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Parsons Engineering Science, Inc. • A Unit of Parsons Infrastructure & Technology Group Inc.
401 Harrison Oaks Boulevard, Suite 210 • Cary, North Carolina 27513 • (919) 677-0080 • Fax: (919) 677-0118

October 28, 1997

Major Ed Marchand
AFCEE/ERT
3207 North Road, Bldg. 532
Brooks AFB, Texas 78235-5363

Subject: Operation and Maintenance Manual, Record Drawings, and Summary of Initial Results for the Expanded Bioventing System Installed at Site SS-41 (Former Fuel Pumping Station No. 3), Charleston AFB, SC (Contract F41624-92-8036, Delivery Order 17)

Dear Major Marchand:

This letter transmits three copies of the Operation and Maintenance (O&M) Manual prepared for the expanded bioventing system recently installed at Site SS-41 (Former Fuel Pumping Station No. 3, Building 93), Charleston Air Force Base (AFB), South Carolina. Appendix A of the O&M Manual contains record drawings for the installed system.

This letter report also provides a summary of the work performed by Parsons Engineering Science, Inc. (Parsons ES) at the site from February through June 1997. Included in this report are the initial bioventing system operating parameters and sampling results. Copies of this letter and the O&M Manual also have been sent to Mr. Al Urrutia, the point of contact at Charleston AFB.

Summary of Field Activities

In November 1993, Parsons ES (formerly Engineering-Science Inc. [ES]) installed a bioventing pilot test system at Site SS-41 to remediate soils impacted by jet fuel releases from an underground storage tank (UST) system at the former Building 93 fuel pumping station. The pilot-scale system was composed of two 4-inch diameter vertical vent wells (VWs) and four multi-depth soil vapor monitoring points (MPs) installed in an area containing fuel-impacted soils. The pilot-scale system was operated for one year, from July 1994 through August 1995.

Based on positive results from the 1-year bioventing pilot test, funding was provided by the Air Force Center for Environmental Excellence (AFCEE) to expand bioventing treatment of vadose zone soils at Site SS-41. An expanded bioventing system, consisting of ten new 2-inch diameter VWs, ten new MPs, two new blower systems, and associated piping, controls, and electrical service, was installed at the site. The four existing MPs installed during previous pilot testing efforts (MPA through MPD) will continue to be used to monitor system performance. One of the pilot test vent wells (VW-1) was retrofitted for soil gas monitoring, and the other pilot test vent well (VW-2) was incorporated into the full-scale system for air injection. The regenerative blower system that had been used for pilot-scale testing was removed from the site and was placed in storage at Charleston AFB.

System installation was performed by Parsons ES and subcontractors during three mobilizations. The first mobilization occurred between February 25-28, 1997 for installation of the VWs and MPs at the site. The second mobilization occurred from April 21-29, 1997, during which the blower systems, electrical systems, and most of the piping systems were installed. Inclement weather and poor site conditions delayed further work at the site until May 6, 1997 when the third mobilization was initiated. Utility trenches and well pads were completed and the piping system was pressure tested during the third mobilization. The system at Site SS-41 was installed as described in the document *Final Corrective Action Plan for Expanded Bioventing System, Site SS-41, Former Building 93 (Fuel Pumping Station No. 3), Charleston AFB, South Carolina* (Parsons ES, 1997). The only deviation from the work plan was the installation of one additional vent well (VW12), installation of one additional monitoring point (MPN), and relocation of one monitoring point (MPK) on the north end of the site. Also, several of the MPs were constructed with a single screen due to shallow water table conditions on the north end of the site.

Vent well VW12 was installed to provide additional soil ventilation capability around the former fuel filters, where a localized area of soil contamination and shallow water table conditions were identified. Figure 1 (attached) shows the site layout with the locations of the bioventing system components. Additional record drawings showing the final design details of the system components are provided in the enclosed O&M Manual.

Summary of Initial Sampling Results

Eight soil samples, eight soil gas samples, and five groundwater samples were collected by Parsons ES for laboratory analysis during expanded system installation and prior to system startup. The soil samples were analyzed by Intertek Testing Services (formerly Inchcape Testing Services) of Richardson, Texas. Analyses included the following: benzene, toluene, ethylbenzene, and xylenes (BTEX) by Method SW-8260a; total petroleum hydrocarbons (TPH) by Method SW-8015 modified for diesel-range organic (DRO) extractables and gasoline range organic (GRO) purgeables as jet fuel; polynuclear aromatic hydrocarbons (PAHs) by Method SW-8310; and metals by Method SW-6010 and SW-7060.

