GW - 21

MONITORING REPORTS

DATE: 1995

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

April 3, 1996

Mr. Roger C. Anderson
Environmental Bureau Chief
State of New Mexico
Oil Conservation Division
2040 S. Pacheco St.
Santa Fe, New Mexico 87505

Dear Mr. Anderson:

Enclosed is the Fourth Quarter 1995 Indian Basin Remediation Project Report. This report is submitted on behalf of the Indian Basin Gas Plant owners in accordance with the Indian Basin Treatment Project Plan prepared by Marathon and approved by the Oil Conservation Division on April 2, 1992. Preparation of this report is also in accordance with the April 2, 1992 New Mexico Oil Conservation Division (OCD) directive for quarterly reporting of remediation project activities.

Please note that as a result of the increased recoveries of three Lower Queen recovery wells drilled late 1995, recovery of condensate from the Lower Queen has increased substantially in the First Quarter of 1996. These data will be presented in our First Quarter 1996 report to follow in a few weeks. If you have any questions, please contact me (915) 687-8312 or Terry Guillory (915) 687-8450.

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental & Safety Representative

Attachment

c: F. D. Searle
T. C. Lowry
T. L. Guillory
William C. Olson, Hydrogeologist, Oil Conservation Division, Santa Fe
R. F. Unger

INDIAN BASIN GAS PLANT
REMEDIATION PROJECT
QUARTERLY REPORT

FOURTH QUARTER 1995
OCTOBER, NOVEMBER, AND DECEMBER

Submitted by
Marathon Oil Company
on behalf of the
Indian Basin Gas Plant Owners

March 21, 1996

EXECUTIVE SUMMARY

The pump-and-treat groundwater remediation system is fully operational and functioning as set forth in the Treatment Project Plan (March 1992). During the quarterly sampling event in October 1995, light nonaqueous phase liquid (condensate) was observed in 13 Lower Queen wells. During the quarter, total fluid recovery from 10 Lower Queen recovery wells averaged 70 gallons per minute (16,662 barrels per week), a 38% increase from the prior quarter as a result of three additional groundwater extraction wells being installed. Dissolved-phase volatile hydrocarbon compounds were removed by air stripping. Lower Queen dissolved benzene concentrations in five downgradient wells range from less than 0.5 to 25 micrograms per liter (μg/L) or parts per billion. Chloride concentrations in all Lower Queen wells are below the State maximum allowable concentration of 250 milligrams per liter (mg/L).

Two Shallow zone wells contained condensate in October. Shallow zone pumping continues from one well. During the quarter, fluid recovery from this well averaged 0.02 gallons per minute (5.7 barrels per week). Dissolved benzene concentrations in the Shallow zone aquifer range from less than 0.5 to 240 μg/L. Four Shallow zone wells sampled in October indicate chloride concentrations at or above the State maximum allowable concentration of 250 mg/L.

Concentrations of benzene, toluene, ethylbenzene, total xylene, and chloride in groundwater collected from a rancher well completed in the Shallow alluvium, a rancher well completed in the Seven Rivers Formation, and surface water from the Upper Indian Hills Spring West (Rocky Arroyo spring) have not exceeded State or Federal drinking water standards.

Condensate recovery from the Lower Queen and Shallow zone for the Fourth Quarter was 28.3 barrels, a 42% increase from the prior quarter. Excluding the volume volatilized by the air stripper and vapor extraction system, cumulative recovery is 3,629.4 barrels or 10.4% of the total estimated spill volume.

The vapor extraction system was not operated during the Fourth Quarter.

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INTRODUCTION

This report summarizes groundwater and unsaturated zone treatment activities conducted during the Fourth Quarter of 1995 in accordance with the Indian Basin Environmental Treatment Project Plan submitted on March 5, 1992 by Marathon Oil Company on behalf of the Indian Basin Gas Plant owners. Preparation of this report is also in accordance with the April 2, 1992 New Mexico Oil Conservation Division (OCD) directive for quarterly reporting of remediation project activities. Remediation activities are continuing to reduce the impact of a liquid gas condensate and brine production pipeline spill discovered in April 1991 near the Indian Basin Gas Plant.

GROUNDWATER ELEVATION

Lower Queen Aquifer

Depth-to-water measurements were acquired from nonpumping Lower Queen monitoring wells in October 1995. Table 1 presents groundwater and product elevations calculated from casing elevation data, depth-to-water measurements, and depth-to-product (light nonaqueous phase liquid; LNAPL) measurements. Figure 1 is a potentiometric map of the Lower Queen aquifer based on October gauging data. Fourth Quarter data indicate both increasing and decreasing groundwater elevations (Figure 2).

Shallow Zone

A potentiometric map was constructed using depth-to-water measurements collected from Shallow zone monitoring wells in October 1995 (Figure 3). Table 2 shows depth-to-water and depth-to-LNAPL measurements, calculated groundwater and LNAPL elevations, and LNAPL thickness in Shallow zone wells. These Shallow zone data indicate increasing and decreasing groundwater elevations during the quarter (Figure 4). Groundwater elevation changes are the result of changes in recharge from rainfall and subsurface and surface inflow to the project area.

Groundwater Recharge (Rainfall)

Daily rainfall is gauged at the gas plant. Monthly rainfall for October, November, and December was 0.0, 0.0, and 0.70 inches, respectively (Table 1). Cumulative rainfall for the Fourth Quarter was 0.70 inches.

QUARTERLY SAMPLING LABORATORY RESULTS

On October 9, 10, 11, and 12, 1995, 36 Shallow zone and 17 Lower Queen monitoring wells were gauged. Appendix A contains summary tables of groundwater gauging, purging, and sampling data prepared by Groundwater Technology, Inc. from notes recorded during field

activities. Water samples were collected by Groundwater Technology, Inc. using Environmental Protection Agency (EPA) sampling protocol. Analytical Technologies, Inc. performed BTEX (EPA Method 8020) and chloride (EPA Method 325.2) analyses.

Twenty-three Lower Queen wells were sampled in October including the plant water supply well, SW-1. All Lower Queen groundwater recovery wells contained measurable condensate (measurements from piezometers installed in select large-diameter wells) or yielded condensate when a sample was drawn from the wellhead sampling port (Table 1). Lower Queen monitoring wells MW-73, MW-74, and MW-76 contain condensate.

Twelve Shallow zone wells were sampled in October. Eight of the twenty-five Shallow zone monitoring wells (including two sumps in Rocky Arroyo) designated for quarterly sampling (compliance wells) in the Treatment Project Plan were sampled (see ***bolded and italicized*** well designations in Table 4). The remaining 18 Shallow zone compliance wells were either dry or bailed dry during purging and did not recharge enough to be sampled. Five Shallow zone wells other than those designated in the Treatment Project Plan were sampled (MW-41, MW-43, MW-49, MW-61, and MW-79). Four Shallow zone wells sampled in October indicate chloride concentrations at or above the State maximum allowable concentration of 250 mg/L (MW-44, MW-49, MW-55, and MW-61).

Tables 3 and 4 are historical summaries of quarterly benzene concentration data since September 1991 for the Lower Queen and Shallow zone wells, respectively. Benzene concentration (in μg/l) versus time graphs for each routinely sampled monitoring well are provided in Appendix B.

Groundwater samples were also collected from two downgradient off-site wells and a natural spring in Rocky Arroyo where the Shallow zone aquifer discharges (Upper Indian Hills Spring West; Hendrickson and Jones, 1952). Concentrations of BTEX and chloride in groundwater collected from the Lyman and Biebelle wells and surface water from the natural spring did not exceed State or Federal drinking water standards during the quarter (Table 4). Laboratory reports for the off site wells and natural spring for October are included in Appendix C. Appendix D are the laboratory reports for the off-site wells and natural spring for December sampling.

GROUNDWATER PUMPING

Fluid recovery from the Lower Queen aquifer and Shallow zone is metered and reported to the State Engineer Office (SEO) in Roswell, New Mexico on a monthly basis per SEO directive. The reports filed with the SEO for Fourth Quarter 1995 are attached in Appendix E. Figures 5,

6, and 7 are stacked bar graphs depicting weekly Lower Queen fluid recovery, weekly Shallow zone fluid recovery, and combined weekly fluid recovery from both zones, respectively.

Ten Lower Queen wells (MW-59, MW-61A, MW-62, MW-65A, MW-68, MW-72, MW-75, MW-81, MW-82 and MW-83) were pumped for the purpose of plume containment and free-phase condensate recovery. Weekly fluid recovery for each well and the plant supply well, SW-1, is shown in Figure 5. Free-phase hydrocarbon recovered from these wells during the quarter totaled 28.3 barrels. Weekly Shallow zone water and condensate recovery from MW-69 is shown in Figure 6. Although gauging indicates free-phase hydrocarbon (condensate) is present in MW-69 (Table 2 and Appendix A, p. 2), none was recovered during the Fourth Quarter.

GROUNDWATER TREATMENT AND PRODUCT RECOVERY

Contaminated groundwater and free-phase hydrocarbon (condensate) from 10 Lower Queen recovery wells are pumped through underground piping to the treatment compound. The treatment compound includes two aboveground tanks, an oil/water separator used as a storage vessel, and an air stripper. Condensate is skimmed from one of the two aboveground tanks and transferred to the oil/water separator which serves as a condensate storage vessel. Groundwater containing dissolved-phase hydrocarbon is transferred from the first tank to the second aboveground tank. Groundwater from the second tank is pumped through the air stripper to remove dissolved-phase volatile organic compounds. Stripped volatile organic compounds are vented to the atmosphere through a stack. Treated groundwater is transferred from the air stripper to the 1200-barrel aboveground steel tank and is used as process water for the gas plant.

The measured volume of condensate recovered from Lower Queen groundwater during the Fourth Quarter was 28.3 barrels. Cumulative condensate recovered by the total fluids system since treatment system startup in April 1992 is 165.3 barrels. Cumulative condensate recovered to date excluding the volume volatilized by the air stripper and vapor extraction system is 3,629.4 barrels or 10.4% of the total estimated spill volume.

VAPOR EXTRACTION SYSTEM

The vapor extraction system was not operated during the Fourth Quarter. On May 5, 1994, the vapor extraction system ceased operation when Marathon determined that a New Mexico Air Pollution Control Bureau 702 air emission permit for is required for system operation. The system has not operated since then and is being stored at the gas plant.

OTHER ACTIVITIES

On August 14, 1995, the PVC casing in Lower Queen groundwater recovery well MW-58 collapsed. The collapsed well was discovered because the downhole pump ceased operating. During the Fourth Quarter sampling event in October, the tubing, flow meter, and pump were removed from the well. The well was partially cleaned out using a bailer to a depth of approximately 218 feet below the top of casing. Some filter-pack sand, bentonite, and pieces of broken PVC pipe were recovered with the bailer. The static water level in October was several feet above the bottom of the well; therefore, the well can be utilized as a monitoring well. The exposed water column is not sufficient, however, to continue to use this well as a recovery well.

In September 1995, three additional Lower Queen groundwater recovery wells were drilled, completed, and developed. Recovery well MW-81 commenced pumping on November 19 and MW-82 and MW-83 commenced pumping on December 11.

REFERENCES CITED

Hendrickson, G. E., and Jones, R. S., 1952, Geology and Ground-water Resources of Eddy County, New Mexico: New Mexico Bureau of Mines & Mineral Resources Ground-water Report 3, 169 p., 4 pls.

TABLES

TABLE 1. LOWER QUEEN DEPTH-TO-WATER, GROUNDWATER ELEVATION, CONDENSATE THICKNESS, AND RAINFALL DATA

LOWER QUEEN WELL	Well Use	Top of Casing (TOC) Elev. (ft AMSL)	Top of 1.25-inch Piezometer Piping Elev. (ft AMSL)	Total Depth from TOC (ft)	Oct./9, 10, 11, 12/1995					Nov-95	Dec-95
					Depth to water (ft)	Ground-water Elev. (ft)	Corrected Groundwater Elev. (ft)	Depth to product (ft)	Condensate thickness (ft)		
MW-57	monitor	3787.70		177.20	159.23	3628.47					
MW-58	monitor	3824.31		218.00	collapsed*				present		
MW-59	recovery	3819.59		211.29					present		
MW-60	monitor	3815.28		223.00	187.29	3627.99					
MW-61A	recovery	3815.97		215.67					present		
MW-62	recovery	3819.90		224.69					present		
MW-63	monitor	3826.16		220.49	198.57	3627.59					
MW-64	monitor	3798.57		201.89	170.33	3628.24					
MW-65A	recovery	3763.26		168.56	136.00	3627.26		134.90	1.10		
MW-66	monitor	3828.98		235.18	201.62	3627.36					
MW-67	monitor	3765.87		165.77	137.54	3628.33					
MW-68	recovery	3797.83		203.43					present		
MW-70	monitor	3822.57		225.07	194.19	3628.38					
MW-71	monitor	3778.05		233.49	151.15	3626.90					
MW-72	recovery	3819.32		236.55					present		
MW-73	monitor	3820.09		222.5	192.35	3627.74		?	present		
MW-74	monitor	3820.82		222.5	187.31	3633.51		?	present		
MW-75	recovery	3816.12		222.5	192.31	3623.81		188.02	4.29		
MW-76	monitor	3796.01		222.5	167.51	3628.50	3628.87	167.10	0.41		
MW-81	recovery	3816.99	3817.03	228.45	190.99	3626.00	3628.47	188.25	2.74		
MW-82	recovery	3825.04	3825.07	231.30	196.62	3628.42					
MW-83	recovery	3794.09	3794.12	205.80	166.55	3627.54	3629.04	164.88	1.67		
SW-1	recovery	3808.19		255.00							
SW-2	monitor	3808.79		292.00	181.70	3627.09					
Monthly Rainfall (in)							0.00			0.00	0.70

* PVC in well collapsed in August 14, 1995 due to chemical injection. Well was cleaned out to 218 ft below top of casing. Well contained free-phase condensate.

AMSL = Above Mean Sea Level

FP = Free Product (condensate) present

NG = Not Gauged

TABLE 2. SHALLOW ZONE DEPTH-TO-WATER, GROUNDWATER ELEVATION, AND CONDENSATE THICKNESS

Shallow Zone Well	TOC Elev. (ft AMSL)	Total Depth from TOC (ft)	October 9, 10, 11, 12, 1995				
			Depth to water (ft)	Ground-water Elev. (ft)	Corrected Groundwater Elev. (ft)	Depth to product (ft)	Condensate thickness (ft)
MW-1	3792.50	16.10	not gauged				
MW-2	3788.82	15.52	not gauged				
MW-3	3787.50	16.97	DRY				
MW-4	3785.88	18.68	not gauged				
MW-5	3801.69	13.05	DRY				
MW-6	3785.17	14.25	DRY				
MW-7	3784.46	17.35	DRY				
MW-8	3795.04	17.38	DRY				
MW-9	3807.85	13.79	DRY				
MW-10	3790.78	18.52	DRY				
MW-11	3806.96	24.85	22.01	3784.95			
MW-12	3809.86	25.21	not gauged				
MW-13	3801.58	22.07	18.46	3783.12	3783.17	18.40	0.06
MW-14	3803.93	24.30	not gauged				
MW-15	3803.59	19.47	not gauged				
MW-16	3801.04	22.66	not gauged				
MW-17	3799.55	19.75	not gauged				
MW-18	3795.82	17.42	not gauged				
MW-19	3797.21	19.11	not gauged				
MW-20	3797.59	16.89	not gauged				
MW-21	3798.21	23.31	not gauged				
MW-22	3799.20	17.30	not gauged				
MW-23	3794.48	12.08	not gauged				
MW-24	3794.09	13.30	DRY				
MW-25	3786.97	10.27	not gauged				
MW-26	3793.01	21.11	not gauged				
MW-27	3790.93	18.23	not gauged				
MW-28	3797.03	18.59	not gauged				
MW-29	3794.06	14.76	DRY				
MW-30	3788.30	14.82	not gauged				
MW-31	3791.15	19.93	not gauged				
MW-32	3797.47	15.70	DRY				
MW-33	3802.48	20.29	not gauged				
MW-34	3806.00	19.97	not gauged				
MW-35	3800.81	20.71	not gauged				
MW-36	3792.94	8.77	not gauged				
MW-37	3795.03	20.83	not gauged				
MW-38	3797.32	20.57	DRY				
MW-39	3796.20	20.54	20.03	3776.17			
MW-40	3803.12	14.07	not gauged				
MW-41	3799.04	24.04	20.58	3778.46			
MW-42	3804.73	23.59	not gauged				
MW-43	3802.05	24.55	21.80	3780.25			
MW-44	3804.14	25.24	21.84	3782.30			
MW-45	3808.68	26.62	not gauged				
MW-46	3805.54	20.24	DRY				
MW-47	3805.09	21.79	DRY				
MW-48	3806.18	19.98	DRY				
MW-49	3805.61	25.91	22.68	3782.93			
MW-50	3813.35	37.15	26.85	3786.50			
MW-51	3810.86	20.06	not gauged				
MW-52	3817.49	21.44	DRY				
MW-53	3809.92	15.32	DRY				
MW-54	3823.86	78.15	47.40	3776.46			
MW-55	3794.40	66.32	32.20	3762.20			
MW-56	3782.45	43.76	DRY				
MW-61	3816.20	57.97	37.38	3778.82			
MW-65	3763.31	57.35	57.07	3706.24			
MW-69p	3805.11	51.27	34.57	3770.54	3772.60	32.28	2.29
MW-77	3775.48	82.20	79.70	3695.78			
MW-78	3785.82	86.62	86.19	3699.63			
MW-79	3788.39	82.90	79.57	3708.82			
MW-80	3821.64	91.80	DRY				
Sump A10	3800.99	13.42	12.80	3788.19			
Sump 16A	3785.14	17.45	14.60	3770.54			
Lyman	3670	70	36	3634			

p = pump present in well

AMSL = Above Mean Sea Level
TOC = Top of Casing datum

TABLE 3. HISTORICAL SUMMARY OF BENZENE CONCENTRATION IN LOWER QUEEN GROUNDWATER

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	Sep-91	Dec-91	Apr-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Jan-94	Apr-94	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95
MW-57	1600	350	150	948**	15.1*	21*	8*	6*	<0.5	<0.5	<0.5	0.7	1.1	4.3	<0.5	<0.5	64
MW-58	40	90	202**	178**	190*	192*	55*	25*	50*	FP	<2.5	2.0	6.7	FP	2.2	FP	FP
MW-59	540	420	40.4**	268**	98.8*	26*	10*	FP	10*	FP	<2.5	13	4.1	FP	FP	FP	FP
MW-60	33	<1	3.5**	19**	31.7*	138*	17*	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-61A	190	10	5.0**	359**	470.1*	585*	2821*	FP	FP	FP	<0.5	<0.5	4.8	16	FP	FP	FP
MW-62	2200	1400	257.5**	357**	212.3*	78*	33*	98*	10*	4.1	<2.5	4.3	13	FP	7.5	FP	FP
MW-63	<1	<1	4.1**	12**	4.3*	12*	7*	4*	14*	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	<0.5	<0.5
MW-64	150	130	233**	115**	14	15*	5*	2	18*	1.7	<0.5	<0.5	<0.5	12	18	17	25
MW-65A	680	150	25.3**	413**	10.6*	3*	4*	<1*	7*	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	NS	FP
MW-66	<1	<1	3.3**	8**	12.1*	3*	<3*	8*	13*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-67	280	320	4.3*	103**	2.6*	8*	7*	7*	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	1.8	<0.5	6.1
MW-68	240	1900	1865**	160**	2208.2**	376*	1890*	150	374*	3000	120	260	FP	FP	FP	FP	FP
MW-70	<1	<1	1.7**	<1	10.7*	<3*	9*	<1*	25*	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5
MW-71	NI	NI	NI	NI	NI	NI	NI	NI	8*	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
MW-72	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	<2.5	18	FP	FP	FP	FP	FP
MW-73	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-74	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-75	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-76	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-81	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP
MW-82	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	280
MW-83	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP
SW-1	<1	<1	5*	17.5*	15.7*	6*	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SW-2	<1	<1	7.9*	7*	69.4*	47*	4	NS	NS	NS	NS	NS	NS	<0.5	NS	NS	NS
Max. Conc.	2200	1900	1865	948	2208	585	2821	2821	2821	3000	120	260	FP	FP	FP	FP	FP

* High Performance Liquid Chromatography (HPLC)
** Average of more than one sample result using HPLC.

