8/1/00-02879

AS/SVE System Status Letter Report Addendum Year Three

for

Site 29 - Crash Crew Burn Pit

Marine Corps Auxiliary Landing Field - Bogue

Bogue, North Carolina

Atlantic Division
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0272

August 2000

TETRA TECH NUS, INC.

8/1/00-02879

070012/P

AS/SVE SYSTEM STATUS
LETTER REPORT ADDENDUM
YEAR THREE
FOR
SITE 29 - CRASH CREW BURN PIT

MARINE CORPS AUXILIARY
LANDING FIELD - BOGUE
BOGUE, NORTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Atlantic Division
Environmental Restoration Branch, Code 1823
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Virginia 23511-2699

Submitted by:
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CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0272

AUGUST 2000

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1.0 INTRODUCTION

The Northern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 272 to Tetra Tech NUS, Inc. (TtNUS), under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62472-90-D-1298. Under CTO 272, TtNUS has designed and implemented a pilot scale air sparging and soil vapor extraction (AS/SVE) system for Site 29, Crash Crew Burn Pit, at Bogue Field, Marine Corps Auxiliary Landing Field (MCALF), North Carolina. Bogue Field is operated under the jurisdiction of Marine Corps Air Station (MCAS) Cherry Point, North Carolina.

This Addendum to the AS/SVE System Status Letter Report for Site 29 - Crash Crew Burn Pit (TtNUS, 1999) provides additional information and data collected after submission of the initial Status Letter Report. This report discusses the operation and status of the AS/SVE system and presents the data collected during the evaluation of the system.

Information on previous activities and reports associated with the investigation of Site 29, the site description, the contaminant assessment, and objectives of the AS/SVE pilot test are provided in the initial Letter Report (TtNUS, 1999). A schematic depicting the layout of the AS/SVE system and monitoring wells in the area of Site 29 is provided in Figure 1-1.

Based on discussions during a Technical Review Committee (TRC) meeting held in June 1992, a Phase II RI was deemed necessary to further delineate the nature and extent of contamination in the groundwater and soil. The final Phase II RI planning documents (Halliburton NUS, 1993) were prepared in July 1993, and the draft final Phase II RI report was submitted in January 1995. The Phase II RI report recommended that the site be addressed under the state underground storage tank (UST) program, product removal be continued, and a Corrective Action Plan (CAP) be pursued under the North Carolina Administrative Code, Subchapter 2L, Section 0106(l) (natural degradation/attenuation) for site-related groundwater contaminants detected at concentrations above state standards. However, before the groundwater CAP can be pursued, all sources of contamination and free product must be removed or controlled.

The AS/SVE pilot test is being conducted to evaluate whether the system can effectively remove and control the source of groundwater and soil contamination at Site 29. Since the site will be more appropriately addressed as part of the underground storage tank program, the Phase II RI was not finalized. It is anticipated that the results of the Phase II RI, as well as other historical data collected will be included with any newly collected data in a comprehensive site assessment (CSA) report to be prepared after the AS/SVE pilot test is completed.

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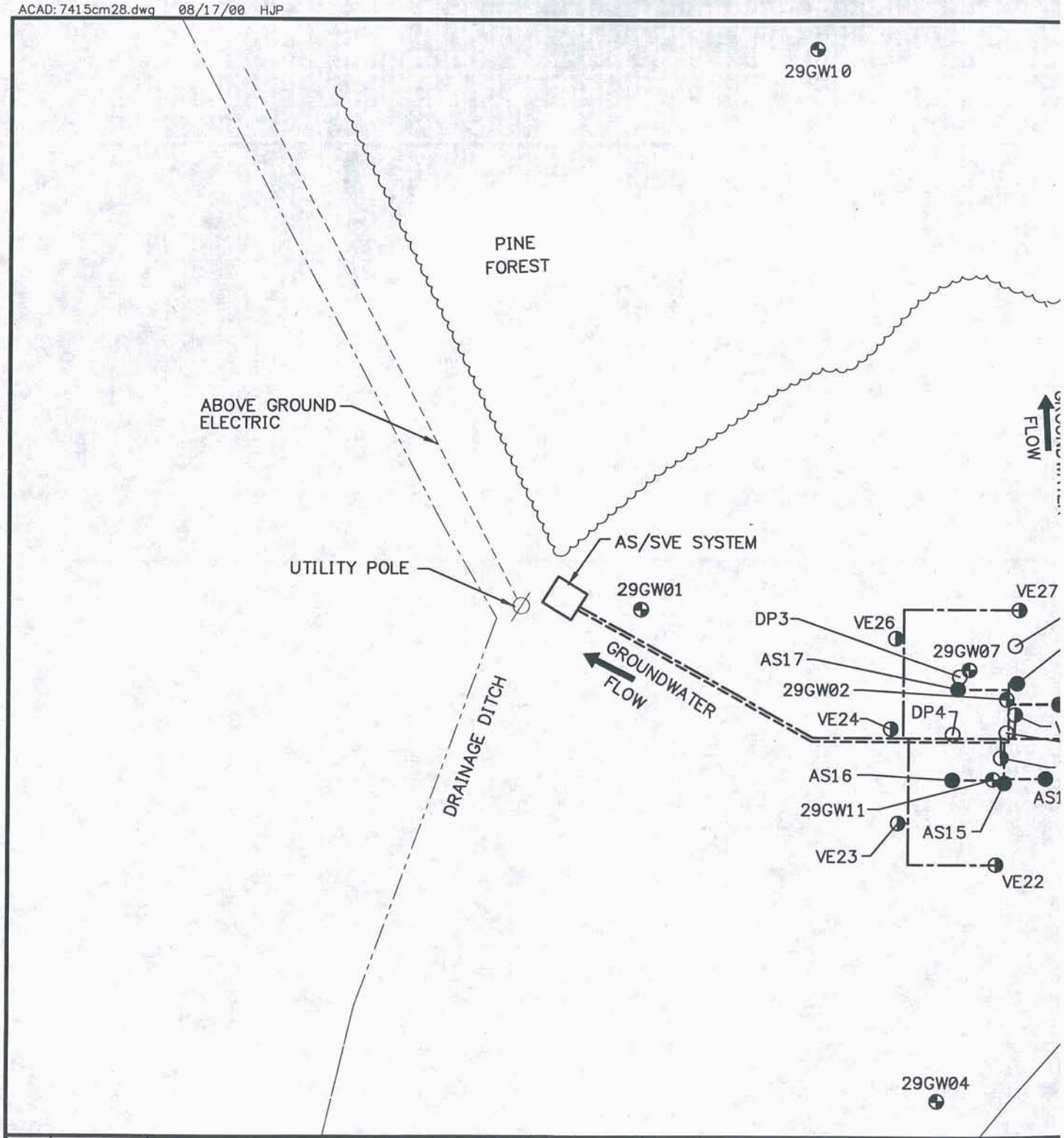

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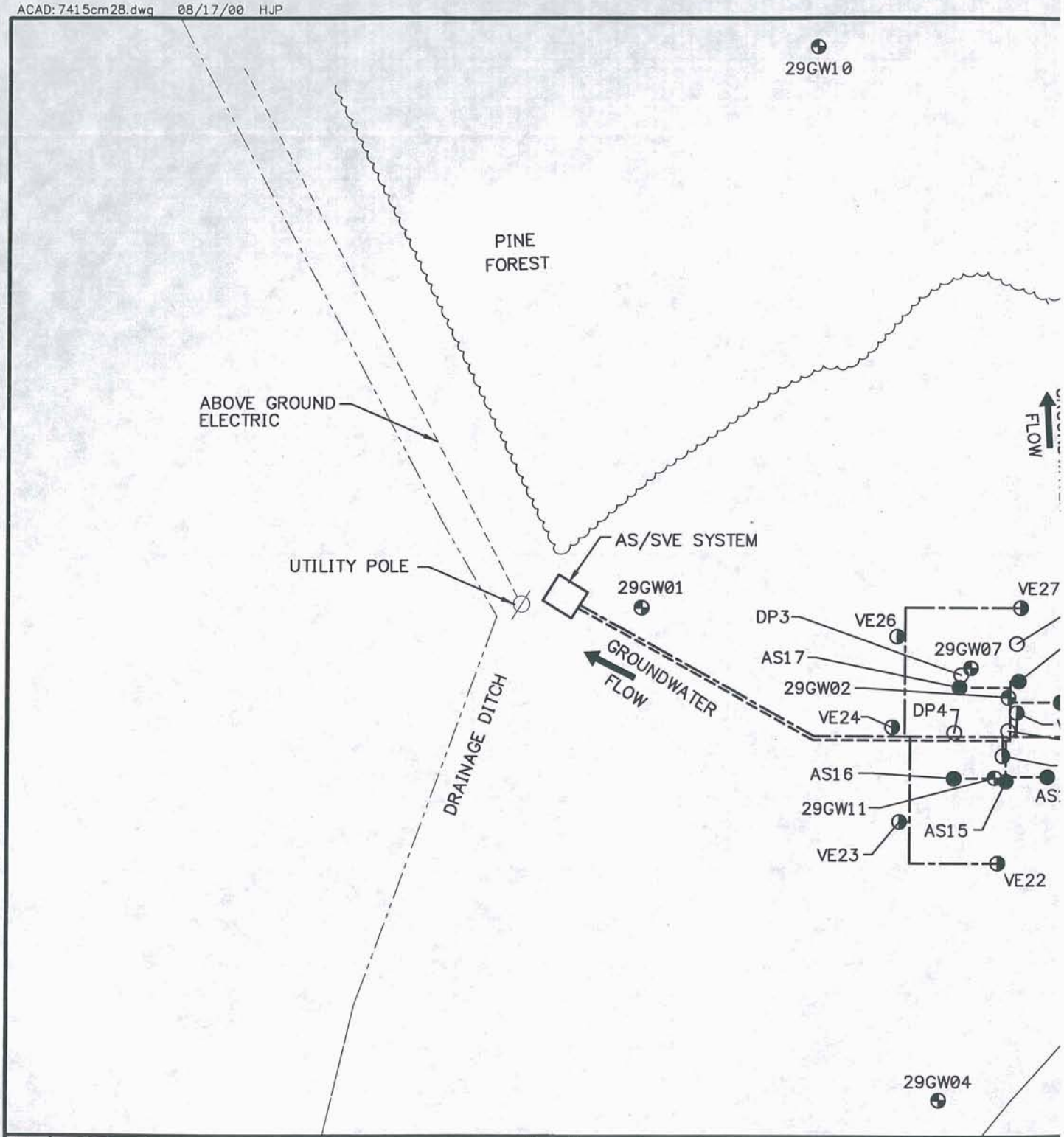

