



WESTERN  
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REGISTERED GEOLOGISTS

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June 15, 1998

Mr. John Rutherford  
Desert Petroleum  
Inc. P.O. Box 1601  
Oxnard, California 93032  
(805) 644-6784 FAX (805) 654-0720

RE: May 1998 Quarterly Groundwater Sampling Report for Former Desert Petroleum Station #796, 2844 Mountain Boulevard, Oakland, California.

Dear Mr. Rutherford:

As you requested Western Geo-Engineers (WEGE) has performed the quarterly monitoring/sampling of this site. The following report represents WEGE's May 1998 Quarterly Groundwater.

## INTRODUCTION

A WEGE sample technician monitored and sampled the four existing groundwater monitoring wells on May 27, 1998. During this site visit, **a thin sheen of free product was found in RS-1.**

## LOCATION

The site is an operating "Compare Price Gas Station" that retails regular unleaded, super-unleaded gasoline and diesel. The site is located East of Highway 13 at 2844 Mountain Blvd., Oakland, California, west of Joaquin Miller Park.

## GROUNDWATER SAMPLING

Table 1 is a summary of groundwater monitoring of this site since May 1990. The most recent sampling/monitoring, May 27, 1998 found a sheen of free product in monitor well RS-1. RS-2 continues to contain high levels of Methyl tertiary Butyl Ether (MTBE), 380 mg/L, which was confirmed using EPA Method 8260. RS-3 and RS-4 contain minor amounts of dissolved gasoline range hydrocarbons, see Appendix B for Laboratory report and Table 1 with Charts showing historic TPHg and MTBE levels for the wells. During this sample event the water samples were also analyzed for the Fuel Oxygenants as requested by the Region Water Board. The following fuel oxygenants were found and the laboratory lower detection limits are listed below.

## FUEL OXYGENANTS

ANALYTE	LOWER DETECTION LIMIT
METHYL-T- BUTYL ETHER (MTBE)	1 UG/L
DI-ISOPROPYL ETHER (DIPE)	5 UG/L
TERTIARY BUTYL ALCOHOL (TBA)	5 UG/L
ETHYL T BUTYL ETHER (ETBE)	5 UG/L
T-AMYL METHYL ETHER (TAME)	1 UG/L

All wells contained MTBE, see Table 1 and Appendix B for Laboratory Report. All other Fuel Oxygenants were below lower laboratory detection limits except for TAME which was found in monitor wells RS-1, RS-2, and RS-3 which contained the following concentrations 1800 ug/L, 3000 ug/L and 14 ug/L.

### GROUNDWATER GRADIENT "FLOW DIRECTION"

Figure 4 depicts groundwater elevations as measured on May 27, 1998. This figure show a gradient flow predominantly to the southwest.

To evaluate the lateral extent of free product beneath the site a workplan was developed and approved (December 10, 1996) to perform a soil probe survey (SPS). The SPS was conducted on January 17, 1997 with findings submitted February 27, 1997 as part of the Interim Remedial Workplan.

### MTBE

The charts presented with Table 1 show that MTBE was present in the groundwater since June 1995. The ratio as compared to gasoline concentrations in groundwater indicates that a leak was occurring at that time with substantial increases in September 1996, May 1997 and November 1997 and May 1998. Concern of the increasing MTBE prompted a site visit on August 6, 1997. A WEGE geologist interviewed the site owner, Mr. Sharahn Shenazi, concerning what may be the cause of elevated MTBE found during quarterly sampling. Mr. Shenazi felt that the MTBE was introduced to the groundwater during washing down of the station. The wash water would drain to the water meter box which is depressed in the station asphalt down slope of the pump islands, see Figure 3. Mr. Shenazi stated that he has had no inventory losses and that the product lines are double contained and the leak detectors indicate everything is fine. The three existing tanks are single walled steel and have been recently lined. During testing of the tanks prior to lining one tank (diesel tank) showed a pressure increase but then tested fine, see September 1997 Quarterly Report.

The water meter box was inspected. The bottom of the box was not sealed and open to the subsurface, no odors were present and field screening with a MiniRae PID showed only 0.5 ppmv existed in the soils beneath the water meter. A soil sample was obtained at approximately one foot beneath the station surface and approximately six inches below the water meter and chain of custody delivered to North State Environmental Analytical Laboratory (NSE). NSE analyzed the soil sample for Total Petroleum Hydrocarbons as gasoline (TPHg), Benzene, Toluene,

Ethylbenzene, Xylenes (BTEX) and MTBE. The laboratory results showed 1.9 mg/Kg of TPHg, trace amounts of BTEX and MTBE below laboratory lower detection limits.

## DISCUSSION

Free phase floating product exists at RS-1 and on August 6, 1997 at Soil Probe Hole M7. MTBE shown a dramatic increase in concentration at RS-2 in September 1996, which coincides with the first measurable presence of free phase floating product in RS-1. The station washing practices drains the wash water to the water meter box. The soil sample obtained beneath the water meter box was below laboratory lower detection limits for MTBE. This strongly suggests that the MTBE influence was not caused by the "wash down" procedures. An interview with the station owner indicated that the existing three underground storage tanks are single walled steel and have recently been lined. The product dispensing piping is double walled and leak detectors have not indicated any leaks.

Based on the laboratory analysis results Western Geo-Engineers feels that a new release has occurred or is occurring at this site and is the source for gasoline with MTBE being introduced into the shallow groundwater.

## RECOMMENDATIONS

1. All tank and line tightness tests should be review from early 1995 to the present.
2. Review of tanks lining test procedures and comments.
3. Conduct a line tightness test.
4. Check continuity and integrity of vapor return lines and system.
5. Check integrity of overspill system.
6. Review inventory records from January 1995 to the present.
7. **Relieve Desert Petroleum Inc. of involvement as a responsible party based on the following:**
  - Desert Petroleum Inc. does not own or operate the site and has no control on how the site is operated and managed
  - Desert Petroleum Inc. has actively investigated and remediated this site since May 1990, with reasonable contaminant decline until mid 1994, see Tables 1 with associated graphs. This decline, projected, would have allowed site closure by mid 1996.
  - Desert Petroleum Inc. has performed source removal on four different occasions:
    - a. July 1989 excavated and removed gasoline-tainted soils from west and southwest of the UST's.
    - b. April 1994 removed the waste oil UST and limited over-excavation and removal of oil and gasoline tainted soils.
    - c. Performed vapor extraction and groundwater treatment using the RSI S.A.V.E.
    - d. October – December 1996 interim free product removal at RS-1 removing 30.4 gallons of gasoline and 1077 gallons of gasoline tainted groundwater.

## **TIME FRAME**

August 1998

Monitoring and sampling groundwater from wells RS-1, RS-2, RS-3 and RS-4.

## **HEALTH AND SAFETY**

This site is being treated as a class D site, normal common sense is to be used.

## **SAMPLE METHODS**

A WEGE technician working directly under California Registered Geologist #3037 using approved methods gauged, purged and sampled the monitor, see Appendix C for procedures.

### ***SAMPLE PRESERVATION.***

Each sample was placed into two, certified clean, glass, 40 ml VOAs with laboratory installed HCl preservative. The samples were then labeled and placed on ice and Chain of Custody delivered to North State Environmental laboratories.

### ***ANALYTICAL METHODS AND DHS LABORATORY SELECTED.***

WEGE contracted North State Environmental (NSE), (ELAP Certificate No. 1753), P.O. Box 5624, South San Francisco, CA. 94083 (415) 588-2838, to perform the analysis of the groundwater samples.

NSE analyzed the samples for Total Petroleum Hydrocarbons as gasoline (TPHg) w/ BTEX distinction utilizing EPA Methods 8020 (GCFID) with 3050 extraction method as described on page 17, Table 2 of the TRI-REGIONAL BOARD STAFF RECOMMENDATIONS FOR PRELIMINARY EVALUATION AND INVESTIGATION OF UNDERGROUND TANK SITES, 10 AUGUST 1990.

NSE noted that Methyl tertiary-Butyl Ether (MTBE) was evident in all samples. MTBE was confirmed for samples RS-2 RS-3 and RS-4 by EPA method 8260, see Table 1 and Appendix B. The detection limits in water are: TPH-G, 50 ug/L; Benzene, Toluene, Ethylbenzene and MTBE, 0.5 ug/L; Xylenes, 2 ug/L.

### ***RINSEATES AND PURGED GROUNDWATER STORAGE/TREATMENT.***

All rinseates and purged water produced from the groundwater sampling and weekly purging of the wells is transferred into 55 gallon DOT H17 drums for later removal (April 2, 1998), by Evergreen Services to be recycled

## LIMITATIONS

The information presented in this report is based on the following:

1. The observations and data collected by field personnel.
2. The results of laboratory analyses performed by a state certified analytical laboratory.
3. Our understanding of the regulations of Alameda County, the City of Oakland and the State of California.
4. References reviewed for this report.

Changes in groundwater conditions can occur due to variations in rainfall, temperature, local and regional water use, and local construction practices. In addition, variations in the soil and groundwater conditions could exist beyond the points explored in this investigation.

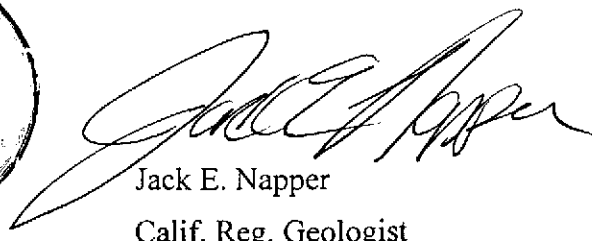
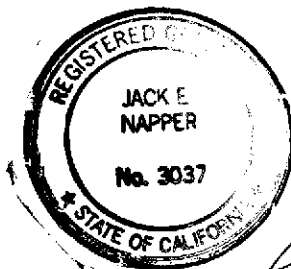
State Certified Laboratory analytical results are included in this report. This laboratory follows EPA and State of California approved procedures; however, WEGE is not responsible for errors in these laboratory results.

The services performed by Western Geo-Engineers, a corporation under California Registered Geologist #3037 and/or Contractors License #513857, have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the State of California, the City of Oakland and Alameda County. Our work and/or supervision of remediation and/or abatement operations, active or preliminary at this site is no way meant to imply that we are owners or operators of this site. Please note that the known contamination of soil and/or groundwater must be reported to the appropriate agencies in a timely manner. No other warranty expressed or implied is made.

