EPA/ROD/R04-01/560
2001

EPA Superfund
Record of Decision:

USN AIR STATION CECIL FIELD
EPA ID: FL5170022474
OU 09
JACKSONVILLE, FL
04/24/2001

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4WD-FFB

Commander
Attn: Scott Glass
BRAC Environmental Coordinator
DON, Southern Division
Naval Facilities Engineering Command
Mail Code 18B12
P.O. Box 190010
North Charleston, South Carolina 20419-9010

Subject: Naval Air Station Cecil Field, Jacksonville, Florida
Record of Decision for Operable Unit 9 (Sites 36 and 37)

Dear Mr. Glass:

The U.S. Environmental Protection Agency (EPA) has reviewed the Record of Decision (ROD) for Operable Unit 9 (Sites 36 and 37). This letter provides approval of the selected remedy. Per your request two original signature pages are being returned for incorporation into copies for the Navy and State of Florida.

The selected remedy includes the use of institutional controls. Per the Memorandum of Agreement (MOA) between EPA, Florida Department of Environmental Protection and the Navy dated 7 September 1999, a Land Use Control Implementation Plan (LUCIP) must be prepared and added to Appendix B and the site names added to Appendix A of the MOA. Further, when the decision is made to transfer the property to any other agency, private person or entity, per Section IX of the MOA, EPA must be noticed at least sixty days prior to any such conveyance and that notice shall indicate the mechanism(s) by which it is intended that any land use controls will be maintained. The LUCIP shall be incorporated into those property disposal procedures (e.g., the Environmental Baseline Survey for Transfer and Finding of Suitability for Transfer) to be utilized to meet CERCLA and 40 CFR 373 notice requirements so that transferee(s) is given notice of existing site conditions.

EPA appreciates the coordination efforts of the Navy and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the excellent working relationship with NAS Cecil Field and Southern Division Naval Facilities Engineering

Command as we move toward a final cleanup of the NPL site. Should you have any questions, or if EPA can be of any further assistance, please contact Ms. Deborah Vaughn-Wright, of my staff, at the letterhead address or at (404) 562-8539.

Sincerely,

Richard D. Green
Director
Waste Management Division

cc: Mr. James Crane, FL DEP
Mr. Eric Nuzie, FL DEP
Mr. David Grabka, FL DEP
Mr. Mark Davidson, SOUTHDIV
Ms. Allison Abernathy, FFRO/OSWE
David Levenstein, FFEO/OECA
Sherri Fields, EAD

REVISION 1
JANUARY 2001

RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
FOR

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 039

JANUARY 2001

PREPARED UNDER THE SUPERVISION OF:

Mark P Speranza

MARK SPERANZA, P.E.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMITTAL BY:

Debbie Wroblewski

DEBBIE WROBLEWSKI
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

CERTIFICATION OF TECHNICAL
DATA CONFORMITY

The Contractor, Tetra Tech NUS, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-94-D-0888 are complete and accurate and comply with all requirements of this contract.

DATE: January 5, 2001

NAME AND TITLE OF CERTIFYING OFFICIAL: Mark Speranza, P.E.
Task Order Manager

TABLE OF CONTENTS

TABLES

FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services, Inc.
ARAR	Applicable or Relevant and Appropriate Requirement
AS	air sparging
AS/VE	air sparging/vapor extraction
BCT	BRAC Cleanup Team
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BOD	biochemical oxygen demand
BRA	baseline risk assessment
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CA	Contamination Assessment
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic foot/feet per minute
CFR	Code of Federal Regulations
COC	chemical of concern
COD	chemical oxygen demand
COPC	chemical of potential concern
CSF	Cancer Slope Factor (U.S. EPA)
DCA	dichloroethane
DCE	dichloroethene
DO	dissolved oxygen
DON	Department of the Navy
DPT	direct push technology
EE	Envirodyne Engineers
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
FID	Flame Ionization Detector
FOC	fraction organic carbon
FS	Feasibility Study
ft	foot/feet
ft^2	square foot/feet
ft^3	cubic foot/feet

GCTL	Groundwater Cleanup Target Levels (FDEP)
GAC	granular activated carbon
gpm	gallons per minute
G&M	Geraghty & Miller
HLA	Harding Lawson Associates
HQ	Hazard Quotient
HRC®	hydrogen-releasing compound
HSWA	Hazardous Substances and Wastes Amendment
IAS	Initial Assessment Study
IBDS	NAS Cecil Field Site-Specific Inorganic Background Data Set
ILCR	incremental lifetime cancer risk
KAG	Kerosene Analytical Group
LDRs	Land Disposal Restrictions
LUCs	Land Use Controls
LUCIP	Land Use Control Implementation Plan
MCL	Maximum Contaminant Level (U.S. EPA)
µg/L	microgram per liter
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NCP	National Oil and Hazardous Waste Contingency Plan
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NPL	National Priority List
NPW	net present worth
NSPS	New Source Performance Standards
O&M	operation and maintenance
ORC®	oxygen-release compound
ORP	oxidation/reduction potential
OSHA	Occupational Safety and Health Act
OSWER	Office of Solid Waste and Emergency Response (U.S. EPA’s)
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PQL	practical quantitation limit
PRB	permeable reactive barrier
PRE	Preliminary Risk Evaluation

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by the Navy, U.S. EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Navy's substantial good-faith compliance with the specific LUC maintenance commitments reflected therein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, is cost effective, and complies with Federal and State requirements that are legally applicable or relevant and appropriate to remedial action. The nature of the selected remedy for Sites 36 and 37 is such that, applicable or relevant and appropriate requirements (ARARs) will be met in the long-term as residual concentration of contaminants in the groundwater are reduced through natural attenuation with monitoring. The remedy utilizes permanent solutions and satisfies the statutory preferences for remedies that employ treatment to reduce toxicity, mobility, or volume as a principal element. Because this remedy would result in hazardous substances remaining onsite above health-based levels, a review will be conducted within 5 years of the commencement of remedial actions to ensure that the remedy continues to provide adequate protection of human health.

1.6 DATA CERTIFICATION CHECKLIST

The information summarized on Table 1-1 is included in Section 2.0: Decision Summary of this ROD. Additional information, if required, can be found in the Administrative Record for Sites 36 and 37.

1.7 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

_______________________________ _______________

Scott A. Glass, P.E. Date
Base Realignment and Closure
Environmental Coordinator

TABLE 1-1

**DATA CERTIFICATION CHECKLIST
SITES 36 AND 37 RECORD OF DECISION
NAS CECIL FIELD – JACKSONVILLE, FLORIDA**

Information	ROD Reference
Chemicals of Concerns (COCs) and thier respective concentrations	Section 2.6 and Table 2-1, pages 2-29 and 2-30
Baseline risk represented by the COCs	Table 2-1, page 2-30
Preliminary Remedial Goals (PRGs) established for COCs	Section 2.7, pages 2-31 and 2-32
Disposition of source materials constituting principal threat	Section 2.10.2 Component 2, page 2-50
Current and reasonably anticipated future land and groundwater use scenarios used in baseline risk assessment and ROD	Sections 2.10.2, pages 2-56 and 2-57
Potential land and groundwater uses available at he site as a result of the selected remedy	Section 2.10.4, Component 4, page 2-58
Estimated capital, operating and maintenance (O&M), and total present worth costs of selected remedy and timeframe over which these costs are projected	Section 2.10.3, page 2-58
Key factors which lead to the selection of the remedy	Section 2.10.1, page 2-49

2.0 DECISION SUMMARY

2.1 SITES NAME, LOCATION, AND DESCRIPTION

NAS Cecil Field is located 14 miles southwest of Jacksonville, Florida, as shown on Figure 2-1. The majority of Cecil Field is located within Duval County. The southernmost part of the facility is located in Clay County. NAS Cecil Field was established in 1941 and provided facilities, services, and material support for the operation and maintenance of naval weapons, aircraft, and other units of the operation forces as designated by the Chief of Naval Operations. NAS Cecil Field was closed in September 1999. Most of the facility has been transferred to the Jacksonville Port Authority and the city of Jacksonville. According to the reuse plan, the facility will have multiple uses but will be used primarily for aviation-related activities.

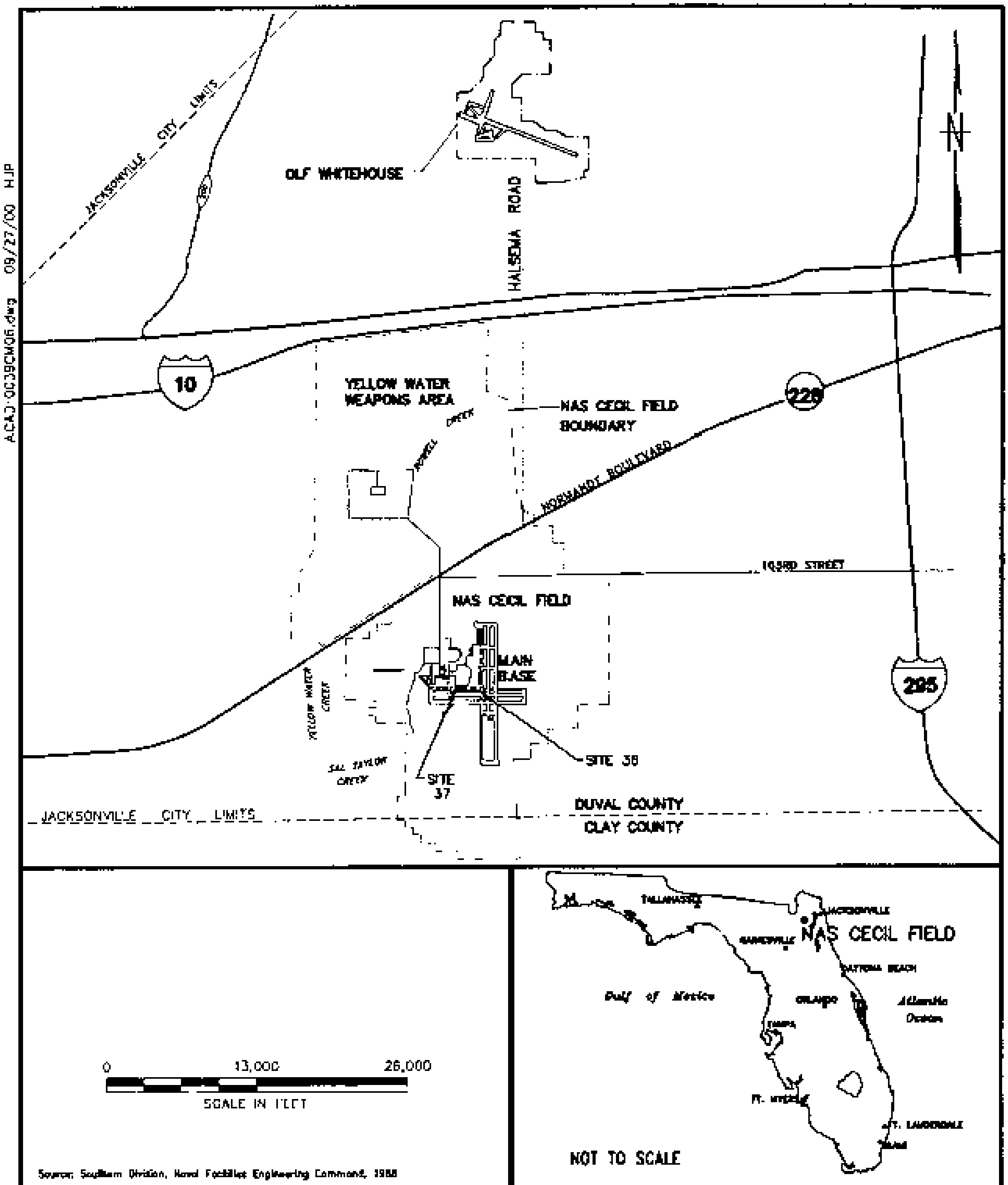
OU 9 consists of the groundwater contamination identified at Site 36, Control Tower TCE Plume and Site 37, Hangars 13 and 14 DCE Plume which are located side by side immediately north of the East-West Runway and south of Crossover Street (formerly Second Street), as shown on Figure 2-2. This ROD addresses the remedy selected for groundwater contamination at OU 9.

Site 36 consists of a groundwater plume which is contaminated with aromatic and chlorinated VOCs and is located south of the Control Tower (Building 82). Site 37 consists of a groundwater plume which is contaminated with aromatic VOCs, chlorinated VOCs, and has concentrations of dissolved iron and manganese. The plume is located south of Hangars 13 and 14. The two contaminant plumes overlap and cover an area of about 67 acres extending in a south-southeast direction towards the intersection of the East-West and North-South Runways.

At Site 37, there is also an area of soil contaminated with aromatic VOCs south of Hangar 14. This area is being cleaned up under the FDEP Petroleum Contaminated Site regulation and will not be addressed in this ROD. No other contaminated soil was identified at OU 9.

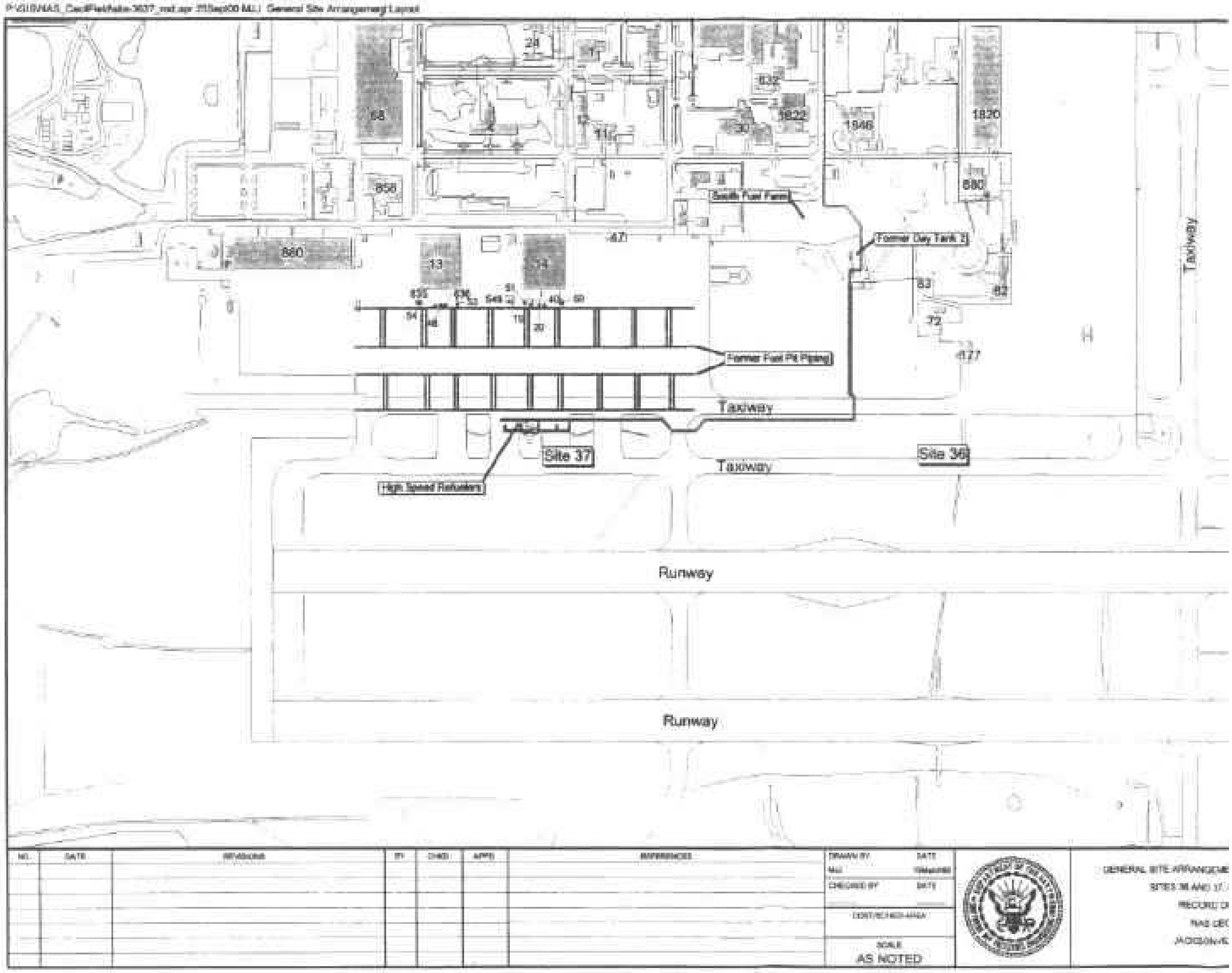
Buildings in this area have been primarily associated with maintenance and servicing of aircraft. Roads, taxiways, runways, and parking aprons cover most of the area. A relatively large (22 acres) unpaved and grass-covered area lies between the two sites. There are also a few grass-covered areas between taxiways and runways. Reuse for Sites 36 and 37 will continue to be aviation-related.

Most buildings at Site 36 were constructed from 1943 to 1968. The Air Traffic Control Tower was built in 1954. Several fuel storage tanks, known as the South Fuel Farm (SFF), operated adjacent to Site 36 in



DRAWN BY HJP DATE 9/27/00		SITE LOCATION MAP RECORD OF DECISION SITES 36 AND 37, OPERABLE UNIT 9 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 0039
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1 REV. 0

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


24
68
832
1822
1946
1820
30
856
880
South Fuel Farm
Former Day Tank 2
47
13
14
83
82
72
427
Former Fuel Pit Piping
Taxiway
Site 37
Site 36
Taxiway
High Speed Refuelers
Runway
Runway
AS NOTED

the 1940’s and 50’s and were removed in 1994. An above-ground fuel storage tank, known as Day Tank 2, also operated adjacent to Site 36 from 1957 to 1996 and was dismantled and removed in 1997.

Most buildings at Site 37 were constructed from 1941 to 1982. Three refueling systems were located to the south of Hangars 13 and 14. Two of these systems were built in the 1940's and were fed from the former SFF. The third system, also known as the East-West High-Speed Refueling System, was built in the late 1950's and was fed from former Day Tank 2.

No disposal facilities were located on the sites. The probable sources of contamination were leaks from tanks or pipelines, spills, and poor housekeeping practices.

Potable water wells are located approximately 1,800 feet (ft) north, or upgradient, from Sites 36 and 37. These wells are screened in the Floridan Aquifer and are not affected by the contamination in the Surficial Aquifer because a confining layer exists between the Floridan and Surficial Aquifer.

2.2 SITES HISTORY AND ENFORCEMENT ACTIVITIES

The first environmental studies for the investigation of waste handling and/or disposal sites at NAS Cecil Field were conducted between 1983 [Geraghty and Miller (G&M), 1983] and 1985 (G&M, 1985). These studies were followed in 1985 by an Initial Assessment Study (IAS) [Envirodyne Engineers (EE), 1985]. A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed in 1988 [Harding Lawson Associates (HLA), 1988].

NAS Cecil Field was placed on the National Priorities List (NPL) by the U.S. EPA and the Office of Management and Budget in December 1989. A Federal Facility Agreement (FFA) for NAS Cecil Field was signed by the FDEP (formerly the Florida Department of Environmental Regulation), U.S. EPA, and the DON in 1990. Following the listing of NAS Cecil Field on the NPL and the signing of the FFA, remedial response activities at the facility have been completed under CERCLA authority. OU 9 is one of twelve operable units that have been identified. A Hazardous and Solid Waste Amendments (HSWA) permit was issued on October 13, 1996. The HSWA permit was renewed on August 25, 2000 and is still in effect.