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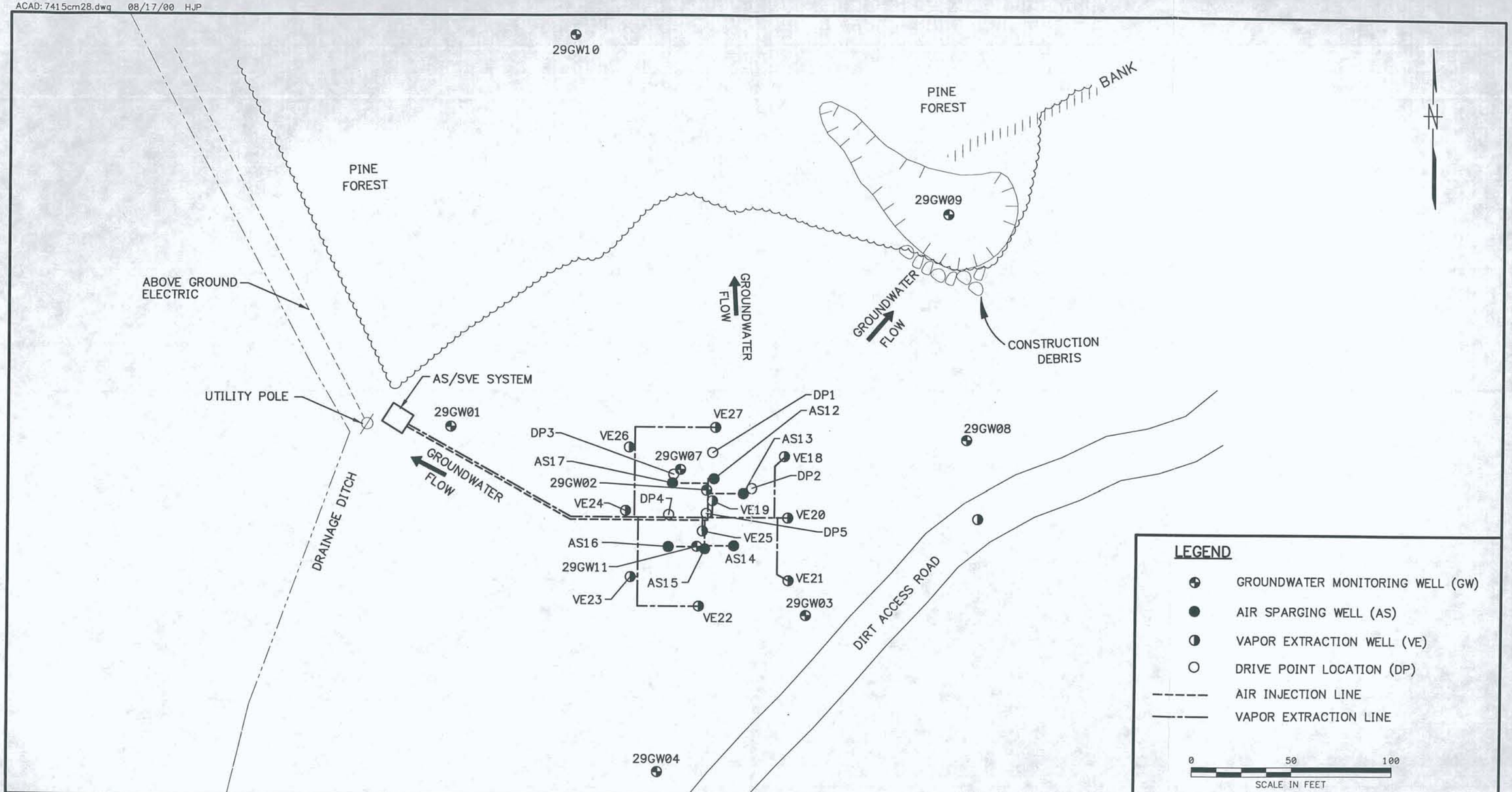

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COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

AS/SVE SYSTEM LAYOUT MAP
SITE 29 – CRASH CREW BURN PIT
MARINE CORPS AUXILERY LANDING FIELD
BOGUE FIELD, NORTH CAROLINA

CONTRACT NO. 7415
OWNER NO. ———
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 1–1
REV. 0

FORM CADD NO. T+NUS_BH.DGN – REV 0 – 1/20/98

2.0 SYSTEM EVALUATION

Installation of the AS/SVE System was initiated on September 3, 1997 and system startup was conducted on September 12, 1997. The system is currently in full operation and is planned to operate through January 2001. A summary of the site activities conducted from installation through preparation of this status report addendum is provided in Table 2-1.

2.1 SYSTEM OPERATION

The project scope included monthly evaluation of the system for 12 months after startup. After 1 month of full operation (October 1997) groundwater samples were collected, and after 6 months of operation (April 1998) soil and groundwater samples were collected in accordance with the work plan. In May 1998, it was decided that system evaluation would be performed every 2 months as a cost savings measure. This enabled the system to be evaluated for a longer period than the originally budgeted one year period. In July 1998, additional groundwater samples were collected to determine whether migration of the groundwater plume had occurred. Based on the free product remaining at the site after 12 months of operation (October 1998), additional sampling was put on hold pending further operation of the system and evaluation of the data. It was also determined that the system was going out of service too often, and system evaluations were returned to a monthly basis in December 1998. In May 1999, the Navy decided to extend the operation of the AS/SVE system for an additional 12-month period.

A meeting with the Navy and State to discuss the Status Letter Report was held on July 27, 1999. At the meeting it was decided the system would be rewired to allow independent operation of the AS and SVE systems. This was acceptable because the extracted vapors no longer required treatment. Rewiring of the system reduced the down time of the system as a whole. At the meeting it was also decided that run meters would be installed on each blower to track the amount of time the individual systems were operational. Table 2-2 provides the number of hours between system evaluations, the number of hours the system was operational, and the number of hours the system was not operating. The meters were installed during the August 25, 1999 field effort along with a full round of sampling, which was also requested during the July meeting. The sampling effort included four soil, four groundwater, and one air sample.

Beginning July 1999 floating free product was no longer observed in the vapor extraction wells and a floating black floc product was identified. About nine months later, in April 2000, the floating floc was no longer present and a sinking black aqueous material was observed with clear water above. Repairs to the system were made in February 2000 and in May 2000, two samples of the sinking black aqueous

TABLE 2-1

SITE ACTIVITIES SUMMARY
AS/SVE SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 1 OF 4

Date	Activity	Comments
9/2/97 through 9/5/97	Installation of system wells	Free product identified in 29GW11 (0.40' thick) and 29GW02 (2.11' thick) prior to system well installation.
9/6/97	Baseline soil sample collection	Five soil boring locations with samples collected from 1'-3' and 4'-6' intervals.
9/7/97	Baseline groundwater collection	GW02 and GW11 sampled. Wells purged prior to sample collection.
9/8/97 through 9/11/97	System installation	None
9/12/97	Initial system start-up Collect air sample (SVE only)	Initial operation of SVE to evaluate soil contamination only. Free product observed in extraction wells. Collected pre-carbon air sample.
9/16/97 through 9/18/97	System evaluation	Heavy rains over weekend. System not operating. Auto shut-off didn't operate correctly. Kept system off until repairs and modifications could be made.
9/30/97 through 10/2/97	System repair and expansion	Installed additional moisture separator with auto shut-off/auto-drain including product separation capability.
10/3/97	Complete system startup (AS/SVE)	Collected pre-carbon air sample. Set system on full auto.
10/14/97	System checked by TtNUS	System operating. Quick check conducted before meeting at MCAS Cherry Point.
10/17/97	One-month evaluation	System not operating. 1500-gal holding tank full. Collected groundwater samples from GW02 and GW11. System couldn't be turned back on until holding tank emptied.
10/30/97	System re-start	Holding tank was emptied and disposed of at MCAS Cherry Point by OHM. System vacuum adjusted. System set on "run" not "auto."
11/20/97	Monthly evaluation	System operating. Collected air sample.
12/17/97	Monthly evaluation	System operating. Air evaluation identified off-gas treatment not required; therefore, took carbon off-line. Collected carbon sample for disposal. Air sample collected. Removed product using vacuum blower.
1/16/98	Monthly evaluation	System operating. Collected air sample.

TABLE 2-1

SITE ACTIVITIES SUMMARY
AS/SVE SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 2 OF 4

Date	Activity	Comments
1/27/98	Monthly evaluation	System operating. Collected air sample and system data.
2/19/89	Monthly evaluation	Heavy rains prior to visit. System running, but no air flows due to high water table and break in AS trunk line. Repaired system and re-set pressures. Collected air sample.
4/1/98 through 4/2/98	Month six evaluation	System operating. Collected soil and groundwater samples. Collected air sample. System data recorded.
5/20/98	Bimonthly evaluation	System operating. Collected air sample.
7/20/98 through 7/21/98	Bimonthly evaluation and additional GW sampling.	Only vapor extraction operating. Air sparge off-line. Additional GW sampling based on 6th month data. No soil samples collected. Collected air sample. Full system put back on-line.
9/30/98	Bimonthly evaluation	System not operating. Couldn't re-start AS unit. Removed product using VE unit. Collected air sample. Operate SVE only. Ordered service of AS blower.
10/22/98 and 11/10/98	System repair	AS blower damaged beyond repair. Unit was replaced by vendor, and system put back on-line. Two service calls required. Twelve-month soil and groundwater sampling put on hold pending review of data; free product still exists at the site.
12/1/98	Monthly evaluation	Systems operating; however, break in air injection trunk line preventing air sparging. Repaired line, collected system data. Made adjustments to system to reduce noise from AS unit.
1/11/99	Monthly evaluation	System not operating. Re-set SVE breaker and replaced drive shaft on AS unit. Collected air sample and system data. Additional field efforts were put on hold pending modification to contract.
1/12/99 through 5/5/99	Contract Modification	Efforts conducted to modify scope for additional system evaluations during this period. Technical direction was obtained on 5/5/99 providing additional 12 months evaluation. Preparation of Status Letter Report. Report scoped to include period from start-up through May 1999.

TABLE 2-1

SITE ACTIVITIES SUMMARY
AS/SVE SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 3 OF 4

Date	Activity	Comments
5/12/99	Monthly evaluation	The first additional system evaluation was conducted on 5/12/99 through 5/14/99. Upon arrival at Site 29 the system was not operating; repairs were made and the system put back on-line.
6/23/99	Monthly evaluation	System in full operation. Data collected and minor system adjustment made.
7/20/99	Report submittal	AS/SVE Status Letter Report submitted.
7/27/99	Monthly evaluation and Meeting	Meeting with Navy and State to discuss AS/SVE Status Letter Report. System evaluation and tour conducted. System was not operating due to full moisture seperator.
8/25/99	Monthly evaluation and sampling effort	System evaluation conducted and collected GW and soil samples. System was shut off for five days prior to sampling effort. Air sample was collected. As per July meeting, run meters installed and system was rewired to permit independent operation of AS and SVE units.
10/4/99	Monthly evaluation	VE unit operated full time, the SVE system went off line 49.2 hrs after previous evaluation. Conducted minor repairs and performed evaluation.
10/27/99	Monthly evaluation	System in full operation. Conducted system evaluation and data collection.
11/18/99	Monthly evaluation	System in full operation. Conducted system evaluation. Run meters identified SVE system was off for 102 hrs and VE system off for 41.6 hrs.
12/9/99	Monthly evaluation	AS system off line. Unit couldn't be restarted and called for replacement. SVE system and other site measurements collected.
1/5/00	System repairs and monthly evaluation	AS blower replaced. System evaluation and data collection conducted.
2/23/00	Monthly evaluation	SVE unit off line. Excessive system vibration. Repairs made to system. Full system back on line.
4/4/00	Monthly evaluation	SVE unit off line. Contacted manufacture to make repair to system. Unable to get SVE system back on line. Collected AS system and other site measurements.

TABLE 2-1

SITE ACTIVITIES SUMMARY
AS/SVE SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 4 OF 4

Date	Activity	Comments
4/25/00	System repairs	PRM conducted repairs to system. AS unit needed rotary vein replacement. Parts ordered. Full system placed back on line.
5/9/00	Monthly evaluation and GW sampling.	System was shut off prior to GW sample collection. Collected sinking black product/liquid from vapor extraction wells - 19 and –24. VE blower had excessive vibration due to bad rotary vein. Only operating SVE system. Collected SVE system and other site measurements.
5/30/00	System repairs	AS blower repaired and other minor repairs made to system. Full system placed back on line.
6/19/00	Contract Modification	Cost Impact Letter (CIL) No. 3 was negotiated and approved for seven additional field system evaluations through January 2001. Also authorized the submission of a CAP in place of the CSA report.
6/27/00	Monthly evaluation and air sample collection	Conducted system evaluation and collected air sample. System in full operation.
Next field effort scheduled for July 25, 2000. AS/SVE system is currently in full operation.		

TABLE 2- 2

AS/SVE HOURS OF OPERATION
MCALF BOGUE FIELD
BOGUE FIELD, NORH CAROLINA

Date	Total Hours During Evaluation Period	Air Sparge			Vapor Extraction		
		Run Meter Reading	Hours System Running	Hours Off-Line	Run Meter Reading	Hours System Running	Hours Off-Line
8/25/99	Run Meter Installation	0.7	Run Meter Installation		0.7	Run Meter Installation	
8/26/99	16.2	16.9	16.2	0.0	16.9	16.2	0.0
10/4/99	965.1	49.9	33.0	932.1	307.7	290.8	674.3
10/6/99	42.0	63.9	14.0	28.0	325.7	18.0	24.0
10/6/99	4.0	67.4	3.5	0.5	2.2	New Run Meter Installated	
10/27/99	501.5	568.6	501.2	0.3	503.3	501.1	0.4
11/18/99	529.0	1097.1	528.5	0.5	1032.0	528.7	0.3
12/9/99	502.3	1598.1	501.1	1.2	1533.2	501.2	1.1
1/5/00	647.7	1598.1	0.0	647.7	2178.1	647.2	0.5
2/24/00	1201.0	2795.0	1196.9	4.1	2601.5	423.4	777.6
5/9/00	1703.3	3724.1	929.1	774.2	3527.4	925.9	777.4
6/27/00	1181.7	4230.4	506.3	675.4	4705.2	1177.8	3.9
7/25/00	672.0	4869.8	639.4	32.6	4804.5	99.3	572.7
Totals	7965.8	4869.1	4869.2	3096.6	5130.2	5129.6	2832.2

material were collected and analyzed for Gasoline Range Organics (GRO) and Diesel Range Organics (DRO).

