

**MONTHLY PROGRESS REPORT
SOIL VAPOR EXTRACTION/AQUIFER AIR SPARGING
REMEDIAL SYSTEM OPERATIONS**

SITE NAME: Navy Exchange Service Station (Building 538)

SITE LOCATION: Naval Air Station, Brunswick, Maine

REPORT PERIOD: 1-30 April 1997

ACTIVITIES SUMMARY

Operations Summary—The soil vapor extraction (SVE) system has been in operation since 15 November 1993. Vent trenches SVE-6 through SVE-8 were installed during the period 14-22 April 1997. SVE trenches SVE-1 and SVE-2 were deactivated to allow operation of three new SVE trenches (SVE-6, SVE-7, and SVE-8) on 22 April 1997. SVE trenches SVE-3 through SVE-8 were actively vented for the remainder of the reporting period. The aquifer air sparging (AAS) system was permanently activated on 18 July 1995. Sparge wells AAS-11 through AAS-13 were installed on 3 April 1997. Sparge wells AAS-6 and AAS-7 were deactivated from 14 to 29 April 1997, and sparge wells AAS-3 through AAS-5 were deactivated from 22 to 29 April 1997 due to construction activities. Sparge wells AAS-3 through AAS-7 were reactivated on 29 April 1997. Remedial construction activities are summarized under separate cover. Figure 1 provides the configuration of the remediation system.

Soil Vapor Extraction System Performance—The SVE trenches operated simultaneously for total system flows of approximately 364 cubic ft per minute (cfm) on 9 April 1997 and 340 cfm on 29 April 1997. Flow rates at individual trenches ranged from 60 cfm (SVE-1, 9 April 1997) to greater than 150 cfm (SVE-3 and SVE-5, 29 April 1997). Flow was obstructed at SVE-4 on 29 April 1997 due to entrained water within the collection line. Flow rates at SVE-3 and SVE-5 on 29 April 1997 are conservative approximations due to flow rate instrument response limitations (i.e., flowmeter calibration range was exceeded). Although individual flow rates were not verified at SVE-3 and SVE-5, an in-line flowmeter was installed to quantify composite flow. Based on the measurement obtained with the in-line composite flowmeter (340 cfm), the flow rates at SVE-3 and SVE-5 were estimated at greater than 150 cfm. Replacement flowmeters with extended calibration ranges and direct flow indication will be installed during SVE collection manifold modifications scheduled for the next reporting period. Field data collected during the site visits are provided in Attachment A.

Quantitative estimates of total volatile hydrocarbon removal rates at individual trenches were prepared based on monitoring data collected in the field using a Foxboro TVA-1000 photoionization/flame ionization detector on 9 and 29 April 1997 (Table 1). To quantify the daily total volatile hydrocarbon removal rate, the flow rate at each vent trench was assumed to be constant for the day.

Total volatile hydrocarbon removal rates from individual trenches ranged from 0.03 lb/day (SVE-3) on 9 April 1997 to 4.47 lb/day (SVE-5) on 29 April 1997. Due to flow obstruction associated with entrained water within the collection line of SVE-4, no hydrocarbon removal was recorded at this location on 29 April 1997. The composite TVH removal rates on 9 and 29 April 1997 were 0.83 lb/day and 1.19 lb/day, respectively. The composite TVH emission rates were 0.13 lb/day and 0.56 lb/day on 9 and 29 April 1997. No exceedances of the State of Maine Department of Environmental Protection air discharge limit of 10 lb/hour, or 100 lb/day, of petroleum hydrocarbons were observed.

Aquifer Air Sparging System Performance—Five sparge wells (AAS-3 through AAS-7) operated simultaneously for total air sparging rates of approximately 148 and 60 standard cubic ft per minute (scfm) on 9 and 29 April 1997, respectively. Sparge rates at individual sparge wells ranged from 5 scfm (AAS-6, 29 April 1997) to 38 scfm (AAS-4, 9 April 1997). Sparge flow at AAS-5 was obstructed on 29 April 1997. Temperature of the sparged air was 90°F on 9 and 29 April 1997. Field data collected during the site visits are provided in Attachment A. Table 2 summarizes the AAS system operational data for April 1997.

