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THIRD QUARTER 2003 OPERATIONS AND MAINTENANCE STATUS REPORT FOR BIOVENTING AND BIOSPARGING SYSTEMS AT SOUTH FUEL FARM NAS CECIL FIELD FL

1/1/2004

CH2MHILL CONSTRUCTORS INC

Third Quarter 2003
Operations and Maintenance Status Report

Bioventing and Biosparging Systems
South Fuel Farm
Naval Air Station Cecil Field
Jacksonville, Florida

Contract No. N62467-98-D-0995
Contract Task Order No. 0086

Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

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Acronyms

ABB-ES	ABB Environmental Services, Inc.
acfm	actual cubic feet per minute
AST	aboveground storage tank
BCT	BRAC Cleanup Team
BEI	Bechtel Environmental, Inc.
bls	below land surface
BRAC	Base Realignment and Closure
°C	degrees Celsius
CCI	CH2M HILL Constructors, Inc.
CLEAN	Comprehensive Long-term Environmental Action Navy
CTO	Contract Task Order
DO	dissolved oxygen
EMT	earth-mounted tank
°F	degrees Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GCTLs	Groundwater Cleanup Target Levels
in Hg	inches of mercury
JP-5	jet propellant 5
µg/L	micrograms per liter
LNAPL	light non-aqueous phase liquid
mg/L	milligrams per liter
mS/cm	milliSeimens per centimeter
mV	millivolts
NAS	Naval Air Station
NAVD	North American Vertical Datum
NAVFAC EFD SOUTH	Naval Facilities Engineering Command, Southern Division
NM	not measured
NTU	nephelometric turbidity units
O&M	operation and maintenance
ORP	oxygen reduction potential
OVA	organic vapor analyzer
ppm	parts per million
psig	pounds per square inch gauge
PVC	polyvinyl chloride
RAP	Remedial Action Plan
scfm	standard cubic feet per minute
SCTLs	Soil Cleanup Target Levels
SFF	South Fuel Farm
UST	underground storage tank

1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) has been contracted by the Department of the Navy, Southern Division Naval Facilities Engineering Command (NAVFAC EFD SOUTH), to provide operation and maintenance (O&M) services at the South Fuel Farm (SFF), Former Naval Air Station (NAS) Cecil Field, Jacksonville, Florida, under Response Action Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0086.

Bioventing and biosparging systems were installed at SFF to reduce petroleum hydrocarbon contaminant concentrations in site groundwater and unsaturated soils. The purpose of this 3rd Quarter 2003 Operation and Maintenance Status Report is to provide a summary of activities performed at the site during the period of July 1, 2003, to September 30, 2003.

1.1 Objective

The objective of the remedial action at the SFF is to reduce the concentrations of petroleum contaminants in the groundwater and unsaturated soils to Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs) and Soil Cleanup Target Levels (SCTLs), respectively, as specified in Tables I and II of Chapter 62-777, Florida Administrative Code (FAC). Bioventing and biosparging systems have been installed and are currently operational at the site to achieve this objective.

1.2 Site History

The SFF is located at the northern edge of the east-west runway at Former NAS Cecil Field in Jacksonville, Florida. The SFF was used as a fuel storage facility for leaded and unleaded gasoline, aviation gasoline, diesel fuel, and jet propellant 5 (JP-5). When fully operational, the facility contained three aboveground storage tanks (ASTs), four underground storage tanks (USTs), and four earth-mounded tanks (EMTs) (Bechtel Environmental, Inc. [BEI], 1998a).

In 1983, the three ASTs were removed. In July 1994, the four USTs and three of the four EMTs were excavated. Excessively contaminated soil that was excavated during the tank removals was returned to the excavations. A contamination assessment was conducted by ABB Environmental Services, Inc. (ABB-ES) to determine the nature and extent of contamination as required by Chapter 62-770, FAC. A Remedial Action Plan (RAP) was submitted by ABB-ES in 1996 specifying the recommended remedial action as enhanced intrinsic remediation through bioventing and biosparging combined with an oxygen barrier wall. Subsequent to RAP submittal, the Base Realignment and Closure (BRAC) Cleanup Team (BCT) agreed to implement remedial action activities for only the northern portion of the SFF site (BEI, 1998a). The southern portion of the bioventing and biosparging systems and the oxygen barrier were subsequently deleted from the RAP by the BCT. Soil excavation was chosen as the remedial alternative for the southern portion of the SFF site. CCI

excavated 28,953 tons of petroleum-impacted soil from October 1998 to February 1999 (CCI, 2001).