In June 19, 2000, the Navy decided to continue operation of the system through January 2001. As of the June 2000 field effort the system was in full operation, however during the July field efforts it was noted that the SVE system was off line due to the high water table. Site 29 is subject to localized flooding as shown in Figure 2-1. This type of flooding has occurred several times during the operation of this system.

2.2 PHYSICAL PARAMETERS

To determine if the AS/SVE system is operating properly, pressure, vacuum, and flow rates are measured at the individual system wells and at the skid-mounted blower units. This data has been tabulated since startup and is provided in Table 2-3. Beginning in April 1998, PID measurements at the well heads were also collected. These measurements are also provided in Table 2-3.

Groundwater elevation measurements were collected during each system evaluation. The fluctuations in the average groundwater depth is provided in Table 2-4 and indicate a fluctuation in the groundwater of about five to six feet. Throughout system operation, the average depth to groundwater has been around 4.8 feet bgs; however, during dry periods the depth to groundwater drops to around 6 feet bgs, and during periods of heavy rain, the area was subject to flooding conditions. When the groundwater rises above the screen interval of the vapor extraction wells, no air flow will be observed. Periods of no flow in the vapor extraction system are shown in Table 2-3.

2.3 FREE PRODUCT EVALUATION

During the first system evaluation in September 1998 free product was identified in the vapor extraction wells. All the system and site monitoring wells were checked for free product using a clear disposable bailer. No free product was observed in any of the wells except for the vapor extraction wells at that time. The free product thickness observed during the monthly evaluations was recorded and is summarized in Table 2-4.

During the period from January 1999 through June 1999 (after 15 to 20 months of system operation), measurable free product persisted in the vapor extraction wells, however toward the end of this period floating black "floc" began to appear. Over the next six months, less free product and more "floc" was observed. The December 1999 field effort was the last time measurable floating free product was reported. The January and February 2000 field efforts did not observe free product, only floating "floc". During the next field effort, conducted in April 2000, no floating product or material was present, however a sinking black aqueous material was noted. This material was sampled for GRO and DRO during the

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FIGURE 2-1

SITE LAYOUT PHOTO

SITE 29 – CRASH CREW BURN PIT

MCALF BOGUE FIELD, NORTH CAROLINA

Site 29 during heavy rainfall event showing localized flooding.

TABLE 2-3

PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 1 OF 8

SAMPLE POINT	SVE Start-Up Only 9/12/1997				Full Start-Up 10/1/97				WEEK 1 10/3/97				First Month 10/30/97			
	VAC ("H_2O)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V
SVE Unit																
Readings before moisture separator (MS). Valve positions before/after MS	35	>6000	>131	NA / 3/4 open	40 "H_2O	>6000	>131	NA / 3/4 open	NC	NC	NC	NA / 5/8 open	NC	900	20	NA / Full Open
Gage before air filter	38	NA	NA	NA	42 "H_2O	NA	NA	NA	38 "H_2O	NA	NA	NA	10"H_2O	NA	NA	NA
Gage after air filter	38	NA	NA	NA	42 "H_2O	NA	NA	NA	38 "H_2O	NA	NA	NA	10"H_2O	NA	NA	NA
AS Unit																
Before make-up valve (gage)	NC	NC	NC	NA	1.5 psi	NA	NA	NA	6.0 psi	NA	NA	NA	NC	NA	NA	NA
Line after make-up valve	NC	NC	NC	1/2 open	6.5 psi	1100	24	1/2 open	5.0 psi	NC	NC	1/2 open	NC	NA	NA	1/2 open
SVE Wells																
VE18	29	1000	22	Full	40 "H_2O	400	9	Full	37 "H_2O	100	2	Full	NC	NC	NC	NC
VE19	28	800	17	Full	38 "H_2O	700	15	Full	38 "H_2O	210	5	Full	NC	NC	NC	NC
VE20	28	650	14	Full	36 "H_2O	100	2	Full	36 "H_2O	50	1	Full	NC	NC	NC	NC
VE21	29	250	5	Full	32 "H_2O	150	3	Full	37 "H_2O	50	1	Full	NC	NC	NC	NC
VE22	31	300	7	Full	36 "H_2O	10	0	Full	40 "H_2O	100	2	Full	NC	NC	NC	NC
VE23	18	300	7	Full	34 "H_2O	100	2	Full	38 "H_2O	150	3	Full	NC	NC	NC	NC
VE24	20	800	17	Full	32 "H_2O	300	7	Full	38 "H_2O	300	7	Full	NC	NC	NC	NC
VE25	29	450	10	Full	38 "H_2O	200	4	Full	39 "H_2O	180	4	Full	NC	NC	NC	NC
VE26	20	600	13	Full	40 "H_2O	300	7	Full	38 "H_2O	300	7	Full	NC	NC	NC	NC
VE27	31	650	14	Full	40 "H_2O	50	1	Full	38 "H_2O	100	2	Full	NC	NC	NC	NC
Total Flow Rate		5800	127			2310	50			1540	34					
AS Wells																
AS12	NR	NR	NR	Full	6.5 psi	220	5	Full	6.0 psi	75	2	Full	NC	NC	NC	NC
AS13	NR	NR	NR	Full	6.0 psi	90	2	Full	5.9 psi	80	2	Full	NC	NC	NC	NC
AS14	NR	NR	NR	Full	6.0 psi	180	4	Full	5.9 psi	65	1	Full	NC	NC	NC	NC
AS15	NR	NR	NR	Full	6.0 psi	200	4	Full	5.8 psi	50	1	Full	NC	NC	NC	NC
AS16	NR	NR	NR	Full	6.0 psi	75	2	Full	6.0 psi	50	1	Full	NC	NC	NC	NC
AS17	NR	NR	NR	Full	6.0 psi	400	9	Full	6.0 psi	150	3	Full	NC	NC	NC	NC
Total Flow Rate						1165	25			470	10					
Drive Point Mon. Wells					(vacuum)				(vacuum)							
DP01	NC	NA	NA	NA	0.0 "H_2O	NA	NA	NA	0.10 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP02	NC	NA	NA	NA	0.0 "H_2O	NA	NA	NA	0.68 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP03	NC	NA	NA	NA	0.2 "H_2O	NA	NA	NA	0.38 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP04	NC	NA	NA	NA	0.0 "H_2O	NA	NA	NA	0.70 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP05	NC	NA	NA	NA	0.0 "H_2O	NA	NA	NA	0.20 "H_2O	NA	NA	NA	NC	NA	NA	NA

TABLE 2-3

PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
PAGE 2 OF 8

SAMPLE POINT	Second Month [1]				Third Month				Fourth Month				Fifth Month			
	11/20/1997				12/18/1997				1/27/1998				2/19/1998 (2)			
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	V
SVE Unit																
Readings before moisture separator (MS). Valve positions before/after MS	19"H_2O	725	16	NA / Full Open	16"H_2O	1200	26	1/2 open / 1/2 open	15"H_2O	500	11	1/2 open / 1/2 open	16"H_2O	150	3	1/2 open / 1/2 open
Gage before air filter	20"H_2O	NA	NA	NA	32"H_2O	NA	NA	NA	38"H_2O	NA	NA	NA	40"H_2O	NA	NA	NA
Gage after air filter	26"H_2O	NA	NA	NA	37"H_2O	NA	NA	NA	45"H_2O	NA	NA	NA	49"H_2O	NA	NA	NA
AS Unit																
Before make-up valve (gage)	5.0 psi	NA	NA	NA	5.0 psi	NA	NA	NA	7.5 psi	NA	NA	NA	9.25 psi	NA	NA	NA
Line after make-up valve	6.0 PSI	900	20	1/2	3.5	1025	22	1/2	5.5 psi	750	16	1/2	NC	NC	NC	1/2
SVE Wells																
VE18	19"H_2O	20	0.4	Full	16"H_2O	25	0.5	Full	15"H_2O	125	2.7	Full	0"H_2O	0	0.0	Full
VE19	20"H_2O	25	0.5	Full	16"H_2O	55	1.2	Full	15"H_2O	10	0.2	Full	0"H_2O	0	0.0	Full
VE20	20"H_2O	30	0.7	Full	16"H_2O	30	0.7	Full	15"H_2O	25	0.5	Full	0"H_2O	0	0.0	Full
VE21	20"H_2O	10	0:2	Full	16"H_2O	20	0.4	Full	15"H_2O	12	0.3	Full	0"H_2O	0	0.0	Full
VE22	18"H_2O	25	0.5	Full	17"H_2O	50	1.1	Full	15"H_2O	12	0.3	Full	0"H_2O	0	0.0	Full
VE23	20"H_2O	30	0.7	Full	16"H_2O	30	0.7	Full	15"H_2O	12	0.3	Full	0.1"H_2O	10 to 20	0.0	Full
VE24	20"H_2O	25	0.5	Full	18"H_2O	30	0.7	Full	15"H_2O	12	0.3	Full	0"H_2O	0	0.0	Full
VE25	18"H_2O	50	1.1	Full	16"H_2O	30	0.7	Full	15"H_2O	30	0.7	Full	0"H_2O	0	0.0	Full
VE26	20"H_2O	25	0.5	Full	16"H_2O	40	0.9	Full	15"H_2O	15	0.3	Full	0.4"H_2O	10 to 20	0.0	Full
VE27	19"H_2O	25	0.5	Full	16"H_2O	35	0.8	Full	15"H_2O	12	0.3	Full	0"H_2O	0	0.0	Full
Total Flow Rate		265	5.8			345	7.5			265	5.8			0	0.0	
AS Wells																
AS12	5.5 psi	50	1.1	Full	5.5 psi	75	1.6	Full	5.0 psi	25	0.5	Full	NC	NC	NC	Full
AS13	5.5 psi	50	1.1	Full	5.5 psi	60	1.3	Full	5.0 psi	75	1.6	Full	NC	NC	NC	Full
AS14	5.5 psi	30	0.7	Full	5.5 psi	75	1.6	Full	5.0 psi	70	1.5	Full	NC	NC	NC	Full
AS15	5.5 psi	60	1.3	Full	5.5 psi	75	1.6	Full	5.0 psi	25	0.5	Full	NC	NC	NC	Full
AS16	5.5 psi	55	1.2	Full	5.5 psi	80	1.7	Full	5.25 psi	55	1.2	Full	NC	NC	NC	Full
AS17	5.5 psi	50	1.1	Full	5.5 psi	75	1.6	Full	5.0 psi	100	2.2	Full	NC	NC	NC	Full
Total Flow Rate		295	6.4			440	9.6			350	7.6			0	0.0	
Drive Point Mon. Wells					(vacuum)				(vacuum)				(vacuum)			
DP01	0.0 "H_2O	NA	NA	NA	0.10 "H_2O	NA	NA	NA	0.02 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP02	0.0 "H_2O	NA	NA	NA	0.03 "H_2O	NA	NA	NA	0.03 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP03	0.0 "H_2O	NA	NA	NA	0.34 "H_2O	NA	NA	NA	0.02 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP04	0.0 "H_2O	NA	NA	NA	0.80 "H_2O	NA	NA	NA	0.04 "H_2O	NA	NA	NA	NC	NA	NA	NA
DP05	0.0 "H_2O	NA	NA	NA	0.30 "H_2O	NA	NA	NA	0.01 "H_2O	NA	NA	NA	NC	NA	NA	NA

