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FINAL ANNUAL GROUNDWATER MONITORING REPORT YEAR 1 FOR OPERABLE UNIT 9 (OU 9) SITE 57 NAS CECIL FIELD FL

6/1/2005

TETRA TECH NUS INC

Annual Groundwater Monitoring Report - Year 1

for

Operable Unit 9, Site 57

at

Naval Air Station Cecil Field

Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0161

June 2005

040510/P

ANNUAL GROUNDWATER MONITORING REPORT - YEAR 1 FOR OPERABLE UNIT 9, SITE 57 AT NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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North Charleston, South Carolina 29406

Submitted by:
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0161

JUNE 2005

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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: June 16, 2005

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ACRONYMS

BTEX	Benzene, toluene, ethylbenzene, and xylenes
bgs	Below ground surface
COC	Chemical of concern
DCA	Dichloroethane
DCE	Dichloroethene
DO	Dissolved oxygen
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Cleanup Target Level
LUC	Land use control
msl	Mean sea level
NAS	Naval Air Station
NTU	Nephelometric turbidity unit
ORP	Oxidation-reduction potential
OU	Operable Unit
PAH	Polynuclear aromatic hydrocarbon
PRE	Preliminary Risk Evaluation
PRO	Petroleum Range Organics
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
TCE	Trichloroethene
TtNUS	Tetra Tech NUS, Inc.
TOC	Total organic carbon
T.O.C.	Top of casing
TRPH	Total recoverable petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile organic compound

1.0 INTRODUCTION

This Annual Groundwater Monitoring Report presents a summary of the work performed during the first year of groundwater monitoring at Operable Unit (OU) 9, Site 57 at Naval Air Station (NAS) Cecil Field located in Jacksonville, Florida. This report was prepared under Contract Task Order 0161 as part of the Comprehensive Long-Term Environmental Action Navy III Contract No. N62467-94-D-0888 for the Naval Facilities Engineering Field Division South. Site 57 is located in the Main Base area, on the western side of the North-South Runways in the area of Buildings 824/824A and 1848 and former Buildings 293 and 846 (see Figures 1-1 and 1-2).

Site 57 consists of groundwater contaminated with petroleum-related and chlorinated volatile organic compounds (VOCs). The Site 57 Petroleum Plume is located in the shallow and intermediate portions of the surficial aquifer and was delineated in the Remedial Investigation (RI) as approximately 750 feet long with an average width of approximately 225 feet (see Figure 1-3). The Petroleum Plume includes exceedances of benzene, toluene, ethylbenzene, and xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and total recoverable petroleum hydrocarbons (TRPH). Site 57 also includes a Trichloroethene (TCE) Plume that partially overlaps the petroleum plume. The Site 57 TCE Plume is located in the shallow zone of the surficial aquifer and was delineated in the RI as approximately 250 feet long with an average width of approximately 180 feet (see Figure 1-3). Tetra Tech NUS, Inc. (TtNUS) conducted a RI at OU 9, Site 57 in 2001 and 2002 to delineate the nature and extent of groundwater contamination, to assess the human health and environmental risks posed by contamination [a Preliminary Risk Evaluation (PRE) rather than a Baseline Risk Assessment], and to provide a basis for selecting alternatives for remediation of the site (TtNUS, 2002).

Site 57 includes the Day Tank 1 area wells with common petroleum-related groundwater contamination. The Site 57 Petroleum Plume is defined by benzene concentrations greater than the Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Level (GCTL) of 1 microgram per liter (µg/L) that extend from the northeastern portion of the former Building 846 location toward the southeast to the area east and southeast of Building 824A, as detected during the RI. The Site 57 TCE Plume, defined by TCE concentrations greater than the GCTL of 3 µg/L, is centered to the east of the Site 57 Petroleum Plume. The TCE Plume also extends toward the southeast, parallel to the Petroleum Plume.

The Record of Decision (ROD) details the selected remedy for OU 9, Site 57, which includes the following:

- Land use controls (LUCs) to prohibit usage of the surficial aquifer beneath the site and thereby preclude unacceptable risks from exposure to contaminated groundwater.

- Long-term groundwater monitoring to verify that no chemicals of concern (COCs) are migrating past selected compliance wells and to evaluate the natural attenuation of the COCs (TtNUS, 2004).

Following completion of the RI, a long-term monitoring program was designed to monitor the concentrations of COCs and the effectiveness of natural attenuation. The Groundwater Remedial Design Work Plan for Long-Term Monitoring was submitted in April 2003 (TtNUS, 2003).

Petroleum-contaminated soil at Site 57 and Day Tank 1 has been being addressed under the Petroleum Program, Chapter 62-770 of the Florida Administrative Code (FAC), and soil removal activities are expected to significantly decrease the potential for contaminated groundwater migration at that site. The Day Tank 1 aboveground storage tank and 24,000 tons of petroleum-contaminated soil were removed in 1999. Supplemental field investigations were conducted in 2002 and 2003 to further delineate the extent of additional soil contamination in the Day Tank 1 area. The investigation identified additional soil contamination near the water table, about 4 to 8 feet below ground surface (bgs). An additional 3,300 cubic yards of contaminated soil was removed in October 2003 to meet residential Soil Cleanup Target Levels (TtNUS, 2003). During this removal action monitoring wells CEF-293-03 and CEF-293-08 were abandoned and re-installed. In September 2004, after the spill containment pond was drained, an additional 6,243 tons of petroleum-contaminated soil was excavated and disposed off site (TN & Associates, 2004).

In accordance with the long-term monitoring component of the selected remedy, TtNUS collected and analyzed groundwater samples for COCs and natural attenuation parameters during the following groundwater monitoring events at OU 9, Site 57:

- First quarter, Year 1: April 2003
- Second quarter, Year 1: July/August 2003
- Third quarter, Year 1: October 2003
- Fourth quarter, Year 1: January 2004

Water-level measurements and groundwater elevations obtained during quarterly sampling events are presented in Table 1-1. A potentiometric surface elevation map generated with water-level data from the January 2004 monitoring event is presented as Figure 1-4. Appendix A includes the potentiometric surface elevation maps from the other quarterly monitoring events.

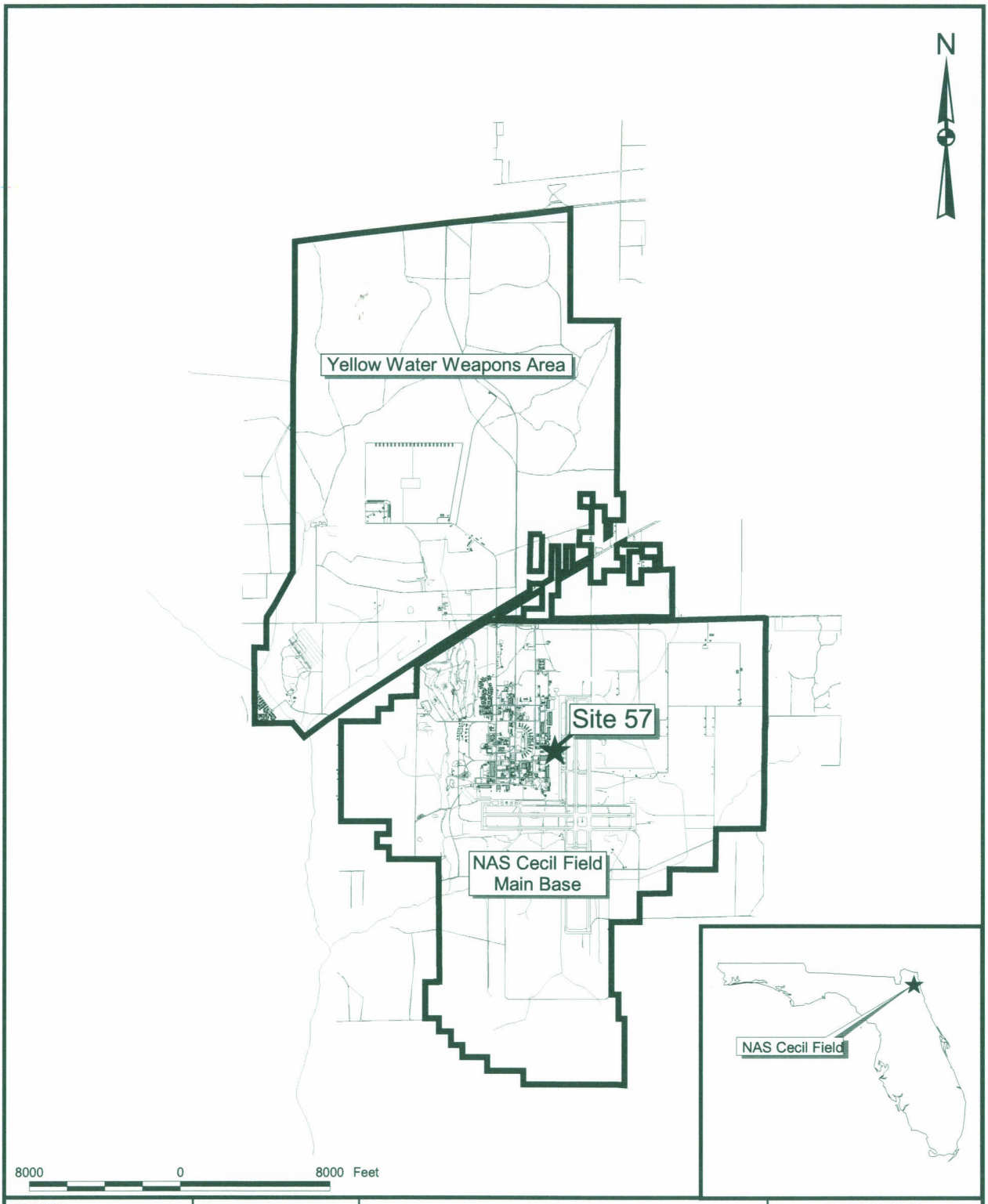
Depth to groundwater in January 2004 ranged from approximately 7.2 to 10.7 feet bgs, approximately 2 to 4 feet deeper than the depths reported in the RI in September 2001. Groundwater flow at Site 57 is to the southeast. The groundwater flow patterns for the quarterly sampling events were similar to the RI.

TABLE 1-1

WATER LEVEL AND POTENTIOMETRIC SURFACE ELEVATION DATA
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

WELL NUMBER	GROUND SURFACE ELEVATION (ft above msl)	TOP OF CASING ELEVATION (ft above msl)	APRIL 2003		AUGUST 2003		OCTOBER 2003		JANUARY 2004	
			DEPTH TO WATER (from T.O.C.)	ELEVATION (ft above msl)	DEPTH TO WATER (from T.O.C.)	ELEVATION (ft above msl)	DEPTH TO WATER (from T.O.C.)	ELEVATION (ft above msl)	DEPTH TO WATER (from T.O.C.)	ELEVATION (ft above msl)
CEF-824A-01Sa	NA	74.88	8.48	66.40	7.73	67.15	8.82	66.06	10.39	64.49
CEF-824A-02S	74.88	74.36	7.60	66.76	6.76	67.60	8.01	66.35	9.74	64.62
CEF-824A-03S	73.75	73.75	8.02	65.73	7.41	66.34	8.30	65.45	9.60	64.15
CEF-824A-04S	74.60	74.60	8.08	66.52	7.22	67.38	8.49	66.11	10.08	64.52
CEF-824A-05S	74.15	74.15	7.94	66.21	7.35	66.80	8.20	65.95	9.70	64.45
CEF-824A-07S	74.48	74.48	8.73	65.75	8.22	66.26	8.96	65.52	10.21	64.27
CEF-824A-08S	74.39	74.39	8.44	65.95	7.43	66.96	8.85	65.54	10.30	64.09
CEF-824A-09S	74.93	74.93	7.80	67.13	6.84	68.09	8.28	66.65	9.80	65.13
CEF-824A-10S	74.12	74.12	6.67	67.45	5.75	68.37	7.19	66.93	8.77	65.35
CEF-824A-11S	74.95	74.95	7.28	67.67	6.29	68.66	7.75	67.20	9.40	65.55
CEF-824A-12I	75.11	75.11	7.92	67.19	6.97	68.14	8.46	66.65	10.03	65.08
CEF-824A-13D	75.40	75.20	7.68	67.52	6.68	68.52	8.20	67.00	9.90	65.30
CEF-824A-14S	75.50	75.24	7.19	68.05	7.25	67.99	8.67	66.57	10.28	64.96
CEF-824A-15I	75.50	75.14	8.11	67.03	7.15	67.99	8.58	66.56	10.20	64.94
CEF-824A-17I	74.70	74.38	7.93	66.45	7.02	67.36	8.36	66.02	10.01	64.37
CEF-824A-18S	72.60	72.56	8.84	63.72	6.74	65.82	8.27	64.29	9.56	63.00
CEF-824A-19S	74.30	74.00	8.84	65.16	7.88	66.12	9.23	64.77	10.54	63.46
CEF-824A-20S	73.30	73.00	7.22	65.78	6.31	66.69	7.61	65.39	9.15	63.85
CEF-824A-21I	75.20	75.03	7.37	67.66	6.47	68.56	7.95	67.08	9.89	65.14
CEF-824A-22S	74.36	74.36	8.38	65.98	7.64	66.72	8.68	65.68	10.16	64.20
CEF-293-1	76.30	76.29	6.54	69.75	5.29	71.00	7.07	69.22	9.21	67.08
CEF-293-3	75.50	75.47	7.57	69.34	6.62	70.29	NM	-	9.60	65.87
CEF-293-5	77.10	76.82	6.85	69.97	2.69	74.13	7.38	69.44	7.24	69.58
CEF-293-8	76.50	76.50	8.30	69.82	7.25	70.87	NM	-	10.71	65.79
CEF-293-10	75.40	75.25	7.54	67.71	6.63	68.62	8.04	67.21	9.62	65.63
CEF-293-11	75.48	75.27	7.59	67.68	6.74	68.53	8.18	67.09	9.86	65.41
CEF-293-13	74.61	74.48	6.85	67.63	6.08	68.40	7.52	66.96	9.34	65.14
CEF-293-14	75.50	75.08	6.96	68.12	6.06	69.02	7.67	67.41	9.72	65.36
CEF-293-19	NA	75.08	7.75	67.33	6.84	68.24	8.28	66.80	9.89	65.19
CEF-293-20	NA	74.37	7.61	66.76	6.68	67.69	8.05	66.32	9.68	64.69
CEF-293-21	NA	74.45	7.70	66.75	6.77	67.68	8.14	66.31	9.87	64.58
CEF-293-22	NA	74.42	6.78	67.64	5.98	68.44	7.44	66.98	9.18	65.24
CEF-825LS-01S	75.70	75.56	7.96	67.60	7.14	68.42	8.46	67.10	10.04	65.52
CEF-16-38S	NA	75.30	8.71	66.59	7.55	67.75	9.18	66.12	10.71	64.59

T.O.C. = Top of casing. NM = Not measured. NA = Not available. msl = Mean sea level.



DRAWN BY MJJ	DATE 15Oct04	GENERAL LOCATION MAP OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 4187
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COST/SCHEDULE-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1-1 / REV 0

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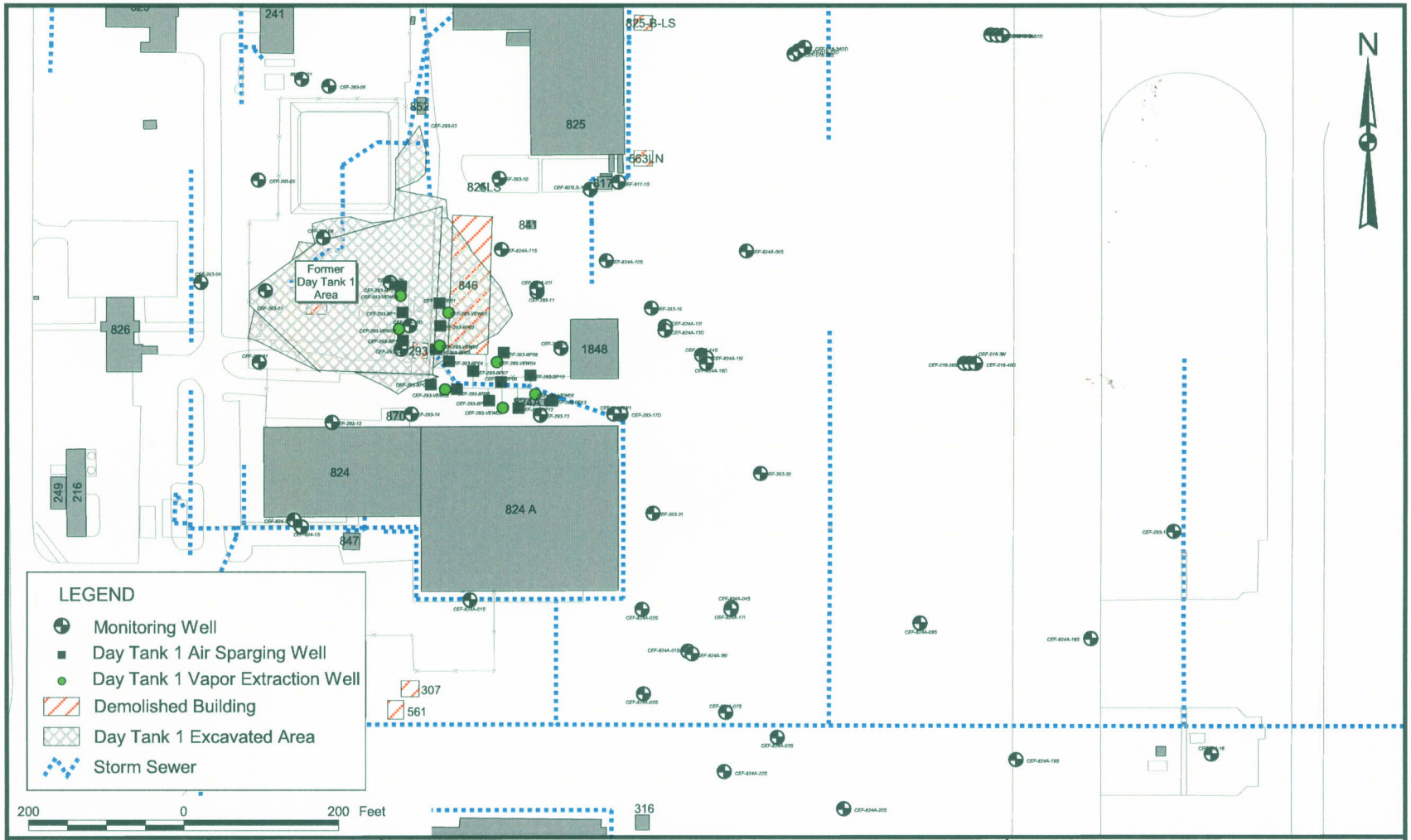

DRAWN BY MJJ	DATE 15Oct04	SITE LOCATION MAP OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 3965
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COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1-2 / REV 0

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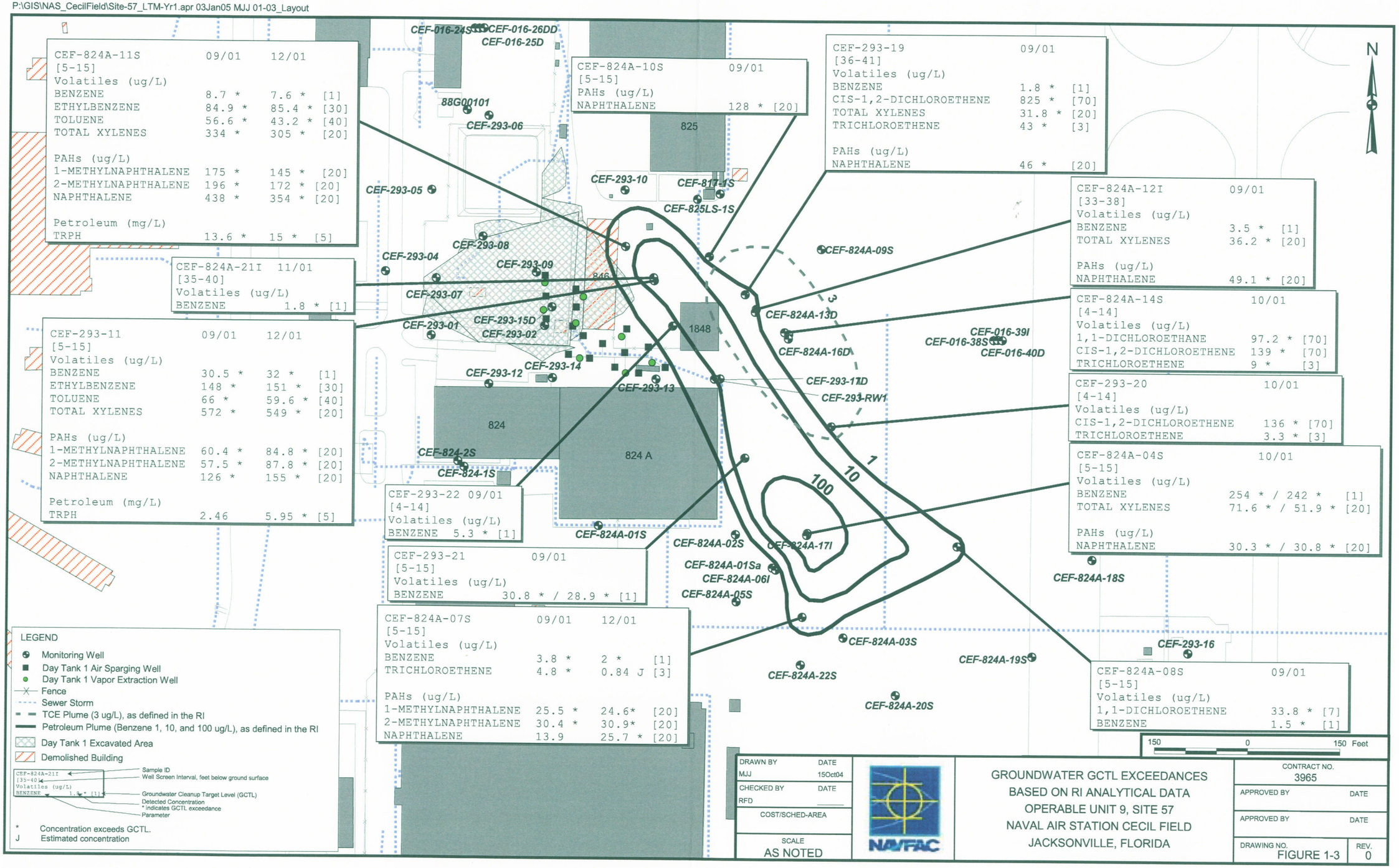

CEF-824A-11S	09/01	12/01	
[5-15]			
Volatiles (ug/L)			
BENZENE	8.7 *	7.6 *	[1]
ETHYLBENZENE	84.9 *	85.4 *	[30]
TOLUENE	56.6 *	43.2 *	[40]
TOTAL XYLENES	334 *	305 *	[20]
PAHs (ug/L)			
1-METHYLNAPHTHALENE	175 *	145 *	[20]
2-METHYLNAPHTHALENE	196 *	172 *	[20]
NAPHTHALENE	438 *	354 *	[20]
Petroleum (mg/L)			
TRPH	13.6 *	15 *	[5]

CEF-824A-21I	11/01	
[35-40]		
Volatiles (ug/L)		
BENZENE	1.8 *	[1]

CEF-293-11	09/01	12/01	
[5-15]			
Volatiles (ug/L)			
BENZENE	30.5 *	32 *	[1]
ETHYLBENZENE	148 *	151 *	[30]
TOLUENE	66 *	59.6 *	[40]
TOTAL XYLENES	572 *	549 *	[20]
PAHs (ug/L)			
1-METHYLNAPHTHALENE	60.4 *	84.8 *	[20]
2-METHYLNAPHTHALENE	57.5 *	87.8 *	[20]
NAPHTHALENE	126 *	155 *	[20]
Petroleum (mg/L)			
TRPH	2.46	5.95 *	[5]

CEF-824A-10S	09/01	
[5-15]		
PAHs (ug/L)		
NAPHTHALENE	128 *	[20]

CEF-293-19	09/01	
[36-41]		
Volatiles (ug/L)		
BENZENE	1.8 *	[1]
CIS-1,2-DICHLOROETHENE	825 *	[70]
TOTAL XYLENES	31.8 *	[20]
TRICHLOROETHENE	43 *	[3]
PAHs (ug/L)		
NAPHTHALENE	46 *	[20]

CEF-824A-12I	09/01	
[33-38]		
Volatiles (ug/L)		
BENZENE	3.5 *	[1]
TOTAL XYLENES	36.2 *	[20]
PAHs (ug/L)		
NAPHTHALENE	49.1 *	[20]

CEF-824A-14S	10/01	
[4-14]		
Volatiles (ug/L)		
1,1-DICHLOROETHANE	97.2 *	[70]
CIS-1,2-DICHLOROETHENE	139 *	[70]
TRICHLOROETHENE	9 *	[3]

CEF-293-20	10/01	
[4-14]		
Volatiles (ug/L)		
CIS-1,2-DICHLOROETHENE	136 *	[70]
TRICHLOROETHENE	3.3 *	[3]

CEF-824A-04S	10/01	
[5-15]		
Volatiles (ug/L)		
BENZENE	254 * / 242 *	[1]
TOTAL XYLENES	71.6 * / 51.9 *	[20]
PAHs (ug/L)		
NAPHTHALENE	30.3 * / 30.8 *	[20]

CEF-293-22	09/01	
[4-14]		
Volatiles (ug/L)		
BENZENE	5.3 *	[1]

CEF-293-21	09/01	
[5-15]		
Volatiles (ug/L)		
BENZENE	30.8 * / 28.9 *	[1]

CEF-824A-07S	09/01	12/01	
[5-15]			
Volatiles (ug/L)			
BENZENE	3.8 *	2 *	[1]
TRICHLOROETHENE	4.8 *	0.84 J	[3]
PAHs (ug/L)			
1-METHYLNAPHTHALENE	25.5 *	24.6*	[20]
2-METHYLNAPHTHALENE	30.4 *	30.9*	[20]
NAPHTHALENE	13.9	25.7 *	[20]

CEF-824A-08S	09/01	
[5-15]		
Volatiles (ug/L)		
1,1-DICHLOROETHENE	33.8 *	[7]
BENZENE	1.5 *	[1]

LEGEND

- Monitoring Well
- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Fence
- Sewer Storm
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI
- Day Tank 1 Excavated Area
- Demolished Building

CEF-824A-21I — Sample ID
[35-40] — Well Screen Interval, feet below ground surface
Volatiles (ug/L)
BENZENE 1.8 * [1]
Groundwater Cleanup Target Level (GCTL)
Detected Concentration
* indicates GCTL exceedance
Parameter

* Concentration exceeds GCTL.
J Estimated concentration

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COST/SCHED-AREA	
SCALE	AS NOTED