Sincerely yours,



George L. Converse  
Project Manager/Geologist-WEGE



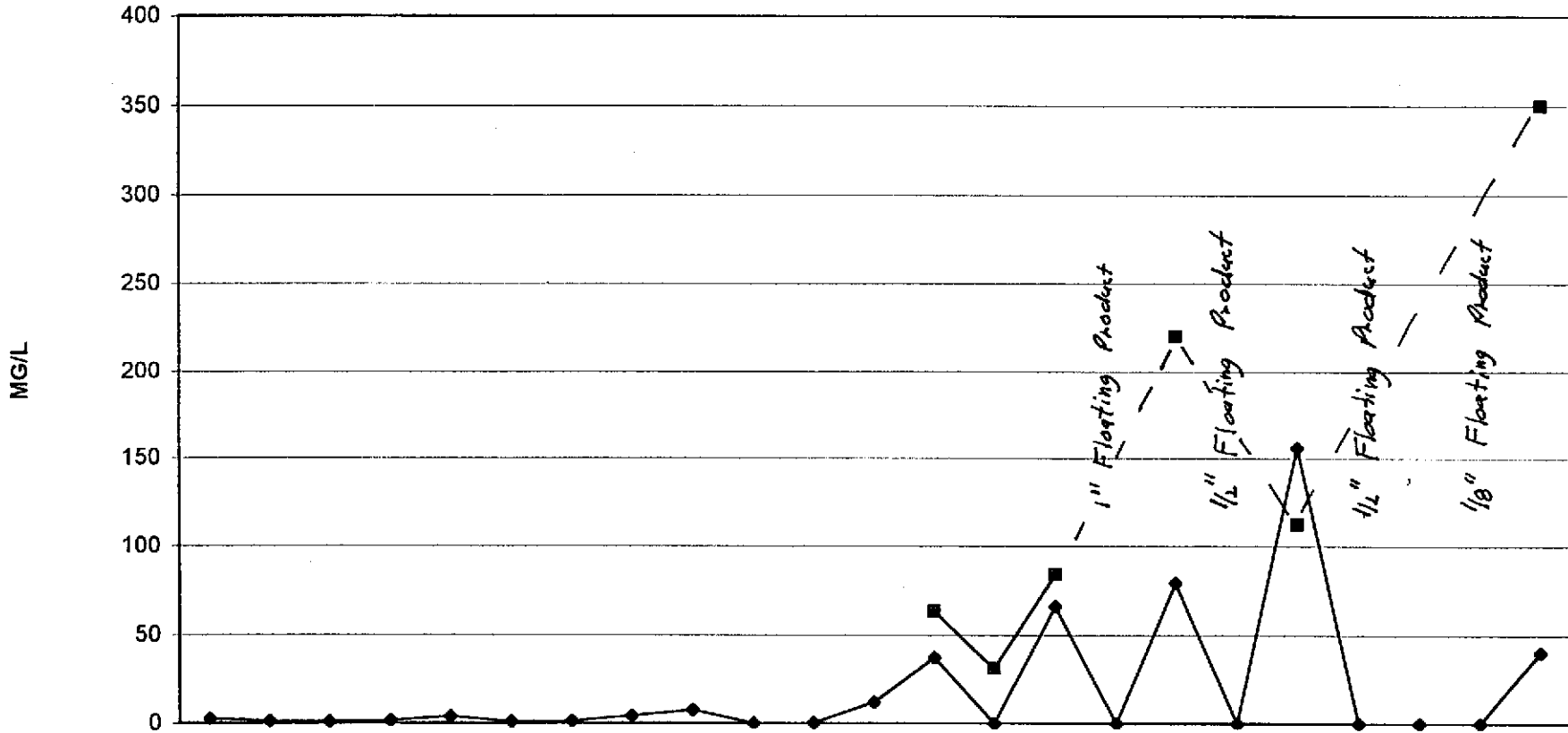
Jack E. Napper  
Calif. Reg. Geologist

cc: Mr. Scott Seary, Alameda County Health (510) 567-6774  
Mr. Leroy Griffin, City of Oakland

TABLE 1  
SUMMARY OF GROUNDWATER MONITORING  
DP796  
2844 MOUNTAIN BOULEVARD, OAKLAND, CALIFORNIA 94602

WELL	DATE	CASING ELEVATION	DEPTH TO TOP FLUID	DEPTH TO TOP WATER	FREE PRODUCT THICKNESS	GROUND WATER ELEVATION	TPH GASOLINE mg/L	ETHYL- BENZENE XYLENES MTBE					SAMPLED BY
								BENZENE ug/L	TOLUENE ug/L	BENZENE ug/L	XYLENES ug/L	MTBE mg/L	
RS-1	MAY-90	689.25	7.2	7.2	0.00	682.05	2.7	370	420	40	320		RSI
	MAY-91	689.25	8.35	8.35	0.00	680.9	1.3	580	130	62	240		RSI
	OCT.-91	689.17	10.22	10.22	0.00	678.95	1.1	140	100	45	210		RSI
	JAN.-92	689.17	8.06	8.06	0.00	681.11	1.7	9.9	31	9.7	170		RSI
	JAN.-93	689.17	5.3	5.3	0.00	683.87	3.7	650	9.2	51	170		RSI
	AUG.-93	689.17	8.56	8.56	0.00	680.61	0.9	14	0.6	2.1	8		RSI
	NOV.-93	689.17	8.44	8.44	0.00	680.73	1.4	9.6	ND	0.9	5		RSI
	Jan-94	689.17	6.88	6.88	0.00	682.29	4.2	95	3.1	58	130		RSI
	May-94	675.63	7.87	7.87	0.00	667.76	7.5	270	11	37	96		RSI
	Aug-94	675.63	16.28	16.28	0.00	659.35	0.13	12	0.5	2.6	5		RSI
	Nov-94	675.63	8.02	8.02	0.00	667.61	0.27	4.7	0.7	0.6	15		RSI
	Feb-95	675.63	6.51	6.51	0.00	669.12	12	81	2.3	1	12		RSI
	Jun-95	675.63	7.34	7.34	0.00	668.29	37	460	ND	ND	ND	63	RSI
	Nov-95	675.63	8.71	8.71	0.00	666.92	ND	660	16	140	330	31	RSI
	Feb-96	675.63	6.95	6.95	0.00	668.68	66	110	ND	12	21	84	RSI
	09/18/96	675.63	8.44	8.52	0.08	667.17	ONE INCH FREE PRODUCT						WEGE
	12/11/96	675.63	6.42	6.62	0.20	669.17	79	4000	37000	8000	45000	220	WEGE*
	02/21/97	675.63	6.88	6.92	0.04	668.74	1/2 INCH FLOATING PRODUCT						WEGE
	05/28/97	675.63	7.88	7.96	0.08	667.73	156	9400	51000	7000	45000	112	WEGE*
	09/02/97	675.63	8.34	8.38	0.04	667.28	1/2 INCH FLOATING PRODUCT						WEGE*
11/24/97	675.63	6.98	7	0.02	668.65	1/4 INCH FLOATING PRODUCT						WEGE*	
02/25/98	675.63	3.51	3.52	0.01	672.12	1/8 INCH FLOATING PRODUCT						WEGE*	
05/27/98	675.63	7.31	7.31	0.00	668.32	40	2200	4000	2300	19000	350	WEGE*	

DP796 - RS1



	MAY-90	MAY-91	OCT-91	JAN-93	AUG-93	NOV-93	Jan-94	May-94	Nov-94	Feb-95	Jun-95	Nov-95	09/18/96	12/11/96	02/21/97	05/28/97	09/02/97	02/25/98	05/27/98
◆ TPHg	2.7	1.3	1.1	3.7	0.9	1.4	4.2	7.5	0.27	12	37	0	0	79	0	156	0	0	40
■ MTBE											63	31		220		112			350

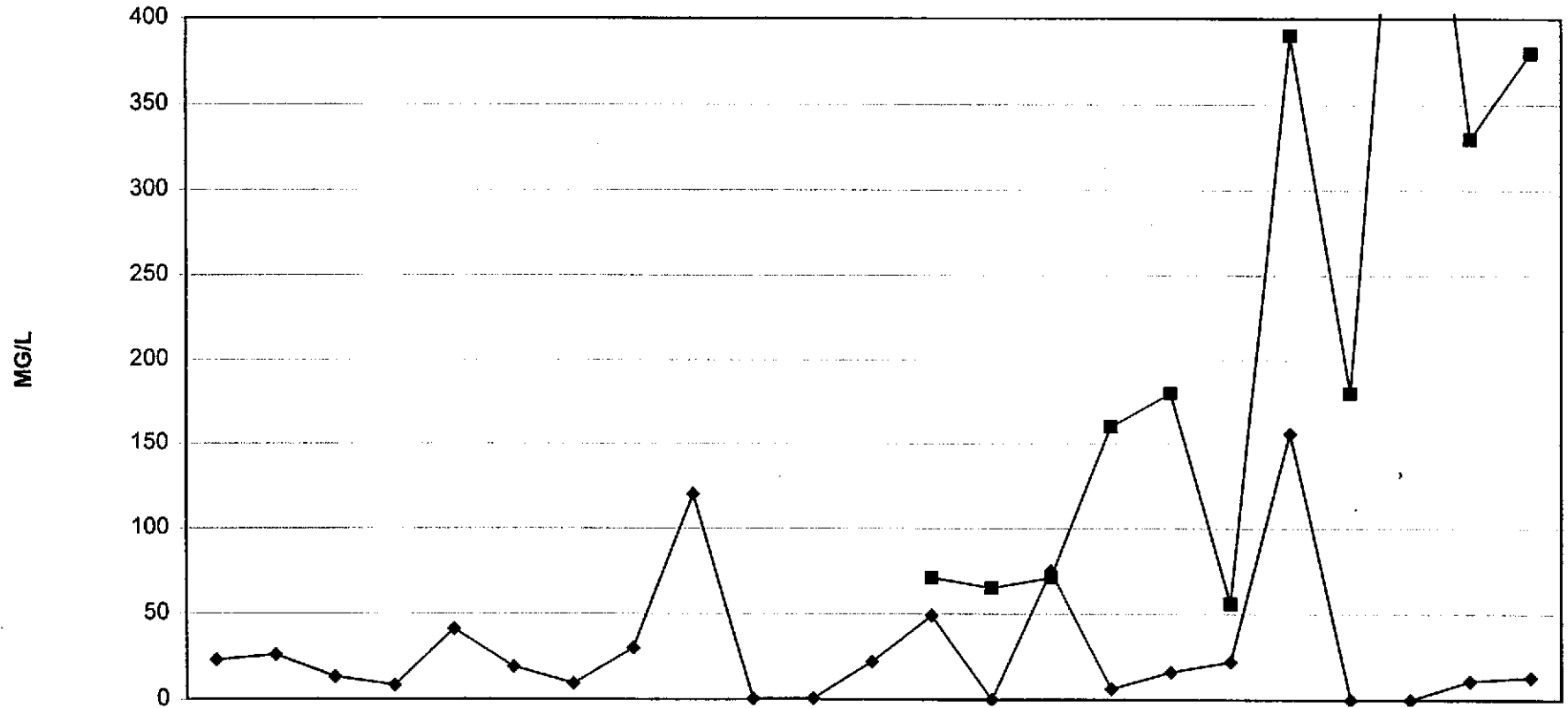
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TABLE 1  
SUMMARY OF GROUNDWATER MONITORING  
DP796  
2844 MOUNTAIN BOULEVARD, OAKLAND, CALIFORNIA 94602

WELL	DATE	CASING ELEVATION	DEPTH TO TOP FLUID	DEPTH TO TOP WATER	FREE PRODUCT THICKNESS	GROUND WATER ELEVATION	TPH GASOLINE mg/L	BENZENE ug/L	TOLUENE ug/L	ETHYL-BENZENE ug/L	XYLENES ug/L	MTBE mg/L	SAMPLED BY
RS-2	MAY-90	689	7.06	7.06	0.00	681.94	23	7200	4800	300	3300		RSI
	MAY-91	689	7.14	7.14	0.00	681.86	26	14000	1800	750	2900		RSI
	OCT.-91	688.89	8.84	8.84	0.00	680.05	13	4300	910	300	2300		RSI
	JAN.-92	688.89	7.34	7.34	0.00	681.55	8.3	1800	920	140	1700		RSI
	JAN.-93	688.89	4.1	4.1	0.00	684.79	41	7000	210	1200	4200		RSI
	AUG.-93	688.89	7.32	7.32	0.00	681.57	19	5300	62	810	1600		RSI
	NOV.-93	688.89	7.34	7.34	0.00	681.55	9.3	2400	3.9	46	800		RSI
	JAN.-94	688.89	5.52	5.52	0.00	683.37	30	4900	ND	880	2600		RSI
	MAY-94	675.25	6.4	6.4	0.00	668.85	120	3300	330	ND	2200		RSI
	AUG.-94	675.25	22.11	22.11	0.00	653.14	0.51	7.3	3.8	3.5	32		RSI
	NOV.-94	675.25	9.82	9.82	0.00	665.43	0.62	6.6	3.9	1.1	47		RSI
	FEB.-95	675.25	4.81	4.81	0.00	670.44	22	228	80	2	463		RSI
	JUN.-95	675.25	5.8	5.8	0.00	669.45	49	1300	160	200	1600	71	RSI
	NOV.-95	675.25	7.64	7.64	0.00	667.61	ND	670	25	150	360	65	RSI
	FEB.-96	675.25	4.69	4.69	0.00	670.56	75	1400	170	59	460	71	RSI
	09/18/96	675.25	7.34	7.34	0.00	667.91	6.3	2000	48	350	570	160	WEGE
	12/11/96	675.25	5.08	5.08	0.00	670.17	16	2000	840	200	3200	180	WEGE
	02/21/97	675.25	5.42	5.42	0.00	669.83	22	2100	1300	600	5100	56	WEGE*
	05/28/97	675.25	6.4	6.4	0.00	668.85	156	4200	89	1000	6900	390	WEGE*
	09/02/97	675.25	6.93	6.93	0.00	668.32	ND	1300	25	360	1400	180	WEGE*
	11/24/97	675.25	5.93	5.93	0.00	669.32	ND	600	ND	ND	ND	610	WEGE*
	02/25/98	675.25	4.59	4.59	0.00	670.66	11	1100	<50	320	2400	330	WEGE*
	05/27/98	675.25	5.61	5.61	0.00	669.64	13	1100	150	600	2700	380	WEGE*