TABLE 2-3

PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Seventh Month 4/1/1998					Eighth Month 5/20/1998 (1)					Tenth Month 7/20/1998 (1)				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit															
Readings before moisture separator (MS). Valve positions before/after MS	10"H_2O	750	16	NA	1/2 open / 1/2 open	11 "H_2O	140	3	NA	1/2 open / 1/2 open	22 "H_2O	1200	26	NA	1/2 open / 1/2 open
Gage before air filter	32"H_2O	NA	NA	NA	NA	35 "H_2O	NA	NA	NA	NA	33 "H_2O	NA	NA	NA	NA
Gage after air filter	42"H_2O	NA	NA	NA	NA	47 "H_2O	NA	NA	NA	NA	76 "H_2O	NA	NA	NA	NA
AS Unit															
Before make-up valve (gage)	7 psi	NA	NA	NA	NA	6.0 psi	NA	NA	NA	NA	6 psi	NA	NA	NA	NA
Line after make-up valve	6 psi	1500	33	NA	1/2	6.5 psi	0	0	NA	1/2	7 psi	1600	35	NA	1/2
SVE Wells			0												
VE18	10	50	1	650.0	Full	2.2	30	1	243.0	Full	22	200	4	220	Full
VE19	10	75	2	815.0	Full	2	50	1	241.0	Full	22	160	3	490	Full
VE20	10	40	1	745.0	Full	1.6	30	1	NA	Full	22	60	1	25	Full
VE21	9.5	25	1	925.0	Full	1.2	5	0	NA	Full	22	50	1	330	Full
VE22	10	25	1	1060.0	Full	0.5	0	0	NA	Full	22	75	2	710	Full
VE23	10	35	1	725.0	Full	1	25	1	NA	Full	22	20	0	861	Full
VE24	10	100	2	755.0	Full	2.2	25	1	NA	Full	22	300	7	210	Full
VE25	10	400	9	730.0	Full	1.2	50	1	NA	Full	22	150	3	157	Full
VE26	9.5	100	2	565.0	Full	1.6	10	0	344.0	Full	22	170	4	350	Full
VE27	10	40	1	580.0	Full	1	15	0	518.0	Full	22	75	2	910	Full
Total Flow Rate		890	19.4				240	5.2				1260	27.5		
AS Wells															
AS12	5	380	8.3	7.9	Full	6.5	350	7.6	NA	Full	6.5	320	7.0	NR	Full
AS13	NC	NC	NC	5.7	Full	6.5	Water	0.0	NA	Full	6.5	700	15.3	NR	Full
AS14	6	180	3.9	4.9	Full	6.5	Water	0.0	NA	Full	6.5	150	3.3	NR	Full
AS15	6	400	8.7	5.0	Full	6.5	410	8.9	NA	Full	6.5	500	10.9	NR	Full
AS16	6	350	7.6	5.1	Full	6.5	Water	0.0	NA	Full	6.5	200	4.4	NR	Full
AS17	6	400	8.7	10.8	Full	6.5	Water	0.0	NA	Full	6.5	500	10.9	NR	Full
Total Flow Rate		1710	37.3				NA	NA				2370	51.7		
Drive Point Mon. Wells															
DP01	0.1 (vac)	NA	NA	850	NA	0.03	NA	NA	NA	NA	0.00	NA	NA	310	NA
DP02	1.0 (pres)	NA	NA	690	NA	0.00	NA	NA	NA	NA	0.00	NA	NA	0	NA
DP03	0.1 (vac)	NA	NA	900	NA	0.02	NA	NA	NA	NA	0.00	NA	NA	130	NA
DP04	0.4 (pres)	NA	NA	730	NA	0.02	NA	NA	NA	NA	0.00	NA	NA	60	NA
DP05	0.00	NA	NA	270	NA	0.00	NA	NA	NA	NA	0.00	NA	NA	0	NA

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PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Twelfth Month 9/30/1998 (1)					Fifteenth Month 12/1/1998 (1)					Twentyith Month 5/13/99				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit															
Readings before moisture separator (MS). Valve positions before/after MS	22 "H_2O	750	16	NA	1/2 open / 1/2 open	28 "H_2O	580	13	NA	1/2 open / 1/2 open	36 "H_2O	1585	35	NA	1/2 open / 1/2 open
Gage before air filter		NA	NA	NA	NA	50 "H_2O	NA	NA	NA	NA	56 "H_2O	NA	NA	NA	NA
Gage after air filter		NA	NA	NA	NA	74 "H_2O	NA	NA	NA	NA	70 "H_2O	NA	NA	NA	NA
AS Unit															
Before make-up valve (gage)	OFF LINE	NA	NA	NA	NA	6 psi	NA	NA	NA	NA	7 psi	NA	NA	NA	NA
Line after make-up valve		0	0	NA	1/2	5.5 psi	gauge	15.75	NA	1/2	8.5 psi	23	1	NA	1/2
SVE Wells			0												
VE18	NC	NC	NC	130.0	Full	22	75	2	104	Full	34	155	3	228	Full
VE19	NC	NC	NC	NC	Full	27	200	4	70	Full	36	87.5	2	675	Full
VE20	NC	NC	NC	285.0	Full	22	75	2	138	Full	33	105	2	155	Full
VE21	NC	NC	NC	230.0	Full	26	60	1	225	Full	36	450	10	77.8	Full
VE22	NC	NC	NC	415.0	Full	28	35	1	108	Full	36	240	5	365	Full
VE23	NC	NC	NC	850.0	Full	25	250	5	57	Full	34	1750	38	1465	Full
VE24	NC	NC	NC	NC	Full	27	210	5	510	Full	34	4500	98	814	Full
VE25	NC	NC	NC	NC	Full	25	180	4	258	Full	34	137.5	3	222	Full
VE26	NC	NC	NC	640.0	Full	26	290	6	110	Full	37	300	7	405	Full
VE27	NC	NC	NC	300.0	Full	25	70	2	360	Full	35	88	2	795	Full
Total Flow Rate		0	0.0				1445	31.5				7813	170.5		
AS Wells															
AS12	OFF LINE			0.0	Full	5.5	WATER	NC	1.2	Full	8.0	320	7	0.0	Full
AS13				11.0	Full	5.5	NC	NC	10.1	Full	8.0	300	7	0.0	Full
AS14				NC	Full	5.5	NC	NC	5.1	Full	8.5	335	7	0.0	Full
AS15				NC	Full	5.5	NC	NC	0.0	Full	8.5	185	4	0.0	Full
AS16				NC	Full	5.5	NC	NC	4.9	Full	8.0	10500	229	0.0	Full
AS17				0.0	Full	5.5	NC	NC	0.0	Full	8.0	525	11	0.0	Full
Total Flow Rate															
Drive Point Mon. Wells															
DP01	0.00	NA	NA	NC	NA	0.00	NA	NA	NC	NA	0.00	NA	NA	164	NA
DP02	0.00	NA	NA	125	NA	0.00	NA	NA	38	NA	0.00	NA	NA	5.5	NA
DP03	0.00	NA	NA	1100	NA	0.00	NA	NA	34	NA	0.00	NA	NA	109	NA
DP04	0.00	NA	NA	800	NA	0.00	NA	NA	28	NA	0.00	NA	NA	286	NA
DP05	0.00	NA	NA	40	NA	0.00	NA	NA	233	NA	0.00	NA	NA	144	NA

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PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Twenty-Second Month					Twenty-Eighth Month					Twenty-Ninth Month				
	6/23/99					7/27/99					8/25/99				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit															
Readings before moisture separator (MS). Valve positions before/after MS	36 "H_2O	1650	36	35	1/2 open / 1/2 open	22 "H_2O	2800	61	54	1/2 open / 1/2 open	25 "H_2O	2750	60	NA	1/2 open / 1/2 open
Gage before air filter	54 "H_2O	NA	NA	NA	NA	65 "H_2O	NA	NA	NA	NA	39 "H_2O	NA	NA	NA	NA
Gage after air filter	70 "H_2O	NA	NA	NA	NA	40 "H_2O	NA	NA	NA	NA	80 "H_2O	NA	NA	NA	NA
AS Unit															
Before make-up valve (gage)	8 psi	NA	NA	NA	NA	8 psi	NA	NA	NA	NA	NA	NA	NA	NA	NA
Line after make-up valve	8 psi	1500	33	NA	1/2	8 psi	2400	52	NA	1/2	6.5 psi	2000	44	NA	1/2
SVE Wells															
VE18	38	75	2	500	Full	20	625	14	290	Full	20	430	9	NA	Full
VE19	34	75	2	100	Full	22	250	5	240	Full	19.5	170	4	NA	Full
VE20	16	30	1	10	Full	20	375	8	0	Full	19.5	215	5	NA	Full
VE21	14	100	2	>5000	Full	21	450	10	225	Full	19.75	185	4	NA	Full
VE22	38	75	2	100	Full	22	315	7	0	Full	21	180	4	NA	Full
VE23	36	50	1	0	Full	22	220	5	246.5	Full	20.25	370	8	NA	Full
VE24	36	200	4	30	Full	22	410	9	23	Full	20	600	13	NA	Full
VE25	36	75	2	250	Full	22	310	7	110	Full	20	300	7	NA	Full
VE26	38	65	1	150	Full	22	590	13	240	Full	20	550	12	NA	Full
VE27	36	125	3	150	Full	21	200	4	120	Full	20	450	10	NA	Full
Total Flow Rate		870	19.0				3745	81.7				3450	75.3		
AS Wells															
AS12	7.0	200	4	0.0	Full	8.0	350	8	NA	Full	6.0	290	6	NA	Full
AS13	7.0	150	3	0.0	Full	8.0	270	6	NA	Full	6.0	180	4	NA	Full
AS14	7.0	180	4	5.0	Full	Water	Water	Water	NA	Full	6.0	215	5	NA	Full
AS15	6.0	300	7	50.0	Full	7.5	7.5	0	NA	Full	6.0	540.0	12	NA	Full
AS16	6.0	76000	1658	5.0	Full	Water	Water	Water	NA	Full	5.5	320	7	NA	Full
AS17	7.0	600	13	0.0	Full	8.0	8	0	NA	Full	6.0	430	9	NA	Full
Total Flow Rate															
Drive Point Mon. Wells															
DP01	0.00	NA	NA	100	NA	0.05	NA	NA	0	NA	0.25	NA	NA	NA	NA
DP02	0.00	NA	NA	0	NA	1.00	NA	NA	0	NA	1.65	NA	NA	NA	NA
DP03	0.00	NA	NA	20	NA	0.00	NA	NA	0	NA	0.20	NA	NA	NA	NA
DP04	0.00	NA	NA	10	NA	0.00	NA	NA	0	NA	0.35	NA	NA	NA	NA
DP05	0.00	NA	NA	50	NA	0.00	NA	NA	0	NA	0.08	NA	NA	NA	NA

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PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Thirty-First Month 10/4/1999 & 10/5/1999					Thirty-Third Month 10/27/99					Thirty-Sixth Month 12/9/99				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit															
Readings before moisture separator (MS). Valve positions before/after MS	30 "H_2O	375	8	NA	1/4 open / 1/4 open	20 "H_2O	375	8	NA	1/2 open / 1/2 open	32 "H_2O	770	17	NA	1/2 open / 1/2 open
Gage before air filter	60 "H_2O	NA	NA	NA	NA	72 "H_2O	NA	NA	NA	NA	Off Line	NA	NA	NA	NA
Gage after air filter	50 "H_2O	NA	NA	NA	NA	40 "H_2O	NA	NA	NA	NA	Off Line	NA	NA	NA	NA
AS Unit															
Before make-up valve (gage)	9 psi	NA	NA	NA	NA	9 psi	NA	NA	NA	NA	Off Line	NA	NA	NA	NA
Line after make-up valve	9 psi	1700	37	NA	1/2	8 psi	3450	75	NA	1/2	Off Line	Off Line	Off Line	NA	1/2
SVE Wells															
VE18	25	375	8	(*)	Full	19.75	289	6	N/C	Full	32	390	9	15	Full
VE19	28	340	7	68	Full	19	345	8	52	Full	32	500	11	325	Full
VE20	28	349	8	1280(*)	Full	19.5	285	6	940	Full	32	375	8	23	Full
VE21	24	300	7	521	Full	20	260	6	490	Full	32	400	9	35	Full
VE22	27	325	7	360	Full	WATER		WATER	400	Full	31	350	8	2	Full
VE23	28	445	10	240	Full	19.5	288	6	215	Full	31	380	8	105	Full
VE24	20	430	9	230	Full	20.25	265	6	128	Full	31	480	10	40	Full
VE25	27	400	9	617	Full	19	337	7	547	Full	31	500	11	175	Full
VE26	28	260	6	420	Full	19.75	316	7	300	Full	32	440	10	150	Full
VE27	27	335	7	830	Full	20	295	6	621	Full	32	450	10	85	Full
Total Flow Rate		3559	77.6				2680	58.5				4265	93.0		
AS Wells															
AS12	8.5	150	3	0	Full	7.0	285	6	0	Full	NA	NA	NA	0	Full
AS13	8.5	80	2	0	Full	WATER	WATER	WATER	0	Full	NA	NA	NA	0	Full
AS14	8.5	110	2	(*)	Full	WATER	WATER	WATER	0	Full	NA	NA	NA	0	Full
AS15	8.75	300.0	7	(*)	Full	7.00	554.0	12	12	Full	NA	NA	NA	0	Full
AS16	WATER	WATER	WATER	0	Full	WATER	WATER	WATER	0	Full	NA	NA	NA	0	Full
AS17	9.0	250	5	0	Full	WATER	WATER	WATER	0	Full	NA	NA	NA	0	Full
Total Flow Rate															
Drive Point Mon. Wells															
DP01	NA	NA	NA	380	NA	0.00	NA	NA	221	NA	NA	NA	NA	0	NA
DP02	NA	NA	NA	140	NA	0.10	NA	NA	151	NA	NA	NA	NA	0	NA
DP03	NA	NA	NA	270	NA	0.00	NA	NA	48	NA	NA	NA	NA	0	NA
DP04	NA	NA	NA	612	NA	0.10	NA	NA	0	NA	NA	NA	NA	0	NA
DP05	NA	NA	NA	71	NA	0.10	NA	NA	0	NA	NA	NA	NA	0	NA

(*) -- Wells were repaired with PVC glue, which shows up on PID. Therefore, PID readings would not prove to be accurate GW/Soil readings.