FP = Free Product (Condensate)
NS = Not Sampled
NI = Not Installed

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	**Sep-91**	**Dec-91**	**Apr-92**	**Jul-92**	**Oct-92**	**Jan-93**	**Apr-93**	**Jul-93**	**Oct-93**	**Jan-94**	**Apr-94**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**
MW-1	250	200	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-2	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-3	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-4	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-5	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-6	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-7	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-8	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-9	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-10	***2300***	***2300***	***1780****	***1842****	***2100***	***NS***	***NS***	***DRY***	***DRY***	***BD***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-11	***3000***	***3800***	***3087****	***2199****	***2942****	***2746****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***1800***	***DRY***	***NS***	***95***	***NS***
MW-12	3800	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-13	***3100***	***3000***	***3492****	***2708****	***NS***	***NS***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***FP***	***FP***	***FP***	***FP***
MW-14	5100**	NS	NS	NS	NS	NS	PUMP	PUMP	FP	FP	NS	NS	NS	NS	NS	NS	NS
MW-15	5100	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-16	1700	NS	NS	NS	NS	NS	514*	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-17	2000	NS	NS	NS	NS	NS	1500	DRY	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-18	4300	NS	2639**	2700	3300	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS	NS	NS
MW-19	***4700***	***NS***	***3195****	***3000***	***3032****	***NS***	***3926****	***DRY***	***VE***	***VE***	***VE***	***VE***	***NS***	***NS***	***NS***	***NS***	***NS***
MW-20	110	NS	NS	NS	NS	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS	NS	NS
MW-21	1000	1100	NS	NS	NS	NS	114*	FP	NS	DRY	NS	NS	NS	NS	NS	NS	NS
MW-22	4	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-23	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-24	***3400***	***NS***	***NS***	***4353****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-25	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-26	3100	3000	NS	2000	1992*	1708*	861*	FP	FP	FP	NS	NS	NS	NS	NS	NS	NS
MW-27	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-28	2200	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-29	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-30	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-31	<1	NS	NS	332**	9*	NS	NS	DRY	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-32	***200***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-33	6300	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-34	2500	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-35	5700	NS	NS	NS	NS	NS	NS	FP	FP	FP	NS	NS	NS	NS	NS	NS	NS

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCl = only Chloride sample

FP = Free Product (condensate)

NS = Not Sampled

VE = Vapor Extraction well

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER (Continued)

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	**Sep-91**	**Dec-91**	**Apr-92**	**Jul-92**	**Oct-92**	**Jan-93**	**Apr-93**	**Jul-93**	**Oct-93**	**Jan-94**	**Apr-94**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**
MW-36	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-37	150	NS	NS	NS	NS	NS	NS	27*	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-38	***15***	***15***	***51****	***37****	***166****	***NS***	***NS***	***DRY***	***BD***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-39	880	NS	NS	NS	NS	14	29*	24*	DRY	<2.5	<0.5	<0.5	DRY	<5.0	NS	NS	NS
MW-40	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-41	200	170	NS	NS	NS	NS	NS	22*	DRY	5.3	0.6	1.4	3.2	13	4.8	<0.5	1.8
MW-42	<1	<1	NS	NS	NS	NS	NS	NS	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-43	320	NS	NS	NS	NS	NS	NS	25*	DRY	<0.5	<0.5	<0.5	0.8	3	0.6	3	1.2
MW-44	***59***	***NS***	***10****	***97****	***12***	***14***	***7****	***6****	***3****	***12***	***22***	***36***	***130***	***63***	***19***	***5.8***	***120***
MW-45	<1	<1	NS	NS	NS	NS	NS	<3*	<3*	<0.5	<0.5	<0.5	NS	NS	NS	NS	NS
MW-46	140	25	NS	NS	NS	NS	NS	NS	DRY	NS	NS	DRY	NS	NS	NS	NS	NS
MW-47	2600	2200	NS	NS	NS	NS	NS	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-48	***<1***	***<1***	***NS***	***47****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-49	35	NS	NS	NS	NS	NS	NS	210*	68*	13	82	150	78	220	120	17	240
MW-50	***<1***	***<1***	***4****	***4****	***8****	***8****	***<1***	***<3****	***9****	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***
MW-51	800	<1	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-52	***<1***	***NS***	***NS***	***5****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-53	***<1***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-54	***<1***	***<1***	***9****	***8****	***62****	***14****	***10****	***<3****	***17****	***8.6***	***<0.5***	***15***	***19***	***<0.5***	***<0.5***	***<0.5***	***0.7***
MW-55	***940***	***400***	***296****	***483****	***215****	***390***	***412****	***625****	***581****	***290***	***370***	***360***	***910***	***650***	***420***	***350***	***100***
MW-56	***2200***	***1000***	***NS***	***1114****	***1026****	***1128****	***VE***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-61	<1	NS	NS	NS	NS	NS	NS	NS	NS	1.4	<0.5	3.2	<5.0	<0.5	<0.5	<0.5	<0.5
MW-65	<1	NS	NS	NS	NS	NS	NS	<3*	DRY	DRY	DRY	NS	<0.5	NS	NS	NS	NS
MW-69	***2400***	***2100***	***NS***	***568****	***1598****	***1284****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***
MW-77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NS	NS	<0.5	NS
MW-78	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	DRY	DRY	DRY	DRY
MW-79	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	110	14	<5	16
MW-80	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	DRY	DRY	DRY	DRY
SUMP A10	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***OCI***	***DRY***	***DRY***	***DRY***	***<0.5***
SUMP A11	1400	2900	3033**	1258**	2815*	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
SUMP 16A	***240***	***2000***	***1233****	***1495****	***632****	***741****	***707****	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***170***	***2.0***	***NS***	***DRY***	***130***
Lyman								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U. Indian Hills Spring West	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Biebelle								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCI = only Chloride sample

FP = Free Product (condensate)

NS = Not Sampled

VE = Vapor Extraction well

FIGURES

Figure 1.
October 1995 Lower Queen Potentiometric Surface
(assumes 6 ft of drawdown in MW-72 and ~3 ft of drawdown in other recovery wells)

Contoured using SURFER 5.0 Kriging Function
Contour Interval = 0.5 feet
Datum is Mean Sea Level

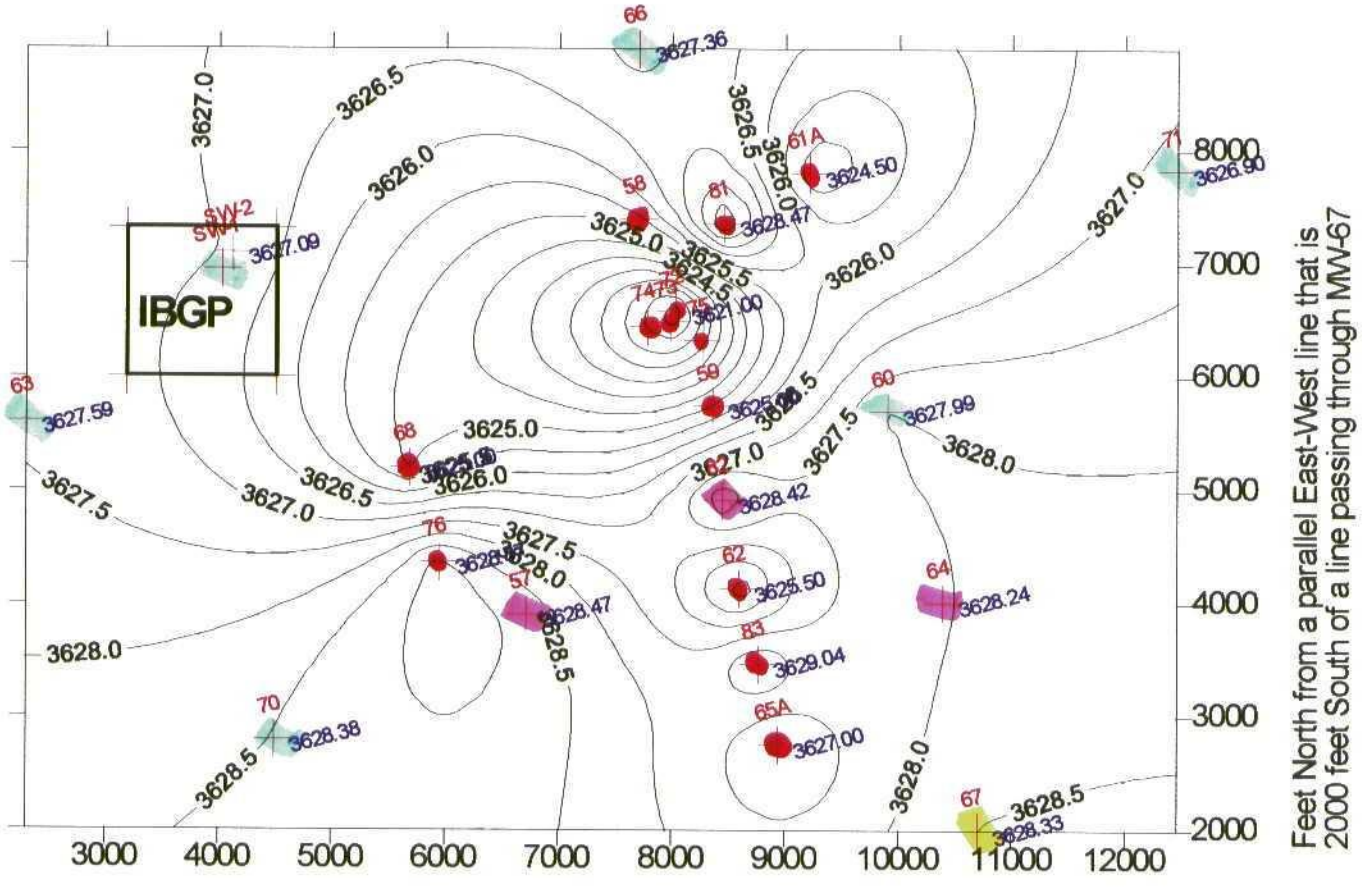


Figure 2. Lower Queen Groundwater Elevation vs. Time

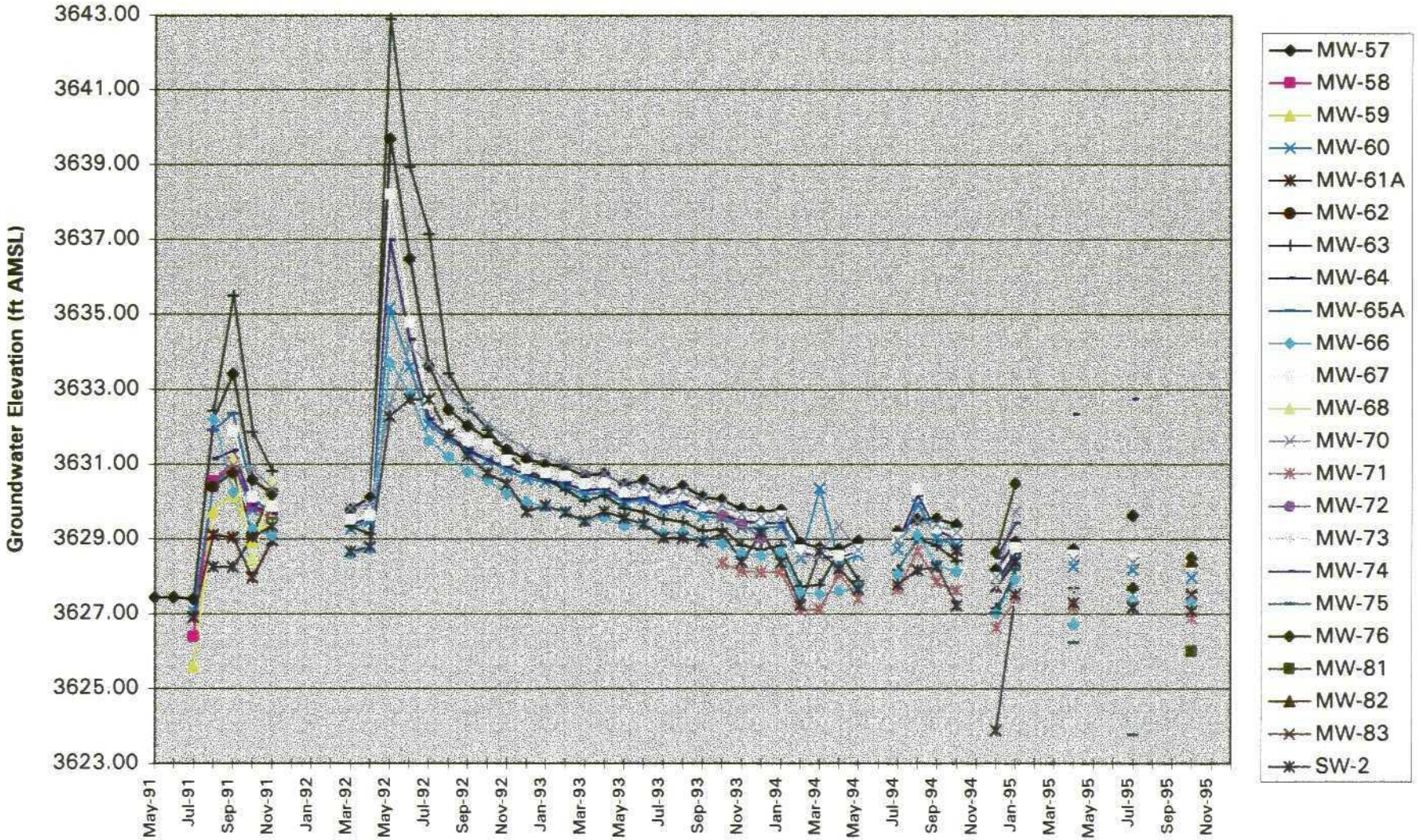


Figure 3.
October 1995 Shallow zone Potentiometric Surface
Contoured using SURFER 5.0 Kriging Function
Contour Interval = 10 feet
Datum is Mean Sea Level

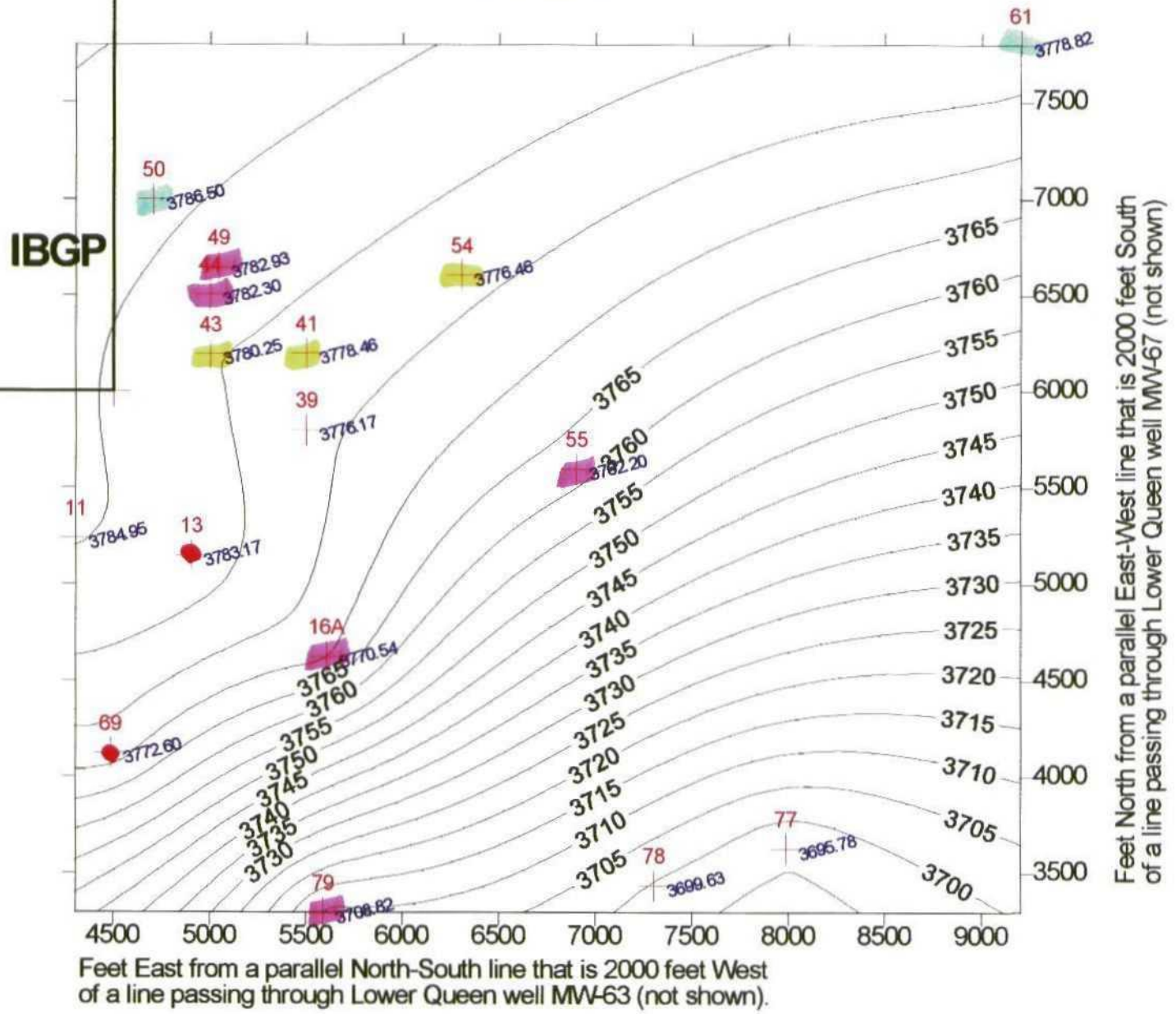


Figure 4. Shallow zone Groundwater Elevation vs. Time

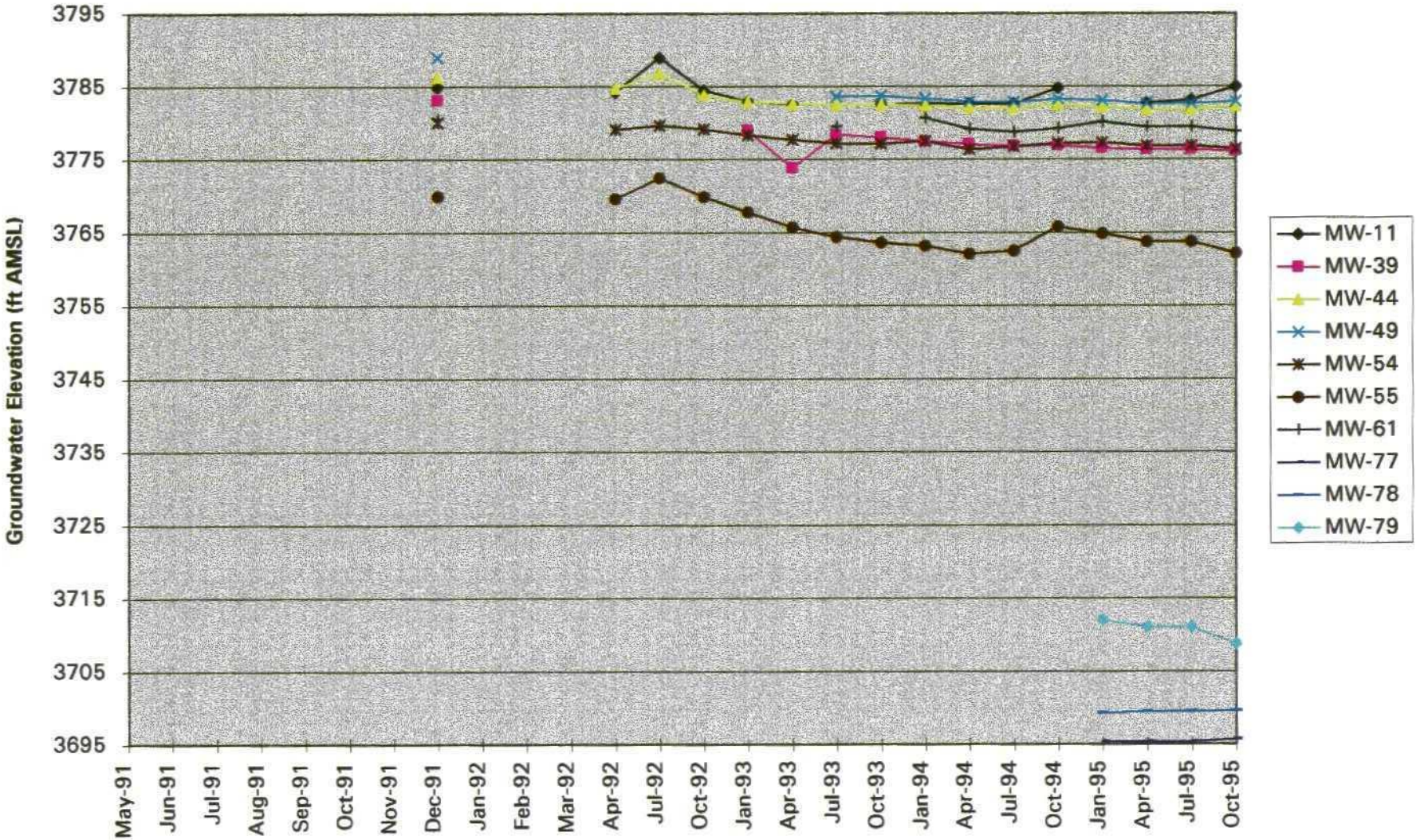
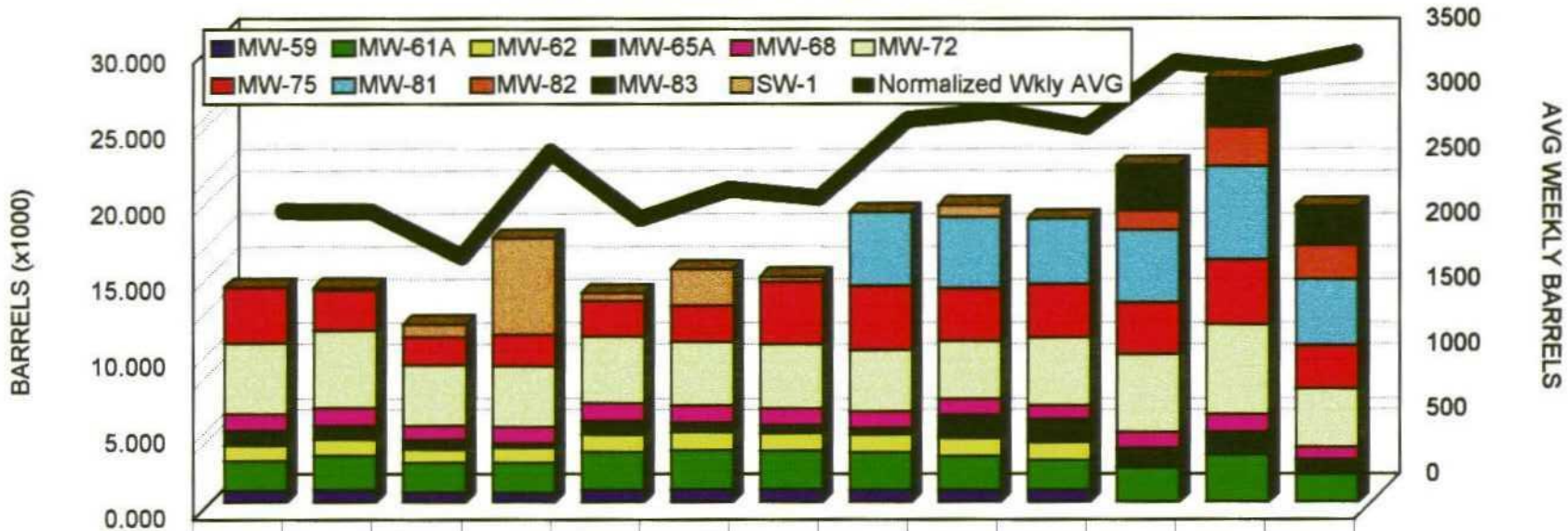