2.2.1 <u>Sites 36 and 37 History</u>

The flightline has been reconfigured over the course of the base’s existence. The original runway was a 2,000-foot circular dirigible landing mat constructed in 1941. Four 5,000-foot runway extensions were later constructed during the Second World War. Parts of these former runways can be found to the west and south of the East-West Runway.

Site 36

Building 177 (Arresting Gear Building) was constructed in 1943, Building 72 (Crash Fire Station) was constructed in 1951, Building 83 (Lighting Vault) was constructed in 1953, Building 286LS (Lift Station) was constructed around 1968, and Building 82 (Air Traffic Control Tower) was constructed in 1954 [ABB Environmental Services, Inc. (ABB-ES), 1994].

Day Tank 2 was constructed in 1957. The tank was taken out of operation in October 1996 and was dismantled in August 1997. The pumps and piping in the immediate vicinity was also demolished at that time. Fuel was pumped from the tank to the high speed refueling pits south of Hangars 13 and 14 (HLA, 1998a).

Site 37

The buildings near Site 37 were constructed over an extended period of time. Building 13 (Corrosion Control Hangar) and Building 14 (Maintenance Hangar) were constructed in 1941. Building 233 (Aircraft Washrack), Building 48 (Maintenance Aircraft Spare Storage), and Building 47 (Air Terminal Building) were constructed in 1942.

Building 50LN (Line Shack), Building 54 (Operational Storage Facility), Building 53 (Operational Storage Building), Building 52A (Operational Storage Building), Building 56 (Radar Facility Storage), and Building UNF8 (Operational Storage Facility) were constructed in 1949 (ABB-ES, 1994).

Building 267 (Storage Air Operations Department) was constructed in 1959. Building 255 (Administrative Office) was constructed in 1962. Building 565 (Electrical Storage Building) was constructed in 1963.

Building 836LN (Line Shack) and Building 835LN (Line Shack) were constructed in 1967 (ABB-ES,1994).

Building 863 (Electrical Distribution Building) and Building UNF2 (Lockheed Modification Team Equipment Storage) were constructed in 1976. Building 20LN (Line Shack) and Building 19LN (Line Shack) were constructed around 1978, and Building 548LN (Line Shack) was constructed in 1980. Building 547 (Public Works Maintenance Storage) was constructed in 1982 (ABB-ES, 1994).

The dates of construction of Building 40 (Hazardous Flammable Storehouse), Building UNF5 (Applied Instruction Building), and Building UNF3 (Sonabuoy Storage) are unknown (ABB-ES, 1994).

According to NAS Cecil Field drawings, there are three refueling systems located to the south of Hangars 13 and 14. The first system is located closest to the hangars and was built in the 1940s. Fuel was delivered to this system by way of a fuel line that extended west from the SFF. The second set was located immediately south of the first system and was built in the 1940s. This system was also fed from the former storage tanks. One of the site drawings notes that several valves had been closed due to leaks in the piping system. The third system, also known as the East-West High Speed Refueling System, was built in the late 1950s. This system was fed from Day Tank 2 by way of a pipeline that extended south from that tank, passed beneath the taxiway, and then turned west to the refuelers.

All of these buildings were in operation until the closure of the facility.

2.2.2 Previous Investigations

The following investigations and studies were performed in and around Sites 36 and 37. Figure 2-3 shows the location of the samples collected prior to the RI. Figures 2-4 and 2-5 show the RI sampling locations [Tetra Tech NUS, Inc. (TtNUS), 1999].

- 1990 to 1991 - Contamination Assessment (CA was performed by ABB-ES at the SFF. The report (ABB-ES, 1992) was issued in July 1992.

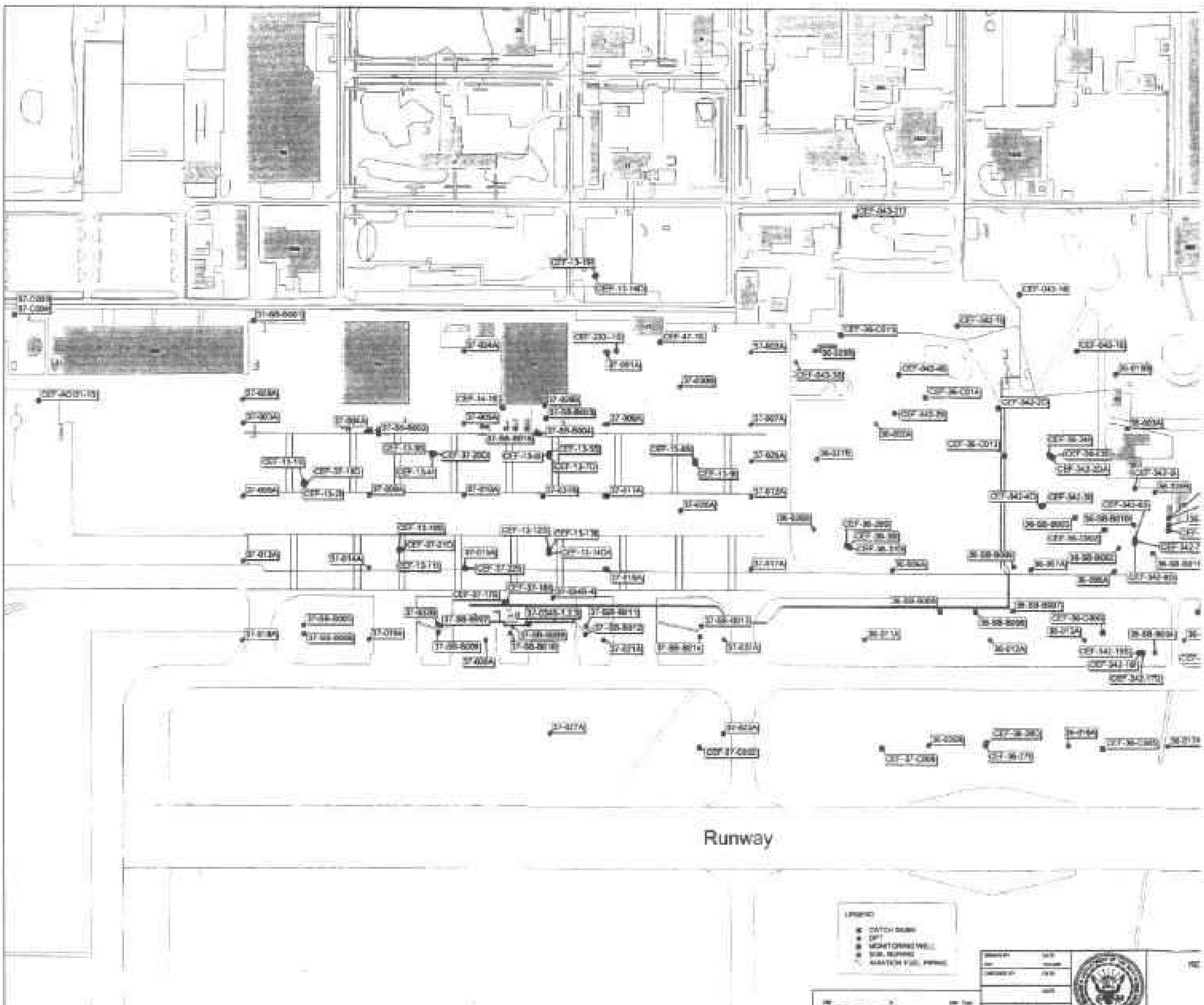
- July 1994 - All tanks in the SFF were removed. This included four underground tanks and three above ground, earth-mounded tanks.

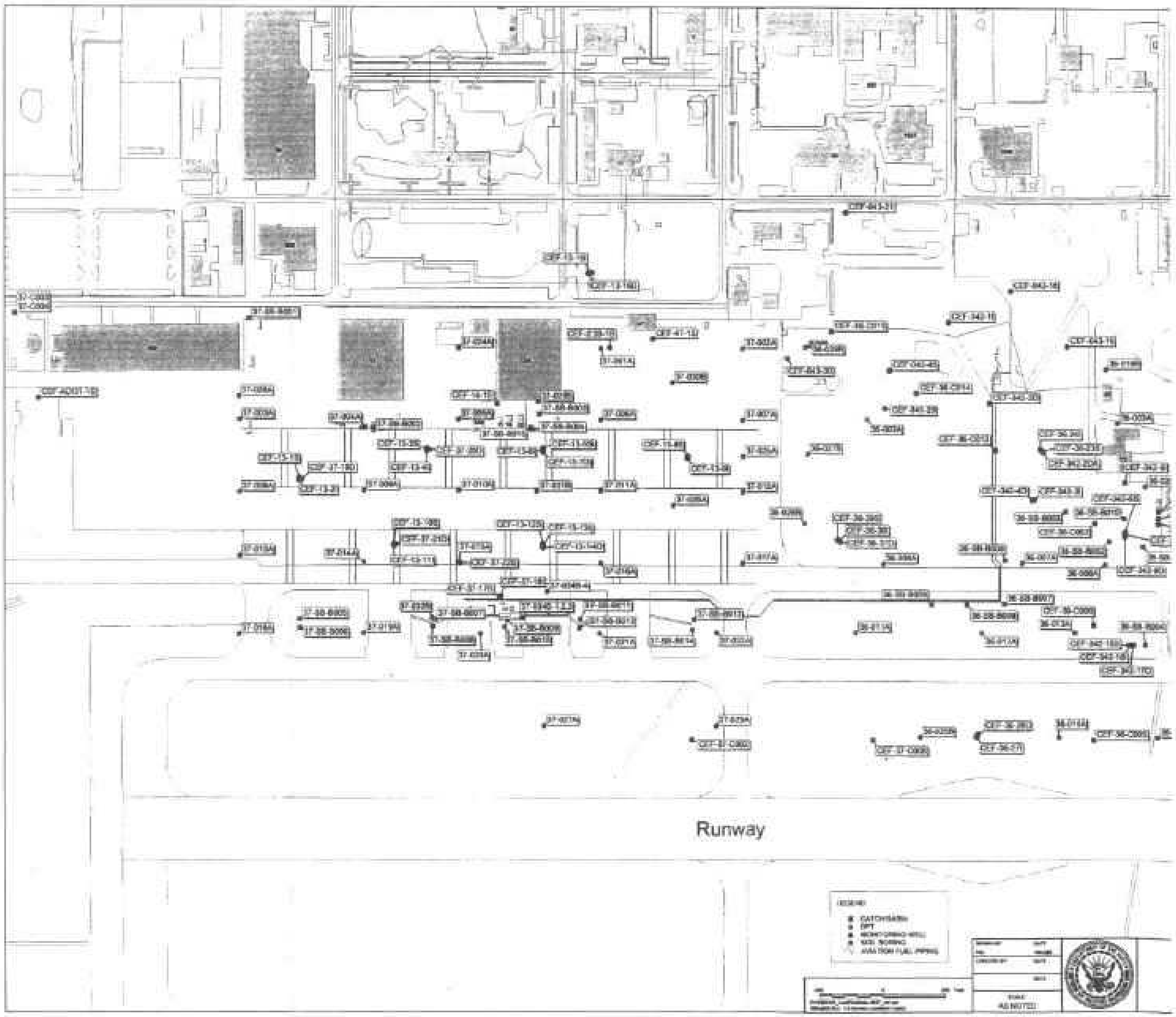
- March 1995 - A supplemental assessment of the SFF was performed by ABB-ES. In January 1996, a CA Report Addendum (ABB-ES, 1996a) was issued for the SFF.

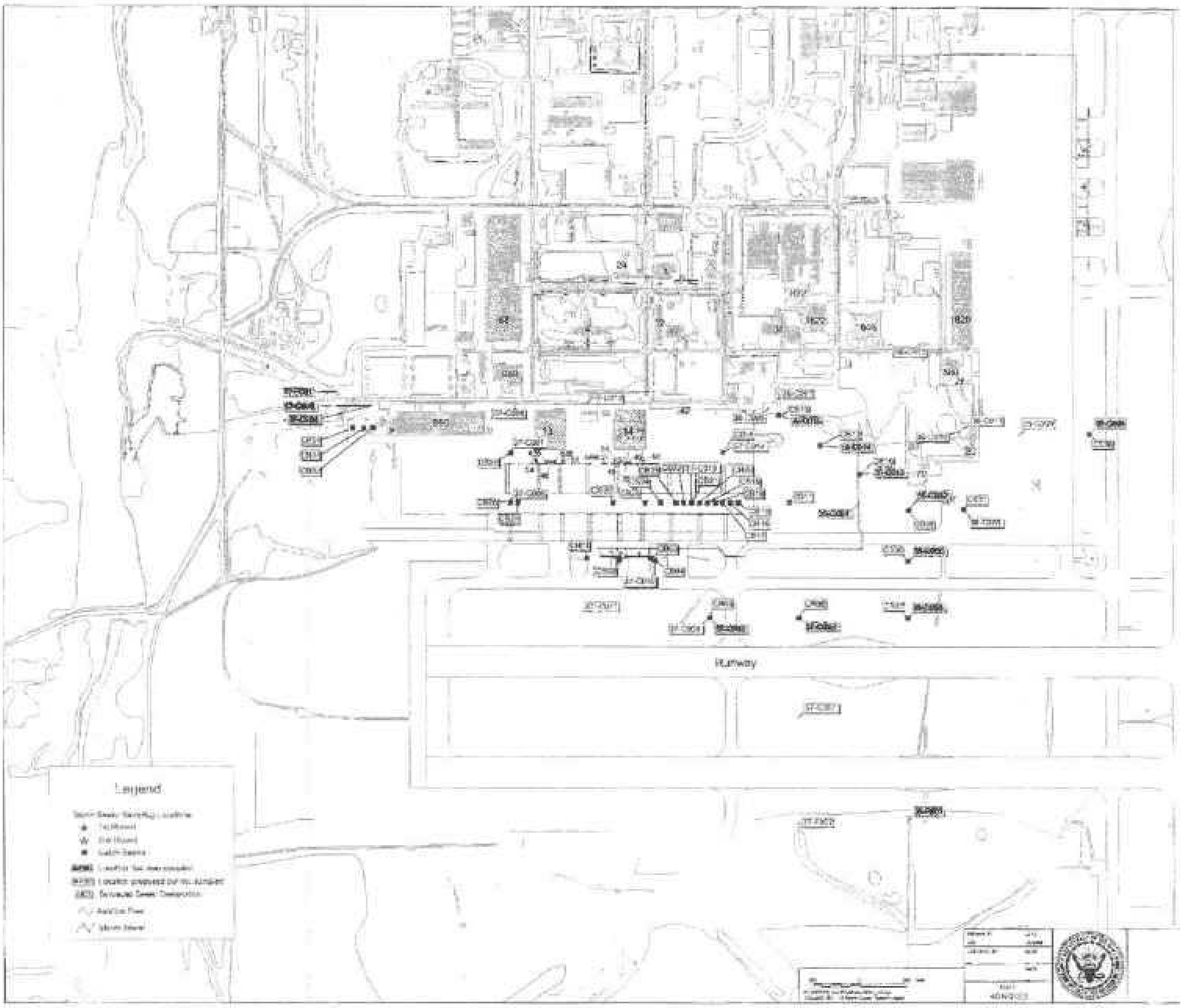
- October 1996 - A Remedial Action Plan (RAP) was submitted for the SFF (ABB-ES, 1996b) to address groundwater contamination. Free-product was also detected in a well south (downgradient) of Day Tank 2. Day Tank 2 was taken out of operation.

- November 1996 - A free-product recovery action at Day Tank 2 using shallow trenches was performed by Bechtel Environmental, Inc. (BEI). This lasted until August 1997. Approximately 34,000 gallons of free product were removed during this activity.

This page intentionally left blank


Runway


Runway



100009/P

- 1996 - Flightline area direct-push technology (DPT) borings and groundwater sampling were performed by ABB-ES as part of the flightline area study. Borings were advanced to 35 ft below ground surface (bgs), and groundwater samples were collected at depths of 10 and 35 ft and analyzed for VOCs. Thirteen borings were advanced in the vicinity of Site 36, and 28 borings were advanced in the vicinity of Site 37. These samples showed the presence of VOCs.

  July 1997 through April 1998 – A site assessment study was performed for Day Tank 2 (HLA, 1998a). This study included 33 shallow soil borings with field Flame Ionization Detector (FID) screening, 6 shallow soil samples for Kerosene Analytical Group (KAG) and Total Recoverable Petroleum Hydrocarbons (TRPH) analysis, and 17 DPT borings with groundwater samples collected at depths of 10, 25, 45, 65, and 85 ft for VOC analysis. Based on the DPTs, 20 monitoring wells were installed in the Day Tank 2 plume. These wells were sampled and analyzed for VOCs and TRPH. Natural attenuation was also evaluated. One sample of water in the storm sewer was sampled and analyzed for VOCs and TRPH. A groundwater benzene, toluene, ethylbenzene, and xylenes (BTEX) plume and a free-product plume were identified. TCE was detected in four Day Tank 2 plume wells. Day Tank 2 was demolished in August 1997 [Supship Portsmouth Environmental Detachment Charleston (SPORTENVDETCHASN), 1997].

- September/October 1997 - Ten DPT borings were advanced near Hangars 13 and 14. Groundwater samples were collected at depths of 10, 25, 45, 65, and 85 ft and analyzed for VOCs. These samples showed the general extent of VOC contamination in the groundwater.

- March 1998 – Four shallow DPTs were advanced at locations of deep DPTs advanced in 1997 during the Day Tank 2 study. Samples were collected from various depths (10, 25, 45, and 65 ft), depending on the location.

- April 1998 – A bioventing and biosparging system was installed and started up by BEI at the SFF.

- May/June 1998 – 16 wells were installed south of Hangars 13 and 14 between the hangars and taxiway. Groundwater samples were analyzed for VOCs and semivolatile organic compounds (SVOCs) and showed the presence of BTEX and halogenated solvents.

- June/July 1998 - Eight additional borings were advanced in the vicinity of Site 36 and groundwater samples were collected from depths of 45, 65, and 85 ft for VOC analysis. Three additional borings were advanced in the vicinity of Site 37 and groundwater samples were collected from depths of 45, 65, and 85 ft and analyzed for VOCs.

