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October 20, 1999

Ms. Cindy Rintoul
NCDENR-DWM
Winston-Salem Regional Office
585 Waughtown Street, Suite 100
Winston-Salem, North Carolina 27107-2241

Subject: **Free Product Recovery Report**
Third Quarter 1999
Exxon RAS # 4-3998
4701 W. Market Street
Greensboro, North Carolina
Groundwater Incident #10001
Site Rank: Intermediate

Dear Ms. Rintoul:

Piedmont Industrial Services, Inc. and ERM, on behalf of Exxon Company, U.S.A., are submitting the enclosed report for the referenced site. A soil vapor extraction and aquifer air sparge system are currently operational at the site. The system operated throughout the reporting period with only temporary shutdowns for maintenance and repairs.

This report summarizes the results of monthly free-product check and free-product recovery efforts completed during the third quarter of 1999. As indicated in the attached report, free-product was observed in wells MW-2 and MW-3. To facilitate free-product removal, an AFVR event was completed on September 13, 1999.

The annual groundwater-sampling event is scheduled to be completed during the next reporting period. Results of the event will be submitted in the next quarterly monitoring report.

If you have any questions or require further information please contact Frank Medlin at (704) 529-4263.

Best Regards,

Piedmont Industrial Services, Inc.

NORTH CAROLINA LICENSED SEAL 1491 GEOLOGIST THOMAS P. LENNON

Tom Lennon
Project Geologist

Enclosure
Copy: Mr. J. Frank Medlin, Exxon Company U.S.A.

FREE PRODUCT RECOVERY REPORT
JULY 1999 THROUGH SEPTEMBER 1999

Exxon RAS # 4-3998
4701 W. Market Street
Greensboro, North Carolina
Groundwater Incident # 10001
Risk Classification: Intermediate

Prepared By:

Piedmont Industrial Services
P.O. Box 5061
Winston-Salem, NC 27113

Date:

October 20, 1999

NORTH CAROLINA LICENSED SEAL 1491 GEOLOGIST THOMAS P. LENNON

Thomas P. Lennon, L.G.
Piedmont Industrial Services, Inc.

Jerry Prosser, L.G.
ERM-Southeast

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Introduction

The following monitoring report is for Exxon RAS #4-3998, located at 4701 West Market Street, in Greensboro, North Carolina (Figure 1).

An aquifer air sparge/soil vapor extraction (AAS/SVE) system was installed and operated from the second quarter 1996 through the present. A site map depicting the locations of groundwater monitoring wells and AAS/SVE treatment system is presented as Figure 2.

The direction of groundwater flow is shown on Figure 3. The total estimated extent of dissolved phase BTEX in groundwater is depicted in Figure 4, along with the estimated extent of nonaqueous-phase liquid (NAPL, or "free-product"). A summary of groundwater analytical data is presented in Table 1. A summary of groundwater gauging data is presented in Table 2. As indicated in the table, over the last nine months, NAPL has been observed in wells MW-2 and MW-3.

Work Performed This Quarter

During the current reporting period monitoring wells MW-2 and MW-3 were gauged for free product (NAPL) on a monthly basis. NAPL gauging data is presented in Table 2. As indicated in the Table, NAPL was observed in wells MW-2 and MW-3 during each of the three monthly gauging events. During the current reporting period, well MW-2 exhibited an average NAPL thickness of 0.24 feet, and well MW-3 exhibited an average NAPL thickness of 0.05 feet.

On September 13, 1999, an AFVR event was conducted at the subject site. The AFVR event was conducted for a period of approximately 8 hours. Wells MW-2 and MW-3 were utilized as collection wells. The 478 gallons of fluid recovered during the AFVR event was emulsified (i.e. NAPL had not separated from the water prior to the vacuum truck leaving the site). The equivalent of 5.34 gallons of NAPL was removed in vapor phase, based on the AFVR mass removal calculations. AFVR calculations are included in Appendix A. NAPL was not observed in wells MW-2 or MW-3 following the completion of the AFVR event.

The SVE/AS system was in continuous operation throughout the current reporting period. Remediation system operation and maintenance is performed monthly. On September 17, 1999, a SVE off-gas sample was collected for laboratory analysis. A table of SVE off-gas analytical results is presented in Table 3.

Conclusions and Recommendations

Planned remediation activities at this site include the continued operation of the AAS/SVE remediation system to reduce dissolved hydrocarbon levels in the groundwater to below risk based corrective action levels (GCLs).

The completion of additional AFVR events is recommended if NAPL continues to be observed in the vicinity of wells MW-2 and MW-3.

The annual groundwater-sampling event will be conducted during the fourth quarter. The results of this sampling event will be included in the next quarterly report.

TABLES

TABLE 1
EPA METHOD 602 AND LEAD GROUND WATER ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