FIGURE 5

WEEKLY LOWER QUEEN FLUID RECOVERY
FOURTH QUARTER 1995

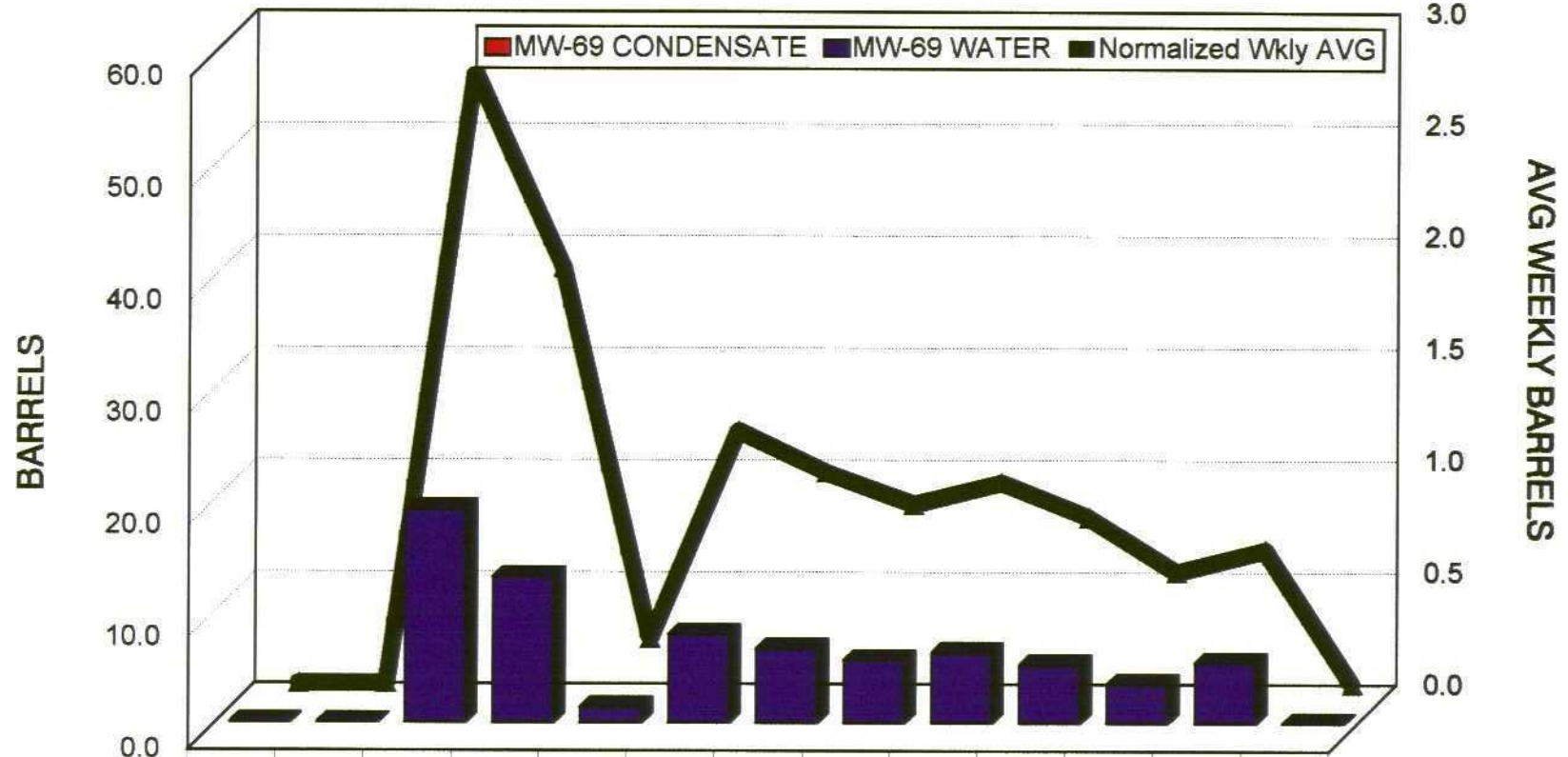


	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/11	12/18	12/27	1/2
						95							96
Normalized Wkly AVG	2019	2017	1670	2477	1962	2189	2119	2726	2789	2665	3167	3097	3242
SW-1	0.000	0.168	0.813	6.347	0.481	2.384	0.318	0.000	0.779	0.000	0.009	0.000	0.013
MW-83	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.014	3.190	2.560
MW-82	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.245	2.609	2.216
MW-81	0.000	0.000	0.000	0.000	0.000	0.000	0.003	4.873	4.676	4.319	4.783	6.122	4.345
MW-75	3.686	2.667	1.871	2.057	2.362	2.409	4.139	4.229	3.501	3.521	3.406	4.280	2.847
MW-72	4.637	5.088	3.969	3.986	4.399	4.167	4.208	4.032	3.788	4.463	5.113	5.909	3.875
MW-68	1.122	1.161	0.942	1.086	1.151	1.149	1.116	1.087	1.064	0.912	1.054	1.180	0.797
MW-65A	0.957	0.927	0.648	0.283	0.924	0.640	0.538	0.437	1.531	1.518	1.262	1.479	0.977
MW-62	1.005	1.046	0.862	1.006	1.106	1.145	1.148	1.169	1.172	1.177	0.029	0.000	0.000
MW-61A	1.980	2.284	1.955	1.986	2.520	2.586	2.528	2.442	2.204	1.950	2.239	3.104	1.820
MW-59	0.748	0.777	0.627	0.592	0.795	0.843	0.833	0.812	0.809	0.791	0.016	0.000	0.000

METER RECORDING DATE

FIGURE 6

WEEKLY SHALLOW ZONE FLUID RECOVERY
FOURTH QUARTER 1995

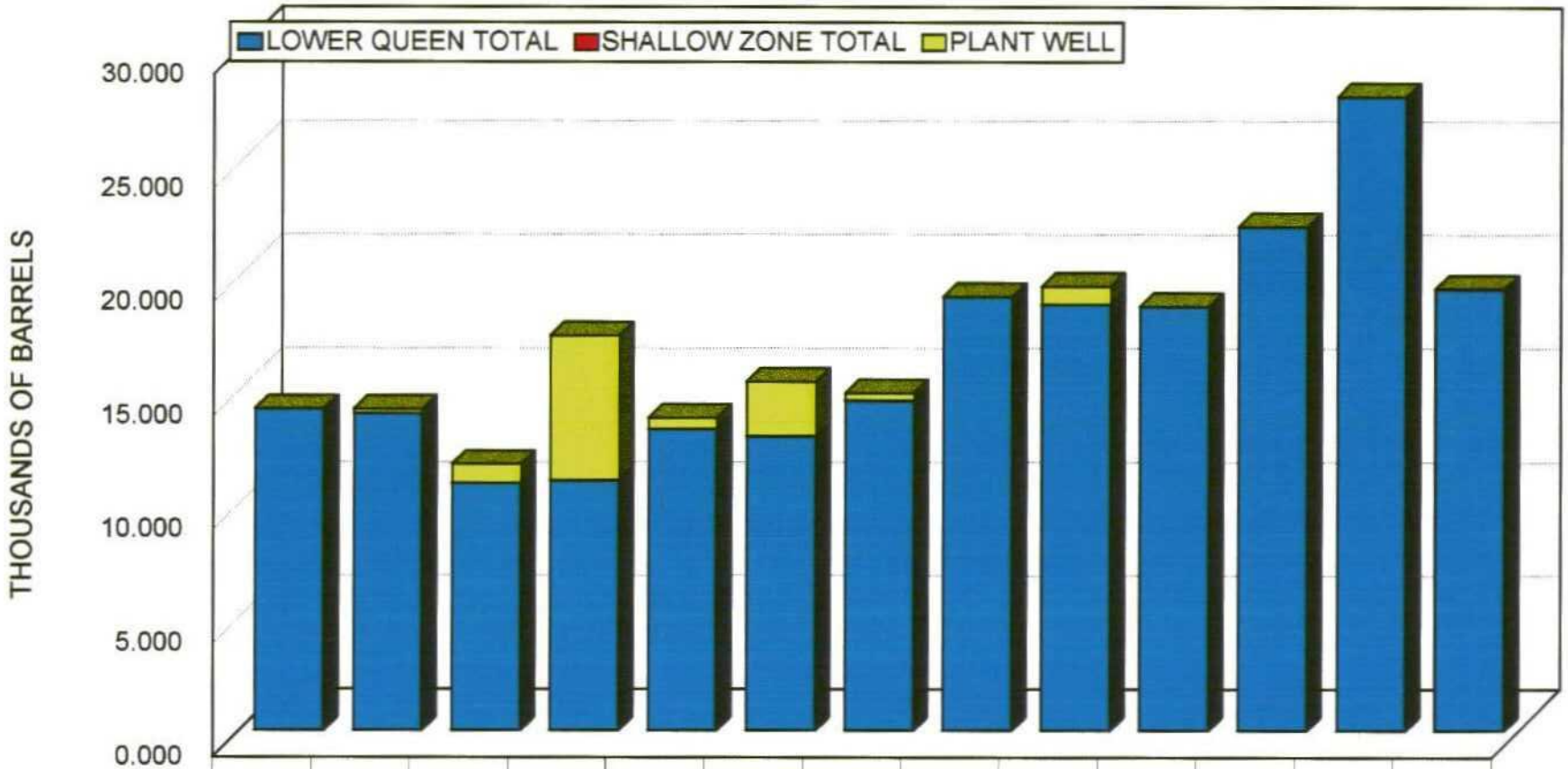


	10/9/95	10/16/95	10/23/95	10/30/95	11/6/95	11/13/95	11/20/95	11/27/95	12/4/95	12/11/95	12/18/95	12/27/95	1/2/96
Normalized Wkly AVG	0.0	0.0	2.7	1.9	0.2	1.1	0.9	0.8	0.9	0.7	0.5	0.6	0.0
MW-69 WATER	0.0	0.0	19.0	13.0	1.4	7.9	6.6	5.6	6.3	5.2	3.5	5.4	0.0
MW-69 CONDENSATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

METER RECORDING DATE

FIGURE 7

WEEKLY TOTAL FLUID RECOVERY
FOURTH QUARTER 1995



	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/11	12/18	12/27	1/2
						95							96
PLANT WELL	0.000	0.168	0.813	6.347	0.481	2.384	0.318	0.000	0.779	0.000	0.009	0.000	0.013
SHALLOW ZONE TOTAL	0.000	0.000	0.019	0.013	0.001	0.008	0.007	0.006	0.006	0.005	0.004	0.005	0.000
LOWER QUEEN TOTAL	14.135	13.950	10.874	10.995	13.255	12.940	14.512	19.079	18.746	18.652	22.162	27.873	19.437

METER RECORDING DATE

APPENDIX A

OCTOBER 1995 GAUGING, PURGING, AND SAMPLING FIELD SUMMARY

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/9/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental -06-02432
IP Correcton: NA
Weather: Sunny & windy

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-80	8	15:01		DRY					0	0	
MW-70	4	15:06		194.19					0	0	
MW-09	2	15:20		DRY					0	0	
MW-79	8	15:32	82.90	79.57					0	356	Sample
MW-06	2	15:56		DRY					0	0	
MW-08	2	16:17		DRY					0	87.9	
MW-53	2	16:34		DRY					0	0	
MW-66	4	16:55		201.62					0	0	
MW-58	4	17:13	172.70	DRY					0	0	No lock or cap, mud on probe

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/10/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental 06-02432
IP Correcton: NA
Weather: Sunny/hot

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-69	4	11:55		34.57	32.28	2.29			0	38.7	Pulled pump to measure/reinstalled
MW-07	2	12:20		DRY					0	0	
MW-81	8	13:36	228.45	190.99	188.25	2.64			0	0	
MW-63	4	15:20	221.88	198.57					0	0	
SW-02	10	15:50		181.70					0	0	
MW-71	4	15:59	235.41	151.15					0	0	
MW-52	2	16:10		DRY					0	0	
MW-61	4	17:08	57.97	37.38					0	0	
MW-60	4	17:21	226.08	187.29					0	0	
MW-61A	--								--	--	Pump in well
MW-64	4	17:30	204.38	170.33					0	0	
MW-67	4	17:43	168.54	137.54					0	329	98% LEL

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/11/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental 06-02432
IP Correcton: NA
Weather: Sunny

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-83	8	08:11	205.80	165.55	164.88	1.67			0	0	N/S Product
MW-65	4	08:22	57.45	57.07					0	0	N/S Insufficient water
MW-65A	4	08:28		136.00	134.90	1.10			0	0	N/S Product
MW-77	8	08:37	82.20	79.70					0	63.3	N/S didn't recover
MW-78	8	08:46	86.62	86.19					0	46.8	No sample, insufficient water
MW-82	8	10:01	231.30	196.62					0	0	Sample (pump)
MW-75	8	10:19		192.31	188.02				--	--	N/S Product
MW-57	4	12:18		159.23					0	0	Sample (pump)
MW-03	2	12:29		DRY					0	18.8	No sample, insufficient water
MW-56	4	12:36		DRY					0	28.0	LEL 100%F
MW-29	2	12:42		DRY					0	0	N/S insufficient water
MW-10	4	12:48		DRY					0	0	N/S insufficient water
MW-55	4	12:55	66.32	32.20					0	0	
MW-74	8	13:05	220.00	187.31					0	35.5	27% LEL N/S due to Condensate in Well
MW-73	8	13:13		192.35					0	0	N/S due to Condensate in Well
MW-72	8	13:21		NM							Water level below 200', pump operational
MW-54	4	10:25		47.40					0	0	Sample

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/12/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Renatl 06-02432
IP Correcton: NA
Weather: Sunny

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-05	2	08:50		DRY					0	0	N/S
MW-24	2	08:57	13.30	13.25					0	0	N/S insufficient water
MW-32	2	09:03		DRY					0	0	N/S
SUMP-16A	24	09:09	17.45	14.60					0	0	Sample
MW-13	2	09:20	21.80	18.46	18.40	0.06			0	0	Product is light
MW-11	4	09:25	25	22.01					0	0	N/S
SUMP-A10	24	09:40	13.42	12.80					0	0	Sample
MW-48	2	09:45		DRY					0	0	N/S
MW-47	2	09:52		DRY					0	32.5	N/S
MW-46	2	09:56		DRY					0	27.7	N/S
MW-50	2	10:00	37.15	26.85					0	0	Sample
MW-45	2	--							--	--	Piping in well/no gauge
MW-49	2	10:05	25.91	22.68					0	0	Sample
MW-44	4	10:09	25.24	21.84					0	0	Sample
MW-43	4	10:13	24.55	21.80					0	0	Sample
MW-41	4	10:17	24.04	20.58					0	0	Sample
MW-38	4	10:20		DRY					0	0	N/S dry
MW-39	4	10:24	20.45	20.03					0	0	N/S insufficnet water
MW-76	8	10:41		167.51	167.10	0.41			0	0	N/S product

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 10/10-11/95

Project Number 023350059.6004 Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-63	4	221.88	198.57	46	Pump	15:59	46	215	3	10-10-95 16:35	7.67	627	72.2	-	MW-63
MW-66	4	237.66	201.62	72	Pump*	13:50	72	230	3	10-10-95 14:40	7.86	1106	71.9	--	MW-66
MW-70	4	228.14	194.19	68	Pump	10:35	68	220	4	10-10-95 11:20	8.06	618	69.2	--	MW-70
MW-54	4	78.15	47.40	62	Pump	16:32	20	70	1	10-11-95 17:30	7.00	3900	80.2	-	MW-54
MW-60	4	226.08	187.29	80	Pump	0805	80	215	5	10-11-95 09:05	7.61	985	65.6	-	MW-60
MW-61A	4	215.67			Pump dedicated					NS					NS
MW-64	4	204.38	170.33	68	Pump	09:32	68	200	6	10-11-95 10:45	7:38	904	69.5	-	MW-64
MW-71	4	235.41	151.15	168	Pump	17:42	168	220	2-3	10-10-95 19:10					MW-71
MW-57	4	179.30	159.23	40	Pump	14:35	40	170	5	10-11-95 15:10	7.37	770	73.7	-	MW-57
MW-67	4	168.54	137.54	62	Pump	11:09	62	160	8	10-11-95 11:45	7.67	761	71.0	-	MW-67

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 10/10-12/95

Project Number 023350059.6004 Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-41	4	24.04	20.58	8	Bail	13:00	2.5	--	--	10/12/95; 14:15	--	--	--	--	MW-41
MW-43	4	24.55	21.80	5	Bail	12:45	2.5	--	--	10/12/95; 14:30	--	--	--	--	MW-43
MW-44	4	25.24	21.84	7	Bail	12:20	7	--	--	10/12/95; 12:35	--	--	--	--	MW-44
MW-49	2	25.91	22.68	1.5	Bail	12:05	1.5	--	--	10/12/95; 12:15	--	--	--	--	MW-49
MW-50	2	37.15	26.85	5	Bail	11:35	5	--	--	10/12/95; 12:00	--	--	--	--	MW-50
MW-55	4	66.32	32.20	68	Pump	15:34	68	60	5	10/11/95; 16:15	6.95	2520	71.5	--	MW-55
MW-61	4	57.97	37.38	40	Bail	18:05	40	NA	NA	10/10/95; 18:45	--	--	--	--	MW-61
MW-39	4	20.54			NS					NS					NS*
MW-65	4	57.35			NS					NS					NS
MW-11	4	25.00	22.01	6	NS					NS					NS
MW-77	8	82.20	79.70	20	Bail		5			NS					NS*
MW-79	8	82.90	79.57		Bail	12:30		--	--	10/10/95; 13:00	--	--	--	--	MW-79

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
4 - *Well MW-39 and MW-77 not sampled due to insufficient recharge.

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 10/10-12/95

Project Number 023350059.6004 Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
SUMP-16A	24	17.45	14.6	--	NS	--	--	--	--	10/12/95; 13:40	--	--	--	--	SUMP-16A
SW-02	10	292.00	--	--	NS	--	--	--	--	NS	--	--	--	--	NS
MW-58		DRY	--	--	NS	DRY	--	--	--	NS	--	--	--	--	NS
MW-65A	4	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
MW-81	8	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
MW-82	8	231.30	196.62	280	Pump	12:26	280	220	5	10/11/95; 14:10	7.46	938	68.7	--	MW-82
MW-83	8	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
SUMP-A10	24	13.42	12.80	--	--	--	--	--	--	10/12/95; 13:55	--	--	--	--	SUMP-A10

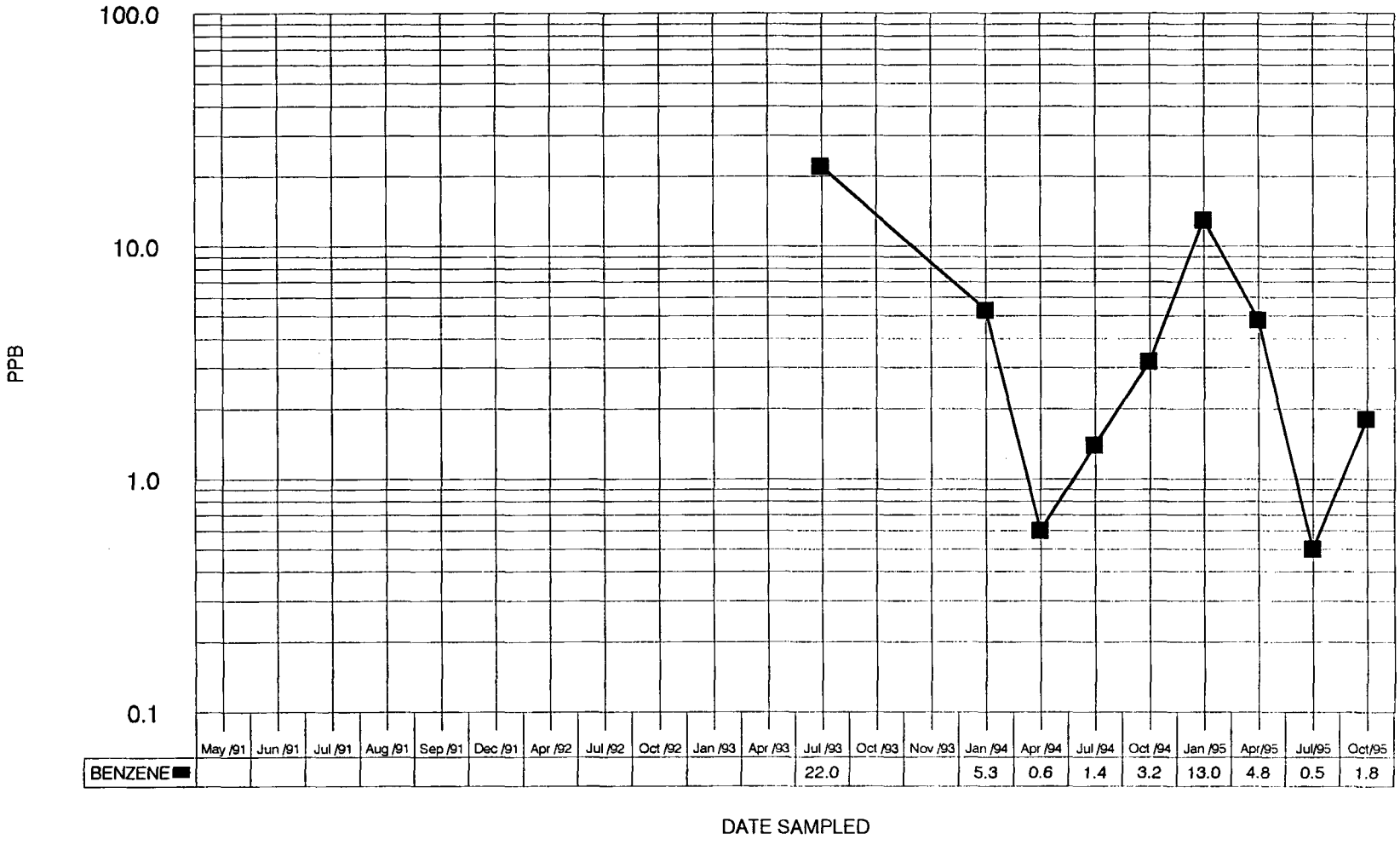
Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
4 - NS*: Well not sampled due to insufficient recharge