BEI installed the approved bioventing and biosparging systems for the northern portion of the SFF site from December 1997 to March 1998. Startup of the bioventing and biosparging systems occurred on April 6, 1998 (BEI, 1998b). BEI performed O&M of the systems from April 1998 to April 1999. EnSafe, Inc. performed the O&M of the systems from April 1999 to May 2001. Since June 2001, CCI has conducted the system O&M.

1.3 Remediation System/Technology Description

1.3.1 Bioventing System

The bioventing system improves intrinsic bioremediation of the contaminated soil by delivering oxygen to the aerobic bacteria in the vadose zone. Oxygen delivery is achieved via subgrade wells at a low flow rate to minimize volatilization and stimulate subgrade indigenous microbial activity (ABB-ES, 1996).

The SFF bioventing system consists of 9 two-inch diameter polyvinyl chloride (PVC) vertical bioventing wells (BV-1 through BV-9), a blower, inlet air filter, flow meter, pressure and temperature gauges, valving, piping, and system controls. The aboveground portion of the bioventing system is located in a fenced, canopy covered equipment area. The bioventing wells are screened from approximately 3 to 8 feet below land surface (bls). The bioventing system is designed to deliver air to each well at a flow rate of 4 actual cubic feet per minute (acfm) at a well head pressure of 20 inches of water (ABB-ES, 1996). The locations of the bioventing wells and equipment area are shown on Figure 1-1.

1.3.2 Biosparging System

The biosparging system is used to treat the contaminated groundwater plume at the SFF site. This treatment system promotes the optimum environment for microbial activity and growth by injecting controlled volumes of air into the groundwater below the deepest point of contamination at controlled pressures via subgrade wells (ABB-ES, 1996).

The SFF biosparging system consists of 23 two-inch diameter PVC vertical biosparging wells (BS-1 through BS-23), a rotary screw air compressor, receiver tank, air dryer, in-line moisture separator, in-line coalescing oil filter, pressure regulator/gauge, header piping, valves, flow gauge, and system controls. The aboveground portion of the biosparging system is located in the same fenced canopy covered equipment area as the bioventing system. The biosparging wells are screened from approximately 27 to 30 feet bls. The biosparging system is designed for each well to operate at a flow rate of 1 acfm at an injection pressure of 15 pounds per square inch gauge (psig) (ABB-ES, 1996). The locations of the biosparging wells are shown on Figure 1-1.

