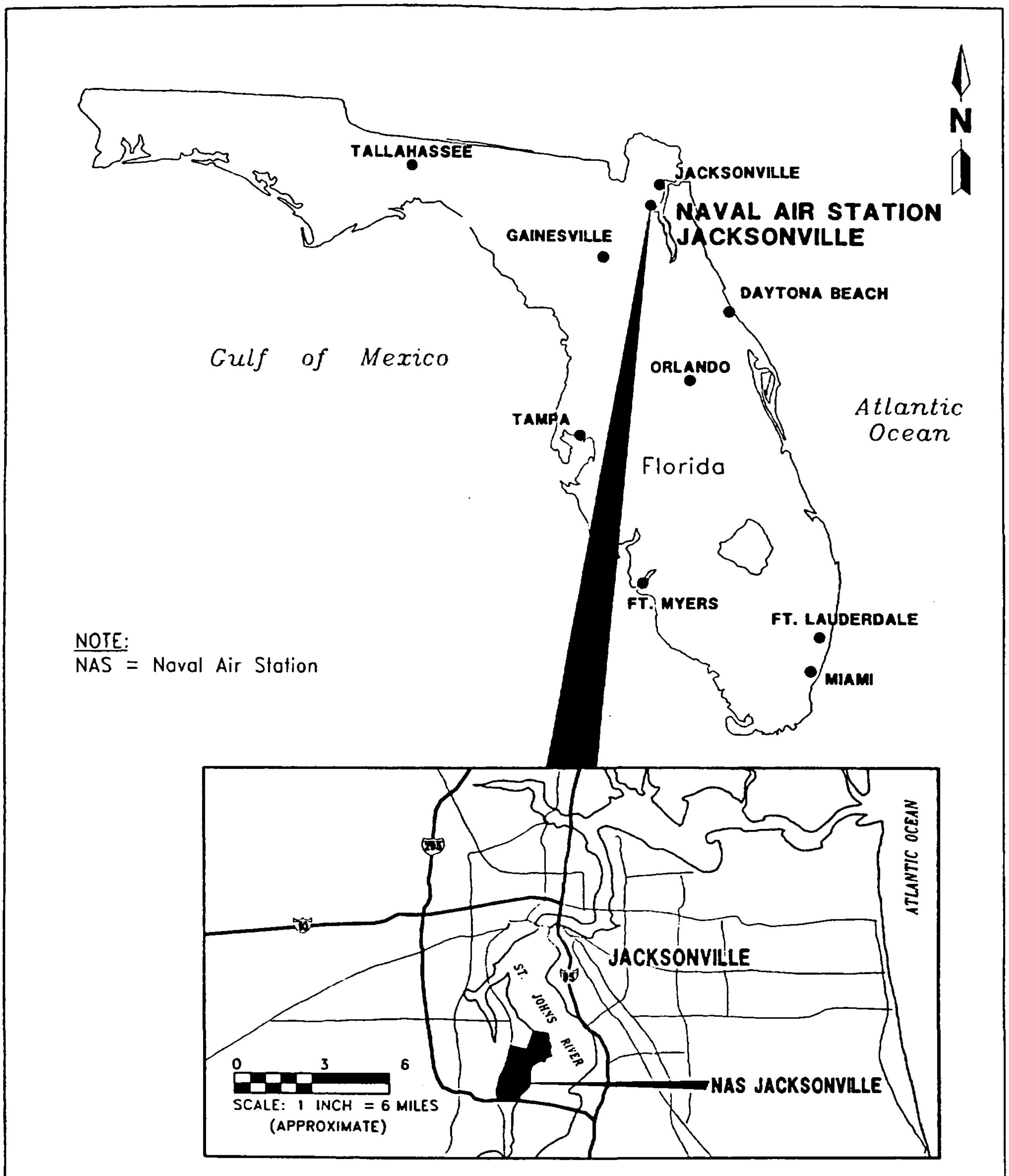

FIGURE 2-1
FACILITY LOCATION MAP

RECORD OF DECISION
OPERABLE UNIT 1

NAVAL AIR STATION
JACKSONVILLE, FLORIDA

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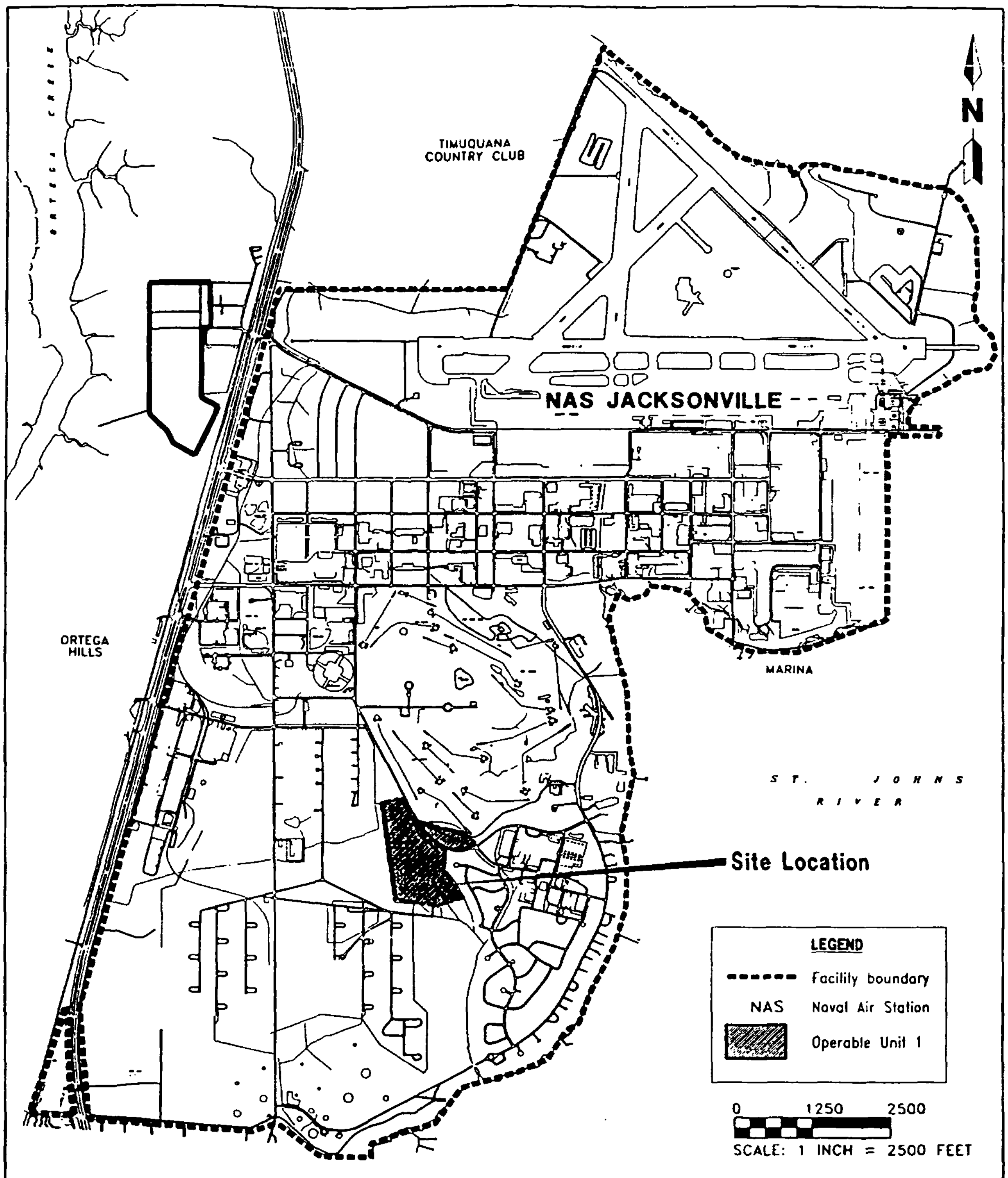

FIGURE 2-2
FACILITY MAP AND LOCATION OF OPERABLE UNIT 1

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RECORD OF DECISION
OPERABLE UNIT 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

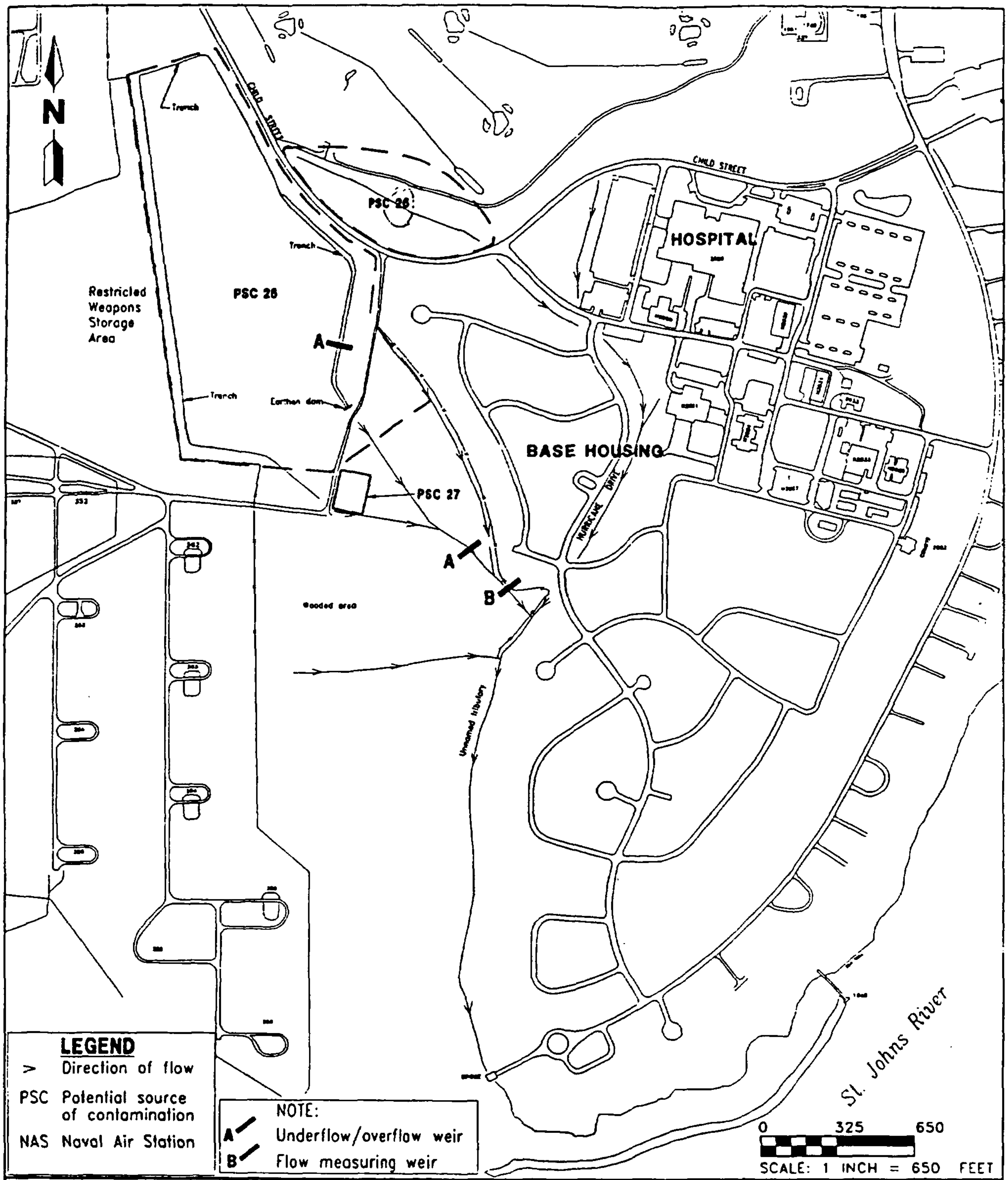

FIGURE 2-3
LOCATION OF OPERABLE UNIT 1 AREA
PSC 26 AND PSC 27

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RECORD OF DECISION
OPERABLE UNIT 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

Table 2-1
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Date	Investigation Title	Activities	Findings
1973	RASO Report of Technical Assistance Visit to NAS Jacksonville, Florida on 8-9 January, 20-22 February, and 19-30 November 1973	• Radiation survey conducted in February 1973, included sampling of soil and groundwater. • Remedial action completed in November 1973 that included removal of 501 barrels of glass vials and soil contaminated with low-level radioactive paint waste.	• A potential hazard to human health and the environment was determined in the radium paint waste disposal area. • Based upon the results of the final surveys, a radiological hazard no longer exists, and the area is acceptable for general use.
1979	Contamination of Soil and Groundwater from the Disposal of Volatile Products Into Pits at NAS Jacksonville, Florida (Navy)	• Twenty-one MWs at the solvent and oil pits were installed. • Water samples were analyzed. • Ten MWs in the base housing area were installed, sampled, and analyzed. • Groundwater pumping test was conducted. • Two underflow weirs were constructed in the drainage ditch adjacent to the disposal pits. • Surface water samples were collected downgradient of the pits. • Four soil samples were collected at PSC 27.	• Analytical results shared methyl-ethyl-ketone, trichloroethene, methyl-isobutyl-ketone, and xylenes in groundwater sampled. • PCBs were detected in one well, located downgradient of PSC 27. • Free-phase hydrocarbons were encountered in the vadose zone soil and on the groundwater table in the northeast part of PSC 26. • Dissolved oil and VOCs were detected in the surface water. • PCBs were detected in two of the four samples.
1983	Remedial Design/Remedial Action (Fred Wilson and Associates)	• A ditch system was constructed with underflow weirs. • Exfiltration gallery was constructed to increase hydraulic gradient. • Three primary disposal pits were excavated and spread across the landfill surface. • Excavated ditch material was blended with dry sandy fill and spread across landfill surface. • Surface water discharge permits issued by USEPA (NPDES, 1983) and FDER (1984).	• While the remediation system demonstrated some effectiveness in removing floating oil, the system failed to meet the effluent limitation of the permits. • The Navy suspended the operations in April 1984.
1986	Monitoring Well Installation (Geraghty & Miller, 1984)	• Two deep surficial MWs were installed at the Oil and Solvent Disposal Pits Area to determine if contaminants in the shallow groundwater were migrating to the deeper zones.	• Trace levels of VOCs and base neutral compounds were detected.
1990	Site Visit (Geraghty & Miller, 1990)	• A site visit consisting of visual observations was made.	• Soil and surface water contamination was visible in some areas of the drainage canals. • Seeping oil was observed along some banks.

See notes at end of table.