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PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Thirty-Fourth Month 1/5/00					Thirty-Fifth Month 2/24/00					Thirty-Seventh Month 4/4/00				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit															
Readings before moisture separator (MS). Valve positions before/after MS	35 "H_2O	500	11	NA	1/2 open / 1/2 open	NC	NC	NC	NC	1/2 open / 1/2 open	20 "H2O	1100	24	NA	1/2 open / 1/2 open
Gage before air filter	84 "H_2O	NA	NA	NA	NA	NC	NC	NC	NC	NA	62 "H2O	NA	NA	NA	NA
Gage after air filter	44 "H_2O	NA	NA	NA	NA	NC	NC	NC	NC	NA	40 "H2O	NA	NA	NA	NA
AS Unit															
Before make-up valve (gage)	9.5 psi	NA	NA	NA	NA	NC	NC	NC	NC	NC	Off Line	Off Line	Off Line	Off Line	Off Line
Line after make-up valve	8.5 psi	325	7	NA	1/2	NC	NC	NC	NC	NC	Off Line	Off Line	Off Line	Off Line	Off Line
SVE Wells															
VE18	34	445	10	0.5	Full	33.75	450	10	0.0	Full	16	220	5	30.0	Full
VE19	34	485	11	12	Full	34	475	10	0.0	Full	17	250	5	42.0	Full
VE20	33	385	8	45	Full	33.5	400	9	25	Full	17	260	6	64	Full
VE21	33.75	395	9	85	Full	33.5	385	8	45	Full	17	280	6	27	Full
VE22	33.75	415	9	0	Full	32.75	425	9	15	Full	18	265	6	107	Full
VE23	32.25	390	9	0	Full	33.75	400	9	0.0	Full	17	310	7	43.0	Full
VE24	33.5	290	6	75	Full	34	300	7	120	Full	16	240	5	98	Full
VE25	33.5	195	4	100	Full	33	200	4	150	Full	18	275	6	55	Full
VE26	34	335	7	50	Full	33.5	375	8	60	Full	16	250	5	24	Full
VE27	33.75	425	9	40	Full	33.75	450	10	10	Full	17	225	5	91	Full
Total Flow Rate		3760	82.0				3860	84.2				2575	56.2		
AS Wells															
AS12	8.0	240.0	5	0	Full	8.25	250.0	5	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
AS13	Water	Water	Water	0	Full	8.25	200.0	4	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
AS14	8.0	190.0	4	0	Full	8.25	225.0	5	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
AS15	8.0	395.0	9	0	Full	8.25	450.0	10	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
AS16	Water	Water	Water	0	Full	8.25	325.0	7	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
AS17	Water	Water	Water	0	Full	8.25	450.0	10	0.0	Full	Off Line	Off Line	Off Line	0.0	Full
Total Flow Rate															
Drive Point Mon. Wells															
DP01	NA	NA	NA	7	NA	0.0	NA	NA	15	NA	NA	NA	NA	88.7	NA
DP02	NA	NA	NA	0	NA	1.5	NA	NA	0.0	NA	NA	NA	NA	22.6	NA
DP03	NA	NA	NA	20	NA	0.0	NA	NA	25	NA	NA	NA	NA	75.0	NA
DP04	NA	NA	NA	0	NA	0.5	NA	NA	0.0	NA	NA	NA	NA	222.0	NA
DP05	NA	NA	NA	0	NA	0.0	NA	NA	0.0	NA	NA	NA	NA	82.0	NA

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PHYSICAL PARAMETERS
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
BOGUE FIELD, NORTH CAROLINA
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SAMPLE POINT	Thirty-Eighth Month 5/9/00					Thirty-Ninth Month 6/27/00				
	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V	VAC/PRES ("H_2O/psi)	VELOCITY (ft/min)	FLOW (ft^3/min)	PID (ppm)	V
SVE Unit										
Readings before moisture separator (MS). Valve positions before/after MS	24 "H2O	NC	NC	NA	1/2 open / 1/2 open	15 "H2O	360	NC	NA	1/2 open / 1/2 open
Gage before air filter	84 "H2O	NA	NA	NA	NA	90 "H2O	NA	NA	NA	NA
Gage after air filter	38 "H2O	NA	NA	NA	NA	31 "H2O	NA	NA	NA	NA
AS Unit										
Before make-up valve (gage)	Off Line	Off Line	Off Line	Off Line	Off Line	7 psi	NA	NA	NA	NA
Line after make-up valve	Off Line	Off Line	Off Line	Off Line	Off Line	6 psi	1650	36	NA	1/2
SVE Wells										
VE18	25	305	7	35.0	Full	30	350	8	3.7	Full
VE19	24	375	8	12.0	Full	30	400	9	6.2	Full
VE20	24	330	7	NC	Full	30	354	8	115	Full
VE21	26	320	7	57	Full	30	545	12	32	Full
VE22	24	390	9	17	Full	30	429	9	106	Full
VE23	24	310	7	0.0	Full	30	510	11	3.8	Full
VE24	25	375	8	0	Full	30	460	10	9	Full
VE25	24	360	8	15	Full	30	315	7	167	Full
VE26	25	320	7	0	Full	30	330	7	13	Full
VE27	25	300	7	97	Full	29.5	340	7	210	Full
Total Flow Rate		3385	73.9				4033	88.0		
AS Wells										
AS12	Off Line	Off Line	Off Line	0.0	Full	6.00	275.0	6	0.0	Full
AS13	Off Line	Off Line	Off Line	0.0	Full	6.50	150.0	3	0.0	Full
AS14	Off Line	Off Line	Off Line	0.0	Full	NA	NA	NA	0.0	Full
AS15	Off Line	Off Line	Off Line	0.0	Full	5.50	450.0	10	0.0	Full
AS16	Off Line	Off Line	Off Line	0.0	Full	NA	NA	NA	0.0	Full
AS17	Off Line	Off Line	Off Line	0.0	Full	6.00	NA	NA	0.0	Full
Total Flow Rate										
Drive Point Mon. Wells										
DP01	NA	NA	NA	11.9	NA	0	NA	NA	90.0	NA
DP02	NA	NA	NA	1.1	NA	0	NA	NA	0.0	NA
DP03	NA	NA	NA	20.8	NA	0	NA	NA	65.0	NA
DP04	NA	NA	NA	10.2	NA	0	NA	NA	112.0	NA
DP05	NA	NA	NA	16.9	NA	0	NA	NA	26.7	NA

V = Valve position
NA = Not Applicable
NR = System not being operated
NC = Not Collected

1 Well measurements collected on 12/17/97during third month evaluation before any adjustments to the system were made.
2 Due to heavy rain the water table was elevated to just below ground surface which means the extraction well screens were below the water level.
3 Month seven evaluation skipped to provide time to evaluate data collected during sixth month sampling event.

070012/P

TABLE 2-4

FREE PRODUCT THICKNESS MEASUREMENT AND AVERAGE DEPTH TO GROUNDWATER
IN VAPOR EXTRACTION WELLS
MCALF BOGUE FIELD
BOGUE FIELD, NORTH CAROLINA
PAGE 1 OF 2

	Free Product thickness measured in inches													
WELL ID	9/17/97	9/30/97	10/2/97	10/30/97	11/20/97	12/17/97	1/27/98	2/19/98	4/1/98	5/20/98	7/20/98	9/30/98	12/1/98	1/11/99
VE18	**0.125**	0.0	**0.125**	**0.25**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VE19	**0.75**	0.0	0.0	**2.5**	0.0	0.0	0.0	0.0	0.0	0.0	**3.5**	0.0	**1.0**	0.0
VE20	0.0	0.0	0.0	0.0	**0.25**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VE21	**12.5**	**0.25**	**2.0**	**6.8**	**12.0**	**17.0**	**0.125**	0.0	**0.25**	0.0	**4.0**	**6.0**	**1.5**	**0.125**
VE22	0.0	0.0	**0.125**	0.0	**12.5**	**18.0**	0.0	0.0	**0.25**	0.0	**0.125**	0.0	0.0	0.0
VE23	NA	**5.0**	**0.125**	**2.0**	NA	**0.125**	**6.0**	0.0	0.0	0.0	**11.0**	**0.25**	**0.125**	0.0
VE24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.0**	**0.5**	0.0	**0.125**
VE25	**0.125**	0.0	0.0	0.0	**0.125**	**0.125**	0.0	0.0	0.0	0.0	**2.0**	**1.0**	**0.25**	0.0
VE26	**9.0**	**2.0**	0.0	**4.0**	**0.25**	0.0	0.0	0.0	0.0	0.0	**3.5**	0.0	**0.25**	0.0
VE27	**8.0**	**0.25**	**0.125**	**6.0**	**6.0**	**13.0**	**6.0**	0.0	**0.25**	0.0	**3.5**	**1.0**	**2.0**	**0.5**

Avg. depth to GW (bgs)	**6.5'**	**5.2'**	**na**	**5.6'**	**5.3'**	**4.3'**	**3.1'**	**0.8'**	**4.1'**	**3.8'**	**5.6'**	**4.5'**	**5.5'**	**4.6'**

TABLE 2-4

FREE PRODUCT THICKNESS MEASUREMENT AND AVERAGE DEPTH TO GROUNDWATER IN VAPOR EXTRACTION WELLS
MCALF BOGUE FIELD
BOGUE FIELD, NORTH CAROLINA
PAGE 2 OF 2

	Free Product thickness measured in inches.											
WELL ID	5/13/99	6/23/99	7/27/99	8/25/99	10/4/99	10/27/99	12/9/00	1/5/00	2/24/00	4/3/00	5/8/00	6/27/00
VE18	0.0	0.0	0.0[2]	0.0[2]	0.0[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0[4]
VE19	0.0	0.0[1]	**0.25**[2]	**4.0**	**0.125**[2]	0.0	0.0	**0.5**[3]	**0.5**[3]	0.0	0.0[4]	0.0
VE20	**0.25**	0.0[1]	0.0[2]	0.0[2]	0.0	**0.5**	0.0	**2.0**[3]	0.0	0.0	0.0[4]	0.0[4]
VE21	**0.5**	**0.25**	0.0[2]	**9.0**[2]	**4.0**	**0.5**	**2.0**	0.0	0.0	0.0	0.0[1,4]	0.0
VE22	0.0	0.0	0.0	0.0[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VE23	0.0	0.0	0.0	**0.5**[2]	0.0	0.0	0.0	0.0	0.0	0.0[4]	0.0[4]	0.0[1,4]
VE24	**3.75**	0.0	0.0[1]	**3.0**	0.0	0.0	0.0	0.0	0.0	0.0[4]	0.0[4]	0.0[4]
VE25	0.0	0.0	0.0	**4.0**	**0.125**	0.0	0.0	0.0	0.0	0.0[4]	0.0[4]	0.0[4]
VE26	**0.5**	0.0[1]	**0.25**	**3.0**	0.0	0.0	0.0	0.0	0.0	0.0[4]	0.0[4]	0.0[4]
VE27	**0.5**	**0.125**	**0.25**[2]	**4.0**	**0.25**[2]	**0.125**	**2.0**[2]	**2.0**[2]	**0.25**[3]	0.0	0.0	0.0[4]
Avg. depth to GW (bgs)	**4.9'**	**4.9'**	**5.8'**	**6.6'**	**3.6'**	**3.9'**	**4.5'**	**5.0'**	**4.9'**	**5.3'**	**4.3'**	**5.6'**

Note: Only vapor extraction wells had visible free product.
January through April were extremely rainy with a very high water table (at the ground surface at times).