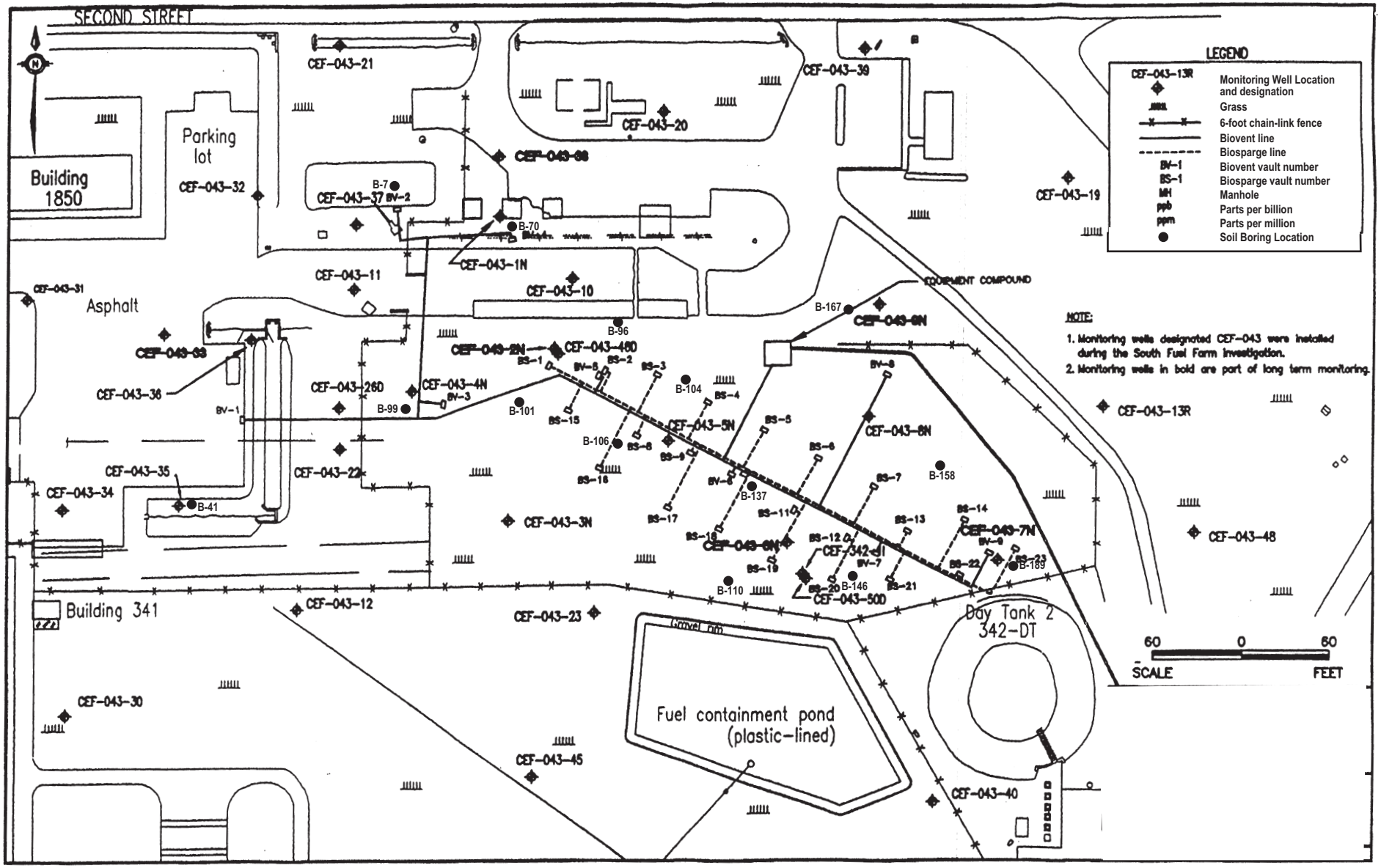

Figure 1-1
Site Plan
South Fuel Farm
NAS Cecil Field
Jacksonville, Florida

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2.0 System Performance Monitoring

Routine O&M checks of the system were performed weekly. During an O&M check, a preventative maintenance checklist (based upon manufacturer's recommendations) was completed, and any required maintenance activity was performed. The meters and gauges in the equipment area were read and recorded during the O&M check on a weekly basis. The meters and gauges in the bioventing and biosparging well vaults were read and recorded during the O&M check on a monthly basis.

During the O&M activities, the injection pressures and individual well air flow rates were adjusted and rebalanced in attempt to achieve the design specifications. These adjustments will be evaluated during the 4th quarter of 2003.

2.1 Operational Efficiencies

2.1.1 Bioventing System

	Operational Period	To Date
Hours of Possible Operation	2208	48096
Hours of Actual Operation	2206	31933.4
Percent Hours of Operation	99.9%	66.4%

2.1.2 Biosparging System

	Operational Period	To Date
Hours of Possible Operation	2208	48096
Hours of Actual Operation	915.4	45043
Percent Hours of Operation	41.5%	93.6%

2.2 Summary of Maintenance and System Downtime

2.2.1 Bioventing System

During the 3rd quarter 2003, the bioventing system ran a total of 91.9 days out of a possible 92 days, resulting in 2 hours of downtime. The bioventing system downtime is detailed as follows:

- Manually shut down system for a total of 1 hour for electrical safety while removing and installing biosparge air compressor air end and cooler.
- Manually shut down for a total of 1 hour to perform routine equipment maintenance.

2.2.2 Biosparging System

During the 3rd quarter 2003, the biosparging system ran a total of 38.1 days out of a possible 92 days, resulting in 1292.6 hours of downtime. The biosparging system downtime is detailed as follows:

- Shut down for a total of 1288.6 hours due to high temperature alarm caused by bearing failure in the air end, and installation of a new air end and cooler.
- Manually shut down for a total of 4 hour to perform routine equipment maintenance.