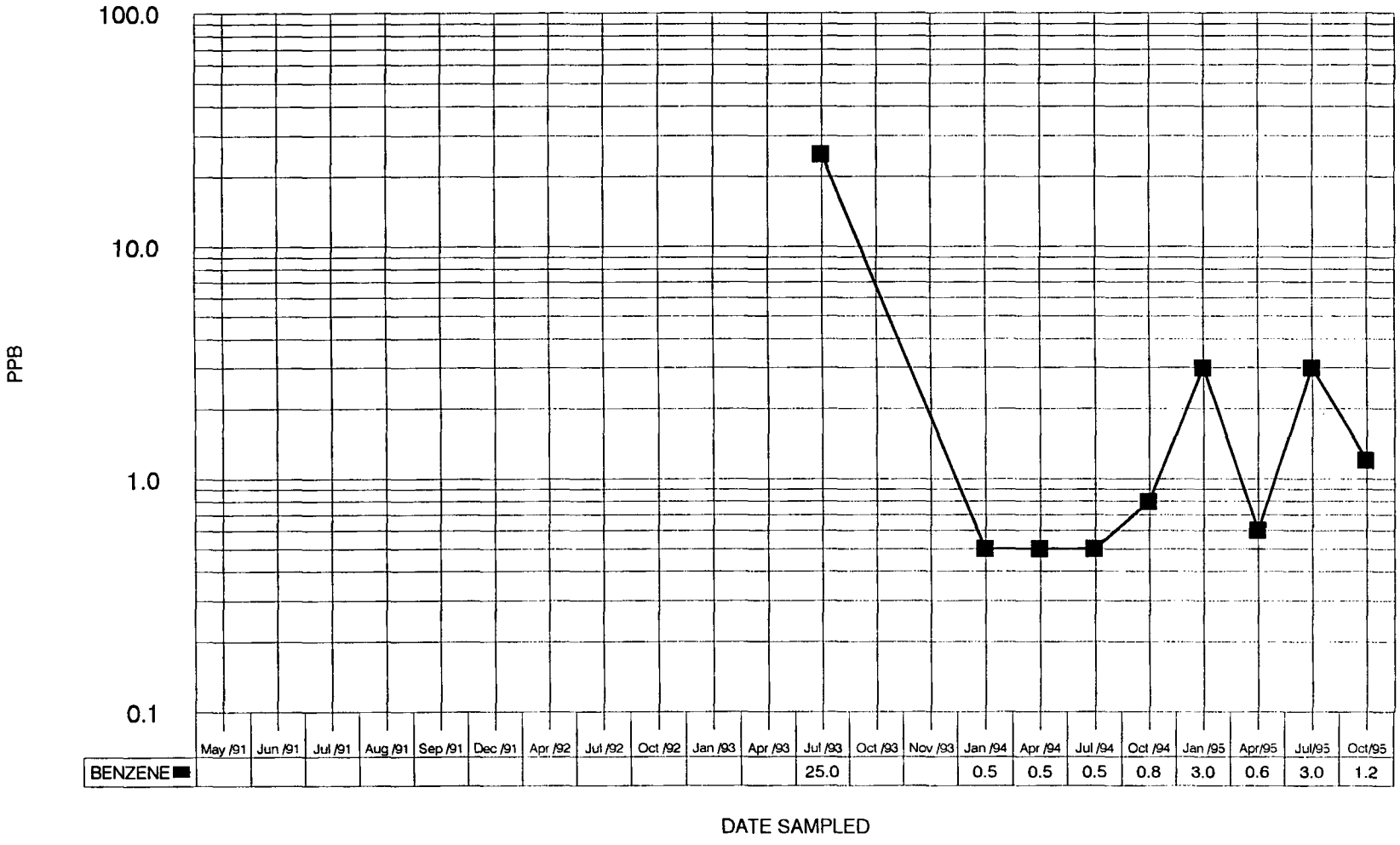
APPENDIX B

BENZENE CONCENTRATION IN GROUNDWATER VS. TIME GRAPHS

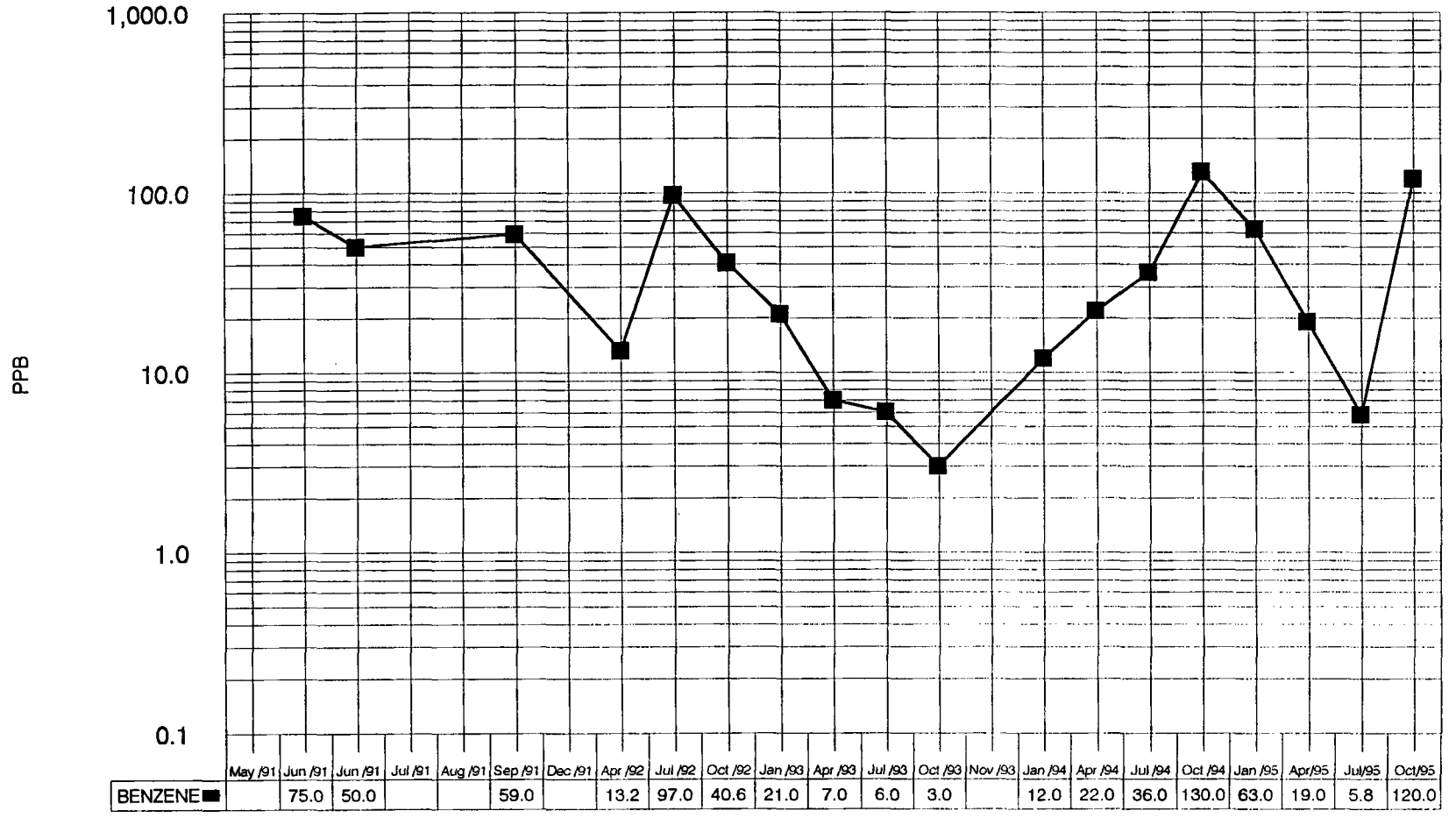
BENZENE IN GROUNDWATER
MW-41



BENZENE IN GROUNDWATER
MW-43



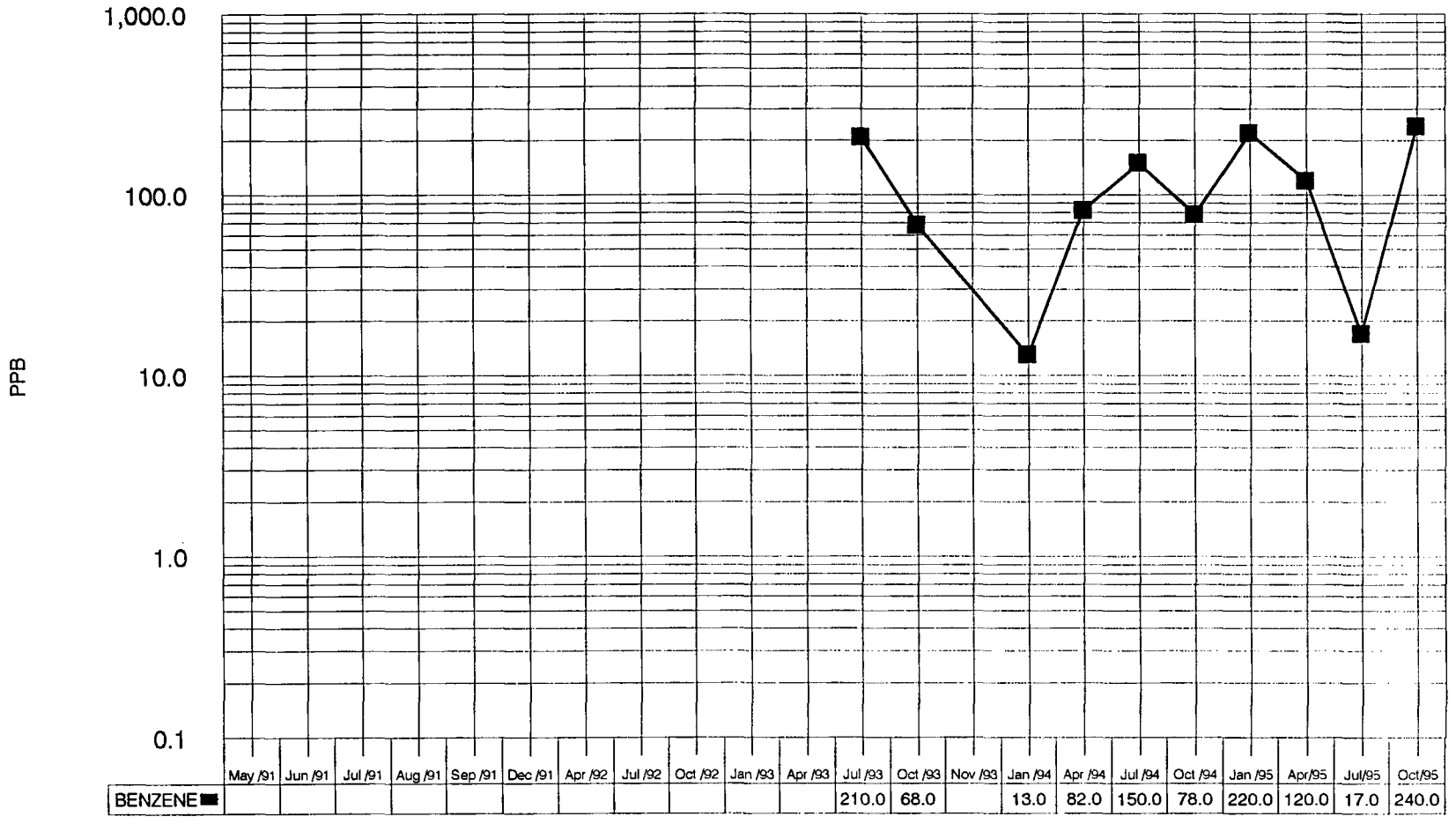
BENZENE IN GROUNDWATER
MW-44



	May /91	Jun /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		75.0	50.0			59.0		13.2	97.0	40.6	21.0	7.0	6.0	3.0		12.0	22.0	36.0	130.0	63.0	19.0	5.8	120.0

DATE SAMPLED

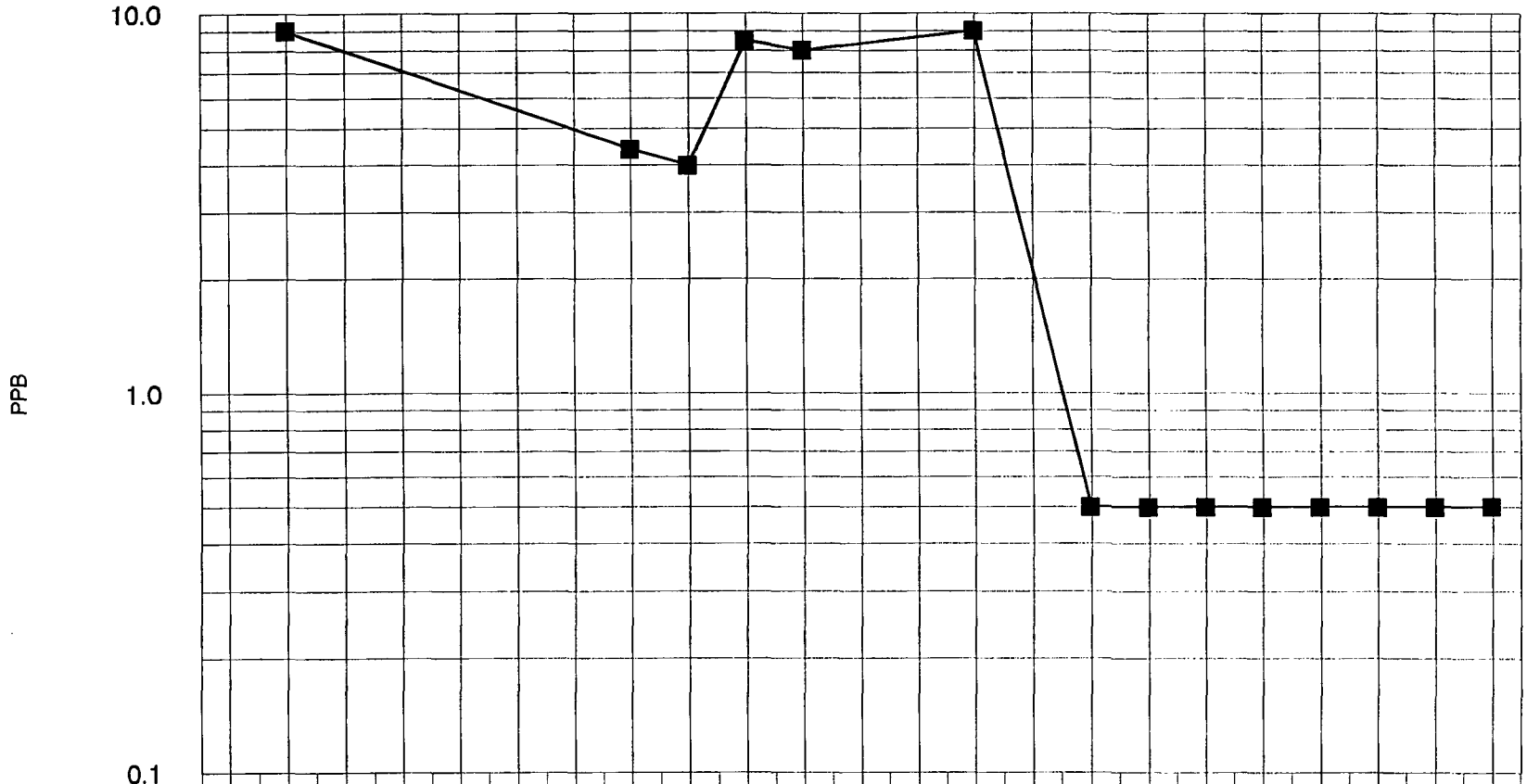
BENZENE IN GROUNDWATER
MW-49



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE												210.0	68.0		13.0	82.0	150.0	78.0	220.0	120.0	17.0	240.0

DATE SAMPLED

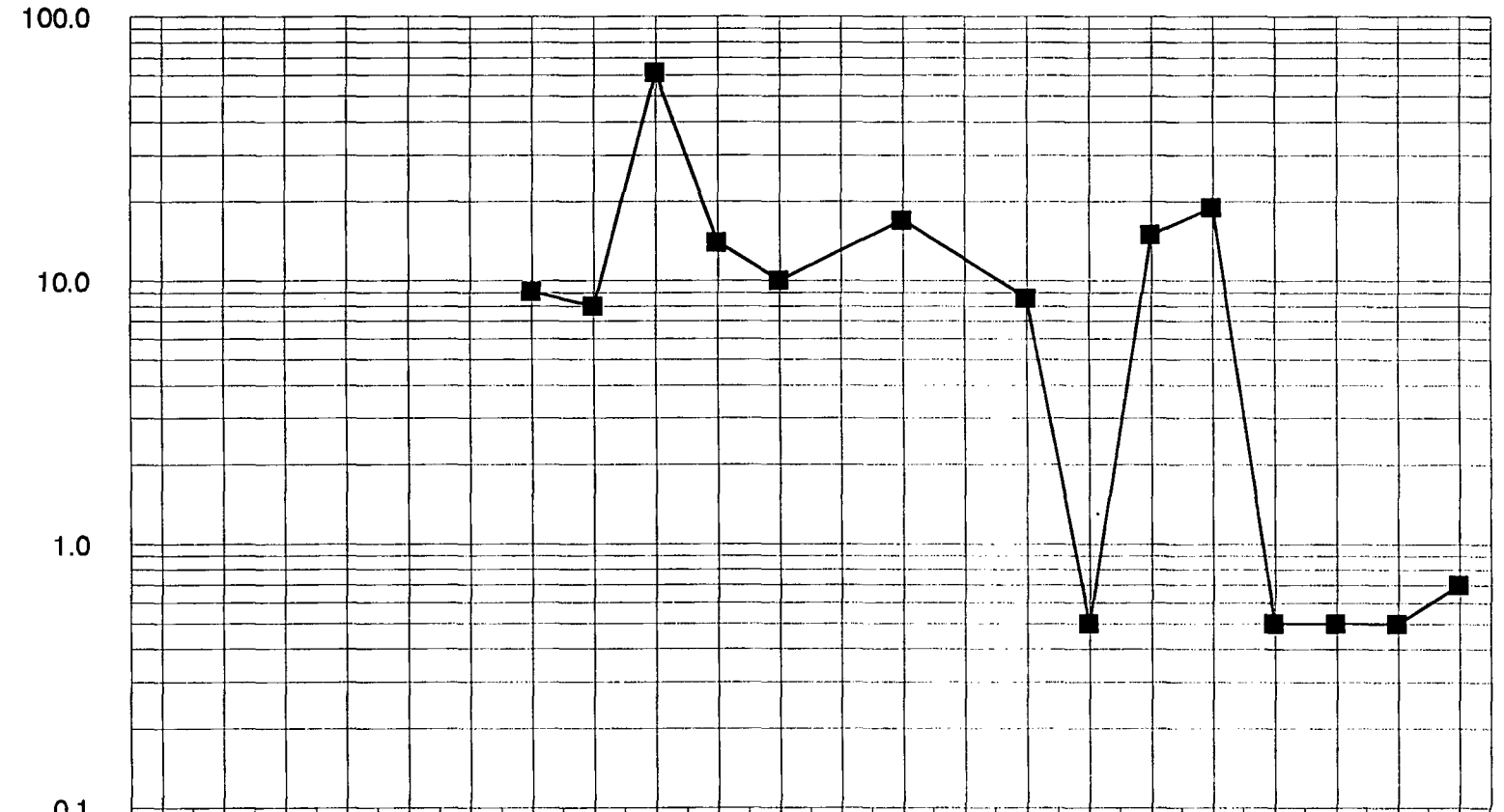
BENZENE IN GROUNDWATER
MW-50



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE ■		9.0			0.0	0.0	0.0	4.4	4.0	8.5	8.0	0.0	0.0	9.0		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