The soil gas samples were analyzed by Air Toxics, Ltd. of Folsom, California for BTEX and total volatile hydrocarbons (TVH) by Method TO-3. Prior to the collection of laboratory soil gas samples, soil gas samples from all existing and newly-installed MPs were analyzed in the field by Parsons ES for oxygen, carbon dioxide, and TVH using direct-reading instruments. The results of the field screening were used to select the samples submitted for laboratory analysis. Soil and soil gas sampling results are summarized in Tables 1 and 2 (attached), respectively, and sampling locations are shown on Figure 1.

Five groundwater samples were collected during a baseline sampling event prior to starting the expanded bioventing system. The South Carolina Department of Health and Environmental Control (SCDHEC) requested groundwater sampling prior to system startup as a condition of the CAP approval. Four existing monitoring wells (MW-10, MW-11, MW-12, MW-14) and one vent well (VW-12) were sampled. Vent well VW-12 was installed several feet into the water table and thus had a sufficient water column for collection of a groundwater sample from the well. The groundwater samples were submitted to Intertek Testing Services for analyses of

volatile organic compounds (VOCs) and for semi-volatile organic compounds (SVOCs) by Methods SW-8260 and SW-8270, respectively. Table 3 summarizes the groundwater analytical results.

Generally, vapor-phase hydrocarbon contamination is widespread throughout subsurface soils at the site. Soil gas laboratory analyses detected TVH concentrations up to 22,000 parts per million by volume (ppmv) and vapor-phase BTEX compounds also were detected. Residual soil hydrocarbons are more localized, with elevated hydrocarbon concentrations found near the middle of the site (MPG) and near the former fuel filters on the north end of the site (MPK). Near the middle of the site, soil contamination is generally found in deeper soils and is more pronounced as a hydrocarbon smear zone in the capillary fringe. The capillary fuel smear zone extends from a depth of approximately 5 feet below ground surface (bgs) to the water table surface, which occurs at depths of approximately 9 to 11 feet bgs near the center of the site. On the north end of the site, soil contamination is more shallow and generally extends from near ground surface (<1.5 feet bgs) to the water table surface (5 to 6 feet bgs).

Based on soil sampling results, the soil TPH concentrations are relatively low at the site. All detected TPH concentrations (combined DRO and GRO) were less than 650 milligrams per kilogram (mg/kg), as shown in Table 1. The highest concentrations of TPH were detected in shallow soil samples collected from MPK and MPM during the expanded system installation. BTEX and PAH compounds also were detected in site soils, with the highest concentrations also detected in MPM and MPK (see Table 1). Soil TPH concentrations detected during the previous pilot study initiated in 1993 ranged from 544 milligrams per kilogram (mg/kg) to 1,400 mg/kg (ES, 1994).

Soil laboratory analyses confirm previous soil gas survey results (Parsons ES, 1997) and indicate that soil hydrocarbon contamination has not migrated far from the source areas. Low oxygen and high TVH concentrations were measured in soil gas samples collected from the MPs throughout the site, indicating the presence of widespread vapor-phase contamination.

Laboratory analyses detected several VOCs in groundwater in two of the five wells sampled. Well MW-11 contained the VOCs toluene, ethylbenzene, xylenes, and 1,2,4-Trimethylbenzene (1,2,4-TMB) but no SVOCs were detected in this well. Well VW-12 contained VOCs (BTEX compounds, 1,2,4-TMB) and SVOCs (Carbazole, 2-Methylnaphthalene, Napththalene). Table 3 summarizes the results.