Table 2-1 (Continued)
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Date	Investigation Title	Activities	Findings
1990	Cone Penetrometer Study of the Oil and Solvent Pits (Geotechnical Laboratory U.S. Army Engineer Waterways Experiment Station, 1991)	• Thirty-four CPT explorations were conducted in the first test area (oil pits). • Twelve explorations were conducted in the second test area (solvent pits).	• The results of the CPT explorations in the oil pit area provided a qualitative estimate of the extent of oil contamination. • Testing in the solvent areas was inconclusive. • The CPT data confirmed a deep, hard layer (thought to be a confining layer) that ranges from less than 20 to more than 55 feet deep.
1991	Soil sampling event of 1991 (Geraghty & Miller)	• Forty-nine locations across OU 1 were sampled for soil; samples were collected at the surface (0-3 inches) and subsurface (4-24 inches) at each location. • The shallow samples were analyzed for metals, TOC, BNAs, and radioactive parameters. • The deeper samples were analyzed for the same parameters plus VOCs. • Twenty of the shallow samples were also analyzed for PCBs. Additional subsurface samples were collected from just above the water table and analyzed for VOCs, BNAs, metals, TOC, radioactive parameters, and TRPH. • A surface radiological survey of the area was conducted.	• The soil (shallow and deep) is contaminated with VOCs, BNAs, and metals throughout OU 1 (with the highest levels detected in the northeastern half of OU 1). • PCBs were detected in all surface soil samples analyzed for PCBs. • The radiological survey detected elevated levels of gross alpha, gross beta, radium-226 and radium-228 at selected locations, especially within a 300-square-foot area on the north-central portion of OU 1.

See notes at end of table.

Table 2-1 (Continued)
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Date	Investigation Title	Activities	Findings
1991	Preliminary Characterization Summary Report Operable Unit 1 Naval Installation Restoration Program NAS Jacksonville, Florida (ABB-ES, 1992)	RI-Round 1 Activities • Geophysical survey conducted to determine deep hard (confining) layer. • Soil gas survey consisting of 11 permanent and 49 temporary locations (primarily in the base housing area). • Ambient air monitoring program conducted for 4 consecutive days and samples were analyzed for TSS, TAL inorganics, BNAs, PCBs, and VOCs. • Thirty-two surface water and sediment samples were collected in and around OU 1, downgradient of OU 1, and in the St. Johns River. • A total of 159 soil samples was collected from 118 locations at OU 1, 118 samples were collected from 0 to 3 inches bls, and the remaining 46 samples were collected from multiple depths ranging from 1 to 12 feet bls. • Eight piezometers were installed at paired locations along the perimeter ditch system. • Twenty shallow (13 to 17 feet deep) and 14 deep (24 to 48 feet deep) surficial MWs were installed. • Five MWs were installed in the Hawthorn Formation (125 to 130 feet deep). • Groundwater was sampled from all newly installed wells and analyzed for TCL VOCs, BNAs, PCBs and pesticides, TAL inorganics with cyanide, dissolved metals, and radionuclides (gross alpha and beta, radium-226 and radium-228). • Horizontal location and elevation survey of all exploration, installation, and sampling locations was conducted. • Water levels were measured and hydraulic conductivity tests performed on all MWs. • Ecological inventory was conducted to characterize the major terrestrial and aquatic communities.	• Geophysical results were inconclusive in terms of identifying a widespread confining (hard) layer. • Target analytes were not detected above the quantitation limit for any soil gas samples. • Ambient air sample analysis detected the presence of SVOCs, PCBs, and TAL inorganics; VOC sampling was incomplete. • VOCs were detected in some surface water; SVOCs were detected in some sediments; and PCBs, TAL inorganics, and radionuclides were detected in both surface water and sediment samples. • Soil sample analysis detected VOCs, SVOCs, PCBs, pesticides, TAL inorganics, dioxins and furans, and radionuclides. • Groundwater analysis detected VOCs, SVOCs, TAL inorganics, pesticides, and radionuclides in the surficial aquifer (i.e., 3 to 48 feet deep). No contaminants were detected in the Hawthorn Formation wells. • Diverse and productive upland and wetland ecological communities exist at OU 1; some macroinvertebrate communities in the OU 1 wetlands appear to be moderately degraded.

See notes at end of table.

Table 2-1 (Continued)
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Date	Investigation Title	Activities	Findings
1993	Focused Remedial Investigation/Focused Feasibility Study for LNAPL Removal, Operable Unit 1, NAS Jacksonville, Florida (ABB-ES 1993); TM for Preferred Remedial Alternative for Light Nonaqueous-Phase Liquid Removal, Operable Unit 1, NAS Jacksonville, Florida, June 1993; and Proposed Plan and Interim Record of Decision Light Nonaqueous-Phase Liquid Source Area, Operable Unit 1 (ABB-ES, 1994)	• Water-level and LNAPL thickness measurements were made in the two existing monitoring wells. • Bail-down tests were performed on MW 9 and MW 13 to estimate the true thickness of the LNAPL. • LNAPL samples were collected from these same two wells for design parameter analysis (specific gravity, kinematic viscosity, flammability, total chlorine, and heat of combustion). • A total of 114 soil and 44 groundwater samples was collected from 32 locations for onsite TPH analysis. • Twenty soil and 11 groundwater samples were selected for off-site confirmatory analysis and engineering parameters. • Nine temporary monitoring wells were installed to confirm the presence and measure thicknesses of the LNAPL.	• Bail-down tests in MW 9 and MW 13 indicate LNAPL thicknesses of 0.79 and 0.62 foot, respectively. • Past and present analyses of the LNAPL indicate that it is a high-viscosity weathered petroleum waste with elevated PCB content. • TPH concentrations in soil were as high as 68,500 mg/kg and in groundwater as high as 493 mg/ℓ. • All nine temporary observation wells contained measurable thicknesses of LNAPL within 36 hours of installation. • Remedial alternatives for LNAPL reduction were developed and analyzed. • A comparative analysis of alternatives was completed. • The Interim Record of Decision, signed on August 11, 1994, recommended Alternative 3: construction and operation of a passive recovery system (consisting of two trenches and one sump) for LNAPL, recovery and off-site treatment and disposal of LNAPL, and temporary onsite stockpiling of soil excavated during construction.
1994	Interim Remedial Action Workplan, Operable Unit 1, NAS Jacksonville, Florida (Ebasco Environmental, 1994)	This remedial action was initiated in February 1995 and is ongoing. The remedial action objective is to remove free-product LNAPL from the aquifer to the extent practicable. The proposed LNAPL recovery system consists of two linear recovery trenches filled with gravel or stone and one large diameter sump. The recovery system can be operated both as a passive gravity collection system and as an active system by lowering the groundwater level to increase flow and collection of the LNAPL.	The remedial action to remove LNAPL will be monitored and managed as part of the overall remedial actions for OU 1.

See notes at end of table.

Table 2-1 (Continued)
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Date	Investigation Title	Activities	Findings
1995	Remedial Investigation OU 1, Navy Installation Restoration Program, NAS Jacksonville, Florida (ABB-ES, this report)	RI Round 2 Activities • Geophysical surveys consisting of electromagnetic and terrain conductivity methods were utilized, in part, to locate buried drums. • A total of 24 SW/SD samples collected around OU 1 and 5 basewide background locations was analyzed for TCL VOCs, SVOCs, PCBs and pesticides, TAL inorganics with cyanide, dissolved metals, TPH, and gamma scan radiological parameters. • Six of the original 24 SW/SD sample locations were resampled and analyzed for radiological parameters, TOC, and dioxin. • One supplemental SW/SD sample and two sediment samples were collected and analyzed for TAL metals. • DPT sampling at 105 locations (182 groundwater samples and 2 soil samples) was conducted. • Field GC screening (VOCs only) of 167 DPT samples was conducted. • A total of 33 contamination delineation MWs, based on the DPT screening results, was installed. • A total of 55 background and water quality and flow modelling MWs was installed (6 Hawthorn Formation, 17 deep surficial, and 32 shallow surficial MWs). • Groundwater samples from all newly installed MWs and selected soil samples from the borings were collected and analyzed for TCL VOCs, SVOCs, PCBs and pesticides, TAL inorganics with cyanide, dissolved metals, TPH, and gamma radiological parameters. • A second groundwater sampling event, for VOCs only, was conducted at all contamination delineation MWs, all Round 1 shallow and deep surficial aquifer wells (except those with free product) and water quality and flow modelling wells MW-58, 59, 61, and 67. • Horizontal location and elevation survey of all exploration, installation, and sampling locations. • Water levels measured and hydraulic conductivity testing conducted on all newly installed MWs. • Completion of an ecological inventory and aquatic biocharacterization in habitat areas outside of the OU 1 boundaries.	• Geophysical results indicate magnetic disturbance virtually throughout the survey areas, with two anomalous (more prominent) areas. Terrain conductivity indicates similar anomalous areas. Ground-penetrating radar was attempted, but the results were inconclusive due to limited penetration in the landfill material. • Analytical results of the surface water sediment sampling indicates positive detections of TCL VOCs, SVOCs, PCBs and pesticides, TAL inorganics in the sediments, and VOCs, SVOCs and TAL inorganics in the surface water. • Analytical results of the DPT groundwater samples indicate positive detection of VOCs in 26 of the 167 samples (i.e., 22 of the 90 locations). • Analytical results of the groundwater samples collected from the background and water quality and flow modelling wells indicate limited occurrence and lower detection levels of TCL VOCs, SVOCs, and PCBs and pesticides; TAL inorganics were also detected. • Analytical results from the 33 contamination delineation MWs indicate positive detections of VOCs at 8 locations and TAL inorganics at all locations. • Analytical results of the second groundwater sampling event indicate positive detections at 26 of the 67 wells sampled.

See notes at end of table.

Table 2-1 (Continued)
Operable Unit 1 Investigative History

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Notes: PSC = potential source of concern.
OU = operable unit.
NAS = Naval Air Station.
RASO = Radiological Affairs Support Office.
MW = monitoring well.
PCBs =polychlorinated biphenyls .
VOC = volatile organic compound.
USEPA = U.S. Environmental Protection Agency.
NPDES = National Pollutant Discharge Elimination System.
FDER = Florida Department of Environmental Regulation (now the Florida Department of Environmental Protection).
CPT = cone penetrometer testing.
TOC = total organic carbon.
BNA = base, neutral, and acid.
ABB-ES = ABB Environmental Services, Inc.
VOA = volatile organic aromatic.
bls = below land surface.
TSS = total suspended solids.
TAL = target analyte list.
SVOC = semivolatile organic compound.
LNAPL = light nonaqueous-phase liquid.
TPH = total petroleum hydrocarbons.
SW/SD = surface water and sediment.
TCL = target compound list.
mg/kg = milligrams per kilogram.
mg/ℓ = milligrams per liter.
GC = gas chromatograph.
RI = Remedial Investigation.

A public comment period was held from July 29, 1996, to September 7, 1996, to solicit comments on the Proposed Plan. In addition, a public meeting was held on August 6, 1996. Representatives from NAS Jacksonville, USEPA, and the Florida Department of Environmental Protection (FDEP), plus the Navy's environmental consultants, presented information on the remedial alternatives evaluated in the RI/FS and answered questions regarding the proposed remedial action at OU 1. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is in Appendix A of this ROD.

2.4 SCOPE AND ROLE OF REMEDIAL ACTION. Investigations at OU 1 indicated the presence of contamination that may pose an unacceptable risk to human and ecological receptors. Therefore, the purpose of the remedial action for OU 1 is to contain and control the contamination at OU 1 while reducing current and future risks posed by COCs to acceptable levels within a 30-year time period.

Based on previous investigations, remedial action objectives (RAOs) and chemical-specific action levels were identified considering both regulatory-based and risk-based criteria. This included the consideration of ARARs, as well as human health and ecological risks. The action levels were developed for COCs so that acceptable exposure levels for both human health and ecological receptors (using the USEPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$) can be achieved. In addition, FDEP's risk target of $1x10^{-6}$ or less was considered. The RAOs identified for OU 1 are presented in Table 2-2.

The only identified ARARs for this site are the State and Federal MCLs (set forth in Table 2-12). Because ARARs are legally enforceable standards, they must be met by the selected remedy for all identified COCs (these COCs are also listed in Table 2-12).

2.5 THE PRESUMPTIVE REMEDY FOR LANDFILLS. The intent of the presumptive remedy for landfills, discussed in "Presumptive Remedy for CERCLA Municipal Landfill Sites" and "Application of CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (Interim Guidance)" (USEPA, 1993; 1996), was integrated into the RI/FS process for OU 1. For CERCLA landfills that contain large volumes of heterogeneous mixtures of municipal and industrial or hazardous waste, the presumptive remedy is containment, including a cover system. For the landfill at OU 1, implementing a containment technology, including a landfill cover (cap), source control, and institutional controls, was determined to be the minimum acceptable action for the site. Consequently, full characterization of the media and exposure pathways that would be addressed by the presumptive remedy (i.e., the landfill soil and debris) was not necessary. The presumptive remedy was not intended to address exposure pathways for media outside the landfill.

2.6 SUMMARY OF SITE CONTAMINATION. The most recent field investigation was divided into two phases. The goal of the field investigation was to collect data to determine the nature and extent of releases of site-derived contaminants; identify potential pathways of migration via the vadose zone, soil, sediment, surface water, and groundwater; and evaluate risks to human and ecological receptors. In addition, the field investigation was intended to identify source areas for interim removal actions. Data were also gathered from background locations to evaluate basewide background chemical concentrations.

Table 2-2
Remedial Action Objectives for OU 1

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Medium	Contaminants Causing Unacceptable Risk	Remedial Action Objectives
Landfill soil and debris	PCBs Inorganics Radionuclides	Reduce exposure to contaminants in the landfill. Prevent contaminants on the surface of the landfill from washing off the site. Control leachate generation from the additional material placed on the landfill.
LNAPL in the vadose zone	Presence of LNAPL (containing PCBs and PAHs)	Remove LNAPL if greater than 0.1 inch from the water table.
Soil outside landfill	SVOCs PCBs Inorganics	Reduce human and ecological exposure to contaminants in the soil. Reduce the potential for humans or ecological receptors to swallow contaminants in the soil.
Groundwater	Low-level VOCs	Reduce the potential for humans to ingest or breathe in contaminants found in the groundwater.
Surface water in unnamed tributary	None	Reduce the potential for humans and ecological receptors to come in contact with contaminants in the surface water that are the result of contamination in the sediment and groundwater.
Sediment in unnamed tributary	Pesticides PCBs Inorganics	Reduce human and ecological exposure to contaminants in the sediment. Reduce the potential for human or ecological receptors to swallow contaminants in the sediment.