NAVFAC

GROUNDWATER GCTL EXCEEDANCES
BASED ON RI ANALYTICAL DATA
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO.	
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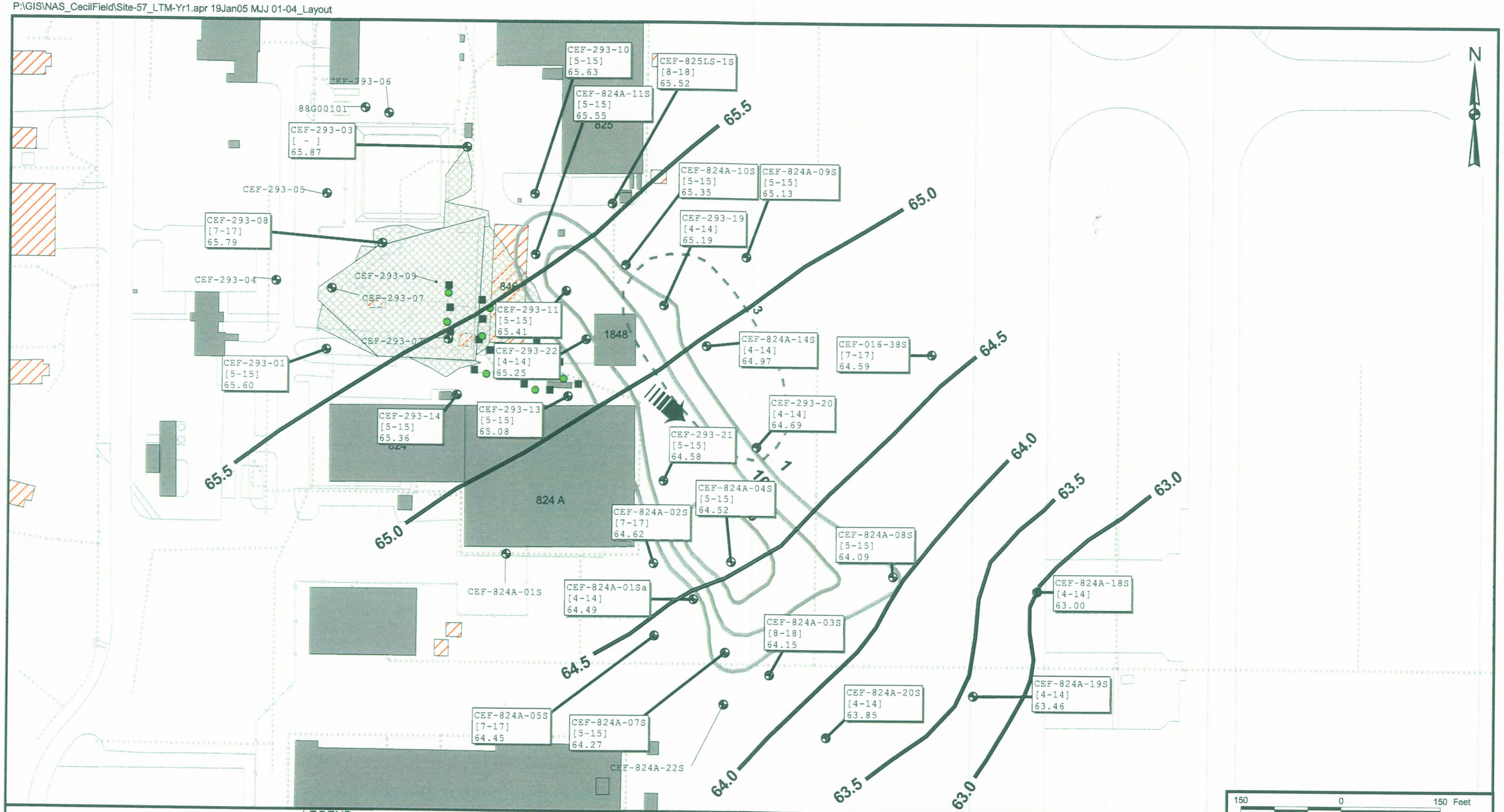

LEGEND

- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Monitoring Well
- Potentiometric Elevation Contour (Dashed where inferred)
- Groundwater Flow
- [4-14] Well screen interval in feet below ground surface
- 67 Potentiometic surface elevation measured 01/20/04 (in feet above mean sea level)
- Sewer Storm
- Day Tank 1 Excavated Area (Excavation occurred in 1999)
- Demolished Building
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI

DRAWN BY MJJ	DATE 15Oct04	
CHECKED BY RFD	DATE	
COST/SCHED-AREA		
SCALE AS NOTED		

NAVFAC

SHALLOW POTENTIOMETRIC SURFACE MAP
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 3965	
APPROVED BY	DATE
APPROVED BY	DATE
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2.0 SITE CHEMICALS OF CONCERN

The RI (TtNUS, 2002) and the draft ROD (TtNUS, 2004) identified the following COCs for OU 9, Site 57 based on the PRE:

- Benzene
- cis-1,2-DCE
- 1,1-Dichloroethane (DCA)
- 1,1-Dichloroethene (DCE)
- Ethylbenzene
- Toluene
- TCE
- Xylenes
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Naphthalene
- TRPH

Table 2-1 presents the frequencies of detection and ranges of concentrations for these COCs based on data from the RI for Site 57.

TABLE 2-1

SUMMARY OF CHEMICALS OF CONCERN IN GROUNDWATER
REMEDIAL INVESTIGATION DATA
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CHEMICAL OF CONCERN	FREQUENCY OF DETECTION	RANGE OF DETECTIONS	LOCATION OF MAXIMUM DETECTION
VOLATILE ORGANIC COMPOUNDS (ug/L)			
Benzene	11 / 41	0.87 - 248	CEF-824A-4S
cis-1,2-Dichloroethene	5 / 41	0.94 - 825	CEF-293-19
1,1-Dichloroethane	7 / 41	1.1 - 97.2	CEF-824A-14S
1,1-Dichloroethene	2 / 41	5 - 33.8	CEF-824A-8S
Ethylbenzene	11 / 41	1 - 151	CEF-293-11
Toluene	7 / 41	1 - 59.6	CEF-293-11
Trichloroethene	5 / 41	1 - 43	CEF-293-19
Xylenes	13 / 41	1.9 - 549	CEF-293-11
POLYNUCLEAR AROMATIC HYDROCARBONS (ug/L)			
1-Methylnaphthalene	13 / 41	1.2 - 145	CEF-824A-11S
2-Methylnaphthalene	12 / 41	1.6 - 172	CEF-824A-11S
Naphthalene	15 / 41	1.2 - 354	CEF-824A-11S
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (mg/L)			
TRPH	23 / 41	0.203 - 15	CEF-824A-11S

3.0 ANALYTICAL RESULTS AND EVALUATION

Long-term monitoring was performed in accordance with the Groundwater Remedial Design Work Plan for Long-Term Monitoring (TtNUS, 2003) and was conducted in general accordance with TtNUS standard operating procedures, United States Environmental Protection Agency (U.S. EPA) Region 4 Environmental Investigations and Standard Operating Procedures (EISOPQAM) (U.S. EPA, 1996), and the FDEP Groundwater Sampling Standard Operating Procedure FS 2200 (FDEP, 2002). The rationale for the locations of the long-term monitoring wells and analyses performed is provided in Table 3-1. The frequencies of detection and ranges of detected concentrations for COCs during Year 1 sampling are provided in Table 3-2. Table 3-3 provides a summary of the COC analytical results for the OU 9, Site 57 long-term monitoring wells. Table 3-4 presents a summary of the natural attenuation indicator parameter analytical results for these wells.

Figures 3-1 through 3-3 are tag maps of Year 1 COC data for VOCs, PAHs, and TRPH, respectively, at Site 57. Figures 3-4 through 3-9 present Year 1 natural attenuation indicator parameter results. Laboratory analytical data from Year 1 quarterly sampling are presented in Appendix B.

3.1 CONTAMINANTS OF CONCERN

Groundwater monitoring conducted during the RI (TtNUS, 2002) identified several COCs (BTEX, cis-1,2-DCE, 1,1-DCA, 1,1-DCE, TCE, three PAHs, and TRPH) in two plumes at Site 57. Data evaluation indicates that the plumes are contained and that contamination has not and is not expected to migrate off site or discharge to a surface water body. The Work Plan for Long-Term Monitoring identified 23 monitoring wells for quarterly sampling in the first year, semi-annual sampling for the next 2 years, and annual sampling thereafter.

Four quarterly groundwater sampling events were conducted during Year 1 from April 2003 to January 2004. Monitoring wells within, upgradient of, and downgradient of the plume were sampled and analyzed for VOCs, PAHs, TRPH (Petroleum Plume only), and natural attenuation parameters. The analytical results from the quarterly sampling events were presented to and discussed with the Navy and regulators during scheduled meetings.

Based on the maximum concentrations of contaminants for the monitoring wells in the Petroleum Plume, BTEX concentrations have generally increased and SVOC and TRPH concentrations have generally decreased since the RI. Based on the maximum concentrations of contaminants in monitoring wells in the TCE Plume, TCE concentrations have generally decreased and concentrations of daughter products (1,1-DCA, 1,1-DCE, cis-1,2-DCE, and vinyl chloride) have generally increased since the RI. Benzene,

ethylbenzene, toluene, xylenes, 1,1-DCA, cis-1,2-DCE, 1,1-DCE, TCE, vinyl chloride, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and TRPH were detected at concentrations greater than FDEP GCTLs during Year 1 groundwater monitoring.

3.1.1 Petroleum Plume

The discussion in this section focuses on concentrations of petroleum-related contaminants. Chlorinated contaminant concentrations are discussed in Section 3.1.2.

Petroleum-related COCs were not detected at concentrations greater than FDEP GCTLs in monitoring well CEF-293-03, upgradient of the Petroleum Plume. Low concentrations of naphthalene were detected in this well during the last quarterly monitoring event only.

Shallow source area monitoring wells within the Petroleum Plume include CEF-293-11 and CEF-824A-04S. In CEF-293-11, BTEX, SVOC, and TRPH concentrations decreased from the first to second sampling event and then increased in the third and fourth events to levels similar to or slightly higher then those detected during the first round. Concentrations of BTEX, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene exceeded GCTLs during all Year 1 events; the TRPH concentration exceeded the GCTL in the fourth event only. In CEF-824A-04S, BTEX and SVOC concentrations increased from the first to second event, decreased in the third event, and then increased in the fourth event. For all COCs detected except naphthalene, fourth quarter concentrations were the highest detected during Year 1. Concentrations of benzene and xylenes in all quarters and ethylbenzene and naphthalene in the second and fourth quarters exceeded GCTLs.

Intermediate monitoring wells located in the source area include CEF-824A-21I and CEF-824A-17I. In CEF-824A-21I, ethylbenzene and xylenes were detected at low concentrations (less than 2 µg/L) in three and two Year 1 events, respectively. Naphthalene and 1-mehtylnaphthalene concentrations in CEF-824A-21I remained relatively consistent and less than GCTLs during Year 1 sampling. Concentrations of 2-methylnaphthalene slightly exceeded its GCTL during three of four Year 1 events. TRPH concentrations were less than 1 mg/L during Year 1 sampling. In CEF-824A-17I, naphthalene at a low estimated concentration was the only COC detected during the first sampling event. Benzene, ethylbenzene, xylenes, and SVOC COC concentrations increased during Year 1; concentrations of benzene, xylenes, and naphthalene exceeded GCTLs during the fourth sampling event.

COC concentrations fluctuated during Year 1 in well CEF-824A-11S, located within the Petroleum Plume, with concentrations of BTEX and TRPH lower and SVOCs higher in the fourth quarter than the first quarter. Benzene, ethylbenzene, xylenes, naphthalene, and 1- and 2-methylnaphthalene concentrations exceeded GCTLs during Year1 sampling. In CEF-293-21, also located within the Petroleum Plume,

BTEX and SVOC concentrations also fluctuated during Year 1. Concentrations increased significantly from the first to second event but decreased to generally levels generally consistent with the first event for BTEX constituents and slightly greater than the first event for SVOCs. Benzene concentrations were greater than the GCTL, and concentrations of other detected COCs were less than GCTLs during Year 1 sampling.

In downplume monitoring well CEF-824A-07S, BTEX and SVOC concentrations followed a pattern similar to CEF-293-11, with decreases from the first to second event, increases from the second to third event, and decreases from the third to fourth event to levels generally consistent with first quarter concentrations. Benzene and SVOC concentrations (except naphthalene in the second event) exceeded GCTLs during Year 1 events. In downplume well CEF-824A-08S, benzene and xylenes were detected at low concentrations during Year 1 sampling event; benzene concentrations were slightly greater than the GCTL of 1 µg/L during the first and third events. Ethylbenzene and toluene were detected at low concentrations (less than 1 µg/L) during the first event only. Napthalene was detected at low concentrations in CEF-824A-08S during the second and fourth events.

Wells sidegradient to the Petroleum Plume include CEF-293-13, CEF-824A-01Sa, CEF-824A-10S, and CEF-293-20. CEF-293-13 had no detections and CEF-824A-01Sa had low detections of 1-methylnaphthalene and 2-methylnaphthalene, with concentrations less than FDEP GCTLs. Naphthalene concentrations in CEF-824A-10S exceeded the FDEP GCTL during all three Year 1 monitoring events, and TPRH concentrations exceeded the GCTL in three of the four events. Ethylbenzene, toluene, and xylenes were also detected in CEF-824A-10S but at concentrations less than GCTLs. In CEF-293-20, low levels of benzene and naphthalene were detected in two and three events, respectively, during Year 1 sampling. In downgradient monitoring well CEF-824A-03S, only naphthalene was detected at a low concentration (less then 1 µg/L) during the fourth event. COCs were not detected during Year 1 in sentinel wells CEF-824A-19S and CEF-824A-20S.

3.1.2 TCE Plume

The discussion in this section focuses on concentrations of chlorinated contaminants. Petroleum-related contaminant concentrations are discussed in Section 3.1.1.

During Year 1 sampling, CEF-824A-10S, located upgradient of the TCE Plume, had low concentrations of TCE, cis-1,2-DCE, and 1,1-DCA, less than FDEP GCTLs. Concentrations decreased during the second event and generally increased thereafter, with fourth quarter concentrations relatively consistent with first quarter levels.

Concentrations of chlorinated VOCs in the source area shallow well, CEF-293-19, followed the same general pattern as in CEF-824A-04S in the Petroleum Plume. Concentrations increased from the first to the second quarter, decreased in the third quarter, and then increased again the Year 1 maximum concentrations. TCE and cis-1,2-DCE exceeded GCTLs during Year 1. In the intermediate source area well, CEF-824A-12I, only tetrachloroethene was detected at low concentrations (less than 1 µg/L) in the first and fourth quarters only. COCs were not detected in deep source area well CEF-824A-13D.

In CEF-824A-14S, within the TCE Plume, concentrations of 1,1-DCA, cis- and trans-1,2-DCE, and TCE increase to Year 1 maximum concentrations in the third quarter and then decreased in the fourth quarter. 1,1-DCE, vinyl chloride, and tetrachloroethene were detected in only one or two quarters at low concentrations. Concentrations of 1,2-DCA, cis-1,2-DCE, and TCE exceeded GCTLs during Year 1 sampling. Only TCE and tetrachloroethene at low concentrations were detected in CEF-824A-15I, the intermediate well paired with CEF-824A-14S. Tetrachloroethene concentrations ranged from an estimated 0.53 to 1.3 µg/L, and TCE was detected in the third quarter only at an estimated concentration of 0.53 µg/L.

Chlorinated COC concentrations in monitoring well CEF-293-20, downplume within the TCE Plume, followed a pattern similar to CEF-293-11 (in the Petroleum Plume), with concentrations of cis-1.2-DCE, TCE, and 1,1-DCA decreasing from the first to second quarter and then increasing in the next two quarters to Year 1 maximum levels. Vinyl chloride and trans-1,2-DCE were detected during the fourth event only at concentrations less than 1 µg/L, and 1,1-DCE was selected at low concentrations during the first and fourth events. Concentrations of cis-1,2-DCE exceeded its GCTL in all quarters except the second, and the TCE concentrations exceeded its GCTL in the fourth quarter only.

In CEF-824A-08S, downgradient of the TCE Plume, TCE was detected in the first and third quarters at concentrations less than the GCTL. 1,1-DCA was detected in all quarters at relatively consistent low levers less then its GCTL. 1,1-DCE concentrations increased during Year 1 and exceeded its GCTL during all quarters.

In the TCE Plume side gradient monitoring well (CEF-824A-09S), 1,1-DCA and TCE were detected at low levels, less than FDEP GCTLs during Year 1 sampling. Chlorinated VOCs were not detected in sentinel monitoring wells CEF-824A-19S and CEF-824A-20S.

3.2 NATURAL ATTENUATION PARAMETERS

Fixed-base laboratory analyses and field analytical tests to determine natural attenuation parameters were performed on the groundwater samples during each sampling event. Fixed-base analytical parameters included alkalinity, chloride, dissolved iron, methane, ethane, ethene, nitrate, nitrite,

orthophosphate, sulfate, dissolved sulfide, and total organic carbon (TOC). Field analytical tests included pH, specific conductance, temperature, turbidity, dissolved oxygen (DO), hydrogen sulfide, sulfide, carbon dioxide, ferrous iron, oxidation-reduction potential (ORP), and alkalinity. Natural attenuation indicator parameter results are presented in Table 3-4 and on Figures 3-4 through 3-9.

3.2.1 Natural Attenuation Overview

The following provides a general overview of the processes involved in biodegradation natural attenuation and of the parameters collected to evaluate natural attenuation at Site 57. Section 3.2.2 provides a site-specific evaluation of the results of natural attenuation sampling at Site 57.

DO is utilized as an electron acceptor during microbial aerobic respiration to mineralize hydrocarbons such as BTEX, which act as electron donors, into carbon dioxide and water providing microorganisms with carbon and energy. Aerobic respiration, or oxygen reduction, is generally the most efficient process by which BTEX constituents are degraded. For chlorinated hydrocarbons, anaerobic degradation pathways are generally more efficient than aerobic pathways.

At DO concentrations greater than approximately 0.5 to 1 mg/L (aerobic conditions), microorganisms can breakdown natural or anthropogenic sources of carbon, including BTEX, through aerobic respiration. DO decreases as oxygen in the aquifer is consumed by these reactions and anaerobic microbes become more successful than aerobic microbes. Chlorinated compounds are generally more efficiently degraded under anaerobic (reducing) conditions. After DO is consumed (DO concentrations less than 0.5 mg/L), anaerobic microorganisms typically use additional electron acceptors (as available) in the following order: nitrate, iron, and sulfate. Following sulfate reduction, degradation via methanogenesis is the dominant process. Many factors, including the natural geochemical makeup of the aquifer and complex oxidation-reduction conditions, affect whether and to what degree each process can occur.

Dissolved Oxygen

In aquifers that typically exhibit anaerobic conditions, DO concentrations less than 1.0 to 0.5 mg/L in contaminated areas suggest that indigenous anaerobic bacterial populations are established and actively degrading natural organic carbon or anthropogenic carbon sources (e.g., petroleum hydrocarbons) in these areas. As stated above, anaerobic biodegradation is more efficient at reducing concentrations of chlorinated contaminants compared to BTEX constituents.

Nitrate and Nitrite

During nitrate reduction, nitrate acts as an electron acceptor, generating nitrite and carbon dioxide. Decreasing nitrate concentrations and increasing nitrite concentrations in a downgradient direction indicate reducing conditions favorable to reductive dechlorination of chlorinated contaminants. However, nitrate may compete with chlorinated hydrocarbons as electron acceptors if present at moderate concentrations (greater than 1 mg/L). Therefore, in order for reductive dechlorination to occur, nitrate concentrations should be between approximately 0.5 mg/L and 1.0 mg/L.

Ferrous Iron

Under anaerobic conditions, ferric iron (iron III) can be used as an electron acceptor. Ferric iron available to microorganisms cannot be measured because it is insoluble; however, soluble ferrous iron, a product of iron reduction, can be used as an indicator. Increasing concentrations of ferrous iron along the flow path within the plume area indicate iron-reducing conditions favorable to anaerobic biodegradation.

Sulfate, Sulfide, and Hydrogen Sulfide

Sulfate reduction occurs after ferric iron electron acceptors have been exhausted. Chlorinated solvents themselves can be used as electron acceptors during reductive dechlorination, and sulfate may compete as an electron acceptor if present at moderate concentrations (greater than 20 mg/L). Therefore, in order for reductive dechlorination to occur, sulfate should be present but less than approximately 20.0 mg/L in the plume. The process of sulfate reduction results in the generation of hydrogen sulfide/sulfide. A decreasing trend in sulfate concentrations coupled with an increasing trend in hydrogen sulfide or sulfide concentrations in the direction of groundwater flow is a strong positive indicator of a sulfate-reducing environment.

Methane, Ethene, and Ethane

During methanogenesis (an anaerobic biodegradation process), some types of bacteria utilize carbon dioxide as an electron acceptor, generating methane as a by-product of fermentation. The presence of methane above background concentrations in areas of contaminated groundwater is a key indicator of strong reducing conditions favorable to anaerobic biodegradation. Ethene and ethane are by-products of the reductive dechlorination of chlorinated ethenes. The presence of ethene and ethane in areas of contaminated groundwater is a key indicator of biodegradation of the chlorinated ethenes.

Oxidation-Reduction Potential

ORP of groundwater is a measure of the relative tendency of the groundwater solution to accept or donate electrons as well as the amount of energy released during electron transfers within the solution. ORP depends upon and influences the rates and types of biodegradation processes; therefore, the measurement of ORP can provide evidence of the types of biodegradation processes that are active in a particular plume or even within different portions of the same plume. In general, reductive dechlorination is possible at ORP levels of less than 50 millivolts, and reductive pathways are likely at ORP levels of less than -100 millivolts. However, great care must be taken during the evaluation of ORP data because most natural waters usually have mixed potentials that cannot be related to a single electron couple. ORP should only be used as a qualitative indicator of the overall oxidation-reduction state of an aquifer.

Carbon Dioxide and Alkalinity

Carbon dioxide is both produced and utilized during the biodegradation of hydrocarbons. Carbon dioxide is produced during aerobic respiration and during anaerobic processes of denitrification, iron reduction, and sulfate reduction. Carbon dioxide is utilized during the anaerobic process of methanogenesis as an electron acceptor in the generation of methane as a by-product of fermentation. Carbon dioxide concentrations approximately two times greater than concentrations in the background wells are an indication that biodegradation processes (except methanogenesis) are occurring.

Alkalinity is a measure of the aquifer's buffering (neutralizing) capacity of acids in water and is expressed as calcium carbonate in mg/L. Alkalinity can give a general indication of the amount of carbon dioxide generated in a plume. Source area and downgradient alkalinity concentrations greater than approximately two times background concentrations suggest carbon dioxide generation associated with biodegradation processes.

Chloride

Chloride is released into groundwater during dechlorination of a solvent plume. Therefore, an increase in chloride ion concentrations in the downgradient direction provides direct evidence that dechlorination is occurring.

Total Organic Carbon

Because chlorinated hydrocarbons are used as electron acceptors during reductive dechlorination, there needs to be a sufficient supply of organic carbon as the primary substrate for microbial growth. Such a supply can come from native organic carbon in the aquifer or anthropogenic sources such as BTEX. Organic carbon concentrations greater than 20 mg/L in the aquifer indicate a sufficient supply of carbon to

act as the primary substrate. TOC is a measure of the natural and anthropogenic carbon present in the aquifer.

3.2.2 Natural Attenuation Evaluation

Shallow groundwater at Site 57 flows from northwest to southeast. Each area of each plume is briefly described in terms of select natural attenuation parameters and contaminant concentrations, and comparisons are made to the upgradient area. This discussion supplements Section 3.1, which discusses contaminant concentration trends over time, a primary line of evidence in determining if monitored natural attenuation is occurring.

3.2.2.1 Petroleum Plume

Background

Upgradient geochemical and COC characteristics based on Year 1 data from well CEF-293-03 are as follows:

- Concentrations of COCs were less than FDEP GCTLs
- DO concentrations ranged from 0.6 mg/L to 1 mg/L
- Ferrous iron concentrations ranged from 0.13 to 0.21 mg/L
- Sulfate was not detected
- Methane concentrations ranged from 0.98 to 67.4 µg/L, and ethene or ethane were not detected
- Carbon dioxide concentrations ranged from 29 to 105 mg/L
- Laboratory alkalinity concentrations ranged from 7 to 7.5 mg/L
- TOC concentrations ranged from 3.9 to 6.8 mg/L

Shallow and Intermediate Wells Within the Plume

Geochemical and COC characteristics based on Year 1 data from shallow wells CEF-293-11, CEF-293-21, CEF-824A-04S, and CEF-824A-11S and intermediate wells CEF-824A-07S and CEF-824A-21I are as follows:

- Concentrations of petroleum-related COCs fluctuated during Year 1; no chlorinated COCs were detected. In CEF-293-11, CEF-293-21, and CEF-824A-21I, COC concentrations in the fourth quarter were relatively consistent with first quarter concentrations. In CEF-824A-04S and CEF-824A-17I, fourth quarter concentrations were generally greater than first quarter concentrations. In CEF-824A-11S, fourth quarter concentrations were less than first quarter concentrations.

- Concentrations of geochemical parameters also fluctuated.

- DO concentrations were greater than 0.5 mg/L during three quarters in CEF-293-21 and CEF-824A-04S and during two quarters in the remaining wells within the plume.

- Carbon dioxide concentrations were greater than two times the maximum background concentration during three quarters in CEF-824A-11S and one quarter in CEF-293-11 and CEF-824A-04S.

- Laboratory alkalinity concentrations were greater than two times the maximum background concentration during three quarters in CEF-293-11, CEF-293-21, and CEF-824A-17I.

- Sulfate was not detected in any of the wells except for CEF-293-21, in which concentrations ranged from 23.2 to 28.1 mg/L. Sulfide and hydrogen sulfide were detected at generally low levels in CEF-293-21 and generally higher levels downgradient of this well.

- Ferrous iron concentrations were less than 1 mg/L in shallow wells except for CEF-824A-11S, in which concentrations ranged from 0.8 to 2.87 mg/L. Concentrations in intermediate wells ranged from 1.36 to 2.95 mg/L.

- Methane concentrations were greater than 500 µg/L during one quarter in CEF-824A-21I and during four quarters in CEF-293-11, CEF-824A-11S, CEF-824A-04S, and CEF-824A-17I.

DO concentrations indicated fluctuations between aerobic and anaerobic conditions, with aerobic conditions favorable to degradation of petroleum-related VOCs predominating for two to three quarters of Year 1. Carbon dioxide and alkalinity concentrations indicated increased biological activity within the plume. Sulfate was not detected in the background well but was detected in CEF-293-11, located in the central portion of the plume. Sulfate-reducing conditions may occur when conditions become more aerobic and may be present downgradient of this well because sulfate was not detected in CEF-824A-04S or CEF-824A-17I (downgradient of CEF-293-11), and sulfide concentrations were greater in these wells than in CEF-293-11. Iron-reducing conditions were not indicated by site data – ferrous iron concentrations were greater than background concentrations in one of the shallow wells and the two intermediate wells, but no increase in the downgradient direction was observed. Methane concentrations were significantly greater than background levels, but other data do not support the strongly reducing conditions indicative of methanogenesis.

Downplume Wells

Geochemical and COC characteristics based on Year 1 data from wells CEF-824A-07S and CEF-824A-08S (furthest downgradient within the plume) are as follows:

- BTEX and chlorinated VOCs were detected in these wells. Concentrations fluctuated, with first quarter concentrations relatively consistent with fourth quarter concentrations.

- DO concentrations were greater than 0.5 mg/L in two quarters in CEF-824A-08S and three quarters in CEF-824A-07S.

- Carbon dioxide concentrations were greater than two times the maximum background concentration during one quarter in CEF-824A-08S.

- Alkalinity was less than background in CEF-824A-07S and was not detected in CEF-824A-08S.

- Sulfate was not detected; sulfide and hydrogen sulfide were detected in both of these wells.

- Concentrations of ferrous iron were less than 0.46 mg/L, not significantly greater than background levels.

- Methane concentrations ranged from 217 to 1,615 µg/L. Concentrations were greater than 500 µg/L during all quarters in CEF-824A-08S and greater than background levels during al quarters in CEF-824A-07S. Ethane and ethene were not detected.