MONITOR WELL ID	DATE	EXPANDED EPA METHOD 602							METHOD 504.1	METHOD 3030C
		TOTAL BTEX	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	MTBE	IPE	EDB	LEAD
MW-1	8/20/92	65,900	5000	35000	3900	22000	<500	–	–	–
	3/25/93	44,600	3500	21000	3100	17000	<250	–	–	–
	6/22/93	44,600	4200	18000	3400	19000	<500	–	–	–
	6/9/94	62,450	6150	22500	5000	28800	96	900	<10	5
	6/14/95	<1	<1	<1	<1	<1	<10	465	–	–
	9/18/95	50,500	4,000	24,000	3,000	19,500	<5,000	<5,000	–	–
	12/6/95	47,700	4,500	18,000	3,600	21,600	<225	1,230	–	–
	3/27/96	15,350	2,340	3,420	1,350	8,240	<450	945	<0.503	<3.0
	6/26/96	32,280	3,420	7,980	2,640	18,240	<200	1,030	<20	<3.0
	6/17/97	25,730	3,000	4,800	2,430	15500	ND	950	ND	ND
	12/16/97	4,250	1,110	560	780	1800	90	130	0.07	ND
	9/30/98	9,125	1,750	715	1,810	4850	15	765	0.34	ND
	12/22/98	1,959	414	327	382	836	ND	311	0.29	
	6/21/99	2,060	600	100	220	1140	ND	400	NT	4
MW-2	8/20/92	13,900	1400	4900	1600	6000	<250	–	–	–
	3/25/93	16,400	2000	7300	1200	5900	<250	–	–	–
	6/22/93	76,800	8100	40000	4700	24000	<2500	–	–	–
	6/9/94	70,520	7160	33500	4560	25300	390	280	<10	3
	6/14/95	234,900	14,000	112,000	17,100	91,800	<225	1,710	–	–
	9/18/95	56,000	4,500	25,000	4,000	22,500	<1,000	1,600	–	–
	12/6/95	5,553	788	2,900	315	1,550	<225	292	–	–
	3/27/96	136,800	22,000	72,000	7,200	35,600	<900	10,800	0.70	<3.0
	6/26/96	103,000	16,000	60,000	4,500	22,500	<10000	<10000	<1000	<3.0
	6/17/97	86,800	13,100	46,000	4,100	23,600	ND	6,000	ND	ND
	12/16/97	90,550	14,000	49,500	4,050	23,000	1,350	4,050	0.22	ND
	9/30/98	116,130	17,400	74,300	7,130	17,300	ND	8,750	1.26	ND
	12/22/98	NS								
	6/21/99	57,660	12,000	40,200	1,040	4,420	ND	7,400	NT	ND
MW-3	8/20/92	84,800	11000	41000	4800	26000	<500	–	–	–
	3/25/93	67,300	9700	35000	3600	19000	<1000	–	–	–
	6/22/93	88,900	13000	50000	3900	22000	<2500	–	–	–
	6/9/94	114,700	12600	65400	4500	32200	<1000	2580	<50	678
	6/14/95	308,200	25,200	157,000	18,000	108,000	<225	2,740	–	390
	9/18/95	125,000	15,000	73,000	6,000	31,000	<5,000	<5,000	–	372
	12/6/95	156,600	19,800	94,500	6,300	36,000	<4500	7,650	–	147
	3/27/96	158,400	23,400	80,100	8,100	46,800	<900	11,200	59	1,400
	6/26/96	106,750	14,300	49,000	5,650	37,800	<5000	7,300	<500	1,010
	6/17/97	39,381	3,550	19,100	2,181	14,550	ND	1,140	ND	376
	12/16/97	97,200	16,400	49,300	4,500	27,000	450	4,720	35	956
	9/30/98	59,530	8,320	37,800	3,560	9,850	ND	2,240	69	516
	12/22/98	NS								
	6/21/99	47,420	2,000	39,000	1,240	5,180	ND	400	NT	259

TABLE 1
EPA METHOD 602 AND LEAD GROUND WATER ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

MONITOR WELL ID	DATE	EXPANDED EPA METHOD 602							METHOD 504.1	METHOD 3030C
		TOTAL BTEX	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	MTBE	IPE	EDB	LEAD
MW-4	8/20/92	4	<2.0	<2.0	<2.0	4	<10	--	--	--
	3/25/93	17.6	1.9	4.7	<1.0	11	<10	--	--	--
	6/22/93	17.5	1.5	<1.0	<1.0	16	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	4
	6/14/95	71	6	9	3	53	<10	<10	--	--
	9/18/95	33	4	<1.0	<1.0	29	<10	33	--	--
	6/17/97	112.2	11.4	ND	15.8	85.0	ND	ND	--	--
	12/16/97	175.0	22.0	2.0	14.0	137.0	ND	2	ND	ND
	9/30/98	65.9	8.8	1.2	2.4	53.5	ND	1	ND	ND
	12/22/98	170.4	31.2	ND	2.2	137.0	2	4	ND	
	6/21/99	180.0	36.0	ND	1.0	143.0	1	3	NT	ND
MW-5	3/25/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/22/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	13
	6/14/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	--
	9/18/95	2	<1.0	1	<1.0	1	<10	27	--	--
MW-6	3/25/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/22/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	13
	6/14/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	--
	9/18/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	14	--	--
MW-7	3/25/93	9.1	1.9	1.9	1.9	3.4	36.0	--	--	--
	6/22/93	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	20
	6/14/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	26
	9/18/95	2	<1.0	1	<1.0	1	10	16	--	15
	12/16/97	11	7	4	<1.0	<1.0	<1.0	<1.0	<0.02	7
	12/22/98	79.5	23.3	26.1	4.5	25.6	24.5	2.0	ND	
	6/21/99	34.0	15.0	9.0	1.0	9.0	16.0	1.0	NT	15
DW-8	3/25/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/22/93	<1.0	<1.0	<1.0	<1.0	<1.0	<10	--	--	--
	6/9/94	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	<1.0	4
	6/14/95	2	<1	1	<1	1	<10	<10	--	--
	9/18/95	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10	--	--
	12/16/97	14	2	6	<1.0	6	<1.0	<1.0	<0.02	5
	9/30/98	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/22/98	ND	ND	ND	ND	ND	ND	ND	ND	ND
	6/21/99	ND	ND	ND	ND	ND	ND	ND	ND	11

TABLE 1
EPA METHOD 602 AND LEAD GROUND WATER ANALYTICAL RESULTS
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

MONITOR WELL ID	DATE	EXPANDED EPA METHOD 602							METHOD 504.1 EDB	METHOD 3030C LEAD
		TOTAL BTEX	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	MTBE	IPE		
MW-9	12/6/95	823	36	7	110	670	<10	38	–	–
	12/16/97	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.02	5
	9/30/98	<1.0	8	70	45	307	ND	8	ND	ND
	12/22/98	124	5	ND	5	114	ND	15	ND	
OP-1	12/16/97	561	320	10	57	174	45	10	<0.02	<3
	12/22/98	525	334	11	47	133	83	8	ND	
MW-1A*	11/20/92	<1.0	<1.0	<1.0	<1.0	<1.0	–	–	–	–
(MW-Moore)	11/13/95	<1.0	<1.0	<1.0	<1.0	<1.0	–	–	–	–
MW-10	36332	ND	ND	ND	ND	ND	ND	ND	NT	NT
MW-11	6/21/99	78	70	<1	<1	7	27	41	NT	NT
MW-12	6/21/99	45,930	7,980	13,000	3,650	21,300	280	4,710	Nt	NT
Mw-13	6/21/99	9,340	3,680	940	760	3,960	<100	1,100	NT	NT
T15A NCAC 2L STANDARD			**1**	**1,000**	**29**	**530**	**200**	**NS**	**0.0004**	**15**
GCL's			**5,000**	**257,500**	**29,000**	**87,500**	**200,000**	**70,000**	**50**	**15**

TABLE 2
GROUND WATER ELEVATION DATA
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