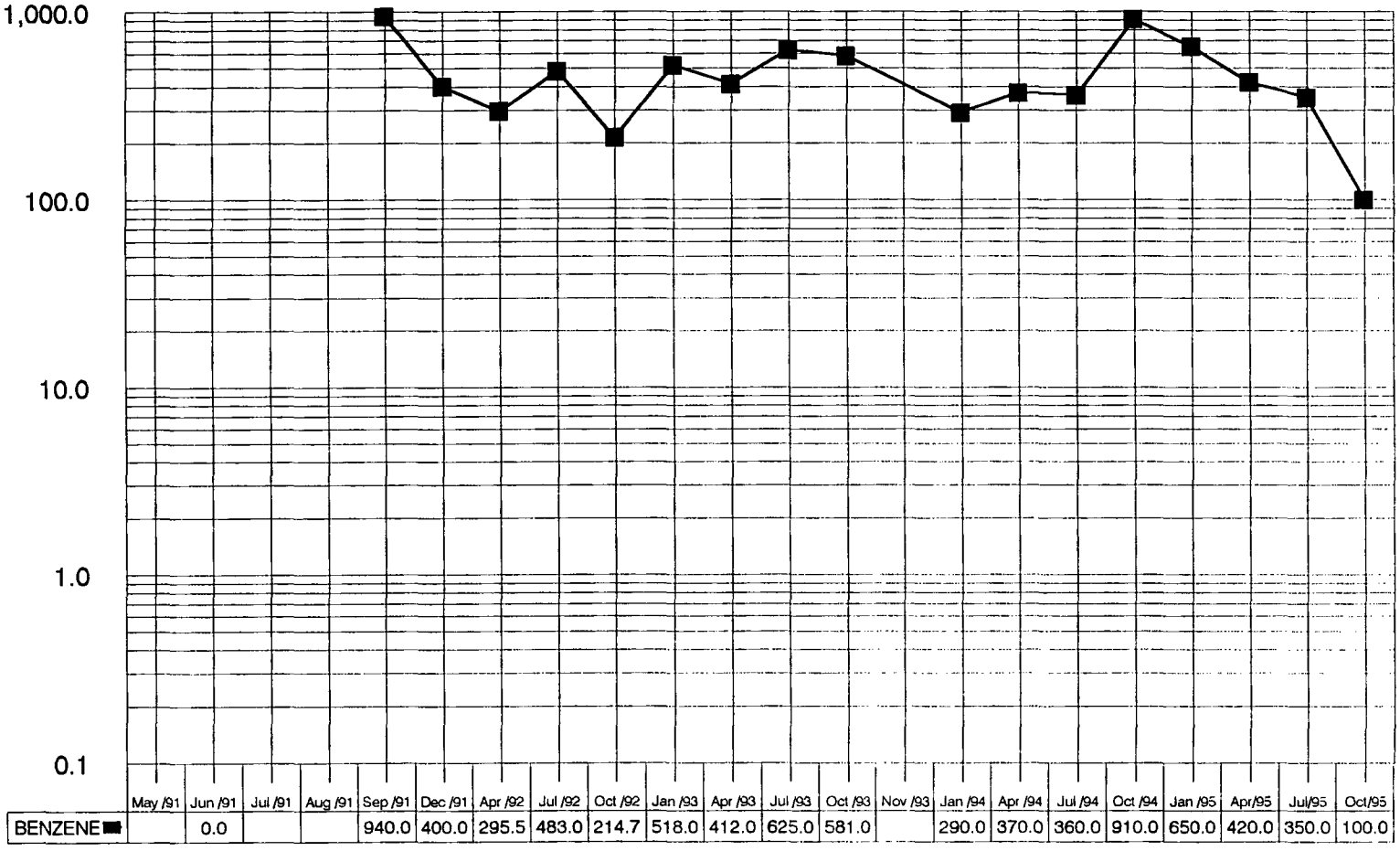
BENZENE IN GROUNDWATER
MW-54



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		0.0			0.0	0.0	9.1	8.0	61.6	14.0	10.0	0.0	17.0		8.6	0.5	15.0	19.0	0.5	0.5	0.5	0.7

DATE SAMPLED

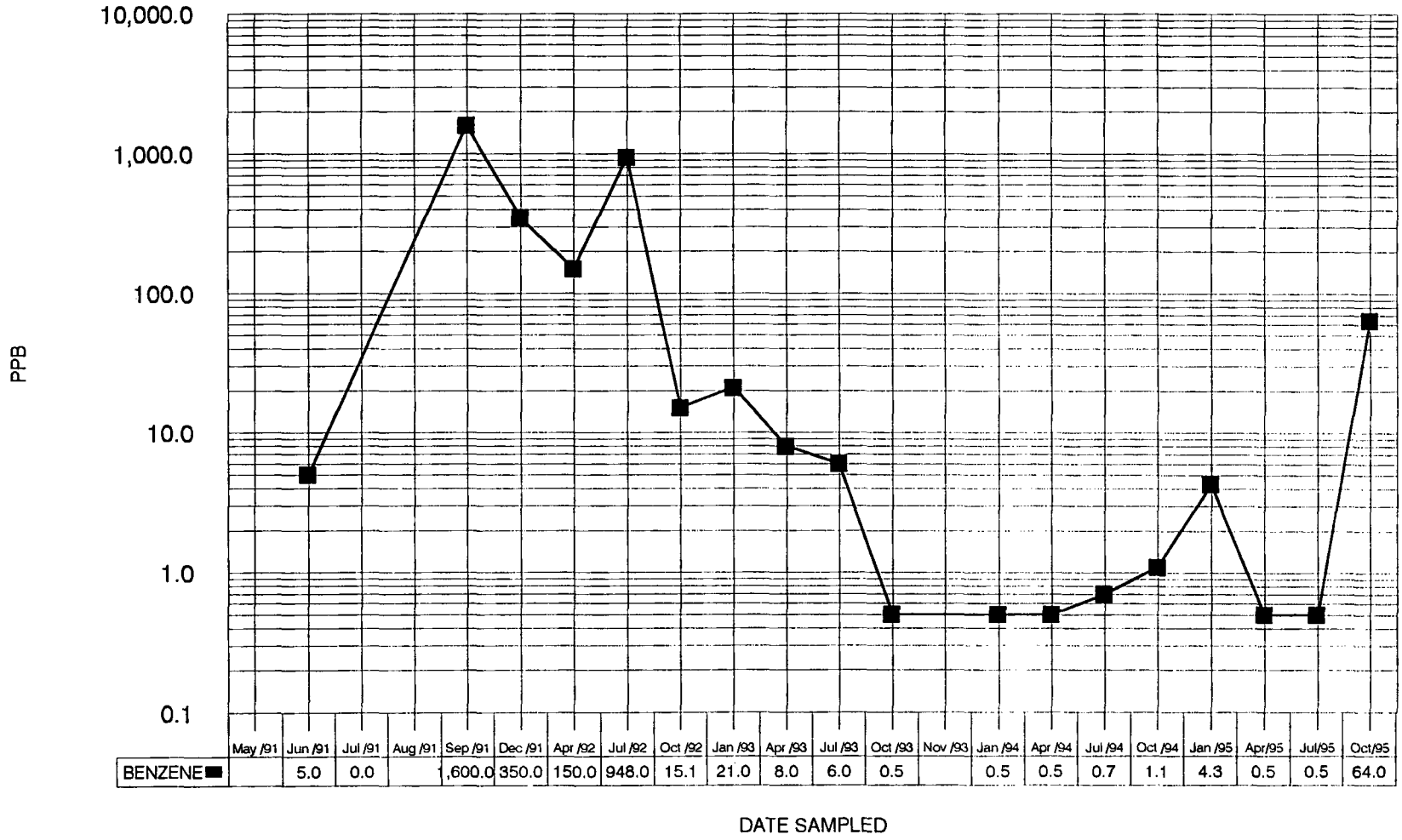
BENZENE IN GROUNDWATER
MW-55



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		0.0			940.0	400.0	295.5	483.0	214.7	518.0	412.0	625.0	581.0		290.0	370.0	360.0	910.0	650.0	420.0	350.0	100.0

DATE SAMPLED

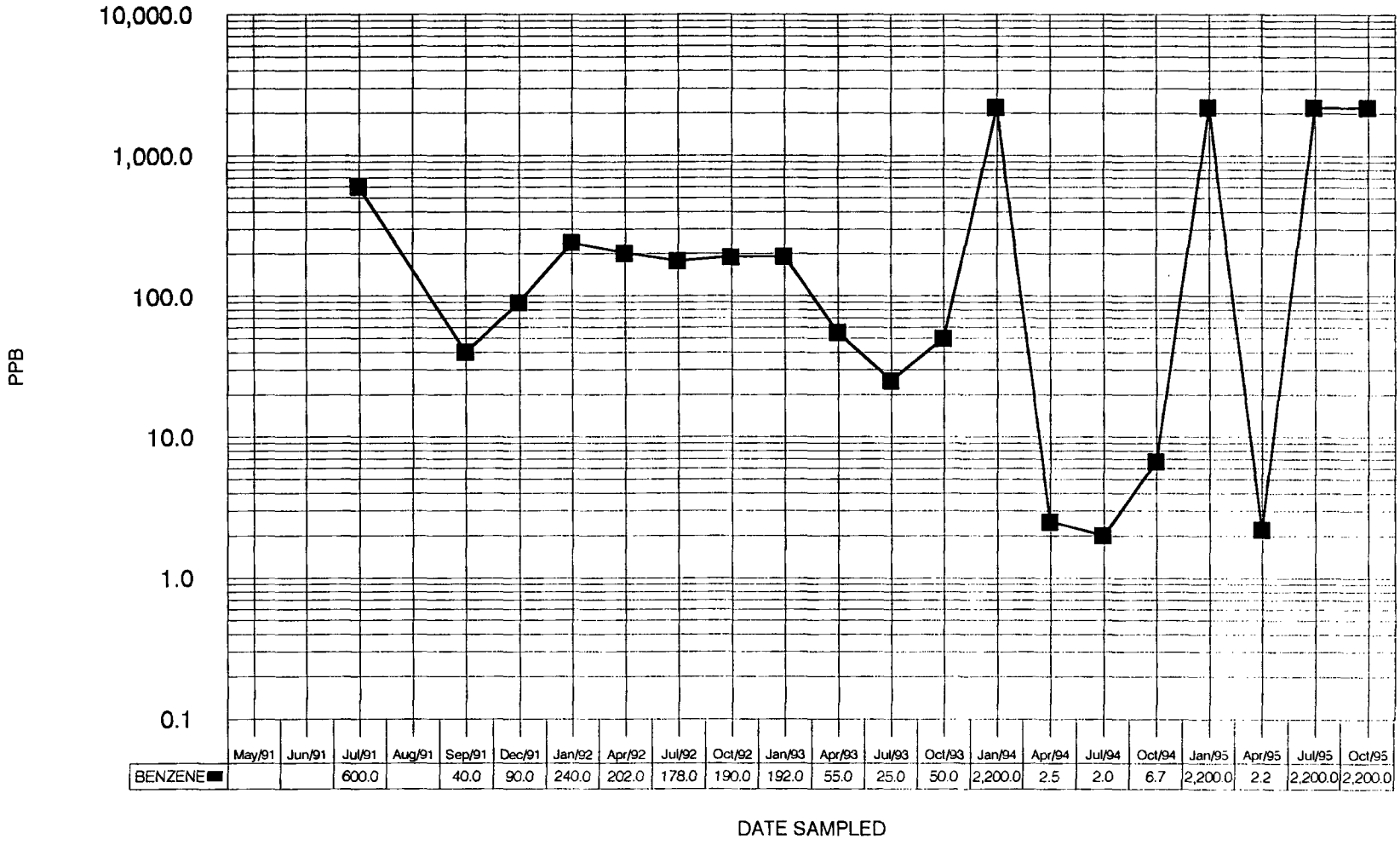
BENZENE IN GROUNDWATER
MW-57



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		5.0	0.0		1,600.0	350.0	150.0	948.0	15.1	21.0	8.0	6.0	0.5		0.5	0.5	0.7	1.1	4.3	0.5	0.5	64.0

DATE SAMPLED

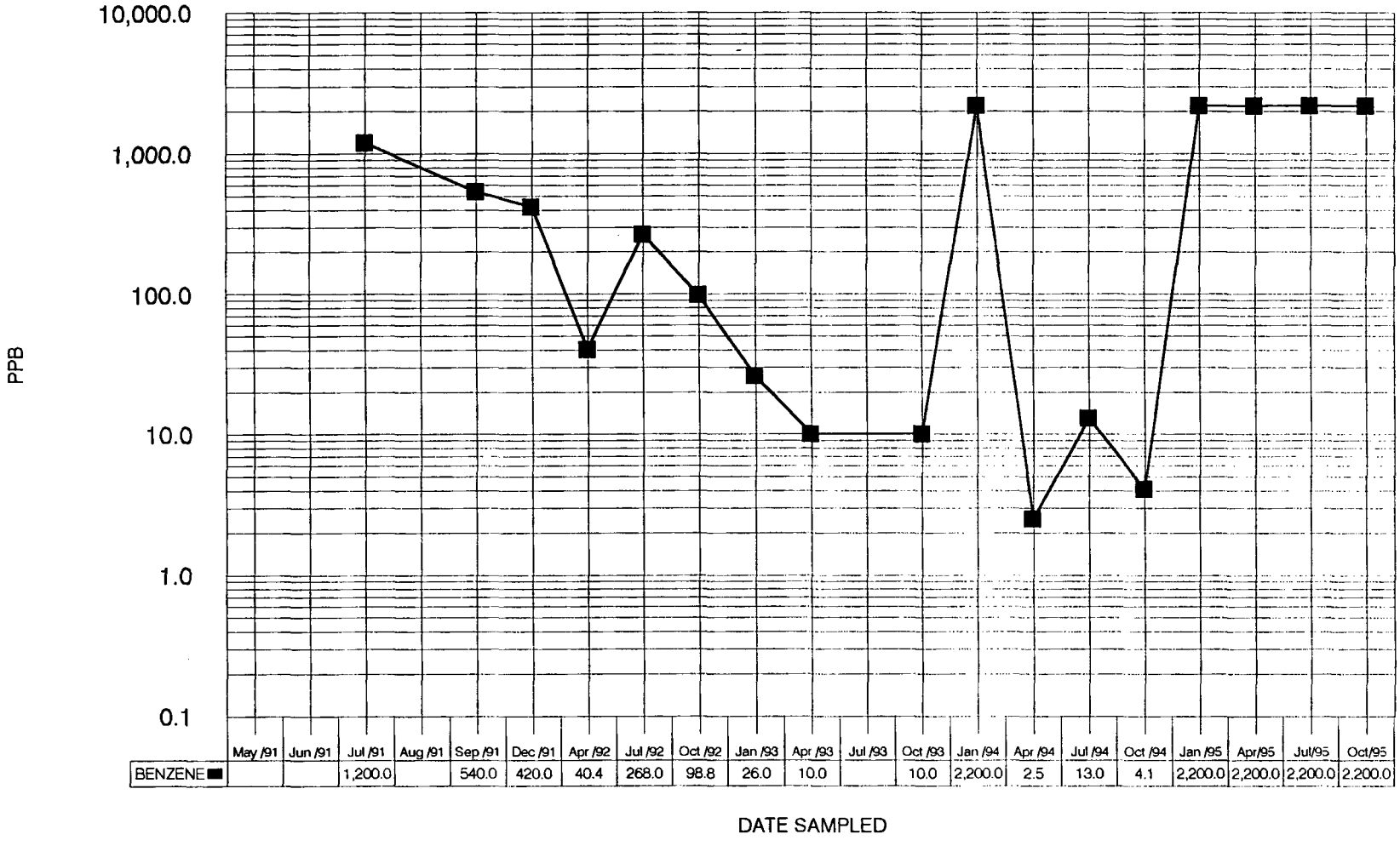
BENZENE IN GROUNDWATER
MW-58



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE			600.0		40.0	90.0	240.0	202.0	178.0	190.0	192.0	55.0	25.0	50.0	2,200.0	2.5	2.0	6.7	2,200.0	2.2	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

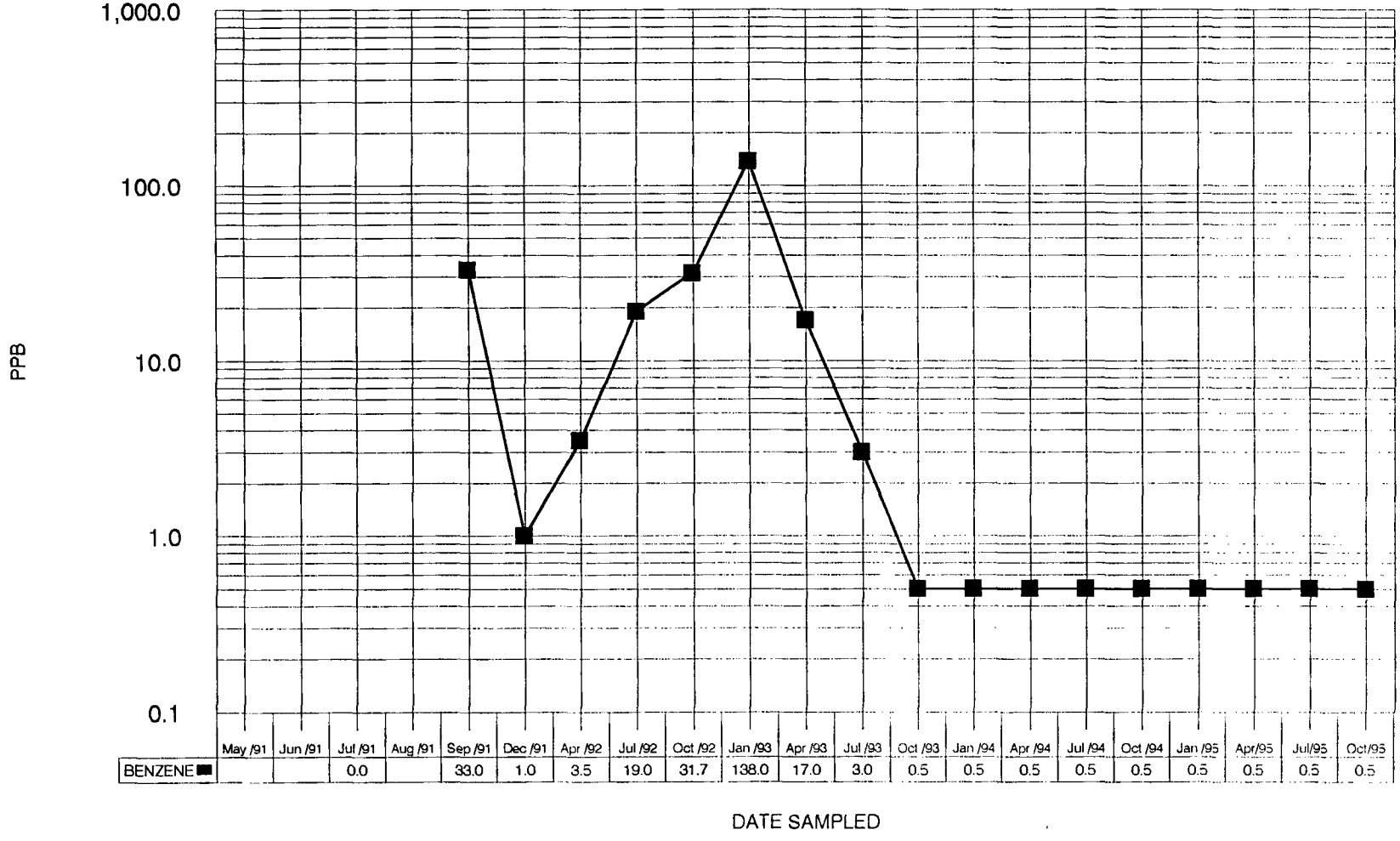
BENZENE IN GROUNDWATER
MW-59



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			1,200.0		540.0	420.0	40.4	268.0	98.8	26.0	10.0		10.0	2,200.0	2.5	13.0	4.1	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

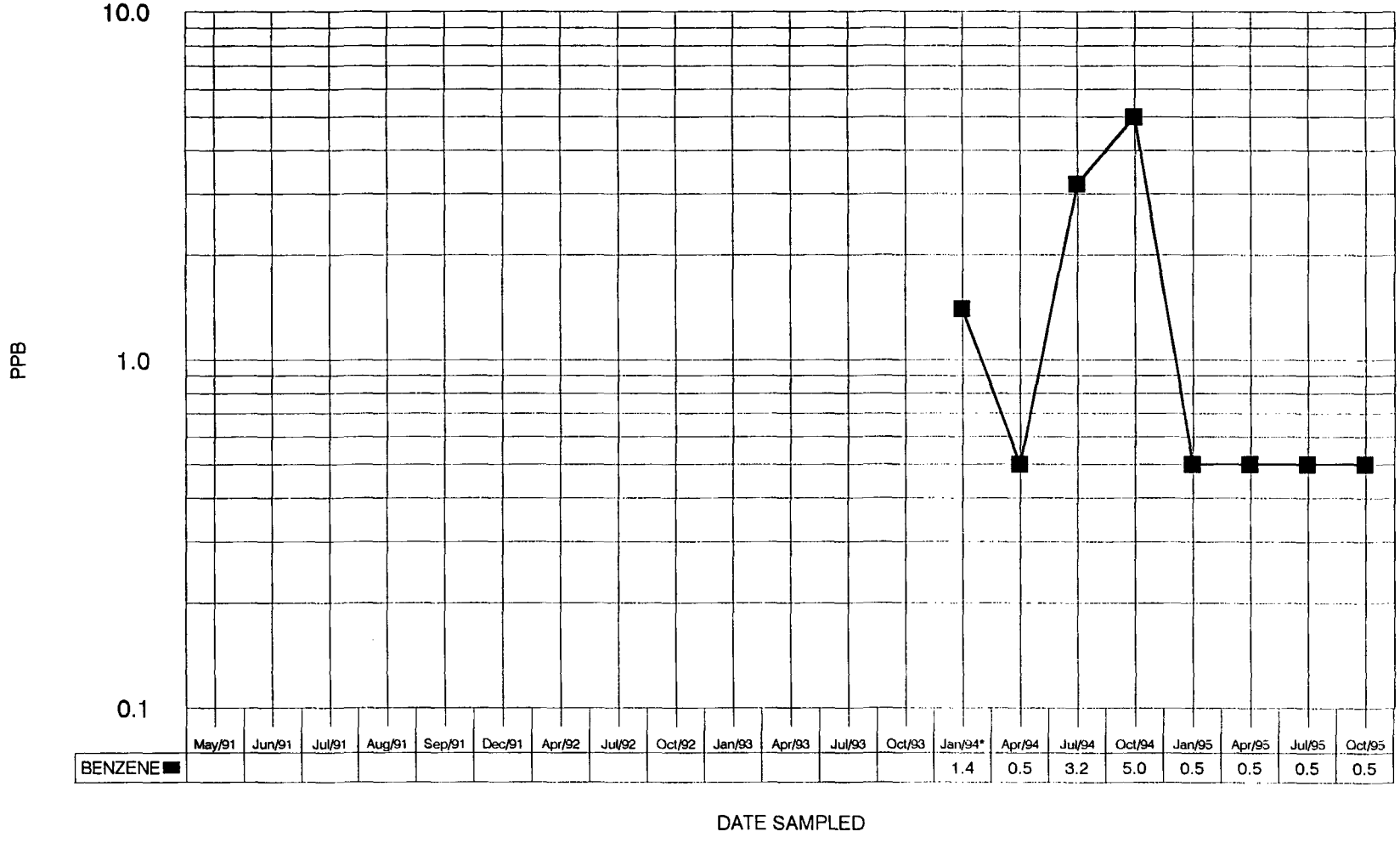
BENZENE IN GROUNDWATER
MW-60



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			0.0		33.0	1.0	3.5	19.0	31.7	138.0	17.0	3.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