Similar to within and just downgradient of the source areas, DO concentrations indicated fluctuations between aerobic and anaerobic conditions, with aerobic conditions favorable to degradation of petroleum-related VOCs predominating for two to three quarters of Year 1. Carbon dioxide and alkalinity concentrations indicated less biological activity in this area. Sulfate-reducing conditions may continue in this area when conditions become more anaerobic. Sulfate was not detected and sulfide concentrations were slightly greater than CEF-824A-04S and CEf-824A-17I, just upgradient within the plume. Methane concentrations were significantly elevated in this area as well, but other data do not support the strongly reducing conditions indicative of methanogenesis in this area.

Downgradient and Sentinel Wells

Geochemical and COC characteristics based on Year 1 data from wells CEF-824A-03S, CEF-824A-19S, and CEF-824A-20S are as follows:

- COC concentrations were low or non-detect. Only chlorinated VOCs at low levels were detected in CEF-824A-22S.

- DO concentrations were greater than 0.5 mg/L in three to four quarters, except in CEF-824A-20S in which DO was greater than 0.5 mg/L in one quarter only.

- Carbon dioxide and laboratory alkalinity concentrations were greater than two times background in one well (CEF-824A-20S) during one quarter.

- Sulfate was not detected, and concentrations of sulfide and hydrogen sulfide were generally less than levels just upgradient and within the plume.

- Ferrous iron concentrations ranged from 0.43 to 1.11 mg/L.

- Methane concentrations ranged from 20.1 to 570 µg/L. Ethane and ethene were not detected.

Except in CEF-824A-20S, DO concentrations indicate a return to more consistently aerobic conditions. Carbon dioxide and alkalinity concentrations indicate decreased biological activity compared to areas within the plume.

3.2.2.2 TCE Plume

Background

Geochemical and COC characteristics based on Year 1 data from well CEF-293-03 were described above in the Petroleum Plume discussion. TOC concentrations in the upgradient well ranged from 3.9 to 6.8 mg/L, indicating a minimal supply of natural organic carbon in the aquifer to act as a substrate for reductive dechlorination. This lack of natural organic carbon as an energy source could limit the biodegradation potential at the site; however, there is a source of anthropogenic carbon in the Petroleum Plume that partially overlaps the TCE Plume. This anthropogenic carbon is available at the site to provide an energy source and act as a substrate for reductive dechlorination. In areas where anaerobic conditions exist in the aquifer, it is possible that these petroleum-related contaminants are being used as the carbon source to drive the reductive dechlorination process.

Shallow Wells in the Central Portion of the Plume

Geochemical and COC characteristics based on Year 1 data from wells CEF-293-19 and CEF-824A-14S are as follows:

- COC concentrations fluctuated and included BTEX and chlorinated constituents. Concentrations in CEF-293-19 were generally greater in the fourth quarter than the first, and concentrations in CEF-824A-14S were generally lower in the fourth quarter than the first quarter.

- DO concentrations were less than 0.5 mg/L during one quarter in CEF-293-19 and two quarters in CEF-824A-14S.

- Ferrous iron concentrations ranged from 0.4 to 0.6 mg/L in CEF-293-19 and 1.59 to 2.93 mg/L in CEF-824A-14S.

- Sulfate was not detected; sulfide and hydrogen sulfide were detected, but concentrations did not increase in a downgradient direction.

- Methane concentrations were greater than 500 µg/L in both wells during all four quarters. Ethene and ethane were not detected.

- Carbon dioxide concentrations were greater than two times the maximum background concentration in two quarters in CEF-293-19.

- Laboratory alkalinity concentrations were greater than two times the maximum background concentration during all four quarters in both wells.

DO concentrations indicated that conditions in the area of CEF-293-19 were aerobic during the first three quarters and turned slightly anaerobic (0.4 mg/L) in the fourth quarter. In CEF-824A-14S, DO level indicated anaerobic conditions during the first and second quarters and aerobic conditions in the last two quarters of Year 1. Ferrous iron concentrations increased in a downgradient direction (CEF-293-19 to CEF-824A-14S), indicating that iron-reducing conditions may be present when the groundwater is more anaerobic. Sulfate was not detected in the upgradient wells or these wells, and no increase in sulfide concentrations in a downgradient direction was observed. Therefore, sulfate-reducing conditions are not indicated by site data. Methane concentrations were elevated (greater than 500 µg/L) in both wells throughout Year 1, potentially indicating the occurrence of methanogenesis; however, elevated methane concentrations in the Petroleum plume were not accompanied by the strongly reducing conditions

indicative of methanogenesis. Carbon dioxide and alkalinity concentrations indicated increased biological activity in this area.

Downplume Well

Geochemical and COC characteristics based on Year 1 data from well CEF-293-20 are as follows:

- BTEX and chlorinated COC concentrations fluctuated generally at low levels (except cis-1,2-DCE), and maximum concentrations of chlorinated COCs were generally detected in the fourth quarter.
- DO concentrations were less than 0.5 mg/L in the first and fourth quarters.
- Concentrations of ferrous iron were greater than 1 mg/L in the first and second quarters.
- Sulfate was not detected, and sulfide and hydrogen sulfide concentrations were generally consistent with levels further upgradient within the plume.
- Methane was detected at concentrations greater than background but less than 500 µg/L. Ethene and ethane were not detected
- Concentrations of carbon dioxide were greater than two times the maximum background concentration in the first and fourth quarters.
- Laboratory alkalinity concentrations were greater than two times background during all four quarters.

DO concentrations indicated anaerobic conditions in the first and fourth quarters and aerobic conditions in the other quarters. Ferrous iron concentrations decreased from levels further upgradient within the plume. Sulfate was not detected in the upgradient wells or these wells, and no increase in sulfide concentrations in a downgradient direction was observed. Therefore, sulfate- and iron-reducing conditions are not indicated by site data. Carbon dioxide and alkalinity concentrations indicated increased biological activity in this area compared to background conditions.

Downgradient Wells

Geochemical and COC characteristics based on Year 1 data from well CEF-824A-08S and CEF-824A-19S are as follows:

- In CEF-824A-08S, BTEX and chlorinated COC concentrations were detected at generally at low levels. COCs were not detected in CEF-824A-19S.

- DO concentrations were greater than 0.5 mg/L in the third and fourth quarters in CEF-824A-08S and all but the second quarter in CEF-824A-19S.

- Concentrations of ferrous iron were less than 1 mg/L in CEF-824A-08S and all but the second quarter in CEF-824A-19S.

- Sulfate was not detected. In CEF-824A-08S, sulfide and hydrogen sulfide concentrations were generally consistent with levels further upgradient within the plume. Sulfide concentrations were low in CEF-824A-19S.

- Methane was detected at concentrations greater than 500 µg/L in all quarters in CEF-824A-08S and on quarter in CEF-824A-19S. Ethene and ethane were not detected

- Concentrations of carbon dioxide were greater than two times the maximum background concentration in only the fourth quarter in CEF-824A-08S.

- Laboratory alkalinity was non-detect in CEF-824A-08S and was consistent with background levels in CEF-824A-19S.

DO concentrations indicated a transition back to aerobic conditions downgradient of the plume. Carbon dioxide and alkalinity concentrations indicated decreased biological activity in this area compared to conditions within the plume.

TABLE 3-1

RATIONALE FOR LONG-TERM MONITORING WELLS
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Well ID	Surficial Aquifer Depth Interval	Total Depth in feet bgs	Analysis				WL	Rationale and Comments
			VOCs	PAHs	TRPH	NA		
CEF-016-38S	S	17					●	Water level only
CEF-293-01	S	15					●	Water level only
CEF-293-03	S	15	●	●		●	●	Upgradient of TCE and Petroleum Plumes
CEF-293-05	S	14					●	Water level only
CEF-293-08	S	17					●	Water level only
CEF-293-10	S	15					●	Water level only
CEF-293-11	S	15	●	●	●	●	●	Source area; highest toluene, ethylbenzene, and xylenes concentrations
CEF-293-13	S	15	●	●		●	●	Sidegradient of Petroleum Plume
CEF-293-14	S	15			●		●	Water level only
CEF-293-19	S	17	●	●	●	●	●	Source area; Highest TCE concentration
CEF-293-20	S	17	●	●		●	●	Downplume in TCE Plume, sidegradient of Petroleum Plume
CEF-293-21	S	17	●	●		●	●	Within Petroleum Plume
CEF-293-22	S	17					●	Water level only
CEF-824A-01Sa	S	14	●	●		●	●	Sidegradient of Petroleum Plume; previous exceedances
CEF-824A-02S	S	17					●	Water level only
CEF-824A-03S	S	18	●	●	●	●	●	Downgradient
CEF-824A-04S	S	15	●	●		●	●	Source Area; highest benzene concentration
CEF-824A-05S	S	17					●	Water level only
CEF-824A-07S	S	15	●	●		●	●	Downplume in Petroleum Plume
CEF-824A-08S	S	15	●	●		●	●	Downplume in Petroleum Plume
CEF-824A-09S	S	15	●	●		●	●	Sidegradient of TCE Plume
CEF-824A-10S	S	15	●	●	●	●	●	Upgradient of TCE Plume, sidegradient of Petroleum Plume
CEF-824A-11S	S	15	●	●	●	●	●	Within Petroleum Plume; highest SVOCs and TRPH
CEF-824A-12I	I	40	●	●	●	●	●	Vertical migration (near highest TCE)
CEF-824A-13D	D	87	●	●		●	●	Vertical migration (near highest TCE)
CEF-824A-14S	S	14	●	●		●	●	Downgradient of TCE source area
CEF-824A-15I	I	41	●	●		●	●	Vertical migration (downgradient of TCE source area)
CEF-824A-17I	I	41	●	●		●	●	Vertical migration at CEF-824A-4S (highest benzene)
CEF-824A-18S	S	15					●	Water level only
CEF-824A-19S	S	15	●	●	●	●	●	Sentinel well
CEF-824A-20S	S	15	●	●	●	●	●	Sentinel well
CEF-824A-21I	I	41	●	●	●	●	●	Vertical migration
CEF-824A-22S	S	14	●	●	●	●	●	Side/downgradient of Petroleum Plume
CEF-825LS-1S	S	19					●	Water level only

NOTES:
S - Shallow zone of surfical aquifer.
I - Intermediate zone of surfical aquifer.
D - Deep zone of surfical aquifer.
NA - Natural attenuation parameters.
WL - Water level only.
bgs - Below ground surface.
VOCs - Volatile organic compound (VOCs) by Method 8260B.
PAHs - Polynuclear aromatic hydrocarbon by Method 8310.
TRPH - Total recoverable petroleum hydrocarbons by Florida Petroleum Range Organics (PRO) Method.

TABLE 3-2

FREQUENCY OF DETECTION FOR CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	First Quarter - Year 1 April 2003				Second Quarter - Year 1 August 2003			
	Frequency of Detection	Range of Detections	Location of Maximum Detection	Average of Detections	Frequency of Detection	Range of Detections	Location of Maximum Detection	Average of Detections
Volatile Organic (ug/L)								
1,1-Dichloroethane	7 / 22	0.25 - 120	CEF-824A-14S	24	8 / 24	0.25 - 185	CEF-824A-14S	33
1,1-Dichloroethene	3 / 22	0.25 - 29.1	CEF-824A-08S	12	2 / 24	0.25 - 29.9	CEF-824A-08S	17.2
cis-1,2-Dichloroethene	5 / 22	0.25 - 441	CEF-824A-14S	152	6 / 24	0.25 - 1100	CEF-824A-14S	279
Benzene	8 / 22	0.25 - 134	CEF-824A-04S	19	11 / 24	0.25 - 275	CEF-824A-04S	38
Ethylbenzene	9 / 22	0.25 - 107	CEF-824A-11S	17	10 / 24	0.25 - 157	CEF-293-11	34
Toluene	6 / 22	0.25 - 9.6	CEF-293-19	6.1	7 / 24	0.25 - 87.2	CEF-293-11	19.0
Trichloroethene	8 / 22	0.25 - 13.8	CEF-824A-14S	4.0	7 / 24	0.25 - 21.5	CEF-824A-14S	7.5
Vinyl chloride	0 / 22				1 / 24	2.0	CEF-824A-14S	2
Xylene (total)	7 / 22	0.5 - 307	CEF-824A-11S	61	11 / 24	0.5 - 520	CEF-293-11	88
Polynuclear Aromatic Hydrocarbons (ug/L)								
1-Methylnaphthalene	9 / 22	0.255 - 76.1	CEF-824A-11S	18.0	12 / 24	0.25 - 158	CEF-824A-11S	25
2-Methylnaphthalene	9 / 22	0.255 - 86.7	CEF-824A-11S	21.1	13 / 24	0.25 - 185	CEF-824A-11S	27
Naphthalene	11 / 22	0.255 - 190	CEF-824A-11S	39	14 / 24	0.26 - 382	CEF-824A-11S	57
Total Recoverable Petroleum Hydrocarbons (mg/L)								
TRPH	6 / 10	0.085 - 12.6	CEF-824A-11S	4.3	8 / 11	0.085 - 14.3	CEF-824A-11S	3.9

TABLE 3-2

FREQUENCY OF DETECTION FOR CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	Third Quarter - Year 1 October 2003				Fourth Quarter - Year 1 January 2004			
	Frequency of Detection	Range of Detections	Location of Maximum Detection	Average of Detections	Frequency of Detection	Range of Detections	Location of Maximum Detection	Average of Detections
Volatile Organic (ug/L)								
1,1-Dichloroethane	7 / 22	0.25 - 203	CEF-824A-14S	36	6 / 23	0.25 - 124	CEF-824A-14S	33
1,1-Dichloroethene	1 / 22	0.25 - 38.6	CEF-824A-08S	38.6	2 / 23	0.25 - 39.2	CEF-824A-08S	20.8
cis-1,2-Dichloroethene	5 / 22	0.25 - 1740	CEF-824A-14S	407	6 / 23	0.25 - 1010	CEF-824A-14S	246
Benzene	8 / 22	0.25 - 111	CEF-824A-04S	22	9 / 23	0.25 - 315	CEF-824A-04S	43
Ethylbenzene	11 / 22	0.25 - 210.5	CEF-293-11	31.6	11 / 23	0.25 - 238	CEF-293-11	38
Toluene	5 / 22	0.25 - 93.3	CEF-293-11	29.1	5 / 23	0.25 - 126	CEF-293-11	39
Trichloroethene	9 / 22	0.25 - 40.5	CEF-824A-14S	6.4	8 / 23	0.25 - 33.8	CEF-824A-14S	7.5
Vinyl chloride	0 / 22				1 / 23	2.5	CEF-824A-14S	0.6
Xylene (total)	8 / 22	0.5 - 711	CEF-293-11	125	9 / 23	0.5 - 863	CEF-293-11	142
Polynuclear Aromatic Hydrocarbons (ug/L)								
1-Methylnaphthalene	12 / 22	0.25 - 155	CEF-824A-11S	27	11 / 23	0.25 - 105	CEF-824A-11S	26
2-Methylnaphthalene	12 / 22	0.25 - 180	CEF-824A-11S	31	11 / 23	0.25 - 127	CEF-824A-11S	32
Naphthalene	12 / 22	0.25 - 332	CEF-824A-11S	63	15 / 23	0.255 - 247	CEF-824A-11S	52
Total Recoverable Petroleum Hydrocarbons (mg/L)								
TRPH	6 / 10	0.085 - 14.7	CEF-824A-11S	5.6	6 / 11	0.09 - 11.4	CEF-824A-11S	5.8

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-293-03					CEF-293-11							
		Sep-01	Apr-03	Jul-03	Oct-03***	Jan-04	Sep-01	Dec-01	Apr-03		Jul-03	Oct-03		Jan-04
									Sample	Duplicate		Sample	Duplicate	
VOLATILE ORGANIC COMPOUNDS (ug/L)														
Acetone	700	50 U	5 U	5 U	NA	5 U	250 U	250 U	25 U	**13**	25 U	25 U	25 U	**11.2**
Benzene	1	1 U	1 U	1 U	NA	0.5 U	**30.5**	**32**	**41.8**	**52**	**31.7**	**37.4**	**36.8**	**44.4**
cis-1,2-Dichloroethene	70	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
1,1-Dichloroethane	70	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
1,1-Dichloroethene	7	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
Ethylbenzene	30	2 U	1 U	1 U	NA	0.5 U	**148**	**151**	**205**	**200**	**157**	**221**	**200**	**238**
4-Methyl-2-pentanone	560	10 U	5 U	5 U	NA	2.5 U	50 U	50 U	25 U	10 U	25 U	13 U	13 U	2.5 U
Tetrachloroethene	3	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
Toluene	40	2 U	1 U	1 U	NA	0.5 U	**66**	**59.6**	**120**	**154**	**87.2**	**95.8**	**90.8**	**126**
trans-1,2-Dichloroethene	31	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
Trichloroethene	3	2 U	1 U	1 U	NA	0.5 U	10 U	10 U	5 U	2 U	5 U	2.5 U	2.5 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	NA	0.5 U	5 U	5 U	2.5 U	1 U	5 U	2.5 U	2.5 U	0.5 U
Xylenes, total	20	6 U	3 U	3 U	NA	1 U	**572**	**549**	**683**	**678**	**520**	**748**	**674**	**863**
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)														
Acenaphthene	20	4.4 U	4.3 U	4.2 U	NA	1.1 U	21 U	20 U	16 U	20 U	4.2 U	1 U	1 U	1.1 U
1-Methylnaphthalene	20	2.2 U	2.2 U	2.1 U	NA	0.53 U	**60.4**	**84.8**	**57.8**	**58.6**	**38**	**74.2**	**52.8**	**80.5**
2-Methylnaphthalene	20	2.2 U	2.2 U	2.1 U	NA	0.53 U	**57.5**	**84.8**	**56.3**	**56.7**	**41.4**	**80.7**	**53.7**	**88.6**
Naphthalene	20	2.2 U	2.2 U	2.1 U	NA	**0.7 J**	**126**	**155**	**117**	**116**	**74.1**	**150**	**91.7**	**168**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)														
TRPH	5	0.28 U	NA	NA	NA	NA	**2.46**	**5.95**	**4.38**	**3.93**	**3.52**	**5.24**	**4.12**	**5.18**

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-293-13						CEF-293-19						
		Sep-01		Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03		Oct-03	Jan-04	
		Sample	Duplicate							Sample	Duplicate		Sample	Duplicate
VOLATILE ORGANIC COMPOUNDS (ug/L)														
Acetone	700	50 U	50 U	5 U	5 U	5 U	5 U	**190**	**22.4**	**62.9**	**98.2**	**125**	**838**	**618**
Benzene	1	1 U	1 U	1 U	1 U	0.5 U	0.5 U	**1.8**	**0.63 J**	**0.79 J**	**0.86 J**	1.3 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	70	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**825**	**214**	**249**	**299**	**174**	**344**	**313**
1,1-Dichloroethane	70	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**58.6**	**30.1**	**32.4**	**42.1**	**28.8**	**59.4**	**53.8**
1,1-Dichloroethene	7	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	1 U	1.3 U	2.5 U	2.5 U
Ethylbenzene	30	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**5**	**2.1**	**2.9**	**3.7**	**2.5**	**5.4**	**4.7 J**
4-Methyl-2-pentanone	560	10 U	10 U	5 U	5 U	2.5 U	2.5 U	**76.1**	**12.1**	**16.8**	**28.7**	**23.5**	**313**	**225**
Tetrachloroethene	3	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	1 U	1.3 U	2.5 U	2.5 U
Toluene	40	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**33.4**	**9.6**	**8.6**	**12.3**	**6.6**	**31**	**26.4**
trans-1,2-Dichloroethene	31	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**5.1**	**1.3**	**1.5**	**1.8**	1.3 U	2.5 U	2.5 U
Trichloroethene	3	2 U	2 U	1 U	1 U	0.5 U	0.5 U	**43**	**10.8**	**13.4**	**16**	**9.9**	**16.3**	**14.8**
Vinyl Chloride	1	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	1 U	1.3 U	2.5 U	2.5 U
Xylenes, total	20	6 U	6 U	3 U	3 U	1 U	1 U	**31.8**	**12.5**	**13.7**	**20.1**	**10.8**	**30.3**	**26.8**
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)														
Acenaphthene	20	4 U	4 U	4 U	4.2 U	1 U	1 U	8 U	8.2 U	**3.6 J**	**3.6 J**	**4.4**	4.4 U	4.3 U
1-Methylnaphthalene	20	**1.4 J**	**2.0**	2 U	2.1 U	0.51 U	0.52 U	4 U	4.1 U	**1.6 J**	**1.9 J**	**1.7 J**	2.2 U	2.2 U
2-Methylnaphthalene	20	**1.6 J**	**2.4**	2 U	2.1 U	0.51 U	0.52 U	4 U	4.1 U	**2.5**	**2.9**	**2.7**	2.2 U	2.2 U
Naphthalene	20	2 U	2 U	2 U	2.1 U	0.51 U	0.52 U	**46**	**52.6**	**51.4**	**59.5**	**89.5**	**182**	**160**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)														
TRPH	5	**0.404**	**0.372**	0.25 U	0.26 U	0.18 U	0.19 U	**4.44**	**3.53**	**2.79**	0.26 U	**4.74**	**8.28**	**9.3**

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-293-20					CEF-293-21							
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Dec-01		Apr-03		Jul-03	Oct-03	Jan-04	
							Sample	Duplicate	Sample	Duplicate			Sample	Duplicate
VOLATILE ORGANIC COMPOUNDS (ug/L)														
Acetone	700	50 U	5 U	**10.1**	10 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	1	**0.87 J**	**0.56 J**	**0.67 J**	1 U	**0.88 J**	**30.8**	**28.9**	**5.1**	**7.8**	**90.7**	**6.9**	**7.9**	**3.8**
cis-1,2-Dichloroethene	70	**136**	**83.8**	**62.3**	**89.1**	**111**	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	70	**1.6 J**	**1.3**	**0.87 J**	**1.3 J**	**2.6**	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	7	2 U	**0.96 J**	1 U	1 U	**2.3**	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	30	2 U	1 U	1 U	1 U	0.5 U	**2.7**	**2.8**	1 U	**0.73 J**	**18.4**	**0.73 J**	**1.4**	**0.65 J**
4-Methyl-2-pentanone	560	10 U	5 U	5 U	5 U	2.5 U	10 U	10 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	1 U	1 U	1 U	0.5 U	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Toluene	40	2 U	1 U	1 U	1 U	0.5 U	2 U	2 U	1 U	1 U	**2.7**	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	**0.52 J**	1 U	1 U	1 U	**0.91 J**	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Trichloroethene	3	**3.3**	**2.4**	**1**	**2.1**	**4.1**	2 U	2 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	1 U	**0.57 J**	1 U	1 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U
Xylenes, total	20	6 U	3 U	3 U	2 U	1 U	**4.1 J**	**4.9 J**	3 U	3 U	**44.9**	1 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)														
Acenaphthene	20	4 U	4.2 U	4.4 U	1 U	1.1 U	4.4 U	4.4 U	4.1 U	4.1 U	4 U	1.1 U	1 U	1 U
1-Methylnaphthalene	20	2 U	2.1 U	2.2 U	0.52 U	0.54 U	**2.2**	**2.5**	**1.3 J**	**1.2 J**	**5.7**	**0.89 J**	**3.2**	**4.7**
2-Methylnaphthalene	20	2 U	2.1 U	2.2 U	0.52 U	0.54 U	**2.2**	**2.6**	**1.1 J**	**1.1 J**	**5.6**	**1.1 J**	**3.4**	**5**
Naphthalene	20	**1.2 J**	**0.57 J**	2.2 U	**2.4**	0.54 U	**2.5**	**3**	**0.84 J**	**0.88 J**	**4.5**	**1.7 J**	**1.4 J**	**1.9 J**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)														
TRPH	5	**0.58**	NA	NA	NA	NA	**0.269**	**0.242 J**	NA	NA	NA	NA	NA	NA

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-01Sa						CEF-824A-3S				
		Sep-01	Dec-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)												
Acetone	700	50 U	50 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U	1 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	10 U	10 U	5 U	5 U	2.5 U	2.5 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	2 U	2 U	1 U	1 U	0.5 U	**1.9**	2 U	1 U	1 U	0.5 U	0.5 U
Vinyl Chloride	1	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	6 U	6 U	3 U	3 U	1 U	1 U	6 U	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)												
Acenaphthene	20	4.4 U	4 U	4.1 U	4.3 U	1.1 U	1.1 U	4 U	4.3 U	4.2 U	1.1 U	1 U
1-Methylnaphthalene	20	**2.1 J**	**1.2 J**	**0.59 J**	**0.82 J**	**0.71 J**	**0.6 J**	2 U	2.2 U	2.1 U	0.54 U	0.52 U
2-Methylnaphthalene	20	**3.7**	**2**	**1.2 J**	**1.3 J**	**1.2 J**	**1 J**	2 U	2.2 U	2.1 U	0.54 U	0.52 U
Naphthalene	20	2.2 U	2 U	2 U	2.1 U	0.54 U	0.54 U	2 U	2.2 U	2.1 U	0.54 U	**0.59 J**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)												
TRPH	5	**0.482**	**0.438**	NA	NA	NA	NA	0.25 U	**0.189 J**	**0.19 J**	0.18 U	0.18 U

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-4S						CEF-824A-7S						
		Sep-01		Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Dec-01	Apr-03	Jul-03	Oct-03		Jan-04
		Sample	Duplicate									Sample	Duplicate	
VOLATILE ORGANIC COMPOUNDS (ug/L)														
Acetone	700	50 U	50 U	10 U	5 U	5 U	5 U	50 U	50 U	5 U	5 U	5 U	5 U	5 U
Benzene	1	**254**	**242**	**134**	**275**	**111**	**315**	**3.8**	**2**	**5.6**	**5.3**	**8.1**	**7.6**	**7**
cis-1,2-Dichloroethene	70	2 U	2 U	2 U	1 U	0.5 U	0.5 U	2 U	2 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	70	2 U	2 U	2 U	1 U	0.5 U	0.5 U	**1.1 J**	**2.9**	**0.81 J**	**1.4**	**2.1**	**2**	0.5 U
1,1-Dichloroethene	7	2 U	2 U	2 U	1 U	0.5 U	0.5 U	2 U	2 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	30	**27.8**	**20.7**	**23.9**	**58**	**14.9**	**59.3**	**2.3**	**2.1**	**2.6**	**2**	**4.1**	**4**	**2.5**
4-Methyl-2-pentanone	560	10 U	10 U	10 U	5 U	2.5 U	2.5 U	10 U	10 U	5 U	5 U	2.5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	2 U	2 U	1 U	0.5 U	0.5 U	2 U	2 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Toluene	40	**2.3**	**1.7 J**	**1.5 J**	**3.4**	**0.72 J**	**4.6**	2 U	2 U	1 U	1 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	2 U	2 U	1 U	0.5 U	0.5 U	2 U	2 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Trichloroethene	3	2 U	2 U	2 U	1 U	0.5 U	0.5 U	**4.8**	**0.84 J**	**1.1**	**1.2**	**0.93 J**	**0.97 J**	**1.4**
Vinyl Chloride	1	5 U	1 U	1 U	1 U	0.5 U	0.5 U	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U
Xylenes, total	20	**71.6**	**51.9**	**66.9**	**150**	**33.2**	**161**	**2.8 J**	6 U	3 U	3 U	1 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)														
Acenaphthene	20	8.8 U	8.8 U	8 U	4.2 U	1.1 U	1.1 U	4 U	4 U	4.1 U	4.2 U	1 U	1 U	1.1 U
1-Methylnaphthalene	20	**7.8**	**7.4**	**5.8**	**11.3**	**5.9**	**12.6**	**25.5**	**24.6**	**30.5**	**22.9**	**34.4**	**28.9**	**30.9**
2-Methylnaphthalene	20	**8.9**	**8.6**	**7.1**	**15.6**	**8.4**	**21**	**30.4**	**30.9**	**39.4**	**27.9**	**45.8**	**38.9**	**42.2**
Naphthalene	20	**30.3**	**30.8**	**19.4**	**38.1**	**11.8**	**37.7**	**13.9**	**25.7**	**22.3**	**17.8**	**23.1**	**19.6**	**20.4**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)														
TRPH	5	**1.72**	**1.69**	NA	NA	NA	NA	**1.67**	**2.13**	NA	NA	NA	NA	NA