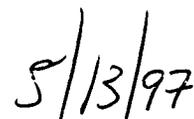
Well Gauging and Water Quality Indicator Parameter Measurements—Table 3 provides a summary of the well gauging data collected during April 1997. Gauging of monitoring wells and non-active air sparging wells confirmed the absence of measurable (≥ 0.01 ft) light, non-aqueous phase liquid in all site wells during the 9 and 29 April 1997 gauging events. Sparge wells AAS-3 through AAS-7 were not gauged during the 9 and 29 April 1997 gauging events, and sparge wells AAS-11 through AAS-13 were not gauged during the 29 April 1997 gauging event due to the presence of sparge well manifolds atop the well heads and/or active sparging at these locations.

Depth to ground water ranged from 2.18 ft (MW-NASB-008) to 7.19 ft (MW-NASB-023) during the 9 April 1997 gauging event. Depth to ground water ranged from 1.71 ft (MW-NASB-027 and MW-NASB-008) to 6.83 ft (MW-NASB-023) during the 29 April 1997 gauging event. Water table elevations increased an average of 0.34 ft at the monitoring and sparge wells gauged during the report period.

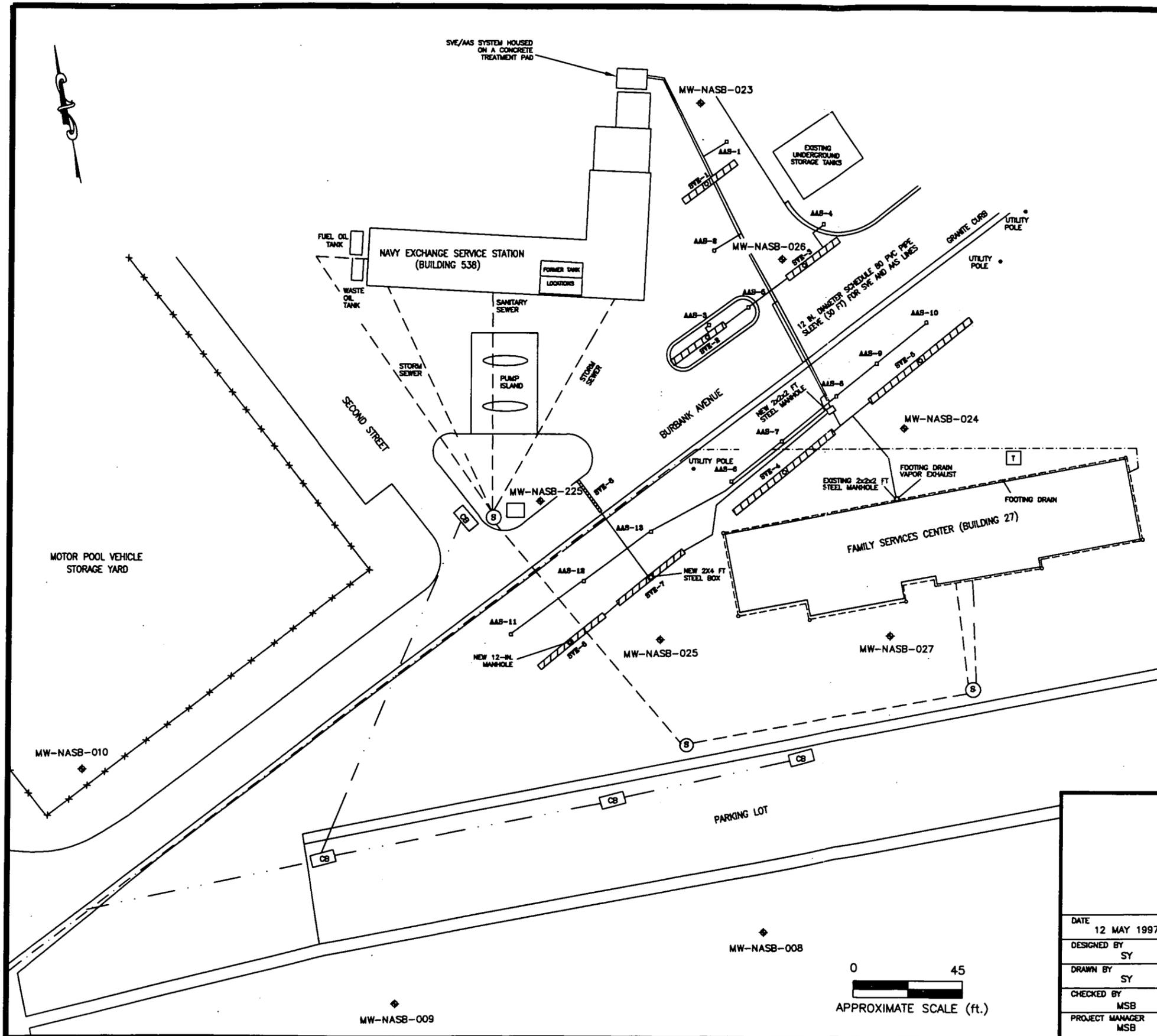
Table 4 provides a summary of water quality indicator parameters measured during April 1997. Water quality indicator parameters were not recorded at sparge well AAS-9 during the 9 and 29 April 1997 gauging events due to insufficient water. Water quality indicator parameters, including temperature, conductivity, pH, redox, and dissolved oxygen, were measured using a Hydrolab Model H2O[®]G water quality meter.