- November 1998/January 1999 – As part of the RI (TtNUS, 1999), extensive field investigations were performed at Sites 36 and 37 to better define the nature and extent of groundwater contamination, to locate contaminant source areas, and to investigate the possibility of infiltration of contaminated groundwater into the storm sewer system. The groundwater investigation was conducted in two phases. During the first phase, 63 temporary DPT wells were installed and sampled, including 29 wells at Site 36 and 34 wells at Site 37. Groundwater samples from these wells were analyzed for VOCs on a fast turnaround basis. Based upon the results of the first phase of the groundwater investigation, 20 permanent monitoring wells were sampled and analyzed, including 14 wells at Site 36 and 6 wells at Site 37. Groundwater samples from these wells were analyzed for Target Compound List (TCL) VOCs. Some wells were sampled and analyzed for semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), and pesticides and polychlorinated biphenyls (PCBs); Target Analyte List (TAL) inorganic compounds; TRPH; hardness; total organic carbon (TOC); and natural attenuation parameters. Geological and hydrogeological tests were also performed to establish potential fate and transport mechanisms for contaminants through groundwater. Geological investigations included the collection of lithologic samples from 7 monitoring wells at Site 36 and 3 monitoring wells at Site 37 and collection of soil samples from two borings at Site 36 and two borings at Site 37 to be analyzed for geotechnical parameters, including TOC, fractional organic carbon (FOC), grain size, porosity, specific gravity, and bulk density. Hydrogeological investigations included the performance of specific capacity (SPECAP) and slug tests. SPECAP tests were performed in three monitoring wells at Site 36 and three monitoring wells at Site 37, and a slug test was performed at one monitoring well at Site 36. The contaminant source investigation included the collection of soil samples from 12 borings at Site 36 and 15 borings at Site 37 and analysis of these samples for TCL VOCs, SVOCs, PAHs, pesticides and PCBs; TAL inorganic compounds; TRPH, KAG, VOCs, and SVOCs, as well as engineering parameters including TOC, FOC, grain size, bulk density, specific gravity, and porosity. The storm sewer investigations were performed in two steps, with the first step including the collection of water samples in two catchbasins at Site 36 and one catchbasin at Site 37; and the second step including the collection water samples from five catchbasins at Site 36 and three catchbasins at Site 37 and the collection of water and sediment samples from three sewer outfalls. Catchbasin water samples were analyzed for TCL VOCs and TRPH. Outfall water samples were analyzed for TCL VOCs, TRPH, hardness, and TOC. Outfall sediment samples were analyzed for TCL VOCs, SVOCs, PAHs, and pesticides/PCBs; TAL inorganic compounds; TRPH; and engineering parameters, including TOC, pH, and grain size.

- July 1999/September 2000 – An FS was conducted for contaminated soil at Site 37 and contaminated groundwater at Sites 36 and 37 (TtNUS, 2000a). This FS developed and evaluated several remedial alternatives, including in-situ treatment and removal and off-site disposal for the area of highly contaminated soil south of Hangar 14 at Site 37. The FS also developed and evaluated a wide range of remedial alternative for the combined groundwater contamination plume at Sites 36 and 37. Evaluated alternatives included monitored natural attenuation, in-situ physical/chemical or biological treatment of contaminant source areas, extraction and on-site treatment of contaminant source areas or entire contaminant plume, and permeable reactive barrier (PRB).

- September 2000 – A Proposed Plan (TtNUS, 2000b) was prepared for OU 9, that consists of the combined groundwater contaminant plume at Sites 36 and 37. This Proposed Plan retained as the proposed remedy a combination of in-situ physical/chemical treatment of contaminant source areas, monitored natural attenuation of the remainder of the contaminant plume, institutional controls, and long-term groundwater monitoring.

In addition, several Base Realignment and Closure (BRAC) site studies were performed at locations near or overlying the Sites 36 and 37 plumes. These studies consisted of the collection of several shallow soil samples and occasionally the installation of a shallow monitoring well. Samples were usually analyzed for TCL organic compounds and TAL inorganic compounds. The following is a summary of these BRAC site studies.

- Hangar 14: Four soil samples and one monitoring well were installed in 1995, followed by PCB delineation for soil in 1997. A Sampling and Analysis Report (SAR) was submitted in 1998. The SAR recommended the removal of the PCB contaminated soil. Approximately 37 tons of contaminated soil were removed in 1998.

- AOI 31: AOI 31 was a temporary collection point. Two soil samples were collected and one monitoring well was installed in 1995-1996. A SAR was submitted in 1998. No further evaluation of the site was recommended. The site was further investigated as potential source of contamination (PSC) 31 in 1999. A total of 381.5 tons of contaminated soil was removed in March 2000. A Technical Memorandum for No Further Action was submitted in September 2000.

- Facility 233: One monitoring well was installed in 1995-1996. A SAR was submittedd in 1998. The SAR recommended that the groundwater contamination be evaluated in the context of the flightline groundwater investigation for Sites 36 and 37.

- UNF 6: One monitoring well was installed and one surface water sample and one sediment sample were collected in 1995-1996. A SAR was submitted in 1998. This site was further investigated as part of PSC 44 in 1999-2000. A Technical Memorandum for No Further Action will be submitted in 2001.

- Facility 40: One shallow soil sample was collected in 1995-1996. A SAR was submitted in 1998. No evidence of releases from this facility was identified. No further evaluation is necessary for this site.

- Facility 314: Two soil samples were collected in 1995. This facility was further investigated as PSC 52. Approximately 70 tons of contaminated soil were removed in February 2000. A Technical Memorandum for No Further Action was submitted in September 2000.

- Facilities 72 and 177: Nine soil samples were collected in 1996 through 1997. One shallow monitoring well was installed near an underground storage tank (UST) at Facility 72 and analyzed for KAG compounds. This area was further investigated as PSC 46 and approximately 386 tons of contaminated soil were removed in August 2000. A Technical Memorandum for No Further Action will be submitted in 2001.

- Facility 83: Twelve soil samples were collected and one monitoring well was installed in 1995-1996. A SAR was submitted in 1998. Approximately 833 tons of contaminated soil were removed in November 1988 and no further action is required.

An investigation of the flightline runway area (Area MB 18) was also performed in 1998 by ABB-ES. This included the collection of 13 soil samples, 14 sediment samples downstream of storm sewer outfalls, and 14 water samples from storm sewers during dry weather conditions. The samples were analyzed for TCL organic compounds and TAL inorganic compounds. Of these locations, only three of the outfalls were potentially affected by Sites 36 or 37.

Several continuing investigations of the BRAC sites are still in progress. These studies include the flightline outfalls and ditches (PSC 39), the drainage ditches to the west of the flightline (PSC 44), continued delineation of soil contamination for PAHs at Facilities 72 and 177 (PSC 46), PAH’s at Building 314 (PSC 52), and PCBs near Runway 9L (PSC 38).

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public notices of the availability of the Proposed Plan (TtNUS, 2000b) were placed in the Metro section of the *Florida Times-Union* on September 9, 2000. A 30-day comment period was held from September 11 through October 10, 2000. The results of the RI (TtNUS, 1999) and Preliminary Risk Evaluation (PRE), the remedial alternatives of the FS (TtNUS, 2000a), and the preferred alternative of the Proposed Plan (TtNUS, 2000b) were also presented and discussed at a Remedial Advisory Board (RAB) meeting held on April 25, 2000, during which comments were solicited from the community. To date, no public comments have been received.

Documents pertaining to OU 9 are available to the public at the Information Repository located at Building 907, 13357 Lake Newman Street, Cecil Commerce Center, Jacksonville, Florida 32252 [Tel (904) 573-0336]. This ROD will become part of the Administrative Record File [NCP §300.825(a)(2)].

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The environmental concerns at NAS Cecil Field are complex. As a result, work at the 24 sites has been organized into twelve OUs. More than 200 other areas are undergoing evaluation in the BRAC and Underground Storage Tank (UST) petroleum programs.

This ROD is the final action for OU 9. Final RODs have been approved for OU1; OU 2, OU 3; OU 4; OU 5, Site 14; OU 7; OU6; and OU 8. An RI, BRA, and FS have also been prepared for OU 5, Site 15 but the FS is currently being re-evaluated. RI/FS are underway for OU 10 and OU 11.

Investigations at OU 9, Sites 36 and 37 indicated the presence of groundwater contamination from past operating practices. This contamination could pose an unacceptable human health risk if the groundwater was used as a potable water source. Potential migration of contaminated groundwater to surface drainage ditches and, eventually to Sal Taylor Creek could also cause adverse effects on aquatic organisms.

The following Remedial Action Objectives (RAOs) were established for groundwater at OU 9, Sites 36 and 37:

- Prevent unacceptable risks from human exposure to contaminated groundwater at Sites 36 and 37,
- Prevent contaminant migration from groundwater to surface water at Site 36, and
- Restore surficial aquifer quality at Sites 36 and 37 to meet PRGs.

The remedy documented in this ROD will achieve these RAOs for groundwater.

2.5 SUMMARY OF SITES CHARACTERISTICS

Contaminant sources, detections, fate and transport, contaminated media, and geologic and hydraulic conditions of OU 9 are discussed in Sections 4.0, 5.0, and 6.0 of the OU 9 RI report (TtNUS, 1999). These site characteristics are summarized in the following paragraphs.

2.5.1 Geology and Hydrogeology

The subsurface at Sites 36 and 37 is composed primarily of silty very fine sand to approximately 90 to 95 ft bgs. Below this silty sand is a layer of limestone. The surficial aquifer system extends from the water table at approximately 5 ft bgs to the top of the limestone layer at approximately 90 to 95 ft bgs. Hydraulic conductivity was measured by SPECAP tests to range from 0.8 to 4 ft/day in shallow wells up to 96 ft/day in deep wells. Groundwater is interpreted to flow to the southeast.

2.5.2 Nature and Extent of Groundwater Contamination

Groundwater contamination has been detected at Sites 36 and 37 in overlapping contaminant plumes (TtNUS, 1999). For the purpose of this ROD, these plumes are considered as a single combined contaminant plume, as was done in the FS (TtNUS, 2000a).

Site 36

Non-chlorinated VOCs, primarily BTEX, were detected in excess of FDEP criteria and Federal Maximum Contaminant Levels (MCLs) in an area approximately 2,300 ft long and 400 ft wide extending in a south-southeast direction from the former Day Tank 2. Highest BTEX concentrations were detected in the upper zone of the intermediate surficial aquifer (30 to 50 ft bgs). Maximum benzene detection [2,180 micrograms per liter (μg/L)] occurred at a location approximately 300 ft east-southeast of Building 72. These BTEX are attributable to fuels that leaked from this tank, and possibly from the adjacent former SFF.

Chlorinated VOCs, primarily TCE, were also detected in excess of FDEP criteria and Federal MCLs. Highest chlorinated VOCs concentrations were detected in the upper intermediate and deep (70 to 90 ft bgs) zones of the surficial aquifer. Maximum TCE detection (128 μg/L) occurred in the deep zone of the surficial aquifer at a location approximately 570 ft south of Building 72. No specific source of chlorinated compounds could be identified, and the compounds appear to be the result of past spills and leaks rather than a former disposal facility.

Several PAHs, such as naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were also detected in excess of FDEP criteria at several locations close to the SFF and Day Tank 2 source areas. PAHs detections were essentially limited to the shallow (5 to 30 ft bgs) and upper intermediate zones of the surficial aquifer. Maximum PAH detection (74 μg/L naphthalene) occurred in the upper intermediate zone of the surficial aquifer at a location approximately 600 ft west-southwest of Building 72.

Only one inorganic compound (iron) was detected in a single unfiltered sample at a concentration (8,650 μg/L) slightly in excess of the NAS Cecil Field Site-Specific Inorganic Background Data Set (IBDS) concentration (7,760 μg/L) (HLA, 1998b). This occurred in the shallow zone of the surficial aquifer at a location approximately 570 ft south of building 72.

Site 37

Non-chlorinated VOCs, primarily BTEX, were detected in excess of FDEP criteria and Federal MCLs at many locations over two overlapping large areas. One of these areas is approximately 1,200 ft long by 600 ft wide and extends in an east-west direction immediately south of Hangars 13 and 14. The other area is approximately 1,600 ft long by 300 ft wide and extends in a south-southeast direction between Sites 36 and 37. Highest BTEX concentrations were detected in the shallow zone of the surficial aquifer. Maximum benzene detection (7,340 μg/L) occurred at a location approximately 150 ft south of Hangar 14. BTEX contamination is attributable to leaking fuels lines and possible spills at plane fueling stations.

Chlorinated VOCs, including 1,1-DCE and 1,1-dichloroethane (DCA), were also detected above FDEP criteria and Federal MCLs but in a relatively limited number of wells and these detections appear to be a localized problem. Highest chlorinated VOCs concentrations were detected in the upper intermediate zone of the surficial aquifer. Maximum 1,1-DCE detection (3,640 μg/L) occurred at a location approximately 150 ft due south of Hangar 14. Chlorinated VOC contamination appears to be the result of past spills and leaks rather than a former disposal facility.

As previously mentioned, an area of highly-contaminated soil was identified in an unpaved area immediately south of Hangar 14. The contamination is limited to fuel-related compounds and will be addressed under the State of Florida petroleum program.

Several SVOCs, including acenaphthene, carbazole, fluorene, 1- and 2-methylnaphthalene, 2- and 4-methylphenol, naphthalene, and phenanthrene were detected above FDEP criteria. These SVOCs were only detected at a few locations in the shallow zone of the surficial aquifer. Maximum SVOC detection (202 μg/L naphthalene) occurred at a location approximately 450 ft east-southeast of Hangar 14.

Two inorganic compounds, including iron and manganese, were detected in excess of NAS Cecil Field IBDS concentrations (7,760 μg/L for iron, 150 μg/L for manganese) (HLA, 1998b). Maximum iron detection (17,500 μg/L) occurred in an unfiltered sample collected in the shallow zone of the surficial aquifer at a location approximately 150 ft southwest of Hangar 13. Maximum manganese detection (237 μg/L) occurred in the same sample.

Combined Contaminant Plume

The volume of groundwater containing benzene in excess of 1 μg/L is estimated at 104,700,000 cubic feet (ft^3) or 784 million gallons. The location and extent of this combined contaminant plume is illustrated on Figure 2-6. Within this combined plume, the volume of groundwater containing TCE in excess of 3 μg/L is estimated at 8,357,000 ft^3 or 62.5 million gallons.

Within this combined contaminant plume, "Hot-Spots" have been defined as contamination source areas where benzene and/or TCE concentrations exceed 1,000 μg/L and 100 μg/L, respectively (TtNUS, 2000a). As shown on Figure 2-6, three such contaminant "Hot-Spots" have been identified and approximately delineated:

- "Hot-Spot" No.1 is an area of elevated BTEX concentrations approximately 31,000 square feet (ft^2) and 1,600,000 gallons in size located immediately southwest of Building 72 at Site 36,

- "Hot-Spot" No.2 is an area of elevated chlorinated VOCs concentrations approximately 75,000 ft^2 and 3,256,000 gallons in size located south-southeast of Building 72 at Site 36, and

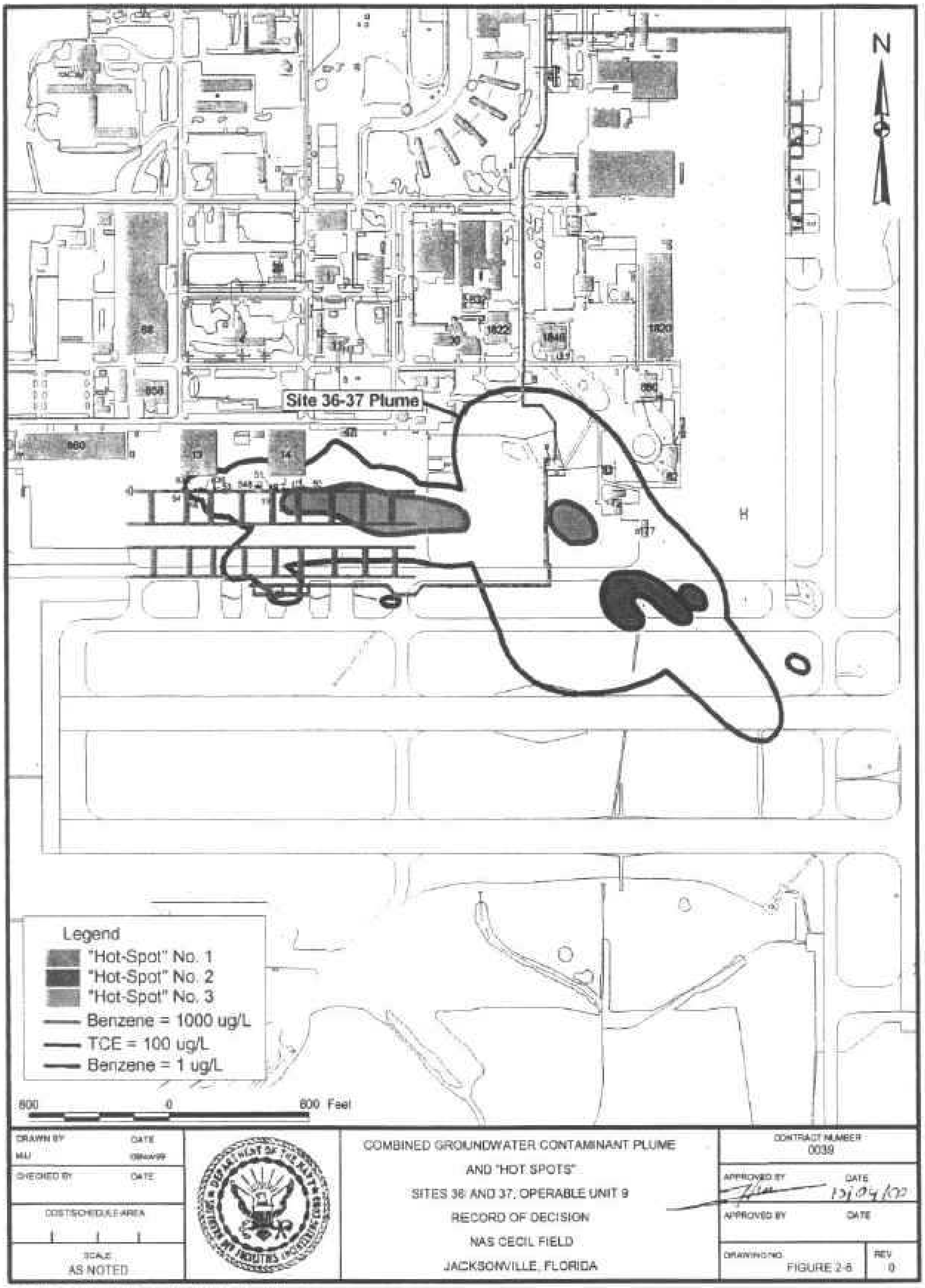
- "Hot-Spot" No.3 is an area of elevated BTEX and chlorinated VOCs concentrations approximately 160,000 ft^2 and 9,356,000 gallons in size located immediately south of Hangars 13 and 14 at Site 37.