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-8S					CEF-824A-9S				
		Dec-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)											
Acetone	700	50 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U
Benzene	1	**1.5**	**1.4**	**0.79 J**	**1.3**	**1**	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	**0.94 J**	**2.5**	**2.2**	**2.6**	**1.2**	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	**9.9**	**10**	**10.5**	**10.8**	**10.6**	**2.4**	**1.1**	**1**	**0.88 J**	**0.93 J**
1,1-Dichloroethene	7	**33.8**	**29.1**	**29.9**	**38.6**	**39.2**	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	2 U	**0.51 J**	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	10 U	5 U	5 U	2.5 U	2.5 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	2 U	**0.99 J**	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	2 U	**0.58 J**	1 U	**0.65 J**	0.5 U	**1 J**	**0.92 J**	**0.89 J**	**0.61 J**	**0.85 J**
Vinyl Chloride	1	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	**1.9 J**	**3**	**1.1 J**	**1.8 J**	**1.7 J**	6 U	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)											
Acenaphthene	20	4.4 U	4.2 U	4 U	1 U	1 U	4 U	4.3 U	4.2 U	1 U	1 U
1-Methylnaphthalene	20	2.2 U	2.1 U	2 U	0.51 U	0.5 U	2 U	2.1 U	2.1 U	0.5 U	0.52 U
2-Methylnaphthalene	20	2.2 U	2.1 U	2 U	0.51 U	0.5 U	2 U	2.1 U	2.1 U	0.5 U	0.52 U
Naphthalene	20	2.2 U	2.1 U	**2.8**	0.51 U	**0.67 J**	2 U	2.1 U	2.1 U	0.5 U	0.52 U
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)											
TRPH	5	0.30 U	NA	NA	NA	NA	**0.352**	NA	NA	NA	NA

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-10S						CEF-824A-11S					
		Sep-01	Apr-03	Jul-03		Oct-03	Jan-04	Sep-01	Dec-01	Apr-03	Jul-03	Oct-03	Jan-04
				Sample	Duplicate								
VOLATILE ORGANIC COMPOUNDS (ug/L)													
Acetone	700	50 U	**50.1**	5 U	**18**	**119**	**92.2**	50 U	250 U	25 U	13 U	13 U	**8**
Benzene	1	1 U	1 U	1 U	1 U	0.5 U	0.5 U	**8.7**	**7.6**	**4.5 J**	**3.3**	**2.2 J**	**1.1**
cis-1,2-Dichloroethene	70	**3.7**	**17.8**	**8**	**11.3**	**27.2**	**22.6**	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
1,1-Dichloroethane	70	**1.1 J**	**3.1**	**1.1**	**1.4**	**3.4**	**3.1**	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
1,1-Dichloroethene	7	2 U	1 U	1 U	1 U	0.5 U	0.5 U	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
Ethylbenzene	30	**8.6**	**3.3**	**4.3**	**4.3**	**3**	**1.3**	**84.9**	**85.4**	**107**	**75.9**	**83.8**	**78.2**
4-Methyl-2-pentanone	560	10 U	**34.9**	**15.9**	**19.2**	**115**	**8.7**	10 U	50 U	25 U	13 U	6.3 U	2.5 U
Tetrachloroethene	3	2 U	1 U	1 U	1 U	0.5 U	0.5 U	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
Toluene	40	**1.0 J**	**9.5**	**2.1**	**3.6**	**11.4**	**11.2**	**56.6**	**43.2**	**5.8**	2.5 U	1.3 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	1 U	1 U	1 U	0.5 U	0.5 U	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
Trichloroethene	3	2 U	**0.72 J**	1 U	1 U	**0.85 J**	**0.78 J**	2 U	10 U	5 U	2.5 U	1.3 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	1 U	0.5 U	0.5 U	1 U	5 U	2.5 U	2.5 U	1.3 U	0.5 U
Xylenes, total	20	**4.0 J**	**4.2**	**2.2 J**	**2.9 J**	**5**	**6.3**	**334**	**305**	**307**	**181**	**184**	**136**
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)													
Acenaphthene	20	20 U	4.3 U	4 U	4 U	1.1 U	1.1 U	80 U	40 U	33 U	4.2 U	10 U	1 U
1-Methylnaphthalene	20	**15.7**	**3.9**	**13.6**	**19.6**	**17.8**	**15.4**	**175**	**145**	**76.1**	**158**	**155**	**105**
2-Methylnaphthalene	20	**16.8**	**2.8**	**15**	**21.5**	**17.2**	**15.7**	**196**	**172**	**86.7**	**185**	**180**	**127**
Naphthalene	20	**128**	**68.3**	**66.7**	**91.5**	**68**	**54.7**	**438**	**354**	**190**	**382**	**332**	**247**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)													
TRPH	5	**4.83**	**7.12**	**4.32**	**4.55**	**5.39**	**5.96**	**13.6**	**15.0**	**12.6**	**14.3**	**14.7**	**11.4**

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-12I					CEF-824A-13D				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)											
Acetone	700	50 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	5 U
Benzene	1	**3.5**	**2.8**	**3.4**	**5.1**	**6.1**	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	**10.4**	**10.1**	**10.5**	**17.2**	**19**	2 U	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	10 U	5 U	5 U	2.5 U	2.5 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	**1 J**	**0.51 J**	1 U	0.5 U	**0.64 J**	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	**36.2**	**33.7**	**39.2**	**46.4**	**52.4**	6 U	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)											
Acenaphthene	20	4.4 U	4.1 U	4 U	1.1 U	1.1 U	4 U	4.1 U	4.3 U	1 U	1.1 U
1-Methylnaphthalene	20	**12.5**	**21.7**	**26.9**	**25.4**	**16.4**	2 U	2.1 U	2.2 U	0.52 U	0.53 U
2-Methylnaphthalene	20	**12.3**	**22.1**	**30.6**	**28.8**	**19.4**	2 U	2.1 U	2.2 U	0.52 U	0.53 U
Naphthalene	20	**49.1**	**58.7**	**78.4**	**87**	**46.7**	2 U	2.1 U	2.2 U	0.52 U	0.53 U
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)											
TRPH	5	**3.28**	**1.71**	**2.48**	**3.26**	**3.28**	0.25 U	NA	NA	NA	NA

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-14S					CEF-824A-15I				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)											
Acetone	700	100 U	25 U	**6.9**	100 U	50 U	50 U	5 U	**8.1**	5 U	5 U
Benzene	1	2 U	5 U	**2.3**	10 U	5 U	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	**139**	**441**	**1100**	**1740**	**1010**	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	**97.2**	**120**	**185**	**203**	**124**	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	**5.0**	**4.5 J**	**4.4**	10 U	5 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	**4.4**	**4.4 J**	**3.9**	**10.1 J**	**7.2 J**	**1.0 J**	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	20 U	25 U	5 U	50 U	25 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	4 U	5 U	**1.2**	10 U	5 U	**1.5 J**	**0.53 J**	**0.58 J**	**0.86 J**	**1.3**
Toluene	40	**4.9**	**9.1**	**19.4**	**33.7**	**26.7**	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	4 U	5 U	**4**	**10.2 J**	**5 J**	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	**9.0**	**13.8**	**21.5**	**40.5**	**33.8**	2 U	1 U	1 U	**0.53 J**	0.5 U
Vinyl Chloride	1	2 U	2.5 U	**2**	10 U	5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	**4.9 J**	15 U	**3.8**	20 U	10 U	**5.2 J**	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)											
Acenaphthene	20	4 U	4.3 U	4.1 U	1 U	1 U	4 U	4.3 U	4.4 U	1.1 U	1 U
1-Methylnaphthalene	20	2 U	2.2 U	2.1 U	0.52 U	0.51 U	**2.0**	**3.8**	**2.5**	**3.1**	**3.9**
2-Methylnaphthalene	20	2 U	2.2 U	2.1 U	0.52 U	0.51 U	2 U	**3.1**	**2.3**	**2.9**	**3.7**
Naphthalene	20	2 U	2.2 U	2.1 U	0.52 U	0.51 U	**2.4**	**9.9**	**7.2**	**8**	**8.5**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)											
TRPH	5	**2.01**	NA	NA	NA	NA	**1.21**	NA	NA	NA	NA

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-17I					CEF-824A-19S				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)											
Acetone	700	50 U	5 U	**6.6**	5 U	5 U	50 U	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U	**0.93 J**	**4.2**	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	2 U	1 U	1 U	**0.63 J**	**3.1**	2 U	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	10 U	5 U	5 U	2.5 U	2.5 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	**4.3 J**	3 U	**1.5 J**	**6.8**	**29.5**	6 U	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)											
Acenaphthene	20	4.4 U	4 U	4.2 U	1 U	1 U	4 U	4.1 U	4.2 U	1.1 U	1 U
1-Methylnaphthalene	20	2.2 U	2 U	2.1 U	**0.68 J**	**2.1**	2 U	2.1 U	2.1 U	0.53 U	0.51 U
2-Methylnaphthalene	20	2.2 U	2 U	**0.77 J**	**1 J**	**3**	2 U	2.1 U	2.1 U	0.53 U	0.51 U
Naphthalene	20	2.2 U	**1.4 J**	**2.2**	**5.9**	**21.9**	2 U	2.1 U	2.1 U	0.53 U	0.51 U
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)											
TRPH	5	**0.533**	NA	NA	NA	NA	0.28 U	0.26 U	0.26 U	0.26 U	0.18 U

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-20S					CEF-824A-21I**				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
VOLATILE ORGANIC COMPOUNDS (ug/L)											
Acetone	700	50 U	5 U	5 U	5 U	5 U	50 U	5 U	5 U	5 U	**6.8**
Benzene	1	1 U	1 U	1 U	0.5 U	0.5 U	**1.8**	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	2 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethane	70	1 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	1 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	1 U	1 U	1 U	0.5 U	0.5 U	**2.2**	**0.81 J**	1 U	**0.62 J**	**0.73 J**
4-Methyl-2-pentanone	560	10 U	5 U	5 U	2.5 U	2.5 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	1 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	1 U	1 U	1 U	0.5 U	0.5 U	**1.5 J**	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	NA	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	1 U	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1 U	0.5 U	0.5 U
Vinyl Chloride	1	1 U	0.5 U	1 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	1 U	3 U	3 U	1 U	1 U	**9**	**1.1 J**	3 U	1 U	**1.8 J**
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)											
Acenaphthene	20	4.4 U	4.2 U	4.4 U	1.1 U	1.1 U	4 U	4.1 U	4.2 U	1.1 U	1.1 U
1-Methylnaphthalene	20	2.2 U	2.1 U	2.2 U	0.53 U	0.53 U	**10.5**	**18.3**	**15**	**13.2**	**14.5**
2-Methylnaphthalene	20	2.2 U	2.1 U	2.2 U	0.53 U	0.53 U	**13.3**	**26.5**	**23**	**19.5**	**20.8**
Naphthalene	20	2.2 U	2.1 U	2.2 U	0.53 U	0.53 U	**6.3**	**4.2**	**3.1**	**2.6**	**3.4**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)											
TRPH	5	0.28 U	0.26 U	0.26 U	0.17 U	0.19 U	**0.744**	**0.686**	**0.739**	**0.538**	**0.479**

TABLE 3-3

CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	TARGET CLEANUP GOAL(1)	CEF-824A-22S**					
		Sep-01		Apr-03	Jul-03	Oct-03	Jan-04
		Sample	Duplicate				
VOLATILE ORGANIC COMPOUNDS (ug/L)							
Acetone	700	50 U	50 U	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U	1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	2 U	2 U	1 U	1 U	0.5 U	**0.59 J**
1,1-Dichloroethane	70	2 U	2 U	1 U	1 U	0.5 U	0.5 U
1,1-Dichloroethene	7	2 U	2 U	1 U	1 U	0.5 U	0.5 U
Ethylbenzene	30	2 U	2 U	1 U	1 U	0.5 U	0.5 U
4-Methyl-2-pentanone	560	10 U	10 U	5 U	5 U	2.5 U	2.5 U
Tetrachloroethene	3	2 U	2 U	1 U	1 U	0.5 U	0.5 U
Toluene	40	2 U	2 U	1 U	1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	31	2 U	2 U	1 U	1 U	0.5 U	0.5 U
Trichloroethene	3	2 U	2 U	**1.3**	**0.87 J**	**1.1**	**1.3**
Vinyl Chloride	1	1 U	1 U	0.5 U	1 U	0.5 U	0.5 U
Xylenes, total	20	6 U	6 U	3 U	3 U	1 U	1 U
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)							
Acenaphthene	20	4 U	4.8 U	4.2 U	4.2 U	1.1 U	1.1 U
1-Methylnaphthalene	20	2 U	2.4 U	2.1 U	2.1 U	0.54 U	0.53 U
2-Methylnaphthalene	20	2 U	2.4 U	2.1 U	2.1 U	0.54 U	0.53 U
Naphthalene	20	2 U	2.4 U	2.1 U	**0.77 J**	0.54 U	**0.58 J**
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) (mg/L)							
TRPH	5	0.28 U	0.28 U	0.26 U	0.25 U	0.19 U	0.19 U

U = Not detected at or above method detection limit as listed.
J = Estimated value.
NA = Not analyzed.
NC = No criterion.
Bolded values exceed method detection limits.
Shaded values exceed FDEP GCTLs.
RI sampling was conducted in September/October 2001.

(1) FDEP GCTL, FAC 62-777, 1999.
* Total of o-, m-, and p-xylenes.
** Wells CEF-824A-21I and CEF-824A-22S were installed in December 2001.
*** Well CEF-293-03 was abandoned and re-installed in October 2003.

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-293-03				CEF-293-11				
		Apr-03	Jul-03	Oct-03*	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	7	7.5	NA	7.5	20.6	31	27.5	18.5	13.5
Alkalinity, field	mg/L	<10	80	NA	<10	65	<10	<10	<10	<10
Carbon dioxide	mg/L	50	29	NA	105	190	225	150	170	60
Chloride	mg/L	20 U	20 U	NA	20 U	23.1	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.15	0.13	NA	0.21	0.02	0.09	0	0.01	0.03
Dissolved oxygen	mg/L	1	0.6	NA	1	0.25	0.3	1	1	0.4
Dissolved sulfide	mg/L	1 U	1 U	NA	1 U	2 U	1.5	1.8	1.4	1.6
Hydrogen sulfide (H_2S)	mg/L	0	0	NA	0.3	2.0	2	5	>5	2
Field sulfide (S^{-2})	mg/L	0.01	0.01	NA	0.13	>0.80	>0.8	>0.8	>0.8	>0.8
Nitrate	mg/L	0.1 U	0.1 U	NA	0.1 U	2.6	0.1 U	1.4	0.39	0.12
Nitrite	mg/L	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	NA	0.1 U	0.1 UJ	20 U	0.1 U	0.1 U	0.1 U
pH	St. units	5.34	4.82	NA	4.45	5.83	5.11	5.29	4.8	4.77
ORP	mV	214	213.3	NA	172.2	-155	14.4	-113.3	90.8	10.2
Specific conductance	mS/cm	0.041	0.059	NA	0.052	0.232	0.119	0.133	0.094	0.075
Sulfate	mg/L	20 U	20 U	NA	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	22.6	25.64	NA	23.34	26.82	23.13	26.06	26.1	22.03
TOC	mg/L	5.6	6.8	NA	3.9	NA	22.6	22.9	23.7	24.4
Turbidity	NTU	0	2.2	NA	4.13	0	1.8	0.9	1.3	0.21
Ethane	ug/L	1 U	1 U	NA	0.6 U	1 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	NA	0.8 U	1 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	0.98	0.5 U	NA	67.4	1693	1670	3400	2881	2635
Iron, filtered	ug/L	31.9 U	7.1 U	NA	439	26.9 U	81.5 U	32.8 U	57.9 B	122 B

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-293-13					CEF-293-19				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5 U	5 U	5.5	6	5 U	20	97	89	85	37.5
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	66.4	50	48	50	<10
Carbon dioxide	mg/L	19	28	20	16	19	300	250	200	70	250
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	40.9	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.03	0.06	0.05	0.09	0	1.18	0.46	0.6	0.4	0.43
Dissolved oxygen	mg/L	1.0	0.8	0.8	0.6	1	0.2	1	1	0.6	0.4
Dissolved sulfide	mg/L	2 U	1 U	1 U	1 U	1 U	3.2	2.1	3.3	3	2.2
Hydrogen sulfide (H_2S)	mg/L	0	0	0	0	0	2.0	0.5	>5	1	0.7
Field sulfide (S^{-2})	mg/L	0.05	0.01	0.1	0.04	0	>0.80	>0.8	0.8	>0.8	>0.8
Nitrate	mg/L	9.2	0.1 U	4.8	2	2.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	0.1 U	26.8	0.1 U	0.1 U	0.1 U	0.1 UJ	20 U	0.13	0.1 U	0.1 U
pH	St. units	5.43	5.4	5.3	5.22	5.32	5.65	5.75	5.49	5.63	5.22
ORP	mV	-81	55.7	35.4	183.3	64.2	-167	-52.1	-166	-5.9	-7.5
Specific conductance	mS/cm	0.192	0.136	0.151	0.096	0.102	0.201	0.25	0.269	0.243	0.142
Sulfate	mg/L	21.8	26.8	26.2	21.2	21.8	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	25.90	21.72	27.18	26.64	20.68	29.09	24.48	28.4	28.29	23.26
TOC	mg/L	NA	9.4	9.1	9.2	8	NA	65.6	68.4	74.5	102
Turbidity	NTU	12.4	6.7	2.3	8.32	7.9	2.8	3.9	4.5	4.4	3.3
Ethane	ug/L	1 U	1 U	1 U	0.6 U	0.6 U	1 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	1 U	0.8 U	0.8 U	1 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	4.8	1.54	1.13	1.87	4.51	5352	4050	4420	4031	6094
Iron, filtered	ug/L	26.0 U	39.5 U	7.1 U	38.9 B	31.5 B	1170	617	573	464	543

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-293-20					CEF-293-21			
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5.7	61.5	54	44	39	59	47	54.5	1
Alkalinity, field	mg/L	23.9	25	45	12	25	30	<10	16	<10
Carbon dioxide	mg/L	225	225	70	135	275	100	60	70	75
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	4
Ferrous iron	mg/L	0.46	1.33	1.4	0.74	0.66	0.04	0.15	0.06	0.07
Dissolved oxygen	mg/L	1.0	0.3	0.6	1	0.3	0.8	0.6	0.4	1
Dissolved sulfide	mg/L	2 U	1.5	1.8	1.9	2.4	1 U	1 U	1 U	7
Hydrogen sulfide (H_2S)	mg/L	>5	>5	5	5	>5	0.3	0.3	0	0.03
Field sulfide (S^{-2})	mg/L	>0.80	0.8	0.8	>0.8	>0.8	0.2	0.05	0.02	0.07
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	2.9	4	10
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	11
Orthophosphate	mg/L	0.1 UJ	20 U	0.1 U	0.1 U	0.1 U	28.1	0.1 U	0.1 U	12
pH	St. units	5.11	6.11	5.38	5.47	5.48	5.75	5.13	5.72	5.45
ORP	mV	-140	-151	-34.8	-102.4	-88	50.6	329	194	32.8
Specific conductance	mS/cm	0.118	0.142	170	0.155	141	0.231	229	0.207	0.174
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	28.1	23.7	23.4	16
Temperature	^{o}C	26.00	25.9	30.71	28.79	24.18	23.94	29.98	28.25	23.43
TOC	mg/L	NA	24.8	22.4	25.7	17.7	10.9	10.3	9.9	18
Turbidity	NTU	8.9	0	2.34	1.8	0.7	0.7	1.03	3.2	4.31
Ethane	ug/L	1 U	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	20
Ethene	ug/L	1 U	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	21
Methane	ug/L	500	171	167	237	304	6.56	69.6	7	22
Iron, filtered	ug/L	499	1280	952	889	578	93.9 U	7.1 U	7.1 U	23

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-1Sa				CEF-824A-3S			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	12	10	11.5	13	6	5 U	5 U	6
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon dioxide	mg/L	100	40	37.5	60	145	120	180	110
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.07	0	0.05	0.06	0.94	1.04	1.03	1.1
Dissolved oxygen	mg/L	1	0.4	1	1	1.5	1	1	0.8
Dissolved sulfide	mg/L	1 U	1 U	1 U	1 U	1.9	1.2	2.8	3
Hydrogen sulfide (H_2S)	mg/L	0.5	0.5	0.2	0.3	2	>5	1	5
Field sulfide (S^{-2})	mg/L	0.23	0.21	0.21	0.27	0.8	>0.8	>0.8	>0.8
Nitrate	mg/L	0.1 U	0.51	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	25.7	0.1 U	0.1 U	0.15	20 U	0.1 U	0.1 U	0.1 U
pH	St. units	5.18	4.84	5.14	5.14	4.22	4.74	4.96	4.71
ORP	mV	17.8	211.5	41	45.9	-71	-60.7	-85.9	-24.1
Specific conductance	mS/cm	0.107	109	0.105	109	0.052	0.076	0.058	0.067
Sulfate	mg/L	25.7	22.8	23.3	22.6	20 U	20 U	20 U	20 U
Temperature	^{o}C	24.99	29.37	28.21	23.4	25.9	28.71	27.54	25
TOC	mg/L	7.6	2.8	6.5	6	10.2	10.2	11.2	10.7
Turbidity	NTU	8.7	0.67	1.84	9.4	2.8	1.7	1.09	1.11
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	4.84	7.41	10.3	10.1	429	570	382	484
Iron, filtered	ug/L	30.7 U	7.1 U	38 B	12.5 B	1160	1090	1100	1130

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-4S					CEF-824A-7S				
		Sep-01	Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5 U	9.5	7.5	8	6.5	5 U	6	5.5	5.5	6
Alkalinity, field	mg/L	10.5	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbon dioxide	mg/L	220	<10	180	700	70	170	130	170	180	190
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.43	0.25	0.3	0.28	0	0.62	0.38	0.41	0.31	0.36
Dissolved oxygen	mg/L	0.5	0.2	1	1	0.8	0.9	0.2	0.8	1	1
Dissolved sulfide	mg/L	8.7	1.7	2.4	2.2	1.9	2 U	2.5	3.2	2	2.6
Hydrogen sulfide (H_2S)	mg/L	>5	5	>5	>5	5	>5	>5	>5	5	>5
Field sulfide (S^{-2})	mg/L	>0.80	NA	0.02	>0.8	0.8	>0.80	>0.8	>0.8	>0.8	0.8
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.13	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	0.1 UJ	20 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 U	20 U	0.1 U	0.1 U
pH	St. units	4.88	4.75	4.79	4.67	4.73	4.81	4.82	4.73	4.71	4.42
ORP	mV	-152	-132	-102	-16.6	-52.1	-148	-116.4	16.5	11.9	24
Specific conductance	mS/cm	0.073	0.061	0.075	0.75	0.087	0.056	0.068	0.058	0.058	0.059
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	28.47	25.42	25.58	28.58	23.76	28.10	28.34	24.78	27.45	24.26
TOC	mg/L	NA	12.3	14	14.5	13	NA	8.5	9.6	9.2	8
Turbidity	NTU	1.08	0	4.2	2.6	0	0	7.4	1.8	7.06	4.11
Ethane	ug/L	1 U	1 U	1 U	0.6 U	0.6 U	1 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	1 U	0.8 U	0.8 U	1 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	2040	594	964	547	866	370	217	259	294	391
Iron, filtered	ug/L	474	268 U	300	314	346	503	293	370	398	347

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-8S				CEF-824A-9S				
		Apr-03	Jul-03	Oct-03	Jan-04	Sep-01	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5 U	5 U	5 U	5 U	5 U	9	9	7.5	9
Alkalinity, field	mg/L	<10	<10	<10	<10	144	<10	20	<10	<10
Carbon dioxide	mg/L	<10	60	50	200	210	>1000	35	70	250
Chloride	mg/L	20 U	20 U	20 U	20 U	22.7	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.46	0.38	0.44	0.38	1.06	0.44	0.2	0.4	0.47
Dissolved oxygen	mg/L	0.4	0.2	1	1	1.1	1	0.3	1	1
Dissolved sulfide	mg/L	2.3	2.7	2.4	3.5	2 U	1.7	1.1	2.1	2
Hydrogen sulfide (H_2S)	mg/L	5	5	>5	>5	5	2	2	2	5
Field sulfide (S^{-2})	mg/L	0.8	0.8	>0.8	>0.8	>0.80	0.38	0.8	>0.8	0.75
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	0.1 U	0.1 U	0.1 UJ	20 U	0.1 U	0.1 U	0.12
pH	St. units	4.71	4.64	4.4	4.59	4.80	5	4.77	4.35	4.77
ORP	mV	-100	-61.9	32	-23.2	-103	-58	-45.6	6.3	-43.5
Specific conductance	mS/cm	0.041	62	0.06	60	0.080	0.047	61	0.07	0.059
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	26.5	28.89	28.83	25.29	29.00	25.5	28.42	28.2	23.54
TOC	mg/L	14.6	15.7	14.8	14.7	NA	14.8	16.4	18.2	16.8
Turbidity	NTU	0.85	0.41	5.08	7	0	0	0.48	2.02	8.2
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	1140	1300	1583	1615	534	319	407	464	525
Iron, filtered	ug/L	475	389	390	401	1210	471	365	372	407

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-10S				CEF-824A-11S			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	10	7	7.5	10	14.5	13	11.5	11.5
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon dioxide	mg/L	90	70	180	100	400	400	250	90
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.22	0.26	0.09	0	1.35	2.87	1.39	0.8
Dissolved oxygen	mg/L	0.8	0.3	0.8	1	0.3	1	0.6	0.4
Dissolved sulfide	mg/L	4.4	3.6	3.5	3.2	1.2	2.5	2	2.4
Hydrogen sulfide (H_2S)	mg/L	5	NA	5	>5	5	>5	5	>5
Field sulfide (S^{-2})	mg/L	0.49	0.59	0.8	0.8	>0.8	0.8	>0.8	0.8
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.17	0.1	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	0.1 U	0.1 U	20 U	0.1 U	0.1 U	0.1 U
pH	St. units	4.85	4.66	4.67	4.7	4.68	4.67	4.6	4.75
ORP	mV	-124	-46.1	-39.1	10.6	31.5	-105	68.5	28.6
Specific conductance	mS/cm	0.071	86	0.089	0.128	0.082	0.095	0.073	77
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	24.8	27.52	27.5	24.3	23.18	26.6	26.9	22.8
TOC	mg/L	65.1	60.8	77.3	62.7	21.3	24.2	23.1	20.7
Turbidity	NTU	4.9	1.27	1.8	1	0	0	1.52	0.5
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	2500	974	1263	982	1220	1810	1611	1622
Iron, filtered	ug/L	130 U	53.1 U	50.7 B	127 B	1900	2010	1240	1590