Initial Operation Parameters

The expanded bioventing system was started on May 8, 1997. The system pressures and air injection rate for each VW was adjusted several times during the next four weeks to allow the system to reach equilibrium and assure optimum air distribution to the contaminated soils. At the end of the initial optimization period (June 10, 1997), air was being injected into vent wells VW2 through VW6 at a combined total rate of approximately 56 cubic feet per minute (cfm) at a pressure of 29 inches of water. Air was being injected into wells VW7 through VW12 at a combined total flow rate of approximately 43 cfm at a pressure of 51 inches of water. Air injection flow rates at individual wells ranged from 1.8 cfm at VW9 to 22.1 cfm at VW5 on June 10, 1997. During this time, pressure responses measured at the MPs ranged from a maximum of

26.5 inches of water at MPK at a depth of 5.3 feet bgs, to a minimum of 0.01 inch of water at MPL at a depth of 4.8 feet bgs. A pressure response of 0.70 inch of water was measured at MPJ (5.0-feet deep), the MP that is the farthest from any VW (40 feet). By comparison, a pressure reading of 20.5 inches of water was measured at the 7.75-foot depth of point MPG (38.5 feet from the nearest VW). These unequal pressure distributions are most likely the result of anisotropic soil permeabilities (i.e. lithologic and soil moisture differences) and variations in the unsaturated zone thickness across the site.

Based on pressure response measurements, it appeared that most of the areas of contaminated soil designated for bioventing treatment were being influenced by the expanded system (Table 4). However, subsequent soil gas oxygen measurements indicated that shallow soils at MPJ were not receiving oxygen and that soils around MPM and the shallow zones of MPH had limited oxygen influence (Table 5). The lack of significant oxygen influence in these areas is most likely due to local site lithology and physiology (i.e. a shallow water table), although it also may indicate that oxygen was being utilized by soil microbes at a faster rate than oxygen was being supplied by air injection in these areas.

Oxygen, carbon dioxide, and TVH soil gas concentrations also were measured at the MPs before and after system optimization to confirm that the entire soil volume designated for remediation is being oxygenated (greater than 7 percent oxygen) by the expanded bioventing system. The area of oxygen influence designated for remediation is shown on Figure 1. This general area was designated for remediation based on soil gas survey results from June 1996 (Parsons ES, 1997). Soil gas oxygen concentrations measured in May and June 1997 during the expanded system operation exceeded 7 percent in all but two of the MPs located within the area designated for remediation. Table 5 summarizes the soil gas oxygen concentrations measured after 1 month of full-scale system operation.

Operation, Maintenance, and Monitoring

This site has been funded for 1 year of system monitoring services under Option 1 of the AFCEE-sponsored Extended Bioventing Project. Option 1 involves O&M support for 1 year and system monitoring at the end of the year. The O&M support period began following system start-up and will continue until June 1998. In mid-June 1998, Parsons ES will request Charleston AFB to shut down the blower units. The blower units will remain off for one month to allow subsurface conditions to equilibrate. In mid-July 1998, Parsons ES will return to the site to perform additional respiration testing and soil gas sampling. Parsons ES also will collect four groundwater samples from site monitoring wells (MW-10, MW-11, MW-12, MW-14) as requested by SCDHEC. The results of these monitoring activities will be used to develop recommendations for further action at this site. Results and recommendations will be provided to AFCEE and Charleston AFB in a brief letter report.

Potential Vapor Migration

Ambient air monitoring was conducted during startup of the expanded system. Monitoring results indicate that operation of the expanded bioventing system does not produce any detectable emissions from the ground surface above background levels.

Migration of fuel vapors through subsurface soils also was monitored during system startup. These results show that system operation will not result in offsite hydrocarbon vapor migration. As shown in Table 5, soil gas TVH concentrations at several perimeter MPs (MW-14, MW-10, MPI, MW-12) did not show an increase in soil gas TVH concentrations. Several other MPs (MPE, MPJ, MPM, MPN) showed slight to moderate increases in soil gas TVH concentrations as a result of air injection at the VWs. However, these vapor-phase hydrocarbons will be biodegraded as they move through the soils. Potential vapor migration through the soils does not pose any significant site risks since this is a remote site that does not have on-site workers or buried utilities and structures that could collect fuel vapors.

If you have any questions or comments regarding the information contained in this letter or in the enclosed O&M Manual, please contact me at (919) 677-0080 or John Ratz at (303) 831-8100.

Sincerely,

PARSONS ENGINEERING SCIENCE, INC.

Grant Watkins

S. Grant Watkins, P.G.
Site Manager

Attachments: References, Figure 1, Tables 1-5
Enclosure: O&M Manual

cc: Al Urrutia (Charleston AFB)
John Ratz (Project Manager, Parsons ES-Denver)
Don Malone (Parsons ES-Cary)
File 726876.28243

References

AFCEE, 1996. Memorandum for 437 SPTG/CEVR regarding Completion of One-Year Bioventing Test, Charleston AFB, Site SS-41, Former Fuel Pumping Station, Building 93. 3 April.