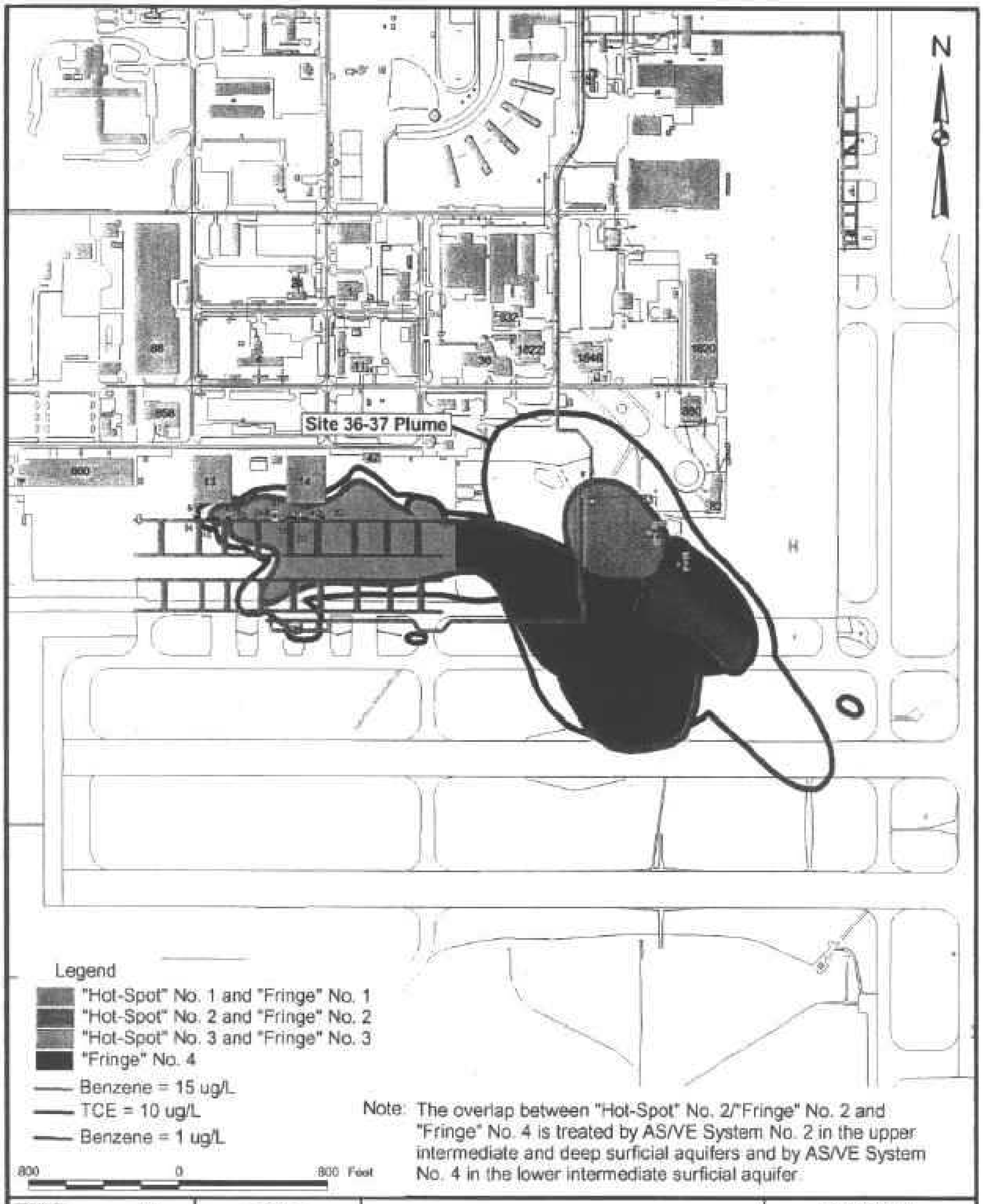
In addition to these three "Hot-Spots", several other areas of relatively high groundwater contamination have been defined and designated as "Fringes" and "Extended Fringes."

A "Fringe" is defined as an area of groundwater where benzene and/or TCE concentrations range from 1,000 to 15 μg/L and from 100 to 10 μg/L, respectively. An "Extended Fringe" is defined as an area of groundwater where benzene and/or TCE concentrations range from 1,000 to 10 μg/L and from 100 to 6 μg/L, respectively (TtNUS, 2000a). Four such "Fringes" and "Extended Fringes" have been identified, as shown on Figures 2-7 and 2-8, respectively:

- "Fringe" No. 1 (approximately 171,000 ft^2 and 6,774,000 gallons) and "Extended Fringe" No. 1 (approximately 250,000 ft^2 and 8,570,000 gallons), which are associated with "Hot-Spot" No.1,

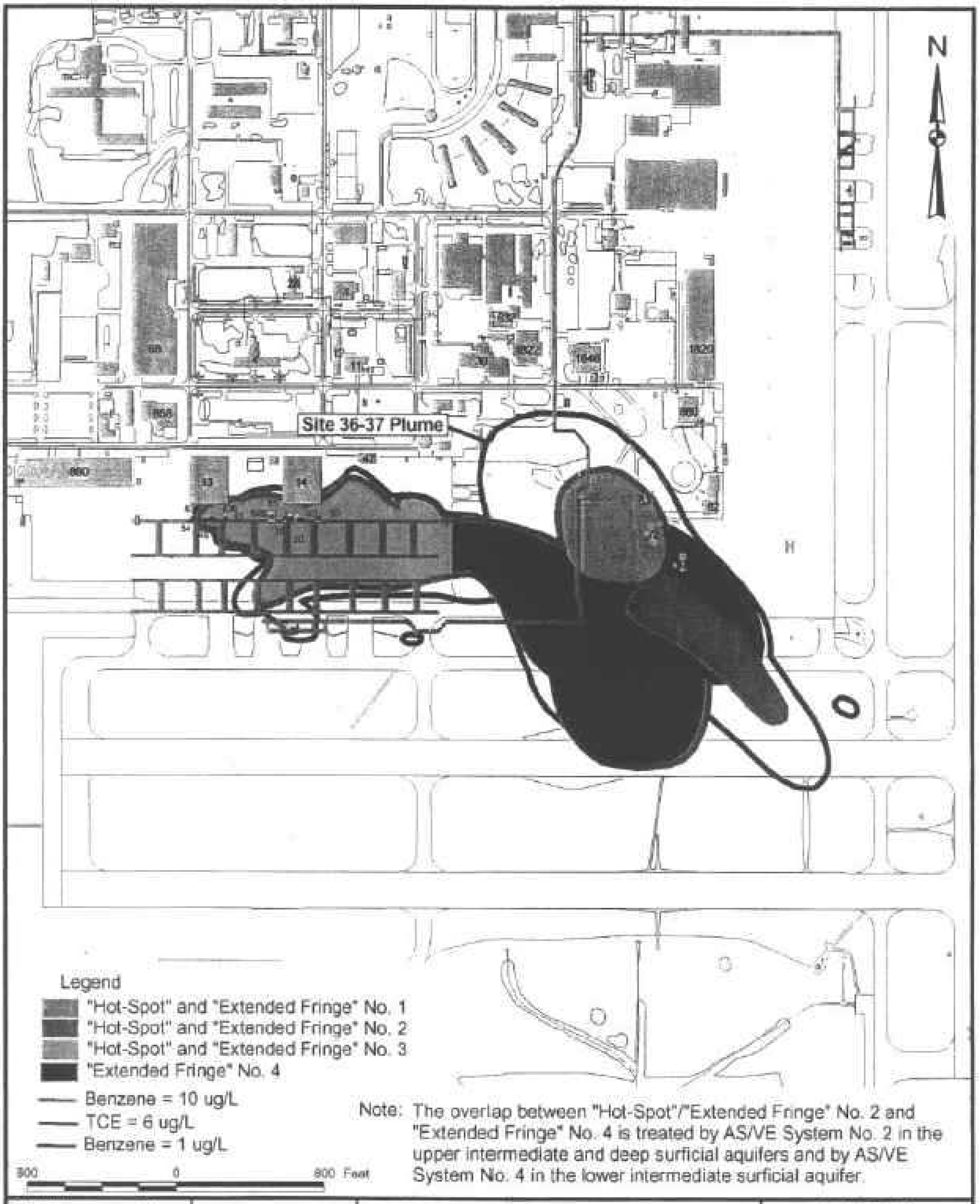
- "Fringe" No. 2 (approximately 85,000 ft^2 and 4,641,000 gallons) and "Extended Fringe" No. 2 (approximately 145,000 ft^2 and 7,610,000 gallons), which are associated with "Hot-Spot" No. 2,


N
Site 36-37 Plume
Legend
"Hot-Spot" No. 1
"Hot-Spot" No. 2
"Hot-Spot" No. 3
Benzene = 1000 ug/L
TCE = 100 ug/L
Benzene = 1 ug/L
600 0 600 Feet
DRAWN BY MJJ
CHECKED BY
COST/SCHEDULE AREA
SCALE AS NOTED
COMBINED GROUNDWATER CONTAMINANT PLUME
AND "HOT SPOTS"
SITES 36 AND 37, OPERABLE UNIT 9
RECORD OF DECISION
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NUMBER 0039
APPROVED BY
DATE
DRAWING NO. FIGURE 2-6
REV 0



Note: The overlap between "Hot-Spot" No. 2/"Fringe" No. 2 and "Fringe" No. 4 is treated by AS/VE System No. 2 in the upper intermediate and deep surficial aquifers and by AS/VE System No. 4 in the lower intermediate surficial aquifer.

DRAWN BY MJJ DATE	COMBINED GROUNDWATER CONTAMINANT PLUME "HOT SPOTS" AND "FRINGES" SITES 36 AND 37, OPERABLE UNIT 9 RECORD OF DECISION NAS CECIL FIELD, JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY DATE		APPROVED BY DATE
COST/SCHEDULE-AREA		APPROVED BY DATE
SCALE AS NOTED		DRAWING NO. FIGURE 2-7 REV 0



DRAWN BY MJJ / DATE 09Nov99		COMBINED GROUNDWATER CONTAMINANT PLUME	CONTRACT NUMBER 0039
CHECKED BY / DATE		"HOT SPOTS" AND "EXTENDED FRINGES"	APPROVED BY / DATE 10/26/00
COST/SCHEDULE-AREA		SITES 36 AND 37, OPERABLE UNIT 9	APPROVED BY / DATE
		RECORD OF DECISION	
SCALE AS NOTED		NAS CECIL FIELD, JACKSONVILLE, FLORIDA	DRAWING NO. FIGURE 2-8 / REV 0

P:\GIS\NAS_CecilField\site-3637_rod.apr 03Oct00 MJJ I-07 Layout Hotspot & Fringe

- "Fringe" No. 3 (approximately 280,000 ft^2 and 20,284,000 gallons) and "Extended Fringe" No. 3 (approximately 340,000 ft^2 and 24,888,000 gallons), which are associated with "Hot-Spot" No. 3, and

- "Fringe" No. 4 (approximately 985,000 ft^2 and 42,852,000 gallons) and "Extended Fringe" No. 4 (approximately 1,156,000 ft^2 and 50,748,000 gallons), which are not associated with a specific "Hot-Spot" and extend in a south-southeast direction between Sites 36 and 37.

2.6 SUMMARY OF SITE RISKS

A Preliminary Risk Evaluation (PRE) was conducted as part of the RI (TtNUS, 1999) to assess human health risk. A PRE is a screening level evaluation that uses maximum concentrations and conservative exposure scenarios. As such, a PRE is typically more protective than a BRA would be for the same site.

The PRE identified a number of chemicals in the groundwater at Sites 36 and 37 as a concern to human receptors. As summarized in Table 2-1, analytical groundwater data for the site were compared to the USEPA's current Drinking Water Standards (U.S. EPA, 1998), FDEP Groundwater Cleanup Target Levels (GCTLs) (FDEP, 1999) as provided in the Florida Administrative Code (FAC 62-777, August 1999), and the NAS Cecil Field site-specific IBDS screening criteria (HLA, 1998b).

For each Chemical of Potential Concern (COPC), Table 2-1 provides a Risk Ratio, which is the ratio of the maximum detected concentration of that chemical over its FDEP's risk-based criterion. For carcinogenic chemicals, the risk-based criterion is that concentration which corresponds to an incremental lifetime cancer risk (ILCR) of 1.0E-06 and for non-carcinogenic chemicals, the risk-based criterion is that concentration which correspond to a Hazard Quotient (HQ) of 1.0. Accordingly, the Risk Ratio provides a basis for determining the risk associated with the maximum detected concentration of a given COPC. For example, Table 2-1 indicates that the Risk Ratio for carcinogenic benzene is 6,100 and this corresponds to an ILCR of 1.0E-06 multiplied by 6.1E03, which is equal to 6.1E-03. A Risk Ratio greater than unit suggests an exceedance of the FDEP's target risks.

TABLE 2-1

GROUNDWATER CHEMICALS DETECTED ABOVE HUMAN HEALTH SCREENING CRITERIA
RECORD OF DECISION
OPERABLE 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA

Chemical	Frequency of Detection[1]	Maximum Detected Concentration	NAS Cecil Field Screening Criterion[2]	USEPA Criterion[3]	FDEP Health-Based Criterion[4]	FDEP Risk-Based Criterion[5]	Risk Ratio[6]
CARCINOGENIC VOLATILE ORGANIC COMPOUNDS (μg/L)							
Benzene	28/36	7,340	NA	5 MCL	1 P	1.2	6,100
1,1-Dichloroethane	2/36	765.5	NA	NA	70 M	1,250	0.6
1,1-Dichloroethene	2/36	3,640	NA	7 MCL	7 P	0.06	60000
Cis-1,2-dichloroethene	2/36	102	NA	70 MCL	70 P	70	1.5
1,2-Dichloroethane	1/36	36.1	NA	5 MCL	3 P	0.38	95
1,1,2-Trichloroethane	1/36	54.95	NA	5 MCL	5 P	0.6	92
Tetrachloroethene	1/36	17.7	NA	5 MCL	3 P	0.7	25
Trichloroethene	5/36	117	NA	5 MCL	3 P	32	37
Vinyl Chloride	1/36	27.2	NA	2 MCL	1 P	0.02	1,360
NON-CARCINOGENIC VOLATILE ORGANIC COMPOUNDS (μg/L)							
Ethylbenzene	18/36	946	NA	700 MCL	30 S	700	1.4
Toluene	13/36	6,290	NA	1,000 MCL	40 S	1,400	4.5
Xylene	14/36	1,530	NA	10,000 MCL	20 S	14,000	0.1
NON-CARCINOGENIC SEMI-VOLATILE ORGANIC COMPOUNDS (μg/L)							
1-Methylnaphthalene	3/7	47.1	NA	NA	20 O	140	0.3
2-Methylnaphthalene	3/7	67.1	NA	NA	20 O	280	0.2
Naphthalene	3/7	202	NA	NA	20 O	140	1.4
2-Methylphenol	1/7	11	NA	NA	35 M	350	0.03
3&4-Methylphenol	2/7	34.2	NA	NA	4 PQL	35	0.98
PESTICIDES & PCB (μg/L)							
None detected above screening levels							
INORGANIC COMPOUNDS (μg/L)							
Iron	7/7	17,500	7,760	300 SMCL	300 S	2,100	8.3
Manganese	6/7	237	96.2	50 SMCL	50 S	161	1.5

1 Number of samples in which the chemical was detected over the total number of samples analyzed.
2 NAS Cecil Field screening criteria values established by the Cecil Field Partnering Team (IBDS).
3 Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL).
4 FDEP published health-based Groundwater Cleanup Target Levels (Chapter 62-777 FAC, August 1999).
5 FDEP risk-based Groundwater Cleanup Target Level for industrial exposure (Chapter 62-777 FAC, August 1999)
6 Ratio of maximum detected concentration to FDEP risk-based criterion
NA Not Available
P Primary Standard
S Secondary Standard
M Minimum Standard (Risk-based)
O Organoleptic
PQL Practical Quantitation Limit

The following compounds were detected in the groundwater above their respective site-specific criteria and were retained as chemicals of concern (COCs) in the RI (TtNUS, 2000a):

- Benzene
- Ethylbenzene
- Toluene
- Xylene
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- 1,1,2-Trichloroethane (1,1,2-TCA)
- Vinyl Chloride
- ci2-1,2-Dichloroethene (cis-1,2-DCE)
- 1,1-Dichloroethane (1,1-DCA)
- 1,2-Dichloroethane (1,2-DCA)
- 1,2-Dichloroethene (1,1-DCE)
- Naphthalene
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- 2-Methylphenol
- 3-Methylphenol
- 4-Methylphenol
- Iron
- Manganese

It should be noted that since there are no indication that the presence of iron and manganese results from site activities, these two chemicals should normally not be considered as COCs. However, because the presence of elevated concentrations of chlorinated VOCs could create anaerobic and reductive conditions that would significantly increase iron and manganese mobility, these chemicals will be considered as COCs in areas of groundwater with both elevated iron and manganese concentrations and exceedances of chlorinated VOCs. The only such area at Sites 36 and 37 is the contaminant “Hot-Spot” located immediately south of Hangar 14.

Because Sites 36 and 37 lack suitable habitat for wildlife and exposure of ecological receptors to groundwater is extremely unlikely, no ecological risks are considered in this ROD.

2.7 PRELIMINARY REMEDIATION GOALS

PRGs are concentrations of contaminants in the environmental media that, when attained, should achieve RAOs. PRGs are developed to ensure that contaminant concentration levels left on site are protective of human and ecological receptors.

Groundwater PRGs were determined for the COCs identified in Section 2.6. These PRGs were based on the following criteria:

- Protection of human health from exposure to contaminants in groundwater
- Restore the aquifer to meet Florida State Groundwater Cleanup Target Levels
- Comply with ARARs and to-be-considered criteria (TBCs) to the extent practicable

PRGs for groundwater at Sites 36 and 37 are:

Chemical of Concern	**PRG (µg/L)**
Benzene	1(1)
Toluene	40(1)
Ethylbenzene	30(1)
Xylenes	20(1)
1,1-DCA	70(2)
1,2-DCA	3(1)
1,1,2-TCA	5(1)
Vinyl Chloride	1(1)
1,1-DCE	7(1)
cis-1,2-DCE	70(1)
TCE	3(1)
PCE	3(1)
Naphthalene	20(2)
1-Methylnaphthalene	20(2)
2-Methylnaphthalene	20(2)
2-Methylphenol	35(2)
Iron	7,760(3)
Manganese	150(4)

1 FDEP drinking water criteria (FAC 62-550, September 1999)
2 FDEP Groundwater Cleanup Target Levels groundwater criteria (FAC 62-777, August 1999)
3 NAS Cecil Field site-specific IBDS criteria (HLA, 1998b)
4 Twice the average background concentration (U.S. EPA, 1995)

2.8 DESCRIPTION OF REMEDIAL ALTERNATIVES

This section provides a narrative of each alternative evaluated for groundwater at OU 9, Sites 36 and 37. For further information on the remedial alternatives, refer to the FS (TtNUS, 2000a) and the Proposed Plan (TtNUS, 2000b). Summaries of the treatment alternatives that were evaluated in the FS are described in the following sections. The remedy selected for this ROD is presented in Section 2.9.

The following 11 remedial alternatives were analyzed for OU 9, Sites 36 and 37 groundwater. These alternatives (as described in the FS) are summarized as follows. This ROD has selected Alternative 3B: Potential Sewer Repairs, AS Treatment of Contaminant “Hot-Spots”, Natural Attenuation, Institutional Controls, and Monitoring.

Alternative 1: No Action:

Evaluation of the No Action alternative is required by law to provide a baseline for comparison with other alternatives. Under this alternative, no remedial activities would occur to groundwater contamination and contaminant concentrations would be reduced only through natural attenuation. No controls would be implemented to reduce exposure by human receptors. Contaminants would attenuate naturally; however, periodic monitoring would not be performed to evaluate the effectiveness of the No Action alternative in meeting PRGs and preventing the potential migration of contaminants into Sal Taylor Creek.

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

Alternative 2: Sewer Repairs, Natural Attenuation, Institutional Controls, and Monitoring:

Sewer repairs would consist of sleeving or lining damaged sections of sewer lines located beneath the water table in the contaminant plume at Site 36 to prevent the migration of groundwater contaminant to surface water through these sewer lines. Natural processes, such as biological degradation, dispersion, advection, and adsorption would eventually reduce the concentrations of groundwater contaminants down to clean-up levels. A long-term groundwater monitoring program would be implemented to evaluate the removal of groundwater COCs through naturally-occurring processes. Groundwater monitoring would also be used to evaluate the potential migration of contaminants. A line of additional monitoring wells, designated as “sentinel wells” would be installed approximately 400 ft downgradient of the leading edge of the contaminant plume and regularly sampled to verify that contaminants are not migrating to the extent that it would constitute a threat to human health and the environment. Institutional controls would consist of preventing exposure to groundwater until PRGs have been met and preventing future residential development. Progress reviews would be conducted every five years to determine the continued adequacy of the remedy.