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-12I				CEF-824A-13D			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	6	5 U	5 U	5 U	258	258	243	254
Alkalinity, field	mg/L	<10	<10	<10	<10	175	<10	175	175
Carbon dioxide	mg/L	190	<10	90	<10	30	<10	18	<10
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.38	0.48	0.47	0.02	0.13	0.23	0.26	0
Dissolved oxygen	mg/L	0.6	0.3	0.2	0.8	1	0.6	0.6	0.8
Dissolved sulfide	mg/L	2.1	1.8	1.8	2.1	1 U	1 U	1 U	1 U
Hydrogen sulfide (H_2S)	mg/L	5	5	>5	1	0	0	0	0
Field sulfide (S^{-2})	mg/L	>0.8	0.04	>0.8	0.8	0.07	0	0.04	0.02
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.23	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	0.1 U	0.12	20 U	0.25	0.19	0.36
pH	St. units	4.51	4.32	4.1	4.27	6.84	6.58	7.05	7.04
ORP	mV	17.8	44.2	-6.5	2.6	42.1	301.1	-2	-113
Specific conductance	mS/cm	0.051	0.54	0.042	0.044	0.477	498	0.414	0.478
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	26.64	28.93	25.72	23.27	25.63	28.99	25.22	23.02
TOC	mg/L	16.5	17.9	17.3	17.7	3.6	3.2	2.4	2.1
Turbidity	NTU	37	8.38	9.97	1.9	11	3.1	3.4	3.4
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	1410	2400	2908	3160	10.9	14.2	15.5	19
Iron, filtered	ug/L	374	462	429	430	350	317	297 B	7.1 U

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-14S				CEF-824A-15I			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	26.5	26	24.5	19	12.5	12	8.5	9.5
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	16	<10	<10
Carbon dioxide	mg/L	90	70	60	<10	160	80	60	<10
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	2.93	2.24	1.97	1.59	3.29	3.6	>3.3	1.85
Dissolved oxygen	mg/L	0.3	0.4	1	1	0.4	1	1.5	1
Dissolved sulfide	mg/L	2.1	2	1.7	1.9	1.7	1.2	1.2	2.3
Hydrogen sulfide (H_2S)	mg/L	2	5	2	1	5	1	2	5
Field sulfide (S^{-2})	mg/L	0.77	0.69	>0.8	0.8	0.38	0.8	>0.8	0.8
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.11	0.1 U	0.14	20 U	0.1 U	0.1 U	0.16
pH	St. units	5.47	4.82	5.03	4.86	5.19	4.78	4.8	4.77
ORP	mV	-111	139.6	-3.4	-28	-74	44.2	17.9	27.6
Specific conductance	mS/cm	0.099	122	0.115	0.105	0.061	80	0.069	0.07
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	24.7	28.85	27.71	23.56	25.5	28.48	26.09	24.36
TOC	mg/L	47.6	45.3	46.4	41.6	16.6	16.7	18.5	19
Turbidity	NTU	8.2	1.75	5.9	0.09	8.2	1.41	1.2	0
Ethane	ug/L	1 U	1 U	3 U	1.2 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	4 U	1.6 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	3290	4390	6143	4894	720	75.9	1464	1956
Iron, filtered	ug/L	3120	2440	2390	2290	4590	4700	3950	3170

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-17I				CEF-824A-19S			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	260	21	19	11.5	6.5	6.5	8	5.5
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon dioxide	mg/L	<10	150	500	60	40	40	40	50
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	2.5	2.38	2.05	1.36	0.54	0.66	1.11	0.43
Dissolved oxygen	mg/L	1	1	0.2	0.1	1	0.4	0.9	1
Dissolved sulfide	mg/L	2.2	2.2	2.7	2.6	1 U	1 U	1 U	1 U
Hydrogen sulfide (H_2S)	mg/L	5	5	>5	5	0	0.3	0.2	0.1
Field sulfide (S^{-2})	mg/L	0.8	0.01	>0.8	0.8	0.15	0.06	0.17	0.05
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	0.1 U	0.1 U	20 U	0.1 U	0.1 U	0.1 U
pH	St. units	5.38	5.11	4.77	4.78	4.79	4.87	4.55	4.79
ORP	mV	-115	-96.7	-35.9	-21.8	84	126.9	87	97
Specific conductance	mS/cm	0.068	0.07	0.076	0.054	0.045	67	0.071	0.061
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	25	26.81	25.54	24.07	26.67	29.38	28.21	25.05
TOC	mg/L	22.9	23.7	23	21.1	7.6	6.7	6	7.1
Turbidity	NTU	5	1	2.08	0	5.6	6.5	17	3.1
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	766	1030	1179	1487	163	178	261	239
Iron, filtered	ug/L	2830	2660	2410	2220	448	356	978	893

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-20S				CEF-824A-21I			
		Apr-03	Jul-03	Oct-03	Jan-04	Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Alkalinity, field	mg/L	<10	<10	<10	<10	<10	<10	<10	<10
Carbon dioxide	mg/L	120	120	400	25	250	220	180	70
Chloride	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	0.77	0.88	0.99	0.77	2.95	2.74	2.63	1.97
Dissolved oxygen	mg/L	0.3	0.05	0.3	1	0.6	0.2	0.6	0.4
Dissolved sulfide	mg/L	1 U	1 U	1 U	1 U	1.6	1.5	1.2	1.5
Hydrogen sulfide (H_2S)	mg/L	0.5	>5	1	0.5	5	3	2	1
Field sulfide (S^{-2})	mg/L	0.41	0.49	0.58	0.23	>0.8	>0.8	>0.8	0.8
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	20 U	0.1 U	0.1 U	0.1 U	20 U	0.1 U	0.1 U	0.1 U
pH	St. units	4.6	4.63	4.42	4.44	4.51	4.57	3.93	4.46
ORP	mV	30.5	-27.1	103.6	-28.1	49.3	-30.5	124	17.9
Specific conductance	mS/cm	0.072	0.091	0.073	0.089	0.044	0.049	0.05	0.04
Sulfate	mg/L	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Temperature	^{o}C	26	30.54	29.18	23.26	24.74	24.9	24.21	21.03
TOC	mg/L	4	4	3.3	3	25.3	22.8	21.7	24.1
Turbidity	NTU	0.12	0.9	1.63	0.1	150	9	9.8	1.92
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	34.3	90.2	49.1	20.1	247	347	180	540
Iron, filtered	ug/L	861	1060	929	845	3100	2920	3030	2780

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETERS IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	UNITS	CEF-824A-22S			
		Apr-03	Jul-03	Oct-03	Jan-04
Alkalinity	mg/L	5 U	5.5	5 U	5 U
Alkalinity, field	mg/L	<10	<10	<10	<10
Carbon dioxide	mg/L	160	120	50	145
Chloride	mg/L	20 U	20 U	20 U	20 U
Ferrous iron	mg/L	6.5	4.6	5.2	1.35
Dissolved oxygen	mg/L	0.1	1	1	1
Dissolved sulfide	mg/L	1 U	1 U	1 U	1 U
Hydrogen sulfide (H_2S)	mg/L	0.3	0.2	0.1	0
Field sulfide (S^{-2})	mg/L	0.19	0.01	0.09	0.11
Nitrate	mg/L	0.1 U	0.1 U	0.1 U	0.1 U
Nitrite	mg/L	0.1 U	0.1 U	0.1 U	0.1 U
Orthophosphate	mg/L	48.6	0.1 U	0.1 U	0.1 U
pH	St. units	4.11	4.8	4.7	4.52
ORP	mV	36	-0.04	10.3	65
Specific conductance	mS/cm	0.153	0.176	0.148	176
Sulfate	mg/L	48.6	36.6	43.3	51.7
Temperature	^{o}C	25.5	29.12	28.66	22.15
TOC	mg/L	3.1	1.9	2.9	2.9
Turbidity	NTU	0	8	3.2	12
Ethane	ug/L	1 U	1 U	0.6 U	0.6 U
Ethene	ug/L	1 U	1 U	0.8 U	0.8 U
Methane	ug/L	19.7	25.9	26	34.2
Iron, filtered	ug/L	6950	5280	5880	7800

U = Not detected at the method detection limit
J = Estimated concentration.
NA = Not analyzed.
mS/Cm = microSiemens/centimeter.
^{o}C = degrees Celcius.

NTU = Nephelometric turbidity units.
TOC = Total organic carbon.
ORP = Oxidation-reduction potential.
* Well CEF-293-03 was abandoned and re-installed in October 2003.

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CEF-824A-10S [5.0-15.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	3.1	1.1/1.4	3.4	3.1	[70]
4-METHYL-2-PENTANONE	34.9	15.9/19.2	115	8.7	[560]
ACETONE	50.1	5 U/18	119	92.2	[700]
CIS-1,2-DICHLOROETHENE	17.8	8/11.3	27.2	22.6	[70]
ETHYLBENZENE	3.3	4.3/4.3	3	1.3	[30]
TOLUENE	9.5	2.1/3.6	11.4	11.2	[40]
TOTAL XYLENES	4.2	2.2 J/2.9 J	5	6.3	[20]
TRICHLOROETHENE	0.72 J	1 U/1 U	0.85 J	0.78 J	[3]

CEF-293-03 [-]	04/03	08/03	10/03	01/04
	ND	ND	NA	ND

CEF-824A-11S [5.0-15.0]	04/03	07/03	10/03	01/04	
ACETONE	25 U	13 U	13 U	8	[700]
BENZENE	4.5 J *	3.3 *	2.2 J *	1.1 *	[1]
ETHYLBENZENE	107 *	75.9 *	83.8 *	78.2 *	[30]
TOLUENE	5.8	2.5 U	1.3 U	0.5 U	[40]
TOTAL XYLENES	307 *	181 *	184 *	136 *	[20]

CEF-824A-21I [35.0-40.0]	04/03	07/03	10/03	01/04	
ACETONE	5 U	5 U	5 U	6.8	[700]
ETHYLBENZENE	0.81 J	1 U	0.62 J	0.73 J	[30]
TOTAL XYLENES	1.1 J	3 U	1 U	1.8 J	[20]

CEF-293-11 [5.0-15.0]	04/03	07/03	10/03	01/04	
ACETONE	25 U/13	25 U	25 U/25 U	11.2	[700]
BENZENE	41.8*/52*	31.7 *	37.4*/36.8*	44.4 *	[1]
ETHYLBENZENE	205*/200*	157 *	221*/200*	238 *	[30]
TOLUENE	120*/154*	87.2 *	95.8*/90.8*	126 *	[40]
TOTAL XYLENES	683*/678*	520 *	748*/674*	863 *	[20]

CEF-293-13 [5.0-15.0]	04/03	08/03	10/03	01/04
	ND	ND	ND	ND

CEF-293-21 [5.0-15.0]	04/03	07/03	10/03	01/04	
BENZENE	5.1 */7.8 *	90.7 *	6.9 *	7.9 */3.8 *	[1]
ETHYLBENZENE	1 U/0.73 J	18.4	0.73 J	1.4 /0.65 J	[30]
TOLUENE	1 U/1 U	2.7	0.5 U	0.5 U /0.5 U	[40]
TOTAL XYLENES	3 U/3 U	44.9 *	1 U	1 U /1 U	[20]

CEF-824A-04S [5.0-15.0]	04/03	07/03	10/03	01/04	
BENZENE	134 *	275 *	111 *	315 *	[1]
ETHYLBENZENE	23.9	58 *	14.9	59.3 *	[30]
TOLUENE	1.5 J	3.4	0.72 J	4.6	[40]
TOTAL XYLENES	66.9 *	150 *	33.2 *	161 *	[20]

CEF-824A-17I [36.0-41.0]	04/03	07/03	10/03	01/04	
ACETONE	5 U	6.6	5 U	5 U	[700]
BENZENE	1 U	1 U	0.93 J	4.2 *	[1]
ETHYLBENZENE	1 U	1 U	0.63 J	3.1	[30]
TOTAL XYLENES	3 U	1.5 J	6.8	29.5 *	[20]

CEF-824A-01Sa [4.0-14.0]	04/03	07/03	10/03	01/04	
TRICHLOROETHENE	1 U	1 U	0.5 U	1.9	[3]

CEF-293-19 [4.0-14.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	30.1	32.4/42.1	28.8	59.4 /53.8	[70]
4-METHYL-2-PENTANONE	12.1	16.8/28.7	23.5	313 /225	[560]
ACETONE	22.4	62.9/98.2	125	838 */618	[700]
BENZENE	0.63 J	0.79 J/0.86 J	1.3 U	2.5 U /2.5 U	[1]
CIS-1,2-DICHLOROETHENE	214 *	249*/299*	174 *	344 */313 *	[70]
ETHYLBENZENE	2.1	2.9/3.7	2.5	5.4 /4.7 J	[30]
TOLUENE	9.6	8.6/12.3	6.6	31 /26.4	[40]
TOTAL XYLENES	12.5	13.7/20.1*	10.8	30.3 */26.8 *	[20]
TRANS-1,2-DICHLOROETHENE	1.3	1.5/1.8	1.3 U	2.5 U /2.5 U	[100]
TRICHLOROETHENE	10.8 *	13.4*/16*	9.9 *	16.3 */14.8 *	[3]

CEF-824A-09S [5.0-15.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	1.1	1	0.88 J	0.93 J	[70]
TRICHLOROETHENE	0.92 J	0.89 J	0.61 J	0.85 J	[3]

CEF-824A-12I [35.0-38.0]	04/03	07/03	10/03	01/04	
BENZENE	2.8 *	3.4 *	5.1 *	6.1 *	[1]
ETHYLBENZENE	10.1	10.5	17.2	19	[30]
TETRACHLOROETHENE	0.51 J	1 U	0.5 U	0.64 J	[3]
TOTAL XYLENES	33.7 *	39.2 *	46.4 *	52.4 *	[20]

CEF-824A-13D [81.0-86.0]	04/03	08/03	10/03	01/04
	ND	ND	ND	ND

CEF-824A-14S [4.0-14.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	120 *	185 *	203 *	124 *	[70]
1,1-DICHLOROETHENE	4.5 J	4.4	10 U	5 U	[7]
ACETONE	25 U	6.9	100 U	50 U	[700]
BENZENE	5 U	2.3 *	10 U	5 U	[1]
CIS-1,2-DICHLOROETHENE	441 *	1100 *	1740 *	1010 *	[70]
ETHYLBENZENE	4.4 J	3.9	10.1 J	7.2 J	[30]
TETRACHLOROETHENE	5 U	1.2	10 U	5 U	[3]
TOLUENE	9.1	19.4	33.7	26.7	[40]
TOTAL XYLENES	15 U	3.8	20 U	10 U	[20]
TRANS-1,2-DICHLOROETHENE	5 U	4	10.2 J	5 J	[100]
TRICHLOROETHENE	13.8 *	21.5 *	40.5 *	33.8 *	[3]
VINYL CHLORIDE	5 U	2 *	10 U	5 U	[1]

CEF-824A-15I [35.0-40.0]	04/03	07/03	10/03	01/04	
ACETONE	5 U	8.1	5 U	5 U	[700]
TETRACHLOROETHENE	0.53 J	0.58 J	0.86 J	1.3	[3]
TRICHLOROETHENE	1 U	1 U	0.53 J	0.5 U	[3]

CEF-293-20 [4.0-14.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	1.3	0.87 J	1.3 J	2.6	[70]
1,1-DICHLOROETHENE	0.96 J	1 U	1 U	2.3	[7]
ACETONE	5 U	10.1	10 U	5 U	[700]
BENZENE	0.56 J	0.67 J	1 U	0.88 J	[1]
CIS-1,2-DICHLOROETHENE	83.8 *	62.3	89.1 *	111 *	[70]
TRANS-1,2-DICHLOROETHENE	1 U	1 U	1 U	0.91 J	[100]
TRICHLOROETHENE	2.4	1	2.1	4.1 *	[3]
VINYL CHLORIDE	1 U	1 U	1 U	0.57 J	[1]

CEF-824A-08S [5.0-15.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	10	10.5	10.8	10.6	[70]
1,1-DICHLOROETHENE	29.1 *	29.9 *	38.6 *	39.2 *	[7]
BENZENE	1.4 *	0.79 J	1.3 *	1	[1]
CIS-1,2-DICHLOROETHENE	2.5	2.2	2.6	1.2	[70]
ETHYLBENZENE	0.51 J	1 U	0.5 U	0.5 U	[30]
TOLUENE	0.99 J	1 U	0.5 U	0.5 U	[40]
TOTAL XYLENES	3	1.1 J	1.8 J	1.7 J	[20]
TRICHLOROETHENE	0.58 J	1 U	0.65 J	0.5 U	[3]

CEF-824A-19S [4.0-14.0]	04/03	08/03	10/03	01/04
	ND	ND	ND	ND

CEF-824A-20S [4.0-14.0]	04/03	08/03	10/03	01/04
	ND	ND	ND	ND

CEF-824A-07S [5.0-15.0]	04/03	07/03	10/03	01/04	
1,1-DICHLOROETHANE	0.81 J	1.4	2.1/2	0.5 U	[70]
BENZENE	5.6 *	5.3 *	8.1*/7.6*	7 *	[1]
ETHYLBENZENE	2.6	2	4.1/4	2.5	[30]
TRICHLOROETHENE	1.1	1.2	0.93 J/0.97 J	1.4	[3]

CEF-824A-22S [3.5-13.5]	04/03	07/03	10/03	01/04	
CIS-1,2-DICHLOROETHENE	1 U	1 U	0.5 U	0.59 J	[70]
TRICHLOROETHENE	1.3	0.87 J	1.1	1.3	[3]

CEF-824A-03S [8.0-18.0]	04/03	08/03	10/03	01/04
	ND	ND	ND	ND

LEGEND

- Long-Term Monitoring Well
- Groundwater Flow
- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Fence
- Sewer Storm
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI
- Day Tank 1 Excavated Area
- Demolished Building

CEF-824A-21I (35-40) Volatiles (ug/L) BENZENE 1.8 * [1]

Sample ID
Well Screen Interval, feet below ground surface
Groundwater Cleanup Target Level (GCTL)
Detected Concentration
* indicates GCTL exceedance
Parameter

* Concentration exceeds GCTL.
J Estimated concentration
U Not detected at or above associated detection limit
NA Not analyzed
ND None detected

NOTES: 1) All results are in ug/L.
2) Duplicate sample results noted as sample/duplicate.
3) RI was conducted in 09/01.

DRAWN BY	DATE
MJJ	15Oct04
CHECKED BY	DATE
RFD	
COST/SCHED-AREA	
SCALE	AS NOTED

NAVFAC

VOLATILE ORGANIC COMPOUNDS
IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO.	
3965	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 3-1	REV. 0

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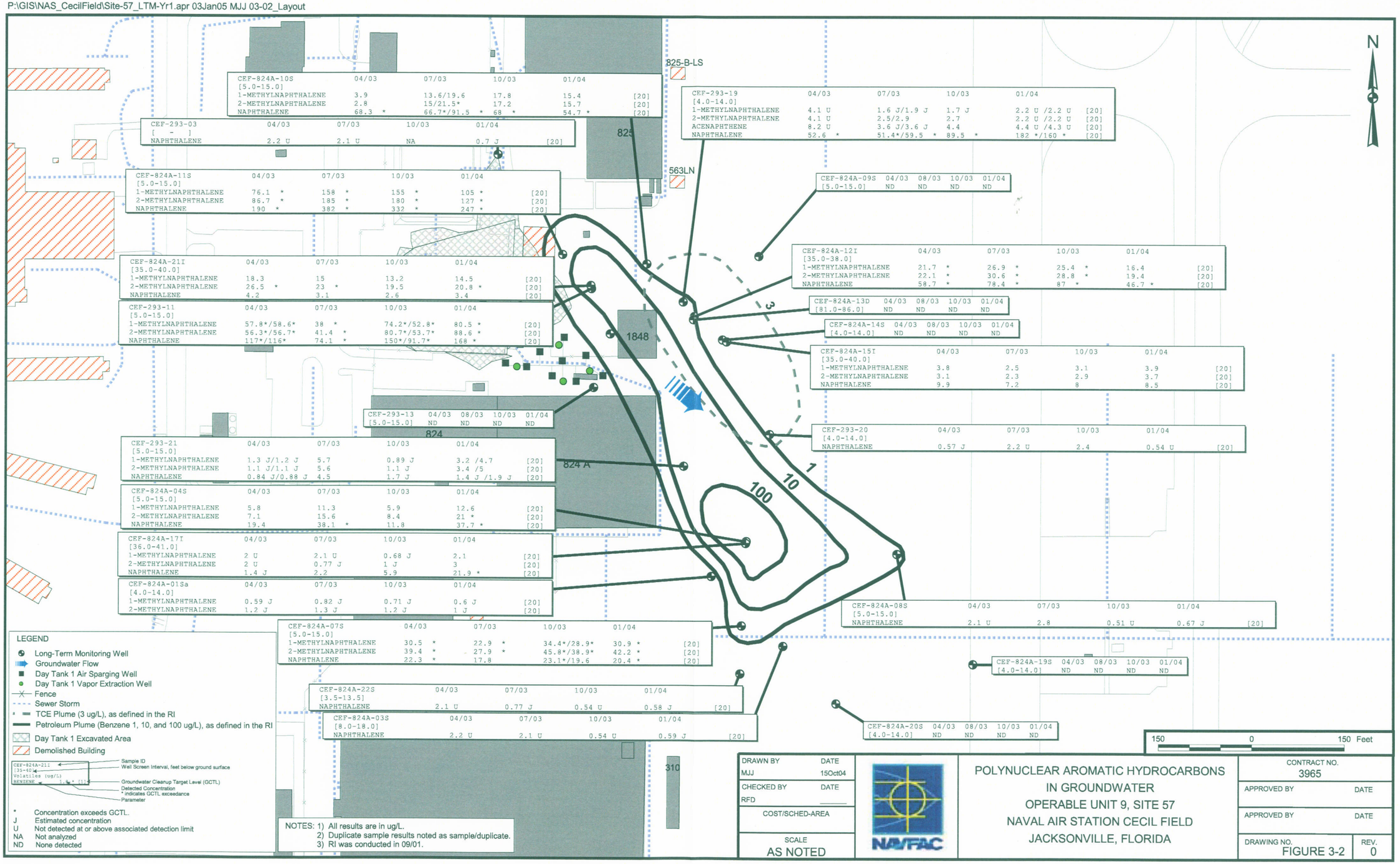
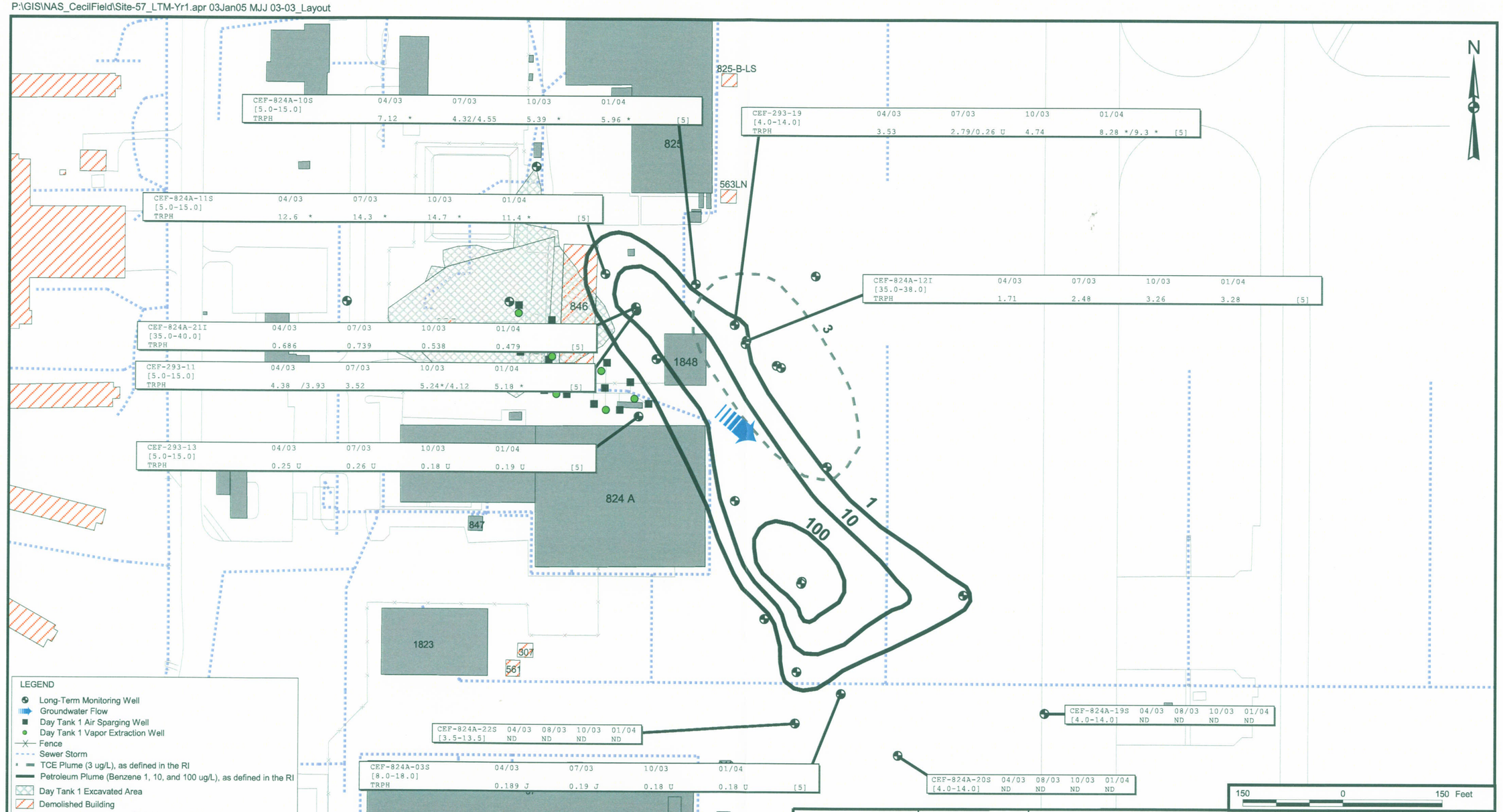


DRAWN BY MJJ	DATE 15Oct04	POLYNUCLEAR AROMATIC HYDROCARBONS IN GROUNDWATER OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 3965
CHECKED BY RFD	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3-2 / REV. 0

P:\GIS\NAS_CecilField\Site-57_LTM-Yr1.apr 03Jan05 MJJ 03-03_Layout



DRAWN BY MJJ	DATE 15Oct04	TOTAL RECOVERABLE PETROLEUM HYDROCARBONS IN GROUNDWATER OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 3965
CHECKED BY RFD	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3-3 / REV. 0