Engineering-Science, Inc. 1994. *Part I-Bioventing Pilot Test Work Plan and Part II-Draft Interim Bioventing Pilot Test Results Report for IRP Site SS-41, Former Flightline Fuel Pump House, Charleston AFB, South Carolina.* January.

Parsons Engineering Science, Inc. 1997. *Final-Corrective Action Plan for Expanded Bioventing System, Site SS-41, Former Building 93 (Fuel Pumping Station No. 3), Charleston AFB, South Carolina.* April.

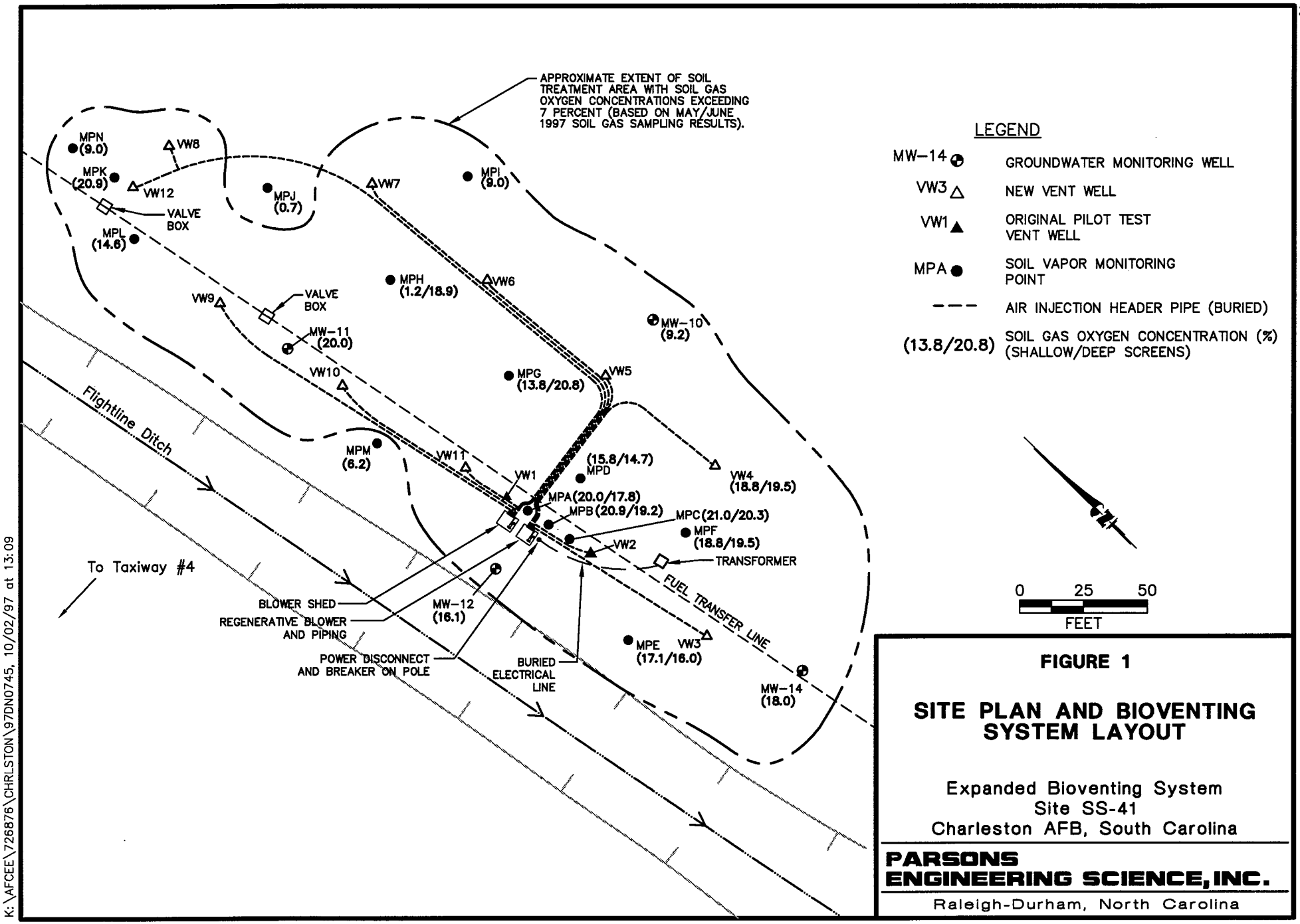

FIGURE 1

SITE PLAN AND BIOVENTING SYSTEM LAYOUT

Expanded Bioventing System
Site SS-41
Charleston AFB, South Carolina

PARSONS ENGINEERING SCIENCE, INC.
Raleigh-Durham, North Carolina

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TABLE 1
SOIL ANALYTICAL RESULTS[a/]
SITE SS-41 (FORMER FUEL PUMPING STATION NO. 3)
CHARLESTON AFB, SC