	MW-1 96.50		MW-2 96.56		MW-3 96.92		MW-4 97.92	
DATE	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION
8/20/92	23.45	73.05	22.99	73.57	24.49	72.43	24.50	73.42
3/25/93	18.77	77.73	18.90	77.66	20.91	76.01	22.62	75.30
6/11/93	19.23	77.27	18.85	77.71	20.74	76.18	21.36	76.56
4/13/94	19.79	76.71	19.06	77.50	21.60	75.32	22.74	75.18
6/9/94	21.97	74.53	21.40	75.16	23.24	73.68	23.26	74.66
6/14/95	22.65	73.85	22.70*	73.86	23.96*	72.96	24.28	73.64
9/18/95	23.73	72.77	24.06*	72.50	25.22*	71.70	24.82	73.10
12/6/95	22.20	74.30	21.70	74.86	23.60	73.32	24.26	73.66
12/14/95	22.10	74.40	21.62	74.94	23.44*	96.92	24.22	73.70
3/27/96	19.56	76.94	19.25	77.31	21.16	75.76	n/a	n/a
6/26/96	20.39	76.11	20.15	76.41	21.70	75.22	n/a	n/a
6/17/97	18.28	78.22	18.08	78.48	19.7	77.22	20.26	77.66
12/16/97	21.84	74.66	21.05	75.51	23.02	73.90	22.92	75.00
9/30/98	22.65	73.85	22.43	74.13	23.41	73.51	22.61	75.31
12/22/98	23.6	72.90	0.5" NAPL	NAPL	0.25" NAPL	NAPL	24.38	73.54
1/28/99	NM	NM	0.03' NAPL	NAPL	22.88	74.04	NM	NM
2/15/99	NM	NM	0.03' NAPL	NAPL	22.8	74.12	NM	NM
3/19/99	NM	NM	0.03' NAPL	NAPL	22.84	74.08	NM	NM
4/21/99	NM	NM	0.03' NAPL	NAPL	23.01	73.91	NM	NM
5/6/99	NM	NM	0.01' NAPL	NAPL	22.38	74.54	NM	NM
6/21/99	29.5	67.00	0.01' NAPL	NAPL	0.01' NAPL	NAPL	29.5	68.42
7/14/99	NM	NM	0.06' NAPL	NAPL	0.10 NAPL	NAPL	NM	NM
8/10/99	NM	NM	0.50' NAPL	NAPL	0.03' NAPL	NAPL	NM	NM
9/13/99	NM	NM	0.17' NAPL	NAPL	0.03' NAPL	NAPL	NM	NM
10/18/99	NM	NM	0.01' NAPL	NAPL	0.01' NAPL	NAPL	NM	NM

	MW-5 97.24		MW-6 96.15		MW-7 98.64		DW-8 98.00	
DATE	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION
3/25/93	22.05	75.19	21.10	75.05	26.60	72.04	9.50	88.50
6/11/93	21.88	75.36	20.71	75.44	25.61	73.03	22.41	75.59
4/13/94	22.74	74.50	21.62	74.53	--	--	--	--
6/9/94	24.19	73.05	23.08	73.07	27.30	71.34	25.31	72.69
6/14/95	25.02	72.22	23.90	72.25	27.78	70.86	25.40	72.60
9/18/95	25.82	71.42	24.86	71.29	27.35	71.29	25.57	72.43
12/6/95	24.77	72.47	23.73	72.42	27.60	71.04	25.18	72.82
12/14/95	24.68	72.56	23.66	72.49	27.47	71.17	25.11	72.89
3/27/96	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6/26/96	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12/16/97	n/a	n/a	n/a	n/a	n/a	n/a	24.25	73.75
9/30/98	n/a	n/a	n/a	n/a	n/a	n/a	22.87	75.13
12/22/98	n/a	n/a	n/a	n/a	27.18	71.46	22.87	75.13
6/21/99	n/a	n/a	n/a	n/a	30.00	68.64	25.02	72.98

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TABLE 2
GROUND WATER ELEVATION DATA
EXXON RETAIL LOCATION 4-3998
4701 WEST MARKET STREET
GREENSBORO, NORTH CAROLINA

DATE	MW-9 94.56		MW -Moore 98.10		0P-1 96.79		MW-10 N/A	
	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION
4/13/94	--	--	--	--	21.06	75.73		
6/9/94	--	--	--	--	23.04	73.75		
6/14/95	--	--	--	--	23.94	72.85		
11/13/95	--	--	23.90	74.20	--	--		
12/6/95	**20.64	73.92	23.12	74.98	--	--		
12/14/95	19.19	75.37	--	--	--	--		
3/27/96	n/a	n/a	--	--	--	--		
6/26/96	n/a	n/a	--	--	--	--		
12/16/97	18.45	76.11	--	--	24.22	72.57		
9/30/98	21.08	73.48	--	--	n/a	n/a		
12/22/98	21.03	73.53	--	--	25.55	71.24		
6/21/99	n/a	n/a	n/a	n/a	n/a	n/a	25.42	n/s

DATE	AS-1 96.38		EP-1 96.31		MW-11		MW-12	
	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION
4/13/94	20.90	75.48	20.77	75.54				
6/9/94	22.65	73.73	22.56	73.75				
6/14/95	23.54	72.84	DRY	--				
6/21/99	n/a	n/a	n/a	n/a	22.36	n/s	23.62	n/s
	MW-13							
DATE	DEPTH TO GROUND WATER	GROUND WATER ELEVATION	DEPTH TO GROUND WATER	GROUND WATER ELEVATION				
36332	25.10	n/s						

Notes:
Depth to ground water measured in feet below top of casing.
Elevations are relative to an on-site reference point which has been assigned an elevation of 100.00 feet.
"--" = Gauging data not available
* = Free product film detected in monitor well (<0.01 feet thick)
** = Ground water not at static level
n/a = well not gauged
n/s = not surveyed

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TABLE 3
SVE OFF-GAS ANALYTICAL RESULTS