2.3 Pressure/Flow Rate Monitoring

2.3.1 Bioventing System

During the 3rd quarter 2003, the blower discharge pressure averaged 30.8 inches of water compared to the design blower discharge pressure of 40 inches of water. The total air injection flow rate at the blower averaged 105 standard cubic feet per minute (scfm) compared to the design blower flow rate of 80 scfm. Bioventing system data for 3rd quarter 2003 are summarized in Table 2-1.

TABLE 2-1
Bioventing System Data

Date	Blower Discharge Pressure (inches of water)	Blower Discharge Temperature (ºF)	Blower Air Flow Rate (scfm)
07/07/2003	30	120	105
07/08/2003	30	126	105
07/14/2003	32	110	105
07/21/2003	30	110	105
07/31/2003	30	112	105
08/04/2003	34	110	105
08/14/2003	32	120	105
08/28/2003	32	120	105
09/03/2003	32	110	105
09/10/2003	30	116	105
09/19/2003	30	100	105
09/25/2003	28	107	110

ºF - degrees Fahrenheit
scfm - standard cubic feet per minute

2.3.2 Biosparging System

During the 3rd quarter 2003, the injection header discharge pressure averaged 15.4 psig compared to the design injection pressure of 15 psig. The 3rd quarter 2003 biosparging system data are tabulated in Table 2-2.

TABLE 2-2
Biosparging System Data

Date	Air Compressor Supply Pressure (psig)	Air Compressor Discharge Temperature (ºF)	Receiver Tank Supply Pressure (psig)	Header Discharge Pressure (psig)
07/07/2003	105	210	100	15
07/08/2003	105	205	95	15
07/14/2003	105	188	100	14
07/21/2003	105	180	100	15
07/31/2003	50	190	45	15.5
08/04/2003	NM	NM	NM	NM
08/14/2003	NM	NM	NM	NM
08/28/2002	103	210	100	15
09/03/2003	78	200	70	16.5
09/10/2003	80	205	75	16
09/19/2003	82	190	75	16.5
09/25/2003	72	208	65	15.5

psig - pounds per square inch gauge
ºF - degrees Fahrenheit
NM - Not Measured

2.4 Water Level Measurements

Depth to groundwater measurements were recorded on a monthly basis from 20 monitoring wells during the 3rd quarter 2003. The results from the 3rd quarter 2003 groundwater level measurement surveys are provided in Table 2-3. Light non-aqueous phase liquid (LNAPL) was not detected in monitoring wells during the 3rd quarter 2003.

The potentiometric surface of the groundwater at the site based on the September 25, 2003 water levels is depicted on Figure 2-1. In general, groundwater flow in the vicinity of the bioventing and biosparging systems is to the southwest.

TABLE 2-3
Water Level Measurements

Well Identification	Date	Top of Casing Elevation (feet NAVD)	Depth to Water (feet bls)	Water Level Elevation (feet NAVD)
CEF-043-1N	7/31/2003	78.15	5.70	72.45
	8/28/2003		5.20	72.95
	9/25/2003		6.74	71.41
CEF-043-2N	7/31/2003	78.00	5.90	72.10
	8/28/2003		5.27	72.73
	9/25/2003		6.82	71.18
CEF-043-3N	7/31/2003	78.26	7.12	71.14
	8/28/2003		6.76	71.50
	9/25/2003		7.83	70.43
CEF-043-4N	7/31/2003	78.07	6.11	71.96
	8/28/2003		5.70	72.37
	9/25/2003		7.07	71.00
CEF-043-5N	7/31/2003	78.46	6.73	71.73
	8/28/2003		3.31	75.15
	9/25/2003		7.31	71.15
CEF-043-6N	7/31/2003	77.79	5.96	72.50
	8/28/2003		5.40	73.06
	9/25/2003		6.91	71.55
CEF-043-7N	7/31/2003	77.61	4.28	73.33
	8/28/2003		4.09	73.52
	9/25/2003		5.83	71.78
CEF-043-8N	7/31/2003	78.41	5.58	72.83
	8/28/2003		4.95	73.46
	9/25/2003		6.46	71.95
CEF-043-9N	7/31/2003	77.50	4.08	73.42
	8/28/2003		3.34	74.16
	9/25/2003		5.00	72.50
CEF-043-10	7/31/2003	78.55	6.15	72.40
	8/28/2003		5.59	72.96
	9/25/2003		7.13	71.42
CEF-043-19	7/31/2003	78.47	4.66	73.81
	8/28/2003		4.17	74.30
	9/25/2003		5.55	72.92
CEF-043-20	7/31/2003	78.59	5.13	73.46
	8/28/2003		4.58	74.01
	9/25/2003		6.18	72.41
CEF-043-21	7/31/2003	76.71	3.97	72.74
	8/28/2003		3.67	73.04
	9/25/2003		5.05	71.66