This alternative would protect human health because it would reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through natural attenuation of contaminants. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment but contaminant toxicity and volume would be reduced through long-term natural attenuation. There would be minimal short-term risks associated with the performance of groundwater monitoring activities, which would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 29 to 105 years, however, no source control measures would be taken. The activities for this alternative would be easy to implement. The net present worth (NPW) of this alternative would be approximately $1,013,000.

Alternative 3A: Sewer Repairs, In-situ Biological Treatment of Contaminant "Hot-Spots", Natural Attenuation, Institutional Controls, and Monitoring:

This alternative would consist of accelerating the natural attenuation of groundwater COCs by first remediating the three contaminant "Hot-Spots" by in-situ biological treatment with the injection of oxygen-releasing compounds (ORC$^{(K)}$) and hydrogen-releasing compounds (HRC$^{(K)}$ by DPT. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the "Hot-Spots" bioremediation.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 830 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the ORC$^{(K)}$/HRC$^{(K)}$ injection systems and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 28 to 92 years. The activities for this alternative would be easy to implement. However, installation of the ORC$^{(K)}$/HRC$^{(K)}$ injection systems would result in significant, but relatively temporary, site disruptions. The NPW of this alternative would be approximately $4,581,000.

Alternative 3B: Sewer Repairs, AS/VE Treatment of Contaminant "Hot-Spots", Natural Attenuation, Institutional Controls, and Monitoring:

This alternative would consist accelerating the natural attenuation of groundwater COCs by first remediating the three contaminant "Hot-Spots" by in-situ AS/VE. An AS/VE system would be installed in each "Hot-Spot" to volatilize COCs from the groundwater and remove the these volatilized COCs with vapor-phase granular activated carbon (GAC) adsorption. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the AS/VE treatment of the "Hot-Spots."

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 830 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the AS/VE systems and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 24 to 92 years. The activities for this alternative would be easy to implement. However, installation of the AS/VE systems would result in significant, but relatively temporary, site disruptions. The NPW of this alternative would be approximately $3,717,000.

Alternative 3C: Sewer Repairs, AS/VE Treatment of Contaminant "Hot-Spots" and "Fringes", Natural Attenuation, Institutional Controls, and Monitoring:

This alternative would be identical to Alternative 3B except that, in order to further accelerate the natural attenuation process, four AS/VE systems would be installed and operated instead of three and the overall area actively remediated by these systems would be significantly larger (1,787,000 ft^2 instead of 266,000 ft^2), as it would include not only the contaminant "Hot-Spots" but the "Fringes" as well.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 860 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the AS/VE systems and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 12 to 50 years. The activities for this alternative would be easy to implement. However, installation of the AS/VE systems would result in severe, but relatively temporary, site disruptions. The NPW of this alternative would be approximately $9,671,000.

Alternative 3D: Sewer Repairs, AS/VE Treatment of Contaminant "Hot-Spots" and "Fringes", Natural Attenuation, Institutional Controls, and Monitoring:

This alternative would be identical to Alternative 3C except that, in order to even further accelerate the natural attenuation process, the four AS/VE systems would actively remediate a larger area (2,126,000 ft^2 instead of 1,787,000 ft^2) including the contaminant "Hot-Spots" and "Extended Fringes."

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 870 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the AS/VE systems and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 8 to 30 years. The activities for this alternative would be easy to implement. However, installation of the AS/VE systems would result in very severe, but relatively temporary, site disruptions. The NPW of this alternative would be approximately $10,911,000.

Alternative 4A: Sewer Repairs; Extraction, On-Site Treatment, and Surface Discharge of Contaminant "Hot-Spots" Groundwater; Natural Attenuation; Institutional Controls; and Monitoring:

This alternative would consist of accelerating natural attenuation by first remediating the contaminant "Hot-Spots" through groundwater extraction with four new pumping wells at the rate of 30 gallons per minute (gpm). The extracted groundwater would be treated by air stripping to volatilize COCs prior to discharge to surface water. The exhaust gas of the air stripper would be treated by vapor-phase GAC adsorption to remove the volatilized COCs prior to venting to atmosphere. The groundwater extraction and treatment system would be operated for an estimated 18 years, after which groundwater remediation would be completed through natural attenuation. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the extraction and treatment of the "Hot-Spots" groundwater.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 830 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the groundwater extraction and treatment system and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 33 to 105 years. The activities for this alternative would be easy to implement and installation of the groundwater extraction and treatment system would not result in significant site disruptions. The NPW of this alternative would be approximately $2,848,000.

Alternative 4B: Sewer Repairs; Long-Term Whole-Plume Extraction, On-Site Treatment, and Surface Discharge Institutional Controls; and Monitoring:

This alternative would consist of remediating the entire contaminant plume through groundwater extraction with six new pumping wells at the rate of 60 gpm. As with Alternative 4A, the extracted groundwater would be treated by air stripping to volatilize COCs prior to discharge to surface water and the exhaust gas of the air stripper would be treated by vapor-phase GAC adsorption prior to venting to atmosphere. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the groundwater extraction and treatment.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 3,200 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the groundwater extraction and treatment system and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 30 to 96 years. The activities for this alternative would be easy to implement and installation of the groundwater extraction and treatment system would not result in significant site disruptions. The NPW of this alternative would be approximately $3,537,000.

Alternative 4C: Sewer Repairs; Mid-Term Whole-Plume Extraction, On-Site Treatment, and Surface Discharge; Institutional Controls; and Monitoring:

This alternative would be identical to Alternative 4B except that, in order to accelerate remediation, groundwater would be extracted from 38 new pumping wells at the rate of 200 gpm. As with Alternatives 4A and 4B, the extracted groundwater would be treated by air stripping to volatilize COCs prior to discharge to surface water and the exhaust gas of the air stripper would be treated by vapor-phase GAC adsorption prior to venting to atmosphere. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the groundwater extraction and treatment.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 3,200 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the groundwater extraction and treatment system and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 30 to 50 years. The activities for this alternative would be easy to implement and installation of the groundwater extraction and treatment system would only result in limited site disruptions. The NPW of this alternative would be approximately $4,734,000.

Alternative 4D: Sewer Repairs; Short-Term Whole-Plume Extraction, On-Site Treatment, and Surface Discharge; Institutional Controls; and Monitoring:

This alternative would be identical to Alternative 4C except that, in order to further accelerate remediation, groundwater would be extracted from 69 new pumping wells at the rate of 300 gpm. As with Alternatives 4A, 4B, and 4C, the extracted groundwater would be treated by air stripping to volatilize COCs prior to discharge to surface water and the exhaust gas of the air stripper would be treated by vapor-phase GAC adsorption prior to venting to atmosphere. Sewer repairs and institutional controls would be the same as for Alternative 2. Monitoring would also be the same as for Alternative 2 with additional groundwater sampling and analysis to evaluate the progress of the groundwater extraction and treatment.

This alternative would protect human health because it would actively remove contaminants from groundwater and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through treatment and natural attenuation of contaminants. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment and an estimated 3,200 pounds of chlorinated VOCs would be removed from the groundwater. There would be minimal short-term risks associated with operation of the groundwater extraction and treatment system and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 20 to 30 years. The activities for this alternative would be easy to implement and installation of the groundwater extraction and treatment system would not result in significant site disruptions. The NPW of this alternative would be approximately $5,873,000.

Alternative 5: Sewer Repairs, Permeable Reactive Barrier, Natural Attenuation, Institutional Controls, and Monitoring:

This alternative would consist of installing a 1,000 ft long PRB in the path of the groundwater contaminant plume to intercept and remove COCs from groundwater prior to migration to surface water. As in Alternative 2, natural attenuation would also significantly contribute to the overall remediation process. Sewer repairs, institutional controls, and monitoring would be the same as for Alternative 2.

This alternative would protect human health because it would prevent contaminant migration and reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs and groundwater monitoring would establish achievement of long-term compliance with ARARs through gatural attenuation of contaminants. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment but contaminant toxicity and volume would be reduced through long-term natural attenuation. There would be some short-term risks associated with the installation of a PRB and performance of groundwater monitoring activities. These risks would be addressed through appropriate health and safety procedures. Based upon modeling results, the PRGs would be attained within 29 to 105 years. Installation of a PRB deep enough to intercept the lower part of the contaminant plume (90 ft bgs) would be difficult and might interfere with the safe use of the East-West runway. The NPW of this alternative would be approximately $9,182,000.

2.9 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section evaluates and compares each of the alternatives with respect to the nine criteria outlined in Section 300.430(e) of the NCP. These criteria are categorized as threshold, primary balancing, or modifying. Table 2-2 gives an explanation of the evaluation criteria. A detailed analysis was performed on the alternatives using the nine evaluation criteria to select a site remedy, and Table 2-3 presents this comparison.

TABLE 2-2

**EXPLANATION OF EVALUATION CRITERIA
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 & 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA**

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

TABLE 2-3

**SUMMARY OF COMPARATIVE EVALUATION OF GROUNDWATER ALTERNATIVES
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 & 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 1 OF 4**

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Sewer Repairs, Natural Attenuation, Institutional Controls and Monitoring	Alternative 3A: Sewer Repairs, In-Situ Biological Treatment, Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3B: Sewer Repairs, AS/VE of "Hot-Spots", Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3C: Sewer Repairs, AS/VE of "Hot-Spots" & "Fringes", Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3D: Sewer Repairs, AS/VE of "Hot-Spots" & "Extended Fringes", Natural Attenuation, Institutional Controls, and Monitoring
Overall Protection of Human Health and Environment	Would not be protective of human health and the environment since no action would occur. Migration of COCs would continue and remain undetected.	Would be protective of human health and the environment since sewer repairs would prevent short-circuiting of contaminated groundwater to surface water and natural attenuation would eventually reduce COCs concentrations down to PRGs over time. Institutional controls and monitoring would provide immediate protection until the PRGs are met by restricting use of the aquifer for drinking purposes, preventing residential development, and detecting the migration of COCs.	Would be more protective of human health and the environment than Alternative 2, since it would provide the same protective components (i.e., sewer repairs, natural attenuation, institutional controls, and monitoring) and, additionally it would accelerate natural attenuation through active in-situ bioremediation of the "Hot-Spots" source areas.	Would be more protective of human health and the environment as Alternative 3A since it would provide most of the same protective components (i.e., sewer repairs, natural attenuation, institutional controls, and monitoring) and also accelerate natural attenuation through active removal of the contaminant source areas designated as "Hot-Spots", although with AS/VE instead of in-situ bioremediation.	Would be more protective of human health and the environment than Alternative 3B since it would provide the same protective components (i.e., sewer repairs, AS/VE of "Hot-Spots", natural attenuation, institutional controls, and monitoring) and, additionally, it would further accelerate natural attenuation through active AS/VE treatment of larger areas of high contamination designated as "Fringes".	Would be more protective of human health and the environment than Alternative 3C since it would provide the same protective components (i.e., sewer repairs, AS/VE of "Hot-Spots", natural attenuation, institutional controls, and monitoring) and, additionally, it would even further accelerate natural attenuation through active AS/VE treatment of even larger areas of high-to-medium contamination designated as "Extended Fringes".
Compliance with ARARs and TBCs: Chemical-Specific Location-Specific Action-Specific	 Would not comply Would not comply Not applicable	 Would Eventually comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply
Long-Term Effectiveness and Permanence	Would have very limited long-term effectiveness and permanence since no action would occur. Contaminant reduction or migration would remain undetected since no monitoring would occur.	Would be long-term effective and permanent. Sewer repairs would effectively prevent short-circuiting of contaminated groundwater to surface water, natural attenuation would eventually reduce COCs concentrations down to PRGs. Institutional controls would effectively prevent unacceptable human health and ecological risk from exposure to contaminated groundwater. Monitoring would effectively evaluate the progress of remediation and detect migration of COCs.	Would be more long-term effective and permanent than Alternative 2 by significantly accelerating natural attenuation through active in-situ bioremediation of "Hot-Spots". The effectiveness of ORC[K]/HRC[K] injection would have to be verified through treatability testing. The long-term effectiveness and permanence of the sewer repairs, institutional controls, and monitoring would be the same as for Alternative 2.	Would be more long-term effective and permanent than Alternative 3A since it would provide the same acceleration of natural attenuation but through the active treatment of "Hot-Spots" with AS/VE, which does not need to be tested. The long-term effectiveness and permanence of the sewer repairs, institutional controls and monitoring would be the same as for Alternative 2.	Would be more long-term effective and permanent than Alternative 3B since it would further accelerate natural attenuation through active AS/VE treatment of a larger area. The long-term effectiveness and permanence of the sewer repairs, institutional controls, and monitoring would be the same as for Alternative 2.	Would be more long-term effective and permanent than Alternative 3C since it would even further accelerate natural attenuation through active AS/VE treatment of an even larger area. The long-term effectiveness and permanence of the sewer repairs, institutional controls, and monitoring would be the same as for Alternative 2.
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment	Would not reduce contaminant toxicity, mobility or volume through treatment since no treatment would occur.	Would not reduction contaminant toxicity, mobility and volume through treatment since no treatment would occur.	Would reduce contaminant toxicity, mobility and volume by removing an estimated 830 pounds of VOCs through in-situ bioremediation of "Hot-Spots".	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 830 pounds of VOCs through AS/VE treatment of "Hot-Spots".	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 860 pounds of VOCs through AS/VE treatment of "Hot-Spots" and "Fringes".	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 870 pounds of VOCs through AS/VE treatment of "Hot-Spots" and "Extended Fringes".

TABLE 2-3

**SUMMARY OF COMPARATIVE EVALUATION OF GROUNDWATER ALTERNATIVES
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 & 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 2 OF 4**

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Sewer Repairs, Natural Attenuation, Institutional Controls and Monitoring	Alternative 3A: Sewer Repairs, In-Situ Biological Treatment, Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3B: Sewer Repairs, AS/VE of "Hot-Spots", Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3C: Sewer Repairs AS/VE of "Hot-Spots" & "Fringes", Natural Attenuation, Institutional Controls, and Monitoring	Alternative 3D: Sewer Repairs, AS/VE of "Hot-Spots" & "Extended Fringes", Natural Attenuation, Institutional Controls, and Monitoring
Short-Term Effectiveness	Would not result in any short-term risk to site workers or adversely impact the surrounding community or environment since no action would occur. The RAOs would never be achieved with the implementation of this alternative.	Would result in a slight possibility of exposing site workers to contaminated groundwater as a result of monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 29 to 105 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of bioremediation and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 28 to 92 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of AS/VE treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 24 to 92 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of AS/VE treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 12 to 50 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of AS/VE treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 8 to 30 years.
Implementability	Technical and administrative implementation would be extremely simple since there would be no action to implement.	Technical implementation of the sewer repairs and monitoring would be simple. Administrative implementation of the institutional controls would be simple.	Technical implementation of the in-situ bioremediation of "Hot- Spots" would be simple although it would create temporary site disruptions and the number of qualified contractors would be limited. Technical implementation of the sewer repairs and monitoring would be simple. Administrative implementation of the institutional controls would be simple. No construction permits would be required.	Technical implementation of the AS/VE treatment of "Hot-Spots" would be somewhat more complex than that of in-situ bioremediation and create greater site disruptions. However, implementation would still be simple and site disruptions would be acceptable. Technical implementation of the sewer repairs, treatment residues disposal, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. Construction permits would be required for the AS/VE systems.	Technical implementation of the very large AS/VE systems required for treatment of "Hot-Spots" and "Fringes" would be far more complex than that of the much smaller systems required for treatment of "Hot-Spots" alone. The magnitude and duration of the resulting site disruptions would likely be unacceptable. Technical implementation of the sewer repairs, treatment residues disposal, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. Construction permits would be required for the AS/VE systems.	Technical implementation of the very large AS/VE systems required for treatment of "Hot-Spots" and "Extended Fringes" would be far more complex than that of the much smaller systems required for treatment of "Hot-Spots" alone. The magnitude and duration of the resulting site disruptions would likely be unacceptable. Technical implementation of the sewer repairs, treatment residues disposal, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. Construction permits would be required for the AS/VE systems.
Costs: Capital 30-Yr NPW of O&M 30-Yr NPW	 $0 $0 $0	 $ 632,000 $ 381,000 $1,013,000	 $2,773,000 $1,808,000 $4,581,000	 $2,379,000 $1,338,000 $3,717,000	 $6,654,000 $3,017,000 $9,671,000	 $ 7,383,000 $ 3,528,000 $10,911,000

TABLE 2-3

**SUMMARY OF COMPARATIVE EVALUATION OF GROUNDWATER ALTERNATIVES
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 & 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 3 OF 4**

Evaluation Criteria	Alternative 4A: Sewer Repairs; Extraction, Treatment, & Discharge of "Hot-Spots"; Natural Attenuation; Institutional Controls; and Monitoring	Alternative 4B: Sewer Repairs; Long-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls; and Monitoring	Alternative 4C: Sewer Repairs; Mid-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls and Monitoring	Alternative 4D: Sewer Repairs; Short-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls; and Monitoring	Alternative 5: Sewer Repairs, Permeable Reactive Barriers, Natural Attenuation, Institutional Controls, and Monitoring
Overall Protection of Human Health and Environment	Would be as protective of human health and the environment as Alternatives 3A and 3B since it would provide most of the same protective components (i.e., sewer repairs, natural attenuation, institutional controls, and monitoring) and also accelerate natural attenuation through active removal of the contaminant source areas designated as "Hot-Spots", although with extraction and on-site treatment instead of in-situ bioremediation or AS/VE.	Would be slightly more protective of human health and the environment than Alternative 4A since it would provide most of the same protective components (i.e., sewer repairs, institutional controls, and monitoring) but would rely upon long-term whole-plume extraction and treatment rather than on a combination of short-term "Hot-Spots" extraction and treatment with natural attenuation, which would result in a shorter remediation time.	Would be more protective of human health and the environment than Alternative 4B, since it would provide provides the same protective components (i.e., sewer repairs, institutional controls, and monitoring) and a more aggressive extraction and treatment scheme which would prevent contaminant plume expansion and significantly shorten remediation time.	Would be more protective of human health and the environment than Alternative 4C, since it would provide provides the same protective components (i.e., sewer repairs, institutional controls, and monitoring) and an even more aggressive extraction and treatment scheme which would also prevent contaminant plume expansion and shorten remediation time even more.	Would be slightly more protective of human health and the environment than Alternative 2 but less so than the various options of Alternatives 3 and 4 because, although it would eventually intercept the leading edge of the contaminant plume with a PRB where COCs would be irreversibly destroyed, it would not involve any active aquifer remediation and would rely almost entirely on natural attenuation to achieve the PRGs.
Compliance with ARARs and TBCs: Chemical-Specific Location-Specific Action-Specific	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply	 Would Eventually Comply Would Comply Would Comply
Long-Term Effectiveness and Permanence	Would have the same long-term effectiveness and permanence as Alternative 3B since it would provide the same acceleration of natural attenuation but through the active treatment of "Hot- Spots", except through extraction and treatment instead of AS/VE, both of which are well-proven. The long-term effectiveness and permanence of the sewer repairs, institutional controls and monitoring would be the same as for Alternative 2.	Would be slightly more long-term effective and permanent than Alternative 4A since it would use long-term whole-plume extraction and treatment until PRGs are met instead of short-term extraction and treatment of the "Hot-Spots" only, with PRGs met through natural attenuation. The long-term effectiveness and permanence of the sewer repairs, institutional controls and monitoring would be the same as for Alternative 2.	Would be more long-term effective and permanent Alternative 4B since it would involve a more aggressive extraction and treatment scheme which would prevent contaminant plume expansion and significantly shorten remediation time. The long-term effectiveness and permanence of the sewer repairs, institutional controls and monitoring would be the same as for Alternative 2.	Would be more long-term effective and permanent Alternative 4C since it would involve an even more aggressive extraction and treatment scheme which would also prevent contaminant plume expansion and shorten remediation time even more. The long-term effectiveness and permanence of the sewer repairs, institutional controls and monitoring would be the same as for Alternative 2.	Would be slightly more long-term effective and permanent than Alternative 2 but less so than the various options of Alternatives 3 and 4 because, although it would eventually intercept the leading edge of the contaminant plume with a PRB where COCs would be irreversibly destroyed, it would not involve any active aquifer remediation and would rely almost entirely on natural attenuation to achieve the PRGs
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 830 pounds of VOCs through extraction and treatment of "Hot-Spots".	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 3,200 pounds of VOCs through extraction and treatment.	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 3,200 pounds of VOCs through extraction and treatment.	Would reduce contaminant toxicity, mobility, and volume by removing an estimated 3,200 pounds of VOCs through extraction and treatment.	Would minimally reduce contaminant toxicity, mobility, and volume by destroying the small amount of COCs which is anticipated to eventually migrate through the PRB.