SVES SAMPLING

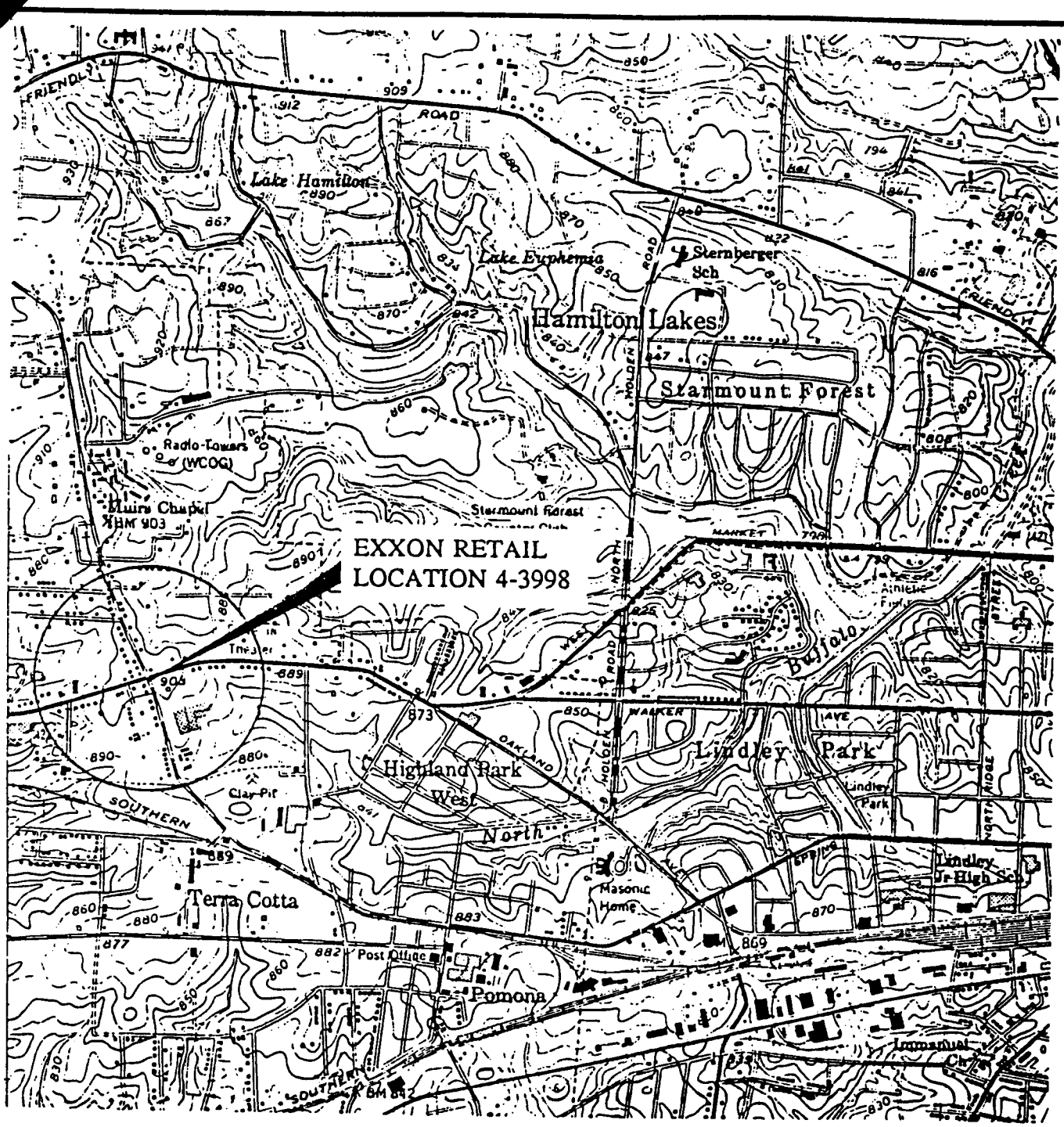
Date	Benzene (ppm)	Toluene (ppm)	Ethyl-benz (ppm)	Tot-Xylenes (ppm)	Total VOCs (TPH, ppm)	Air Velocity (fps)	Flow Rate ft^3/min	TPH Removed This period (lbs)	Equivalent NAPL Recovered This Period (gallons)
6/12/96	*2.91*	*2.50*	*<0.5*	*1.07*	*44.50*	*38.26*	*200.23*	--	--
12/16/97	--	--	--	--	*3.60*	--	--	--	--
4/6/99	*<15*	*0.52*	*0.82*	*2.15*	*8.26*	*166.00*	*868.73*	*301.10*	*48.18*
6/16/99	***5.10***	***6.60***	***0.80***	***1.90***	***59.00***	***186.00***	***973.40***	***2769.33***	***443.09***
9/17/99	***3.40***	***4.40***	***0.50***	***2.20***	***38.00***	***155.43***	***813.42***	***446.87***	***71.50***

Results in micrograms per liter (ug/l). EDB = Ethylene dibromide

MTBE = Methy tert-butyl ether "--" = not analyzed

IPE = Isopropyl ether

FIGURES



SOURCE: GREENSBORO, NC 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE, 1951 (PHOTOREVISED 1968)