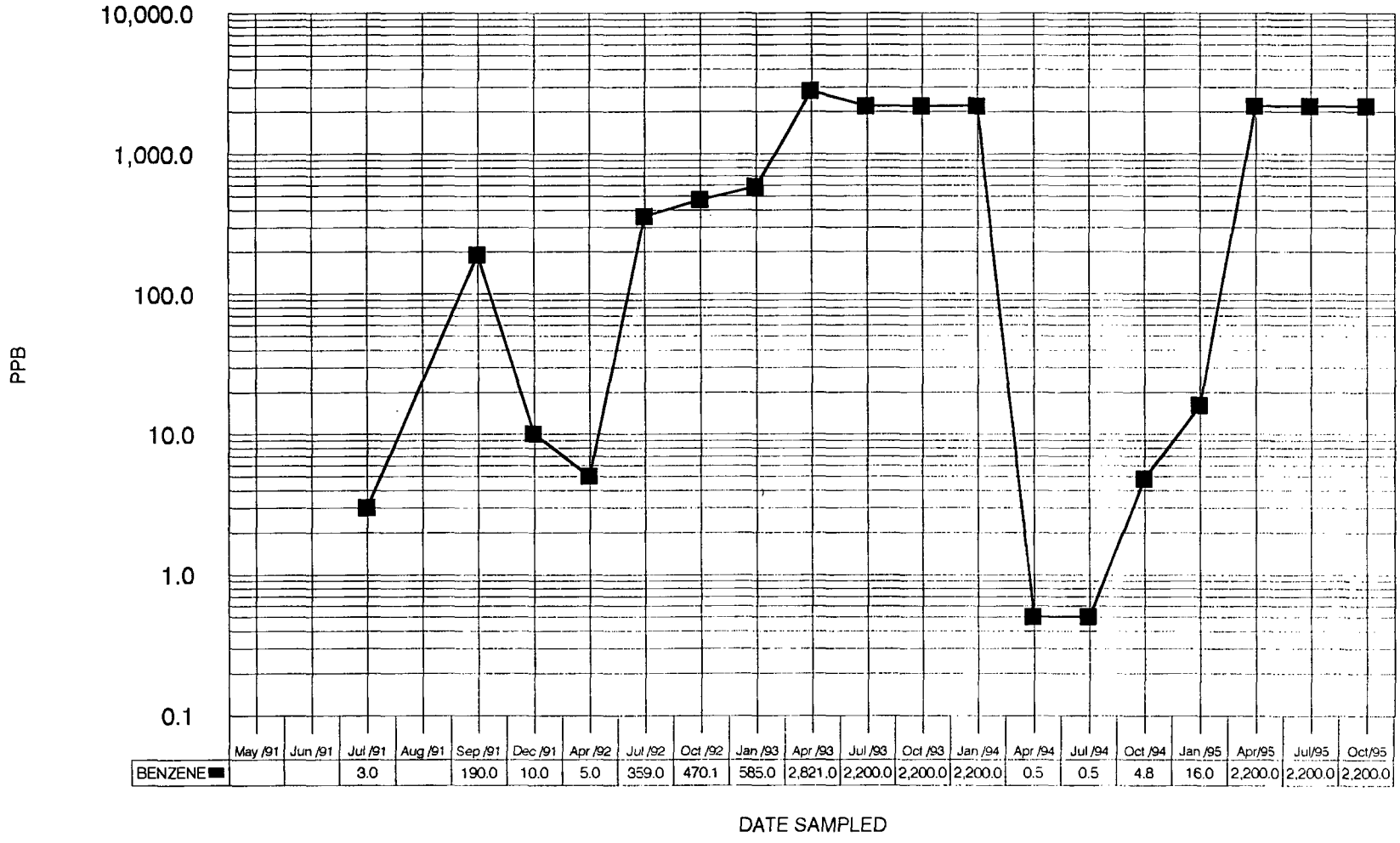
DATE SAMPLED

BENZENE IN GROUNDWATER
MW-61



*- Jan. 1994 was the first time this well was sampled.

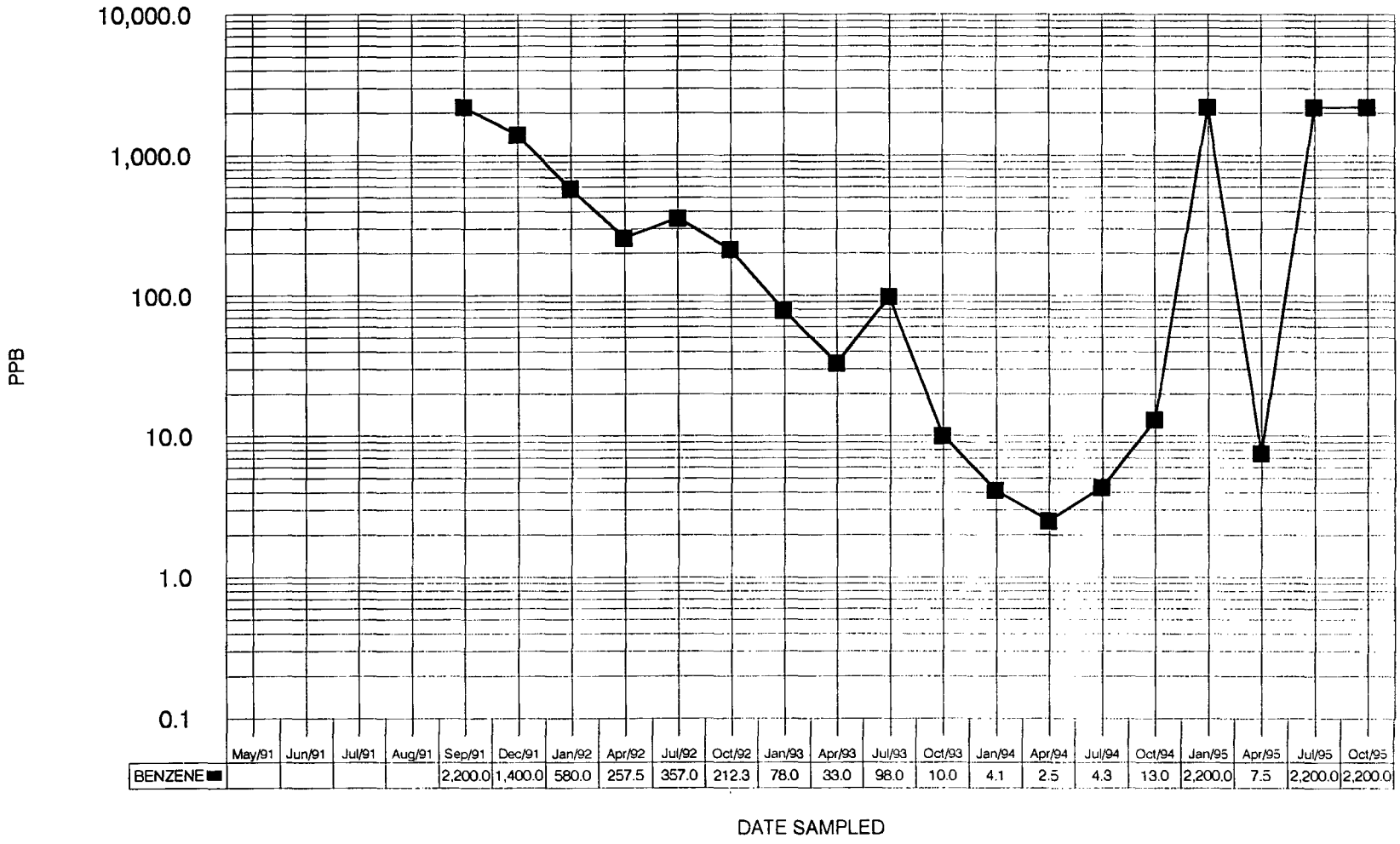
BENZENE IN GROUNDWATER
MW-61A



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			3.0		190.0	10.0	5.0	359.0	470.1	585.0	2,821.0	2,200.0	2,200.0	2,200.0	0.5	0.5	4.8	16.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

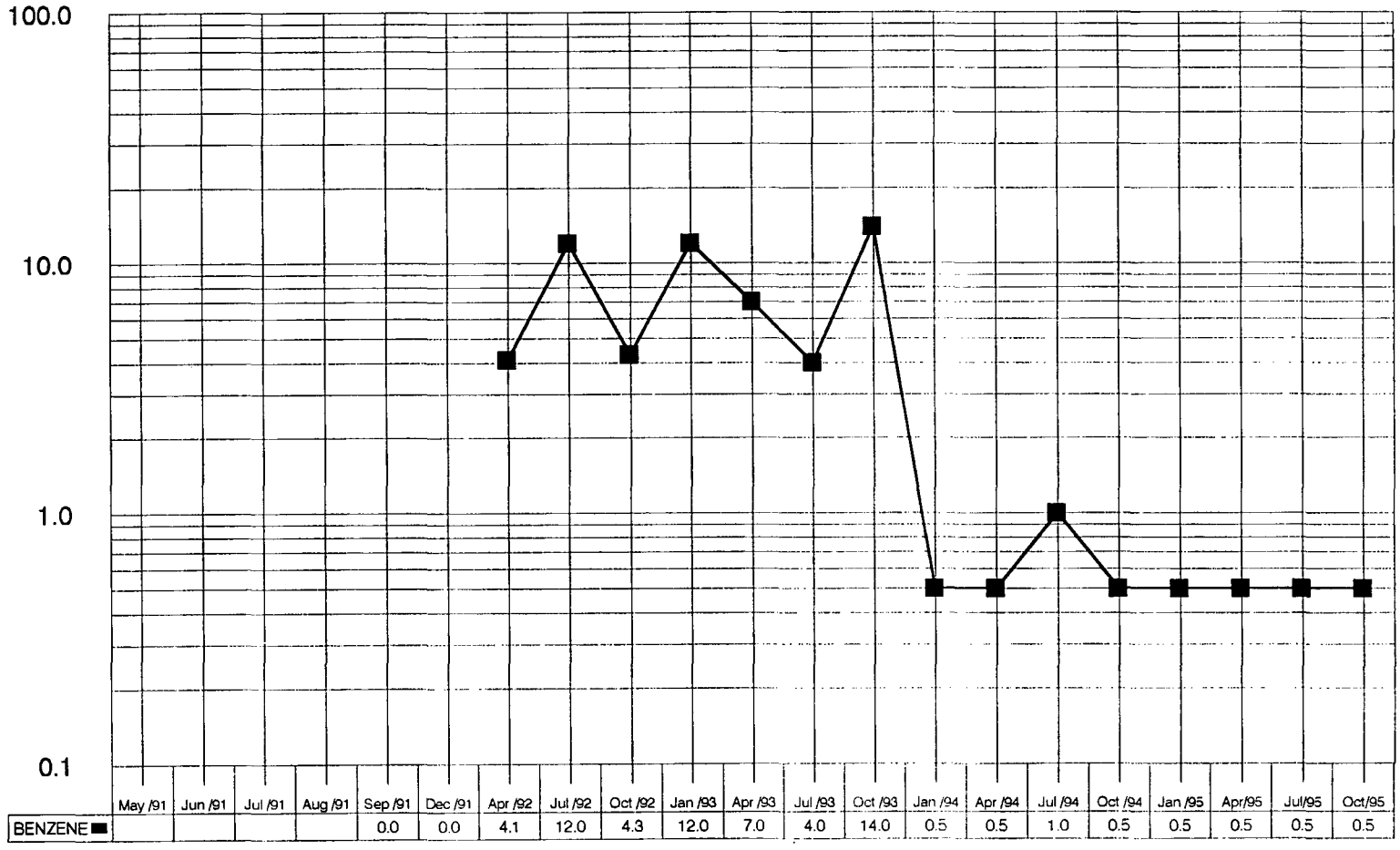
BENZENE IN GROUNDWATER
MW-62



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE					2,200.0	1,400.0	580.0	257.5	357.0	212.3	78.0	33.0	98.0	10.0	4.1	2.5	4.3	13.0	2,200.0	7.5	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

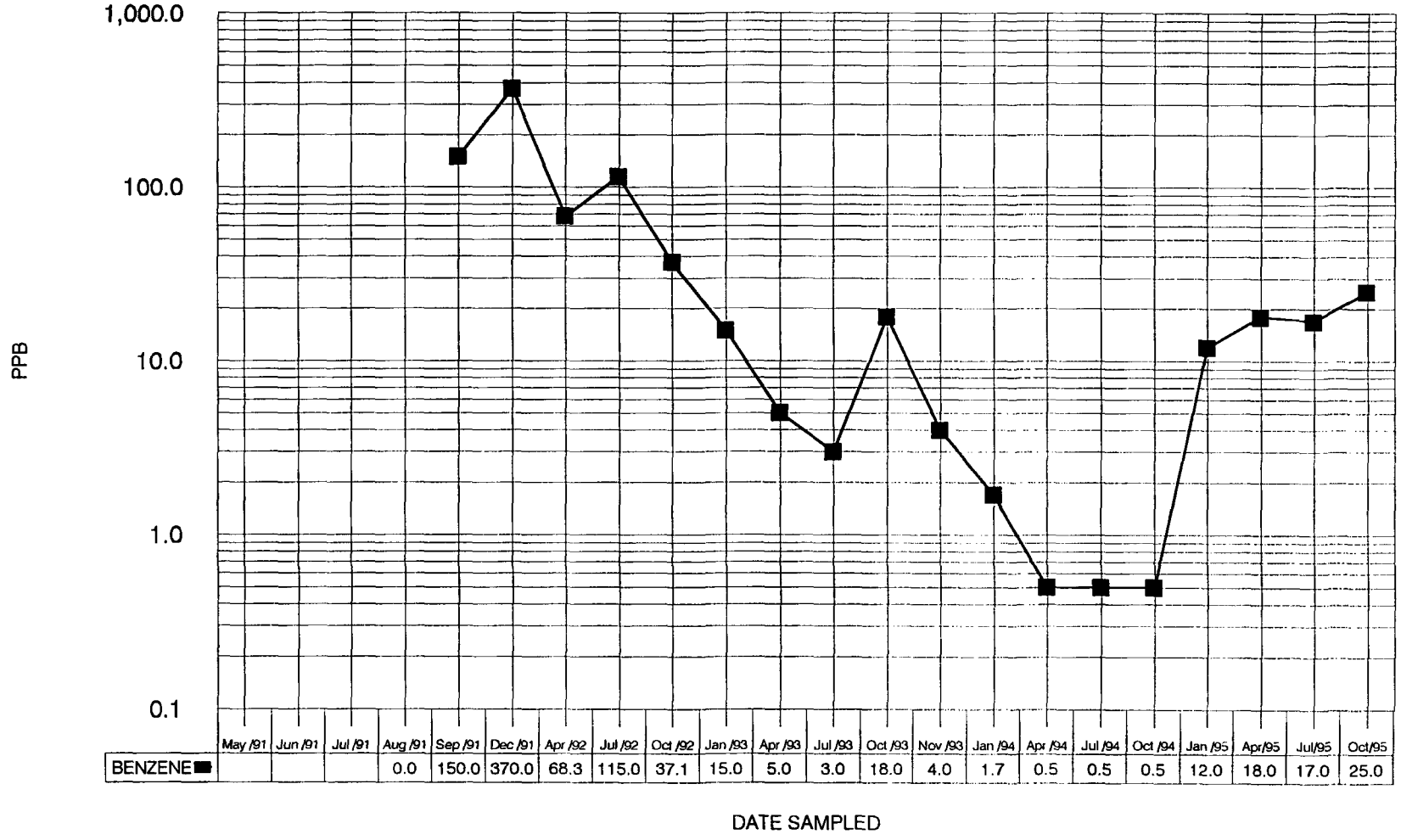
BENZENE IN GROUNDWATER
MW-63



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					0.0	0.0	4.1	12.0	4.3	12.0	7.0	4.0	14.0	0.5	0.5	1.0	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

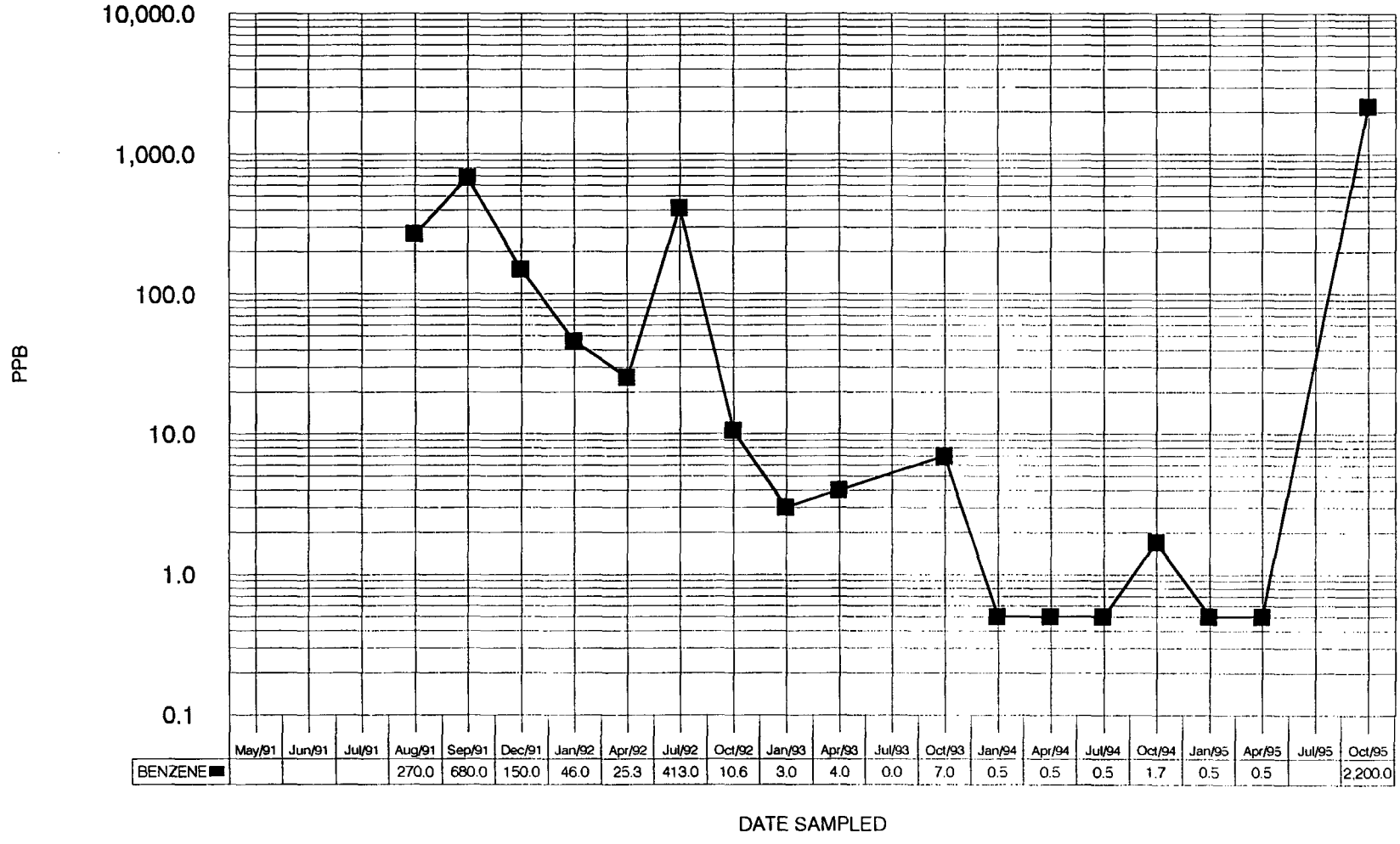
BENZENE IN GROUNDWATER
MW-64



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE				0.0	150.0	370.0	68.3	115.0	37.1	15.0	5.0	3.0	18.0	4.0	1.7	0.5	0.5	0.5	12.0	18.0	17.0	25.0