1 Sheen
2 Black Flock
3 Floating flock, not typical free product.
4 Black material or liquid identified at bottom of bailer or in multiple bails.

May 2000 investigation. Also during this evaluation, a product sheen was noted in vapor extraction well VE21. This transformation of a floating free product to a sinking product is displayed in the photos provided in Figure 2-2.

As presented in the initial status letter report, a graphical comparison of the monthly rainfall data collected at MCALF Bogue and the free product measured in the vapor extraction wells was conducted. Figure 2-3 plots the total monthly rainfall and the amount of free product observed from the start-up of the project through June 2000.

Since the groundwater table fluctuates quickly with the various rain events, it is more appropriate to compare the groundwater depth to the observed free product from the same day. Figure 2-4 provides a plot of the groundwater depth versus the observed average free product thickness.

2.4 ANALYTICAL RESULTS

As presented and discussed in the initial status report (TtNUS, 1999), baseline data were collected prior to system startup. During the operation of the system, groundwater and soil samples were collected to monitor system progress and air samples were collected to verify compliance with regulatory and health and safety requirements.

The analytical results of sampling conducted since the initial status report was submitted are provided in Appendix A and are discussed in the following sections.

2.4.1 Soil Data

A round of soil samples were collected on August 25, 1999. Soil samples were collected from two of the five pre-startup soil boring locations at depth intervals of 1 to 3 feet and 4 to 6 feet. The samples were analyzed for BTEX, GRO, DRO, eicosane, pyrene, and nonane. The two soil boring locations were located in the immediate area of the AS/SVE system. The results of these analyses are summarized on the Tag Map provided as Figure 2-5.

As can be seen on Figure 2-5, the primary constituents of concern are DRO and GRO. Concentrations of these constituents have reduced between system startup and the August 1999 sampling event. The highest concentrations of the constituents persist at the static water table depth of 4 to 6 feet bgs.

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FIGURE 2-2
VAPOR EXTRACTION WELL VE 27 PHOTOS
MCALF BOGUE FIELD
BOGUE FIELD, NC
PAGE 1 OF 2

Photo of Vapor Extraction Well VE27 taken January 5, 2000 showing discolored groundwater, floating black floc material, and a thin floating free product layer on top.

FIGURE 2-2
VAPOR EXTRACTION WELL VE 27 PHOTOS
MCALF BOGUE FIELD
BOGUE FIELD, NC
PAGE 2 OF 2

Photo of Vapor Extraction Well VE27 taken July 26, 2000 showing sinking product. Similar material was identified in almost all of the VE wells.

FIGURE 2-3
PRECIPITATION AND PRODUCT THICKNESS CHART
SITE 29 - CRASH CREW BURN PIT
MCALF BOGUE FIELD, NC

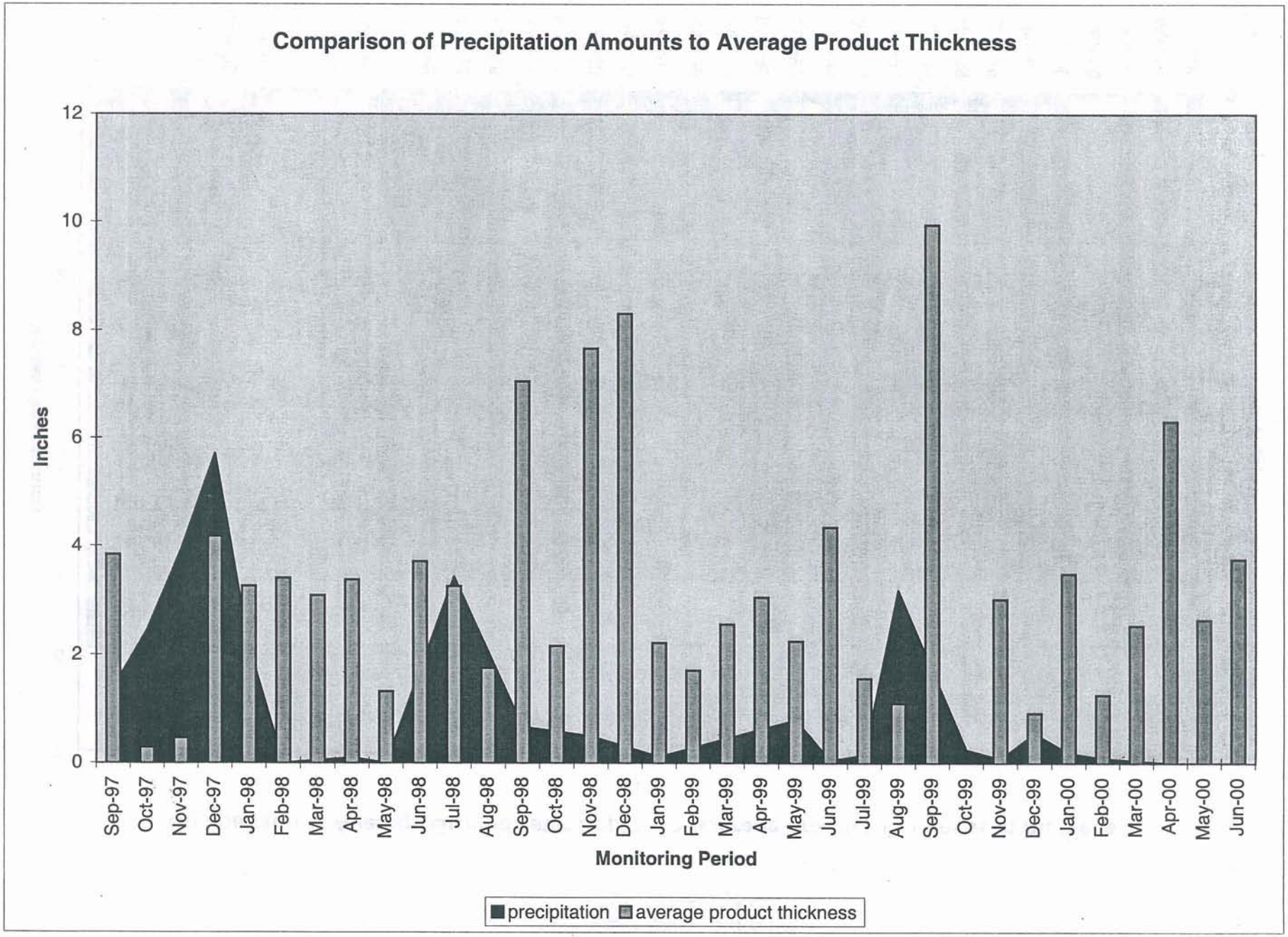
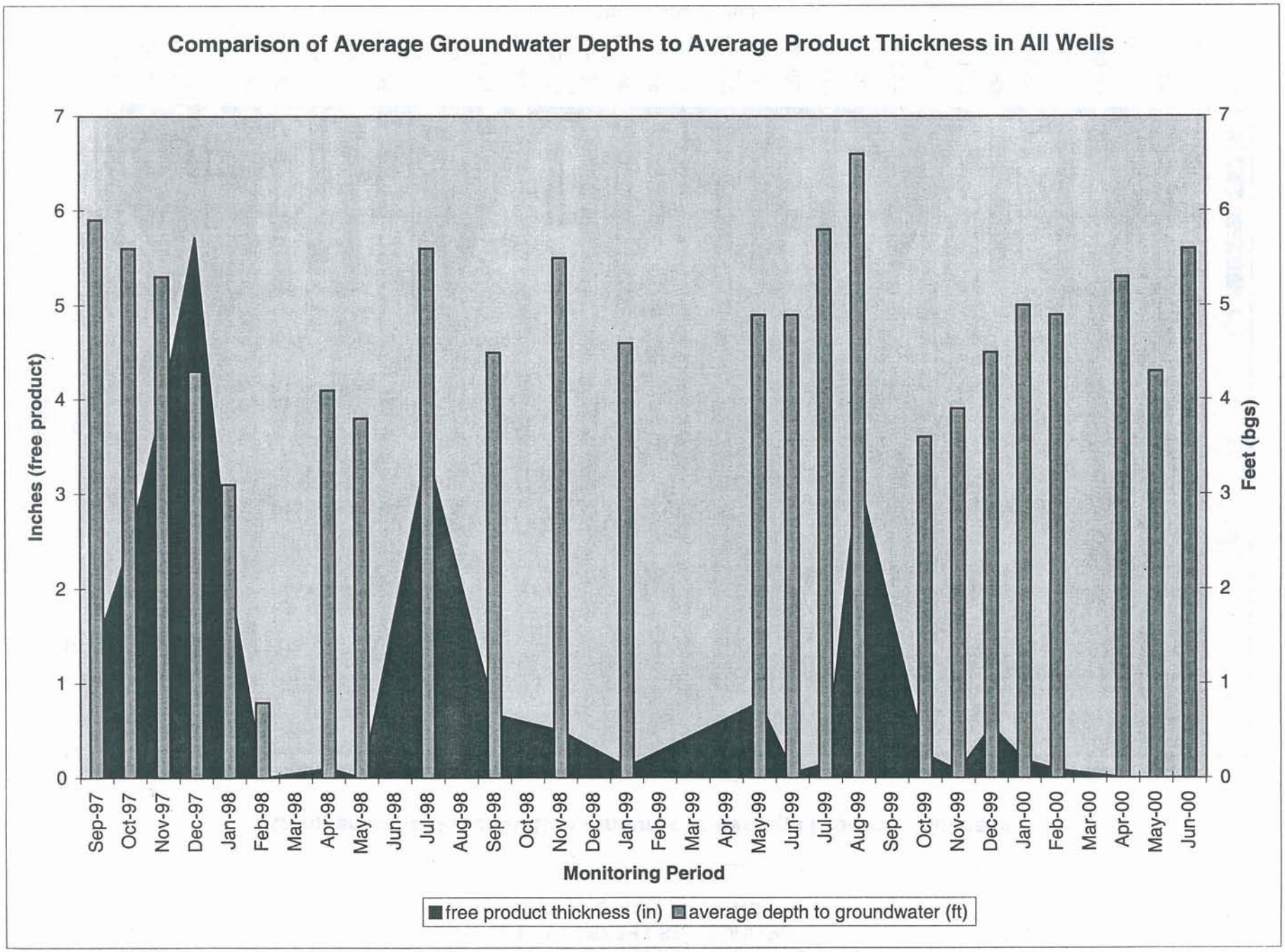


FIGURE 2-4
GROUNDWATER DEPTH AND PRODUCT THICKNESS CHART
SITE 29 - CRASH CREW BURN PIT
MACLF BOGUE FIELD, NC



2.4.2 Groundwater Data

A round of groundwater sampling was conducted on August 24, 1999. The results of the sampling effort are provided in Table 2-5. Four shallow monitoring wells were sampled in August 1999, one in the system area (S29-MW-02), two down-gradient of the system, (S29-MW-01 and S29-MW-10) and one side-gradient to the system (S20-MW-08). The groundwater samples were analyzed for BTEX and TRPH. All the samples were below the regulatory criteria except for one detection of benzene in S29-MW-10. Benzene was detected at a concentration of 2.9 µg/1, which is slightly above the regulatory criteria of 1.0 µg/1 but decreased from the previous sampling efforts in 1994 and 1998 which detected benzene concentrations of 7.6 µg/l and 13.0 µg/l, respectively.

In May 2000 the sinking black aqueous material which was noted in the vapor extraction wells was sampled. The liquid was analyzed for GRO and DRO. The results of the sample collected from VE19 were 1,700,000 µg/l GRO and 160,000 µg/l DRO and for VE24 were 110,000 µg/l and 8,300 µg/l DRO. The clear groundwater above the sinking material was not sampled.

The results of the groundwater samples collected in August 1999 and May 2000 are included in Appendix A.

2.4.3 Air Data

Air samples were collected during startup of the system and during the monthly system evaluations to determine the amount of contamination being extracted and whether treatment of the off gas was required. The testing concluded that off-gas treatment was not required to meet the regulatory and health and safety requirements and the GAC could be removed and the off-gas treatment unit was taken off line in December 1997.