DP796 - RS2



	MAY-90	MAY-91	OCT-91	JAN-93	AUG-93	NOV-93	JAN-94	MAY-94	NOV-94	FEB-95	JUN-95	NOV-95	09/18/96	12/11/96	02/21/97	05/28/97	09/02/97	02/25/98	05/27/98
◆ TPHg	23	26	13	41	19	9.3	30	120	0.62	22	49	0	6.3	16	22	156	0	11	13
■ MTBE											71	65	160	180	56	390	180	330	380

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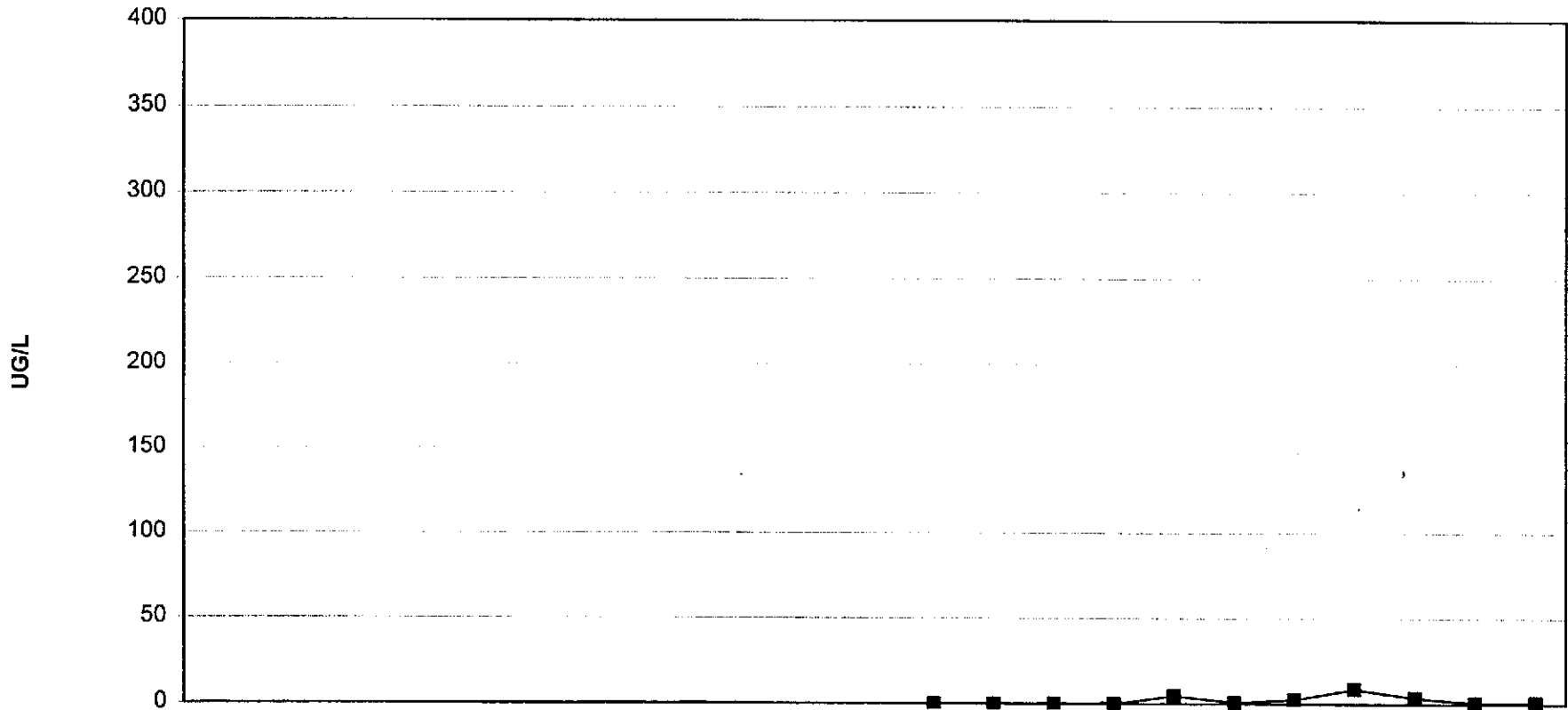
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TABLE 1  
SUMMARY OF GROUNDWATER MONITORING  
DP796  
2844 MOUNTAIN BOULEVARD, OAKLAND, CALIFORNIA 94602

WELL	DATE	CASING ELEVATION	DEPTH TO TOP FLUID	DEPTH TO TOP WATER	FREE PRODUCT THICKNESS	GROUND WATER ELEVATION	TPH GASOLINE mg/L	BENZENE ug/L	TOLUENE ug/L	ETHYL-BENZENE ug/L	XYLENES ug/L	MTBE mg/L	SAMPLED BY
RS-3	MAY-90	670	6	6	0.00	664.00	0.33	2	1	1	150		RSI
	MAY-91	670	6.76	6.76	0.00	663.24	ND	0.4	ND	0.8	8		RSI
	OCT.-91	670	8.98	8.98	0.00	661.02	ND	ND	ND	ND	ND		RSI
	JAN.-92	670	6.81	6.81	0.00	663.19	ND	2.2	7.2	0.6	4		RSI
	JAN.-93	670	4.05	4.05	0.00	665.95	ND	ND	ND	ND	ND		RSI
	AUG.-93	670	7.19	7.19	0.00	662.81	ND	30	6	2.4	5		RSI
	NOV.-93	670	7.12	7.12	0.00	662.88	ND	4.8	0.4	0.6	2		RSI
	JAN.-94	670	5.42	5.42	0.00	664.58	0.33	25	3.2	3.9	12		RSI
	MAY-94	676.2	5.78	5.78	0.00	670.42	0.67	34	4	28	70		RSI
	AUG.-94	676.2	5.86	5.86	0.00	670.34	ND	ND	ND	ND	ND		RSI
	NOV.-94	676.2	5.08	5.08	0.00	671.12	0.069	2.5	3.1	1	4		RSI
	FEB.-95	676.2	4.51	4.51	0.00	671.69	ND	0.3	0.4	ND	1		RSI
	JUN.-95	676.2	5.29	5.29	0.00	670.91	ND	ND	ND	ND	ND	0.066	RSI
	NOV.-95	676.2	7.1	7.1	0.00	669.10	ND	ND	ND	ND	ND	0.044	RSI
	FEB.-96	676.2	4.48	4.48	0.00	671.72	0.12	ND	ND	ND	ND	0.11	RSI
	09/18/96	676.2	6.92	6.92	0.00	669.28	1	13	8.6	10	17	0.033	WEGE
	12/11/96	676.2	4.9	4.9	0.00	671.30	0.085	20	2	<0.5	14	4.7	WEGE
	02/21/97	676.2	4.94	4.94	0.00	671.26	0.12	5	2	2	6	0.85	WEGE*
	05/28/97	676.2	7.92	7.92	0.00	668.28	ND	6	ND	ND	ND	2.4	WEGE
	09/02/97	676.2	6.6	6.6	0.00	669.60	ND	0.9	ND	ND	ND	8.6	WEGE*
	11/24/97	676.2	5.89	5.89	0.00	670.31	0.14	13	2	1	12	3.6	WEGE*
	02/25/98	676.2	4.29	4.29	0.00	671.91	ND	ND	ND	ND	4	0.85	WEGE*
	05/27/98	676.2	5.01	5.01	0.00	671.19	ND	7	ND	ND	11	0.94	WEGE*

10

DP796 - RS3



11

	MAY-90	MAY-91	OCT-91	JAN-93	AUG-93	NOV-93	JAN-94	MAY-94	NOV-94	FEB-95	JUN-95	NOV-95	09/18/96	12/11/96	02/21/97	05/28/97	09/02/97	02/25/98	05/27/98
TPHg	0.33	0	0	0	0	0	0.33	0.67	0.069	0	0	0	1	0.085	0.12	0	0	0	0
MTBE											0.066	0.044	0.033	4.7	0.85	2.4	8.6	0.85	0.94

DATE SAMPLED

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DP796  
2844 MOUNTAIN BOULEVARD, OAKLAND, CALIFORNIA 94602

WELL	DATE	CASING ELEVATION	DEPTH TO TOP FLUID	DEPTH TO TOP WATER	FREE PRODUCT THICKNESS	GROUND WATER ELEVATION	TPH GASOLINE mg/L	BENZENE ug/L	TOLUENE ug/L	ETHYL-BENZENE ug/L	XYLENES ug/L	MTBE mg/L	SAMPLED BY
RS-4	MAY-90	689.06	8.34	8.34	0.00	680.72	0.44	9	11	9	49		RSI
	MAY-91	689.06	9.5	9.5	0.00	679.56	ND	8	4	3	5		RSI
	OCT.-91	689.1	10.82	10.82	0.00	678.28	0.83	280	120	24	170		RSI
	JAN.-92	689.1	9.31	9.31	0.00	679.79	0.62	34	8.3	2.1	21		RSI
	JAN.-93	689.1	6.89	6.89	0.00	682.21	0.15	32	1.7	5.8	13		RSI
	AUG.-93	689.1	9.68	9.68	0.00	679.42	ND	0.9	0.7	ND	0		RSI
	NOV.-93	689.1	9.83	9.83	0.00	679.27	ND	ND	ND	ND	ND		RSI
	JAN.-94	689.1	8.17	8.17	0.00	680.93	ND	1.7	ND	0.81	2		RSI
	MAY-94	675.38	8.69	8.69	0.00	666.69	ND	ND	ND	ND	1		RSI
	AUG.-94	675.38	9.04	9.04	0.00	666.34	0.42	6.5	4.1	1.9	40		RSI
	NOV.-94	675.38	8	8	0.00	667.38	0.13	4.1	0.7	1.7	8		RSI
	FEB.-95	675.38	7.93	7.93	0.00	667.45	ND	6	1.2	3.5	13		RSI
	JUN.-95	675.38	8.61	8.61	0.00	666.77	ND	ND	ND	ND	ND	0.069	RSI
	NOV.-95	675.38	10.43	10.43	0.00	664.95	ND	ND	ND	ND	ND	0.047	RSI
	FEB.-96	675.38	7.44	7.44	0.00	667.94	0.96	ND	ND	0.6	ND	0.08	RSI
	09/18/96	675.38	9.58	9.58	0.00	665.80	<0.05	<0.5	<0.5	<0.5	<2	0.2	WEGE
	12/11/96	675.38	7.5	7.5	0.00	667.88	0.075	<0.5	0.6	<0.5	<2	0.104	WEGE
	02/21/97	675.38	8.26	8.26	0.00	667.12	ND	1	1	ND	1	0.19	WEGE*
05/28/97	675.38	8.92	8.92	0.00	666.46	ND	6	ND	ND	ND	0.11	WEGE	
09/02/97	675.38	9.39	9.39	0.00	665.99	0.1	3	ND	ND	ND	0.039	WEGE*	
11/24/97	675.38	8.22	8.22	0.00	667.16	0.041	<0.5	2	<0.5	<2	0.21	WEGE*	
02/25/98	675.38	7.19	7.19	0.00	668.19	ND	3	ND	ND	ND	5.6	WEGE*	
05/27/98	675.38	8.4	8.4	0.00	666.98	ND	ND	ND	ND	ND	2.4	WEGE*	
WATER METER BOX							mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg		
	08/06/97	SOIL AT ONE FOOT DEPTH BELOW SURFACE					1900	0.45	0.6	6.5	9.9	ND	WEGE