TABLE 2-3 (CONTINUED)
Water Level Measurements

Well Identification	Date	Top of Casing Elevation (feet NAVD)	Depth to Water (feet bls)	Water Level Elevation (feet NAVD)
CEF-043-22	7/31/2003	77.24	5.08	72.16
	8/28/2003		4.55	72.69
	9/25/2003		6.37	70.87
CEF-043-32	7/31/2003	76.53	4.06	72.47
	8/28/2003		3.73	72.80
	9/25/2003		5.10	71.43
CEF-043-33	7/31/2003	76.97	4.72	72.25
	8/28/2003		4.44	72.53
	9/25/2003		5.75	71.22
CEF-043-34	7/31/2003	76.84	4.63	72.21
	8/28/2003		4.50	72.34
	9/25/2003		NM	NM
CEF-043-38	7/31/2003	77.62	5.05	72.57
	8/28/2003		4.51	73.11
	9/25/2003		6.09	71.53
CEF-043-48	7/31/2003	77.10	4.25	72.85
	8/28/2003		3.51	73.59
	9/25/2003		5.53	71.57
CEF-043-50D	7/31/2003	77.23	6.95	70.28
	8/28/2003		6.43	70.80
	9/25/2003		7.84	69.39

bls - below land surface
NAVD - National Geodetic Vertical Datum 1929 (NGVD 1929)
NM - not measured