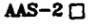
Michael S. Battle, P.G., Project Manager



Date



LEGEND

-  SOIL VAPOR EXTRACTION TRENCH
-  AAS-2 □ AQUIFER AIR SPARGING WELL
-  MW-3 ◆ MONITORING WELL
-  ○ ACCESS VAULT TO SVE TRENCH
-  (S) — UNDERGROUND SANITARY LINE
-  - - - UNDERGROUND ELECTRIC LINE
-  [T] ELECTRIC TRANSFORMER
-  -x-x- EXISTING CHAIN LINK FENCE
-  [CB] - - - UNDERGROUND STORM SEWER

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995 AND 5 MAY 1997.

DWG. FILE F:\CAD\29600\35\MODNEX.DWG

SITE PLAN SHOWING LAYOUT OF
REMEDATION SYSTEM AS-BUILT
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

FIGURE 1

DATE	12 MAY 1997
DESIGNED BY	SY
DRAWN BY	SY
CHECKED BY	MSB
PROJECT MANAGER	MSB



3 WASHINGTON CENTER
THE MAPLE BUILDING
NEWBURGH, NEW YORK 12550
(914) 565-8100

PROJECT NUMBER	29600.35
SCALE	1"=45'
FILE NAME	MODNEX
DRAWING NUMBER	-
SHEET NUMBER	1 OF 1

TABLE 1 SUMMARY OF SOIL VAPOR EXTRACTION/AQUIFER AIR SPARGING
PERFORMANCE DATA RECORDED AT THE
NAVY EXCHANGE SERVICE STATION (BUILDING 538)
NAVAL AIR STATION, BRUNSWICK, MAINE
APRIL 1997