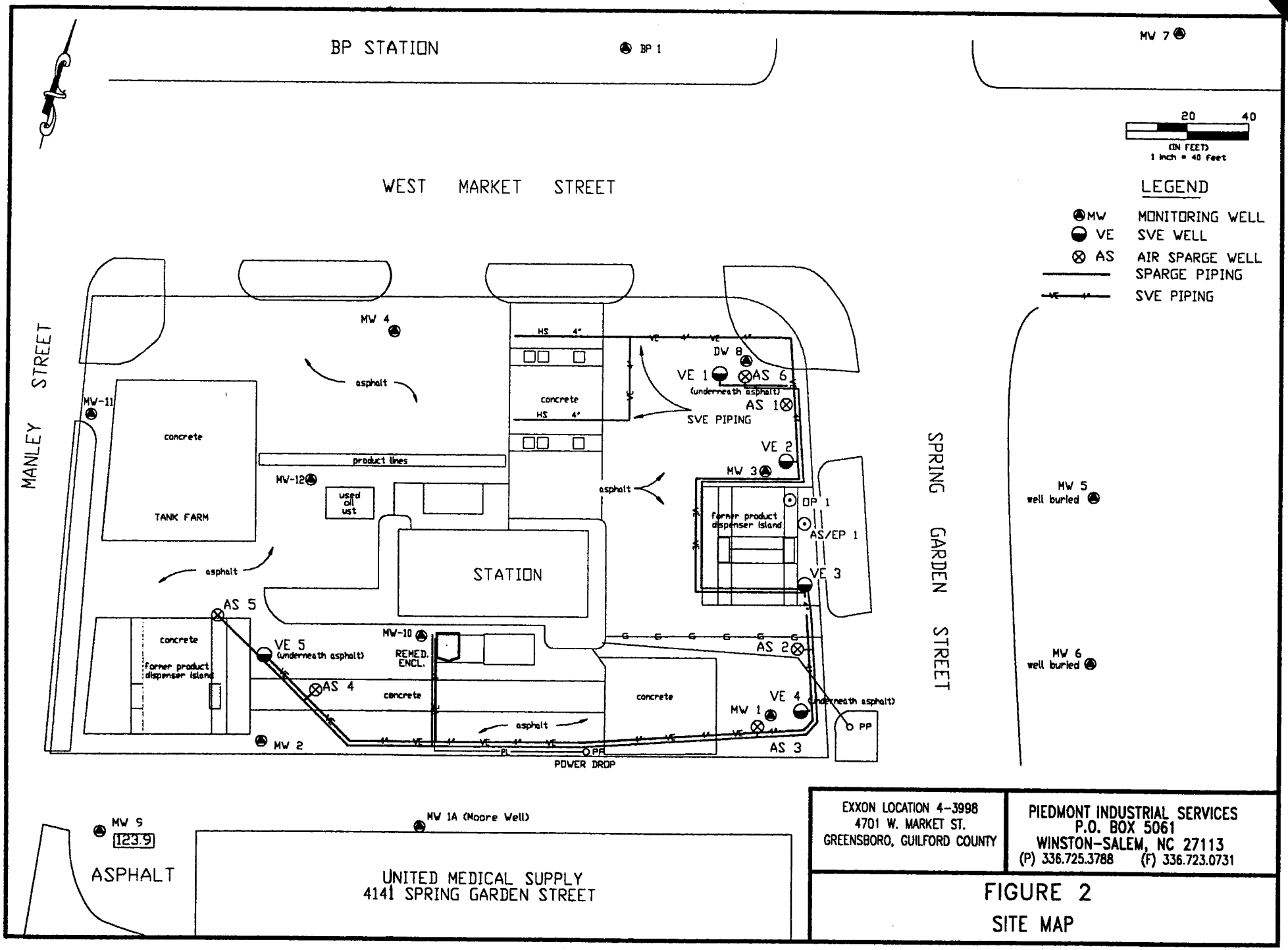
SCALE IN FEET

0 2000

ERM-Southeast, Inc.
CHARLOTTE, NORTH CAROLINA
ERM

SITE LOCATION MAP
EXXON COMPANY, U.S.A.
RETAIL LOCATION 4-3998
GREENSBORO, NORTH CAROLINA

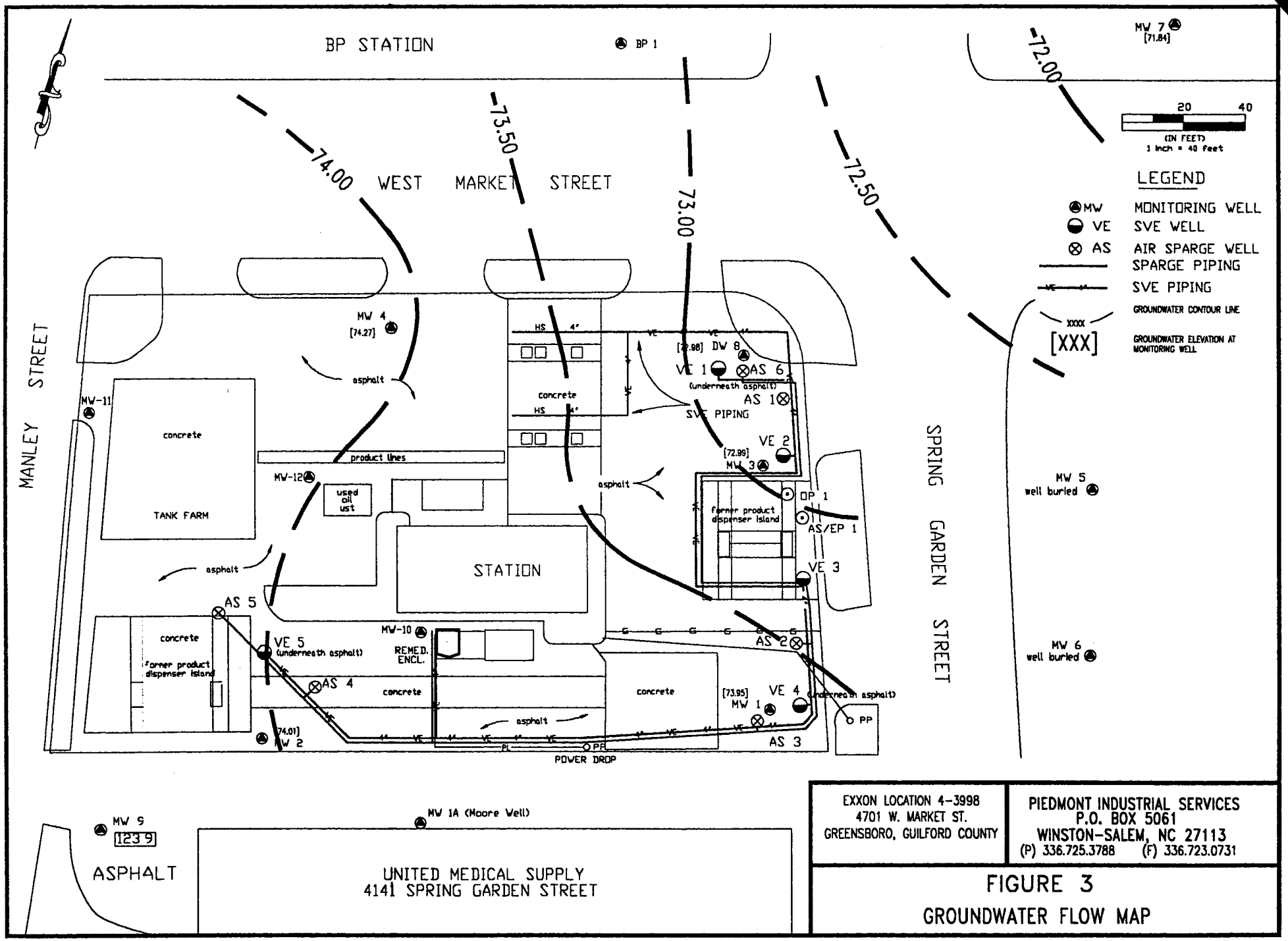
FIGURE
1



EXXON LOCATION 4-3998
4701 W. MARKET ST.
GREENSBORO, GUILFORD COUNTY

PIEDMONT INDUSTRIAL SERVICES
P.O. BOX 5061
WINSTON-SALEM, NC 27113
(P) 336.725.3788 (F) 336.723.0731

FIGURE 2
SITE MAP



EXXON LOCATION 4-3998
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P.O. BOX 5061
WINSTON-SALEM, NC 27113
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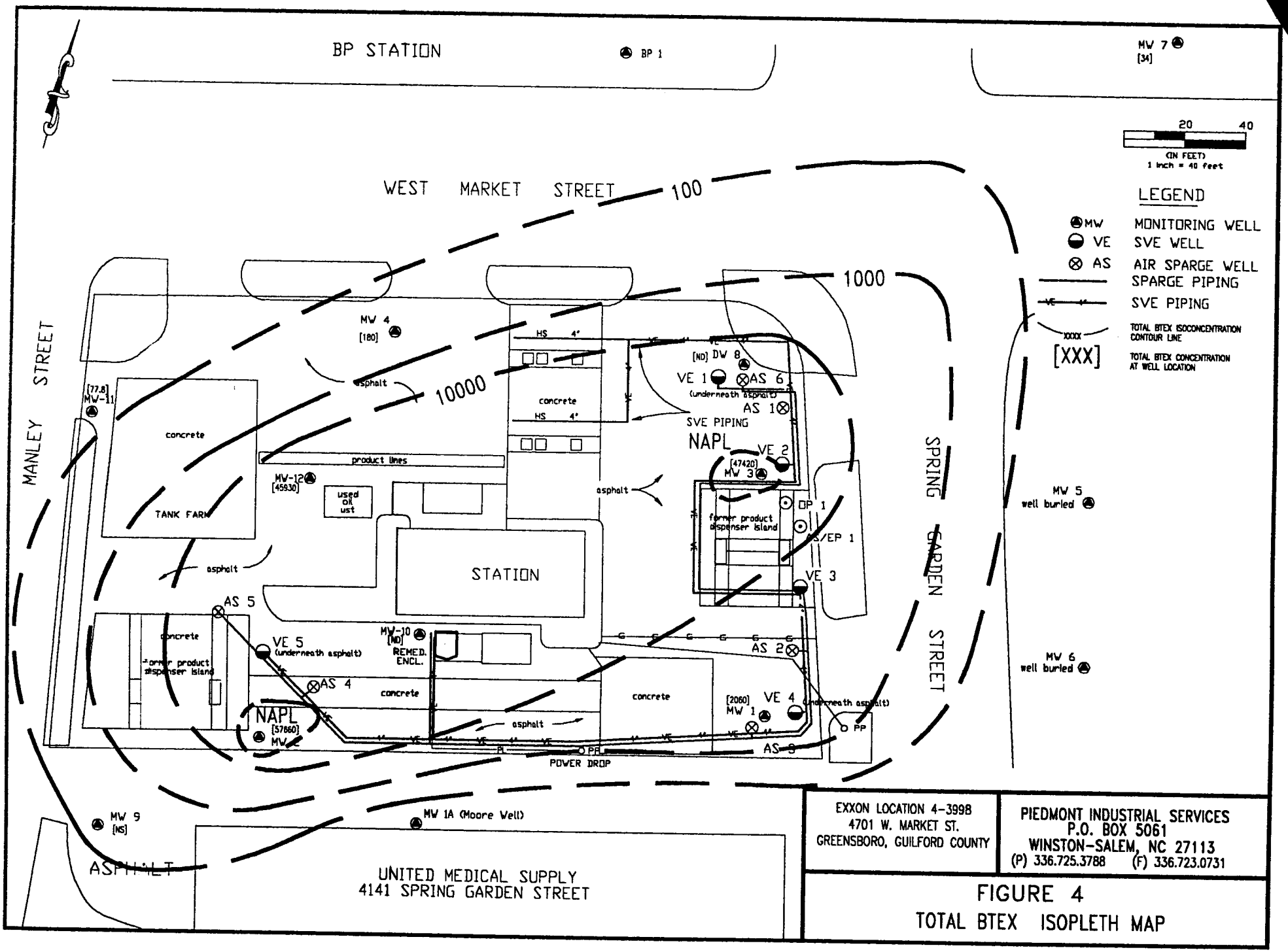
FIGURE 3
GROUNDWATER FLOW MAP



EXXON LOCATION 4-3998
4701 W. MARKET ST.
GREENSBORO, GUILFORD COUNTY

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P.O. BOX 5061
WINSTON-SALEM, NC 27113
(P) 336.725.3788 (F) 336.723.0731

FIGURE 4
TOTAL BTEX ISOPLETH MAP

APPENDIX A

AGGRESSIVE FLUID VAPOR RECOVERY EVENT

SITE NAME : **4-3998**

CLIENT: **Exxon**

DATE: **9/13/99**

Vacuum Truck Stack Diameter: **6"**
Total gallons of water recovered (measured from vacuum truck tank): **478 gallons**