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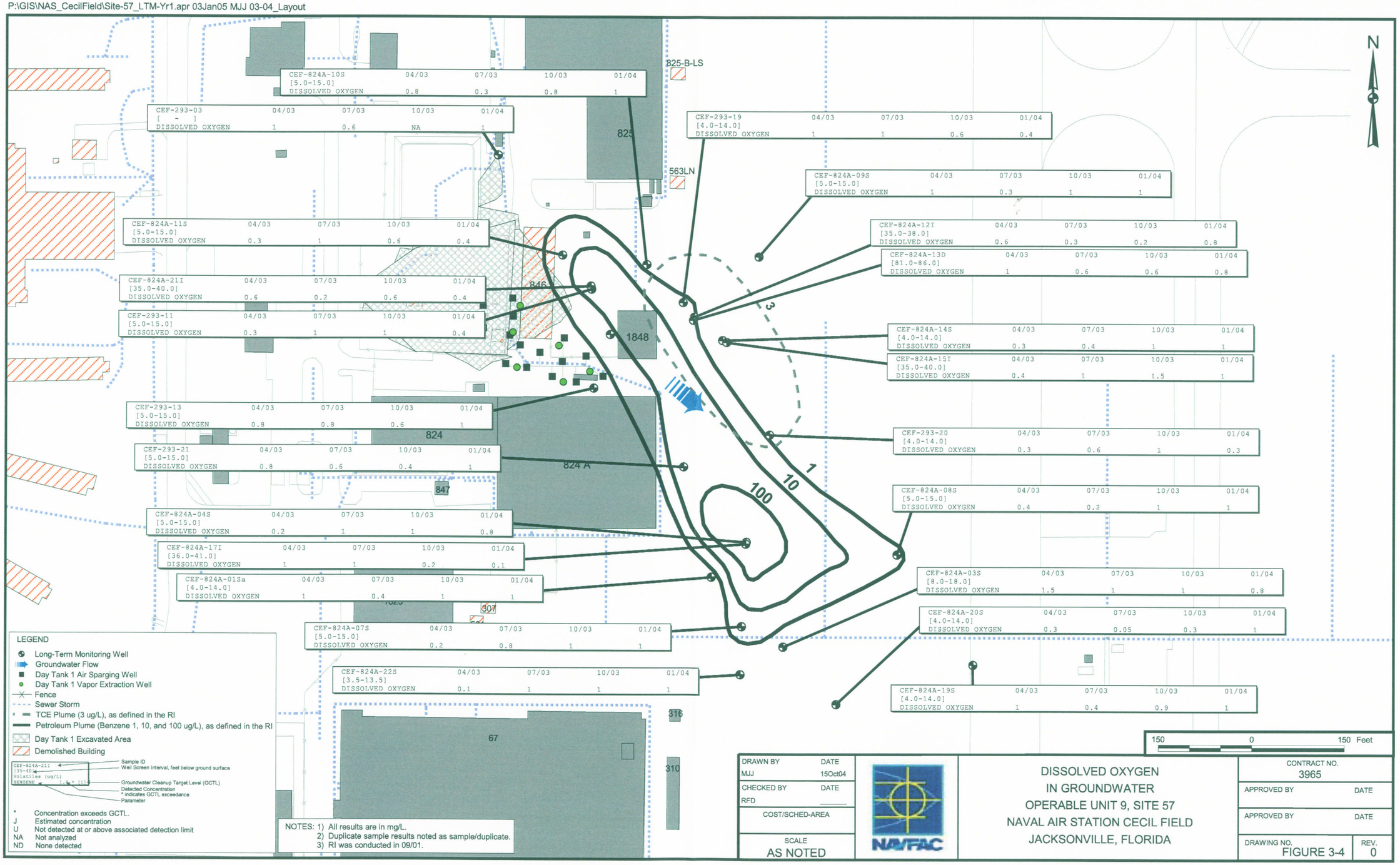

DRAWN BY MJJ	DATE 15Oct04	DISSOLVED OXYGEN IN GROUNDWATER OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 3965
CHECKED BY RFD	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 3-4 / REV. 0

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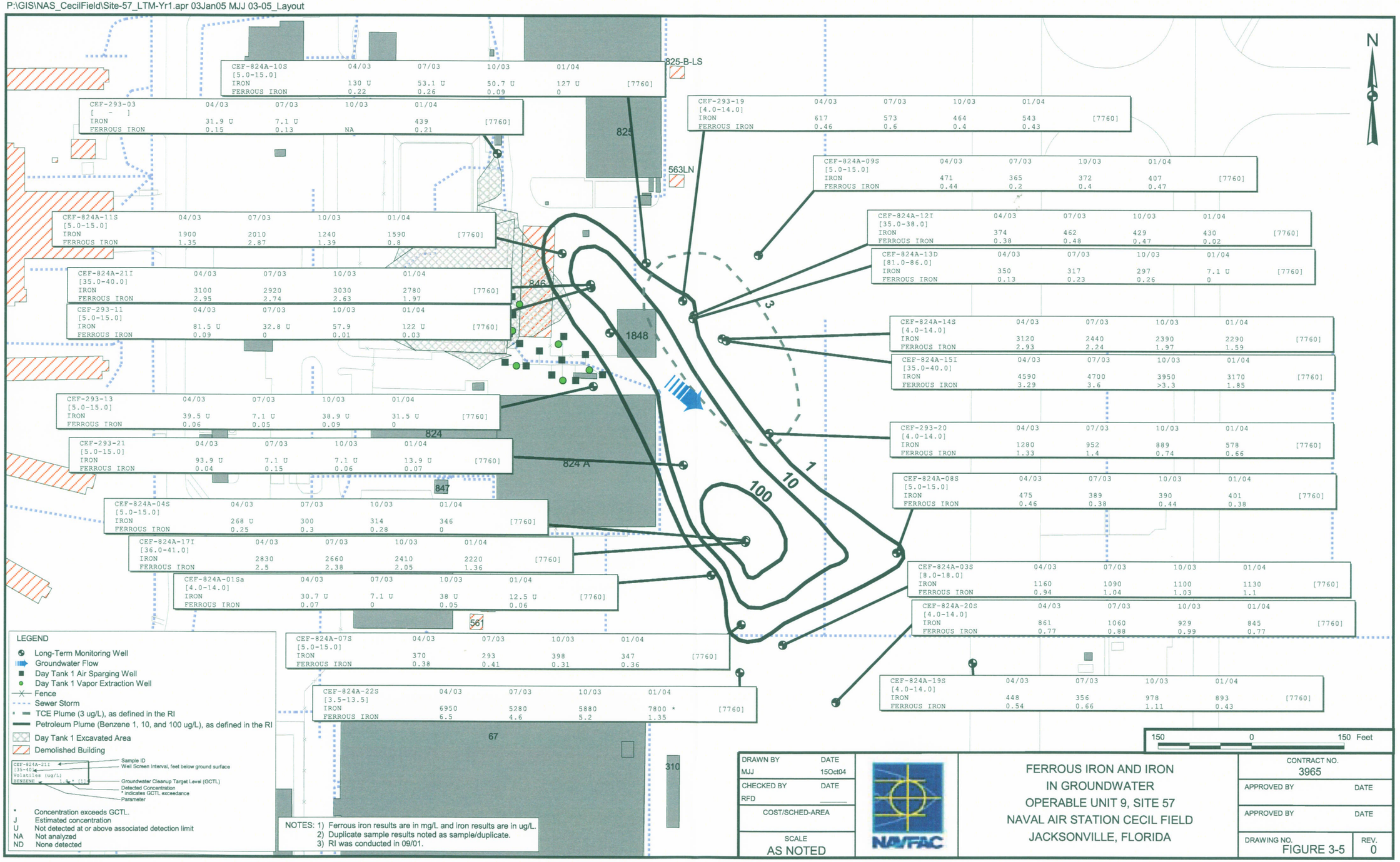

CEF-824A-10S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	130 U	53.1 U	50.7 U	127 U	[7760]
FERROUS IRON	0.22	0.26	0.09	0	

CEF-293-03 [-]	04/03	07/03	10/03	01/04	
IRON	31.9 U	7.1 U		439	[7760]
FERROUS IRON	0.15	0.13	NA	0.21	

CEF-293-19 [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	617	573	464	543	[7760]
FERROUS IRON	0.46	0.6	0.4	0.43	

CEF-824A-09S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	471	365	372	407	[7760]
FERROUS IRON	0.44	0.2	0.4	0.47	

CEF-824A-11S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	1900	2010	1240	1590	[7760]
FERROUS IRON	1.35	2.87	1.39	0.8	

CEF-824A-12I [35.0-38.0]	04/03	07/03	10/03	01/04	
IRON	374	462	429	430	[7760]
FERROUS IRON	0.38	0.48	0.47	0.02	

CEF-824A-13D [81.0-86.0]	04/03	07/03	10/03	01/04	
IRON	350	317	297	7.1 U	[7760]
FERROUS IRON	0.13	0.23	0.26	0	

CEF-824A-21I [35.0-40.0]	04/03	07/03	10/03	01/04	
IRON	3100	2920	3030	2780	[7760]
FERROUS IRON	2.95	2.74	2.63	1.97	

CEF-293-11 [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	81.5 U	32.8 U	57.9	122 U	[7760]
FERROUS IRON	0.09	0	0.01	0.03	

CEF-824A-14S [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	3120	2440	2390	2290	[7760]
FERROUS IRON	2.93	2.24	1.97	1.59	

CEF-824A-15I [35.0-40.0]	04/03	07/03	10/03	01/04	
IRON	4590	4700	3950	3170	[7760]
FERROUS IRON	3.29	3.6	>3.3	1.85	

CEF-293-13 [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	39.5 U	7.1 U	38.9 U	31.5 U	[7760]
FERROUS IRON	0.06	0.05	0.09	0	

CEF-293-20 [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	1280	952	889	578	[7760]
FERROUS IRON	1.33	1.4	0.74	0.66	

CEF-293-21 [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	93.9 U	7.1 U	7.1 U	13.9 U	[7760]
FERROUS IRON	0.04	0.15	0.06	0.07	

CEF-824A-08S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	475	389	390	401	[7760]
FERROUS IRON	0.46	0.38	0.44	0.38	

CEF-824A-04S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	268 U	300	314	346	[7760]
FERROUS IRON	0.25	0.3	0.28	0	

CEF-824A-17I [36.0-41.0]	04/03	07/03	10/03	01/04	
IRON	2830	2660	2410	2220	[7760]
FERROUS IRON	2.5	2.38	2.05	1.36	

CEF-824A-03S [8.0-18.0]	04/03	07/03	10/03	01/04	
IRON	1160	1090	1100	1130	[7760]
FERROUS IRON	0.94	1.04	1.03	1.1	

CEF-824A-01Sa [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	30.7 U	7.1 U	38 U	12.5 U	[7760]
FERROUS IRON	0.07	0	0.05	0.06	

CEF-824A-20S [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	861	1060	929	845	[7760]
FERROUS IRON	0.77	0.88	0.99	0.77	

CEF-824A-07S [5.0-15.0]	04/03	07/03	10/03	01/04	
IRON	370	293	398	347	[7760]
FERROUS IRON	0.38	0.41	0.31	0.36	

CEF-824A-19S [4.0-14.0]	04/03	07/03	10/03	01/04	
IRON	448	356	978	893	[7760]
FERROUS IRON	0.54	0.66	1.11	0.43	

CEF-824A-22S [3.5-13.5]	04/03	07/03	10/03	01/04	
IRON	6950	5280	5880	7800 *	[7760]
FERROUS IRON	6.5	4.6	5.2	1.35	

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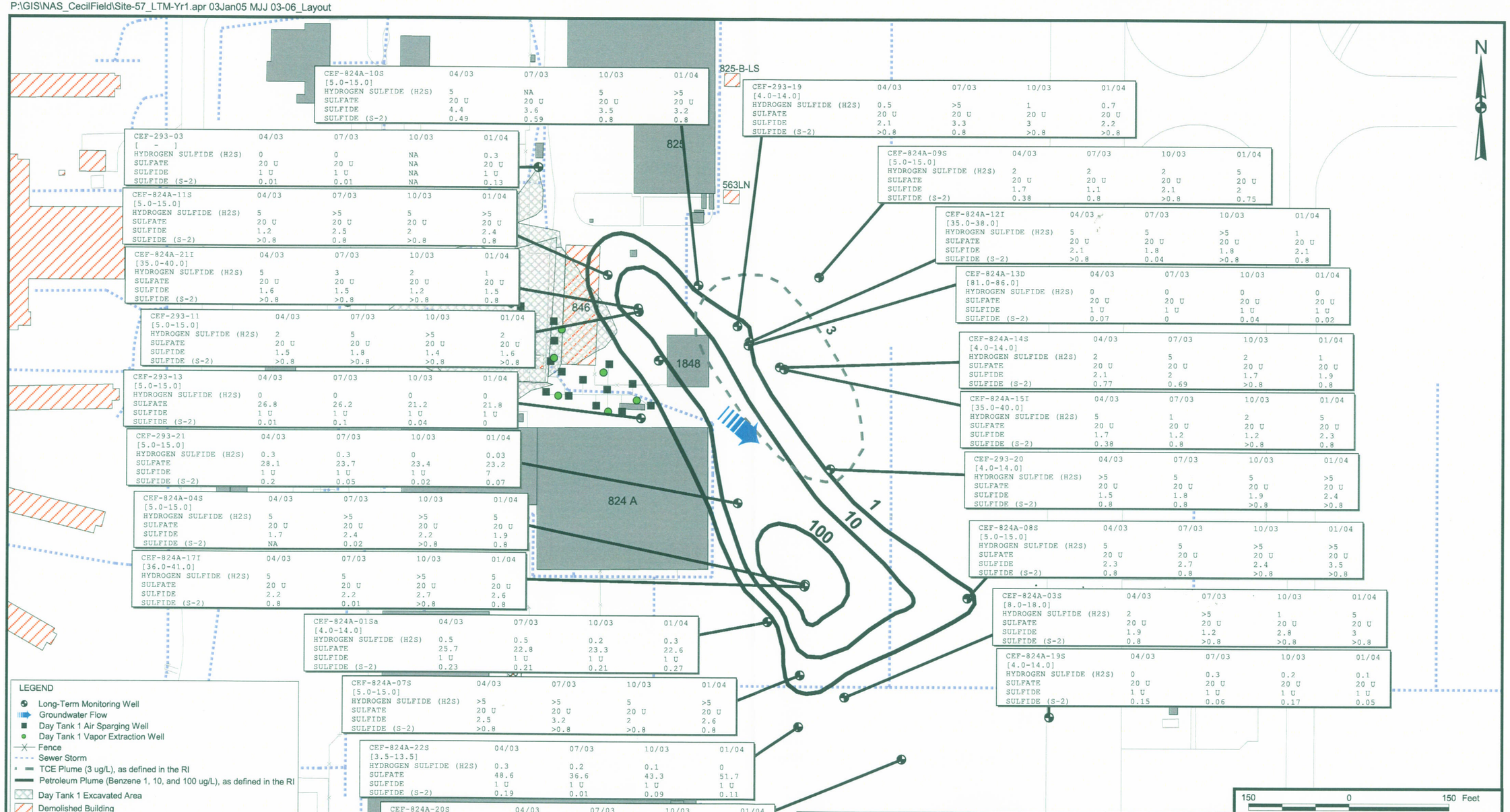

CEF-824A-10S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	NA	5	>5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	4.4	3.6	3.5	3.2
SULFIDE (S-2)	0.49	0.59	0.8	0.8

CEF-293-19 [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0.5	>5	1	0.7
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.1	3.3	3	2.2
SULFIDE (S-2)	>0.8	0.8	>0.8	>0.8

CEF-293-03 [-]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0	0	NA	0.3
SULFATE	20 U	20 U	NA	20 U
SULFIDE	1 U	1 U	NA	1 U
SULFIDE (S-2)	0.01	0.01	NA	0.13

CEF-824A-09S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	2	2	2	5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.7	1.1	2.1	2
SULFIDE (S-2)	0.38	0.8	>0.8	0.75

CEF-824A-11S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	>5	5	>5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.2	2.5	2	2.4
SULFIDE (S-2)	>0.8	0.8	>0.8	0.8

CEF-824A-12I [35.0-38.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	5	>5	1
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.1	1.8	1.8	2.1
SULFIDE (S-2)	>0.8	0.04	>0.8	0.8

CEF-824A-21I [35.0-40.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	3	2	1
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.6	1.5	1.2	1.5
SULFIDE (S-2)	>0.8	>0.8	>0.8	0.8

CEF-824A-13D [81.0-86.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0	0	0	0
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.07	0	0.04	0.02

CEF-293-11 [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	2	5	>5	2
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.5	1.8	1.4	1.6
SULFIDE (S-2)	>0.8	>0.8	>0.8	>0.8

CEF-824A-14S [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	2	5	2	1
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.1	2	1.7	1.9
SULFIDE (S-2)	0.77	0.69	>0.8	0.8

CEF-293-13 [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0	0	0	0
SULFATE	26.8	26.2	21.2	21.8
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.01	0.1	0.04	0

CEF-824A-15I [35.0-40.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	1	2	5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.7	1.2	1.2	2.3
SULFIDE (S-2)	0.38	0.8	>0.8	0.8

CEF-293-21 [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0.3	0.3	0	0.03
SULFATE	28.1	23.7	23.4	23.2
SULFIDE	1 U	1 U	1 U	7
SULFIDE (S-2)	0.2	0.05	0.02	0.07

CEF-293-20 [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	>5	5	5	>5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.5	1.8	1.9	2.4
SULFIDE (S-2)	0.8	0.8	>0.8	>0.8

CEF-824A-04S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	>5	>5	5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.7	2.4	2.2	1.9
SULFIDE (S-2)	NA	0.02	>0.8	0.8

CEF-824A-08S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	5	>5	>5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.3	2.7	2.4	3.5
SULFIDE (S-2)	0.8	0.8	>0.8	>0.8

CEF-824A-17I [36.0-41.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	5	5	>5	5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.2	2.2	2.7	2.6
SULFIDE (S-2)	0.8	0.01	>0.8	0.8

CEF-824A-03S [8.0-18.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	2	>5	1	5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1.9	1.2	2.8	3
SULFIDE (S-2)	0.8	>0.8	>0.8	>0.8

CEF-824A-01Sa [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0.5	0.5	0.2	0.3
SULFATE	25.7	22.8	23.3	22.6
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.23	0.21	0.21	0.27

CEF-824A-19S [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0	0.3	0.2	0.1
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.15	0.06	0.17	0.05

CEF-824A-07S [5.0-15.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	>5	>5	5	>5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	2.5	3.2	2	2.6
SULFIDE (S-2)	>0.8	>0.8	>0.8	0.8

CEF-824A-22S [3.5-13.5]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0.3	0.2	0.1	0
SULFATE	48.6	36.6	43.3	51.7
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.19	0.01	0.09	0.11

CEF-824A-20S [4.0-14.0]	04/03	07/03	10/03	01/04
HYDROGEN SULFIDE (H2S)	0.5	>5	1	0.5
SULFATE	20 U	20 U	20 U	20 U
SULFIDE	1 U	1 U	1 U	1 U
SULFIDE (S-2)	0.41	0.49	0.58	0.23

LEGEND

- Long-Term Monitoring Well
- Groundwater Flow
- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Fence
- Sewer Storm
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI
- Day Tank 1 Excavated Area
- Demolished Building

CEF-824A-21I — Sample ID
[35-40] — Well Screen Interval, feet below ground surface
Volatiles (ug/L)
BENZENE 1 * (1) — Groundwater Cleanup Target Level (GCTL); Detected Concentration; * indicates GCTL exceedance; Parameter

* Concentration exceeds GCTL.
J Estimated concentration
U Not detected at or above associated detection limit
NA Not analyzed
ND None detected

NOTES: 1) All results are in mg/L.
2) Duplicate sample results noted as sample/duplicate.
3) RI was conducted in 09/01.

DRAWN BY	DATE
MJJ	15Oct04
CHECKED BY	DATE
RFD	
COST/SCHED-AREA	
SCALE	AS NOTED

NAVFAC

SULFATE AND SULFIDE
IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 3965
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3-6
REV. 0

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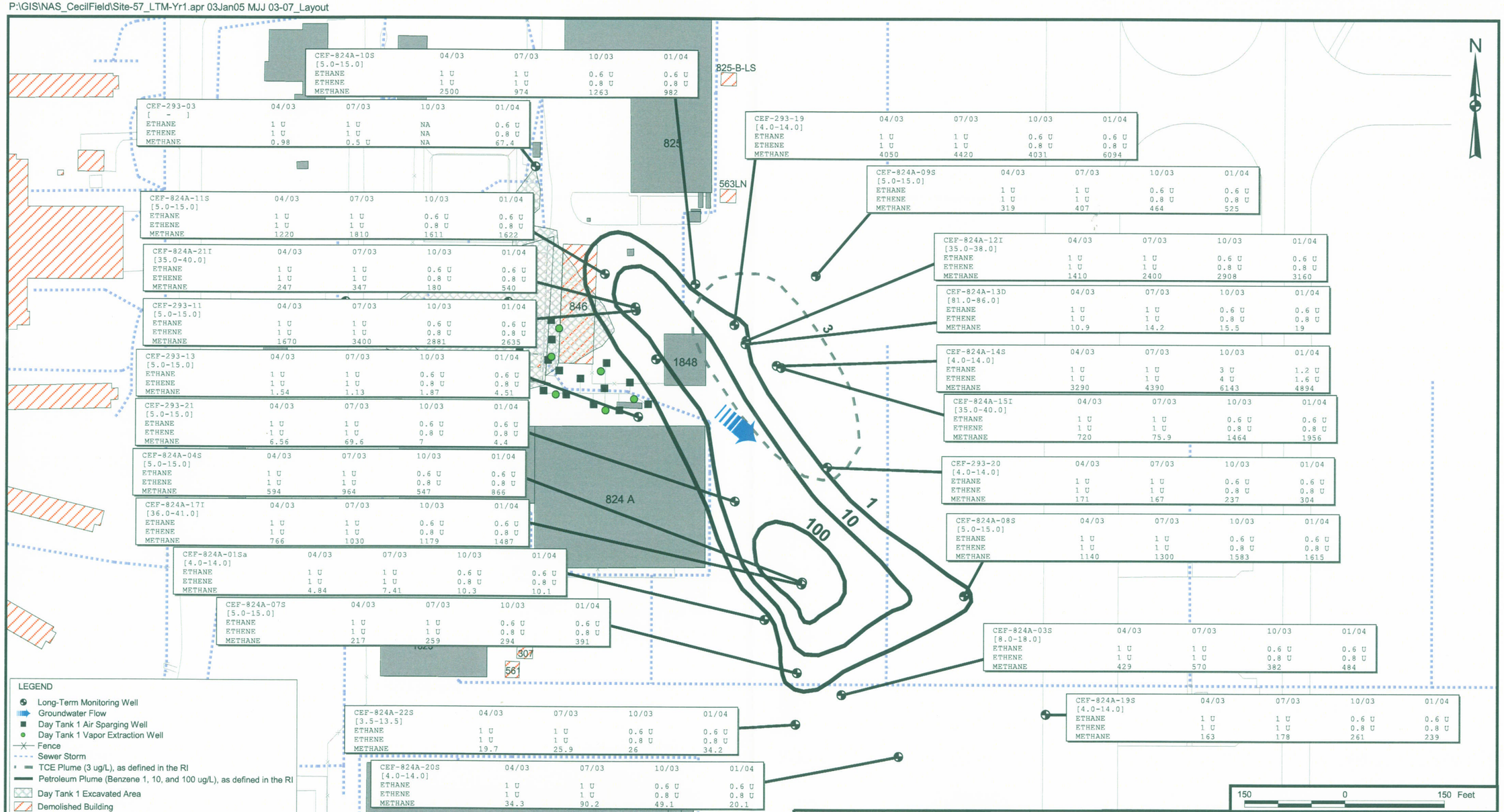


LEGEND

- Long-Term Monitoring Well
- Groundwater Flow
- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Fence
- Sewer Storm
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI
- Day Tank 1 Excavated Area
- Demolished Building

CEF-824A-21I [35-40] Volatiles (ug/L) BENZENE 1 U * [1]

- Sample ID
- Well Screen Interval, feet below ground surface
- Groundwater Cleanup Target Level (GCTL)
- Detected Concentration
- * indicates GCTL exceedance
- Parameter

* Concentration exceeds GCTL.
J Estimated concentration
U Not detected at or above associated detection limit
NA Not analyzed
ND None detected

NOTES: 1) All results are in ug/L.
2) Duplicate sample results noted as sample/duplicate.
3) RI was conducted in 09/01.

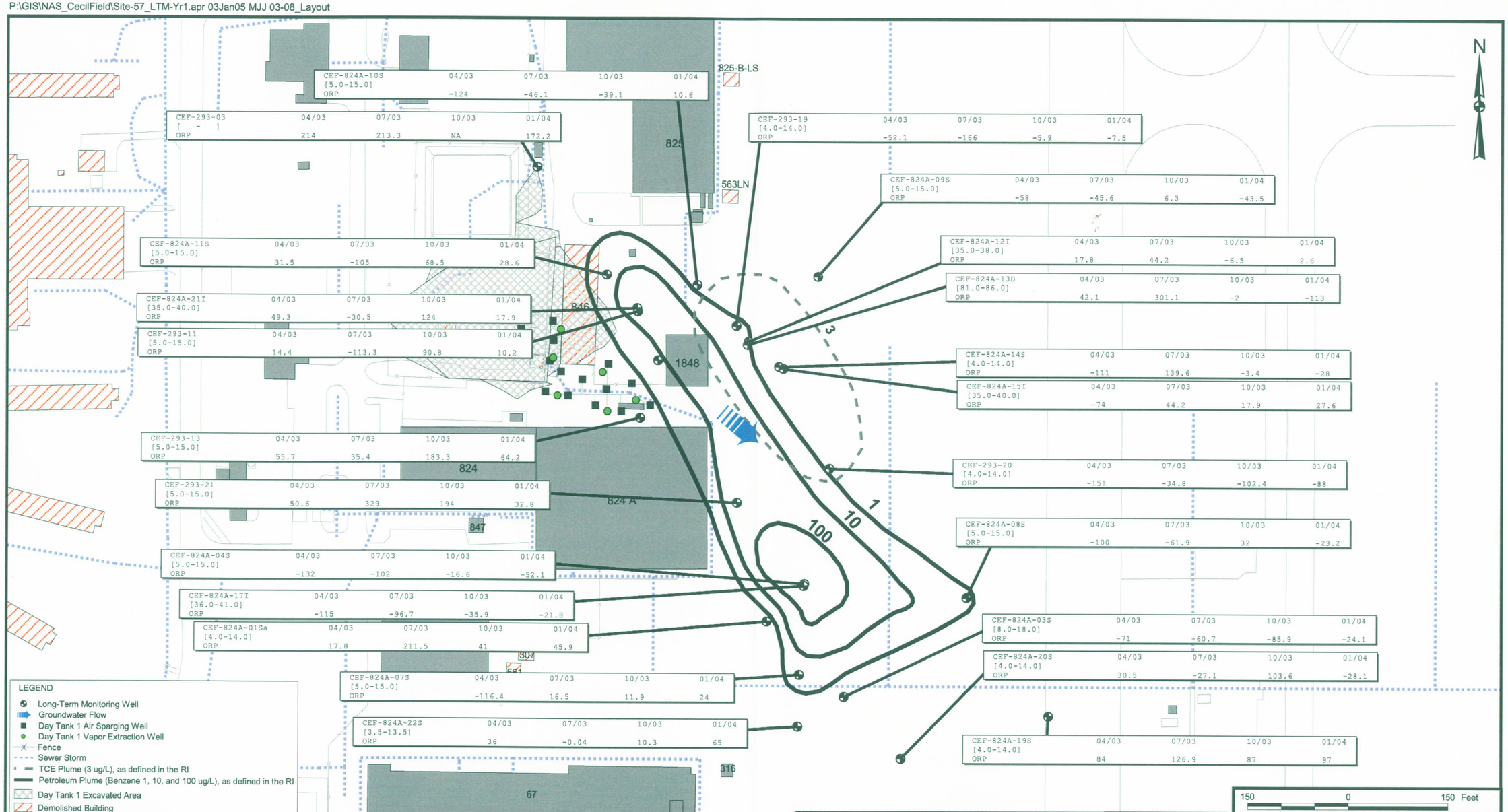
DRAWN BY MJJ	DATE 15Oct04
CHECKED BY RFD	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

NAVFAC

METHANE, ETHANE, AND ETHENE
IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