Notes: OU = operable unit.
PSC = potential source of contamination.
PCB = polychlorinated biphenyl.
LNAPL = light nonaqueous-phase liquid.
PAH = polynuclear aromatic hydrocarbon.
SVOC = semivolatile organic compound.
VOC = volatile organic compound.

2.6.1 Background The background sampling program established concentrations of inorganics and radiological activity naturally present in basewide surface soil, subsurface soil, sediment, surface water, and groundwater. Organic compounds present in these media as a result of human activity and not related to OU 1 were identified. Results of the background sampling program indicated detectable concentrations of various inorganic analytes in all media and the presence of low levels of polyaromatic hydrocarbons and formerly used pesticides in background surface soil.

2.6.2 Soil Gas Survey The soil gas survey was conducted to evaluate the potential that volatile organic compounds (VOCs) have migrated, via soil gas, to areas that could have an adverse impact on residents in base housing, located east and south of OU 1. In addition, the soil gas survey was intended to identity potential LNAPL source areas. The results of the study indicated that volatile contaminants were not detected at the base housing area.

2.6.3 Surface Water and Sediment The purpose of the surface water and sediment sampling event was to assess whether or not the contaminants had migrated from OU 1 via drainage features connected in the past or present at the site. VOCs were detected in some surface water samples but not in sediment samples. Semi-volatile organic compounds (SVOCs) and pesticides were detected in some of the sediment samples but not in surface water samples. PCBs and inorganics including radionuclides were detected in both sediment and surface water samples, but at background levels.

Additional samples collected during Round 2 of the field investigation indicated that contamination in the surface water is not extensive and that surface water appears to be acting only as a transport medium for contaminants found in groundwater and sediment. Several organic compounds (including volatile and semivolatile organics), pesticides, PCBs, and inorganics were detected in various areas sampled. Low levels of vinyl chloride were detected at one location, which appears to be from groundwater discharge there. Additional surface water samples collected to support the feasibility study indicated there was no significant change in surface water quality conditions.

Volatile and semivolatile organics, pesticides and PCBs, dioxins and furans, radionuclides, and inorganics were detected in several sediment samples collected during Round 2. The VOC detections appear to be predominately around the perimeter ditch. PCBs appear to be widespread in the sediment samples, especially in samples from the perimeter ditch system, which may have been a result of transport from the landfill area of suspended particulate contaminated with PCBs. The inorganic compounds (including radionuclides) detected in the sediment were widespread. However, the inorganics could not be directly attributed to the landfill and were within natural background levels associated with the base as a whole.

2.6.4 Soils Soil sampling was conducted to determine the horizontal and vertical extent of contamination in the soil outside the landfill and to assess whether or not site soil could potentially serve as an exposure pathway to human or ecological receptors. Soil sampling conducted within the landfill was not intended to fully characterize the contamination therein, but was to support the design of the cover (cap) system proposed by the presumptive remedy. The contaminants detected in the soil samples consist of VOCs, SVOCs, pesticides, PCBs, dioxins and furans, and radionuclides. The highest concentration of soil contaminants was detected within the landfill in the vicinity of the former solvent and oil disposal pits.

Based on a comparison of concentrations found at OU 1 with those established in the background sampling program, it was deduced that most of the inorganic and radiological concentrations are at or below background levels and are not due to activities at OU 1 specifically. The concentrations detected are more likely associated with basewide and/or regional issues. Furthermore, while some of the inorganic parameters detected at OU 1 were above background, none were above regulatory or guidance levels.

2.6.5 Groundwater The purpose of the groundwater sampling was to determine current groundwater quality and support a preliminary assessment of groundwater as an exposure pathway to human or ecological receptors. Samples collected from monitoring wells installed in the surficial aquifer system (10 to 40 feet below land surface) contained concentrations of VOCs, SVOCs, pesticides, and inorganics, including radionuclides (only VOCs and SVOCs were retained as potential risk contributors). Free-phase hydrocarbons (LNAPL), which contain PCBs, were also detected in monitoring wells located near the former waste oil disposal pits. The LNAPL was further addressed in a Focused RI/FS report for the LNAPL source area (ABB-ES, 1994a).

Groundwater analytical results indicate the presence of a groundwater plume of dissolved VOC contamination (chlorinated solvents and fuel constituents) underlying the landfill area and to the east under portions of the golf course and base housing area. The direction of contaminant migration appears to be eastward toward the unnamed tributary that discharges to the St. Johns River. The groundwater from the area around the waste oil disposal pits and the LNAPL area northeast of Child Street contains both petroleum hydrocarbons and chlorinated solvents. Groundwater from the southern end of the main landfill area south of Child Street primarily contains chlorinated solvents.

Based on a comparison of concentrations found at OU 1 with those established in the background sampling program, it was deduced that most of the inorganic and radiological concentrations are at or below background levels and are not due to activities at OU 1 specifically. The concentrations detected are more likely associated with basewide and/or regional issues. Furthermore, while some of the inorganic parameters detected at OU 1 were above background, none were above regulatory or guidance levels.

2.6.6 LNAPL Source Area This area was not specifically addressed during the remedial investigation (RI), but was evaluated in a focused remedial investigation in March and April of 1993. The results of this focused investigation indicated an estimated 5,900 to 10,200 gallons of LNAPL was present north of Child Street. Laboratory analysis indicated the LNAPL was a viscous, weathered petroleum product with a PCB content greater than 50 milligrams per kilogram.

LNAPL removal is currently underway as part of the interim removal action (IRA) described in the IROD for the LNAPL source area (ABB-ES, 1994b). Until the interim RAOs are met, the activities described in the IROD will continue in parallel with the remaining remedial actions for OU 1 described in this ROD, thus enabling the overall site RAOs to be met.

2.6.7 Ecological Inventory An ecological inventory to characterize the major terrestrial and aquatic ecological communities was conducted at, and in the vicinity of, OU 1. These data were used to assess potential and probable pathways by which biological receptors would be exposed to media containing site-related contaminants and to note readily apparent evidence of stress on biological receptors at OU 1. The ecological resources at or near OU 1 have been adversely affected by past disposal operations.

2.6.8 Migration Pathways The migration pathways of concern at OU 1 are groundwater and surface water. The migration of contaminants from OU 1 in groundwater appears to be limited primarily to VOCs, although there is some limited migration of SVOCs. These organics originate from two major areas: within the main landfill area, south of Child Street and the LNAPL area, north of Child Street. Each of these source areas has produced a VOC plume, and both VOC plumes have migrated away from their respective source areas and are about halfway to their primary discharge point, the unnamed tributary. The unnamed tributary system entirely captures both identified groundwater plumes migrating from OU 1.

2.7 SUMMARY OF SITE RISKS. CERCLA directs the Navy to conduct a risk assessment to determine whether or not the site poses a current or future threat to human health and the environment in the absence of any remedial action. Both a human health risk assessment (HHRA) and ecological risk assessment (ERA) were performed for OU 1. The risk assessments evaluated the contaminants detected in site media during the RI and provided the basis for selecting the remedial alternatives.

2.7.1 HHRA An HHRA was conducted to characterize the risks associated with potential exposures to site-related contaminants at OU 1 for human receptors. The HHRA is provided as Chapter 6.0 of the RI/FS report (ABB-ES, 1996a), and supporting documentation is provided in Appendix R of that report.

Four components of the HHRA were completed: (1) selection of human health chemicals of potential concern (CPCs), (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization.

Human Health CPCs. Table 2-3 summarizes the human health CPCs selected for surface soil, surface water, sediment, and groundwater evaluation at OU 1. These chemicals are the focus of the baseline risk assessment.

Exposure Assessment. OU 1 was evaluated to identify the populations that might come into contact with site-related chemicals and the pathways through which exposure might occur. OU 1 was investigated and will be remediated in a manner consistent with a presumptive remedy for landfills. The presumptive remedy includes containment and/or control of migration of chemicals from the landfill, and also prevents exposure to surface soil and groundwater within the landfill via capping and institutional controls regarding the use of the property. Therefore, the baseline risk assessment evaluated risks associated with potential exposures to compounds that have already migrated from the landfill into the surrounding environment.

There are five potential media that may be sources of human exposure: surface soil (area north of Child Street and area south of Child Street), subsurface soil (north of Child Street), surface water, sediment, and groundwater. Under current

Table 2-3
Summary of Human Health Chemicals of Potential Concern (HHCPCs)

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Environmental Medium	HHCPCs	
Surface Soil	**Inorganics**:	antimony, arsenic, cadmium, chromium, cobalt, lead, manganese, nickel.
	Organics:	benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, 4,4-DDD, 4,4-DDT, Aroclor-1254, Aroclor-1260, alpha-chlordane, gamma-chlordane, 1,2,3,4,6,7,8-HpCDF, HpCDF's (total), HxCDF's (total), OCDF, 1,2,3,4,6,7,8-HpCDD, HpCDD's (total), OCDD
	Radioisotopes:	gross alpha, gross beta
Subsurface Soil	**Inorganics**:	aluminum, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, vanadium, zinc
	Organics:	1,2-dichloroethane, benzene, chlorobenzene, chloroform, ethylbenzene, tetrachloroethene, toluene, trichloroethene, xylenes, 2-methylnaphthalene, acenaphthene, dibenzofuran, fluoranthene, naphthalene, phenanthrene, pyrene
	Radioisotopes:	gross alpha, gross beta
Surface Water	**Inorganics**:	aluminum, antimony, arsenic, beryllium, cadmium, cobalt, iron, manganese, sodium
	Organics:	1,2-dichloroethene, benzene, trichloroethene, vinyl chloride
	Radioisotopes:	actinium-228, gross alpha, gross beta, lead-214, radium-226, radium-228, thallium-208
Sediment	**Inorganics**:	arsenic, beryllium, chromium, manganese, mercury, thallium
	Organics:	benzo(a)anthracene, benzo(a)pyrene, benzo(h)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, Aroclor-1248, Aroclor-1260, 1,2,3,4,6,7,8-HpCDD, OCDD, 2,3,7,8-TCDF, OCDF
	Radioisotopes:	bismuth-214, cesium-137, gross alpha, gross beta, lead-212, lead-214, potassium-40, radium-226, radium-228, thallium 208, uranium-235
Groundwater	**Inorganics**:	aluminum, arsenic, barium, beryllium, chromium, cobalt, iron, lead, nickel, thallium, vanadium
	Organics:	1,1-dichloroethane, 1,2 dichloroethane 1,2 dichloroethene, total benzene, carbon disulfide, ethylbenzene, trichloroethane, vinyl chloride, 2-methylnaphthalene, 2-methylphenol, 4-methylphenol, acenaphthene carbazole, dibenzofuran, naphthalene, phenanthrene, phenol, bis(2-ethylhexyl) phthalate
	Radioisotopes:	bismuth-214, gross alpha, gross beta, radium-223, radium-226, radium-228, thorium-232

Notes: PSC = potential source of contamination.
OU = operable unit.
DDD = dichlorodiphenyldichloroethane.
DDT = dichlorodiphenyltrichloroethane.
HpCDF = heptachlorodibenzo-p-furan.
HxCDF = hexachlorodibenzofuran.
OCDF = octachlorodibenzofuran.
HpCDD = heptachlorodibenzo-p-dioxin.
OCDD = octachlorodibenzodioxin.
TCDF = tetrachlorodibenzo-p-furan.

land use, there is no exposure to groundwater or subsurface soil. For future land use, it is assumed all five media are potential sources of exposure.

For the current land use, a neighborhood child is presumed to be potentially exposed via (1) incidental ingestion and dermal contact to surface water and sediment and via (2) incidental ingestion, dermal contact, and inhalation (of dust) for surface soil. For future land use, residents are presumed to be potentially exposed via (1) incidental ingestion and dermal contact to surface water and sediment; (2) incidental ingestion, dermal contact, and inhalation (of dust) for surface soil; and (3) ingestion and inhalation (of volatiles) associated with drinking water.

Toxicity Assessment. The toxicity assessment is a 2-step process whereby the potential hazards associated with the route-specific exposure to a given chemical are (1) identified by reviewing relevant human and animal studies, and (2) quantified through analysis of dose-response relationships. USEPA has calculated numerous toxicity values that have undergone extensive review within the scientific community. These values (published in IRIS and other journals) are used in the baseline evaluation to calculate both carcinogenic and non-carcinogenic risks associated with each CPC and rate of exposure.

Risk Characterization. In the final step of the risk assessment, the results of the exposure and toxicity assessments are combined to estimate the overall risk from exposure to site contamination.

For cancer-causing chemicals, risk is estimated to be a probability. For example, a particular exposure to chemicals at a site may present a 1 in 10,000 (or $1x10^{-4}$) chance of developing cancer over an estimated lifetime of 70 years. For noncancer-causing chemicals, the dose of a chemical for which a receptor may be exposed is estimated, and compared to the reference dose (RfD). The RfD is developed by USEPA scientists, and represents an estimate of the amount of a chemical a person (including the most sensitive persons) could be exposed to over a lifetime, without developing adverse effects. The measure of the likelihood of adverse effects other than cancer occurring in humans is called the hazard index (HI). An HI greater than 1 suggests that adverse effects are possible.

For OU 1, potential risks were identified for some exposure scenarios. Table 2-4 provides a summary of the predicted risks for the various exposure scenarios.

All site-related cancer and noncancer risks for current land use are consistent with USEPA guidelines, established in the NCP, that indicate that the excess lifetime cancer risk due to exposure to HHCPCs at the site, by each complete exposure pathway, should not exceed a range of $1x10^{-4}$ to $1x10^{-6}$ or an HI of 1. There are, however, several parameters that have associated cancer risks that are greater than $1x10^{-6}$, which is a level of concern as stated by FDEP.