DATE SAMPLED

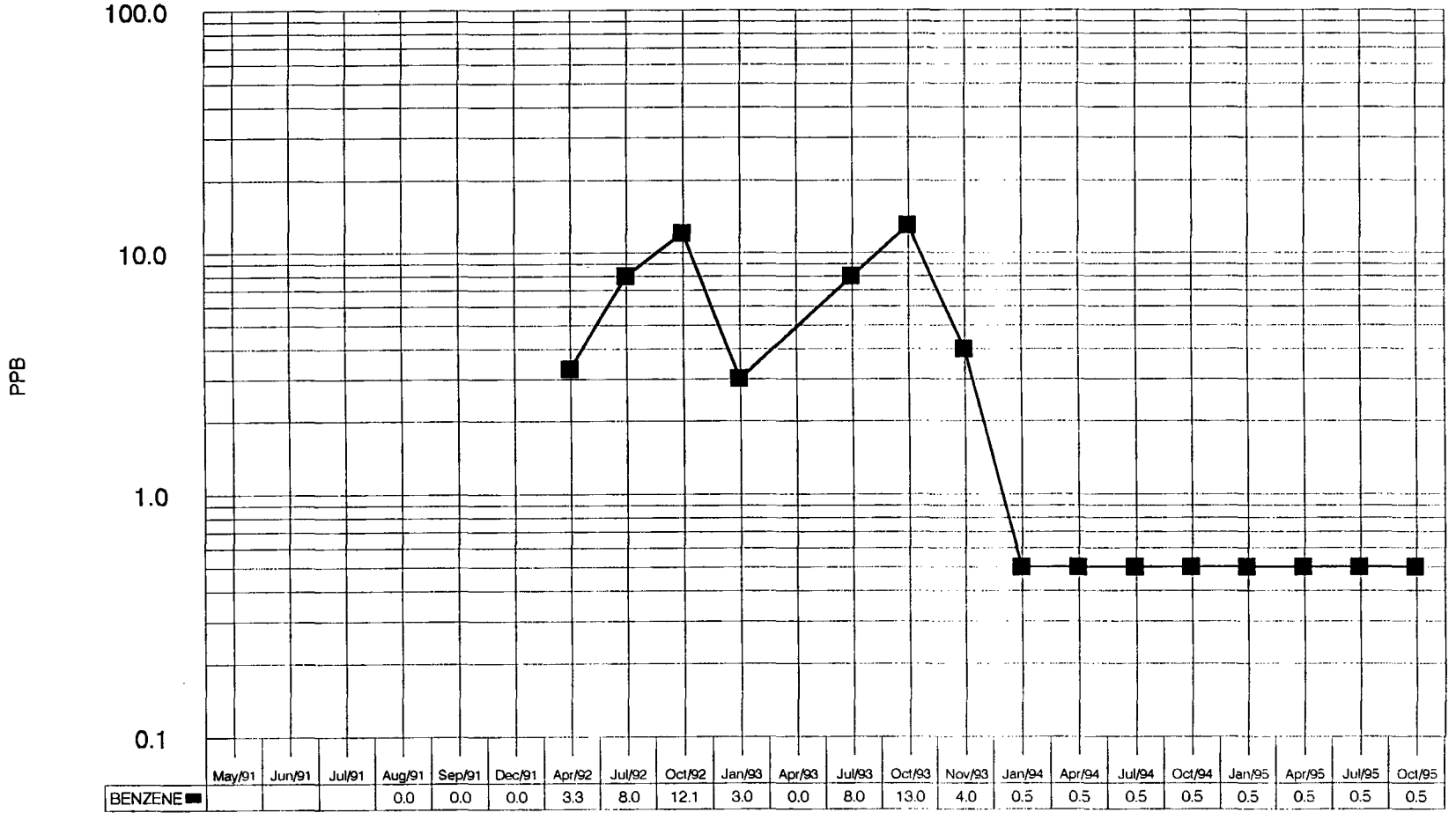
BENZENE IN GROUNDWATER
MW-65A



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE				270.0	680.0	150.0	46.0	25.3	413.0	10.6	3.0	4.0	0.0	7.0	0.5	0.5	0.5	1.7	0.5	0.5		2,200.0

Note: Free-phase condensate = 2200 ppb benzene

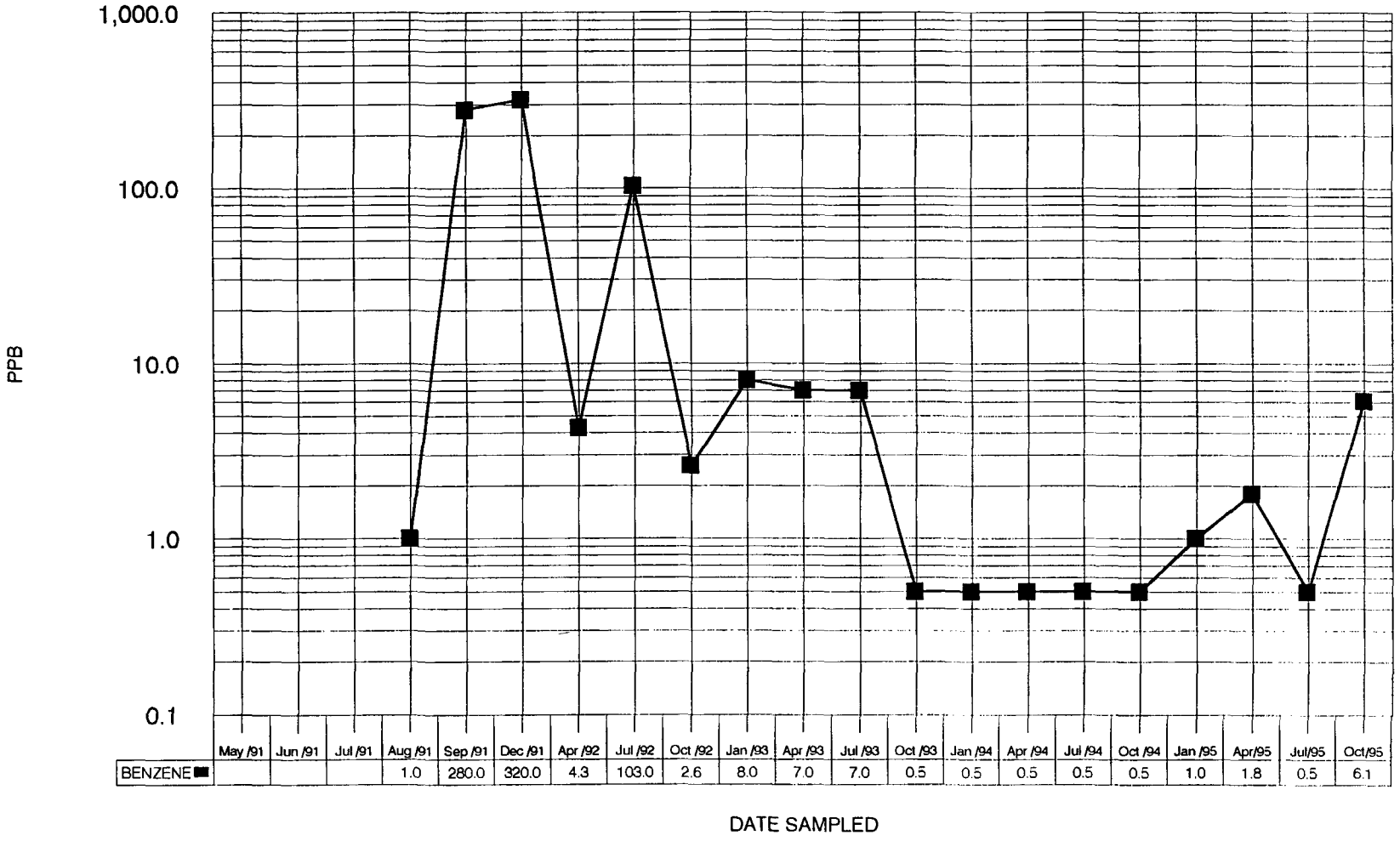
BENZENE IN GROUNDWATER
MW-66



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE				0.0	0.0	0.0	3.3	8.0	12.1	3.0	0.0	8.0	13.0	4.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

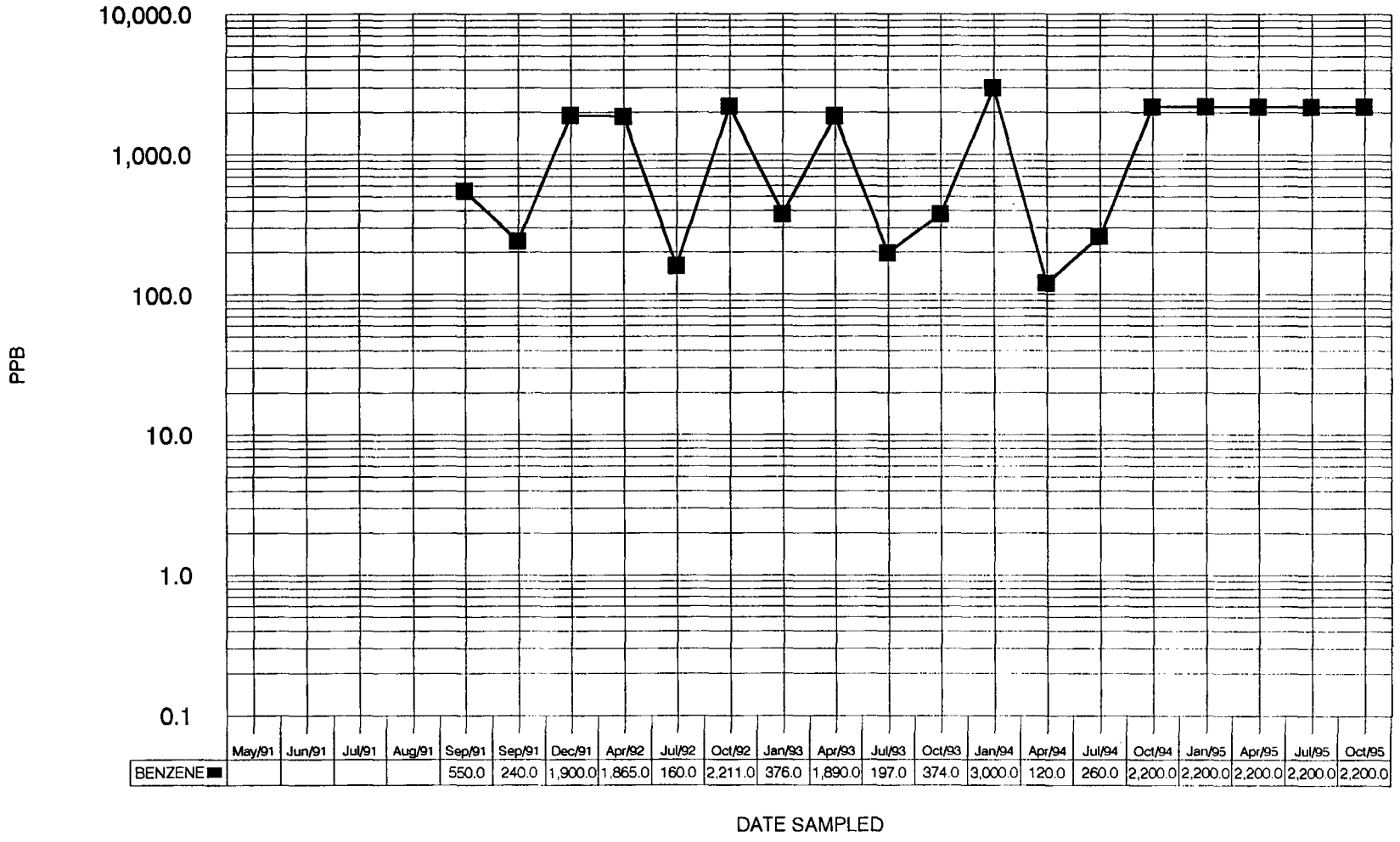
BENZENE IN GROUNDWATER
MW-67



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE				1.0	280.0	320.0	4.3	103.0	2.6	8.0	7.0	7.0	0.5	0.5	0.5	0.5	0.5	1.0	1.8	0.5	6.1

DATE SAMPLED

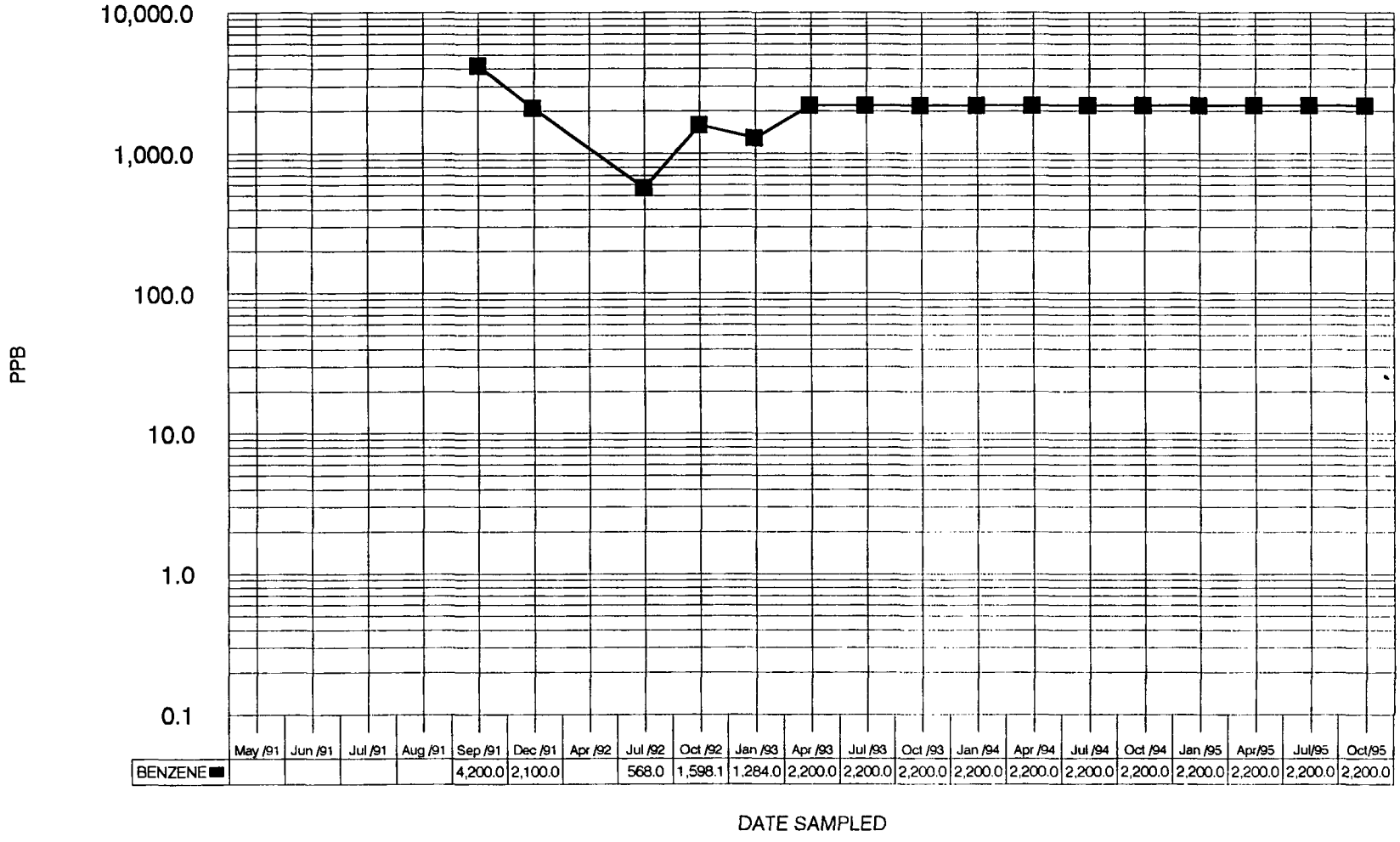
BENZENE IN GROUNDWATER
MW-68



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Sep/91	Dec/91	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE					550.0	240.0	1,900.0	1,865.0	160.0	2,211.0	376.0	1,890.0	197.0	374.0	3,000.0	120.0	260.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

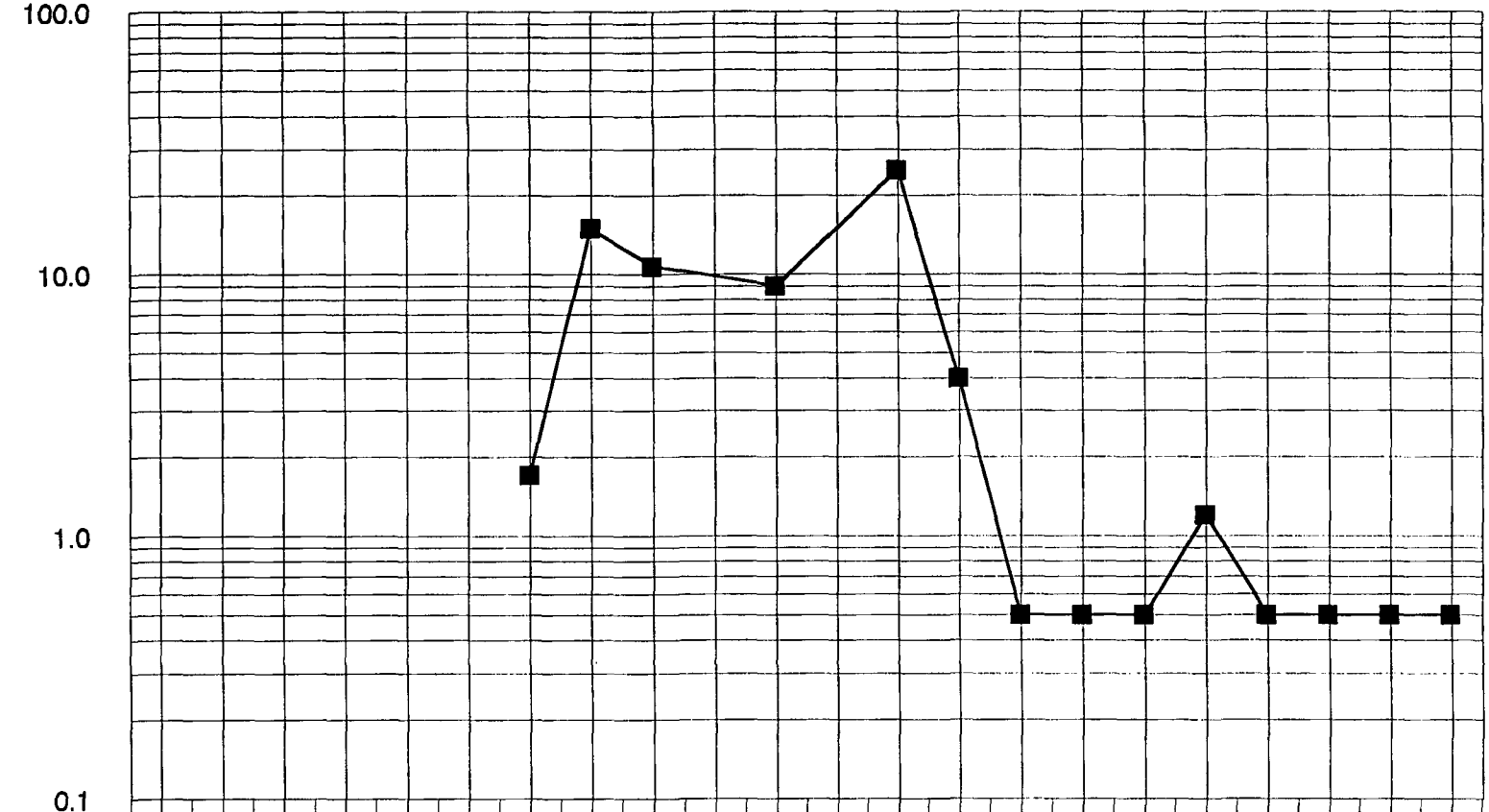
BENZENE IN GROUNDWATER
MW-69



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					4,200.0	2,100.0		568.0	1,598.1	1,284.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

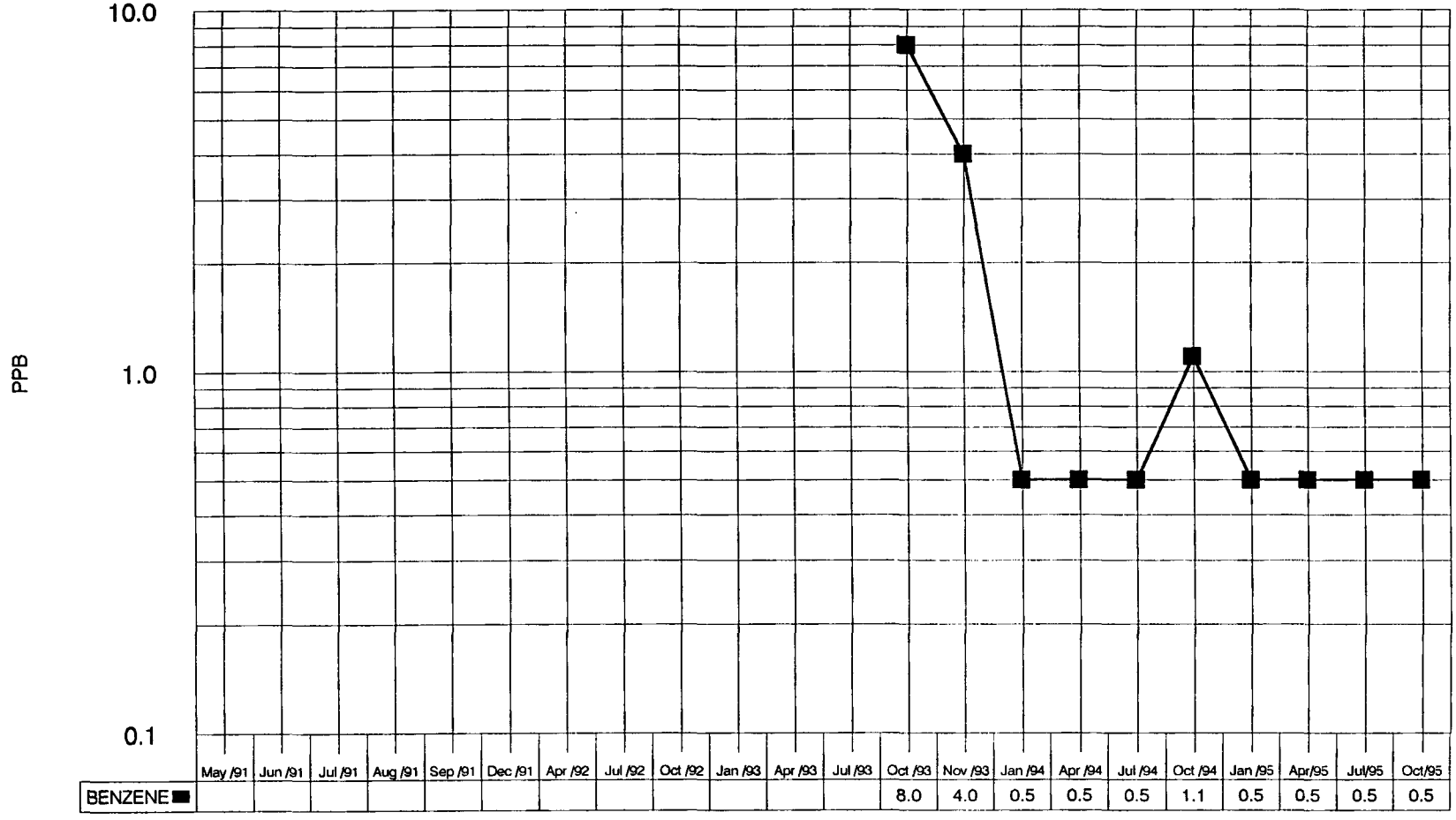
BENZENE IN GROUNDWATER
MW-70



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					0.0	0.0	1.7	15.0	10.7	0.0	9.0	0.0	25.0	4.0	0.5	0.5	0.5	1.2	0.5	0.5	0.5	0.5