MTBE Methyl t-Butyl Ether

TPH Total Petroleum Hydrocarbons

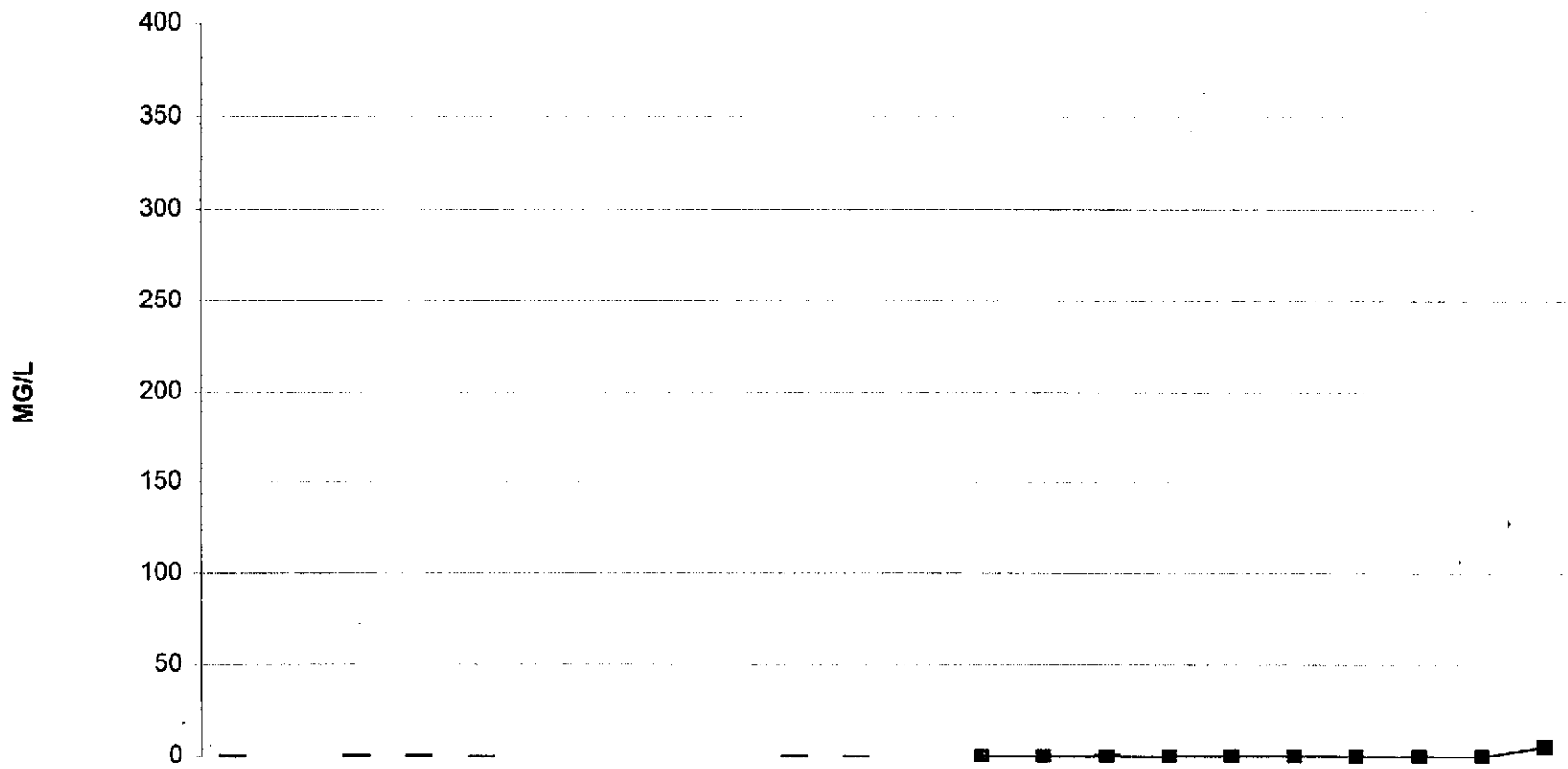
mg/L Milligrams per liter (ppm)

ND or < Below laboratory detection limits

ug/L Micrograms per liter (ppb)

\* MTBE confirmed by GC/MS 8260 method.

DP796 - RS4



	MAY-90	MAY-91	JAN-92	JAN-93	AUG-93	NOV-93	MAY-94	AUG-94	NOV-94	JUN-95	NOV-95	FEB-96	12/11/96	02/21/97	05/28/97	09/02/97	02/25/98
TPHg	0.44	0	0.62	0.15	0	0	0	0.42	0.13	0	0	0.96	0.075	0	0	0.1	0
MTBE										0.069	0.047	0.08	0.104	0.19	0.11	0.039	5.6

DATE SAMPLED

13

**-WEGE-**

FORMER DESERT PETROLEUM #796  
2844 MOUNTAIN BOULEVARD  
OAKLAND, CALIFORNIA

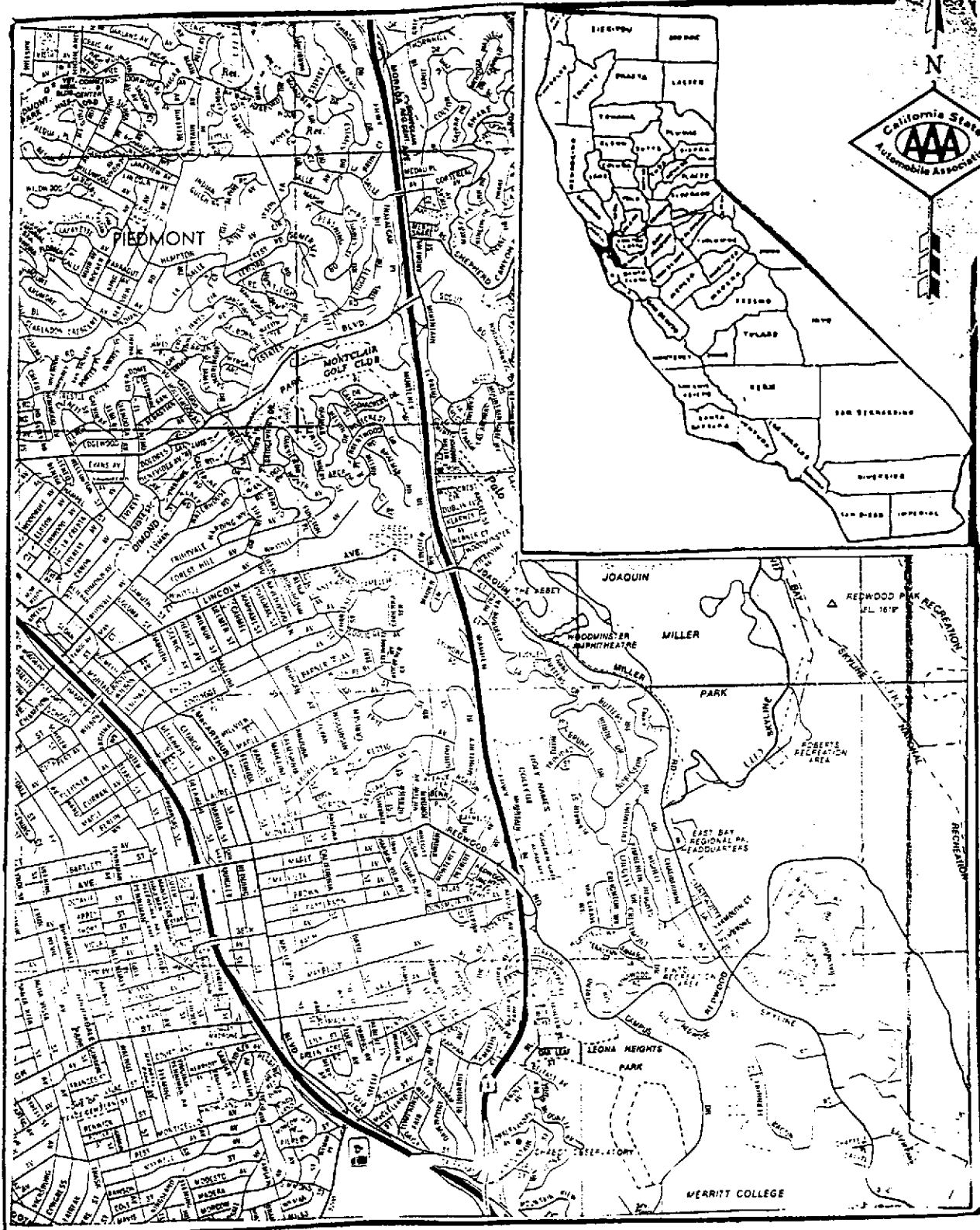


FIGURE 1

Location (AAA Map)