TABLE 2-3

**SUMMARY OF COMPARATIVE EVALUATION OF GROUNDWATER ALTERNATIVES
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 & 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 4 OF 4**

Evaluation Criteria	Alternative 4A: Sewer Repairs; Extraction, Treatment, & Discharge of "Hot-Spots"; Natural Attenuation; Institutional Controls; and Monitoring	Alternative 4B: Sewer Repairs; Long-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls; and Monitoring	Alternative 4C: Sewer Repairs; Mid-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls and Monitoring	Alternative 4D: Sewer Repairs; Short-Term Whole-Plume Extraction, Treatment, & Discharge; Institutional Controls; and Monitoring	Alternative 5: Sewer Repairs, Permeable Reactive Barriers, Natural Attenuation, Institutional Controls, and Monitoring
Short-Term Effectiveness	Would result in a possibility of exposing site workers to contaminated groundwater as a result of extraction and treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within an estimated 33 to 105 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of extraction and treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 30 to 96 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of extraction and treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 30 to 50 years.	Would result in a possibility of exposing site workers to contaminated groundwater as a result of extraction and treatment and monitoring activities. This risk would be reduced through compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 20 to 30 years.	Would result in a possibility of exposing workers to contaminated groundwater during the installation and sampling of monitoring wells. This risk would be reduced through engineering controls and compliance with appropriate site-specific health and safety procedures. There would be no risk to the surrounding community and environment. RAOs would be achieved immediately upon implementation of the institutional controls and monitoring. PRGs would met within 29 to 105 years.
Implementability	Technical implementation of the "Hot-Spots" extraction and treatment would be considerably simpler than that of either the in-situ bioremediation or AS/VE of the same "Hot-Spots". Installation and O&M of the small number of extraction wells and small on-site treatment system would be simple and would create no significant site disruption. Implementation of the sewer repairs, surface discharge, disposal of treatment residues, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. A construction permit would be required and the substantive requirements of an NPDES permit would have to be met.	Technical implementation of the long-term whole-plume extraction and treatment would only be slightly more complex than that of "Hot-Spots" extraction and treatment. Installation and O&M of the small number of extraction wells and small on-site treatment system would be simple and would create no significant site disruption. Implementation of the sewer repairs, surface discharge, disposal of treatment residues, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. A construction permit would be required and the substantive requirements of an NPDES permit would have to be met.	Technical implementation of the mid-term whole-plume extraction and treatment would be somewhat more complex than that of the long-term whole-plume extraction and treatment. Installation and O&M of the extraction wells and relatively large on-site treatment system would be simple and would create only slight short-term site disruptions. Implementation of the sewer repairs, surface discharge, disposal of treatment residues, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. A construction permit would be required and the substantive requirements of an NPDES permit would have to be met.	Technical implementation of the short-term whole-plume extraction and treatment would only be slightly more complex than that of the mid-term whole-plume extraction and treatment. Installation and O&M of the extraction wells and large on-site treatment system would be simple and would create only slight short-term site disruptions. Implementation of the sewer repairs, surface discharge, disposal of treatment residues, and monitoring would be simple. Administrative implementation of the institutional controls would be simple. A construction permit would be required and the substantive requirements of an NPDES permit would have to be met.	Technical implementation of the PRB would be very complex because of the depth to which it would have to be installed (95 ft bgs) and the shallowness of the water table (6 ft bgs) would make wall excavation and placement very difficult. The close proximity of two active runways would also create a potentially hazardous situation. Implementation of the sewer repairs and monitoring would be simple. Administrative implementation of the PRB would be complex since it might require FAA approval of the construction permit. Administrative implementation of the institutional controls would be simple.
Costs: Capital 30-Yr NPW of O&M 30-Yr NPW	 $1,372,000 $1,476,000 $2,848,000	 $1,684,000 $1,853,000 $3,537,000	 $2,357,000 $2,377,000 $4,734,000	 $3,072,000 $2,801,000 $5,873,000	 $8,801,000 $ 381,000 $9,182,000

ARAR	applicable or relevant and appropriate requirement	O&M	operation and maintenance
AS/VE	air sparging/vapor extraction	ORC[K]	oxygen-releasing compound
COC	chemical of concern	PRG	Preliminary Remedial Goal
FAA	Federal Aviation Administration	PRB	permeable reactive barrier
HRC[K]	hydrogen-releasing compound	RAO	Remedial Action Objective
NPDES	National Pollutant Discharge Elimination System	TBC	to-be-considered (criterion)
NPW	net present worth	VOC	volatile organic compound

2.10 SELECTED REMEDY

2.10.1 Summary of Rationale For Remedy Selection

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives, and U.S. EPA, FDEP, and public comments, a modified Alternative 3B was selected to address the contaminants in the groundwater at OU 9, Sites 36 and 37.

This remedy was selected as a result of discussions held by the BCT (BCT, 2000a). The main reason for selecting this remedy is that, although there is strong evidence of ongoing natural attenuation, it was felt that active source remediation was required to speed-up the restoration of the surficial aquifer.

The modifications to Alternative 3B for the selected remedy were discussed and agreed upon by the BCT (BCT, 2000b). These modifications and the associated rationale can be summarized as follows:

- *Component 1: Sewer Repairs* will only be implemented if the results from ongoing sewer and surface water monitoring show a significant impact to surface water quality as a result of short-circuiting of groundwater contaminants through leaky sewers. The reason for this modification is that it was felt that the relatively high cost of the sewer repairs (approximately $1,800,000) can only be justified by a real threat to the environment.

- Extraction and treatment of the vapors extracted by the AS systems of *Component 2: AS/VE Treatment of "Hot-Spots"* will only implemented if a detailed characterization conducted as part of the design shows that VOC emissions from these vapors would exceed regulatory criteria. This modification was made because a preliminary evaluation shows that the quantity of VOCs emissions resulting of the AS treatment of "Hot-Spots" would only be approximately 835 pounds over a period of 3 to 5 years, which is well below the regulatory thresholds of 3 pounds per hour or 15 pounds per day.

- The AS systems for "Hot-Spots" Nos. 1 and 2 will be consolidated into a single system for the treatment of both "Hot-Spots." This means that the arrays of air sparging wells will remain the same for each "Hot-Spot" but that the air compressor systems will be located in a single central building. This modification is required because no elevated structure can be erected in the immediate vicinity of "Hot-Spot" No. 2 due to its proximity to active runways.

2.10.2 Remedy Description

The remedy is illustrated on Figure 2-9 and consists of five major components: (1) sewer sampling and potential repairs; (2) AS treatment of contaminant "Hot-Spots", evaluation and, if required, extraction and treatment of air sparging vapors; (3) natural attenuation; (4) institutional controls; and (5) monitoring.

Component 1: Sewer Sampling and Potential Repairs

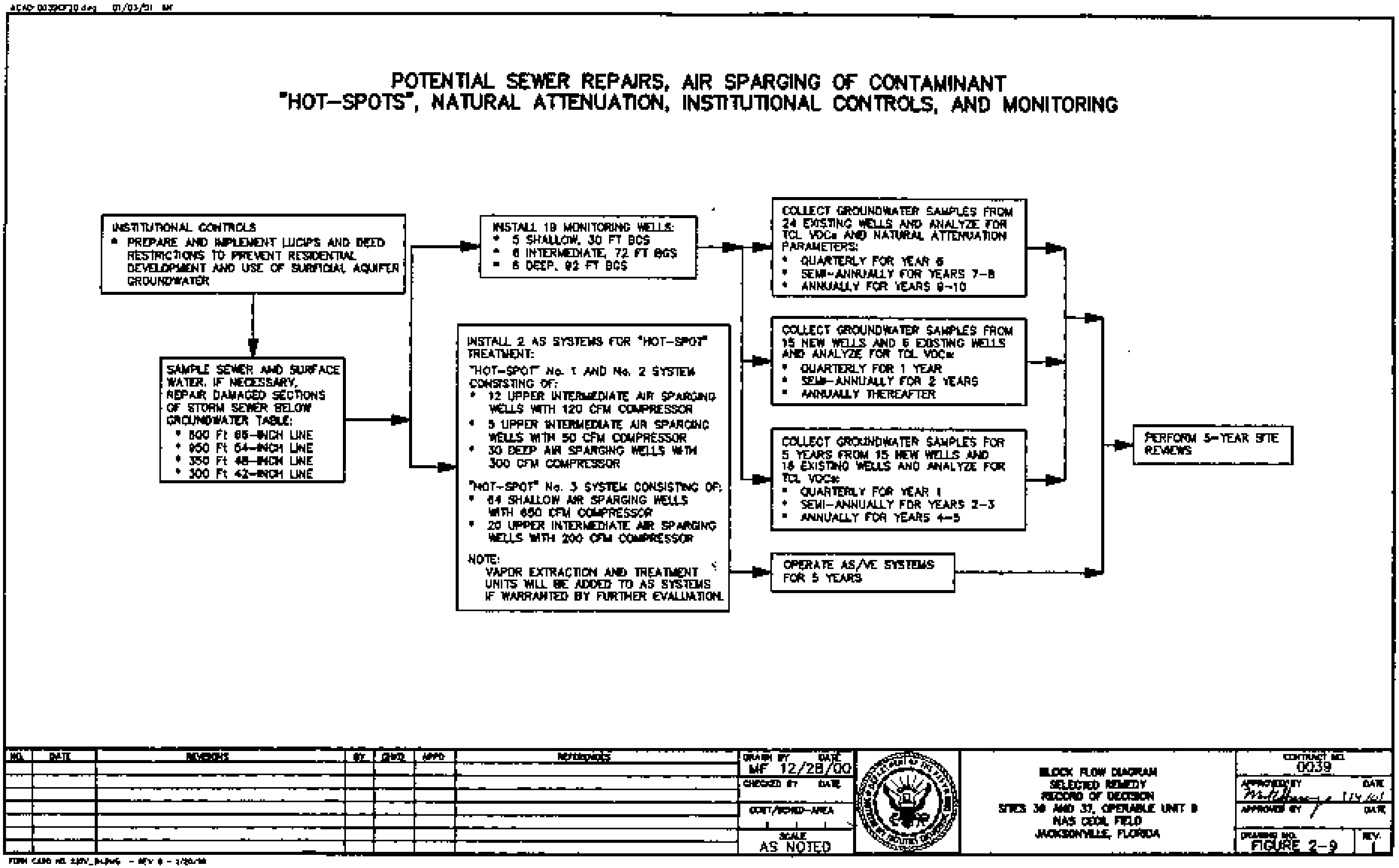
Sewer sampling will be conducted to evaluate impacts to surface water. If results of this sampling show that annual average detected concentrations exceed FDEP surface water quality criteria, damaged sections of storm sewer located beneath the water table in the contaminant plume will be repaired in place by insertion of a plastic liner or sleeve. The focal point of these repairs would be Catch Basin CB09 located approximately 500 ft southwest of Building 72 at Site 36. As shown on Figure 2-10, sections of the four sewer lines converging at this catch basin will be repaired, including 300 ft of 42-inch line extending west from CB09 to 36-C001, 950 ft of 54-inch line extending northwest from CB09 to CB13, 350 ft of 48-inch line extending east from CB09 to CB31, and 600 ft (2x300) of 66-inch line extending south from CB09 to CB08.

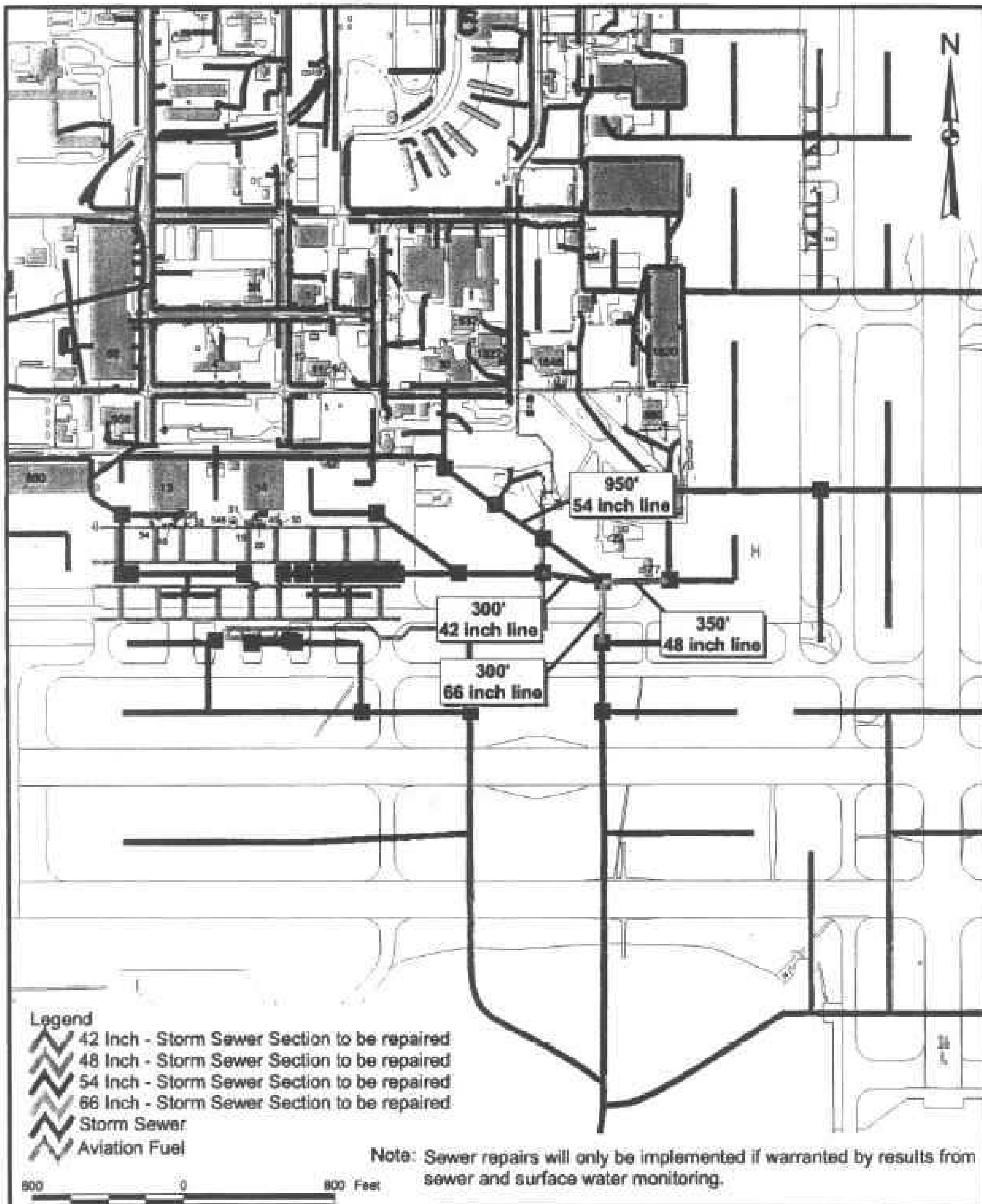
Component 2: AS Treatment of Contaminant "Hot-Spots"

This component will consist of installing two AS systems and operating these systems for a period of 5 years. One system will treat "Hot-Spots" Nos. 1 and 2 at Site 36 and the other will treat "Hot-Spot" No. 3 at Site 37. In addition, a more thorough evaluation of air sparging vapors will be conducted during the design phase to determine if extraction and treatment of these vapors is necessary. Locations of the "Hot-Spots" are shown on Figure 2-6.

Each AS system will consist of an array of air sparging wells and one or more air sparging compressor systems. Air sparging wells will be screened at various depths to provide effective air circulation through the areas of contaminated groundwater. The air sparging wells screened at a specific depth will be connected to a dedicated air sparging compressor system. Each air sparging compressor system will feature a compressor, a receiver tank, and the necessary controls. Figure 2-11 shows the process flow diagram for a typical AS system. The air sparging compressor system(s) will be housed in a pre-engineered pre-constructed structure enclosed in a fenced-in area.

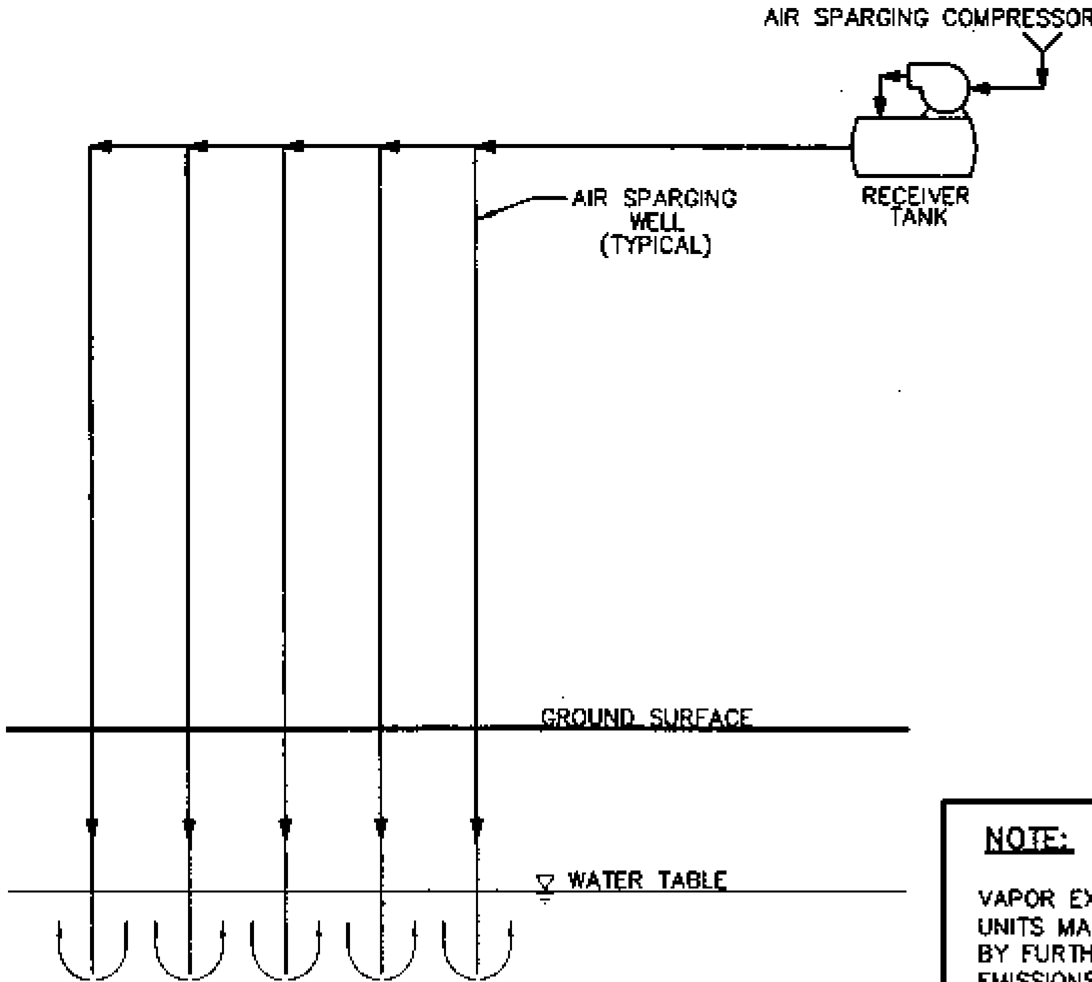
Design air sparging flows will range from 10 to 15 cubic feet per minute (cfm) per well. Based upon the results of the full-scale remedial actions and pilot-scale tests performed at similar NAS Cecil Field sites (e.g., Sites 3 and 16), it is assumed that under these operating conditions the effective area of influence of each air sparging well will be approximately 2,500 ft^2.