Site-related cancer and noncancer risks in surface water, surface soil north of Child Street, and sediment under future residential land use assumptions are consistent with acceptable risk as described by the USEPA. Cancer risks associated with chlorinated solvents and future use of groundwater as drinking water are sufficiently high to indicate the need to prevent drinking water use in the area of the plume. Cancer and noncancer risks associated with future residential use of areas not addressed by the presumptive remedy are slightly above the generally acceptable range. These risks are predominately due to PCBs

Table 2-4
Summary of Predicted Risks for Various Exposure Scenarios

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Land Use	Exposure Route	HI	ELCR
<u>**Current Land Use**</u>			
Surface soil:			
North of Child Street	Child transient:		
	Incidental ingestion	0.02	7×10^{-7}
	Dermal contact	0.1	1×10^{-6}
	Inhalation of particulates	ND	5×10^{-9}
	Total child transient:	**0.1**	$\mathbf{2 \times 10^{-6}}$
South of Child Street			
	Child transient:		
	Incidental ingestion	0.1	3×10^{-6}
	Dermal contact	0.6	1×10^{-5}
	Inhalation of particulates	ND	2×10^{-7}
	Total child transient:	**0.7**	$\mathbf{1 \times 10^{-5}}$
Surface water:	Child transient (wader):		
	Incidental ingestion	0.1	4×10^{-6}
	Dermal contact	0.6	5×10^{-6}
	Total child transient:	**0.7**	$\mathbf{8 \times 10^{-6}}$
Sediment:	Child transient (wader):		
	Incidental ingestion	0.07	2×10^{-6}
	Dermal contact	0.3	1×10^{-5}
	Total child transient	**0.4**	$\mathbf{2 \times 10^{-5}}$
<u>**Future Land Use**</u>			
Surface soil:			
North of Child Street	Adult resident:		
	Incidental ingestion	0.08	6×10^{-6}
	Dermal contact	0.3	8×10^{-6}
	Inhalation of particulates	ND	9×10^{-8}
	Total adult resident:	**0.4**	$\mathbf{1 \times 10^{-5}}$

See notes at end of table.

Table 2-4 (Continued)
Summary of Predicted Risks for Various Exposure Scenarios

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Land Use	Exposure Route	HI	ELCR
Future Land Use (Continued)			
	Child Resident:		
	Incidental ingestion	0.7	1×10^{-5}
	Dermal contact	0.5	3×10^{-6}
	Inhalation of particulates	ND	1×10^{-7}
	Total child resident:	**1.2**	**1×10^{-5}**
	Total resident:	**NC**	**2×10^{-5}**
South of Child Street	Adult resident:		
	Incidental ingestion	0.4	3×10^{-5}
	dermal contact	2.0	7×10^{-5}
	Inhalation of particulates	ND	4×10^{-6}
	Total adult resident:	**2.0**	**1×10^{-4}**
	Child resident:		
	Incidental ingestion	4.0	6×10^{-5}
	Dermal contact	2.0	3×10^{-5}
	Inhalation of particulates	NC	5×10^{-6}
	Total child resident:	**6.0**	**1×10^{-4}**
	Total resident:	**NC**	**2×10^{-4}**
Subsurface soil:			
North of Child Street	Excavation worker:		
	Incidental ingestion	0.002	7×10^{-11}
	Dermal contact	0.003	4×10^{-11}
	Inhalation of particulates	1.1	1×10^{-7}
	Total excavation worker:	**1.1**	**1×10^{-7}**
Surface water:	Adult resident (wader):		
	Incidental ingestion	0.08	5×10^{-6}
	Dermal contact	0.6	9×10^{-6}
	Total adult resident	**0.7**	**1×10^{-5}**
	Child resident (wader):		
	Incidental ingestion	0.4	5×10^{-6}
	Dermal contact	0.9	4×10^{-6}
	Total child resident:	**1.3**	**9×10^{-6}**
	Total resident:	**NC**	**2×10^{-5}**
Sediment:	Adult resident (wader):		
	Incidental ingestion	0.08	6×10^{-6}
	Dermal contact	0.08	8×10^{-6}
	Total adult resident:	**0.16**	**1×10^{-5}**

See notes at end of table.

Table 2-4 (Continued)
Summary of Predicted Risks for Various Exposure Scenarios

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Land Use	Exposure Route	HI	ELCR
Future Land Use (continued)			
	Child resident (wader):		
	Incidental ingestion	0.7	1×10^{-5}
	Dermal contact	0.4	9×10^{-6}
	Total child resident:	**1.1**	**2×10^{-5}**
	Total resident:	**NC**	**3×10^{-5}**
Groundwater:	Adult resident:		
	Ingestion drinking water	20	1×10^{-3}
	Inhalation (shower)	0.03	6×10^{-5}
	Total adult resident:	**20**	**1×10^{-3}**

Notes: PSC = potential source of contamination.
OU = operable unit.
ELCR = excess lifetime cancer risk.
HI = hazard index.
ND = no toxicity values available for calculation.
NC = not calculated because child and adult hazard indices are not additive.

in soil in areas south of Child Street. There is at least one chemical in each medium that has associated cancer risk greater than $1x10^{-6}$.

Calculated risks associated with potential exposure to radionuclides in surface water, sediment, and groundwater are consistent with risks at background sampling locations, and are therefore not considered site-related. No radiological risks have been calculated for surface and subsurface soil, because all detected radionuclide activities are consistent with background conditions.

2.7.2 ERA The purpose of the ERA for OU 1 is to assess potential adverse effects to ecological receptors resulting from contamination of surface soil, surface water, and sediment. Components of the ERA include (1) problem formulation, (2) selection of ecological contaminants of potential concern, (3) ecological exposure assessment, (4) ecological effects assessment, and (5) risk characterization. Ecological CPCs represent the nonradiological and radiological analytes detected in media (surface soil, surface water, and sediment) that were considered in the risk assessment process. Table 2-5 provides a summary of the CPCs selected for OU 1 to be evaluated for each medium.

Potential risks to terrestrial plants and soil invertebrates were evaluated by comparing the CPCs in surface soil to screening toxicological benchmarks. Based on this risk evaluation, the CPCs do not appear to pose an unacceptable ecological risk to ecological receptors.

Risks to semiterrestrial wildlife from exposures to CPCs in surface water and sediment associated with consumption of contaminated prey, incidental sediment ingestion, and surface water consumption were evaluated based on food-chain exposure modeling. No risks to semiterrestrial receptors that may forage in the grassy drainage ditch or St. Johns River were estimated in the ERA. In the forested stream habitat, large wading birds (e.g., herons) may be adversely affected as a result of food-chain exposure to Aroclor-1260, 4,4'-dichlorodiphenyldichloroethane (DDD), mercury, and thallium; mercury was determined to be the primary risk contributor to this class of receptors. No ecological risks related to exposure to radiological contaminants were predicted.

Risks to aquatic receptors were evaluated by comparing surface water exposure point concentrations to available standards, criteria, and guidance values established for nonradiological contaminants. Radiological risks were evaluated by comparing the combined internal and external dose estimates for aquatic receptors to a threshold benchmark value. The relative magnitude of benchmark exceedances in these aquatic environments suggests that sensitive receptors (e.g., water fleas, certain fish, and amphibians) could be affected by the site-related contaminants, although risk estimates do not suggest that the overall aquatic community would necessarily be affected. Sediment exposure point concentrations of the CPCs were compared with sediment toxicological benchmarks. With the exception of the PCB CPCs, benchmark exceedances were relatively minor and are not considered to pose substantial ecological risk to aquatic receptors. Aquatic exposures to PCBs, which exceeded benchmark values in all three aquatic areas, may result in direct toxicological effects to aquatic receptors. No radiological risks to aquatic receptors associated with surface water or sediment exposure to radionuclides in any of these areas are evident.

Table 2-5
Ecological Chemicals of Potential Concern

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Environmental Medium		Contaminants of Potential Concern
Surface Soil	**Inorganics:**	aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, manganese, mercury, nickel, selenium, silver, vanadium and zinc
	Organics:	acetone, benzene, carbon disulfide, 1,2-dichloroethylene (total), methylene chloride, toluene, xylene (total), acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, butylbenzylphthalate, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, 4-methylphenol, naphthalene, phenanthrene, pyrene, 1,2,4-trichlorobenzene, aldrin, Aroclor-1254, Aroclor-1260, alpha-BHC, alpha-chlordane, gamma-chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, heptachlor and heptachlor epoxide, 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF, OCDF, HpCDDs (total), HpCDFs (total), HxCDFs (total)
	Radionuclides:	gross alpha, gross beta, radium-226
Surface Water	**Inorganics:**	Aquatic receptors and wildlife: aluminum, barium, beryllium, cadmium, cobalt, copper, cyanide, lead, manganese, dissolved mercury and silver Aquatic only: iron Wildlife only: antimony, arsenic, chromium, nickel, selenium, thallium and zinc
	Organics:	Aquatic receptors and wildlife: acetone, trichloroethylene, vinyl chloride, dibenzofuran, bis(2-ethylhexyl)phthalate and total petroleum hydrocarbons Wildlife only: benzene, chlorobenzene, 1,1-dichloroethane, 1,2-dichloroethylene, ethylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, toluene, acenaphthene, di-n-butylphthalate, di-n-octylphthalate and phenol
	Radionuclides:	Aquatic receptors and wildlife: actinium-228, gross alpha, gross beta, lead-214, radium-226, radium-228 and thallium-208
Sediment	**Inorganics:**	Aquatic receptors and wildlife: aluminum, arsenic, barium, beryllium, cadmium, cobalt, copper, cyanide, lead, manganese, mercury, selenium, silver, thallium, vanadium and zinc Aquatic only: iron Wildlife only: chromium
	Organics:	Aquatic receptors and wildlife: acetone, benzene, 2-butanone, carbon disulfide, chlorobenzene, 1,1-dichloroethane, 1,2-dichloroethylene, methylene chloride, tetrachloroethylene, toluene, trichloroethylene, vinyl chloride, xylenes (total), benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, di-n-octylphthalate, bis(2-ethylhexyl)phthalate, fluoranthene, indeno-(1,2,3-cd)pyrene, phenanthrene, phenol, pyrene, Aroclor-1248, Aroclor-1260, gamma-BHC, alpha-chlordane, gamma-chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, OCDD, OCDF, 1,2,3,4,6,7,8-HpCDD, 2,3,7,8-TCDF and total petroleum hydrocarbons Wildlife only: acenaphthene, benzo(a)anthracene and benzo(a)pyrene
	Radionuclides:	Aquatic receptors and wildlife: actinium-228, bismuth-212, bismuth-214, cesium-137, gross alpha, gross beta, lead-212, lead-214, potassium-40, radium-226, radium-228, thallium-208 and uranium-235

See notes on next page.

Table 2-5 (Continued)
Ecological Chemicals of Potential Concern

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Notes: PSC = potential source of contamination.
OU = operable unit.
BHC = benzene hexachloride.
DDD = dichlorodiphenyldichloroethane.
DDE = dichlorodiphenyldichloroethene.
DDT = dichlorodiphenyltrichloroethane.
HpCDD = heptachlorodibenzo-p-dioxin.
HpCDF = heptachlorodibenzo-p-furan.
OCDF = octachlorodibenzofuran.
HxCDF = hexachlorodibenzofuran.
OCDD = octachlorodibenzodioxin.

2.8 DESCRIPTION OF ALTERNATIVES. Five cleanup alternatives were considered for OU 1. These cleanup alternatives were developed by the U.S. Navy, the USEPA, and the FDEP. Although the selected alternative is intended to be a final remedy, the alternative includes contingent actions that would be taken if it is determined that the base actions would not achieve RAOs within the anticipated timeframe in a cost-effective manner.

The five alternatives considered are listed below.

Alternative 1:

Base Action. Capping and Covering, and Intrinsic Bioremediation of Groundwater.

Continent Action. None

Alternative 2:

Base Action. Capping and Covering and Intrinsic Bioremediation with Groundwater Hot Spot Removal.

Contingent Action. Tributary Water Collection.

Alternative 3:

Base Action. Capping and Covering, Soil and Sediment Excavation, and Intrinsic Bioremediation of Groundwater.

Contingent Actions. Tributary Water Collection, and/or Enhanced Bioremediation.

Alternative 4:

Base Action. Capping and Covering, Soil and Sediment Excavation, Enhanced Bioremediation of Groundwater.

Contingent Action. None

Alternative 5:

Base Action. Capping and Covering, Soil and Sediment Excavation, Pump-and-Treat Groundwater.

Contingent Action. None

Table 2-6 presents a summary of the alternatives considered.

The USEPA, FDEP, and the Navy have agreed that the presumptive remedy for landfills, consisting of a cover (cap) system, will be constructed over the landfill soil and debris as part of the remedial action at OU 1. Therefore, all of the alternatives included this common remedy for landfill sites. The cover (cap) system is intended to shield the radionuclides present in the landfill, prevent exposure to other contaminants, and reduce the potential for leachate generation from additional material placed on the landfill.

Table 2-6
Remedial Alternatives Evaluated for OU 1

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Description of Key Components	Cost[1]	Cost with Contingencies[1]	Duration
Alternative 1: Capping and covering, intrinsic bioremediation of groundwater.	<u>**Base Action**</u> Capping and covering of landfill soil and debris. Continued collection and off-site transport of LNAPL. Upgrade the system, if required to meet RAOs. Intrinsic bioremediation of groundwater. Institutional controls for sediment. Groundwater access restrictions, monitoring, and 5-year reviews. <u>**Contingent Action**</u> None.	$ 4.5 million	NA	30 years
Alternative 2: Capping and covering, intrinsic bioremediation with hot spot removal, and a contingent action for collecting the surface water in the unnamed tributary.	<u>**Base Action**</u> Capping and covering of landfill soil and debris. Continued collection and off-site transport of LNAPL. Upgrade the system, if required to meet RAOs. Intrinsic bioremediation of groundwater. Pump, treat, and discharge the most contaminated groundwater. Institutional controls for sediment. Groundwater access restrictions, monitoring, and 5-year reviews. <u>**Contingent Action**</u> Surface water collection and treatment, if monitoring indicates discharge requirements cannot be met.	$ 5.1 million	$ 5.5 million	30 years

See notes at end of table.

Table 2-6 (Continued)
Remedial Alternatives Evaluated for OU 1

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Description of Key Components	Cost[1]	Cost with Contingencies[1]	Duration
Alternative 3: Capping and covering, soil and sediment excavation, intrinsic bioremediation of groundwater, and contingent actions for enhanced bioremediation and tributary collection.	<u>**Base Action**</u> Consolidation and capping of excavated soil and sediment, and landfill soil and debris. Continued collection and off-site transport of LNAPL. Upgrade the system, if required to meet RAOs. Intrinsic bioremediation of groundwater. Groundwater access restrictions, monitoring, and 5-year reviews. <u>**Contingent Actions**</u> Enhanced bioremediation, if the results of the first 5-year monitoring indicates RAOs for groundwater will not be met within 30 years. Surface water collection and treatment, if monitoring indicates discharge requirements cannot be met.	$ 4.2 million	$ 7.3 million	30 years
Alternative 4: Capping and covering, soil and sediment excavation, enhanced bioremediation of groundwater.	<u>**Base Action**</u> Consolidation and capping of excavated soil and sediment, and landfill soil and debris. Continued collection and off-site transport of LNAPL. Upgrade the system, if required to meet RAOs. Enhanced bioremediation of groundwater. Groundwater access restrictions, monitoring, and 5-year reviews. <u>**Contingent Action**</u> None.	$5.8 million	NA	12 years

See notes at end of table.