Since the initial status letter report, two air samples were collected, one in August 1999 and one in June 2000. The analytical results from all the air sampling efforts are provided in Table 2-6. The results indicate contaminant concentrations in the off gas are still at levels which do not exceed OSHA and EPA Region III RBC. At no point after the initial modeling was conducted did the concentrations exceed those that were used to conduct the modeling. Sampling of the off gas has been reduced to semiannual sampling to verify continued compliance.

2.5 SYSTEM STATUS

The system is currently in the thirty-third month of operation. The PVC piping is in good condition; however, some of the connections have required replacement. Several extraction wells were damaged

TABLE 2-5

GROUNDWATER ANALYTICAL RESULTS
AS/SVE TREATABILITY STUDY SYSTEM
MCALF BOGUE FIELD, NC
PAGE 1 OF 2

		S29-GW-M02 Monitioring Well 02 (middle of the AS/SVE system)						S29-GW-11 Monitioring Well 11 (middle of the AS/SVE system)			
ANALYTE	Regulatory Standard (ug/l)	29GW02 Phase II RI, Round 3 - 4/94	GW-M02-01 9/7/97	GW-M02-02 10/17/97	GW-M02-03 4/3/98	GW-M02-04 7/22/98	GW-M02-04 8/24/99	GW-M11-01 9/7/97	GW-M11-02 10/17/97	GW-M11-03 4/3/98	GW-M11-04 7/22/98
Benzene	1.0 (1)	**86 ug/l**	**19.0 ug/l**	**1.4 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l	<5 ug/l	<1 ug/l	<1 ug/l	<1 ug/l
Ethyl Benzene	29 (2)	**38 ug/l**	**31.0 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l	<1 ug/l	**15.0 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l
Toluene	1,000 (1,2)	**<1 ug/l**	<5 ug/l	<1 ug/l	<1 ug/l	<1 ug/l	<1 ug/l	**13.0 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l
Xylene, Total	530 (1)	**134J ug/l**	**94.0 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l	<1 ug/l	**4.0 ug/l**	<1 ug/l	<1 ug/l	<1 ug/l

TABLE 2-5

GROUNDWATER ANALYTICAL RESULTS
AS/SVE TREATABILITY STUDY SYSTEM
MCALF BOGUE FIELD, NC
PAGE 2 OF 2

		S29-GW-M03 Monitoring Well 3 (up gradient well)				S29-GW-M10 Monitoring Well 10 (down gradient well)						S29-GW-M01 Monitoring Well 01 (down gradient well)				S29-GW-M08 Monitoring Well 08 (down gradient well)			
ANALYTE	Regulatory Standard (ug/l)	GW-03-RI-3 4/94		GW-03-04 7/22/98		GW-10-RI-3 4/94		GW-10-04 7/22/98		GW-10-04 8/24/99		29GW-01 Phase II RI, Round 3 - 4/94		GW-01-04 8/24/99		29GW-O8 Phase II RI, Round 3 - 4/94		GW-08-04 8/24/99	
Benzene	1.0 (1)	**0.3**	**ug/l**	<1	ug/l	**7.6**	**ug/l**	**13.0**	**ug/l**	**2.9**	**ug/l**	<1	ug/l	<1	ug/l	<1	ug/l	<1	ug/l
Ethyl Benzene	29 (2)	<1	ug/l	<1	ug/l	**0.6**	**ug/l**	**0.8**	**ug/l**	<1	ug/l	7.65	ug/l	<1	ug/l	<1	ug/l	<1	ug/l
Toluene	1,000 (1,2)	<1	ug/l	<1	ug/l	**0.4**	**ug/l**	<1	ug/l	<1	ug/l	<1	ug/l	<1	ug/l	<1	ug/l	<1	ug/l
Xylene, Total	530 (1)	<1	ug/l	<1	ug/l	**6.6**	**ug/l**	**2.7**	**ug/l**	<1	ug/l	9.3	ug/l	<1	ug/l	2.65	ug/l	<1	ug/l

Bold = Detected Value
Initial sample for MW03 and MW10 result from last sample collected prior to system installation (RI Phase 11 sample round 3).
1 North Carolina State Groundwater Standard
2 Federal Primary Maximum Contaminant Level (MCL)

Extraction Wells Sampling Effort (5/9/00)
VE19: DRO=1,700,000 ug/L; GRO=110,000 ug/L
VE24: DRO=160,000 ug/L; GRO=8,300 ug/L

TABLE 2-6

AIR ANALYTICAL RESULTS
AS/SVE TREATABILITY STUDY SYSTEM
MCALF BOGUE FIELD, NC
PAGE 1 OF 2

ANALYZE	S29-AS-G00-01 9/12/97 Start-up SVE Only	S29-AS-G-02 10/3/97 AS/SVE Baseline	S29-AS-G00-03 11/20/97 AS/SVE Second Month	S29-AS-G00-04 12/18/97 AS/SVE Third Month	S29-AS-G00-05 1/27/98 AS/SVE Forth Month(1)	S29-AS-G00-06 2/19/98 AS/SVE Fifth Month(1)	S29-AS-G00-07 4/1/98 AS/SVE Sixth Month(1)	S29-AS-G00-08 5/20/98 AS/SVE Eight Month	S29-AS-G00-09 7/21/98 AS/SVE Tenth Month
Oxygen	15.0 %	20 %	23 %	17 %	22 %	22 %	21 %	21 %	16 %
Carbon dioxide	3.40 %	1 %	0.35 %	4.1 %	0.048 %	0.039 %	0.2 %	0.3 %	3 %
Benzene	**1500 ppb**	**45 ppb**	<6.9 ppb	**29 ppb.**	<6.7 ppb	<0.67 ppb	<3.6 ppb	<0.68 ppb	**44 ppb**
Toluene	<68 ppb	<24 ppb	<6.9 ppb	<6.9 ppb	<6.7 ppb	<0.67 ppb	<3.6 ppb	**2 ppb**	<35 ppb
Ethyl Benzene	**3400 ppb**	**140 ppb**	**12 ppb**	**45 ppb**	<6.7 ppb	<0.67 ppb	<3.6 ppb	**1.4 ppb**	**66.0 ppb**
m,p-Xylene	**7400 ppb**	**380 ppb**	**50 ppb**	**160 ppb**	<6.7 ppb	<0.67 ppb	**12 ppb**	**5 ppb**	**100 ppb**
o-Xylene	**330 ppb**	<24 ppb	<6.9 ppb	**22 ppb**	<6.7 ppb	<0.67 ppb	<3.6 ppb	**2.6 ppb**	<35 ppb

TABLE 2-6

AIR ANALYTICAL RESULTS
AS/SVE TREATABILITY STUDY SYSTEM
MCALF BOGUE FIELD, NC
PAGE 2 OF 2

ANALYZE	S29-AS-G00-10 9/30/98 AS/SVE Twelveth Month[2]	S29-AS-G00-11 1/12/99 AS/SVE Fifteenth Month	S29-AS-G00-12 5/14/99 AS/SVE Ninteenth Month	S29-AS-G00-13 8/25/99 AS/SVE Twenty-Second Month	S29-AS-G00-13 6/27/00 AS/SVE Thirty-First Month
Oxygen	12 %	14 %	19 %	14 %	17 %
Carbon dioxide	9.2 %	4.8 %	0.12 %	4.1 %	3.8 %
Benzene	**14 ppb**	<6.7 ppb	<6.8 ppb	**77 ppb**	**8.3 ppb**
Toluene	<3.5 ppb	<6.7 ppb	<6.8 ppb	**170 ppb**	**61 ppb**
Ethyl Benzene	**30.0 ppb**	**9.2 J ppb**	<6.8 ppb	**73 ppb**	**9.2 ppb**
m,p-Xylene	**26 ppb**	**6.7 J ppb**	<6.8 ppb	**80 ppb**	**15 ppb** [3]
o-Xylene	**8.7 ppb**	<6.7 ppb	<6.8 ppb	<24 ppb	NA

Bold = Detected Value

1 January through April had exceptionally high water table. Vadose zone screen area not fully represented and may have provided false non detections when considering the seasonal low full vadose zone as treatment area. March water levels were still high.

NOTE: Air samples shown on this table were collected between vacuum blower and first GAC unit.

2 October event identifed AS unit not operating which explains the lower oxygen and higher CO_2.

3 Xylenes reported as total value

during storm events and during grass cutting operations. Repairs to the wells were conducted. The plastic sheeting has several punctures and tears, but the nylon netting is preventing the rips from getting larger. Spot repairs have been made to address the damage. The MCAS Cherry Point is keeping up with the grass mowing operation in the area, however there are many thick vegetation outcrops within the system area. The system pressure, vacuum, and flow rate measurements are all within the desired ranges. The AS blower rotary veins have been replaced twice and the AS blower drive couple has also been replaced. The system is currently in good operating condition, but does have a history of going off line. The main causes for the system going off line include: excessive water in moisture separator due to high water table, intentional shut offs during storm events, and equipment failures.

3.0 SUMMARY AND RECOMMENDATIONS

On June 19, 2000, the scope of this project was modified to operate and evaluate the AS/SVE system until January 2001. The modification included monthly system evaluations, quarterly air sampling, additional groundwater sampling, and preparing and submitting this status letter report addendum.

It was recommended in the Draft Final Phase II RI, that due to the nature and activities associated with the site contaminants that this site be addressed under the state underground storage tank program. The RI report also recommended that product removal continue and a CAP involving natural degradation/attenuation be implemented once all contamination sources and free product are removed or controlled.

The pilot study AS/SVE system has reduced the amount of free product at Site 29. This has been accomplished by volatilization, increased aerobic biodegradation, and other natural degradation processes. However, a sinking petroleum based aqueous material has been observed in the extraction wells. The monitoring wells (29GW02 and 29GW11) that historically had free product no longer contain product.

The concentrations of BTEX compounds in the groundwater in the two source area wells have been reduced to below the detection limits; however, benzene groundwater concentration in one of the downgradient wells (S29-GW-M10) has decreased but is still above the regulatory standard of 1.0 ppb. Soil contamination still exists and there appears to be a relationship between the fluctuation of the groundwater table and observed soil contamination levels. Both groundwater and soil contamination concentrations have decreased overall since system startup. Contaminant concentrations in the off-gas air samples are below action levels and, therefore, off-gas treatment is not required.

Pending further discussion of potential actions at the site the following activities are recommended:

- Continue to operate the AS/SVE system. The AS system will continue to be operated to provide an aerobic condition in the source area and, along with the SVE system, promote volatilization of the free product and dissolved phase constituents. Continue to record physical parameters of the system to assure that it is operating within the desired ranges and make adjustments as necessary.

- Collect a round of soil samples at the four locations previously sampled to evaluate progress of soil cleanup and trends.

- Collect a round of groundwater samples. The monitoring wells to be sampled for this round should include the downgradient wells (29GW09, 29GW10, and 29GW01) and the shallow source wells. Analytical parameters to be evaluated should be verified with state prior to sampling.

- Collect quarterly air samples to identify and document system discharge concentrations.

- Continue to collect data on physical observations, groundwater level measurements, and PID readings, and perform monthly maintenance of the system.

- Discuss possible additional actions at the site including conducting a soil source removal action, chemical oxidation of groundwater, or possible enhanced bioremediation additives.

REFERENCES

Brown & Root Environmental, July 1997. Pilot Test Work Plan, Site 29 - Crash Crew Burn Pit, Marine Corps Auxiliary Landing Field, Bogue, North Carolina.

Halliburton NUS Environmental Corporation, May 1991. Final RI Planning Documents. Prepared under Contract No. N62470-90-D-7630 for the Naval Facilities Engineering Command, Norfolk, Virginia.

Halliburton NUS Environmental Corporation, October 1992. Final Remedial Investigation. Prepared under Contract N62470-90-D-7630 for the Naval Facilities Engineering Command, Norfolk, Virginia.

Halliburton NUS Environmental Corporation, July 1993. Phase II RI Planning Documents. Prepared under Contract No. N62470-90-D-7630 for the Naval Facilities Engineering command, Norfolk, Virginia.

Halliburton NUS Corporation, January 1995. Draft Final Remedial Investigation Report, Phase II RI, Site 29 - Crash Crew Burn Pit, Marine Corps Auxiliary Landing Field, Bogue, North Carolina.

NUS Corporation, February 1989. Draft Site Inspection (SI) Report, Site 29 - Crash Crew Burn Pit, Marine Corps Auxiliary Landing Field, Bogue, North Carolina.