Analyte (Units)[b/]	Sample Location-(Depth) (feet below ground surface)							
Soil Hydrocarbons	**MPE-(8)**	**MPF-(8)**	**MPG-(7)**	**MPK-(5)**	**MPM-(4)**	**VW9-(7)**	**VW10-(7)**	**VW11-(7)**
TPH/VOCs								
TPH-GRO as Jet Fuel (mg/kg)	NA	0.33	0.64	137	308	NA	0.97	NA
TPH-DRO (mg/kg)	NA	15.4	61.7	305	339	NA	14	NA
Benzene (µg/kg)	<5.76[c/]	<59.9	<5.91	223	<623	<319	<56.2	<588
Toluene (µg/kg)	<5.76	<59.9	<5.91	57.4	<623	<319	<56.2	<588
Ethylbenzene (µg/kg)	<5.76	86.3	<5.91	358	736	<319	<56.2	<588
Xylenes (µg/kg)	<5.76	1,620	9.00	3,610	7,490	815	65.8	<588
PAHs								
Anthracene (µg/kg)	<50.9	<52.9	67.6	<50.7	<55.1	<56.4	<49.7	148
Benzo(a)anthracene (µg/kg)	<10.0	<10.4	161	<10.0	13.8	<11.1	22.6	<10.2
Benzo(b)fluoranthene (µg/kg)	<13.9	<14.5	294	<13.9	<15.1	<15.5	38.2	<14.2
Benzo(k)fluoranthene (µg/kg)	<13.1	<13.7	138	<13.1	<14.2	<14.6	14.1	<13.4
Benzo(g,h,i)perylene (µg/kg)	<58.6	<61.0	221	<58.4	<63.5	<65.0	<57.3	<59.9
Benzo(a)pyrene (µg/kg)	<17.7	<18.4	245	<17.7	<19.2	<19.7	28.7	<18.1
Chrysene (µg/kg)	<11.6	<12.1	258	<11.6	17.8	<12.9	13.6	<11.9
Dibenz(a,h)-anthracene (µg/kg)	<23.2	<24.1	44.6	<23.1	39.5	<25.7	<22.6	<23.6
Fluoranthene (µg/kg)	<16.2	<16.9	762	32.3	88.8	<18.0	61.5	161
Flourene (µg/kg)	<16.2	<16.9	<16.7	<16.2	50.4	<18.0	<15.9	38.2
Indeno(1,2,3-cd)pyrene (µg/kg)	<33.2	<34.5	204	<33.1	<35.9	<36.8	33.9	<33.9
Naphthalene (µg/kg)	<232	<241	<238	455	<251	<257	<226	<236
Phenanthrene (µg/kg)	<49.4	<51.4	217	<49.3	<53.5	<54.8	<48.3	332
Pyrene (µg/kg)	<20.9	<21.7	561	53.5	122	<23.1	32.8	121
Soil Metals								
Arsenic (mg/kg)	NA	1.66	2.97	1.18	NA	NA	NA	NA
Barium (mg/kg)	NA	25.4	19.5	20.4	NA	NA	NA	NA
Chromium (mg/kg)	NA	7.87	8.20	5.82	NA	NA	NA	NA
Lead (mg/kg)	NA	<12.0	12.2	<11.5	NA	NA	NA	NA

[a/] Soil samples collected February 26-27, 1997.

[b/] (mg/kg) = milligrams per kilogram. (µg/kg) = micrograms per kilogram (Results reported on a dry weight basis)

[c/] Compound analyzed for, but was below quantitation detection limit. Number shown represents the quantitation limit.