POTENTIAL SEWER REPAIRS, AIR SPARGING OF CONTAMINANT "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
INSTITUTIONAL CONTROLS
• PREPARE AND IMPLEMENT LUCIPS AND DEED RESTRICTIONS TO PREVENT RESIDENTIAL DEVELOPMENT AND USE OF SURFICIAL AQUIFER GROUNDWATER
SAMPLE SEWER AND SURFACE WATER. IF NECESSARY, REPAIR DAMAGED SECTIONS OF STORM SEWER BELOW GROUNDWATER TABLE:
• 500 Ft 66-INCH LINE
• 950 Ft 54-INCH LINE
• 350 Ft 48-INCH LINE
• 300 Ft 42-INCH LINE
INSTALL 19 MONITORING WELLS:
• 5 SHALLOW, 30 FT BGS
• 6 INTERMEDIATE, 72 FT BGS
• 8 DEEP, 92 FT BGS
INSTALL 2 AS SYSTEMS FOR "HOT-SPOT" TREATMENT:
"HOT-SPOT" No. 1 AND No. 2 SYSTEM CONSISTING OF:
• 12 UPPER INTERMEDIATE AIR SPARGING WELLS WITH 120 CFM COMPRESSOR
• 5 UPPER INTERMEDIATE AIR SPARGING WELLS WITH 50 CFM COMPRESSOR
• 30 DEEP AIR SPARGING WELLS WITH 300 CFM COMPRESSOR
"HOT-SPOT" No. 3 SYSTEM CONSISTING OF:
• 64 SHALLOW AIR SPARGING WELLS WITH 650 CFM COMPRESSOR
• 20 UPPER INTERMEDIATE AIR SPARGING WELLS WITH 200 CFM COMPRESSOR
NOTE:
VAPOR EXTRACTION AND TREATMENT UNITS WILL BE ADDED TO AS SYSTEMS IF WARRANTED BY FURTHER EVALUATION.
COLLECT GROUNDWATER SAMPLES FROM 24 EXISTING WELLS AND ANALYZE FOR TCL VOCs AND NATURAL ATTENUATION PARAMETERS:
• QUARTERLY FOR YEAR 6
• SEMI-ANNUALLY FOR YEARS 7-8
• ANNUALLY FOR YEARS 9-10
COLLECT GROUNDWATER SAMPLES FROM 15 NEW WELLS AND 6 EXISTING WELLS AND ANALYZE FOR TCL VOCs:
• QUARTERLY FOR 1 YEAR
• SEMI-ANNUALLY FOR 2 YEARS
• ANNUALLY THEREAFTER
COLLECT GROUNDWATER SAMPLES FOR 5 YEARS FROM 15 NEW WELLS AND 18 EXISTING WELLS AND ANALYZE FOR TCL VOCs:
• QUARTERLY FOR YEAR 1
• SEMI-ANNUALLY FOR YEARS 2-3
• ANNUALLY FOR YEARS 4-5
OPERATE AS/VE SYSTEMS FOR 5 YEARS
PERFORM 5-YEAR SITE REVIEWS
NO.
DATE
REVISIONS
BY
CHKD
APPD
REFERENCES
DRAWN BY
DATE
MF 12/28/00
CHECKED BY
DATE
COST/SCHED-AREA
SCALE
AS NOTED
BLOCK FLOW DIAGRAM
SELECTED REMEDY
RECORD OF DECISION
SITES 36 AND 37, OPERABLE UNIT 8
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NO.
0039
APPROVED BY
DATE
APPROVED BY
DATE
DRAWING NO.
FIGURE 2-9
REV.
1



DRAWN BY	DATE	POTENTIAL SITE 36 STORM SEWER REPAIRS, PLAN VIEW	CONTRACT NUMBER 0039
CHECKED BY	DATE	SITES 36 AND 37, OPERABLE UNIT 9	APPROVED BY / DATE 01/05/01
COST/SCHEDULE-AREA		RECORD OF DECISION	APPROVED BY / DATE
		NAS CECIL FIELD	
SCALE AS NOTED		JACKSONVILLE, FLORIDA	DRAWING NO. FIGURE 2-10 / REV 1

ACAD: 0039PF07.dwg 01/03/01 MF



NOTE:

VAPOR EXTRACTION AND TREATMENT UNITS MAY BE ADDED IF WARRANTED BY FURTHER EVALUATION OF AS EMISSIONS.

DRAWN BY MF DATE 1/3/01	PROCESS FLOW DIAGRAM TYPICAL AS SYSTEM RECORD OF DECISION SITES 36 & 37, OPERABLE UNIT 9 NAS CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 0039
CHECKED BY DATE		APPROVED BY [signature] DATE 1/4/01
COST/SCHED-AREA		APPROVED BY DATE
SCALE AS NOTED		DRAWING NO. FIGURE 2-11 REV. 2

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

The “Hot-Spots” Nos. 1 and 2 AS system (System No. 1) will include 12 air sparging wells for “Hot-Spot” No.1 and 35 air sparging wells for “Hot-Spot” no. 2. The “Hot-Spot” No. 1 air sparging wells will be screened in the upper intermediate zone of the surficial aquifer (30 to 50 ft bgs). Five of the “Hot-Spot” No. 2 air sparging wells will be screened in the upper intermediate zone of the surficial aquifer and the other thirty in the deep zone of the surficial aquifer (70 to 90 ft bgs). The central air sparging system will feature one compressor system for “Hot-Spot” No. 1 and two compressor systems for “Hot-Spot” no. 2. The “Hot-Spot” No. 1 compressor system will include a 120 cfm air compressor and a 150-gallon receiver tank. The “Hot-Spot” No. 2 compressor systems will include one 50 cfm air compressor with a 75-gallon receiver tank (intermediate system) and a 300 cfm air compressor with a 400-gallon receiver tank (deep system).

The “Hot-Spot” No. 3 AS system (System No. 2) will include 84 air sparging wells. Sixty-four of the air sparging wells will be screened in the shallow zone of the surficial aquifer and the other twenty in the upper intermediate zone of the surficial aquifer. There will be a shallow and upper intermediate air sparging compressor systems. The shallow system will feature a 650 cfm air compressor and a 1,000-gallon receiver tank and the upper intermediate system will feature a 200 cfm air compressor and a 250-gallon receiver tank.

Component 3: Natural Attenuation

Natural attenuation will rely on naturally occurring processes within the aquifer to significantly reduce the concentrations of BTEX and chlorinated VOCs. Microorganisms within the surficial aquifer groundwater will use the contaminants as substrate during growth processes. As a result, the contaminants will be metabolized by the microorganisms into other products. Aquifer conditions will be continually monitored to ensure that concentrations are being adequately reduced through natural processes. In addition, their degradation products, which are most often less toxic but can produce other toxic products, such as vinyl chloride, will also be monitored.

Component 4: Institutional Controls

Institutional controls will include limitation of land use to industrial purposes and restriction of surficial aquifer use. These controls would eliminate or reduce pathways of exposure to contaminants at the site. A Land Use Controls Implementation Plan (LUCIP), including deed restrictions, will be prepared and implemented to insure that, prior to any future development at Sites 36 and 37, adequate measures would be taken to minimize adverse human health and environmental effects. In particular, LUCs and deed restrictions will prevent future site development for residential purposes.

Use of groundwater will be controlled through deed restrictions and a formal notification will be made to the agency administrating the well installation permit program in Duval County not to issue permits for installation of drinking water wells at the site which would draw water from the surficial aquifer.

Component 5: Monitoring

Monitoring will consist of regularly collecting and analyzing groundwater samples both from within the contaminant plume to assess effectiveness of the AS treatment and subsequent natural attenuation and downgradient of the leading edge of the plume to evaluate contaminant migration.

Monitoring for effectiveness of the AS treatment will consist of collecting groundwater samples from 15 new wells and six existing wells and analyzing them for TCL VOCs. Sampling frequency will be quarterly for the first year of operation of the AS systems, semi-annually for the following two years, and annually for the remaining two years.

Monitoring for natural attenuation will be performed over a period of five years after completion of the AS treatment (Years 6 to 10) and will consist of collecting samples from 24 existing monitoring wells and analyzing them for TCL VOCs and natural attenuation indicator parameters (U.S. EPA, 1999a), such as oxidation/reduction potential (ORP), dissolved oxygen (DO), pH, alkalinity, temperature, conductivity, biochemical and chemical oxygen demand (BOD and COD), TOC, ferrous and total iron, sulfur compounds (sulfates, sulfides), nitrogen compounds (nitrates, nitrites), orthophosphates, chlorides, and metabolic gases (methane, ethane, ethene, and carbon dioxide). Sampling frequency will be quarterly for the first year, semi-annual for the next two years, and annual for the remaining two years.

Monitoring for contaminant migration will be performed over a period of up to 120 years and will consist of collecting samples from 6 existing and 15 new monitoring wells and analyzing them for TCL VOCs. New monitoring wells will include a line of sentinel wells located 400 ft downgradient of the leading edge of the contaminant plume. Sampling frequency will be quarterly for the first year, semi-annual for the next two years, and annual for the remaining 117 years.

If analysis of the groundwater collected from the line of sentinel wells indicate that the benzene PRG of 1 µg/L has been exceeded, the following step-by-step actions would be taken (BCT, 2000c):

1. The sentinel well(s) where the exceedance(s) was(were) detected would be re-sampled to verify the exceedance(s).

2. If the exceedance(s) is(are) verified, additional hydrogeological modeling would be performed to determine a revised predicted expansion of the contaminant plume based upon the new monitoring data.

3. If the revised contaminant plume expansion predicted by the additional modeling indicates continued contaminant plume expansion beyond the sentinel wells, alternate remedy(ies) will be implemented.

Reviews will be performed every five years to evaluate site status, assess the continued adequacy of remedial activities and determine whether further action is necessary. These site reviews are required because the selected remedy allows contaminants to remain in groundwater at concentrations in excess of PRGs.

The monitoring component will include the installation of new monitoring wells and the maintenance of the new and existing wells that are sampled. As part of the change in the ownership of Sites 36 and 37 from the military to the private sector, provisions were incorporated into the property transfer documents to ensure that monitoring will continue.

2.10.3 <u>Summary of Estimated Remedy Costs</u>

The estimated capital, operation and maintenance (O&M), and net present worth (NPW) costs of the selected remedy are as follows:

- Capital Cost: $1,449,000
- 30-Year NPW of O&M Costs: $1,280,000
- 30-Year NPW: $2,729,000

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. A detailed breakdown of the above estimates is provided in Appendix A.

2.10.4 <u>Expected Outcomes of the Selected Remedy</u>

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

- Immediately upon implementation of *Component 4: Institutional Controls* of the remedy, Sites 36 and 37 will be environmentally safe for their intended use as active aviation facilities, or any other similar industrial or commercial use.

- Within five years of the implementation of *Component 2: AS Treatment of Contaminant "Hot-Spots",* these "Hot-Spots" will be effectively neutralized as sources of further groundwater contamination and as driving forces for contaminant plume expansion.

- Within a maximum of 120 years after implementation of the remedy, or possibly sooner as may be determined through continued implementation of *Component 5: Monitoring,* the groundwater PRGs will be attained and Sites 36 and 37 will become available for unrestricted use.

2.11 STATUTORY DETERMINATIONS

The remedial alternative selected for OU 9, Sites 36 and 37 is consistent with CERCLA and the NCP. The selected remedy provides protection of human health and the environment, attains ARARs, and is cost-effective. Tables 2-4 through 2-7 listsand describe Federal and State chemical- and action-specific ARARs to which the selected remedy must comply. There are no location-specific ARARs for this remedy. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. The selected remedy also provides flexibility to implement additional remedial measures, if necessary, to address RAOs or unforeseen issues.

2.12 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OU 9, Sites 36 and 37 (TtNUS, 2000b) was released for public comment on September 9, 2000. The Proposed Plan identified the use of in-situ AS/VE to remove groundwater contaminants in the source areas "Hot-Spots" in conjunction with natural attenuation and the application of institutional controls as the preferred alternative. The public was invited to comment during a 30-day period extending from September 11 to October 10, 2000. No public comments have yet been received; therefore, no changes to the proposed remedy, as originally identified in the Proposed Plan, have yet been made.

TABLE 2-4

**FEDERAL CHEMICAL-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Safe Drinking Water Act (SWDA) Regulations, Maximum Contaminant Levels (MCLs)	40 CFR Part 141	Relevant and Appropriate	Establishes enforceable standards for potable water for specific contaminants that have been determined to adversely affect human health.	Were used as protective levels for groundwater or surface waters that are current or potential drinking water sources.
SDWA Regulations, National Secondary Drinking Water Standards (SMCLs)	40 CFR Part 143	To Be Considered	Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic qualities of drinking water.	Were used as protective levels for groundwater or surface waters that are current or potential drinking water sources.
U.S. EPA Office of Drinking Water, Health Advisories		Potential To Be Considered	Health advisories are estimates of non-carcinogenic risk due to consumption of contaminated drinking water.	These advisories would be considered for contaminants in surface water and groundwater that is or could be used as a potable water source.
Cancer Slope Factors (CSFs)		To Be Considered	CSFs are guidance value used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	CSFs were considered for development of human health protection PRGs for soil and groundwater at this site.
Reference Doses (RfDs)		To Be Considered	RFDs are guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants.	RFDs were considered for development of human health protection PRGs for soil and groundwater at this site

TABLE 2-5

**STATE CHEMICAL-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 1 OF 2**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Groundwater Guidance Concentration, Bureau of Groundwater Protection – June,1994		Applicable	This document establishes maximum concentration levels for groundwater contaminants in the state of Florida. Groundwater with concentrations less than the listed values are considered "free from" contamination.	The values provided in this document were considered when determining cleanup levels for groundwater. These guidance values for groundwater are considered ARARs by the FDEP. However, by definition of ARARS in the NCP, state requirements must be a state law or regulation; an environmental or facility siting law; promulgated; more stringent than the Federal requirement; identified in a timely manner; and consistently applied. All of these parameters must be met according to the NCP. The Groundwater Guidance Concentrations are not promulgated as law or regulation; however, it is recognized that the FDEP maintains the position that these guidance concentrations are considered ARARs.
Florida Groundwater Guidance, Bureau of Groundwater Protection, June 1994.		Relevant and Appropriate	The document provides maximum concentration levels of contaminants for groundwater in the State of Florida. Groundwater with concentrations less than the listed values are considered "free from" contamination.	The values in this guidance were considered when determining cleanup levels for groundwater. Although some values are not promulgated, Florida Department of Environmental Protection considers them applicable or relevant and appropriate requirements for setting cleanup criteria.

TABLE 2-5

**STATE CHEMICAL-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 2 OF 2**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Florida Groundwater classes, Standards and Exemptions	FAC Chapter 62-520	Applicable	This rule designates the groundwater of the state into five classes and establishes minimum “free from” criteria. This rule also specifies that Classes I & II must meet the primary and secondary drinking water standards listed in Chapter 62-550.	These regulations were used to determine cleanup levels for groundwater that is a potential source of drinking water.
Groundwater Cleanup Target Levels (GCTLs)	FAC Chapter 62-777	Applicable	This document provides guidance for soil, groundwater, and surface water cleanup levels that can be developed on a site-by-site basis.	These guidelines were used in determining cleanup goals.

TABLE 2-6

**FEDERAL ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 1 OF 4**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Wastes	40 CFR Part 261	Applicable for off-site transportation, storage, and disposal (TSD) facility	Defines the listed and characteristic hazardous wastes subject to RCRA. Appendix II contains the Toxicity Characteristic Leaching Procedure.	These regulations will apply to determine whether residues (spent GAC) from onsite treatment should be considered as hazardous.
Clean Air Act (CAA) Regulations, National Ambient Air Quality Standards (NAAQSs)	40 CFR Part 50	Relevant and appropriate for on-site TSD facility	Establishes primary (health-based) and secondary (welfare-based) air quality standards for carbon monoxide, lead, nitrogen dioxide, particulate, matter, ozone, and sulfur oxides emitted from a major source of air emissions. The NAAQSs form the basis for all regulations promulgated under the CAA. However, the NAAQSs themselves are non-enforceable and are not ARARs themselves.	Site remediation activities must comply with NAAQS. The principal application of these standards is during remedial activities resulting in exposures through dust and vapors. In general, emissions from CERCLA activities are not expected to qualify as a major source, and are therefore, not expected to be applicable requirements. However, the requirements may be determined to be relevant and appropriate for non-major sources with significantly similar emissions.
RCRA Regulations, Land Disposal Restrictions (LDRs)	40 CFR Part 268	Potentially applicable for off- site TSD facility	This regulation prohibits the land disposal of untreated hazardous wastes and provides criteria for the treatment of hazardous waste prior to land disposal.	LDRs may have to be complied with for the off-site disposal of on-site treatment residues.
Clean Air Act (CAA) National Emission Standards for Hazardous Air	40 CFR Part 61	Applicable	NESHAPs are a set of emissions standards for specific chemicals from specific production activities.	Emissions of hazardous air pollutants will be minimized by off gas treatment of the AS/VE systems.

TABLE 2-6

**FEDERAL ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 2 OF 4**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Pollutants (NESHAPs)				
Air/Superfund National Technical Guidance	EPA Guidance: EPA/450/1 - 89/001- EPA/450/1 - 89/004	To Be Considered	This guidance describes methodologies for predicting risks due to air release at a Superfund site.	These guidance documents will be considered when risks due to air releases from AS/VE treatment are evaluated.
OSHA Regulations, General Industry Standards	29 CFR Part 1910	Applicable	Requires establishment of programs to assure worker health and safety at hazardous waste sites, including employee training requirements.	These regulations would apply to all response activities.
OSHA Regulations, Occupational Health and Safety Regulations	29 CFR Part 1910, Subpart Z	Applicable	Establishes permissible exposure limits for workplace exposure to a specific listing of chemicals.	Standards are applicable for worker exposure to OSHA hazardous chemicals during remedial activities.
OSHA Regulations, Recordkeeping, Reporting, and Related Regulations	29 CFR Part 1904	Potentially Applicable	Provides recordkeeping and reporting requirements applicable to remedial activities.	These requirements apply to all site contractors and subcontractors and must be followed during all site work.
OSHA Regulations, Health and Safety Standards	29 CFR Part 1926	Applicable	Specifies the type of safety training, equipment, and procedures to be used during investigation and remediation.	All phases of the selected remedy will be executed in compliance with this regulation.