Table 2-6 (Continued)
Remedial Alternatives Evaluated for OU 1

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Description of Key Components	Cost[1]	Cost with Contingencies[1]	Duration
Alternative 5: Capping and covering, soil and sediment excavation, pump-and-treat groundwater. Cost: Duration:	**Base Action** Consolidation and capping of excavated soil and sediment, and landfill soil and debris. Continued collection and off-site transport of LNAPL. Upgrade the system, if required to meet RAOs. Collection, treatment, and discharge of groundwater. Groundwater access restrictions, monitoring, and 5-year reviews. **Contingent Action** None.	$ 10.2 million	NA	14 years

[1] Costs represented are present worth dollars.

Notes: PSC = potential source of contamination.
OU = operable unit.
LNAPL = light nonaqueous-phase liquid.
RAOs = remedial action objectives.

Each alternative proposed will continue the IRA for LNAPL removal as presented in the IROD (ABB-ES, 1994b). The passive recovery system will be monitored quarterly until it is deemed necessary that the recovery system be upgraded to an active mode. All alternatives also propose implementing groundwater restrictions, groundwater and surface water monitoring, and 5-year reviews.

Alternatives 3 through 5 propose excavation of hot spots of contaminated soil and sediment to provide additional reduction of unacceptable risks associated with these media. These spoils would be consolidated within the landfill and covered with the cover (cap).

Other alternatives that also share similarities:

- Alternatives 1, 2, and 3 propose to treat groundwater via intrinsic bioremediation as the primary treatment technology.
- Alternatives 2 and 5 propose to pump, treat, and discharge groundwater.
- Alternative 4 proposes to treat groundwater via enhanced bioremediation while Alternative 3 proposes to treat groundwater via enhanced bioremediation as a contingent action.
- Alternatives 2 and 3 include a contingent action for tributary water collection.

<u>2.9 SUMMARY OF THE COMPARATIVE ANALYSES OF ALTERNATIVES</u>. In selecting the preferred alternative for OU 1, nine criteria were used to evaluate the alternatives developed in the feasibility study. The first seven are technical criteria based on the degree of protection of the environment, cost, and engineering feasibility issues. The alternatives were further evaluated based on the final two criteria: acceptance by the USEPA and FDEP, and acceptance by the community. The nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The USEPA requires that the alternative implemented must satisfy the threshold criteria. Primary balancing criteria weigh the major tradeoffs among alternatives. Modifying criteria are considered after public comment. Based on the evaluation of the alternatives against these criteria, Alterative 3 was selected as the preferred alternative for OU 1.

The subsections that follow discuss the five alternatives relative to the nine criteria.

2.9.1 Threshold Criteria

<u>Overall Protection of Human Health and the Environment</u>. All five alternatives would provide a partial cover (cap) system to contain the soil and debris within the landfill. The only identified ARARs for this site concern groundwater; these ARARs are the State and Federal MCLs for COCs. The COCs and their respective MCLs are listed on Table 2-12. This would achieve RAOs by reducing exposure to contamination and reducing surface migration of contamination. Additionally, all five alternatives would incorporate the continued collection and off-site

transport of LNAPL and would impose restrictions on the access to groundwater during aquifer restoration.

Each alternative differs with respect to relative cumulative, residual risk. As such, there are variations on minimizing exposure to soil outside the landfill, reducing exposure to sediment in the unnamed tributary, and controlling contaminants in groundwater.

Alternatives 1 and 2 would reduce the cumulative residual risk to soil and sediment to the high (i.e., less aggressive) end of USEPA's acceptable risk range. This reduction would primarily be accomplished by capping the landfill. Conversely, Alternatives 3 through 5 would reduce the cumulative residual risk for soil and sediment further to approach the low (i.e., more aggressive) end of USEPA's acceptable risk range. This additional level of protection would be accomplished by excavating soil outside the landfill and the sediment in the unnamed tributary, prior to landfill capping. Thus, Alternatives 3 through 5 may be more protective of human health and ecological receptors than Alternatives 1 and 2, and should be considered if an increased level of risk reduction is desired. However, because excavation of sediment would disrupt the existing ecosystem and damage the wetlands, the risk reduction achieved by Alternatives 3 through 5 may be outweighed by the ecological impact created.

All five alternatives are expected to eventually meet the same residual risk levels for groundwater. The primary differences among the alternatives are the methods of groundwater treatment. Intrinsic bioremediation is a naturally occurring, ongoing treatment method that has been identified as a primary or secondary treatment technology for groundwater for all alternatives. Furthermore, for Alternatives 1 through 4, intrinsic or enhanced bioremediation serves as the primary groundwater treatment method. Alternative 3 includes a contingency to allow flexibility in the alternative to achieve RAOs. Alternative 2 includes the installation of a pump-and-treat system for hot spot removal, while Alternative 5 would include the installation of a pump-and-treat system as a hydraulic barrier for groundwater. These differences pose a variety of advantages and disadvantages, each of which is discussed as part of the remaining criteria.

Compliance with ARARs. As proposed, each alternative is intended to comply with ARARs. Federal and State landfill closure regulations are not applicable because the landfill was not used after the effective dates of those regulations. The partial cover (cap) system is intended to satisfy relevant and appropriate portions of selected closure regulations to be consistent with the presumptive remedy and to achieve RAOs. Furthermore, all five alternatives are anticipated to eventually achieve action levels for contaminated media. The rates at which they achieve those criteria vary, and some actions may use contingent actions to achieve these criteria.

Soil and sediment outside the landfill would be excavated to achieve action levels for Alternatives 3 through 5. Thus, action levels would be achieved instantaneously. For sediment, Alternatives 1 and 2 would rely primarily on natural processes such as flushing and scouring, and secondarily on treating groundwater to achieve action levels for those media. Alternatives 2 and 3 include additional protection of surface water by including contingent actions for tributary collection that will be implemented in the event there is a potential for surface water quality to deteriorate below Florida surface water standards.

Alternatives 1 through 4 rely primarily on intrinsic or enhanced bioremediation for groundwater, while Alternative 5 provides an active pump-and-treat system as the primary groundwater treatment technology. Both types of technologies would theoretically be effective in achieving action levels for organics. Alternative 3 includes a contingent action to enhance bioremediation in the event that MCLs for COCs in groundwater will not be met in 30 years.

2.9.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. All of the alternatives are roughly equal in long-term effectiveness and permanence. The landfill cover (cap) would be designed as a permanent radioactive shield. It would require periodic inspection and maintenance to ensure that it is working as designed.

Groundwater treatment proposed by each alternative is permanent. The contingent action for Alternative 3 and Alternative 4 would create subsurface conditions that would enhance natural bacterial action to continue to break down organics over a long period of time. Alternative 1 and the contingent actions of Alternatives 2 and 3 would do this, also, at a much slower rate, as these alternatives rely on unenhanced natural conditions in the aquifer. The contingent action for Alternative 2 and Alternative 5 could potentially create new risks by generating radioactive sludges from the onsite treatment unit.

Alternatives 3 through 5 include excavation of soils and sediments to permanently eliminate any potential exposure. Alternatives 1 and 2 rely on natural processes such as flushing, scouring, and erosion to eventually eliminate potential exposure to sediments.

Short-Term Effectiveness. For all the alternatives, the landfill cover (cap) provides a shield for radionuclides, prevents exposure to other contaminants, and reduces infiltration through the additional material within a short period of time. Alternatives 1 and 2, and Alternative 3 (base action) would be least effective in the short run because they take the longest time to achieve cleanup levels for groundwater as they rely on natural conditions for groundwater cleanup. Alternative 3 (base and contingent actions) and Alternative 4 are slightly more effective in the short term because they would create an environment in which bacteria can break down organics in groundwater more quickly than natural conditions would allow. By implementing an active pump-and-treat system, Alternative 5 is as effective in the short term as Alternative 3 (base and contingent actions) or Alternative 4.

Implementability. A landfill cap would be constructed at OU 1 for each alternative. The five alternatives include an increasing level of coordination. Alternatives 3 through 5 would be more difficult to implement than Alternatives 1 and 2 because they include sediment excavation that may require diverting or dewatering the tributary. Additionally, the trenches proposed for infiltration of nutrient-rich water in the contingent action for Alternative 3 and Alternative 4 would be relatively easy to maintain, but may require some temporary relocation of residents during construction, thereby making these alternatives more difficult to implement. The active pump-and-treat system required for Alternatives 2 and 5 is more difficult to implement than the other alternatives because operation and maintenance on the pumps and treatment of the water before discharge is required. The onsite treatment system required for Alternatives 2 and 5 would have additional maintenance.

Reduction of Toxicity, Mobility, or Volume of Contaminants. All of the alternatives offer reduction of mobility of landfill contaminants by proposing construction of a landfill cap. However, the toxicity of landfill contaminants would remain unchanged. Soil and sediment excavation, offered by Alternatives 3 through 5, reduces the mobility of contaminants in those media because they would be capped within the landfill. The toxicity of groundwater is reduced because contaminants are either treated or degrade to less toxic substances.

Alternatives 2 and 5 reduce the mobility and volume of contaminated groundwater at OU 1 by pumping. Alternative 3 (base and contingent actions) and Alternative 4 rely on the mobility of groundwater to carry nutrient-rich water into the aquifer to create the environment necessary for bacteria to degrade organics. Alternative 1 offers the least reduction of mobility of all the alternatives.

Cost. The relative costs for the proposed alternatives ranged from $3.8 million to $10.2 million. Alternative 1 has the lowest cost, followed by Alternative 3, 2, 4, and 5, respectively. As noted in the description of the alternatives, the contingent actions proposed by Alternatives 2 and 3 increase the costs of those alternatives.

2.9.3 Modifying Criteria

State and Federal Acceptance. The FDEP and USEPA have concurred with the Navy's selection of Alternative 3 as the preferred alternative.

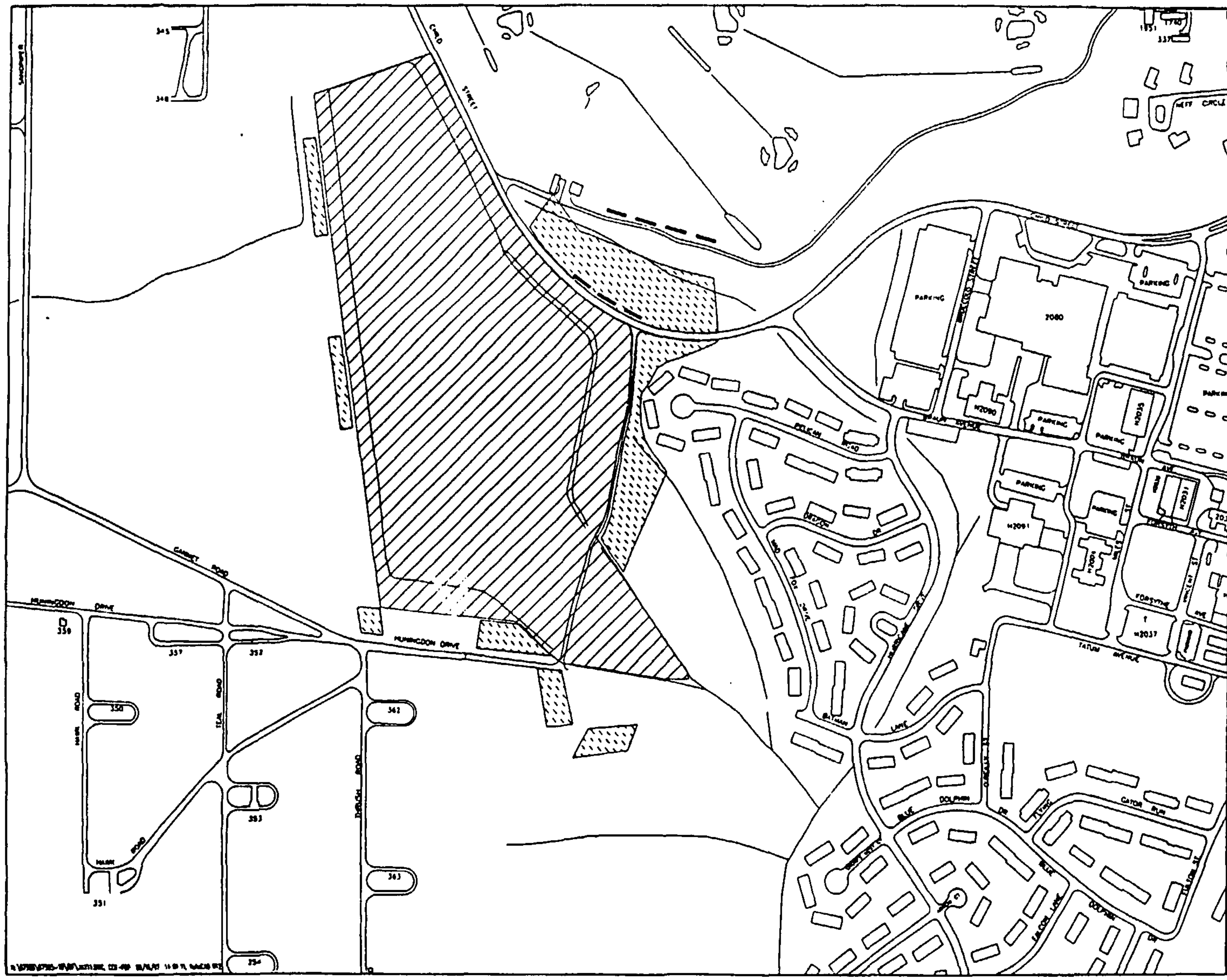
Community Acceptance. Community acceptance of the preferred alternative was evaluated at the end of the public comment period. The comments received during this period are addressed in the Responsiveness Summary included in Appendix A.

2.10 SELECTED ALTERNATIVE

Of the five alternatives evaluated, the selected remedial action for OU 1 is Alternative 3. Figure 2-4 presents the general site layout proposed by this alternative. Alternative 3 involves the procedures below.

Landfill Soil and Debris. The soil and debris within the landfill would be capped and covered. The proposed cover (cap) consists of

- a 30-mil geomembrane laid over the radionuclide-contaminated soil and debris, and the additional materials placed on the landfill (to prevent water from infiltrating through this material);
- an 18-inch layer of soil placed over the geomembrane and on the remainder of the landfill (the thickness of this layer may change slightly during design to ensure proper grading and radionuclide shielding); and
- a 6-inch layer of vegetative cover to promote vegetation that will absorb rainwater and reduce surface runoff.