NA = Not analyzed; TPH = Total Petroleum Hydrocarbons; GRO = gasoline range organics; DRO = diesel range organics

Note: Laboratory analysis for VOCs by Method SW-8260; for TPH by Methods 3550/5030 and SW-8015 (mod.); for polynuclear aromatic hydrocarbons (PAHs) by Method SW-8310; for metals by EPA Methods 6010A and 7060. Only those analytes that were detected in one or more soil samples are listed in table.

TABLE 2
INITIAL SOIL GAS FIELD AND LABORATORY ANALYTICAL RESULTS[a/]
SITE SS-41 (FORMER FUEL PUMPING STATION NO. 3)
CHARLESTON AFB, SC

Sample Location	Screen Depth (feet)	Field Screening Data			Laboratory Analytical Data				
		Oxygen (%)	Carbon Dioxide (%)	TVH (ppmv) [b/]	TVH (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)
MPA	5	0.0	10.0	2,200	----[c/]	----	----	----	----
	8	0.0	9.8	2,800	----	----	----	----	----
MPB	5	0.8	9.5	1,560	----	----	----	----	----
	8	0.0	10.0	3,200	----	----	----	----	----
MPC	5	0.0	10.0	1,800	----	----	----	----	----
	8	0.0	10.1	1,400	----	----	----	----	----
MPD	5	0.0	10.3	3,000	----	----	----	----	----
	8	0.0	10.1	8,400	----	----	----	----	----
MPE	4.5	3.5	7.2	840	280	<0.062	3.2	0.34	0.11
	7.5	1.0	8.5	460	----	----	----	----	----
MPF	5	0.0	9.2	4,800	----	----	----	----	----
	7.8	0.0	10.2	>20,000	22,000	12	290	29	24 M[d/]
MPG	4.75	0.0	7.2	1,000	----	----	----	----	----
	7.75	0.5	9.5	2,200	560	<0.11	4.8	0.86	0.67
MPH	4.25	0.0	4.9	560	----	----	----	----	----
	6.75	0.0	4.5	>20,000	3,800	<0.54	39	7.0	8.6 M
MPI	5.5	1.0	11.8	1,900	20	0.13	<0.13	<0.13	<0.13
MPJ	5	0.0	10.2	3,200	1,800	<0.61	27	7.2 M	5.8 M
MPK	5.3	0.2	7.0	>20,000	19,000	93 M	14	34	100
MPL	4.8	0.8	5.5	380	----	----	----	----	----
MPM	3.2	2.5	6.5	4,400	4,500	20	5.3 M	5.0	28
MPN	5.5	4.5	4.2	400	----	----	----	----	----

a/ Soil gas field screening samples collected on 24 April 1997. Soil gas samples for laboratory analyses collected on 29 April 1997.

b/ TVH = total volatile hydrocarbon results reported in parts per million, volume per volume. Field screening results exclude methane.

c/ = not analyzed.

d/ M = reported value may be biased due to apparent matrix interferences.

TABLE 3
GROUNDWATER ANALYTICAL RESULTS[a/]
SITE SS-41 (FORMER FUEL PUMPING STATION NO. 3)
CHARLESTON AFB, SC

Analyte (Units)[b/]	Sample Location (Well Number)				
	MW-10	MW-11	MW-12	MW-14	VW-12
VOCs					
Benzene (µg/L)	<5.00 c/	<5.00	<5.00	<5.00	120
Toluene (µg/L)	<5.00	5.23	<5.00	<5.00	7.04
Ethylbenzene (µg/L)	<5.00	25.2	<5.00	<5.00	214
Xylenes (µg/L)	<10.0	175.6	<10.0	<10.0	760
1,2,4-Trimethylbenzene (µg/L)	<5.00	101	<5.00	<5.00	372
SVOCs/PAHs					
Carbazole (µg/L)	<16.2	<10.0	<10.0	<10.0	19.0
2-Methylnaphthalene (µg/L)	<33.2	<10.0	<10.0	<10.0	35.7
Naphthalene (µg/L)	<232	<10.0	<10.0	<10.0	96.9

a/ Groundwater samples collected April 22, 1997.
b/ (µg/L) = micrograms per liter
c/ Compound analyzed for, but was below quantitation detection limit. Number shown represents the quantitation limit.
VOCs = Volatile organic compounds; SVOCs = semi-volatile organic compounds; PAH = Polynuclear aromatic hydrocarbons
Note: Laboratory analysis for VOCs by Method SW-8260 and for SVOCs/PAHs by Method SW-8270. Only those analytes that were detected in one or more groundwater samples are listed in table.