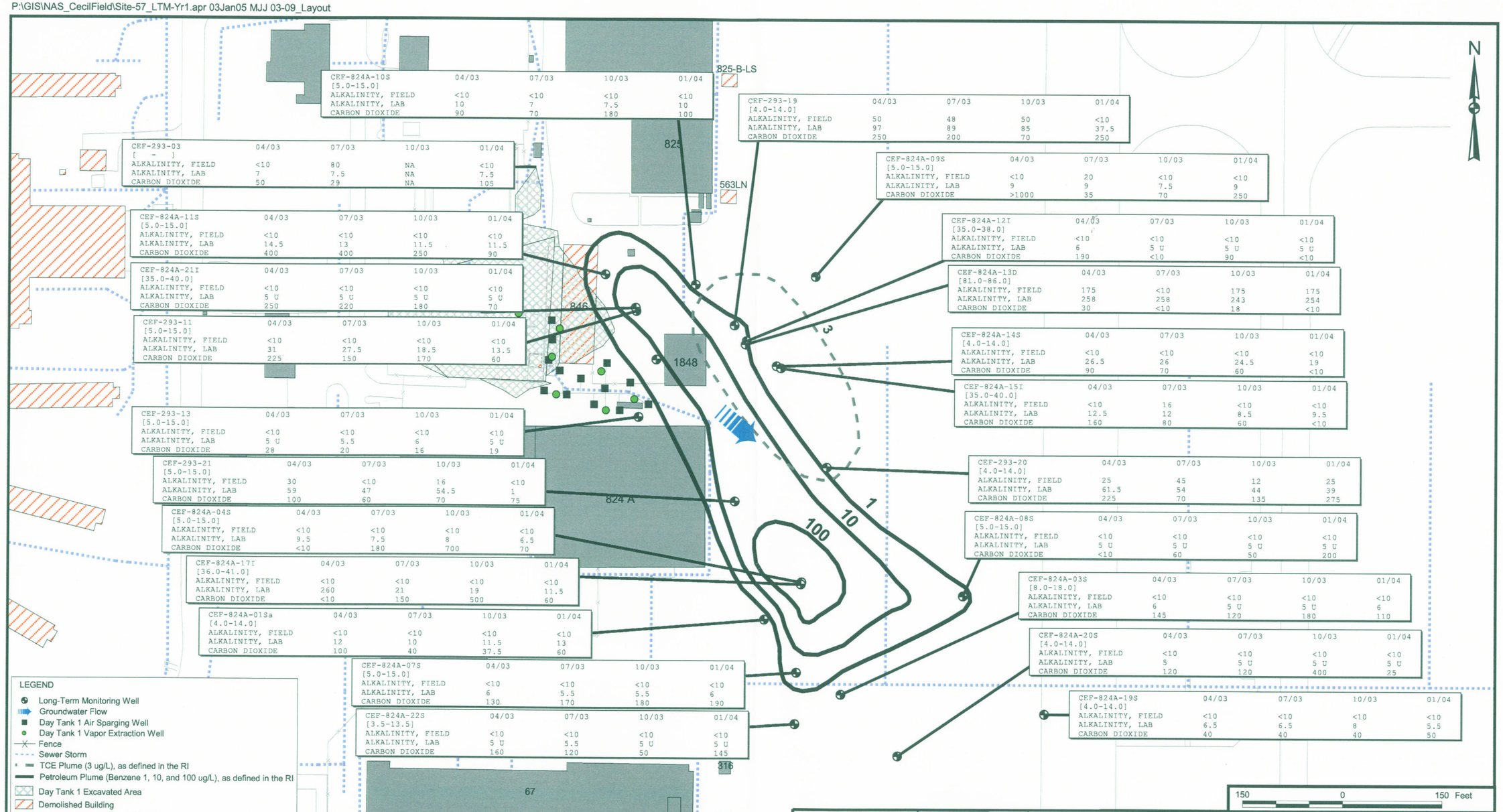
CONTRACT NO. 3965	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 3-7	REV. 0

P:\GIS\NAS_CecilField\Site-57_LTM-Yr1.apr 03Jan05 MJJ 03-08_Layout



DRAWN BY MJJ	DATE 15Oct04	OXIDATION-REDUCTION POTENTIAL IN GROUNDWATER OPERABLE UNIT 9, SITE 57 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 3965
CHECKED BY RFD	DATE		APPROVED BY / DATE
COST/SCHED-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3-8 / REV. 0

P:\GIS\NAS_CecilField\Site-57_LTM-Yr1.apr 03Jan05 MJJ 03-09_Layout



CEF-824A-10S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	10	7	7.5	10
CARBON DIOXIDE	90	70	180	100

CEF-293-19 [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	50	48	50	<10
ALKALINITY, LAB	97	89	85	37.5
CARBON DIOXIDE	250	200	70	250

CEF-293-03 [-]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	80	NA	<10
ALKALINITY, LAB	7	7.5	NA	7.5
CARBON DIOXIDE	50	29	NA	105

CEF-824A-09S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	20	<10	<10
ALKALINITY, LAB	9	9	7.5	9
CARBON DIOXIDE	>1000	35	70	250

CEF-824A-11S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	14.5	13	11.5	11.5
CARBON DIOXIDE	400	400	250	90

CEF-824A-12I [35.0-38.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	6	5 U	5 U	5 U
CARBON DIOXIDE	190	<10	90	<10

CEF-824A-21I [35.0-40.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	5 U	5 U	5 U	5 U
CARBON DIOXIDE	250	220	180	70

CEF-824A-13D [81.0-86.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	175	<10	175	175
ALKALINITY, LAB	258	258	243	254
CARBON DIOXIDE	30	<10	18	<10

CEF-293-11 [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	31	27.5	18.5	13.5
CARBON DIOXIDE	225	150	170	60

CEF-824A-14S [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	26.5	26	24.5	19
CARBON DIOXIDE	90	70	60	<10

CEF-824A-15I [35.0-40.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	16	<10	<10
ALKALINITY, LAB	12.5	12	8.5	9.5
CARBON DIOXIDE	160	80	60	<10

CEF-293-13 [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	5 U	5.5	6	5 U
CARBON DIOXIDE	28	20	16	19

CEF-293-20 [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	25	45	12	25
ALKALINITY, LAB	61.5	54	44	39
CARBON DIOXIDE	225	70	135	275

CEF-293-21 [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	30	<10	16	<10
ALKALINITY, LAB	59	47	54.5	1
CARBON DIOXIDE	100	60	70	75

CEF-824A-08S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	5 U	5 U	5 U	5 U
CARBON DIOXIDE	<10	60	50	200

CEF-824A-04S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	9.5	7.5	8	6.5
CARBON DIOXIDE	<10	180	700	70

CEF-824A-17I [36.0-41.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	260	21	19	11.5
CARBON DIOXIDE	<10	150	500	60

CEF-824A-03S [8.0-18.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	6	5 U	5 U	6
CARBON DIOXIDE	145	120	180	110

CEF-824A-01Sa [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	12	10	11.5	13
CARBON DIOXIDE	100	40	37.5	60

CEF-824A-20S [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	5	5 U	5 U	5 U
CARBON DIOXIDE	120	120	400	25

CEF-824A-07S [5.0-15.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	6	5.5	5.5	6
CARBON DIOXIDE	130	170	180	190

CEF-824A-19S [4.0-14.0]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	6.5	6.5	8	5.5
CARBON DIOXIDE	40	40	40	50

CEF-824A-22S [3.5-13.5]	04/03	07/03	10/03	01/04
ALKALINITY, FIELD	<10	<10	<10	<10
ALKALINITY, LAB	5 U	5.5	5 U	5 U
CARBON DIOXIDE	160	120	50	145

LEGEND

- Long-Term Monitoring Well
- Groundwater Flow
- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Fence
- Sewer Storm
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI
- Day Tank 1 Excavated Area
- Demolished Building

CEF-824A-21I [35-40] Volatiles (ug/L) BENZENE 1.5* [1]

- Sample ID
- Well Screen Interval, feet below ground surface
- Groundwater Cleanup Target Level (GCTL)
- Detected Concentration
- * indicates GCTL exceedance
- Parameter

* Concentration exceeds GCTL.
J Estimated concentration
U Not detected at or above associated detection limit
NA Not analyzed
ND None detected

NOTES: 1) All results are in mg/L.
2) Duplicate sample results noted as sample/duplicate.
3) RI was conducted in 09/01.

DRAWN BY	DATE
MJJ	15Oct04
CHECKED BY	DATE
RFD	
COST/SCHED-AREA	
SCALE	AS NOTED

NAVFAC

ALKALINITY AND CARBON DIOXIDE
IN GROUNDWATER
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 3965
APPROVED BY DATE
APPROVED BY DATE
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REV. 0

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The ROD identified the following Remedial Action Objectives (RAOs) for OU 9, Site 57:

- Prevent unacceptable risk from exposure to Site 57 groundwater with concentrations of chlorinated VOCs, BTEX, PAHs, and TRPH greater than the cleanup goals that are the federal Maximum Contaminant Levels and FDEP GCTLs.

- Restore groundwater contaminated concentrations at Site 57 to less than cleanup goals that are the federal Maximum Contaminant Levels and FDEP GCTLs.

The selected remedy, as detailed in the ROD, includes the following:

- Implementation of institutional controls (LUCs).
- Natural attenuation evaluation.
- Long-term monitoring to evaluate the progress of remediation.

The long-term monitoring program at OU 9, Site 57 is being conducted in accordance with the approved design (TtNUS, 2003). The long-term monitoring and natural attenuation evaluation began in April 2003.

Based on an evaluation of groundwater elevations, the groundwater pattern for the quarterly sampling events was similar to the RI. The current well network adequately monitors contaminant trends and potential plume migration at Site 57, and sentinel wells CEF-824A-19S and CEF-824A-20S are properly placed downgradient compliance wells within the monitoring network.

The concentrations of contaminants in the Petroleum Plume have increased in some portions of the plume and decreased in others. Similarly, the concentrations of contaminants in the TCE Plume have generally increased in some wells but decreased in other wells since the RI investigation. BTEX, cis-1,2-DCE, 1,1-DCE, 1,1-DCA, TCE, vinyl chloride, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and TRPH have been detected at concentrations greater than GCTLs.

The geochemical parameters indicate that natural attenuation processes (especially biological) are active at the site and should impact contaminant concentrations. DO concentrations are generally less than 1 mg/L, which indicate conditions favorable for anaerobic biological activity. The concentrations of ferrous iron, sulfides, methane, carbon dioxide, and alkalinity increase at the source and then gradually

decrease downgradient and the concentration of sulfate decrease at the source. Geochemical conditions generally indicate iron-reducing and sulfate-reducing conditions are present and methanogenesis is occurring within the plumes.

The geochemical environment is not optimal for the degradation of Petroleum Plume (most efficiently degraded under aerobic conditions); however, the anaerobic biodegradation will be more efficient for the destruction of chlorinated COCs as compared to Petroleum Plume. The ongoing geochemical conditions will promote biodegradation processes in both plumes.

This data obtained during the first year of groundwater monitoring will provide a good baseline for comparison to subsequent monitoring events.

4.2 RECOMMENDATIONS

Based on an evaluation of data collected during the first year of groundwater monitoring, TtNUS recommends continuing the long-term monitoring program on a semi-annual basis in accordance with the Groundwater Remedial Design Work Plan for Long-Term Monitoring (TtNUS, 2003). The groundwater samples should be analyzed for the same parameters as in Year 1.

REFERENCES

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

FDEP, 2002. FDEP Groundwater Sampling Standard Operating Procedure FS 2200.

TN & Associates, 2004. Draft Remedial Action Completion Report, Soil Removal, Day Tank 1, Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, November.

TtNUS (Tetra Tech NUS, Inc), 2002. Remedial Investigation Report for Operable Unit 9, Sites 57 and 58, Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, August.

TtNUS, 2003. Groundwater Remedial Design Work Plan for Long-Term Monitoring for Operable Unit 9, Sites 57 and 58, Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, April.

TtNUS, 2004. Draft Record of Decision, Operable Unit 9, Sites 57 and 58, Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, January.

United States Department of the Navy, 1998. Technical Guidelines for Evaluating Monitored Natural Attenuation of Petroleum Hydrocarbon and Chlorinated Solvents in Ground Water at Naval and Marine Corps Facilities, September.

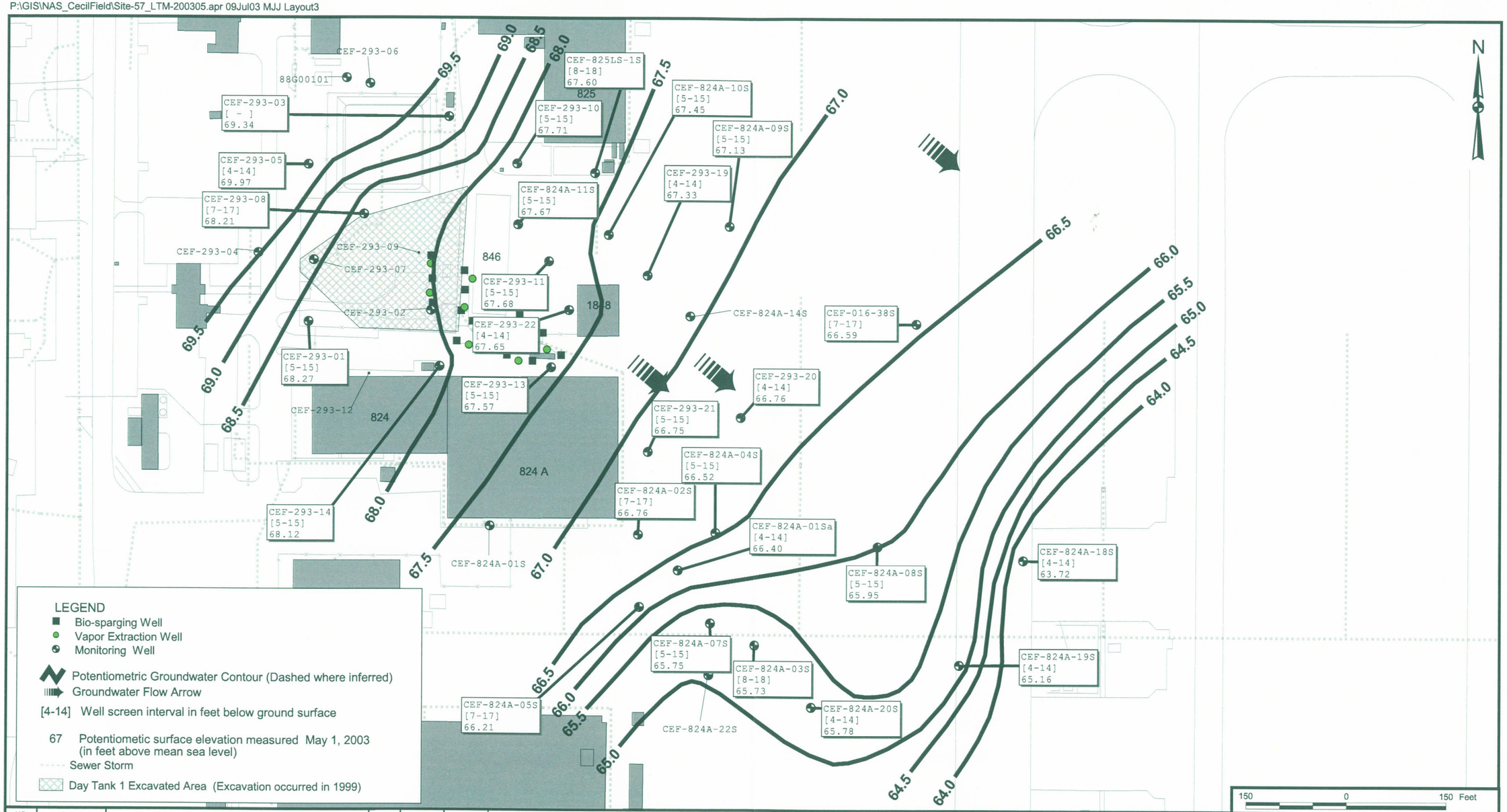
U.S. EPA (United States Environmental Protection Agency), 1996. Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), Athens, Georgia, May.

U.S. EPA, 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. OSWER Publication EPA/600/R-98/128, September.

APPENDIX A

QUARTERLY POTENTIOMETRIC SURFACE ELEVATION MAPS

P:\GIS\NAS_CecilField\Site-57_LTM-200305.apr 09Jul03 MJJ Layout3



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MJJ	DATE 21May03
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

POTENTIOMETRIC SURFACE
OU 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 4187	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE 2-1	REV. 0

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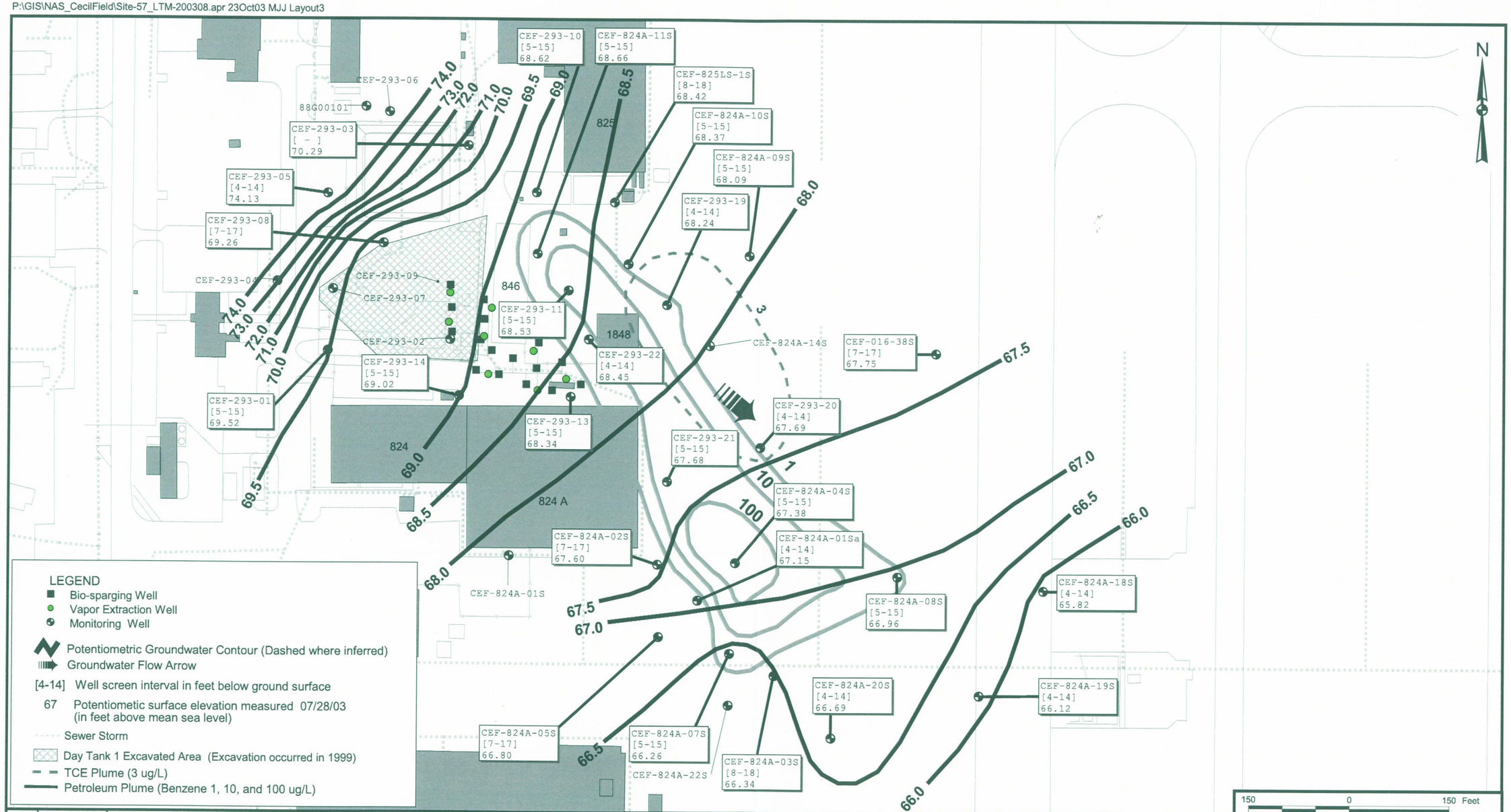

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MJJ DATE 21May03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

POTENTIOMETRIC SURFACE
OU 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 4187
APPROVED BY DATE
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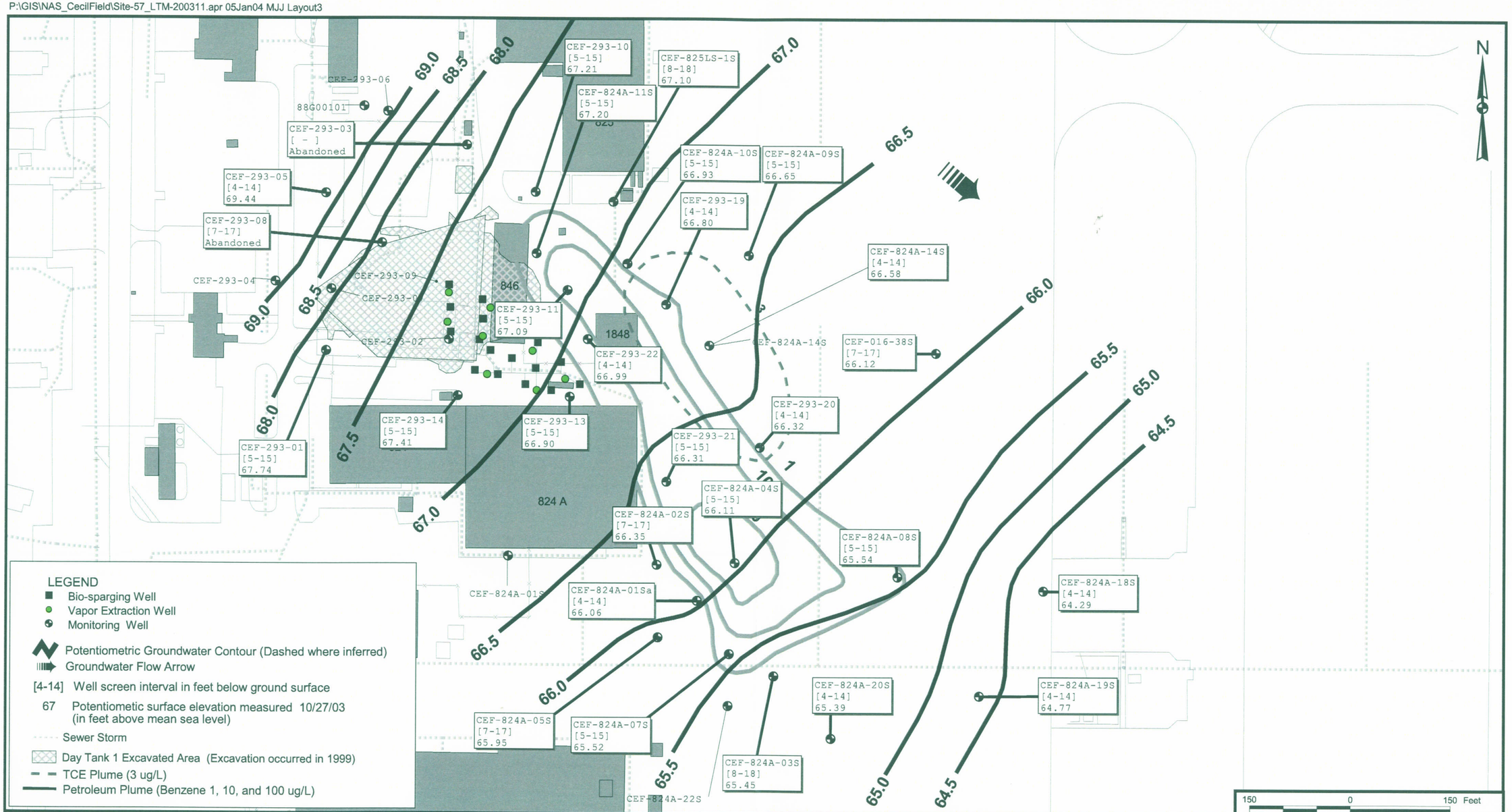
P:\GIS\NAS_CecilField\Site-57_LTM-200311.apr 05Jan04 MJJ Layout3



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MJJ	DATE 21May03
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

SHALLOW POTENTIOMETRIC SURFACE
OU 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 4187	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	REV. 0

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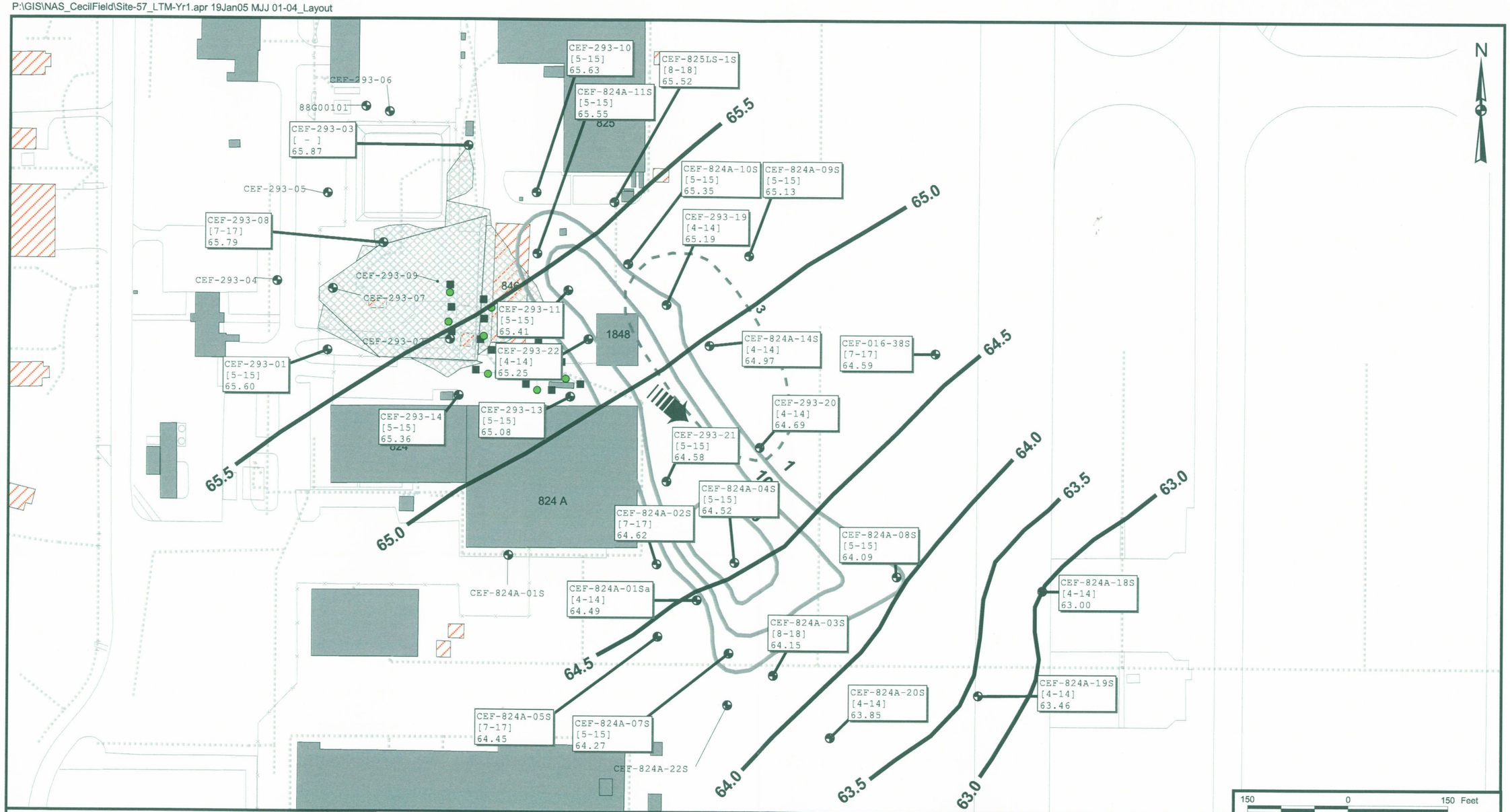

LEGEND

- Day Tank 1 Air Sparging Well
- Day Tank 1 Vapor Extraction Well
- Monitoring Well
- Potentiometric Elevation Contour (Dashed where inferred)
- Groundwater Flow
- [4-14] Well screen interval in feet below ground surface
- 67 Potentiometic surface elevation measured 01/20/04 (in feet above mean sea level)
- Sewer Storm
- Day Tank 1 Excavated Area (Excavation occurred in 1999)
- Demolished Building
- TCE Plume (3 ug/L), as defined in the RI
- Petroleum Plume (Benzene 1, 10, and 100 ug/L), as defined in the RI

DRAWN BY MJJ	DATE 15Oct04
CHECKED BY RFD	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

NAVFAC

SHALLOW POTENTIOMETRIC SURFACE MAP
OPERABLE UNIT 9, SITE 57
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 3965	
APPROVED BY	DATE
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DRAWING NO.	REV. 0

APPENDIX B

YEAR 1 ANALYTICAL LABORATORY RESULTS

Site 57

APRIL 2003

F17519– CTO 161
F17558– CTO 161
F17575– CTO 161

AUGUST 2003

F18778– CTO 161
F18798– CTO 161
F18818– CTO 161
F18838– CTO 161

OCTOBER 2003

F20326 – CTO 161
F20352 – CTO 161
F20381 – CTO 161

JANUARY 2004

F21771– CTO 161
F21802– CTO 161
F21818– CTO 161

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: AUGUST 5, 2003**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG / PAH / TPH**
CTO 161 – NAS CECIL FIELD
SDG F17519

SAMPLES: 8/Aqueous/VOA/OVG/PAH/TPH

CEF-824A-03S-11*	CEF-824A-04S-11	CEF-824A-07S-11
CEF-824A-08S-11	CEF-824A-17I-11	CEF-824A-19S-11*
CEF-824A-20S-11*	CEF-824A-22S-11*	

OVERVIEW

The sample set for CTO 161, SDG F17519, Naval Air Station (NAS) Cecil Field; Florida consists of eight (8) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (plus BTEX) and polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG) . In addition, samples designated with an (*) were analyzed for total petroleum hydrocarbons (TPH). No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech, NUS on April 24th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Method 8260B, 8310, RSK SOP-147-175, and Florida PRO analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

- * Data Completeness
- * Holding Times
- Initial/continuing calibrations
- * Laboratory method/field quality control blank results
- Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**AUGUST 6, 2003**
FROM:	**JACQUELINE J. RASPANTI**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F17519

SAMPLES: 8/Aqueous/

CEF-824A-03S-11	CEF-824A-04S-11	CEF-824A-07S-11
CEF-824A-08S-11	CEF-824A-17I-11	CEF-824A-19S-11
CEF-824A-20S-11	CEF-824A-22S-11	

Overview

The sample set for CTO 161, NAS CECIL FIELD, SDG F17519, consists of eight (8) aqueous environmental samples.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved sulfide, and dissolved iron. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of –F. The samples were collected by Tetra Tech NUS on April 24, 2003 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW 846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
• Laboratory Blank Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: AUGUST 27, 2003**

FROM: **SETH STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG / PAH / TPH**
CTO 161 – NAS CECIL FIELD
SDG F17558

SAMPLES: 8/Aqueous/VOA/OVG/PAH/TPH

CEF-293-20-11	CEF-293-21-11	CEF-293-DU-01-11
CEF-824A-01SA-11	CEF-824A-09S-11	CEF-824A-12I-11
CEF-824A-13D-11	CEF-824A-14S-11	

OVERVIEW

The sample set for CTO 161, SDG F17558, Naval Air Station (NAS) Cecil Field; Florida consists of eight (8) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds and polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG) . Sample CEF-824A-12I-11 was analyzed for total petroleum hydrocarbons (TPH). One field duplicate pair was included in this SDG: CEF-293-DU-01-11 / CEF-293-21-11.