LEGEND

(diagonal hatching)	Landfill cover
(dotted pattern)	Surface soil to be removed and placed in the landfill
(dashed line)	Existing LNAPL collection trench
LNAPL	Light nonaqueous-phase liquid

NOTE:
The areas of sediment excavation are shown on figure 2-5.

0 175 350
SCALE: 1 INCH = 350 FEET

FIGURE 2-4
SITE LAYOUT FOR THE SELECTED ALTERNATIVE (ALTERNATIVE 3)

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LNAPL. LNAPL collection and off-site disposal would continue as described in the IROD for LNAPL (ABB-ES, 1994b). This includes upgrading to an active system, if required to meet RAOs.

Soil and Sediment. Prior to capping, contaminated soil exceeding the $1x10^{-4}$ action levels would be excavated from the area outside the landfill and placed on top of the existing soil and debris. Approximately 9,000 cubic yards (i.e., 4,000 cubic yards from north of Child Street and 5,000 cubic yards from south of Child Street) would be excavated (see Figure 2-4).

In addition to excavating soil from outside the landfill, approximately 900 cubic yards of sediment from the unnamed tributary would also be excavated, as shown on Figure 2-5. Based on practical and technical implementation issues (i.e., impact to wetlands, forested areas, ecological receptors, and dewatering), only hot spots of contaminated sediments were selected for excavation. Excavation of those hot spots would reduce the cumulative, residual risk to approach the low (i.e., more aggressive) end of USEPA's acceptable risk range. Once excavated, the media (i.e., soil from outside the landfill and sediment from the unnamed tributary) would be capped under the partial cover (cap) system described above.

The soil portion of the landfill cover would be extended over the soil excavation to create the desired grade. Additionally, sediment remaining in the unnamed tributary would be graded to maintain continued surface water flow into the St. Johns River. Minimal borrow soil (other than that required for the landfill cover) is anticipated to be required. Select areas, or hot spots, of contaminated soil and sediment would be excavated. This soil would be placed within the landfill and covered with the cap. Sediment would be drained of excess water prior to placement in the landfill.

Groundwater.

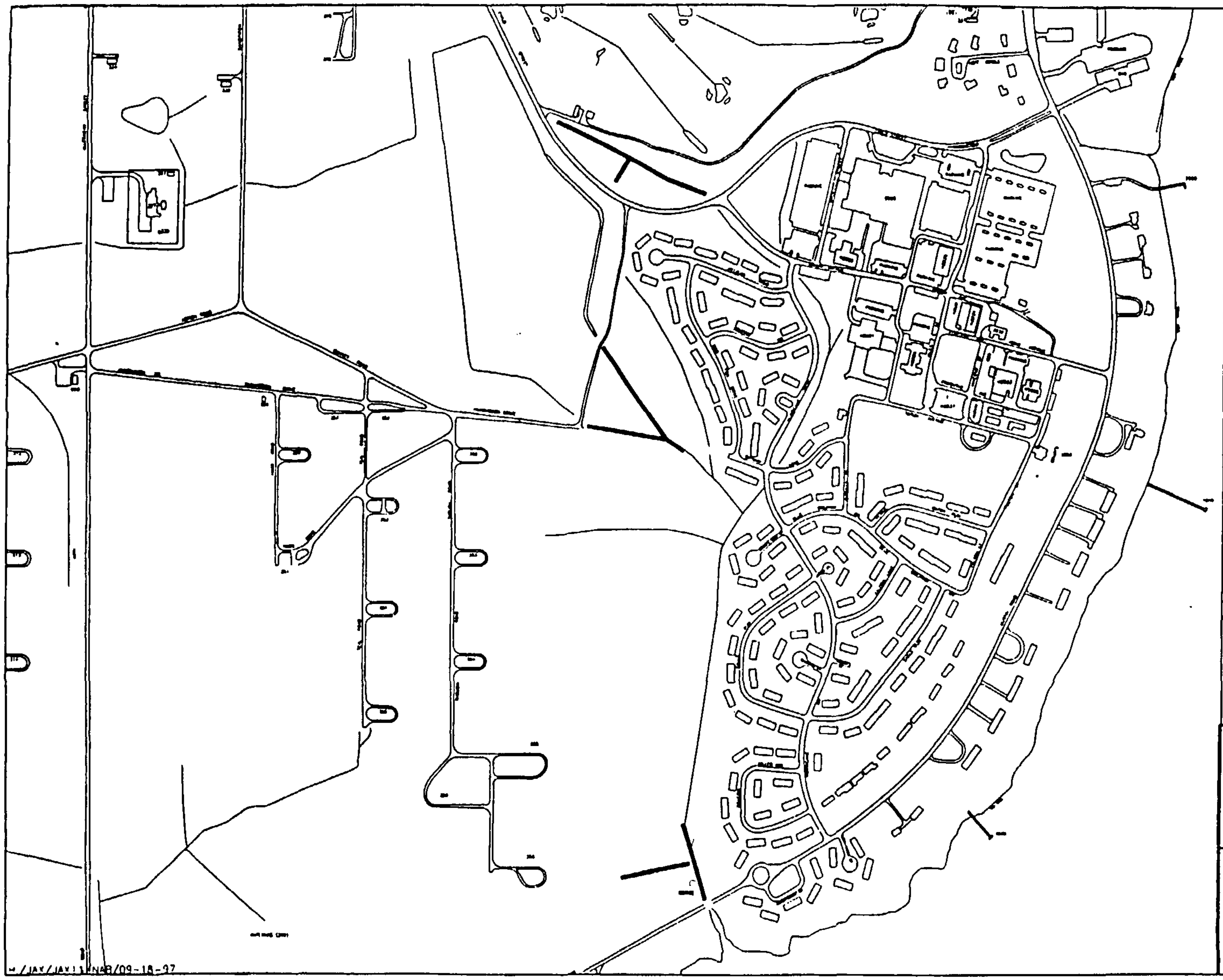
Base Action. The groundwater treatment component for this alternative consists of natural, unaided biodegradation and natural attenuation. Based on the relatively low concentrations of chlorinated VOCs detected in groundwater, it appears that subsurface conditions are conducive to natural attenuation according to USEPA Region IV Guidance. Results of groundwater samples indicate that reductive dechlorination is occurring.

Access restrictions will be placed on the base to prevent consumption of the groundwater at OU 1 from the surficial aquifer at OU 1 in the affected area. These restrictions would include

- constructing a fence around the site,
- posting signs along the fence, and
- obtaining a legal restriction on use of groundwater for consumption.

These access restrictions will be outlined and described in a Memorandum of Agreement (MOA), between the FDEP, the USEPA, and the commanding officer for NAS Jacksonville. These restrictions shall remain in effect until the groundwater contamination levels for COCs meet or are below MCLs and concurrence is obtained from FDEP and USEPA to remove them.

Quarterly groundwater and surface water monitoring will be implemented upon completion of the remedial action to assess the restoration of the surficial aquifer, to evaluate the potential for breakthrough of contaminants into the unnamed tributary (i.e., the point of compliance), and to assess when groundwater



N

LEGEND

Sediment to be removed and placed in the landfill

0 275 550

SCALE: 1 INCH = 550 FEET

FIGURE 2-5
SEDIMENT TO BE REMOVED

RECORD OF DECISION
OPERABLE UNIT 1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

access restrictions could be lifted. Groundwater monitoring locations are presented on Figure 2-6 and described in Table 2-7. Surface water will also be sampled and analyzed during the quarterly monitoring program. Specific surface water sample locations will be chosen during the design for the OU 1 remedial action.

Contingent Actions. In addition to this primary action, this alternative also proposed two contingency actions: (1) a tributary collection system (i.e., collection of surface water) with onsite treatment and discharge and (2) enhanced bioremediation.

If monitoring data for two consecutive quarters show concentrations of chemicals in surface water greater than Florida surface water standards, then one or more seepage meters will be installed to collect water samples at the direct interface of groundwater discharge to surface water. These samples will be analyzed and, if concentrations of COCs are still greater than Florida surface water standards, then the first contingent action, tributary water collection, will be implemented. Table 2-8 presents the COCs and their associated Class III surface water standards.

If, after a review of data accumulated during 5 years of natural attenuation, it is predicted that concentrations of COCs in groundwater would not achieve MCLs in 30 years, the second contingent action would occur (i.e., enhanced bioremediation).

The two contingent actions are discussed below.

Tributary Collection System. The collection system would consist of a series of well points placed along the tributary's bank to collect groundwater before it reaches the tributary. The collected water would be treated by an onsite treatment system. This treatment system would consist of the following:

- pH adjustment and chemical precipitation
- coagulation
- flocculation
- clarification
- granular activated carbon adsorption

Once treated, the water would be discharged either to surface water (the unnamed tributary) or to a wastewater treatment plant (a Federally owned treatment works). If discharged to surface water, a National Pollutant Discharge Elimination System (NPDES) permit would be required. Collected water would be treated to achieve levels stipulated in the NPDES permit. Routine effluent monitoring will be performed to verify the effectiveness of the treatment. In the event that the NPDES permit criteria (or treatment levels) could not be achieved, reverse osmosis and further pH adjustments (i.e., with sulfuric acid) will be added to the treatment system.

Enhanced Bioremediation. This contingent action would consist of injection of a carbon source and nutrients (nitrogen and phosphorus) into the groundwater to stimulate bacterial growth. The infiltration system would consist of trenches placed across the groundwater plume at distances equivalent to 4 to 5 years of

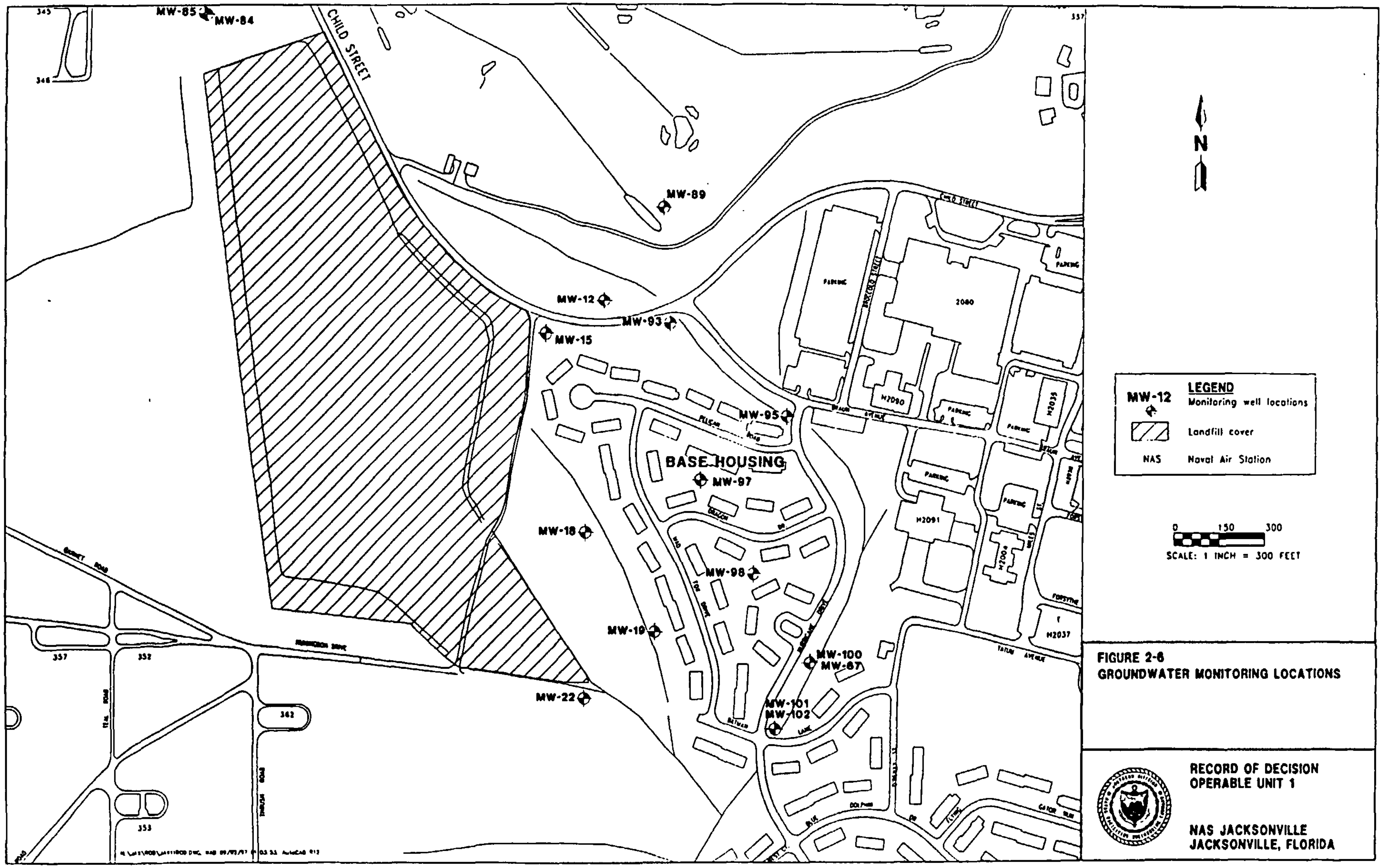


FIGURE 2-6
GROUNDWATER MONITORING LOCATIONS

RECORD OF DECISION
OPERABLE UNIT 1

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JACKSONVILLE, FLORIDA

Table 2-7
Groundwater Monitoring Program

Record of Decision
PSCs 26 and 27 at OU 1
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Monitoring Well (identification)	Approximate Concentration of Total TCL Organics (μg/ℓ)	Depth (relative)	Screened Interval (feet below land surface)	Purpose of Sampling (TCL organics only)
MW-12	125	Deep	30 to 35	Monitor groundwater downgradient of LNAPL area.
MW-18	430	Deep	26.5 to 31.5	Monitor groundwater downgradient of landfill.
MW-19	2,918	Deep	19 to 24	Monitoring groundwater downgradient of landfill.
MW-22	28	Deep	25 to 30	Monitor southern edge of dissolved plume.
MW-67	95	Shallow	3.5 to 13.5	Monitor vicinity of groundwater discharge to surface water.
MW-84	--	Deep	35 to 40	Monitor groundwater upgradient from the landfill (serves as background).
MW-85	--	Shallow	3 to 13	Monitor groundwater upgradient from the landfill (serves as background).
MW-89	6,423	Shallow	3 to 13	Monitor concentrations of benzene, toluene, ethylbenzene, and xylene compounds in vicinity of light non-aqueous-phase liquid area.
MW-93	--	Shallow	3 to 13	Monitor groundwater between the stream and the housing area.
MW-95	--	Shallow	3 to 13	Monitor groundwater between the stream and the housing area.
MW-97	101	Deep	22.5 to 27.5	Monitor extent of dissolved plume in housing area.
MW-98	10	Deep	20.5 to 25.5	Monitor extent of dissolved plume in housing area.
MW-100	200	Deep	16.5 to 21.5	Monitor vicinity of groundwater discharge to surface water.
MW-101	256	Shallow	3 to 13	Monitor vicinity of groundwater discharge to surface water.
MW-102	21	Deep	16.5 to 21.5	Monitor vicinity of groundwater discharge to surface water.