Sample Date	System Status	Total Volatile Hydrocarbons (ppm _v) ^(a)	Vacuum at Treatment Plant (in. H ₂ O)	Vacuum at Trench (in. H ₂ O)	Flow Rate (cfm)	Daily Total Volatile Hydrocarbon Removal Rate ^(b) (lb/day)
SVE-1 INTAKE						
09 APR 1997	SVE/AAS	2.06	13.0	8.5	60	0.04
29 APR 1997	SVE/AAS	No data; offline				
SVE-2 INTAKE						
09 APR 1997	SVE/AAS	21.56	10.0	6.0	63	0.47
29 APR 1997	SVE/AAS	No data; offline				
SVE-3 INTAKE						
09 APR 1997	SVE/AAS	1.08	10.0	8.0	71	0.03
29 APR 1997	SVE/AAS	No data; flow obstructed				
SVE-4 INTAKE						
09 APR 1997	SVE/AAS	2.91	14.0	4.0	65	0.07
29 APR 1997	SVE/AAS	0.0	28.0	0.0	0	0.00
SVE-5 INTAKE						
09 APR 1997	SVE/AAS	3.53	13.0	0.5	105	0.13
29 APR 1997	SVE/AAS	85.2	25.0	2.0	>150	4.47 ^(c)
SVE COMPOSITE INTAKE						
09 APR 1997	SVE/AAS	6.56	61.0	NA	364	0.83
29 APR 1997	SVE/AAS	10.0	56.0	NA	340	1.19
SVE COMPOSITE EMISSIONS						
09 APR 1997	SVE/AAS	1.00	NA	NA	364	0.13
29 APR 1997	SVE/AAS	4.7	NA	NA	340	0.56
<p>(a) Based on measurements taken with photoionization detector. Photoionization detector measurements considered a conservative approximation of total volatile hydrocarbon concentrations at sample location due to instrument response limitations.</p> <p>(b) Loading rate calculated using formula provided by EPA (1989): $ER = Q \times C \times MW \times 1.58 \times 10^{-7} \times 24$, where: ER = Emissions rate (lb/day), Q = Flow rate (cfm), C = Total volatile hydrocarbon concentration in influent (ppm_v), MW = Molecular weight (average) of vapor phase weathered gasoline (92.14 g/mole).</p> <p>(c) Total volatile hydrocarbon removal rate measurements considered a conservative approximation, due to flow rate instrument response limitations.</p>						
<p>NOTE: cfm = Cubic feet per minute; NA = Not applicable; SVE/AAS = Soil vapor extraction/aquifer air sparging. SVE composite removal (flow) rate taken as summation of flow rates of individual SVE trench lines.</p>						

TABLE 2 SUMMARY OF AQUIFER AIR SPARGING SYSTEM OPERATIONS DATA
 NAVY EXCHANGE SERVICE STATION (BUILDING 538)
 NAVAL AIR STATION, BRUNSWICK, MAINE
 APRIL 1997

Monitoring Date	Sparge Air Pressure (PSI)	Sparge Air Temperature (°F)	Sparge Air Injection Rate (scfm)
Sparge Well AAS-3			
9 APR 1997	3.5	90	24
29 APR 1997	2.0	90	35
Sparge Well AAS-4			
9 APR 1997	1.5	90	38
29 APR 1997	1.5	90	10
Sparge Well AAS-5			
9 APR 1997	1.0	90	32
29 APR 1997	No data; flow obstructed		
Sparge Well AAS-6			
9 APR 1997	2.0	90	32
29 APR 1997	2.0	90	5
Sparge Well AAS-7			
9 APR 1997	1.5	90	22
29 APR 1997	2.0	90	10
Sparge System Compressor (Composite)			
9 APR 1997	7.0	90	148
29 APR 1997	5.0	90	60
NOTE: scfm = Standard cubic feet per minute; PSI = Pounds per square inch. Sparge system composite air injection rate (scfm) taken as summation of air injection rates at individual sparge wells.			

TABLE 3 SUMMARY OF WELL GAUGING DATA
NAVY EXCHANGE SERVICE STATION (BUILDING 538)
NAVAL AIR STATION, BRUNSWICK, MAINE, APRIL 1997