The samples were collected by Tetra Tech, NUS on April 28th-29th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Method 8260B, 8310, RSK SOP-147-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
• Initial/continuing calibrations
* • Laboratory method/field quality control blank results
• Field Duplicate Precision
* • Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**JUNE 16, 2003**
FROM:	**ETHAN G. LEE**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – IRON AND MISCELLANEOUS PARAMETERS**
NAS CECIL FIELD – CTO 161
SAMPLE DELIVERY GROUP (SDG) – F17558

SAMPLES: 8/AQUEOUS/

CEF-293-20-11	CEF-293-21-11	CEF-293-DU-01-11
CEF-824A-01SA-11	CEF-824A-09S-11	CEF-824A-12I-11
CEF-824A-13D-11	CEF-824A-14S-11	

Overview

The sample set for NAS Cecil Field, CTO 161, SDG F17558, consists of eight (8) aqueous environmental samples. One (1) field duplicate pair (CEF-293-DU-01-11 / CEF-293-21-11) is included in this SDG.

All samples were analyzed for dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, and total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and sulfide were appended with the suffix "-F". The samples were collected by Tetra Tech NUS April 28-29, 2003 and analyzed by Accutest Laboratories Southeast, Inc. Iron analyses were conducted using SW846 method 6010B. Alkalinity analyses were conducted using EPA method 310.1. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. TOC analyses were conducted using EPA method 415.1. Dissolved iron analyses were conducted using EPA method 376.1.

Iron analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
• Laboratory Blank Analyses
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: AUGUST 5, 2003**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / OVG / PAH / TPH**
CTO 161 – NAS CECIL FIELD
SDG F17575

SAMPLES: 9/Aqueous/VOA/OVG/PAH/TPH

CEF-293-03-11	CEF-293-11-11*	CEF-293-13-11*
CEF-293-19-11*	CEF-293-DU-02-11*	CEF-824A-10S-11*
CEF-824A-11S-11*	CEF-824A-15I-11	CEF-824A-21I-11*

OVERVIEW

The sample set for CTO 161, SDG F17575, Naval Air Station (NAS) Cecil Field; Florida consists of nine (9) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (plus BTEX) and polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG) . In addition, samples designated with an (*) were analyzed for total petroleum hydrocarbons (TPH). One field duplicate pair was included in this SDG: CEF-293-DU-02-11 / CEF-293-11-11.

The samples were collected by Tetra Tech, NUS on April 29th-30th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Method 8260B, 8310, RSK SOP-147-175, and Florida PRO analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

- Data Completeness
- * Holding Times
- Initial/continuing calibrations
- * Laboratory method/field quality control blank results
- * Field Duplicate Precision
- Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**AUGUST 4, 2003**
FROM:	**JACQUELINE J. RASPANTI**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F17575

SAMPLES: 9/Aqueous/

CEF-293-03-11	CEF-293-11-11	CEF-293-13-11
CEF-293-19-11	CEF-293-DU-02-11	CEF-824A-10S-11
CEF-824A-11S-11	CEF-824A-15I-11	CEF-824A-21I-11

Overview

The sample set for CTO 161, NAS CECIL FIELD, SDG F17575, consists of nine (9) aqueous environmental samples. One (1) field duplicate pair (CEF-293-DU-02-11 / CEF-293-11-11) is included within this SDG.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved sulfide, and dissolved iron. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of –F. The samples were collected by Tetra Tech NUS on April 29 and 30, 2003 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW 846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
  • Laboratory Blank Analyses
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**AUGUST 21, 2003**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/OVG/PAH/TPH**
CTO 161, NAS CECIL FIELD
SDG F18778

SAMPLES: 4/Aqueous

CEF-824A-04S-12 CEF-824A-12I-12 CEF-824A-13D-12
CEF-824A-17I-12

OVERVIEW

The sample set for CTO 161 NAS Cecil Field, SDG F18778 consists of four (4) aqueous environmental samples. All samples were analyzed for volatile organic compounds (VOCs) and polynuclear aromatic hydrocarbons (PAHs). Sample CEF-824A-12I-12 was analyzed for total petroleum hydrocarbons.

The samples were collected by TetraTech NUS on July 28, 2003 and analyzed by Accutest Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8310, modified 8015 (Florida-PRO), and RSK 147/175 analysis and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

* • Data completeness
* • Holding times
* • Initial/continuing calibrations
* • Laboratory method blank results
* • Detection Limits

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

The text of this report is formatted to address only gross non-compliances resulting in the rejection of data and the elimination of false positives.

Volatiles

No qualification of the data was necessary.

OVG

No qualification of the data was necessary.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**AUGUST 21, 2003**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – IRON AND MISCELLANEOUS PARAMETERS**
NAS CECIL FIELD – CTO 161
SAMPLE DELIVERY GROUP (SDG) – F18778

SAMPLES: 4/AQUEOUS/

CEF-824A-04S-12F CEF-824A-12I-12F CEF-824A-13D-12F
CEF-824A-17I-12F

Overview

The sample set for NAS Cecil Field, CTO 161, SDG F18778, consists of four (4) aqueous environmental samples.

All samples were analyzed for dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, and total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and sulfide were appended with the suffix "-F". The samples were collected by Tetra Tech NUS July 7, 2003 and analyzed by Accutest Laboratories, Inc. Iron analyses were conducted using SW846 method 6010B. Alkalinity analyses were conducted using EPA method 310.1. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. TOC analyses were conducted using EPA method 415.1. Dissolved sulfide analyses were conducted using EPA method 376.1.

Iron analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
• Laboratory Blank Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE:** **OCTOBER 21, 2003**

FROM: **BERNARD F SPADA III** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC/OVG/PAH/TPH/MET/MISC**
CTO 161, NAS CECIL FIELD
SDG F18798

SAMPLES: 8/Aqueous

CEF-293-20-12	CEF-293-21-12	CEF-824A-03S-12*
CEF-824A-14S-12	CEF-824A-15I-12	CEF-824A-20S-12*
CEF-824A-22S-12*	CEF-824A-7S-12	

OVERVIEW

The sample set for CTO 161, NAS Cecil Field, SDG F18798 consists of eight (8) environmental aqueous samples. All samples were analyzed for volatile organic compounds (VOC), methane, ethane, and ethene organic volatile gases (OVG), polynuclear aromatic hydrocarbons (PAH), dissolved iron, and alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, dissolved sulfide, and total organic carbon (TOC) miscellaneous parameters. The samples denoted with an asterisk (*) were also analyzed for total petroleum hydrocarbons (TPH). The samples analyzed for dissolved iron and dissolved sulfide were designated with an "-F" suffix.

The samples were collected by TetraTech NUS on July 29, 2003 and analyzed by Accutest Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8310, and 6010B, EPA 300/SW-846 9056, RSK-147/175, Florida Pro, and EPA Methods 310.1, 365.3, and 415.1 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * Data completeness
- * Holding times
- * Initial and continuing calibration
- Laboratory method and field quality control blank results
- * Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

The following compound was detected in the method blank:

Compound	Maximum Concentration	Blank Action Level
Methylene chloride	1.8 µg/L	18 µg/L

Sample aliquot and dilution factors were taken into consideration when applying the blank action levels. No qualifications were made on this basis because all results for methylene chloride were non-detected.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**SEPTEMBER 21, 2003**
FROM:	**BERNARD F SPADA III**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC/OVG/PAH/TPH**
CTO 161, NAS CECIL FIELD
SDG F18818

SAMPLES: 4/Aqueous

CEF-824A-08S-12 CEF-824A-11S-12* CEF-824A-19S-12
CEF-824A-21I-12*

OVERVIEW

The sample set for CTO 161, NAS Cecil Field, SDG F18818 consists of four (4) environmental aqueous samples. All samples were analyzed for volatile organic compounds (VOC), methane, ethane, and ethene organic volatile gases (OVG), and polynuclear aromatic hydrocarbons (PAH). The samples denoted with an asterisk (*) were also analyzed for total petroleum hydrocarbons (TPH).

The samples were collected by TetraTech NUS on July 30, 2003 and analyzed by Accutest Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B and 8310, RSK-147/175, and Florida Pro analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Data completeness
- * Holding times
- * Initial and continuing calibration
- * Laboratory method and field quality control blank results
- * Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatiles

No qualifications were assigned to this fraction.

OVG

Sample T4945-MS exceeded the percent recovery quality control criteria for methane. No qualifications were made on this basis because the concentration of methane in the un-spiked sample was >10X the concentration spiked.

The results for methane in the EDD for samples CEF-824A-08S-12 and CEF-824A-11S-12 did not match the Form Is. The results from the Form Is were entered into the database and used for validation. No qualifications were made on this basis.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE:** **SEPTEMBER 24, 2003**

FROM: **JACQUELINE J. RASPANTI** **COPIES:** **DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F18818

SAMPLES: 4/Aqueous/

CEF-824A-08S-12 CEF-824A-11S-12 CEF-824A-19S-12
CEF-824A-21I-12

Overview

The sample set for CTO 161, NAS CECIL FIELD, SDG F18818, consists of four (4) aqueous environmental samples.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved sulfide, and dissolved iron. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of –F. The samples were collected by Tetra Tech NUS on July 30, 2003 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW 846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
* • Laboratory Blank Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**OCTOBER 21, 2003**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/OVG/PAH/TPH/IRON/MISCELLANOUS PARAMETERS**
CTO 161, NAS CECIL FIELD
SDG F18838

SAMPLES: 9/Aqueous

CEF-293-03-12	CEF-293-11-12*	CEF-293-13-12*
CEF-293-19-12*	CEF-293-DU01-12*	CEF-824A-01SA-12
CEF-824A-09S-12	CEF-824A-10S-12*	CEF-824A-DU02-12*

OVERVIEW

The sample set for CTO 161 NAS Cecil Field, SDG F18838 consists of nine (9) aqueous environmental samples. All samples were analyzed for volatile organic compounds (VOCs) and polynuclear aromatic hydrocarbons (PAHs), dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and sulfide were appended with the suffix "-F". Samples denoted with an asterisk (*) were analyzed for total petroleum hydrocarbons. Two (2) field duplicate pairs were included in this SDG: CEF-293-DU01-12 / CEF-293-19-12 and CEF-824A-DU02-12 / CEF-824A-10S-12.

The samples were collected by TetraTech NUS on July 28, 2003 and analyzed by Accutest Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8310, modified 8015 (Florida-PRO), and RSK 147/175 analysis and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- * Data completeness
- * Holding times
- * Initial/continuing calibrations
- Laboratory method blank results
- Field Duplicate Imprecision
- * Detection Limits

The symbol (*) indicates that quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

The text of this report is formatted to address only gross non-compliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: DECEMBER 24, 2003**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/PAH/OVG/TPH**
CTO ~~282~~ 161 – NAS CECIL FIELD
SDG: F20326

SAMPLES: 2/Aqueous/VOA/PAH/OVG/TPH

CEF-824A-12I-13* CEF-824A-13D-13

OVERVIEW

The sample set for CTO ~~282~~ 161, SDG: F20326, Naval Air Station (NAS) Cecil Field; Florida consists of two (2) aqueous environmental samples. All samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (methane, ethane, and ethane). In addition, sample CEF-824A-12I-13 was analyzed for total petroleum hydrocarbons. No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech, NUS on October 28th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW-846 Methods 8260B, 8310, RSK SOP–147/175, and Florida-Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data completeness
* • Holding times
• Initial/continuing calibrations
* • Laboratory method blank results
* • Detection limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**DECEMBER 29, 2003**
FROM:	**JACQUELINE J. RASPANTI**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F20326

SAMPLES: 2/Aqueous/

CEF-824A-12I-13 CEF-824A-13D-13

Overview

The sample set for CTO 161, NAS CECIL FIELD, SDG F20326, consists of two (2) aqueous environmental samples.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved sulfide, and dissolved iron. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of –F. The samples were collected by Tetra Tech NUS on October 28, 2003 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW 846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
* • Laboratory Blank Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: DECEMBER 24, 2003**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / PAH / OVG / TPH**
CTO 161 – NAS CECIL FIELD
SDG F20352

SAMPLES: 11/Aqueous/VOA/PAH/OVG/TPH

CEF-293-11-13*	CEF-293-20-13	CEF-293-21-13
CEF-293-DU02-13*	CEF-824A-01SA-13	CEF-824A-09S-13
CEF-824A-10S-13*	CEF-824A-11S-13*	CEF-824A-14S-13
CEF-824A-15I-13	CEF-824A-21I-13*	

OVERVIEW

The sample set for CTO 161, SDG F20352, Naval Air Station (NAS) Cecil Field; Florida consists of eleven (11) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG). In addition, the five samples designated with an asterisk (*) were analyzed for total petroleum hydrocarbons. One field duplicate pair was included in this SDG: CEF-293-DU02-13 / CEF-293-11-13.

The samples were collected by Tetra Tech, NUS on October 29th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B and 8310, RSK SOP-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
• Initial/continuing calibrations
* • Laboratory method blank results
• Field duplicate Precision
• Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**DECEMBER 19, 2003**
FROM:	**ETHAN G. LEE**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – IRON AND MISCELLANEOUS PARAMETERS**
NAS CECIL FIELD – CTO 161
SAMPLE DELIVERY GROUP (SDG) – F20352

SAMPLES: 11/AQUEOUS/

CEF-293-11-13	CEF-293-20-13	CEF-293-21-13
CEF-293-DU02-13	CEF-824A-01SA-13	CEF-824A-09S-13
CEF-824A-10S-13	CEF-824A-11S-13	CEF-824A-14S-13
CEF-824A-15I-13	CEF-824A-21I-13	

Overview

The sample set for NAS Cecil Field, CTO 161, SDG F20352, consists of eleven (11) aqueous environmental samples. One (1) field duplicate pair (CEF-293-DU02-13 / CEF-293-11-13) was included in this SDG.

All samples were analyzed for dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and dissolved sulfide were appended with the suffix "-F". The samples were collected by Tetra Tech NUS on October 29, 2003 and analyzed by Accutest Laboratories Southeast, Inc. Iron analyses were conducted using SW846 method 6010B. Alkalinity analyses were conducted using EPA method 310.1. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. TOC analyses were conducted using EPA method 415.1. Dissolved sulfide analyses were conducted using EPA method 376.1.

Iron analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
  • Laboratory Blank Analyses
* • Field Duplicate Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: DECEMBER 23, 2003**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / PAH / OVG / TPH**
CTO 161 – NAS CECIL FIELD
SDG F20381

SAMPLES: 11/Aqueous/VOA/PAH/OVG/TPH

CEF-293-13-13*	CEF-293-19-13*	CEF-824A-03S-13*
CEF-824A-04S-13	CEF-824A-07S-13	CEF-824A-08S-13
CEF-824A-17I-13	CEF-824A-19S-13	CEF-824A-20S-13*
CEF-824A-22S-13*	CEF-824A-DU03-13	

OVERVIEW

The sample set for CTO 161, SDG F20381, Naval Air Station (NAS) Cecil Field; Florida consists of eleven (11) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG). In addition, the five samples designated with an asterisk (*) were analyzed for total petroleum hydrocarbons. One field duplicate pair was included in this SDG: CEF-824A-DU03-13 and CEF-824A-07S-13.

The samples were collected by Tetra Tech, NUS on October 30th, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B and 8310, RSK SOP-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

- Data completeness
- * Holding times
- Initial/continuing calibrations
- * Laboratory method/field quality control blank results
- * Field duplicate precision
- Detection limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**DECEMBER 22, 2003**
FROM:	**JACQUELINE J. RASPANTI**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F20381

SAMPLES: 11/Aqueous/

CEF-293-13-13	CEF-293-19-13	CEF-824A-03S-13
CEF-824A-04S-13	CEF-824A-07S-13	CEF-824A-08S-13
CEF-824A-17I-13	CEF-824A-19S-13	CEF-824A-20S-13
CEF-824A-22S-13	CEF-824A-DU03-13	

Overview

The sample set for CTO 161, NAS CECIL FIELD, SDG F20381, consists of eleven (11) aqueous environmental samples. One (1) field duplicate pair (CEF-824A-DU03-13 / CEF-824A-07S-13) is included within this SDG.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved sulfide, and dissolved iron. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of –F. The samples were collected by Tetra Tech NUS on October 30 and 31, 2003 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW 846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
• Laboratory Blank Analyses
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: APRIL 16, 2004**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / PAH / OVG / TPH**
CTO 161 – NAS CECIL FIELD
SDG F21771

SAMPLES: 9/Aqueous/VOA/PAH/OVG/TPH

CEF-293-20-14	CEF-293-21-14	CEF-293-DU01-14
CEF-824A-01SA-14	CEF-824A-09S-14	CEF-824A-12I-14*
CEF-824A-13D-14	CEF-824A-14S-14	CEF-824A-15I-14

OVERVIEW

The sample set for CTO 161, SDG F21771, Naval Air Station (NAS) Cecil Field; Florida consists of nine (9) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG). In addition, the one sample designated with an asterisk (*) was analyzed for total petroleum hydrocarbons. One field duplicate pair was included in this SDG: CEF-293-DU01-14 / CEF-293-21-14.

The samples were collected by Tetra Tech, NUS on January 22nd, 2004 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B and 8310, RSK SOP-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
• Initial/continuing calibrations
* • Laboratory method blank results
• Field duplicate Precision
* • Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**FEBRUARY 27, 2004**
FROM:	**ETHAN G. LEE**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – IRON AND MISCELLANEOUS PARAMETERS**
NAS CECIL FIELD – CTO 161
SAMPLE DELIVERY GROUP (SDG) – F21771

SAMPLES: 9/AQUEOUS/

CEF-293-20-14	CEF-293-21-14	CEF-293-DU01-14
CEF-824A-01SA-14	CEF-824A-09S-14	CEF-824A-12I-14
CEF-824A-13D-14	CEF-824A-14S-14	CEF-824A-15I-14

Overview

The sample set for NAS Cecil Field, CTO 161, SDG F21771, consists of nine (9) aqueous environmental samples. One (1) field duplicate pair (CEF-293-DU01-14 / CEF-293-21-14) was included in this SDG.

All samples were analyzed for dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and dissolved sulfide were appended with the suffix "-F". The samples were collected by Tetra Tech NUS on January 22, 2004 and analyzed by Accutest Laboratories Southeast, Inc. Iron analyses were conducted using SW846 method 6010B. Alkalinity analyses were conducted using EPA method 310.1. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. TOC analyses were conducted using EPA method 415.1. Dissolved sulfide analyses were conducted using EPA method 376.1.

Iron analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
  • Laboratory Blank Analyses
* • Field Duplicate Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: APRIL 19, 2004**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / PAH / OVG / TPH**
CTO 161 – NAS CECIL FIELD
SDG F21802

SAMPLES: 9/Aqueous/VOA/PAH/OVG/TPH

CEF-293-11-14*	CEF-293-13-14*	CEF-293-19-14*
CEF-293-DU02-14*	CEF-824A-04S-14	CEF-824A-17I-14
CEF-824A-20S-14*	CEF-824A-21I-14*	CEF-824A-22S-14*

OVERVIEW

The sample set for CTO 161, SDG F21802, Naval Air Station (NAS) Cecil Field; Florida consists of nine (9) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG). In addition, the seven samples designated with an asterisk (*) were analyzed for total petroleum hydrocarbons. One field duplicate pair was included in this SDG: CEF-293-DU02-14 / CEF-293-19-14.

The samples were collected by Tetra Tech, NUS on January 23rd, 2004 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B and 8310, RSK SOP-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
• Initial/continuing calibrations
* • Laboratory method blank results
• Field duplicate Precision
• Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**FEBRUARY 26, 2004**
FROM:	**ETHAN G. LEE**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – IRON AND MISCELLANEOUS PARAMETERS**
NAS CECIL FIELD – CTO 161
SAMPLE DELIVERY GROUP (SDG) – F21802

SAMPLES: 9/AQUEOUS/

CEF-293-11-14	CEF-293-13-14	CEF-293-19-14
CEF-293-DU02-14	CEF-824A-04S-14	CEF-824A-17I-14
CEF-824A-20S-14	CEF-824A-21I-14	CEF-824A-22S-14

Overview

The sample set for NAS Cecil Field, CTO 161, SDG F21802, consists of nine (9) aqueous environmental samples. One (1) field duplicate pair (CEF-293-DU02-14 / CEF-293-19-14) was included in this SDG.

All samples were analyzed for dissolved iron, alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon (TOC), and dissolved sulfide. Samples analyzed for dissolved iron and dissolved sulfide were appended with the suffix "-F". The samples were collected by Tetra Tech NUS on January 23, 2004 and analyzed by Accutest Laboratories Southeast, Inc. Iron analyses were conducted using SW846 method 6010B. Alkalinity analyses were conducted using EPA method 310.1. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. TOC analyses were conducted using EPA method 415.1. Dissolved sulfide analyses were conducted using EPA method 376.1.

Iron analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Recoveries
  • Laboratory Blank Analyses
* • Field Duplicate Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **M. SPERANZA** **DATE: MARCH 2, 2004**

FROM: **SETH C. STAFFEN** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA / PAH / OVG / TPH**
CTO 161 – NAS CECIL FIELD
SDG F21818

SAMPLES: 7/Aqueous/VOA/PAH/OVG/TPH

CEF-293-03-14*	CEF-824A-03S-14	CEF-824A-07S-14
CEF-824A-08S-14	CEF-824A-10S-14*	CEF-824A-11S-14*
CEF-824A-19-14*		

OVERVIEW

The sample set for CTO 161, SDG F21818, Naval Air Station (NAS) Cecil Field; Florida consists of seven (7) aqueous environmental samples. The samples were analyzed for Target Compound List (TCL) volatile organic compounds, polynuclear aromatic hydrocarbons (PAH), and organic volatile gases (OVG). In addition, the four samples designated with an asterisk (*) were analyzed for total petroleum hydrocarbons. No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech, NUS on January 26th, 2004, 2003 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B and 8310, RSK SOP-175, and Florida Pro analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
• Initial/continuing calibrations
* • Laboratory method blank results
* • Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

The text of this report is formulated to address only gross noncompliances resulting in the rejection of data and the elimination of false positives.

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SPERANZA**	**DATE:**	**FEBRUARY 27, 2004**
FROM:	**JACQUELINE J. RASPANTI**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION –IRON AND MISCELLANEOUS PARAMETERS**
CTO- 161 NAS CECIL FIELD
SAMPLE DELIVERY GROUP (SDG) – F21818

SAMPLES: 7/Aqueous/

CEF-293-03-14	CEF-824A-03S-14	CEF-824A-07S-14
CEF-824A-08S-14	CEF-824A-10S-14	CEF-824A-11S-14
CEF-824A-19S-14		

The sample set for CTO 161, NAS CECIL FIELD, SDG F21818, consists of seven (7) aqueous environmental samples.

All samples were analyzed for alkalinity, chloride, nitrate, nitrite, orthophosphate, sulfate, total organic carbon, dissolved iron, and dissolved sulfide. Samples analyzed for dissolved iron and dissolved sulfide are appended with a suffix of F. The samples were collected by Tetra Tech NUS on January 26, 2004 and analyzed by Accutest Laboratories Southeast, Inc. under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses were conducted using SW846 method 6010B. Chloride, nitrate, nitrite, and sulfate analyses were conducted using EPA method 300. Orthophosphate analyses were conducted using EPA method 365.3. Total organic carbon analyses were conducted using EPA method 415.1. Analyses for alkalinity were conducted using EPA method 310.1. Sulfide analyses were conducted using EPA method 376.1.

Metals analyses were conducted using Inductively Coupled Plasma (ICP) methodologies.

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Results
  • Laboratory Blank Analyses
* • Detection Limits

* - All quality control criteria were met for this parameter.

<u>Laboratory Blank Analyses:</u>

The following contaminant was detected in the laboratory method/preparation blanks at the following maximum concentration:

Analyte	Maximum Concentration	Action Level
Iron	69.1 µg/L	345.5 µg/L