Total gallons of free product (measured from vacuum truck tank): **0 + 5.34 gallons (vapor) = 5.34 gallons**
Extraction points: **MW-2, MW-3**

GAUGING DATA FOR COLLECTION WELLS

MW-2: Before AFVR 23.33 to NAPL, 23.50 to GW = 0.17' NAPL
MW-2: After AFVR No NAPL, 27.40 to GW = No NAPL

MW-3: Before AFVR 24.57 to NAPL, 24.60 to GW = 0.03' NAPL
MW-3: After AFVR No NAPL, 25.70 to GW = No NAPL

AGGRESSIVE FLUID VAPOR RECOVERY EVENT

SITE NAME : 4-3998

CLIENT: Exxon

DATE: 9/13/99

VACUUM PRESSURE AND GAUGING ON NEARBY WELLS

TIME	Well ID #						
	Vacuum Pressure (inches water)			Depth to Groundwater			
	MW-1			MW-1			
0900	0			23.4			
0915	.5			23.4			
0930	.5			23.4			
0945	.5			23.4			
1000	.5			23.4			
1015	.5			23.4			
1030	.5			23.4			
1045	.5			23.4			
1100	.5			23.4			
1130	.5			23.4			
1200	.5			23.4			
1230	.5			23.4			
1300	5			23.4			
1330	.5			23.4			
1400	.5			23.4			
1430	.5			23.4			

NOTES:

AGGRESSIVE FLUID VAPOR RECOVERY EVENT

SITE NAME: **Exxon 4-3998**
IDENTIFY THE WELL AND THE I.D. OF EACH WELL USED FOR AFVR: **MW-3 and MW-2**

PROVIDE BLOWER SPECIFICATIONS OF THE VACUUM TRUCK (cfm @ in Hg): 600

DRY STANDARD CUBIC FEET PER MINUTE (DSCFM) AIR FLOW CALCULATIONS (Qstd)