Gauging Date	Well Elevation (ft MSL)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Water Table Elevation (ft MSL)
MW-NASB-023					
9 APR 1997	67.29	7.19	---	---	60.10
28 MAR 1997	67.29	6.83	---	---	60.46
MW-NASB-024					
9 APR 1997	65.31	5.40	---	---	59.91
29 APR 1997	65.31	5.18	---	---	60.13
MW-NASB-025					
9 APR 1997	64.34	6.56	---	---	57.78
29 APR 1997	64.34	6.35	---	---	57.99
MW-NASB-026					
9 APR 1997	66.61	6.88	---	---	59.73
29 APR 1997	66.61	6.20	---	---	60.41
MW-NASB-027					
9 APR 1997	60.50	2.35	---	---	58.15
29 APR 1997	60.50	1.71	---	---	58.79
MW-NASB-008					
9 APR 1997	59.22	2.18	---	---	57.04
29 APR 1997	59.22	1.71	---	---	57.51
MW-NASB-009					
9 APR 1997	59.00	3.61	---	---	55.39
29 APR 1997	59.00	3.33	---	---	55.67
MW-NASB-010					
9 APR 1997	62.03	6.40	---	---	55.63
29 APR 1997	62.03	6.28	---	---	55.75
MW-NASB-225					
9 APR 1997	64.61	6.33	---	---	58.28
29 APR 1997	64.61	6.12	---	---	58.49
NOTE: LNAPL = Light, non-aqueous phase liquid; MSL = Mean sea level. Dashes (---) indicate LNAPL not detected in well. Depth to water measurements recorded from marker on top of polyvinyl chloride well riser. Sparge Wells AAS-3 through AAS-7 and AAS-11 through AAS-13 were not gauged because of the presence of sparge well manifolds atop the well heads, and/or active sparging.					

TABLE 3 (Continued)

Gauging Date	Well Elevation (ft MSL)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Water Table Elevation (ft MSL)
Sparge Well AAS-1					
9 APR 1997	66.89	6.99	---	---	59.90
29 APR 1997	66.89	6.57	---	---	60.32
Sparge Well AAS-2					
9 APR 1997	65.96	6.51	---	---	59.45
29 APR 1997	65.96	6.79	---	---	59.17
Sparge Well AAS-8					
9 APR 1997	65.65	6.40	---	---	59.25
29 APR 1997	65.65	5.71	---	---	59.94
Sparge Well AAS-9					
9 APR 1997	65.98	5.98	---	---	60.00
29 APR 1997	65.98	5.71	---	---	60.27
Sparge Well AAS-10					
9 APR 1997	66.26	5.96	---	---	60.30
29 APR 1997	66.26	5.50	---	---	60.76
Sparge Well AAS-11					
9 APR 1997	62.51	5.51	---	---	57.00
29 APR 1997	62.51	No data; sparge well manifold present			
Sparge Well AAS-12					
9 APR 1997	64.13	6.11	---	---	58.02
29 APR 1997	64.13	No data; sparge well manifold present			
Sparge Well AAS-13					
9 APR 1997	64.62	6.82	---	---	57.80
29 APR 1997	64.62	No data; sparge well manifold present			

TABLE 4 SUMMARY OF WATER QUALITY INDICATOR PARAMETERS
 NAVY EXCHANGE SERVICE STATION (BUILDING 538)
 NAVAL AIR STATION, BRUNSWICK, MAINE
 APRIL 1997

Monitoring Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (μmhos/cm)	Redox (mV)
MW-NASB-023					
9 APR 1997	5.26	8.41	7.72	255	545
29 APR 1997	5.63	10.18	4.59	208	396
MW-NASB-024					
9 APR 1997	5.88	6.06	7.32	70.2	478
29 APR 1997	5.95	6.59	6.58	73.9	377
MW-NASB-025					
9 APR 1997	5.66	6.95	6.75	350	414
29 APR 1997	5.75	7.64	5.45	165	394
MW-NASB-026					
9 APR 1997	5.93	6.56	5.75	336	439
29 APR 1997	6.05	6.97	5.03	572	375
MW-NASB-027					
9 APR 1997	5.68	5.78	7.81	47.9	396
29 APR 1997	5.68	7.12	6.25	48.7	393
MW-NASB-008					
9 APR 1997	5.66	5.15	1.92	258	384
29 APR 1997	6.00	5.30	3.13	247	374
MW-NASB-009					
9 APR 1997	5.54	5.22	6.64	84.7	347
29 APR 1997	6.05	5.32	6.07	159	376
MW-NASB-010					
9 APR 1997	5.58	5.46	3.81	223	429
29 APR 1997	6.03	7.36	3.10	235	305
MW-NASB-225					
9 APR 1997	5.61	7.41	7.08	287	294
29 APR 1997	6.20	8.17	1.68	245	301
Sparge Well AAS-1					
9 APR 1997	5.33	8.81	4.92	95.3	541
29 APR 1997	5.55	10.02	4.54	95.0	396