-WEGE-

FORMER DESERT PETROLEUM #796  
2844 MOUNTAIN BOULEVARD  
OAKLAND, CALIFORNIA

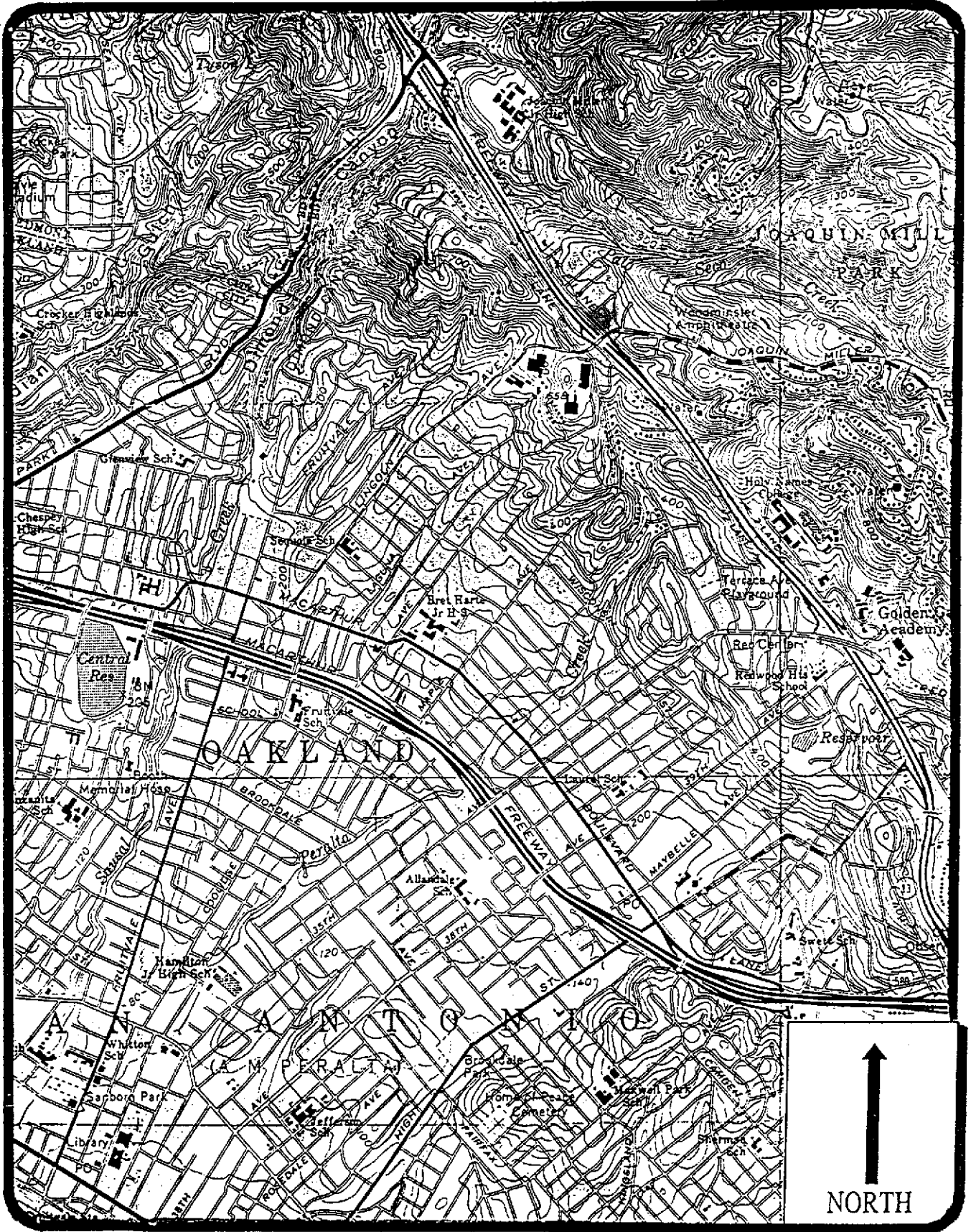
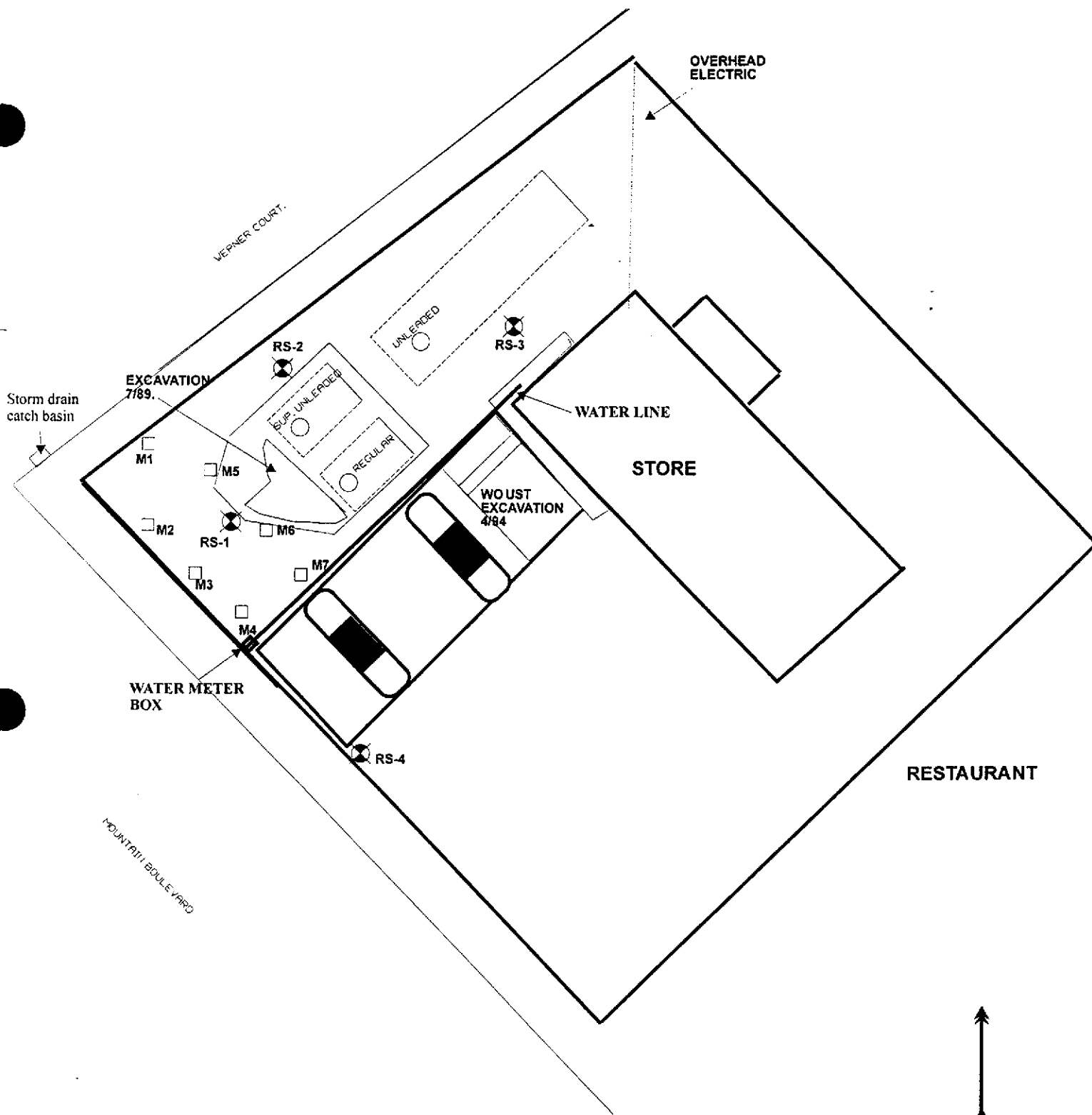


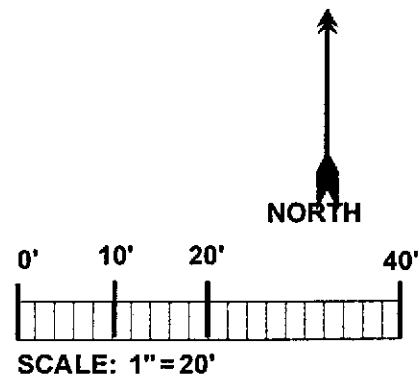
FIGURE 2, USGS TOPOGRAPHIC MAP



**FIGURE 3**

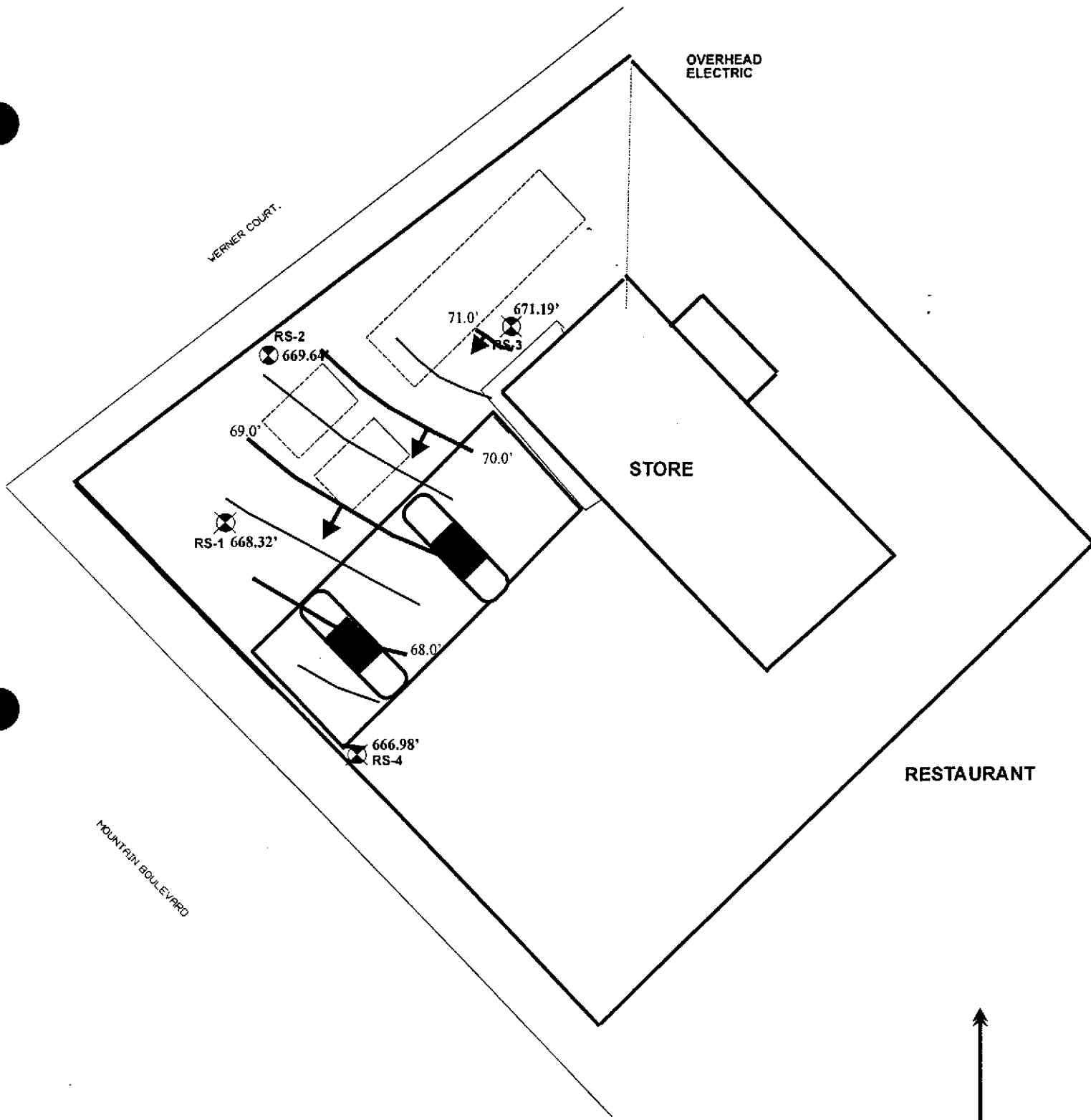
**FORMER DESERT PETROLEUM #796  
2844 MOUNTAIN BOULEVARD  
OAKLAND, CALIFORNIA**