TABLE 4
MAXIMUM PRESSURE RESPONSE AT SYSTEM VAPOR MONITORING POINTS

SITE SS-41 (FORMER FUEL PUMPING STATION NO. 3)
CHARLESTON AFB, SC

FINAL AIR INJECTION PRESSURES AND FLOW RATES [a/]

Blower #1 (VWs 2-6): 56 cfm (total) at a pressure of 29 in. H_2O

Blower #2 (VWs 7-12): 43 cfm (total) at a pressure of 51 in. H_2O

Monitoring Location	Distance From Nearest VW (feet)	Screen Depth (feet bgs) [b/]	Maximum Pressure Response[a/] (inches of water)
MPA	30	5.0	11.31
		8.0	12.96
MPB	20	5.0	13.06
		8.0	13.13
MPC	10	5.0	16.58
		8.0	17.51
MPD	30	5.0	11.30
		8.0	12.24
MPE	32	4.5	0.38
		7.5	0.38
MPF	32.5	5.0	5.75
		7.8	6.47
MPG	38.5	4.75	8.24
		7.75	20.5
MPH	38	4.25	0.07
		6.75	17.63
MPI	38	5.5	6.66
MPJ	40	5.0	0.70
MPK	8	5.3	26.5
MPL	21	4.8	0.01
MPM	28	3.2	9.33
MPN	28	5.5	1.59 [c/]

[a/] Measurements taken on 10 June 1997 unless otherwise indicated. Note, soil gas pressures intended to represent long-term operating conditions. Readings fluctuated during the first month of system startup.

[b/] bgs = below ground surface.

[c/] Measurement taken on 9 May 1997; represents maximum observed pressure at MPN.

TABLE 5
AIR INJECTION INFLUENCE ON SOIL OXYGEN CONCENTRATIONS AT SYSTEM MONITORING POINTS

SITE SS-41 (FORMER FUEL PUMPING STATION NO. 3)
CHARLESTON AFB, SC

Monitoring Point Location	Distance From Nearest VW (feet)	Screen Depth (feet bgs)[a/]	Initial Oxygen[b/] (%)	Final Oxygen[c/] (%)	Initial TVH[b/] (ppmv)	Final TVH[c/] (ppmv)
MPA	30.0	5.0	0.0	20.0	2,200	22
		8.0	0.0	17.8	2,800	220
MPB	20.0	5.0	0.8	20.9	1,560	28
		8.0	0.0	19.2	3,200	320
MPC	10.0	5.0	0.0	21.0	1,800	8
		8.0	0.0	20.3	1,400	52
MPD	30.0	5.0	0.0	15.8	3,000	37
		8.0	0.0	14.7	8,400	810
MPE	32.0	4.5	3.5	17.1	840	1,600
		7.5	1.0	16.0	460	2,300
MPF	32.5	5.0	0.0	18.8	4,800	120
		7.8	0.0	19.5	>20,000	6,000
MPG	38.5	4.75	0.0	13.8	1,000	53
		7.75	0.5	20.8	2,200	14
MPH	38.0	4.25	0.0	1.2	560	440
		6.75	0.0	18.9	>20,000	5,100
MPI	38.0	5.5	1.0	9.0[/d]	1,900	800
MPJ	40.0	5.0	0.0	0.7	3,200	10,600
MPK	8.0	5.3	0.2	20.9	>20,000	2,000
MPL	21.0	4.8	0.8	14.6	380	440
MPM	28.0	3.2	2.5	6.2	4,400	5,200
MPN	28.0	5.5	4.5	9.0	400	620
MW-10	28.5	6.3-9	0.5	9.2	440	172
MW-11	26.0	4.3-8	0.0	20.0	12,200	2,800
MW-12	38.5	4.3-12	7.8	16.1	1,600	790
MW-14	39.5	4.3-11	7.2	18.0	130	63

[a/] bgs = below ground surface.

[b/] Measurements taken on 24 April 1997 for MPs, and on 6 November 1996 for MWs, all prior to air injection.

[c/] Measurements taken on 10 June 1997 except as noted.

[d/] Measurement reported as maximum oxygen concentration observed after system startup, measured during 22 May 1997 soil gas sampling event. Subsequent measurements showed lower oxygen and higher TVH concentrations.

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