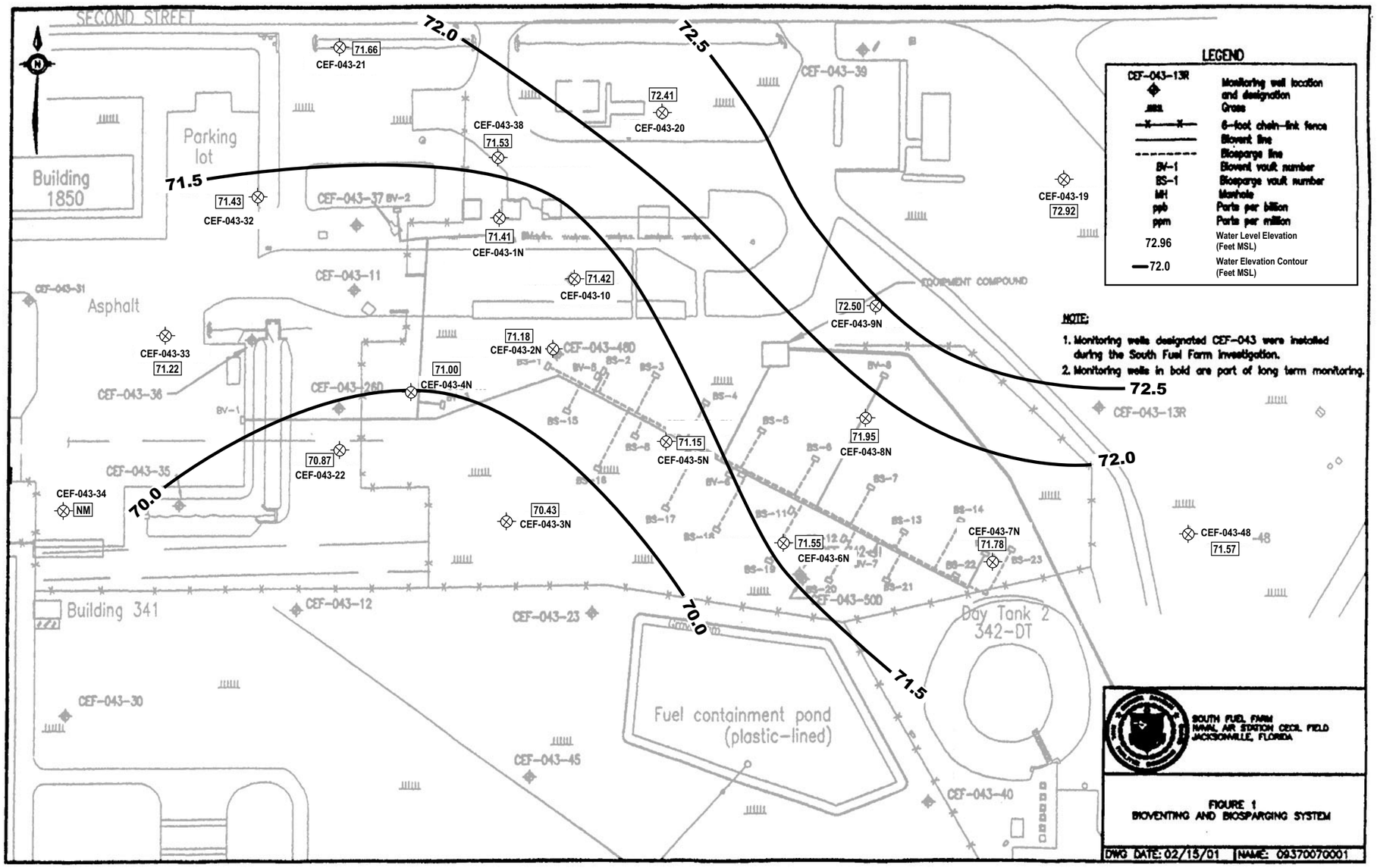

Figure 2-1
Potentiometric Surface Map - September 25, 2003
South Fuel Farm
NAS Cecil Field
Jacksonville, Florida

3.0 Summary of Sampling and Laboratory Analytical Results

3.1 Soil Monitoring

Soil screening and sampling is conducted on an annual basis. Annual soil screening and sampling was conducted in 4th quarter 2003.

3.2 Groundwater Monitoring

Groundwater sampling is conducted on an annual basis. The annual groundwater sampling event is scheduled to be performed in the 2nd quarter of 2004.

Field tests were performed on the headspace and groundwater from selected monitoring wells on a monthly basis during the 3rd quarter 2003 to evaluate indications of biological activity and influence of the bioventing and biosparging systems. The headspace in each monitoring well was tested for percent methane, percent carbon dioxide, percent oxygen, pressure, and total hydrocarbons (using an organic vapor analyzer [OVA]). The groundwater in each monitoring well was tested for pH, conductivity, turbidity, dissolved oxygen (DO), temperature, and oxygen reduction potential (ORP). The results of the field tests are summarized in Table 3-1.

Methane, carbon dioxide, and oxygen levels are measured as an indication of biological activity. Pressure is measured as an indication of the influence of the bioventing and biosparging systems. OVA readings are measured as an indication of the levels of petroleum hydrocarbons. As compared to upgradient wells (CEF-043-19, -20, -21, and –48), in general, elevated carbon dioxide levels and less than ambient oxygen levels were observed in a majority of the wells in the vicinity of the bioventing/biosparging systems. These data suggest that biological activity is occurring. Elevated hydrocarbon levels (OVA readings greater than 50 parts per million [ppm]) were noted in monitoring well CEF-043-2N, CEF-043-3N, CEF-043-4N, CEF-043-5N, CEF-043-6N, and CEF-043-7N.

The dissolved oxygen levels were greater than 1 milligram per liter (mg/L), which indicates favorable conditions for aerobic biological activity.