**SITE CONDITIONS  
May 27, 1998.**



-  **GROUNDWATER MONITORING WELL.**
-  **SOIL PROBE TEST HOLE, JANUARY 17, 1997.**

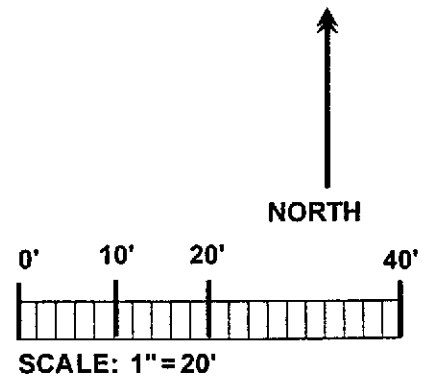




**FIGURE 4**

**FORMER DESERT PETROLEUM #796  
2844 MOUNTAIN BOULEVARD  
OAKLAND, CALIFORNIA**

**GROUNDWATER GRADIENT  
MAY 27, 1998**



 **GROUNDWATER  
MONITORING WELL.**

**RS-1**  
**GROUNDWATER GRADIENT CONTOUR  
INTERVAL IS 0.5 FEET.**

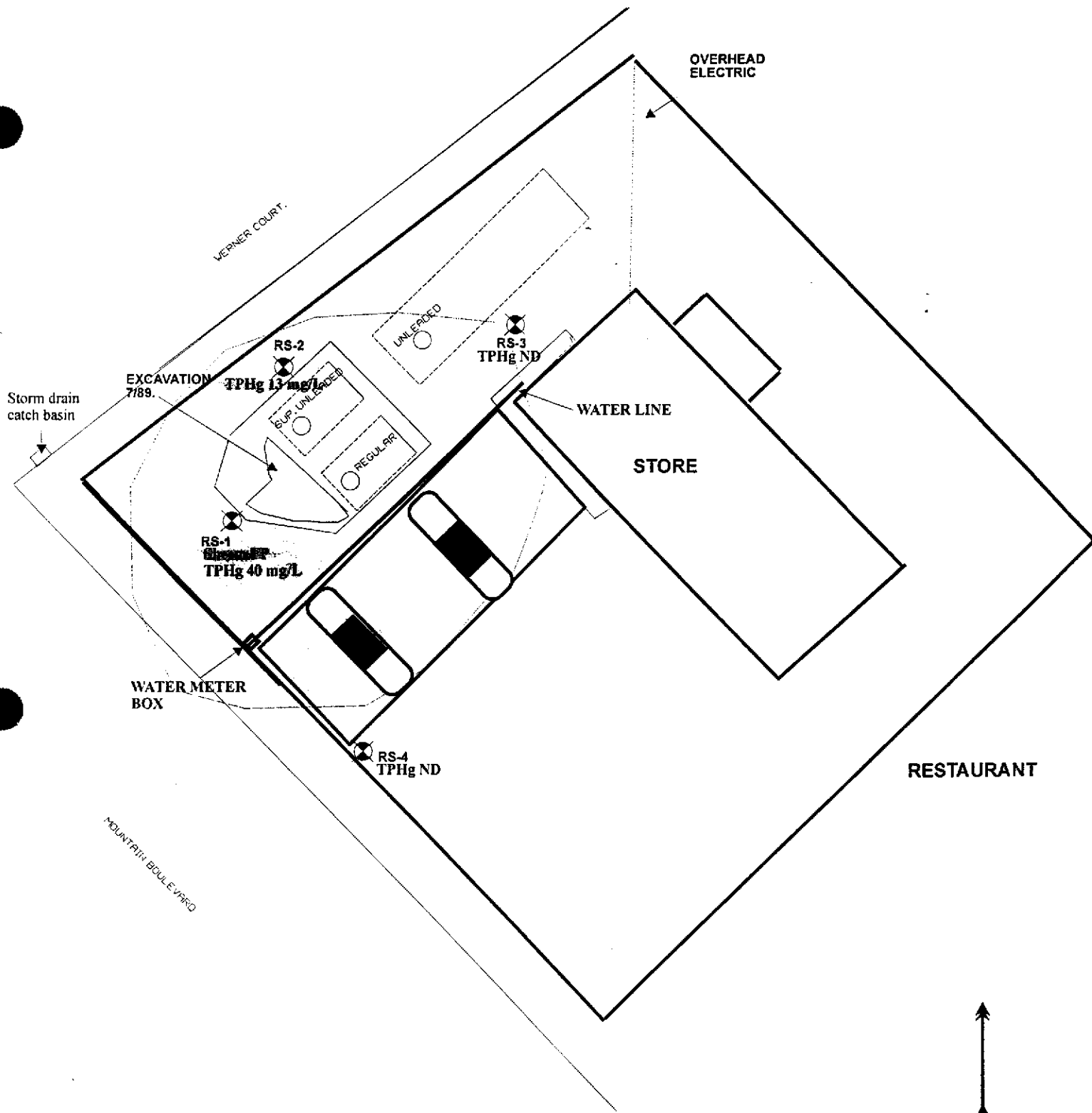
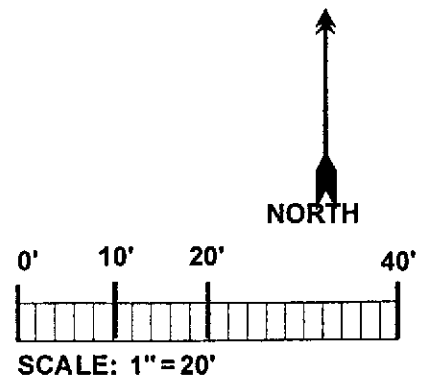


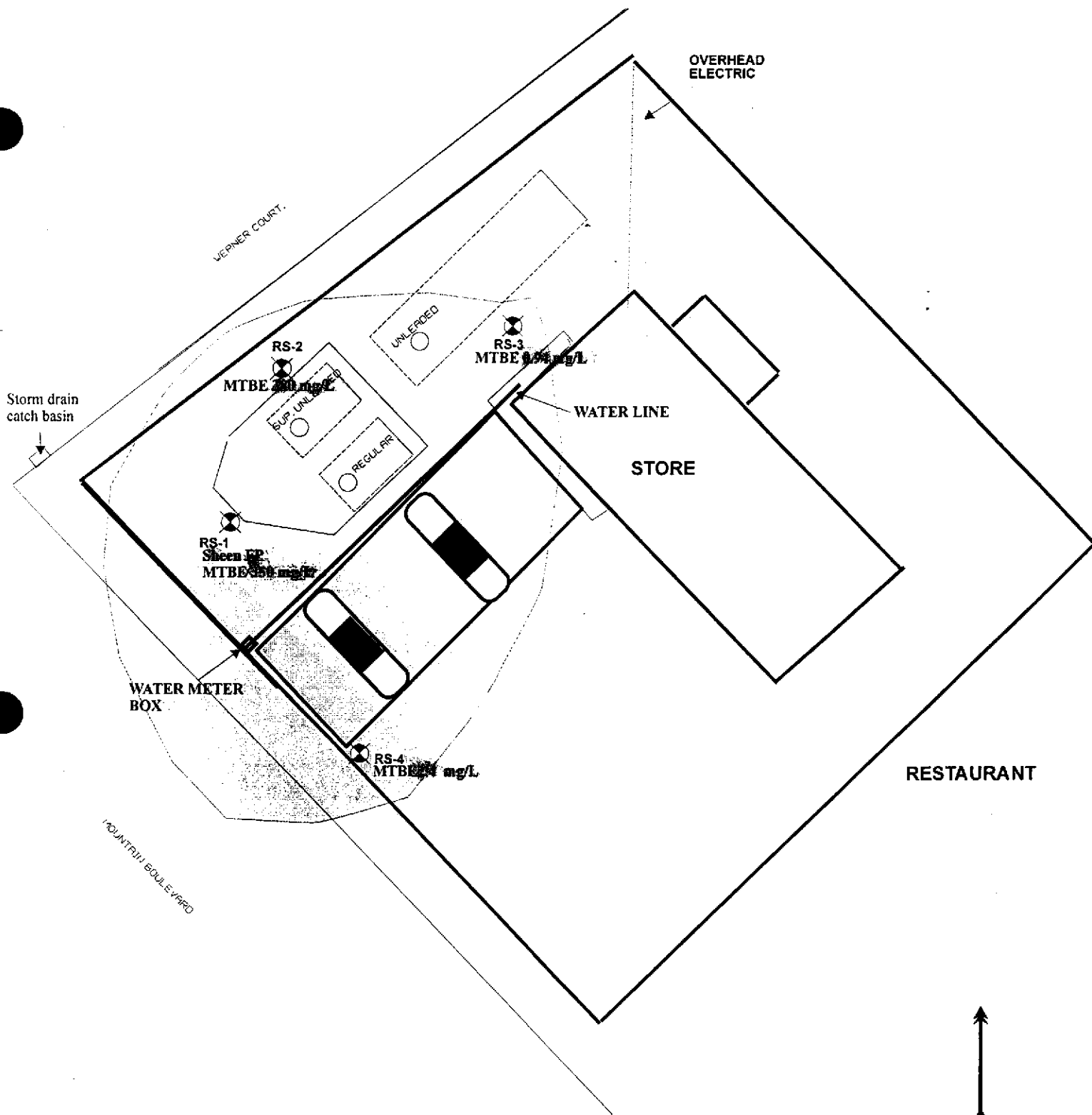
FIGURE 5

FORMER DESERT PETROLEUM #796  
 2844 MOUNTAIN BOULEVARD  
 OAKLAND, CALIFORNIA

SITE CONDITIONS - Gasoline Range Hydrocarbon Plume  
 May 27, 1998



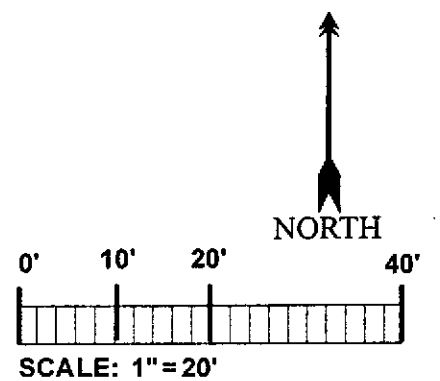

 GROUNDWATER  
 MONITORING WELL  
 RS-1



**FIGURE 6**

**FORMER DESERT PETROLEUM #796  
2844 MOUNTAIN BOULEVARD  
OAKLAND, CALIFORNIA**

**SITE CONDITIONS - MTBE Plume  
May 27, 1998**




**GROUNDWATER MONITORING WELL.**  
 RS-1

# WELL SAMPLING DATA SHEET

*5-27-98*

SITE DP 796	DATE <del>5-21-98</del>	TIME 10:56
WELL RS-1	SAMPLED BY. <i>mp</i>	
WELL ELEVATION		
PRODUCT THICKNESS		
DEPTH TO WATER DTW: 7.31 DTB: 29.66		
FLUID ELEVATION		
BAILER TYPE Disposable Bailer		
PUMP David LTT		

WELL PURGING RECORD				
TIME	VOLUME REMOVED	TEMP.	pH	COND.
11:57	1st bailer	63.9	7.09	.08
11:06	30 gal	64.9	6.89	.09
11:07		66.5	6.86	.09
11:09	5	67.8	6.88	.09
11:11		67.3	6.88	.08
11:13	5	66.4	6.86	.08
11:14		66.3	6.87	.08
11:15		66.2	6.86	.08

FINAL VOLUME PURGED	42 gal
TIME SAMPLED	11:17
SAMPLE ID.	RS-1
SAMPLE CONTAINERS	2 vials
ANALYSIS TO BE RUN	TPHg / BTEX / MTBE oxygenates
LABORATORY	NSE
NOTES:	1st bailer light sheene light gas odor

# WELL SAMPLING DATA SHEET

5-27-98

SITE DP 796	DATE 5-21-98	TIME 10:00
WELL RS-2	SAMPLED BY. <i>mp</i>	
WELL ELEVATION		
PRODUCT THICKNESS		
DEPTH TO WATER DTW: 5.61 DTB: 25.02		
FLUID ELEVATION		
BAILER TYPE Disposable Bailer		
PUMP David LTT		

## WELL PURGING RECORD

TIME	VOLUME REMOVED	TEMP.	pH	COND.
10:02	1st bailer	66.1	7.89	.08 x1000
10:06	20 gal	65.4	7.77	.08
10:09		66.5	7.78	.08
10:13	15	66.6	7.69	.08
10:15		67.7	7.62	.08
10:16		67.2	7.65	.08
10:17		67.5	7.63	.08
10:18		67.3	7.63	.08

FINAL VOLUME PURGED 27 gal
TIME SAMPLED 10:20
SAMPLE ID. RS-2
SAMPLE CONTAINERS 2 VOLS
ANALYSIS TO BE RUN TPHg / BTEX / MTBE
LABORATORY NSE
NOTES: 1st bailer clear with light sewer odor