Notes: PSC = potential source of contamination.
OU = operable unit.
MW = monitoring well.
TCL = target compound list.
μg/ℓ = micrograms per liter.
LNAPL = light, nonaqueous-phase liquid.
-- = not detected.

Table 2-8
Trigger Levels for Contingent Action

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Parameter (Contaminant of Concern in Groundwater)	Concentration Triggering Contingent Action[1]
Volatile Organic Compounds ($\mu g/\ell$)	
1,1-dichloroethene	3.2
1,2-dichloroethane	1,580
1,2-dichloroethene (cis)	–
1,2-dichloroethene (trans)	–
benzene	–
trichloroethene	80.7
vinyl chloride	–
Semivolatile Organic Compounds ($\mu g/\ell$)	
bis(2-ethylhexyl)phthalate	–
naphthalene	–

[1] Concentrations triggering contingent action are the Florida surface water standards for Class III freshwaters. Where an entry is marked "–," no standard is available for that compound.

Notes: PSC = potential source of contamination.
OU = operable unit.
$\mu g/\ell$ = micrograms per liter.

be disposed of off-site. The amount of carbon source and nutrients being injected would be assessed and adjusted based on the quality of groundwater observed during quarterly monitoring.

Cost. The estimated cost of this alternative is $4.2 million (with contingencies the cost could increase to $7.3 million). The estimated duration for the entire remedy is 30 years.

Residual Risk. The anticipated residual risks upon completion of the alternative are presented in Table 2-9.

2.11 STATUTORY DETERMINATIONS. The remedial action selected for implementation at OU 1 is consistent with CERCLA and the NCP. The selected remedy satisfies the statutory preference for treatment to the extent practicable, which permanently and significantly reduces the mobility, toxicity, and/or volume of hazardous substances as a principal element. Table 2-10 summarizes the comparison of the selected remedy with the nine evaluation criteria. Table 2-11 provides a summary of ARARs specific to the selected remedy, and Table 2-12 presents a comparison of concentrations of groundwater COCs to MCLs.

Because this remedy will result in hazardous substances remaining onsite, a review will be conducted within 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

2.12 DOCUMENTATION OF SIGNIFICANT CHANGES. There are no significant changes in this remedial action from that described in the Proposed Plan.

Table 2-9
Residual Risks in Media of Concern

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
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Medium	Human Health Excess Lifetime Cancer Risk	Human Health Hazard Index	Ecological Hazard Index[1]
Soil north of Child Street			
Baseline Conditions[2]	3×10^{-5}	1.2	11
Selected Alternative[3]	2×10^{-5}	0.3	2
Soil south of Child Street			
Baseline Conditions	2×10^{-4}	6	8.8
Selected Alternative	3×10^{-5}	0.8	5.5
Groundwater			
Baseline Conditions	1×10^{-3}	20	NE
Selected Alternative	[4]5×10^{-4}	[4]6	NE
Surface water			
Baseline Conditions	2×10^{-6}	NA	NA
Selected Alternative	2×10^{-6}	NA	NA
Sediment			
Baseline Conditions	3×10^{-6}	1	27
Selected Alternative	1×10^{-6}	0.2	10

[1] Cumulative residual risk calculations are based on wildlife receptors for soil and sediment. ARARs are used for surface water, which yield a hazard quotient (HQ) of 1 for individual chemicals. The cumulative HQ is dependent upon the number of chemicals present.
[2] Baseline conditions are those currently existing.
[3] The preferred alternative is Alternative 3, which consists of installing a cover (cap) system, excavating hot spot areas in the soil and sediment, and intrinsic bioremediation and/or natural attenuation and institutional controls for groundwater.
[4] These residual risks are attributed to concentrations of inorganics (such as arsenic and beryllium) in groundwater that are at levels less than background concentrations.

Notes: PSC = potential source of contamination.
OU = operable unit.
NE = not evaluated; no exposure pathway identified.
NA = not applicable.
ARAR = applicable or relevant and appropriate requirement.

Table 2-10
Comparison of Selected Remedy with Nine Evaluation Criteria

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Evaluation Criteria	Assessment
Overall Protection of Human Health and the Environment	Consolidation of contaminated soil and construction of a partial cover (cap) system would protect human health and the environment by reducing human health and ecological risks posed by exposure to contaminants in these media at the landfill. Collection and off-site transport of LNAPL would reduce the source of petroleum contaminants in groundwater and would comply with the regulatory requirements for LNAPL removal. Institutional controls and monitoring of groundwater quality would protect the public and the environment during aquifer restoration. In the event that trend data indicate groundwater RAOs will not be met in 30 years, enhanced bioremediation can be implemented. Excavating sediments in the unnamed tributary would reduce human health-based risks, but would create adverse environmental effects by disrupting the existing ecosystem.
Compliance with ARARs	Federal and State landfill closure ARARs are not applicable because the landfill was not used after the effective dates of the regulations. This alternative would be expected to meet on-site disposal and treatment ARARs, as well as chemical-specific action levels. In the event that surface water quality deteriorates below Florida surface water standards for two consecutive quarters and samples from the installed seepage meter also exceed Florida surface water standards, contingent action for collection and treatment of tributary water would be implemented. In the event that groundwater action levels will not be met within 30 years with natural attenuation, a contingent action to enhance bioremediation can be implemented. Collection and off-site transport of LNAPL would comply with regulatory requirements for LNAPL. Table 2-11 provides a summary of ARARs specific to this alternative.
Long-term Effectiveness	Magnitude of residual risk. The selected alternative would reduce the cumulative, residual risk to approach the low (i.e., more aggressive) end of USEPA's acceptable risk range for soil, sediment, and surface water. This alternative would reduce the potential for future groundwater contamination by controlling infiltration through the additional material placed on the landfill; however, unexpected releases of landfill contaminants could pose an increased risk. This risk would be minimized by the implementation of institutional controls and groundwater monitoring. Sediments in the unnamed tributary would be excavated to reduce the risks to human heath; however, the excavation would create an adverse environmental effects by disrupting the existing ecosystem. Adequacy and reliability of controls. Long-term maintenance would be required to preserve the integrity of the cap. This alternative includes a long-term monitoring plan to maintain the cap, evaluate the effectiveness of LNAPL removal, and assess the rate of enhanced bioremediation of organics. This alternative would also include permanent sediment remediation through excavation, but would result in an adverse impact to the existing ecosystem. In the event that surface water quality deteriorates below Florida surface water standards for two consecutive quarters and samples from the installed seepage meter(s) also exceed Florida surface water standards, a contingent action for collection and treatment of tributary water would be implemented. In the event that groundwater action levels will not be met within 30 years, a contingent action to enhance bioremediation can be implemented. It is anticipated that this alternative would require approximately 25 to 44 years to achieve chemical-specific action levels for site-related chemicals through intrinsic bioremediation.
Reduction of Toxicity, Mobility, and Volume	The partial cover (cap) system would control the infiltration through the additional material placed on the landfill thus reducing the toxicity, mobility, and volume of leachate potentially generated. Intrinsic bioremediation would reduce the toxicity and volume of organics dissolved in groundwater. It is uncertain whether the degradation products would be more or less mobile than the parent compounds. In either case, the biodegradation of organics would achieve chemical-specific action levels, and would be irreversible.

See notes at end of table.

Table 2-10 (Continued)
Comparison of Selected Remedy with Nine Evaluation Criteria

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Evaluation Criteria	Assessment
Short-term Effectiveness	The partial cover (cap) system would be immediately effective in reducing exposure to contaminated soil and debris. However, increased noise and dust from construction and truck traffic during the consolidation of soil may cause an adverse impact to the community. Construction workers grading and excavating contaminated soil may be exposed to risks posed by inhalation of particulates and dermal contact with soil. However, these risks could be offset by using appropriate protective equipment.
Implementability	Placement of soil in the landfill and construction of the partial cover (cap) system would require less than 1 year to implement. Standard equipment would be required. Because only institutional controls and monitoring would be required for groundwater, there are no implementation issues. Excavation of sediments would require less than 1 year. Similarly for these components, only standard construction equipment would be required.
Federal and State Acceptance	The USEPA and FDEP have concurred with the selected remedy.
Community Acceptance	The community has been given the opportunity to review and comment on the selected remedy. Comments received were addressed (see Appendix A) and did not alter the selected remedy proposed in the proposed plan.

Notes: PSC = potential source of contamination.
OU = operable unit.
LNAPL = light nonaqueous-phase liquid.
ARAR = applicable or relevant and appropriate requirement.
USEPA = U.S. Environmental Protection Agency.

Table 2-11
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements Chemical Specific	Synopsis	Consideration in the Remedial Response Process for Alterative 3
Chemical-Specific		
Federal		
Clean Water Act (CWA) Regulations, Ambient Water Quality Criteria [40 CFR Part 131]	Ecological and health-based Federal Ambient Water Quality Criteria (AWQC) are guidelines used by states to set their State-specific water standards for surface water.	**Relevant and Appropriate.** AWQC were used in the determination of cleanup goals in the absence of State water quality standards at OU 1.
State		
Chapter 62-302, FAC, Florida Surface Water Standards, August, 1994	Defines classifications of surface waters and establishes water quality standards (WQS) for surface water within the classifications. The State's antidegradation policy is also established in this rule. Applies to unnamed creek discharges to the St. Johns River, which is classified as a Class III marine surface water.	**Applicable.** State WQSs were used in the determination of cleanup goals for surface waters. The minimum WQSs mandate that all surface waters of the State must be "free from" contaminants as described at Chapter 62-302.500, FAC.
Chapter 62-520, FAC, Groundwater Classes, Standards, and Exemptions, October, 1994	Establishes the groundwater classification system for the State and provides qualitative minimum criteria for groundwater based on the classification. Groundwater at OU 1 is classified as G-II, designated for potable water use. This rule adopts the Federal primary and secondary drinking water standards and establishes some State standards that are more stringent than Federal standards. Like Federal MCLs, these standards are considered ARARs for cleanup of groundwater that is a current or potential source of drinking water.	**Applicable.** Groundwater at OU 1 is subject to this rule and, therefore must be free from components of discharges in concentrations that are harmful to the organisms responsible for treatment or stabilization of the discharge; are carcinogenic, mutagenic, teratogenic, or toxic to human beings; are acutely toxic to indigenous species of significance to the aquatic community; pose a serious danger to public health, safety, or welfare; create or constitute a nuisance; or impair the reasonable and beneficial uses of the adjacent waters.
Chapter 62-650, FAC, Florida Water Quality Based Effluent Limitations, November, 1989	All activities and discharges, except dredge and fill, must meet effluent limitations based on technology or water quality. This rule states that in addition to any other technology-based groundwater effluent limitation requirements, all sources will also meet water quality-based effluent limitations where necessary to meet groundwater quality standards.	**Applicable.** The substantive permitting requirement established in this rule is an applicable requirement for the discharge of treated groundwater (under the contingent action) to a surface water body (e.g., unnamed creek).

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements Action Specific	Synopsis	Consideration in the Remedial Response Process for Alternative 3
Location-Specific		
Federal		
Endangered Species Act [40 CFR Part 302(h), Appendix A]	Requires remedial action to avoid jeopardizing the continued existence of Federally listed endangered or threatened species. Requirements include notification to the USEPA and minimization of adverse effects to such endangered species.	**Applicable.** When implementing this alternative, minimization of impact to endangered species existing in and around OU 1 will be considered.
Action-Specific		
Federal		
Clean Air Act (CAA) Regulations, Emissions Standards [40 CFR Part 50]	This rule provides emissions standards, which are promulgated to attain the National Ambient Air Quality Standards (NAAQSs), for hazardous air pollutants likely to cause an increase in mortality or a serious illness to humans.	**Relevant and Appropriate.** Emissions standards and monitoring requirements promulgated in this rule are relevant and appropriate requirements during soil excavation activities. The State of Florida has jurisdiction for the implementation of these regulations through the State Implementation Plan.
CAA Regulations, New Source Performance Standards (NSPS) [40 CFR Part 60]	Establishes NSPS for specified sources that are similar to a source that has established NSPSs (such as air-stripping technologies). The NSPSs limit the emissions of a number of different pollutants, including the six criteria pollutants list (carbon monoxide, nitrogen dioxide, volatile organic compounds, sulfur dioxide, particulate matter, and lead), for which NAAQSs are established, as well as fluorides, sulfuric acid mist, and total reduced sulfur (including hydrogen sulfide [H_2S]).	**Relevant and Appropriate.** If it is determined during the design that the remedy would create potential air impact, the response action or the equipment for the response action may qualify as a new source; therefore, these requirements should be met.

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process for Alternative 3
Action-Specific (Continued)		
Federal (continued)		
Clean Water Act (CWA) Regulations, National Pollutant Discharge Elimination System (NPDES) [40 CFR Parts 122 and 125]	Requires permits specifying the permissible concentration or level of contaminants in the effluent for the discharge of pollutants from any point source into waters of the United States.	**Applicable.** Under the contingent action, treated groundwater that is discharged to onsite surface water bodies must meet the substantive requirements of an NPDES permit, but would not have to meet the Resource Conservation and Recovery Act (RCRA) land disposal restriction levels, because discharges to surface waters that meet the requirements of an NPDES permit are exempt from the RCRA land disposal restrictions. Because the State of Florida is not recognized as delegated by the U.S. Environmental Protection Agency (USEPA), a facility discharging wastewater to the surface waters of the State would require an NPDES permit as well as a State wastewater discharge permit. When Florida becomes classified as a "delegated" State, a single permit will meet both Federal and State discharge requirements. All Federal NPDES permits must be certified by the State of Florida to confirm that Florida surface water standards are met.
Hazardous Materials Transportation Act, Hazardous Materials Transportation Regulations [49 CFR Parts 171-179]	Provides requirements for the packaging, labeling, manifesting, and transporting of hazardous materials. Packaging and transportation requirements for radioactive materials are provided in Parts 171-179.	**Applicable.** Contaminated materials (e.g., sludge from treated groundwater), will be handled, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.
RCRA Regulations, General Facility Standards [40 CFR Subpart B, 264.-10-264.18]	Sets the general facility requirements, including general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a facility located in a 100-year floodplain must be designed, constructed, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	**Relevant and Appropriate.** Under the contingent action, the construction of an onsite treatment facility must meet the substantive requirements of this rule.
RCRA Regulations, Hazardous Waste Permits Program [40 CFR Part 270]	Establishes requirements for obtaining permits to treat, store, or dispose of hazardous wastes.	**Relevant and Appropriate.** Though obtaining a permit for onsite actions is not required, remedial actions for Alternative 3 must meet the substantive requirements of the permit program.