TABLE 3-1
Field Test Results

Well Identification	Sample Date	Air					Groundwater					
		Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Pressure (in Hg)	OVA (ppm)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	ORP (mV)
CEF-043-1N	07/31/2003	0	4.6	13.5	nm	0.27	6.47	0.496	2.5	4.48	25.7	46
	08/28/2003	0	2.8	17.8	29.1	3.91	6.71	0.599	37.7	6.19	27	105
	09/25/2003	0	4.6	15.2	29.6	8.2	6.33	0.414	0.3	4.77	27	-183
CEF-043-2N	07/31/2003	0	0	20	30	300	6.64	0.262	0.1	6.33	26	-16
	08/28/2003	0	0.4	20.4	29.3	131	6.57	0.283	0.6	0.633	27.1	73
	09/25/2003	0	5.1	15.9	29.6	6.4	6.15	0.23	0	5.44	26.3	-39
CEF-043-3N	07/31/2003	0	2.8	15.4	30	5.05	5.38	0.053	25.2	7.57	24.9	183
	08/28/2003	0	8.9	10.3	29.3	210	5.64	0.6	32.5	6.31	26	204
	09/25/2003	0	2.5	19.1	29.7	0	5.09	0.047	999	4.25	25.2	158
CEF-043-4N	07/31/2003	0	17	0	30	1031	5.99	0.692	0	4.6	25.8	-14
	08/28/2003	0.4	12.2	4	29.3	3800	6.04	0.741	0	6.67	26.8	-107
	09/25/2003	0	12.8	6	29.6	4.1	5.87	0.512	0	4.71	25.6	36
CEF-043-5N	07/31/2003	0	0.8	18.1	30	102	5.67	0.106	66	9.43	25.2	145
	08/28/2003	0.3	2.9	16	29.4	7300	5.63	0.06	787	6.92	26.6	210
	09/25/2003	0	0	20.7	29.7	282	5.32	0.055	26.6	9.66	25.1	290
CEF-043-6N	07/31/2003	0	6.3	3.3	30.1	14	5.6	0.379	12.7	4.4	25.7	152
	08/28/2003	0	11.5	4.3	29.4	90	5.79	0.404	2.6	5.52	26.9	107
	09/25/2003	0	1.2	19.2	29.7	4.62	5.41	0.252	6.4	7.22	26	281
CEF-043-7N	07/31/2003	0	1.3	14.8	30.1	351	5.97	0.221	80	4.44	24.7	143
	08/28/2003	0	0.9	17.5	29.6	31.7	5.92	0.282	0	5.93	27.1	168
	09/25/2003	0	1.5	20.1	29.8	1.71	5.47	0.106	5.9	6.61	25.6	334
CEF-043-8N	07/31/2003	0	0	20.1	30.1	0	5.73	0.09	118	7.56	25.9	131
	08/28/2003	0	0.7	19.6	29.4	25.8	6.02	0.092	89	6.45	27	170
	09/25/2003	0	2.5	16.6	29.7	0.64	5.37	0.078	5.8	6.88	25.8	236
CEF-043-9N	07/31/2003	0	0.7	19.6	30.1	2.12	5.84	0.145	73	7.11	26.6	104
	08/28/2003	0	0.9	19.7	29.6	13.4	6.16	0.214	8.5	6.5	27.4	159
	09/25/2003	0	0.9	20.1	29.7	0.27	5.61	0.173	21	4.12	25.9	7
CEF-043-10	07/31/2003	0	0.3	18.1	30	6.49	NR	NR	NR	NR	NR	NR
	08/28/2003	0	0.4	20.4	29.3	7.31	5.88	0.515	1.1	5.28	30.2	155
	09/25/2003	0	2.6	17.4	29.6	0.91	5.41	0.417	999	3.31	28.4	228
CEF-043-19	07/31/2003	0	0	20.1	30.1	2.78	5.02	0.033	648	5.61	24.5	194
	08/28/2003	0	3.3	17.1	29.5	9.22	5.72	0.086	172	6.27	26.9	188
	09/25/2003	0	0.6	20	29.7	0.41	4.12	0.03	142	3.25	25.6	335
CEF-043-20	07/31/2003	0	0	20.5	30	4.24	NR	NR	NR	NR	NR	NR
	08/28/2003	0	0.4	20.6	29.1	10.5	6.94	0.07	12	6.5	27.6	146
	09/25/2003	0	0.3	20.5	29.6	0	4.57	0.03	34.6	4.49	25.2	206
CEF-043-21	07/31/2003	0	0	20.1	30	2.25	6.37	0.137	1.7	7.33	25.8	33
	08/28/2003	0	0.7	20.6	29.1	7.39	6.41	0.143	9.4	5.35	27.1	152
	09/25/2003	0	0	20.7	29.6	0.56	5.65	0.109	0	2.74	26	176