# WELL SAMPLING DATA SHEET

5-27-98

SITE DP 796	DATE 5-21-98	TIME 9:42
WELL RS-3	SAMPLED BY. <i>mp</i>	
WELL ELEVATION		
PRODUCT THICKNESS		
DEPTH TO WATER DTW: 5.01 DTB: 24.40		
FLUID ELEVATION		
BAILER TYPE Disposable Bailer		
PUMP David LTT		

## WELL PURGING RECORD

TIME	VOLUME REMOVED	TEMP.	pH	COND.
9:44	1st bailer	67.6	6.35	.08 x1000
9:48	30 gal	67.4	6.22	.08
9:50		67.1	6.89	.08
9:53	5	67.3	6.73	.08
9:54		67.2	6.81	.08
9:55		67.1	6.85	.08
9:56		67.0	6.82	.08
			sampling	

FINAL VOLUME PURGED 36 <sup>3</sup> / <sub>4</sub> gal
TIME SAMPLED 9:57
SAMPLE ID. RS-3
SAMPLE CONTAINERS 2 vials
ANALYSIS TO BE RUN TPHg / BTEX / MTBE
LABORATORY NSE
NOTES: 1st bailer clear No odor

# WELL SAMPLING DATA SHEET

5-27-98

SITE DP 796	DATE 5-21-98	TIME 10:30
WELL RS-4	SAMPLED BY. <i>mp</i>	
WELL ELEVATION		
PRODUCT THICKNESS		
DEPTH TO WATER DTW: 8.50 DTB: 25.14		
FLUID ELEVATION		
BAILER TYPE Disposable Bailer		
PUMP David LTT		

## WELL PURGING RECORD

TIME	VOLUME REMOVED	TEMP.	pH	COND.
10:33	1st bailer	63.8	7.24	.08 x1000
10:39	32 gal	65.2	7.17	.08
10:40		66.8	7.21	.08
10:41		66.9	7.20	.08
10:42		66.7	7.20	.08
10:43		66.6	7.20	.08
		<i>sampled</i>		

FINAL VOLUME PURGED	3 3/2 gal
TIME SAMPLED	10:45
SAMPLE ID.	RS-4
SAMPLE CONTAINERS	2 VO95
ANALYSIS TO BE RUN	TPHg / BTEX / MTBE
LABORATORY	NSE
NOTES:	1st bailer clear No odor



# North State Environmental Analytical Laboratory

Phone: (415) 588-9652 Fax: (415) 588-1950

Chain of Custody / Request for Analysis

Lab Job No.: \_\_\_\_\_ Page 1 of 1

Client: <i>Western Bio Products</i>	Report to:	Phone:	Turnaround Time
Mailing Address: <i>1286 E. Blaine St. Carbondale, CA 95720</i>	Billing to: <i>same</i>	Fax:	
		PO# / Billing Reference:	
			Sampler: <i>MP</i>

Project / Site Address: <i>2944 Mountain Blvd. Carbondale, CA</i>					Analysis Requested								Comments/Hazards
Sample ID	Sample Type	Container No. / Type	Pres.	Sampling Date / Time	<i>THU</i>	<i>MTG</i>	<i>CHLORINE</i>						
<i>NS-1</i>	<i>HR</i>	<i>7/293</i>	<i>HR</i>	<i>5-27-98/10:17</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						<i>SEE ORIGINAL</i>
<i>NS-2</i>	<i> </i>	<i> </i>	<i> </i>	<i>11:21</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						<i>only</i>
<i>NS-3</i>	<i> </i>	<i> </i>	<i> </i>	<i>11:57</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						
<i>NS-4</i>	<i> </i>	<i> </i>	<i> </i>	<i>11:15</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						

Relinquished by: <i>Matt P. Smith</i>	Date: <i>5-28-98</i>	Time: <i>10:00</i>	Received by: <i>J. H. M. / 10:17</i>	Lab Comments
Relinquished by:	Date:	Time:	Received by:	
Relinquished by:	Date:	Time:	Received by:	



# LAWRENCE TANK TESTING, INC.

PO BOX 407, DOWNIEVILLE, CALIFORNIA 95936  
 PHONE 916-289-3109 - FAX 916-289-3322

## WELL SHEET

TECHNICIAN DAVID

INVOICE NO. SP-54  
 DATE MAY 27 1998

SITE NAME OAKLAND MTN BLVD  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_  
 PHONE \_\_\_\_\_

CUSTOMER WESTERN GEO  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_  
 PHONE \_\_\_\_\_

WELL NO. | DESCRIPTION OF WORK PERFORMED

RS 3 35 GALLONS  
RS 2 35  
RS 4 37  
RS 1 40

RATES  
 LABOR AND TRAVEL TIME \$ \_\_\_\_\_ PER HOUR  
 MILEAGE \$ \_\_\_\_\_ PER MILE

MATERIALS USED	QTY	PRICE	TOTAL

	HOURS	MINUTES
ARRIVAL TIME	9	00
DEPARTURE TIME	11	45
TOTAL TIME AT SITE		

TOTAL OF MATERIALS \$ \_\_\_\_\_  
 TOTAL OF LABOR \$ \_\_\_\_\_

TRAVEL TIME FROM \_\_\_\_\_ TO \_\_\_\_\_ TO \_\_\_\_\_ \$ \_\_\_\_\_

TOTAL MILEAGE \_\_\_\_\_ \$ \_\_\_\_\_

JOB TOTAL \$ \_\_\_\_\_



# North State Environmental Analytical Laboratory

Phone: (415) 588-9652 Fax: (415) 588-1950

98-600

Chain of Custody / Request for Analysis

Lab Job No.: \_\_\_\_\_ Page 1 of 1

Client: <i>Western Geo Engineers</i>	Report to:	Phone:	Turnaround Time
Mailing Address: <i>1386 E Beamer St. Woodland C.A. 95776</i>	Billing to:	Fax:	
	→ <i>Same</i>	PO# / Billing Reference:	
			Sampler: <i>MP</i>

Project / Site Address: *2844 Mountain Blvd.  
Oakland C.A.*

Analysis

Requested

	Sample ID	Sample Type	Container No. / Type	Pres.	Sampling Date / Time	Analysis Requested			Comments/Hazards
						TPH5/BTEX	MTBE	Oxygenates	
1	<i>RS-1</i>	<i>H2O</i>	<i>3/VogS</i>	<i>HCL</i>	<i>5-27-98/11:17</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>8260 oxygenates only</i>
2	<i>RS-2</i>				<i>10:20</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	<i>RS-3</i>				<i>9:57</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	<i>RS-4</i>				<i>10:45</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Relinquished by: <i>Matt Penick</i>	Date: <i>5-28-98</i> Time: <i>10:00</i>	Received by: <i>[Signature]</i>	Lab Comments
Relinquished by:	Date: _____ Time: _____	Received by:	
Relinquished by:	Date: _____ Time: _____	Received by:	



North State Environmental  
Chemical Waste Disposal · Trucking · Consulting

# C E R T I F I C A T E O F A N A L Y S I S

Lab Number: 98-600  
Client: Western Geo-Engineers  
Project: 2844 Mountain Blvd, Oakland, CA

Date Reported: 06/12/98

Gasoline and BTEX by Methods 8015M and 8020

Analyte	Method	Result	Unit	Date Sampled	Date Analyzed
Sample: 98-600-01		Client ID: RS-1		05/27/98	WATER
Gasoline	8015M	40000	ug/L		06/02/98
Benzene	8020	2200	ug/L		
Ethylbenzene	8020	2300	ug/L		
Toluene	8020	4000	ug/L		
Xylenes	8020	19000	ug/L		
Sample: 98-600-02		Client ID: RS-2		05/27/98	WATER
Gasoline	8015M	13000	ug/L		06/02/98
Benzene	8020	2000	ug/L		
Ethylbenzene	8020	600	ug/L		
Toluene	8020	150	ug/L		
Xylenes	8020	2700	ug/L		
Sample: 98-600-03		Client ID: RS-3		05/27/98	WATER
Gasoline	8015M	ND			06/02/98
Benzene	8020	7	ug/L		
Ethylbenzene	8020	ND			
Toluene	8020	ND			
Xylenes	8020	11	ug/L		



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C E R T I F I C A T E O F A N A L Y S I S

Lab Number: 98-600  
Client: Western Geo-Engineers  
Project: 2844 Mountain Blvd, Oakland, CA

Date Reported: 06/12/98

Gasoline and BTEX by Methods 8015M and 8020

Analyte	Method	Result	Unit	Date Sampled	Date Analyzed
Sample: 98-600-04	Client ID: RS-4			05/27/98	WATER
Gasoline	8015M	ND			06/02/98
Benzene	8020	ND			
Ethylbenzene	8020	ND			
Toluene	8020	ND			
Xylenes	8020	ND			



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## CERTIFICATE OF ANALYSIS

Quality Control/Quality-Assurance

Lab Number: 98-600  
Client: Western Geo-Engineers  
Project: 2844 Mountain Blvd, Oakland, CA

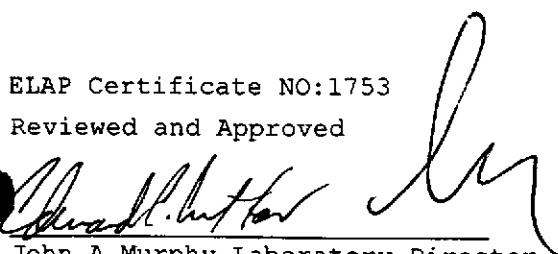
Date Reported: 06/12/98

Gasoline and BTEX by Methods 8015M and 8020

Analyte	Method	Reporting Limit	Unit	Blank	MS/MSD Recovery	RPD
Gasoline	8015M	50	ug/L	ND	89	10
Benzene	8020	0.5	ug/L	ND	106	6
Ethylbenzene	8020	0.5	ug/L	ND	114	8
Toluene	8020	0.5	ug/L	ND	106	9
Xylenes	8020	1.0	ug/L	ND	107	8

ELAP Certificate NO:1753

Reviewed and Approved

  
John A. Murphy, Laboratory Director

Page 3 of 3



North State Environmental  
Chemical Waste Disposal · Trucking · Consulting

# C E R T I F I C A T E O F A N A L Y S I S

Job Number: 98-600  
Client : Western Geo-Engineers  
Project : 2844 Mountain Blvd, Oakland, CA

Date Sampled : 05/27/98  
Date Analyzed: 06/09/98  
Date Reported: 06/12/98

## Volatile Organics by GC/MS Method 8260

Laboratory Number	98-600-01	98-600-02	98-600-03	98-600-04
Client ID	RS-1	RS-2	RS-3	RS-4
Matrix	WATER	WATER	WATER	WATER
Analyte	ug/L	ug/L	ug/L	ug/L
Ethanol	ND<500	ND<500	ND<500	ND<500
Methyl-t-Butyl Ether	350000	380000	940	2400
Di-isopropyl Ether	ND<5	ND<5	ND<5	ND<5
tertiary Butyl Alcohol	ND<5	ND<5	ND<5	ND<5
Ethyl-t-Butyl Ether	ND<5	ND<5	ND<5	ND<5
t-Amyl Methyl Ether	1800	3000	14	ND<1
SUR-Dibromofluoromethane	105% Rec	101% Rec	113% Rec	110% Rec
SUR-Toluene-d8	110% Rec	105% Rec	93 % Rec	105% Rec
SUR-4-Bromofluorobenzene	111% Rec	107% Rec	93 % Rec	105% Rec



North State Environmental  
Chemical Waste Disposal · Trucking · Consulting

# C E R T I F I C A T E O F A N A L Y S I S

Job Number: 98-600

Client : Western Geo-Engineers

Project : 2844 Mountain Blvd, Oakland, CA

Date Sampled : 05/27/98

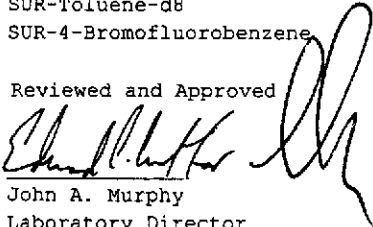
Date Analyzed: 06/09/98

Date Reported: 06/12/98

## Volatile Organics by GC/MS Method 8260 Quality Control/Quality Assurance Summary

Laboratory Number	98-600	MS/MSD	RPD
Client ID	Blank	Recovery	
Matrix	WATER	WATER	
Analyte	Results ug/L	%Recoveries	
Ethanol	ND<500		
Methyl-t-Butyl Ether	ND<1		
Di-isopropyl Ether	ND<5		
tertiary Butyl Alcohol	ND<5		
Ethyl-t-Butyl Ether	ND<5		
t-Amyl Methyl Ether	ND<1		
1,1-Dichloroethene	ND<1	83	0
Benzene	ND<1	127	0
Trichloroethene	ND<1	109	0
Toluene	ND<1	125	0
Chlorobenzene	ND<1	121	0
SUR-Dibromofluoromethane	105% Rec	108/107	1
SUR-Toluene-d8	98 % Rec	99/97	2
SUR-4-Bromofluorobenzene	103% Rec	104/104	0

Reviewed and Approved

  
John A. Murphy  
Laboratory Director

## **Appendix C**

### **Methods and Procedures**

### **QA/QC**

This Appendix documents the specific methods, procedures, and materials used to collect and analyze groundwater samples.