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Action-Specific (Continued)		
Federal (continued)		
RCRA Regulations, Land Disposal Restrictions (LDRs) [40 CFR Part 268]	Establishes restrictions on land disposal of untreated hazardous wastes and provides standards for treatment of hazardous wastes prior to land disposal. Universal Treatment Standards (UTSs) for organic hazardous substances that are subject to LDRs became effective on December 19, 1994.	**Relevant and Appropriate.** Under the contingent action, groundwater treatment system residuals (e.g., sludge) that exhibit the RCRA-hazardous waste toxicity characteristic will have to be treated until concentrations are below the characteristic levels established under RCRA before disposal. Groundwater itself is exempt from LDRs; however, the treatment residuals from the groundwater would be subject to LDRs and would need to be disposed of appropriately. Treated groundwater that is discharged to surface water must meet the substantive requirements of an NPDES permit, but would not have to meet the RCRA LDRs, because discharges to surface waters that meet the requirements of an NPDES permit are exempt from the RCRA LDRs. Consolidation of soil under a landfill cap at OU 1 would not trigger LDRs because disposal occurred before the effective date of RCRA and because wastes will not be "generated" (i.e., they will not be moved out of the area of contamination).
RCRA Regulations, Manifest System, Recordkeeping, and Reporting [40 CFR Part 264, Subpart E]	Outlines procedures for manifesting hazardous waste for owners and operators of onsite and off-site facilities that treat, store, or dispose of hazardous waste.	**Applicable.** These regulations apply to Alternative 3 when transportation of wastes (e.g., sludge generated during pumping and treatment of groundwater) to an off-site treatment, storage, or disposal facility occurs. Manifests would need to be completed for the receiving facility.
RCRA Regulations, Miscellaneous Units [40 CFR Part 264, Subpart X]	These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, and wetlands that may have adverse effects on human health and the environment.	**Relevant and Appropriate.** The design of a treatment system for the contingent action, while not specifically regulated under other subparts of RCRA, must prevent the release of hazardous constituents and future impact on the environment.
RCRA Regulations, Preparedness and Prevention [40 CFR Part 264, Subpart C]	Outlines requirements for safety equipment and spill control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	**Applicable.** Safety and communication equipment will be incorporated into all aspects of the remedial action for OU 1, and local authorities will be familiarized with site operations.

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Synopsis	Consideration in the Remedial Response Process
Action-Specific (Continued)		
Federal (continued)		
RCRA Regulations, Standards Applicable to Transporters of Hazardous Waste [40 CFR Part 263, Subpart A]	Establishes procedures for transporters of hazardous waste within the United States if the transportation requires a manifest under 40 CFR Part 262.	**Applicable.** Transportation of RCRA wastes to an off-site treatment, storage, and disposal facility (TSDF) must meet the requirements of this rule.
RCRA Regulations, Landfills [40 CFR Part 264, Subpart N]	Provides requirements for closure of a Subtitle C landfill.	**Relevant and Appropriate.** Hazardous materials placed within the landfill cap must meet the substantive requirements of this rule.
State		
Chapter 62-2, FAC, Florida Air Pollution Rules, October, 1992	Establishes permitting requirements for owners or operators of any source that emits any air pollutant. This rule also establishes ambient air quality standards for sulfur dioxide, PM_{10}, carbon monoxide, lead, and ozone.	**Relevant and Appropriate.** Although this rule is directly applicable to industrial polluters, these requirements are relevant and appropriate for excavation activities that could result in the release of regulated contaminants to the atmosphere (e.g., particulate emissions during excavation).
Chapter 62-4, FAC, Florida Rules on Permits, November, 1994	Establishes procedures for obtaining permits for sources of pollution.	**Applicable.** These permit requirements are substantive in nature and must be met during implementation of Alternative 3.
Chapter 62-272, FAC, Ambient Air Quality Standards - December, 1994	Establishes ambient air quality standards necessary to protect human health and public welfare. It also establishes maximum allowable increases in ambient concentrations for subject pollutants to prevent significant deterioration of air quality in areas where ambient air quality standards are being met. Approved air quality monitoring methods are also specified.	**Applicable.** These standards should be met for excavation activities.

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Action-Specific (Continued)		
State (continued)		
Chapter 62-273, FAC, Air Pollution Episodes - September, 1994	In order to prevent episode conditions (defined as a "condition which exists when meteorological conditions and rates of discharge of air pollutants combine to produce pollutant levels in the atmosphere which, if sustained, can lead to a substantial threat to the health of the people") from continuing or from developing into more severe conditions, action must be taken. This rule classifies an air episode as an air alert, warning, or emergency and establishes criteria for determining the level of the air episode. It also establishes response requirements for each level.	**Relevant and Appropriate.** Although this rule is directly applicable to industrial polluters, these requirements are relevant and appropriate for excavation activities that may result in the emission of sulfur dioxide, PM_{10}, carbon monoxide, ozone, or nitrogen dioxide to the atmosphere.
Chapter 62-730, FAC, Florida Hazardous Waste Rules - October, 1993	Adopts, by reference, appropriate sections of 40 CFR and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation, and disposal of hazardous wastes.	**Relevant and Appropriate.** The substantive permitting requirements for hazardous waste must be met where applicable for implementation of Alternative 3.
Chapter 62-736, FAC, Florida Rules on Hazardous Waste Warning Signs - July, 1991	Requires warning signs at National Priority List (NPL) and Florida Department of Environmental Protection (FDEP)-identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** OU 1 is on an NPL site; therefore, these requirements must be met.
Chapter 62-770, FAC, Florida Petroleum-Contaminated Site Cleanup Criteria - February, 1990	Establishes a cleanup process to be followed at all petroleum-contaminated sites. Actions to be taken to remove LNAPL (i.e., free product) from sites are outlined, and cleanup levels for G-I and G-II groundwater are provided for both the gasoline and kerosene/mixed products analytical groups.	**Relevant and Appropriate.** Though UST petroleum products were not the source of the LNAPL at OU 1, the recovery actions outlined in this regulation are suitable for removal of LNAPL from OU 1, where G-II groundwater exists. LNAPL recovery is being undertaken as part of an IRA at OU 1.

See notes at end of table.

Table 2-11 (Continued)
Summary of Federal and State ARARs Specific to Alternative 3

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Standards and Requirements	Consideration in the Remedial Response Process

Notes: ARARs = applicable or relevant and appropriate requirements.
PSCs = potential sources of contamination.
CAA = Clean Air Act.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CFR = Code of Federal Regulations.
CWA = Clean Water Act.
DOT = Department of Transportation.
FAC = Florida Administrative Code.
FDEP = Florida Department of Environmental Protection.
H_2S = hydrogen sulfide.
IRA = Interim Remedial Action.
LDRs = Land Disposal Restrictions.
LNAPL = light nonaqueous-phase liquid.
NAAQSs = National Ambient Air Quality Standards.
NAS = Naval Air Station.
NCP = National Contingency Plan.
NPDES = National Pollutant Discharge Elimination System.
NPL = National Priority List.
NSPS = New Source Performance Standards.
OU = operable unit.
PM_{10} = particulate matter less than 10 micron in size.
RCRA = Resource Conservation and Recovery Act.
SDWA = Safe Drinking Water Act.
SWMUs = Solid Waste Management Unit.
TSDF = Transportation, Storage, and Disposal Facility.
UTSs = Universal Treatment Standards.

Table 2-12
Comparison of Concentrations of Chemicals of Concern to Maximum Contaminant Levels

Record of Decision
PSCs 26 and 27 at OU 1
Naval Air Station Jacksonville
Jacksonville, Florida

Parameter	Range of Detected Concentrations	Groundwater Criteria			
		Federal MCL[1]	Florida MCL[2]	Non-MCL Florida Guidance Concentration[3]	Background Concentration[4]
Volatile Organic Compounds ($\mu g/\ell$)					
1,1-Dichloroethene	6 to 150	7	7	NA	NA
1,2-Dichloroethane	3 to 47	5	3	NA	NA
1,2-Dichloroethene (cis)	3 to [5]1,800	70	70	NA	NA
1,2-Dichloroethene (trans)	3 to [5]1,800	100	100	NA	NA
Benzene	2 to 250	5	1	NA	NA
Trichloroethene	3 to 3,000	5	3	NA	NA
Vinyl chloride	2 to 710	2	1	NA	NA
Semivolatile Organic Compounds ($\mu g/\ell$)					
bis(2-Ethylhexyl)phthalate	2 to 71	6	6	NA	NA
Naphthalene	2 to 49	NA	NA	6.8	NA

[1] Federal MCLs are from U.S. Environmental Protection Agency Drinking Water Regulations and Health Advisories.
[2] Florida MCLs are from Florida Administrative Code (FAC) 62-550.310 and FAC 62-550.320.
[3] Florida non-MCL Guidance Concentrations are from Chapters 3, 4, and 5 of the Florida Department of Environmental Protection Groundwater Guidance Concentrations for Class G-II groundwater.
[4] Background was calculated as the arithmetic mean of detected concentrations in background samples. This enables a direct ARAR comparison to existing concentrations.
[5] Total 1,2-dichloroethene reported.

Notes: ARAR = applicable or relevant and appropriate requirements.
MCL = maximum contaminant level.
$\mu g/\ell$ = micrograms per liter (parts per billion).
NA = not applicable.
[shaded] = indicates the selected criterion for groundwater.

REFERENCES

ABB Environmental Services, Inc. (ABB-ES). 1994a. *Focused Remedial Investigation and Feasibility Study for Light Nonaqueous-Phase Liquid (LNAPL) Removal, RI/FS, Operable Unit 1, Naval Air Station (NAS) Jacksonville, Jacksonville, Florida.*

ABB-ES, 1994b. *Interim Record of Decision, LNAPL Source Area, Operable Unit 1, NAS Jacksonville, Jacksonville, Florida.*

ABB-ES. 1996a. *Remedial Investigation and Feasibility Study, Operable Unit 1, NAS Jacksonville, Jacksonville, Florida.*

ABB-ES. 1996b. *Proposed Plan, Operable Unit 1, NAS Jacksonville, Jacksonville, Florida.*

U.S. Environmental Protection Agency (USEPA). 1993. *Presumptive Remedy for Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Municipal Landfill Sites.* Office of Solid Waste and Emergency Response (OSWER) directive 9355.0-049FS.

USEPA. 1996. *Application of CERCLA* Municipal *Landfill Presumptive Remedy to Military Landfills (Interim Guidance)*. OSWER directive 9355.0-62FS (April).

APPENDIX A

RESPONSIVENESS SUMMARY

Appendix A: Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides regulatory agencies with information about the community preferences regarding the remedial alternatives presented for Potential Sources of Contamination (PSC) 26 and 27, at Operable Unit (OU) 1, Naval Air Station (NAS) Jacksonville. Second, the Responsiveness Summary documents how public comments have been considered and integrated into the decision-making process. Third, it provides the Navy, U.S. Environmental Protection Agency (USEPA), and Florida Department of Environmental Protection (FDEP) with the opportunity to respond to each comment submitted.

The Remedial Investigation, Feasibility Study, and the Proposed Plan for OU 1 were made available in an information repository maintained at the Charles D. Webb Wesconnett Branch of the Jacksonville Public Library.

No written comments were received during the public comment period. However, the following comments and responses were received and provided during the Public Meeting (held August 8, 1996):

Comment: PCB transformers from OU 1 have been removed, but is there evidence of leaks from the transformers? If so, has this area been cleaned up?

Response: **Soil surrounding the area where transformers were once located has been excavated and disposed of offsite; however, PCBs were detected throughout the entire landfill area.**

Comment: Are the USEPA and FDEP satisfied with the preferred alternative and the process (i.e., the process by which implementation of the alternative will be completed)? Will testing of the alternative occur over a number of years?

Response: **The USEPA and FDEP have agreed with the preferred alternative, and are satisfied with the process by which it will be implemented. Testing of the alternative will occur, and the CERCLA process provides for USEPA and FDEP review of the site every 5 years for 30 years or longer.**

Comment: Does the USEPA and FDEP prefer this alternative as opposed to digging the landfill up and hauling the waste somewhere else?

Response: **USEPA has a policy for cleanups of landfills at CERCLA sites. This policy states that the preferred remedy is to leave the landfill in place, as it is not thought to be environmentally sensible or cost effective to excavate landfill materials for disposal at another location. It is also not practical to place the contents of one landfill into another landfill. Instead, it is preferable to control exposures and migration by capping, and control other exposures by land use restrictions.**

Comment: Does the EPA agree that there has been no seepage that was dumped into the aquifer to the point that the groundwater is damaged; are wells damaged at all?

Response: The groundwater is contaminated at OU 1, and as a part of the selected remedy, groundwater would be addressed by natural attenuation. If natural attenuation does not prove to be successful over time, then nutrients will be added to the groundwater to accelerate bioremediation. So, the intent is that at the end of the 30-year period, groundwater will meet all USEPA and FDEP groundwater standards. Also, there are no drinking wells in this area.

Comment: Does the bioremediation process work on PCBs?

Response: Yes.

Comment: Oversight of remedial actions has been occurring for some time now. How long has the Navy and NAS Jacksonville been looking after this as far as digging up soil in the vicinity of the transformers, and disposing of it? How long have they been after the environmental control aspect of this as opposed to reaching the point of decision?

Response: Vandalism to the transformers was discovered in 1978, and the transformers themselves were removed and the soil in the vicinity of the transformers was excavated and disposed of offsite. The landfill itself was closed in 1978.

Comment: Where has waste been disposed since 1978?

Response: NAS Jacksonville has a contract with the City of Jacksonville for disposal of waste at the City landfill.

Comment: Is waste disposed there now without regard as to what the waste is?

Response: NAS Jacksonville sends only solid waste to the City's landfill. Hazardous waste from the base is strictly managed.

Comment: Where is hazardous waste disposed?

Response: Hazardous waste generated at NAS Jacksonville is collected and [the process is] inspected regularly by the EPA and FDEP. NAS Jacksonville has a permanent storage area for hazardous waste, and from there it is disposed of through the Defense Logistics Agency and their contractors.