TABLE 3-1
Field Test Results

Well Identification	Sample Date	Air				Groundwater						
		Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Pressure (in Hg)	OVA (ppm)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	ORP (mV)
CEF-043-22	07/31/2003	0	5.2	13.6	30	0	NR	NR	NR	NR	NR	NR
	08/28/2003	0	2.8	13	29.3	6.58	5.04	0.058	66.3	6.11	26.8	237
	09/25/2003	0	7.8	15	29.6	0	4.54	0.049	6	4.6	25.3	302
CEF-043-32	07/31/2003	0	0.2	19.7	30	2.75	6.42	0.542	1.6	5.72	28.7	55
	08/28/2003	0	0.2	20.6	29.1	4.15	6.58	0.641	0.5	4.95	30.5	125
	09/25/2003	0	0.4	20.5	29.6	0.36	6.45	0.455	999	3.94	28	81
CEF-043-33	07/31/2003	0	0	20.1	30	2.45	6.25	0.352	2.8	6.05	29.2	84
	08/28/2003	0	0.4	20.9	29	4.05	6.34	0.439	0	4.5	30.7	153
	09/25/2003	0	0.9	19.9	29.6	0.61	6.04	0.258	0	4.08	28.2	128
CEF-043-34	07/31/2003	0	0	20.5	30	2.92	6.36	0.078	3	4.12	27.5	79
	08/28/2003	0	0.2	21	29	4.7	6.83	0.052	6	5.61	29.1	-4
	09/25/2003	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
CEF-043-38	07/31/2003	0	2.2	15.6	30	3.66	6.32	0.263	0	6.19	26.6	41
	08/28/2003	0	3.9	16.5	29.1	5.41	6.64	0.382	374	5.14	27.6	133
	09/25/2003	0	3.1	18.4	29.6	0	5.85	0.215	999	5.7	26.5	156
CEF-043-38	07/31/2003	0	0	20.4	30.1	9.46	6.06	0.119	11	7.84	25.5	130
	08/28/2003	0	0.5	20	29.6	4.94	6.2	0.183	4.7	6.3	27.2	173
	09/25/2003	0	0.3	20.5	29.8	0.13	5.22	0.049	4.9	3.38	25.4	321
CEF-043-50D	07/31/2003	0	0	20.3	30.1	4.56	5.58	0.139	0	7.23	25.2	144
	08/28/2003	0	0.7	19.3	29.4	8.41	6.01	0.148	0	6.95	26.3	189
	09/25/2003	0	0	20.6	29.7	0.71	5.49	0.124	0	5.55	25.9	273

Note: All measurements taken using direct reading instruments in the field.
% -percent
in Hg -inches of mercury
OVA - organic vapor analyzer
ppm - parts per million
mS/cm - millisiemans per centimeter
NTU - nephelmetric turbidity units
mg/L - milligrams per liter
°C - degrees Celcius
ORP - oxygen reducing potential
mV - millivolts

4.0 Conclusions and Recommendations

The bioventing and biosparging systems operated with an efficiency of 99.9 percent and 41.5 percent, respectively. The significant downtime of the biosparging system was due to the necessary replacement of the air compressor air end and cooler. The biosparge system operational efficiency is expected to increase in the 4th quarter 2003. The bioventing system actual blower discharge pressure averaged 30.8 inches of water compared to the design blower discharge pressure of 40 inches of water and total air injection flow rate averaged 105 scfm compared to the design blower flow rate of 80 scfm. The biosparging system actual injection discharge pressure averaged 15.4 psig compared to the design injection pressure of 15 psig.

Based on field parameter testing results, biological activity is occurring at the site. The biosparging injection continues to provide sufficient oxygen as indicated by the dissolved oxygen readings being greater than 1 mg/L.

Based solely on the results of the field tests, CCI recommends continuing the operation of the bioventing and biosparging remediation systems. The Navy Comprehensive Long-term Environmental Action Navy (CLEAN) contractor is currently evaluating remedial alternatives to supplement and/or modify the existing bioventing and biosparging systems. Operation of the current bioventing and biosparging systems will continue until implementation of the remedial alternative.

5.0 References

ABB Environmental Services, Inc. 1996. Remedial Action Plan; South Fuel Farm; Naval Air Station Cecil Field, Jacksonville, Florida. October.

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Bechtel Environmental, Inc. 1998b. Completion Report for the South Fuel Farm Bioventing and Biosparging Systems; Naval Air Station Cecil Field, Jacksonville, Florida. September.

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