#### **Gauging and Measuring Monitor Wells**

Prior to sampling a well, WEGE personnel obtain three measurements:

1. the depth to groundwater (DTW);
2. the product thickness using a battery powered depth to water-product interface probe and/or by using a specially designed bailer;
3. the total depth of casing, to calculate the total water volume in the well.

The DTW-product interface probe is lowered into the well casing until the instrument signals when the top of free phase floating product (if present) and/or the top of water is reached. The distance from the top of free phase floating product and/or water to the top of casing is read from the tape that is attached to the probe. The probe is then lowered to the bottom of the well and the tape is read again. The tape is calibrated in 0.01-foot intervals for accuracy to 0.01 foot. The measured distance is subtracted from the established elevation at the top of casing to determine the elevation of groundwater with respect to mean sea level and the difference between the top of groundwater and the base of the well is noted to establish water volume in the well. The probe and tape is washed with TSP (Tri Sodium Phosphate) and rinsed in distilled water before each measurement. WEGE has designed and built bailers that will collect a sample of the contents of a well to show the exact thickness of any floating product. Some of the abbreviations used in water sampling and or measuring or monitoring are: BGS, Below Ground Surface; DTW, Depth to Water (from surface reference i.e. usually TOC); TOC, Top of Casing; MSL, Mean Sea Level; AMSL and BMSL, Above and Below MSL; BS, Below Surface; TOW, Top of Water; TSP, Tri Sodium Phosphate.

#### **Purging Standing Water from Monitor Wells**

If no product is present, WEGE personnel purge the well by removing groundwater until the water quality parameters (temperature, pH, and conductivity) stabilize, or until the well is emptied of water. Periodic measurements of groundwater temperature, pH, and conductivity are taken with a Hydac Monitor or other meter and recorded along with the volume of groundwater removed from the well. Purging is done by one or more methods singularly or in combination. Bailers, pneumatic or electric sample pumps, or vacuum pump tanks or trucks may be used. The usual amount of water removed is three borehole volumes, unless otherwise stated.



$$BV = (7.48/4) \times (CD^2 + P (BD^2 - CD^2)) \times (WD - GW)$$

BV borehole volume (gallons)                      BD borehole diameter (feet)  
 CD casing diameter (feet)                        WD well depth (feet)  
 GW depth to groundwater (feet)                P porosity of the gravel pack, 25%

Table of Common Boring and Casing Diameters

Boring diameter inches	Casing diameter inches	Volume gallons/ foot	3 Volumes X (WD-GW) gallons /foot
4	1	0.042	0.126
6	1	0.082	0.246
6	2	0.173	0.519
8	2	0.277	0.831
8	4	0.671	2.013
10	2	0.572	1.716
10	4	0.844	2.532

EXAMPLE: An 8 inch boring with 2 inch casing requires removal of 0.831 gallons of water per foot of water column.

The water collected during purging is either safely stored on-site in 55 gallon DOT 17H drums for later disposition, transported to an approved on-site/off-site treatment facility or to a sewer discharge system.

**Collection of Water Sample for Analysis**

The groundwater in the well is allowed to recover, to at least 80% of its volume prior to purging, if practical, before the groundwater sample is collected.

$$\text{Percent Recovery} = (1 - \frac{\text{Residual drawdown}}{\text{Maximum drawdown}}) \times 100.$$

A fresh bailer is used to collect enough water for the requirements of the laboratory for the analyses needed or required. The water samples are decanted from the bailer into the appropriate number and size containers. These containers are furnished pre-cleaned to exact EPA protocols, with and without preservatives added, by the analytical laboratory or a chemical supply company. The bottles are filled, with no headspace, and then capped with plastic caps with teflon liners.

The vials or bottles containing the groundwater samples are labeled with site name, station, date, time, sampler, and analyses to be performed, and documented on a chain of custody form. They are placed in ziplock bags and stored in a chest cooled to 4 °C with ice. The preserved samples are COC (chain of custody) delivered to the chosen laboratory.

### **Analytical Results**

TPH is the abbreviations used for Total Petroleum Hydrocarbons used by the laboratories for water and soil analyses. The letter following TPH indicates a particular distinction or grouping for the results. The letters "g", "d", "k", or "o" indicate gasoline, diesel, kerosene, or oil, respectively, i.e. TPH-d for diesel ranges TPH.

BTEX or MTBE are acronyms or abbreviations used for Benzene, Toluene, Ethylbenzene and all of the Xylenes (BTEX) and Methyl tertiary-Butyl Ether (MTBE), respectively.

MBTEX is the designation for the combination of the above five compounds.

Laboratory lower detection limits unless otherwise noted, due to matrix interference or elevated concentrations of target compounds, are as follows:

TPHg	50 ug/L	MTBE	0.5 ug/L
Benzene	0.5 ug/L	Toluene	0.5 ug/L
Ethyl Benzene	0.5 ug/L	Total Xylenes	1.0 ug/L

The less than symbol, <, used with a "parts per value" indicates the lower detection limit for a given analytical result and the level, if present, of that particular analyte is below or less than that lower detection limit.

Other abbreviations commonly used are ppm, ppb, mg/Kg, ug/Kg, ml/l and ul/l are parts per million, parts per billion, milligrams per kilogram, micrograms per kilogram, milliliters per liter, microliters per liter, respectively.

### **Vapor Recovery System Monitoring and Sampling**

#### **INFLUENT SAMPLE**

**The influent sample is obtained from a sample port located on the**

Sample ports are located at the orifice plate of the well adapter-venting tree. This lateral is under vacuum. A 1-liter tedlar bag fitted with a special septum "valve" and tubing bib is placed within an air tight vacuum sample box (ATVSB). Sterile poly tubing is then used to attach the intake port of the ATVSB to the tedlar bag.

Sterile poly tubing is also used to attach the intake of the ATVSB to the sample port of the orifice plate. The exhaust port for the ATVSB is then attached to a vacuum pump, which creates a vacuum inside the ATVSB allowing the tedlar bag to pull the sample from the valved manifold sample port without the danger of cross contamination, as could occur when using an in-line pump. Once the tedlar bag is filled, its valve is closed and locked and the appropriate label is placed on the tedlar bag.

The label for the tedlar bag sample show the date, time, sample ID# and analyses to be run.

The tedlar bag sample is Chain of Custody hand delivered to WEGE's laboratory that same day.

WEGE's laboratory analyzes the vapor samples by injection into a FID (Flame Ionizing Detector) chromatograph. The resulting chromatogram is compared to standard chromatograms of known TFH (Total Fuel Hydrocarbons, gasoline) and BTEX (benzene, toluene, ethylbenzene, and xylenes) concentrations. CO<sub>2</sub> measurement is obtained with a Draeger tube.

The standards are produced by injecting measured volumes of known density gasoline or BTEX compounds into tedlar bags filled with a measured amount of air, usually one liter. Injecting 10 microliters (ul) of 0.75-mg/L gasoline makes the gasoline standard into one liter of air, the density was previously determined by weighing a know volume of gasoline. The resulting concentration is  $10 \text{ ul} \times 0.75 \text{ mg/L} / 11 = 7.5 \text{ mg/L}$ . The BTEX standard is made by injecting 5 ul of each compound into one liter of air, and using the following densities to calculate the concentration:

- Benzene, 0.88 mg/ul;
- Toluene, 0.87 mg/ul;
- Ethylbenzene, 0.87 mg/ul
- Xylenes, 0.87 mg/ul.

The following are the resulting concentrations: Benzene, 4.4 mg/l; Toluene, 4.35 mg/l; Ethylbenzene, 4.35 mg/l; and Xylenes 4.35 mg/l.

## CALCULATIONS

To calculate the pounds (lb) per day the concentration is multiplied by the volume of air produced in one day.

The lab reports the Concentrations (C) of the air sampling in ug/liter. The first step is to convert this value to lbs/cf (pounds per cubic foot).  $1 \text{ ug/l} \times 0.000001 \text{ g/ug} \times 0.0022051 \text{ g} \times 28.321 \text{ /cf} = 0.00000006211 \text{ lb/cf}$

The volume of air produced in one day, equals the flow rate (Q) x the time of flow.

$$V = Q \times T = \text{cf/day} = \text{cf/min} \times 1440 \text{ min/day}$$

The volume must be corrected to standard temperature and pressure (STP).

$$P = \text{Pressure} = 14.7 \text{ lb/in}^2 \text{ @ STP}$$

V = Volume cf

T = Temperature in degrees above absolute Zero = 491.58oR @ STP.

Using the Ideal Gas Law  $P_1V_1/T_1 = P_2V_2/T_2$

Solving for  $V_2 = P_1V_1T_2/P_2T_1$

Assuming  $P_1 = P_2 = 14.7 \text{ lb/in}^2$ , P cancels from the equation

Leaving  $V_2 = V_1T_2/T_1$ .

$V_1 = Q \text{ cf/m} \times 1440 \text{ min/day}$

$T_2 = 491.58\text{oR}$   $T_1 = 459.58 + T^{\text{OF}}$  at site.

$V_2 = Q \text{ cf/min} \times 1440 \text{ min/day} \times 491.58\text{oR}/(459.58\text{o} + T^{\text{OF}})$

$X \text{ lb/day} = C \text{ ug/l} \times 0.0000000621 \text{ lb l/ug} \text{ cf} \times Q \text{ cf/min} \times$   
 $1440 \text{ min/day} \times 491.58\text{oR}/(459.58\text{o} + T^{\text{OF}})$

Q for the Influent sample = The well flow rate.

### **Chain of Custody Documentation**

All water samples that are collected by WEGE and transported to a certified analytical laboratory are accompanied by chain-of-custody (COC) documentation. This documentation is used to record the movement and custody of a sample from collection in the field to final analysis and storage. Samples to be analyzed at the certified laboratory were logged on the COC sheet provided by the laboratory. The same information provided on the sample labels (site name, sample location, date, time, and analysis to be performed) is also noted on the COC form. Each person relinquishing custody of the sample set signs the COC form indicating the date and time of the transfer to the recipient. A copy of the COC follows the samples or their extracts throughout the laboratory to aid the analyst in identifying the samples and to assure analysis within holding times.

Copies of the COC documentation are included with the laboratory results in Appendix C of the sampling report.