Date	Time	Vacuum (inches of Hg)	Velocity (ft/min)	Pipe ID (in)	Temp (°F)	Rel Humid (%)	Water Vapor (Wt%)	Water Vapor (Vol%)	Q_{std} (flow)
9/13/99	9:00	25.0	3034	6	150	20	0.033	0.050	490
9/13/99	9:15	26.0	3760	6	200	10	0.054	0.080	544
9/13/99	9:30	26.0	4890	6	200	10	0.054	0.080	707
9/13/99	9:45	26.0	4528	6	200	9	0.047	0.070	661
9/13/99	10:00	26.0	4537	6	200	9	0.047	0.070	663
9/13/99	10:15	26.0	4590	6	200	9	0.047	0.070	671
9/13/99	10:30	26.0	4920	6	200	9	0.047	0.070	719
9/13/99	10:45	26.0	3998	6	200	9	0.047	0.070	584
9/13/99	11:00	26.0	4041	6	200	9	0.047	0.070	590
9/13/99	11:30	26.0	4175	6	200	9	0.047	0.070	610
9/13/99	12:00	26.0	3918	6	200	9	0.047	0.070	572
9/13/99	12:30	26.0	4225	6	200	9	0.047	0.070	617
9/13/99	13:00	26.0	4460	6	200	9	0.047	0.070	652
9/13/99	13:15	25.0	3344	6	200	9	0.047	0.070	488
9/13/99	13:30	25.0	3558	6	200	9	0.047	0.070	520
9/13/99	13:45	26.0	4778	6	200	8	0.041	0.062	704
9/13/99	14:00	27.0	4558	6	200	8	0.041	0.062	672
9/13/99	14:15	27.0	4454	6	200	8	0.041	0.062	657
9/13/99	14:30	27.0	4587	6	200	8	0.041	0.062	676
9/13/99	14:45	27.0	4514	6	200	8	0.041	0.062	665
9/13/99	15:00	27.0	4476	6	200	8	0.041	0.062	660
9/13/99	15:15	27.0	4367	6	200	8	0.041	0.062	644
9/13/99	15:30	27.0	4522	6	200	8	0.041	0.062	667
9/13/99	16:00	27.0	4485	6	200	8	0.041	0.062	661
9/13/99	16:30	27.0	4269	6	200	8	0.041	0.062	629
9/13/99	17:00	27.0	4326	6	200	8	0.041	0.062	638

NOTES

Qstd = Flow at DSCFM
Vacuum = The level of vacuum being applied should be recorded from the vacuum truck tank (inches of Hg)
Velocity = The rate at which air flows is measured at the blower discharge piping (anemometer or pitot tube)
Pipe ID = The inside diameter of the blower discharge piping (from the vacuum truck)
Temperature = The temperature of the air stream exiting the blower discharge piping (dry bulb temp., in deg.°F)
Relative humidity = The % relative humidity of the air stream exiting the blower discharge piping
B_{wsw} = water vapor % by weight, i.e., pounds of water per pound of dry air, derived from the Psychrometric chart (temp Vs relative humidity)
B_{ws} = water vapor % by volume ; When exhaust vapor stream temperatutes >250 deg F, water vapor % by volume assumed to be zero. Psychometric charts do not exceed 250 deg F.

EQUATIONS

B_{ws} = (B_{wsw}/18 lb-mole H_2O)/[(1/28.84 lb-mole dry air) + (B_{wsw}/18 lb-mole H_2O)]

Q_{std} = (1-Water Vapor) * velocity * (PI * (diameter/24)^2) * (528°R/(Temp + 460))

EMISSION CALCULATIONS

Time Recorded	Elapsed Time (min)	Flow (DSCFM)	$PPM_{measured}$ (ppm)	PPM_{wet}	PPM_{dry}	K (#C - gas)	PPM_{conc}	$C_{c:m}$ (mg/dsm^3)	C_c (lb/dscf)	PMR_c (lb/hr)	PMR_g (lb/hr)	PMR (lb)
9:00 AM	0	Start of Test										0
9:00 AM	0	490	600	600	652	6	3911	1952	0.00012184	3.97	4.60	1.15
9:15	15	544	200	200	217	6	1304	651	0.0000406	1.72	1.99	0.50
9:30	30	707	100	100	108	6	645	322	0.0000201	0.80	0.92	0.23
9:45	45	661	100	100	108	6	645	322	0.0000201	0.80	0.92	0.23
10:00	60	663	90	90	97	6	581	290	0.0000181	0.73	0.84	0.21
10:15	75	671	90	90	97	6	581	290	0.0000181	0.78	0.90	0.23
10:30	90	719	90	90	97	6	581	290	0.0000181	0.63	0.73	0.18
10:45	105	584	90	90	97	6	581	290	0.0000181	0.64	0.74	0.19
11:00	120	590	90	90	97	6	581	290	0.0000181	0.66	0.77	0.45
11:30	155	610	90	90	97	6	581	290	0.0000181	0.62	0.72	0.36
12:00	185	572	90	90	97	6	581	290	0.0000181	0.67	0.78	0.39
12:30	215	617	90	90	97	6	581	290	0.0000181	0.71	0.82	0.41
13:00	245	652	500	500	538	6	3226	1610	0.0001005	2.95	3.41	1.70
13:15	275	488	900	900	968	6	5807	2897	0.0001809	5.64	6.53	3.26
13:30	305	520	880	880	938	6	5627	2808	0.0001753	7.41	8.57	4.29
13:45	335	704	880	880	938	6	5627	2808	0.0001753	7.07	8.18	4.09
14:00	365	672	860	860	916	6	5499	2744	0.0001713	6.75	7.81	3.90
14:15	395	657	860	860	916	6	5499	2744	0.0001713	6.95	8.04	4.02
14:30	425	676	840	840	895	6	5371	2680	0.0001673	6.68	7.73	3.86
14:45	455	665	820	820	874	6	5243	2616	0.0001633	6.47	7.48	3.74
15:00	485	660	800	800	853	6	5115	2552	0.0001593	6.15	7.12	3.56
15:15	515	644	800	800	853	6	5115	2552	0.0001593	6.37	7.37	3.69
15:30	545	667	800	800	853	6	5115	2552	0.0001593	6.32	7.31	3.66
16:00	575	661	800	800	809	6	4854	2422	0.0001512	5.71	6.61	3.30
16:30	605	629	800	800	800	6	4800	2395	0.0001495	5.72	6.62	3.31
17:00	635	638	800	800	800	6	4800	2395	0.0001495	0.00	0.00	0.00
								Total emissions in pounds				**33.39**
								Total emissions in gallons				**5.34**