NUS Corporation, March 1989. Final Site Inspection Report. Prepared under Contract No. N62470-84-C-6886 for the Naval Facilities Engineering Command, Norfolk, Virginia.

NUS Corporation, May 1991. Final Remedial Investigation (RI) Planning Documents, Site 29 - Crash Crew Burn Pit, Marine Corps Auxiliary Landing Field, Bogue, North Carolina.

Tetra Tech NUS (TtNUS) Inc. 1999. AS/SVE System Status Letter Report for Site 29 - Crash Crew Burn Pit. Prepared for Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia, July.

Water and Air Research, Inc., March 1983. Initial Assessment Study (IAS) at MCAS Cherry Point, NC. Prepared under Contract No. 2474-82-C-8273 for Navy Energy and Environmental Support Activity.

APPENDIX A

ANALYTICAL RESULTS

CTO 272 MCAS CHERRY POINT
BOGUE FIELD
WATER DATA

Sample Location:	VE19	VE29	29GW01	29GW02	29GW08	29GW10
Sample:	S29-SVE19-FLOC	S29-SVE29-FLOC	S29GW01-04	S29GW02-04	S29GW08-04	S29GW10-04
Lad ID:	C0E110204001	C0E110204002	93419003	93419004	93419001	93419002
Sample Date:	5/9/00	5/9/00	8/24/99	8/24/99	8/24/99	8/24/99
QC Type:	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
Volatiles (ug/L)						
BENZENE			1 U	1 U	1 U	2.9
ETHYLBENZENE			1 U	1 U	1 U	1 U
TOLUENE			1 U	1 U	1 U	1 U
XYLENES, TOTAL			1 U	1 U	1 U	1 U
Petroleum Hydrocarbons						
DIESEL RANGE ORGANICS (ug/L)	1700000	160000				
GASOLINE RANGE ORGANICS (ug/L)	110000	8300				
TOTAL PETROLEUM HYDROCARBONS (mg/L)			0.5 U	0.5 U	0.5 U	0.5 U

CTO 272 MCAS CHERRY POINT
BOGUE FIELD
SOIL DATA

Sample Location:	SB20	SB20	SB22	SB22
Sample:	S29SB200103-3	S29SB200406-3	S29SB220102-3	S29SB220406-3
Lab ID:	93418001	93418002	93418003	93418004
Sample Date:	8/25/99	8/25/99	8/25/99	8/25/99
QC Type:	NORMAL	NORMAL	NORMAL	NORMAL
Semivolatiles (ug/kg)				
PYRENE	370 U	400 U	39 J	43 J
Volatiles (ug/kg)				
BENZENE	11 U	120 U	11 U	110 U
ETHYLBENZENE	11 U	120 U	11 U	630
TOLUENE	11 U	120 U	11 U	110 U
XYLENES, TOTAL	11 U	120 U	11 U	210
Petroleum Hydrocarbons (mg/kg)				
EICOSANE & NONAN	9.5 U	10 U	9.2 U	9 U
GASOLINE RANGE ORGANICS	14 U	160	2.8 U	88
OIL & GREASE	0.1	1.3	0.34	0.72
TPH-DIESEL-FUEL #2	5800	13000	3000	7900

CTO 272 MCAS CHERRY POINT
BOGUE FIELD
AIR DATA

Sample:	S29-ASSVE-082699	S29-SVE-062700
Lab ID:	93472001	M0G050204-001
Sample Date:	8/26/99	6/27/00
QC Type:	NORMAL	NORMAL
Volatiles (ppbv)		
BENZENE	77	8.3
ETHYLBENZENE	73	9.2
TOLUENE	170	61
M+P-XYLENES	80	
O-XYLENE	24 U	
XYLENES, TOTAL		15
Miscellaneous Parameters (%)		
CARBON DIOXIDE	4.1	3.8
OXYGEN	14	17

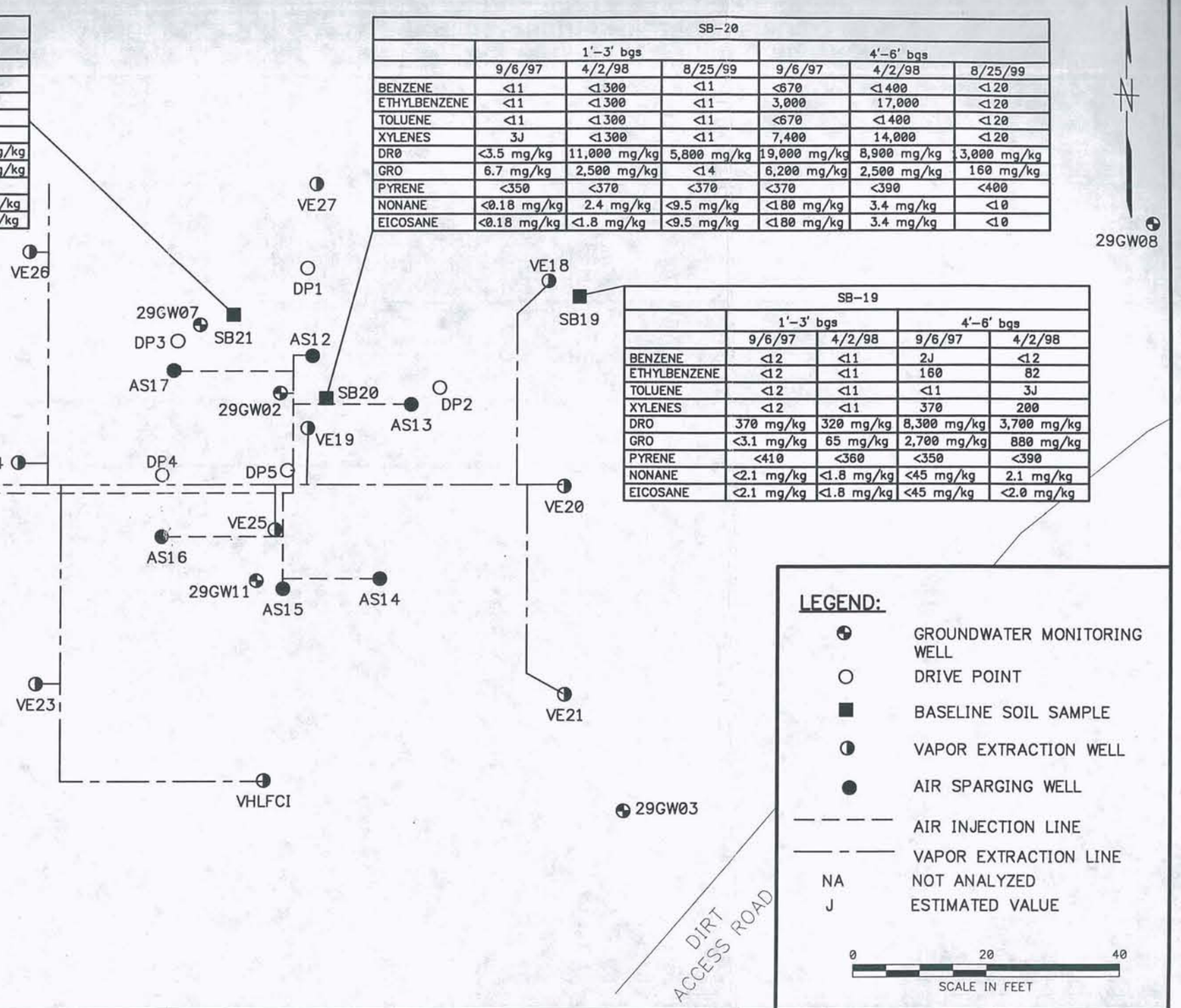
ACAD: 7415tm03.dwg 08/28/00 HJP

SB-21	1'-3' bgs		4'-6' bgs	
	9/6/97	4/2/98	9/6/97	4/2/98
BENZENE	<11	<11	<670	<1400
ETHYLBENZENE	<11	<11	5,100	6,700
TOLUENE	<11	<11	<670	<1400
XYLENES	<11	<11	19,000	4,00
DRO	8,200 mg/kg	10,000 mg/kg	29,000 mg/kg	13,000 mg/kg
GRO	300 mg/kg	880 mg/kg	8,400 mg/kg	2,600 mg/kg
PYRENE	<350	<360	150J	<380
NONANE	<71 mg/kg	<1.8 mg/kg	190 mg/kg	2.2 mg/kg
EICOSANE	<71 mg/kg	<1.8 mg/kg	190 mg/kg	<1.9 mg/kg

SB-20	1'-3' bgs			4'-6' bgs		
	9/6/97	4/2/98	8/25/99	9/6/97	4/2/98	8/25/99
BENZENE	<11	<1300	<11	<670	<1400	<120
ETHYLBENZENE	<11	<1300	<11	3,000	17,000	<120
TOLUENE	<11	<1300	<11	<670	<1400	<120
XYLENES	3J	<1300	<11	7,400	14,000	<120
DRO	<3.5 mg/kg	11,000 mg/kg	5,800 mg/kg	19,000 mg/kg	8,900 mg/kg	3,000 mg/kg
GRO	6.7 mg/kg	2,500 mg/kg	<14	6,200 mg/kg	2,500 mg/kg	160 mg/kg
PYRENE	<350	<370	<370	<370	<390	<400
NONANE	<0.18 mg/kg	2.4 mg/kg	<9.5 mg/kg	<180 mg/kg	3.4 mg/kg	<10
EICOSANE	<0.18 mg/kg	<1.8 mg/kg	<9.5 mg/kg	<180 mg/kg	3.4 mg/kg	<10

SB-19	1'-3' bgs		4'-6' bgs	
	9/6/97	4/2/98	9/6/97	4/2/98
BENZENE	<12	<11	2J	<12
ETHYLBENZENE	<12	<11	160	82
TOLUENE	<12	<11	<11	3J
XYLENES	<12	<11	370	200
DRO	370 mg/kg	320 mg/kg	8,300 mg/kg	3,700 mg/kg
GRO	<3.1 mg/kg	65 mg/kg	2,700 mg/kg	880 mg/kg
PYRENE	<410	<360	<350	<390
NONANE	<2.1 mg/kg	<1.8 mg/kg	<45 mg/kg	2.1 mg/kg
EICOSANE	<2.1 mg/kg	<1.8 mg/kg	<45 mg/kg	<2.0 mg/kg

SB-22	1'-3' bgs				4'-6' bgs		
	9/6/97	DUP	4/2/98	8/25/99	9/6/97	4/2/98	8/25/99
BENZENE	<55	<110	<11	<11	<11	<1400	<110
ETHYLBENZENE	410	600	<11	<11	<11	<1400	630
TOLUENE	<55	<110	<11	<11	<11	<1400	<110
XYLENES	100	120	<11	<11	<11	<1400	210
DRO	45,000 mg/kg	NA	3,200 mg/kg	3,000 mg/kg	320 mg/kg	13,000 mg/kg	7,900 mg/kg
GRO	3,100 mg/kg	NA	500 mg/kg	<2.8	720 mg/kg	3,200 mg/kg	88 mg/kg
PYRENE	88J	NA	<350	39J	<350	57J	43J
NONANE	<370 mg/kg	NA	<1.8 mg/kg	<9.2	<1.8 mg/kg	3 mg/kg	<9.0
EICOSANE	<370 mg/kg	NA	<1.8 mg/kg	<9.2	<1.8 mg/kg	<1.9 mg/kg	<9.0



NOTES:

1. SOIL BORING SB-23 SAMPLES COLLECTED AT 1' TO 3' AND 4' TO 6' NOT SHOWN. RESULTS WERE ALL NON DETECTS EXCEPT FOR GRO @ 1' TO 3' @ 9.1 mg/Kg. SB23 IS LOCATED WEST OF SB22. SB23 NOT RESAMPLED DURING 4/21/98 SOIL SAMPLING EVENT.

2. ALL CONCENTRATIONS PRESENTED IN µg/kg EXCEPT WHERE OTHERWISE NOTED.

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 8/17/00
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SOIL SAMPLE RESULT TAG MAP
SITE 29-CREW CRASH BURN PIT
MARINE CORPS AUXILIARY LANDING FIELD
BOGUE FIELD, NORTH CAROLINA

CONTRACT NO. 7415 OWNER NO. 0272
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 2-5 REV. 1

FORM CADD NO. T:NUS_BH.DGN - REV 0 - 1/20/98