TABLE 4 (Continued)

Monitoring Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (μ mhos/cm)	Redox (mV)
Sparge Well AAS-2					
9 APR 1997	5.73	7.10	5.57	485	469
29 APR 1997	5.89	8.79	1.87	481	384
Sparge Well AAS-8					
9 APR 1997	5.71	4.75	9.01	119.3	492
29 APR 1997	5.70	5.96	8.03	73.9	392
Sparge Well AAS-9					
9 APR 1997	No data; insufficient water				
29 APR 1997	No data; insufficient water				
Sparge Well AAS-10					
9 APR 1997	6.29	3.91	8.00	82.9	433
29 APR 1997	6.58	5.90	8.33	66.3	346
Sparge Well AAS-11					
9 APR 1997	5.08	6.39	7.55	194	482
29 APR 1997	No data; sparge well manifold present				
Sparge Well AAS-12					
9 APR 1997	5.49	7.25	4.52	246	446
29 APR 1997	No data; sparge well manifold present				
Sparge Well AAS-13					
9 APR 1997	5.77	6.34	2.46	592	390
29 APR 1997	No data; sparge well manifold present				

Attachment A

**Supporting Data Field Monitoring
and Sampling Activities**



EA Engineering,
Science, and
Technology

FIELD RECORD OF SVE SYSTEM OPERATIONS

Project Name: <u>NEY Service Station</u>	Project No.: <u>29600.35</u>	Date: <u>4/9/97</u>
EA Personnel: <u>BDA, SYC</u>	Building Temperature: <u>62°F</u>	

Location	Time (hr/min)	Vacuum (in H ₂ O)	Flow Rate (scfm)	Air Temperature (°F)	O ₂ (%)	CO ₂ (%)	Total Volatile Hydrocarbons (ppm _v)
SVE-1	0900	13	60				2.06
2		16	63				21.56
3		10	71				1.08
4		14	65				2.91
5		13	105				3.53
Knock out		28		54			
Vac-relief		61					
Influent							6.56
Effluent							1.00
SVE-1		8.5					
2		6					
3		8					
4		4					
5		6.5					

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COMMENTS: _____



EA Engineering,
Science, and
Technology

FIELD RECORD OF SVE SYSTEM OPERATIONS

Project Name: <u>NEY Service Station</u>	Project No.: <u>29600.35</u>	Date: <u>4/29/97</u>
EA Personnel: <u>SVC, MDC</u>	Building Temperature: <u>80°</u>	

Location	Time (hr/min)	Vacuum (in H ₂ O)	Flow Rate (scfm)	Air Temperature (°F)	O ₂ (%)	CO ₂ (%)	Total Volatile Hydrocarbons (ppm _v)
SVE-1	745	OFF	—	—	—	—	—
2		OFF	—	—	—	—	—
3		25	7150				29.8
4		28	0				0.0
5		25	7150				85.2
Knockout		56		55			
Influent							10.6
Effluent							4.7
Vac-relief		78					
SVE-1		OFF					
2		OFF					
3		18					
4		0					
5		2					

OILS - OFF

EA 5120 0794-4

COMMENTS: SVE-5 is the total for SVE-5, SVE-6, and SVE-7
SVE1 and SVE2 are OFF to make more pull on
SVE-5 through SVE-7.
Combined Flow rate of 340 cfm.