NOTES

$PPM_{measured}$ = Actual measurements (ppm) taken with a OVA or TVA at the blower discharge piping

PPM_{wet} = "wet" concentration

PPM_{dry} = "dry" concentration

K = Number of carbons in calibration gas: (Methane K = 1, or Propane K = 3, or Hexane K = 6)

PPM_c= PPM_v, Volumetric concentration of VOC emissions as carbon, dry basis at STP

$C_{c:m}$ = mg/dsm^3, mass concentration of VOC emissions as carbon

M_c = 12.01 mg/mg-mole, molecular weight of carbon

K_3 = 24.07 dsm^3/10^6 mg-mole, mass to volume conversion factor at STP

C_c = lb/dcsf, mass concentration of VOC emissions as carbon, dry basis at STP

PMR_c = lb/hr, pollutant mass removal rate of VOC's as carbon

PMR_g = lb/hr, pollutant mass removal rate of of VOC's as gasoline

PMR = lb, pollutant mass removal of VOC's as gasoline

EQUATIONS

$PPM_{wet} = PPM_{measured}$

$PPM_{dry} = (PPM_{wet})/(1-B_{ws})$

$PPM_c = (PPM_d)(K)$

$C_{c:m} = (PPM_c)(M_c / K_3)$

$C_c = (C_{c:m})(62.43x10^{-9}$ lb-m^3/mg-ft$^3)$

$PMR_c = (C_c)(Q_{std})(60$ min/hr)

$PMR_g = (PMR_c)(M_g/M_{cg})$

PMR = (PMR_g)(#minutes/60)

APPENDIX B

SPECIALIZED ASSAYS ENVIRONMENTAL
2960 Foster Creighton Dr.
Nashville, Tennessee 37204

1-800-765-0980
615-726-0177
Fax: 615-726-3404

160774

EXXON COMPANY USA

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUESTED

LWR #: _____

Name: PIEDMONT INDUSTRIAL SERVIC
TOM LENNON 8259
Phone: 336-725-3788
Fax: 336-723-0731

Address: 309 Sunset Drive
WINSTON SALEM, NC 27103

Client Project #
Name:

Project Mgr: Tom Lennon
Exxon Env. Work Release: 19900714

Exxon Contact: Frank Medlin [circle one] EE or C&M Phone:

RAS #: 4-3998
Site Address: 4701 W. Market St.
State ID #:

Cooler Seal
Seal Intact
Consultant Receipt yes no Initial
Laboratory Receipt yes no Initial

Air Bill # 812042088283
1 # of coolers
Sample Temperature ___ [*C] upon receipt

Sampled by [please print] Alan Duke
Ship Date: 9-17-99
Sampler Signature: [signature]

TAT REQUESTED 24hr 48hr 72hr other _____ day Exxon Std TAT

FIELD SAMPLE ID	SAE LAB # [for lab use only]	# CONT	Matrix: WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved: HCL	HNO3	H2SO4	ICE	NON-PRES	OTHER SPECIFY	Sampling: DATE	TIME	BTEX 602 ☐ 8020 ☒	MTBE ☐	EDB METHOD	PETROLEUM HYDROCARBONS, GC, 8015 GAS ☒ DIESEL ☐	TRPH/OIL AND GREASE 418.1 ☐ 9070 ☐ 9071 ☐ 413.1 ☐ 413.2 ☐	PURGEABLE HALOCARBONS 601 ☐ 8010 ☐ 8021 ☐	PURGEABLE AROMATICS 602 ☐ 8020 ☐ 8021 ☐	PCB's ☐	VOLATILE ORGANICS 624 ☐ 8240 TCL ☐ 8260 ☐	EXTRACTABLE ORGANICS 625 ☐ 8270 TCL ☐	PAH's 610 ☐ 8310 ☐ 8100 ☐ 8270 ☐	TCLP METALS ☐ VOA's ☐ BNA's ☐ P/H ☐ TOTAL ☐	METALS RCRA ☐ PP ☐ TAL ☐	LEAD 238.2 ☐ 200.7 ☐ 6010 ☐ 7421 ☐	CORROSIVITY ☐ REACTIVITY ☐	FP OPEN CUP ☐ CLOSED CUP ☐	OTHER
SVE Effluent		1			X										9-17	410	X			X																	

99-A142895

SPECIAL DETECTION LIMITS:

REPORTING LIMITS:

CLIENT REMARKS:

STORAGE LOCATION:

	DATE	TIME
...uished by Sampler: [signature]	9-17-99	500
... Affiliation: P.C.S.		
...by:		
...tion:		

	DATE	TIME
Received by:		
Received by: P.J. R. Bul...	9/18/99	9:00

SPECIALIZED ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

PIEDMONT INDUSTRIAL SERVICES 8259
TOM LENNON
P.O. BOX 5061
WINSTON SALEM, NC 27103

Lab Number: 99-A142895
Sample ID: SVE EFFLUENT
Sample Type: Air bag
Site ID:

Date Collected: 9/17/99
Time Collected: 16:10
Date Received: 9/18/99
Time Received: 9:00

Project:
Project Name: EXXON 4-3998
Sampler: ALAN DUKE

Analyte	Result ng/m3	Result PPMV	Dilution Factor	Analysis Date	Analysis Time	Analyst	Method
Benzene	3.40	1.05	1.	9/18/99	20:34	T McCollum	EPA-18
Toluene	4.40	1.15	1.	9/18/99	20:34	T McCollum	EPA-18
Ethyl benzene	0.500	0.11	1.	9/18/99	20:34	T McCollum	EPA-18
Xylene	2.20	0.50	1.	9/18/99	20:34	T McCollum	EPA-18
TRPH Lo >C4-C10	38.0	9.12	1.	9/18/99	20:34	T McCollum	EPA-18

These results relate only to the items tested.
This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By: Eric S Smith Report Date: 9/20/99

Theodore J. Duello, Ph.D., Lab Director
Michael H. Dunn, M.S., Technical Director
Johnny A. Mitchell, Dir. Technical Services
Eric Smith, Assistant Technical Director
Gail A Lage, Technical Services

Laboratory Certification Number: 387

COPY 1