TABLE 2-6

**FEDERAL ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 3 OF 4**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
RCRA Regulations, Contingency Plan and Emergency Procedures	40 CFR 264, Subpart D	Potentially Relevant and Appropriate	Outlines requirements for emergency procedures to be followed in case of an emergency.	The administrative requirements established in this rule would be met if residues from on-site treatment are determined to be hazardous.
CAA Regulations, New Source Performance Standards (NSPS)	40 CFR Part 60	Potentially Relevant and Appropriate	This rule 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 for which NAAQSs are established.	This rule will be adhered to if the AS/VE systems are determined to qualify as new air emission sources.
RCRA Regulations, General Facility Standards	40 CFR Subpart B, 264.10-264.18	Relevant and Appropriate	Sets the general facility requirements including general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a facility located in a 100-year floodplain must be designed, constructed, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	The substantive requirements of this rule are applicable requirements. A permitted treatment facility will be selected for offsite disposal of the on-site treatment residues.
RCRA Regulations, Preparedness and Prevention	40 CFR Part 264, Subpart C	Relevant and Appropriate	Outlines requirements for safety equipment and spill control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Safety and communication equipment will be incorporated into all aspects of the remedial process and local authorities would be familiarized with site operations.

TABLE 2-6

**FEDERAL ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 4 OF 4**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
RCRA Regulations, Releases from Solid Waste Management Units (SWMUs)	40 CFR Part 264, Subpart F	Potentially Relevant and Appropriate for off-site TSD	Establishes the requirements for SWMUs at RCRA regulated TSD facilities. The scope of the regulation encompasses groundwater protection standards, point of compliance, compliance period, and requirements for groundwater monitoring.	These regulations would be followed for the off site disposal of on-site treatment residues if these are determined to be hazardous.
RCRA Regulations, Standards for Owners and Operators of Hazardous Waste TSD Facilities	40 CFR Part 264	Potentially Relevant and Appropriate for off-site TSD	Establishes minimum national standards defining the acceptable management of hazardous wastes for owners and operators of facilities that treat, store, or dispose of hazardous wastes.	These regulations would be followed for the off site disposal of on-site treatment residues if these are determined to be hazardous.

TABLE 2-7

**STATE ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 1 OF 2**

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Florida Hazardous Waste Rules – October, 1993	FAC Chapter 62-730	Potentially Applicable	Adopts by reference sections of the Federal hazardous waste regulations and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation and disposal of hazardous wastes.	These regulations would apply if onsite treatment residues (e.g., spent GAC) were deemed.
Florida Air Pollution Rules – October, 1992	FAC Chapter 62-2	Relevant and Appropriate	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.	These regulations will be followed.
Florida Ambient Air Quality Standards – December, 1994	FAC Chapter 62-272	Applicable	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.	These ambient air quality standards will be met.

TABLE 2-7

STATE ACTION-SPECIFIC ARARs
RECORD OF DECISION
OPERABLE UNIT 9, SITES 36 AND 37
NAS CECIL FIELD - JACKSONVILLE, FLORIDA
PAGE 2 OF 2

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Air Pollution Episodes – September, 1994	FAC Chapter 62-273	Relevant and Appropriate	This rule classifies an air episode as an air alert, warning or emergency and establishes criteria for determining the level of the air episode. It also establishes response requirements for each level.	These regulations will be adhered to.
Florida Water Well Permitting and Construction Requirements – March, 1992	FAC Chapter 62-532	Applicable	Establishes minimum standards for the location, construction, repair, and abandonment of water wells. Permitting requirements and procedures are established.	The substantive requirements for permitting will be met for the construction, repair, or abandonment of monitoring wells.
Florida Rules on Hazardous Waste Warning Signs – July, 1991	FAC Chapter 62-736	Applicable	Requires warning signs at NPL and FDEP identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	This requirement will be met.

REFERENCES

ABB-ES (ABB Environmental Services, Inc.), 1992. *Contamination Assessment Report, South Fuel Farm, Facility 43.* Prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Charleston, South Carolina. July.

ABB-ES, 1994. *Base Realignment and Closure Environmental Baseline Survey Report, NAS Cecil Field.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. November.

ABB-ES, 1996a. *Contamination Assessment Report Addendum, South Fuel Farm, Naval Air Station Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. January.

ABB-ES, 1996b. *Remedial Action Plan, South Fuel Farm, Naval Air Station Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. October.

BCT [BRAC (Base Realignment and Closure) Cleanup Team], 2000a. *BCT Meeting Minutes No. 1104, Actions Nos. 414 and 415.* Meeting of February, 23.

BCT, 2000b. *BCT Meeting Minutes Nos. 1303, 1304, and 1305.* Meeting of December 5, 2000.

BCT, 2000c. *BCT Meeting Minutes No. 1247.* Meeting of August 21.

EE (Envirodyne Engineers), 1985. *Initial Assessment Study of NAS Cecil Field, Jacksonville, Florida.* Prepared for Naval Energy and Environmental Support Activity (NEESA), NEESA 13-073, Port Hueneme, California, July.

FDEP (Florida Department of Environmental Protection), 1999. *Contaminant Target Rule, Soil, Groundwater, and Surface Water, Target Cleanup Levels.* Florida Administrative Code (FAC) 62-777, August.

G&M, (Geraghty & Miller, Inc.), 1983. *Hydrogeologic Assessment and Groundwater Monitoring Plan, NAS Cecil Field, Jacksonville,* Florida. Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. October.

G&M, 1985. *Year-End Report of Groundwater Monitoring.*

HLA (Harding Lawson Associates, Inc.), 1988. *Draft Final RCRA Facility Investigation (RFI) Report, NAS Cecil Field, Jacksonville, Florida*. Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. March.

HLA, 1998a. *Site Assessment Report Day Tank 2 Facility 342 NAS Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. July.

HLA, 1998b. *Inorganic Background Data Set.*

SPORTENVDETCHASN (Supship Portsmouth Environmental Detachment Charleston), 1997. *Completion Report for the Day Tank 2 Removal at NAS Cecil Field, Jacksonville, Florida.* October.

TtNUS (Tetra Tech NUS), 1999. *Remedial Investigation Report, Site 36 - Control Tower TCE Plume and Site 37 - Hangars 13 and 14 DCE Plume, Naval Air Station Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. August.

TtNUS, 2000a. *Feasibility Study Report For Site 36 - Control Tower TCE Plume and Site 37 - Hangars 13 and 14 DCE Plume, Naval Air Station Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. September.

TtNUS, 2000b. *Proposed Plan For Operable Unit 9, Sites 36 and 37, Naval Air Station Cecil Field, Jacksonville, Florida.* Prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina. September.

U.S. EPA (United States Environmental Protection Agency), 1995. *Supplemental Guidance to Risk Assessment Guidance for Superfund (RAGS), Region 4 Bulletins, Health Risk Assessment.* November

U.S. EPA, 1998. *Current Drinking Water Standards.* Office of Water, Washington D.C. November.

U.S. EPA, 1999a. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-17P. April.

U.S. EPA, 1999b. *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, Final. OSWER)* Directive 9200.1-23P, Washington, D.C. July.

APPENDIX A

ESTIMATED REMEDY COSTS

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITES 36 and 37
SELECTED REMEDY
AS OF "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING

			Unit Cost				Extended Cost					
Item	**Quantity**	**Unit**	**Subcontract**	**Material**	**Labor**	**Equipment**	**Subcontract**	**Material**	**Labor**	**Equipment**	**Subtotal**	**Comments**
1 PROJECT PLANNING												
1.1 Prepare Remedial Action Plan	300	hr			$35.00		$0	$0	$10,500	$0	$10.500	
2 MOBILIZATION/DEMOBILIZATION												
2.1 Office Trailer	6	mo	$195.00				$1,170	$0	$0	$0	$1,170	
2.2 Storage Trailer	6	mo	$85.00				$510	$0	$0	$0	$510	
2.3 Construction Survey	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500	
2.4 Equipment Mobilization/Demobilization	1	ls			$800.00	$3,500.00	$0	$0	$800	$3,500	$4,300	
2.5 Site Utilities	6	mo	$1,000.00				$6,000	$0	$0	$0	$6,000	
3 DECONTAMINATION												
3.1 Decontamination Trailer	6	mo	$2,200.00				$13,200	$0	$0	$0	$13,200	
3.2 Temporary Decon Pad	1	ls		$500.00	$450.00	$155.00	$0	$500	$450	$155	$1,105	
3.3 Decon Water	6,000	gal		$0.20			$0	$1,200	$0	$0	$1,200	
3.4 Decon Water Storage Tank, 6,000 gallon	6	mo	$577.50				$3,465	$0	$0	$0	$3,465	
3.5 Clean Water Storage Tank, 4,000 gallon	6	mo	$472.50				$2,835	$0	$0	$0	$2,835	
3.6 PPE (5 p * 5 days * 26 Weeks)	650	day		$30.00			$0	$19,500	$0	$0	$19,500	
3.7 Disposal of Decon Waste (liquid & solid)	6	mo	$4,500.00				$27,000	$0	$0	$0	$27,000	
4 MONITORING WELL INSTALLATION												
4.1 Install Monitoring Wells (Mud Rotary) - 2" PVC	1,278	lf	$23.75				$30,353	$0	$0	$0	$30,353	
4.2 Well Development	38	hour	$35.00				$1,330	$0	$0	$0	$1,330	
4.3 Collect/Containerize IDW	19	ea	$50.00				$950	$0	$0	$0	$950	
4.4 Transport/Dispose IDW Off Site	19	drum	$150.00				$2,850	$0	$0	$0	$2,850	
4.5 Stick-up Pads w/Posts	19	ea	$500.00				$9,500	$0	$0	$0	$9,500	
4.6 Survey Well Locations	1	ls	$800.00				$800	$0	$0	$0	$800	
5 GROUNDWATER SAMPLING AND ANALYSIS												
5.1 Collect Samples	5	day		$150.00	$336.00	$100.00	$0	$750	$1,680	$500	$2,930	5 wells per day, 2 laborers
5.2 Sample Analysis - standard turn around time	15	ea	$250.00				$3,750	$0	$0	$0	$3,750	VOCs
6 WELL INSTALLATION												
6.1 Install Air Sparging Wells	600	ft	$21.00				$12,600	$0	$0	$0	$12,600	system 1
6.2 Install Air Sparging Wells	2,950	ft	$21.00				$61,950	$0	$0	$0	$61,950	system 2
6.3 Install Air Sparging Wells	2,920	ft	$21.00				$61,320	$0	$0	$0	$61,320	system 3
6.4 Well Development	688	hr	$35.00				$24,080	$0	$0	$0	$24,080	2 hours per well
6.5 Piping, 2" PVC (includes installation)	10,000	lf		$0.42	$3.49	$2.68	$0	$4,200	$34,900	$26,800	$65,900	10% for fittings
6.6 Piping, 4" PVC (includes installation)	2,900	lf		$1.49	$5.10	$3.93	$0	$4,321	$14,790	$11,397	$30,508	10% for fittings
6.7 Pavement Removal and Replacement - 2" & 4" pipe	8,000	lf		$1.16	$0.96	$0.45	$0	$9,280	$7,680	$3,600	$20,560	
6.8 Collect/Containerize IDW	688	ea	$50.00				$34,400	$0	$0	$0	$34,400	
6.9 Transport/Dispose IDW Off Site	688	drum	$150.00				$103,200	$0	$0	$0	$103,200	
7 AS/VE SYSTEM INSTALLATION (2 SYSTEMS)												
7.1 Concrete Foundation (6")	1,500	sf		$2.74	$3.50	$.067	$0	$4,110	$5,250	$1,005	$10,365	
7.2 Treatment System Buildings	1,500	sf		$4.36	$0.93	$0.56	$0	$6,540	$1,395	$840	$8,775	
7.3 Compressor, 50 cfm, 15HP	1	ea		$23,920.00	$200.00		$0	$23,920	$200	$0	$24,120	
7.4 Compressor, 120 cfm, 25HP	1	ea		$28,000.00	$200.00		$0	$28,000	$200	$0	$28,200	
7.5 Compressor, 200 cfm, 40 HP	1	ea		$38,380.00	$250.00		$0	$38,380	$250	$0	$38,630	
7.6 Compressor, 300 cfm, 100 HP	1	ea		$40,180.00	$310.00		$0	$40,180	$310	$0	$40,490	
7.7 Compressor, 650 cfm, 100 HP	1	ea		$60,100.00	$448.00		$0	$60,100	$448	$0	$60,548	
7.8 Receiver Tank, 75 gallon	1	ea		$1,400.00			$0	$1,400	$0	$0	$1,400	
7.9 Receiver Tank, 150 gallon	1	ea		$1,900.00			$0	$1,900	$0	$0	$1,900	
7.10 Receiver Tank, 250 gallon	1	ea		$2,400.00			$0	$2,400	$0	$0	$2,400	
7.11 Receiver Tank, 400 gallon	1	ea		$3,000.00			$0	$3,000	$	$0	$3,000	
7.12 Receiver Tank, 1000 gallon	1	ea		$5,500.00			$0	$5,500	$0	$0	$5,500	
7.13 Instruments and Controls	3	ea		$23,000.00	$17,500.00		$0	$69,000	$52,500	$0	$121,500	
7.14 Plumb/Electrify System	3	ea		$3,000.00	$2,580.00		$0	$9,000	$7,740	$0	$16,740	1 plumber, 1 electrician
7.15 Systems Start-up and Testing	3	ea		$1,000.00	$1,000.00		$0	$3,000	$3,000	$0	$6,000	
8 INSTITUTIONAL CONTROLS												
8.1 Prepare Deed Restrictions & LUCIPs	100	hours			$35.00		$0	$0	$3,500	$0	$3,500	
9 SITE RESTORATION												
9.1 Vegetable Disturbed Area	1	ls		$750.00	$750.00		$0	$750	$750	$0	$1,500	
Subtotal Direct Costs less Subcontract								$336,931	$146,343	$47,797	$531,071	
Local Area Adjustments								99%	88%	88%		
								$332,214	$128,782	$42,061	$503,057	
Overhead on Labor Cost @ 30%									$38,635		$38,635	
G & A on Labor Cost @ 10%									$12,878		$12,878	
G & A on Material Cost @ 10%								$33,221			$33,221	

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITES 36 and 37
SELECTED REMEDY
AS OF "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal	Comments
Total Direct Cost								$365,435	$180,295	$42,061	$587,791	
Indirects on Total Direct Labor Cost @ 75%									$135,221		$135,221	
Profit on Total Direct Cost @ 10%											$58,779	
Subtotal											$781,791	
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$35,537	
Total Field Cost											$817,328	
Subtotal Subcontractor Cost							$402,763				$402,763	
G & A on Subcontract Cost @ 10%							$40,276				$40,276	
Profit on Subcontractor Cost @ 5%											$20,138	
Subcontractor Cost											$463,177	
Contingency on Total Field and Subcontractor Costs @ 10%											$128,050	
Engineering on Total Field Cost @ 5%											$40,866	
TOTAL COST											$1,449,422	

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITES 36 and 37
SELECTED REMEDY
AS OF "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric	2,157,000	kWh	$0.06	$129,420	
2	Maintenance	1	ls	$16,384.40	$16,384	5% of Installation Cost
3	Labor, Mobilization/Demobilization, Per Diem, Supplies	52	wk	$925.00	$48,100	1 visit per week - 1 day
4	Labor, Mobilization/Demobilization, Per Diem, Supplies	4	mo	$1,950.00	$7,800	1 visit per quarter - 2 laborers, 2 days
5	Quarterly Reports	4	ea	$4,000.00	$16,000	
	Subtotal Cost for One Year Operation				$217,704	

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITES 36 and 37
SELECTED REMEDY
AS OF "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
Annual Groundwater Sampling Cost

Item	Item Cost Year 1	Item Cost Years 2 & 3	Item Cost Years 4 & 5	Item Cost Year 6	Item Cost Years 7 & 8	Item Cost Years 9 & 10	Item Cost Years 11 thru 30	Item Cost Every 5 years	Notes
Sampling	$16,000	$8,000	$4,000	$16,000	$8,000	$4,000	$3,000		Labor, Mobilization/Demobilization, Field Supplies
Analysis/Water	$31,000	$15,500	$7,750	$5,250	$5,250	$5,250	$5,250		Analyze samples from 31 wells for TCL VOCs. Quarterly year 1; semi-annually years 2 - 3 and annually years 4 - 10. Analyze samples from 21 wells annually for years 11 - 30.
Analysis/Water	$0	$0	$0	$72,000	$36,000	$18,000	$0		Analyze samples from 24 wells for natural attenuation and VOCs. Quarterly year 6; semi-annually years 7 & 8 and annually years 9 & 10.
Report	$16,000	$8,000	$4,000	$16,000	$8,000	$4,000	$4,000		Document sampling events and results
Site Review								$5,000	
TOTALS	$63,000	$31,500	$15,750	$109,250	$57,250	$31,250	$12,250	$5,000	

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITES 36 and 37
SELECTED REMEDY
AS OF "HOT-SPOTS", NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
Present Worth Analysis

Year	Capital Cost	Operation & Maintenance Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$1,449,422			$1,449,422	1.000	$1,449,422
1		$217,704	$63,000	$280,704	0.935	$262,459
2		$217,704	$31,500	$249,204	0.873	$217,555
3		$217,704	$31,500	$249,204	0.816	$203,351
4		$217,704	$15,750	$233,454	0,763	$178,126
5		$217,704	$20,750	$238,454	0.713	$170,018
6			$109,250	$109,250	0.666	$72,761
7			$57,250	$57,250	0.623	$35,667
8			$57,250	$57,250	0.582	$33,320
9			$31,250	$31,250	0.544	$17,000
10			$36,250	$36,250	0.508	$18,415
11			$12,250	$12,250	0.475	$5,819
12			$12,250	$12,250	0.444	$5,439
13			$12,250	$12,250	0.415	$5,084
14			$12,250	$12,250	0.388	$4,753
15			$17,250	$17,250	0.362	$6,245
16			$12,250	$12,250	0.339	$4,153
17			$12,250	$12,250	0.317	$3,883
18			$12,250	$12,250	0.296	$3,626
19			$12,250	$12,250	0.277	$3,393
20			$17,250	$17,250	0.258	$4,451
21			$12,250	$12,250	0.242	$2,965
22			$12,250	$12,250	0.226	$2,769
23			$12,250	$12,250	0.211	$2,585
24			$12,250	$12,250	0.197	$2,413
25			$17,250	$17,250	0.184	$3,174
26			$12,250	$12,250	0.172	$2,107
27			$12,250	$12,250	0.161	$1,972
28			$12,250	$12,250	0.150	$1,838
29			$12,250	$12,250	0.141	$1,727
30			$17,250	$17,250	0.131	$2,260
					TOTAL PRESENT WORTH	$2,728,746