FIELD RECORD OF WATER QUALITY PARAMETER ANALYSIS

Project Name: <u>NEX Service Station</u>	Project No: <u>29600.35</u>	Date: <u>4/9/97</u>
Weather/Temperature/Barometric Pressure/Humidity: <u>Sunny, windy, 30°</u>		
EA Personnel: <u>SYC, BOA</u>	Equipment: <u>hydrolab, Solinst Interface meter</u>	

Location	Time (0000 hr)	Depth To Water (ft)	Depth to Product	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µmhos)	Redox (mV)
MW-NASB 023		7.19	-	5.26	8.41	7.72	255	545
MW-NASB 024		5.40	-	5.88	6.06	7.32	70.2	478
MW-NASB 025		6.56	-	5.66	6.95	6.75	350	414
MW-NASB 026		6.88	-	5.93	6.56	5.75	336	439
MW-NASB 027		2.35	-	5.68	5.78	7.81	47.9	396
MW-NASB 008		2.18	-	5.66	5.15	1.92	258	384
MW-NASB 009		3.61	-	5.54	5.22	6.64	84.7	347
MW-NASB 010		6.40	-	5.58	5.46	3.81	223	429
MW-NASB 025		6.33	-	5.61	7.41	7.08	287	294
AAS-1		6.99	-	5.33	8.81	4.92	95.3	541
AAS-2		6.51	-	5.73	7.10	5.57	485	469
AAS-8		6.40	-	5.71	4.75	9.01	119.3	492
AAS-9		5.98	-	insufficient water				
AAS-10		5.96	-	6.29	3.91	8.00	82.9	433
AAS-11		5.51	-	5.08	6.39	7.55	194	482
AAS-12		6.11	-	5.49	7.25	4.52	246	446
AAS-13		6.82	-	5.77	6.34	2.46	592	390

Calibration Date: See attached calibration sheet

COND. Model: _____ Standard: _____ Reading: _____
 pH: Model: _____ Standard: _____ Reading: _____
 DO: Model: _____ Temp: _____ Reading: _____

FIELD RECORD OF WATER QUALITY PARAMETER ANALYSIS

Project Name: <u>NEX Service Station</u>	Project No: <u>29600.35</u>	Date: <u>4/29/97</u>
Weather/Temperature/Barometric Pressure/Humidity: <u>Sunny, 45°</u>		
EA Personnel: <u>SYC, MOC</u>	Equipment: <u>Solinst interface meter hydrobb</u>	

Location	Time (0000 hr)	Depth To Water (ft)	Depth to Product	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µmhos)	Redox (mV)
MW-NASB 023		6.83	—	5.63	10.18	4.59	208	396
MW-NASB 024		5.18	—	5.95	6.59	6.58	73.9	377
MW-NASB 025		6.35	—	5.75	7.64	5.45	165	394
MW-NASB 026		6.20	—	6.05	6.97	5.03	572	375
MW-NASB 027		1.71	—	5.68	7.12	6.25	48.7	393
MW-NASB 008		1.71	—	6.00	5.30	3.13	247	374
MW-NASB 009		3.33	—	6.05	5.32	6.07	159	376
MW-NASB 010		6.28	—	6.03	7.36	3.10	235	305
MW-NASB 225		6.12	—	6.20	8.17	1.68	245	301
AAS-1		6.57	—	5.55	10.02	4.54	95.0	396
AAS-2		6.79	—	5.89	8.79	1.87	481	384
AAS-8		5.71	—	5.70	5.96	8.03	73.9	392
AAS-9		5.71	insufficient water					
AAS-10		5.50	—	6.58	5.90	8.33	66.3	346
AAS-11		actively sparging						
AAS-12		actively sparging						
AAS-13		actively sparging						

Calibration Date: <u>See attached calibration sheet</u>			
COND.	Model: _____	Standard: _____	Reading: _____
pH:	Model: _____	Standard: _____	Reading: _____
DO:	Model: _____	Temp: _____	Reading: _____