DATE SAMPLED

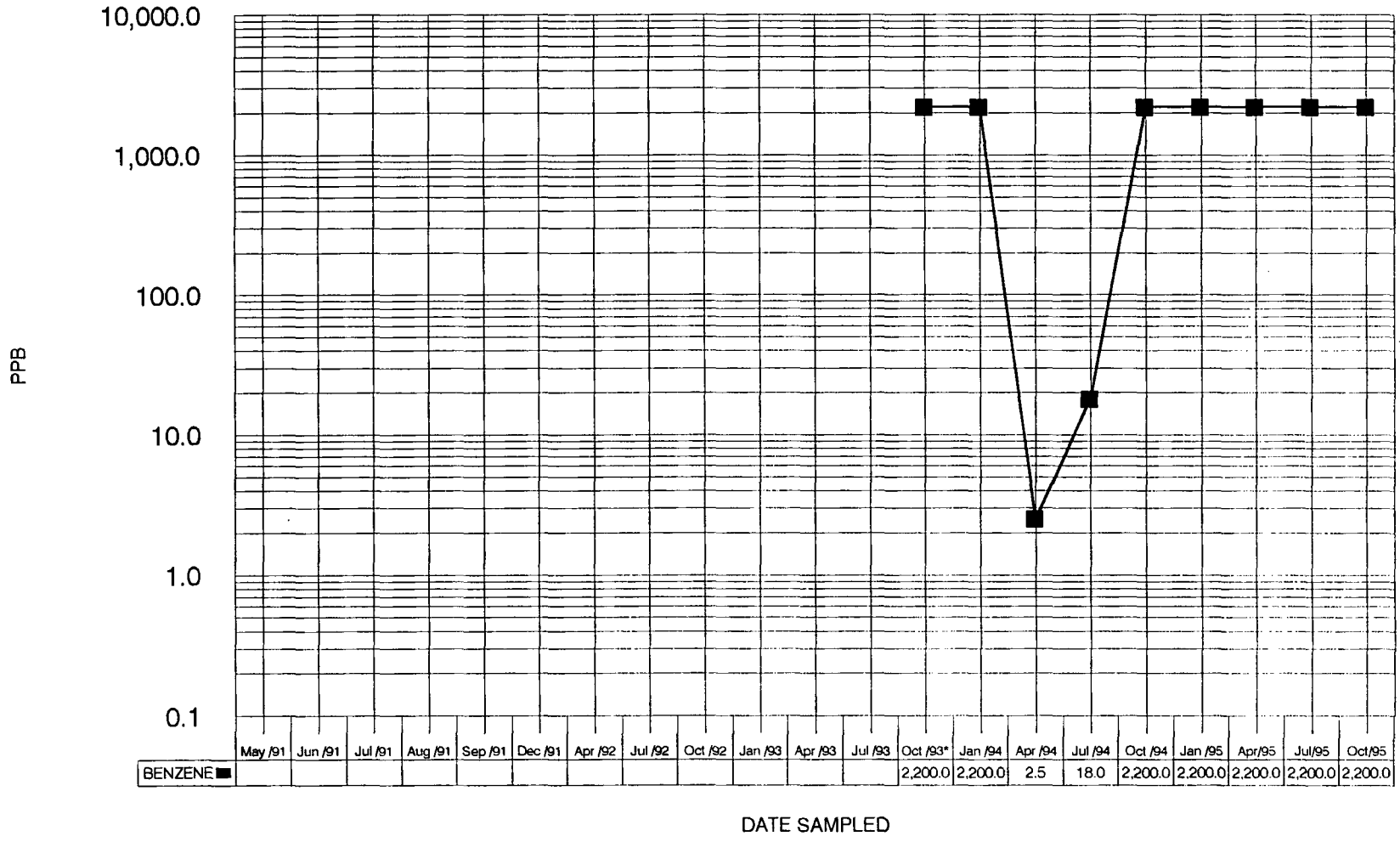
BENZENE IN GROUNDWATER
MW-71



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE ■													8.0	4.0	0.5	0.5	0.5	1.1	0.5	0.5	0.5	0.5

DATE SAMPLED

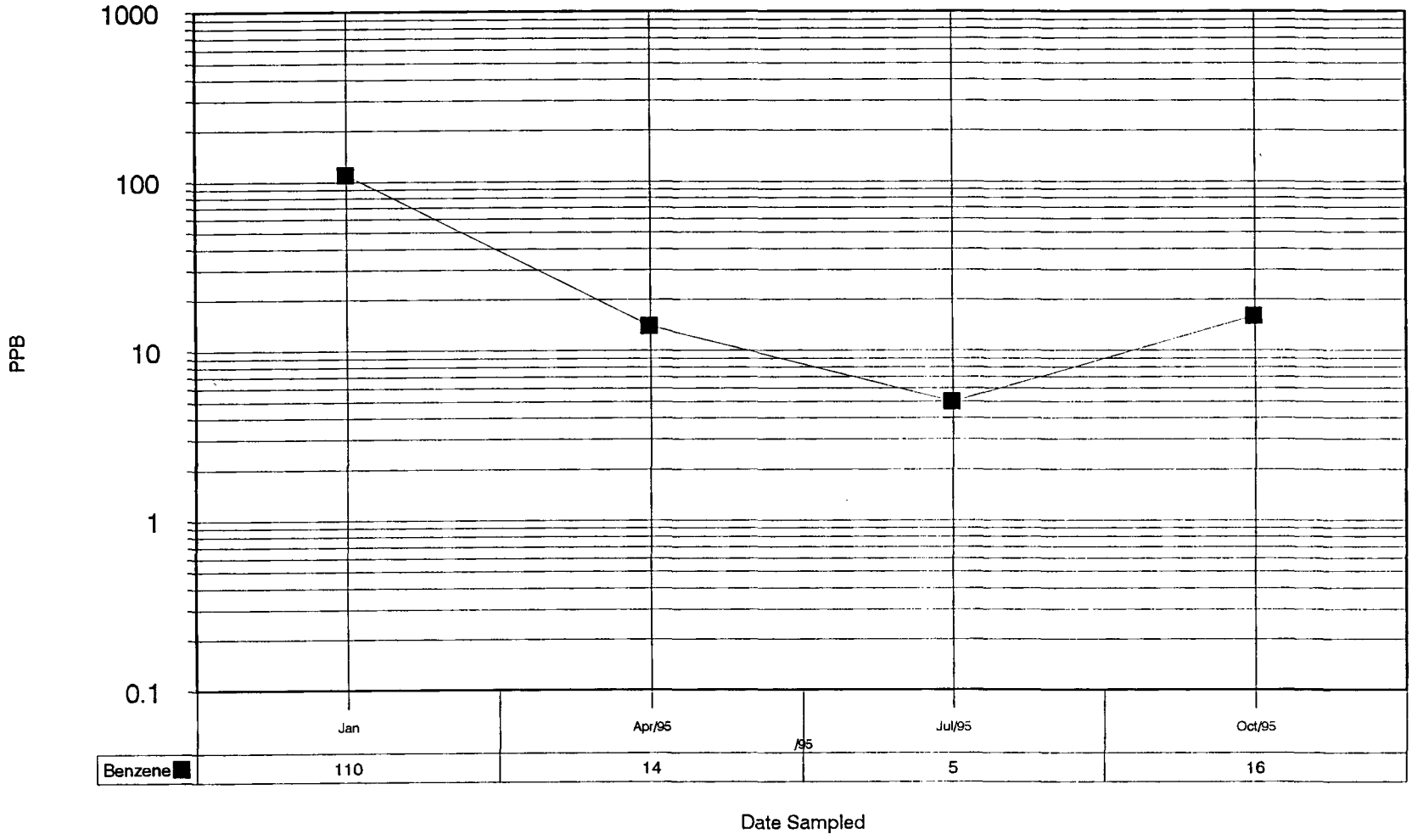
BENZENE IN GROUNDWATER
MW-72



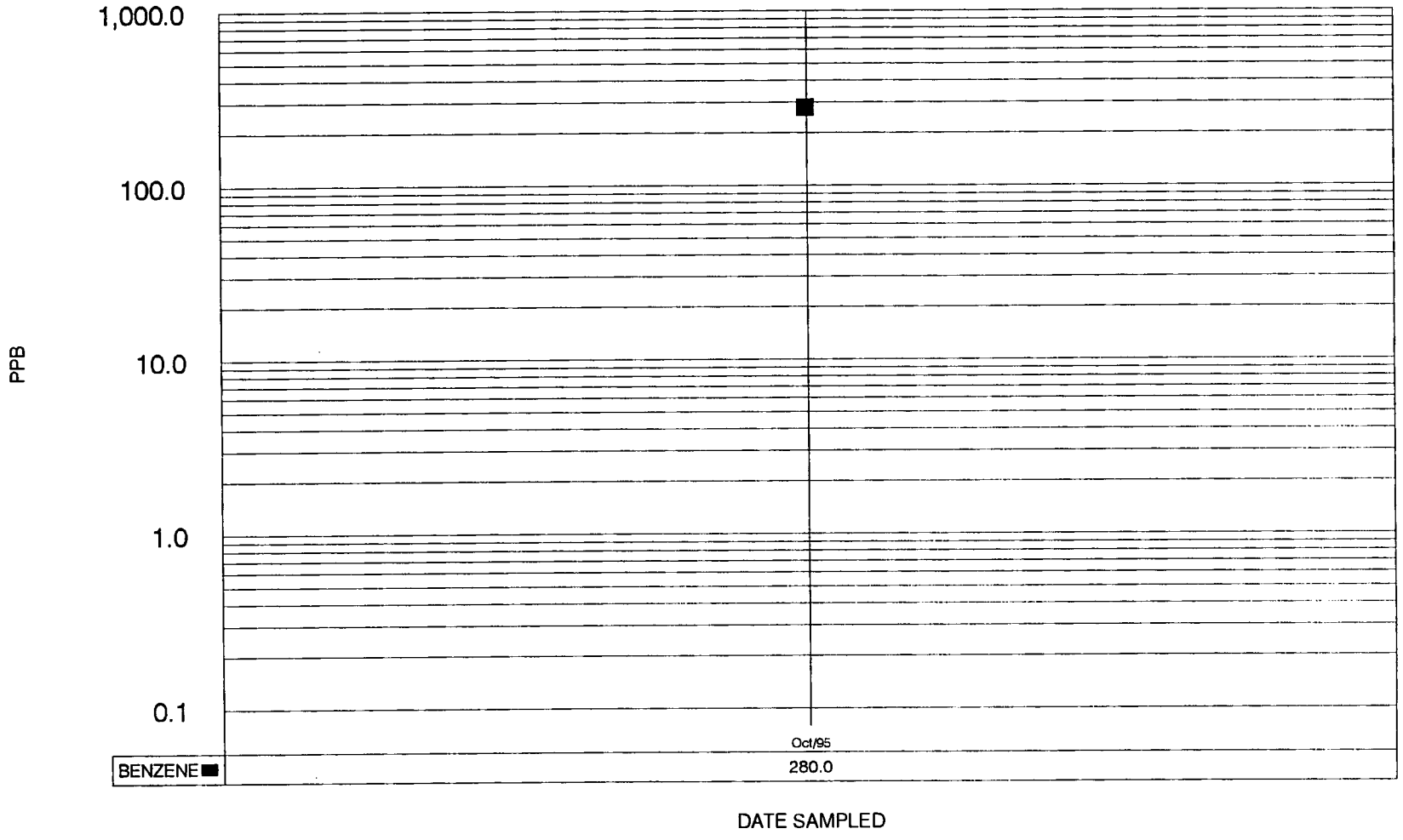
*October 1993 was the first time this well was sampled.

Note: Free-phase condensate = 2200 ppb benzene

BENZENE IN GROUNDWATER
MW-79



BENZENE IN GROUNDWATER
MW-82



*October 1995 was the first time this well was sampled.

APPENDIX C

OCTOBER 1995 LABORATORY RESULTS -

NATURAL SPRING, MONITORING, RANCHER, AND PLANT SUPPLY WELLS

Analytical**Technologies,**Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **510344**

October 30, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702

Project Name/Number: INDIAN BASIN REMEDIATION 44999

Attention: Bob Menzie

On **10/13/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

This report is being reissued per client request to meet reporting specifications.

Due to matrix interferences, EPA Method 8020 analysis for sample "MW-79" was analyzed at a dilution. The detection limits have been raised accordingly.

EPA Method 325.3 analyses were performed by Analytical Technologies, Inc., 11 East Olive Road, Pensacola, FL.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

MCR

NOV 1 1995

Environmental & Safety

Analytical Technologies, Inc.

CLIENT : MARATHON OIL CO. DATE RECEIVED : 10/13/95

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION REPORT DATE : 10/27/95

ATI ID: 510344

	ATI PENSACOLA ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	NA	DI10995	AQUEOUS	10/09/95
02	NA	PW10995	AQUEOUS	10/09/95
03	NA	EB101095	AQUEOUS	10/10/95
04	NA	RB MW-70	AQUEOUS	10/10/95
05	510344-05	MW-70	AQUEOUS	10/10/95
06	510344-06	MW-79	AQUEOUS	10/10/95
07	NA	RB MW-66	AQUEOUS	10/10/95
08	510344-08	MW-66	AQUEOUS	10/10/95
09	NA	RB MW-63	AQUEOUS	10/10/95
10	510344-10	MW-67	AQUEOUS	10/11/95
11	NA	RB MW-82	AQUEOUS	10/11/95
12	510344-12	MW-82	AQUEOUS	10/11/95
13	NA	RB MW-57	AQUEOUS	10/11/95
14	510344-14	MW-57	AQUEOUS	10/11/95
15	NA	RB MW-55	AQUEOUS	10/11/95
16	510344-16	MW-55	AQUEOUS	10/11/95
17	510344-17	MW-54	AQUEOUS	10/11/95
18	510344-18	MW-50	AQUEOUS	10/12/95
19	510344-19	MW-63	AQUEOUS	10/10/95
20	510344-20	MW-61	AQUEOUS	10/10/95
21	NA	RB MW-71	AQUEOUS	10/10/95
22	510344-22	MW-71	AQUEOUS	10/10/95
23	NA	RB MW-60	AQUEOUS	10/11/95
24	510344-24	MW-60	AQUEOUS	10/11/95
25	NA	RB MW-64	AQUEOUS	10/11/95
26	510344-26	MW-64	AQUEOUS	10/11/95
27	NA	RB MW-67	AQUEOUS	10/11/95
28	510344-28	MW-49	AQUEOUS	10/12/95
29	510344-29	MW-44	AQUEOUS	10/12/95
30	510344-30	SUMP-16A	AQUEOUS	10/12/95
31	510344-31	SUMP-10A	AQUEOUS	10/12/95
32	510344-32	MW-41	AQUEOUS	10/12/95
33	510344-33	MW-43	AQUEOUS	10/12/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	33

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-05			Lab ID: 001		
CHLORIDE (325.3)	MG/L	10	1	CIW039	
Comments:					
Client ID: 510344-06			Lab ID: 002		
CHLORIDE (325.3)	MG/L	30	1	CIW039	
Comments:					
Client ID: 510344-08			Lab ID: 003		
CHLORIDE (325.3)	MG/L	9	1	CIW039	
Comments:					
Client ID: 510344-10			Lab ID: 004		
CHLORIDE (325.3)	MG/L	6	1	CIW039	
Comments:					
Client ID: 510344-12			Lab ID: 005		
CHLORIDE (325.3)	MG/L	76	1	CIW039	
Comments:					
Client ID: 510344-14			Lab ID: 006		
CHLORIDE (325.3)	MG/L	47	1	CIW039	
Comments:					
Client ID: 510344-16			Lab ID: 007		
CHLORIDE (325.3)	MG/L	250	10	CIW039	+
Comments:					
Client ID: 510344-17			Lab ID: 008		
CHLORIDE (325.3)	MG/L	110	1	CIW039	

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-18			Lab ID: 009		
CHLORIDE (325.3)	MG/L	240	10	CIW039	+
Comments:					
Client ID: 510344-19			Lab ID: 010		
CHLORIDE (325.3)	MG/L	12	1	CIW039	
Comments:					
Client ID: 510344-20			Lab ID: 011		
CHLORIDE (325.3)	MG/L	300	10	CIW039	+
Comments:					
Client ID: 510344-22			Lab ID: 012		
CHLORIDE (325.3)	MG/L	21	1	CIW039	
Comments:					
Client ID: 510344-24			Lab ID: 013		
CHLORIDE (325.3)	MG/L	9	1	CIW040	
Comments:					
Client ID: 510344-26			Lab ID: 014		
CHLORIDE (325.3)	MG/L	12	1	CIW040	
Comments:					
Client ID: 510344-28			Lab ID: 015		
CHLORIDE (325.3)	MG/L	350	10	CIW040	+
Comments:					
Client ID: 510344-29			Lab ID: 016		
CHLORIDE (325.3)	MG/L	520	10	CIW040	+

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-30			Lab ID: 017		
CHLORIDE (325.3)	MG/L	63	1	CIW040	
Comments:					
Client ID: 510344-31			Lab ID: 018		
CHLORIDE (325.3)	MG/L	3	1	CIW040	
Comments:					
Client ID: 510344-32			Lab ID: 019		
CHLORIDE (325.3)	MG/L	240	10	CIW040	+
Comments:					
Client ID: 510344-33			Lab ID: 020		
CHLORIDE (325.3)	MG/L	220	10	CIW040	+
Comments:					

Analytical**Technologies,** Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client ID:	Lab ID:	Matrix:	Date/Time Sampled:	Date Received:
510344-05	001	WATER	10-OCT-95 1130	14-OCT-95
510344-06	002	WATER	10-OCT-95 1300	14-OCT-95
510344-08	003	WATER	10-OCT-95 1445	14-OCT-95
510344-10	004	WATER	11-OCT-95 1145	14-OCT-95
510344-12	005	WATER	11-OCT-95 1410	14-OCT-95
510344-14	006	WATER	11-OCT-95 1510	14-OCT-95
510344-16	007	WATER	11-OCT-95 1615	14-OCT-95
510344-17	008	WATER	11-OCT-95 1730	14-OCT-95
510344-18	009	WATER	12-OCT-95 1200	14-OCT-95
510344-19	010	WATER	10-OCT-95 1645	14-OCT-95
510344-20	011	WATER	10-OCT-95 1845	14-OCT-95
510344-22	012	WATER	10-OCT-95 1910	14-OCT-95
510344-24	013	WATER	11-OCT-95 0905	14-OCT-95
510344-26	014	WATER	11-OCT-95 1045	14-OCT-95
510344-28	015	WATER	12-OCT-95 1215	14-OCT-95
510344-29	016	WATER	12-OCT-95 1235	14-OCT-95
510344-30	017	WATER	12-OCT-95 1340	14-OCT-95
510344-31	018	WATER	12-OCT-95 1355	14-OCT-95
510344-32	019	WATER	12-OCT-95 1415	14-OCT-95
510344-33	020	WATER	12-OCT-95 1430	14-OCT-95

Analytical**Technologies,**Inc.

"Method Report Summary"

Accession Number: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510344-05	CHLORIDE (325.3)	MG/L	10
510344-06	CHLORIDE (325.3)	MG/L	30
510344-08	CHLORIDE (325.3)	MG/L	9
510344-10	CHLORIDE (325.3)	MG/L	6
510344-12	CHLORIDE (325.3)	MG/L	76
510344-14	CHLORIDE (325.3)	MG/L	47
510344-16	CHLORIDE (325.3)	MG/L	250
510344-17	CHLORIDE (325.3)	MG/L	110
510344-18	CHLORIDE (325.3)	MG/L	240
510344-19	CHLORIDE (325.3)	MG/L	12
510344-20	CHLORIDE (325.3)	MG/L	300
510344-22	CHLORIDE (325.3)	MG/L	21
510344-24	CHLORIDE (325.3)	MG/L	9
510344-26	CHLORIDE (325.3)	MG/L	12
510344-28	CHLORIDE (325.3)	MG/L	350
510344-29	CHLORIDE (325.3)	MG/L	520
510344-30	CHLORIDE (325.3)	MG/L	63
510344-31	CHLORIDE (325.3)	MG/L	3
510344-32	CHLORIDE (325.3)	MG/L	240

Analytical**Technologies,** Inc.

"Method Report Summary"

Accession Number: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510344-33	CHLORIDE (325.3)	MG/L	220

Analytical**Technologies,**Inc.

"WetChem Quality Control Report"

Parameter:	CHLORIDE	CHLORIDE
Batch Id:	CIW039	CIW040
Blank Result:	<1	<1
Anal. Method:	325.3	325.3
Prep. Method:	N/A	N/A
Analysis Date:	24-OCT-95	24-OCT-95
Prep. Date:	24-OCT-95	24-OCT-95

Sample Duplication

Sample Dup:	510178-3	510279-13
Rept Limit:	<1	<1
Sample Result:	<1	9.31
Dup Result:	<1	9.41
Sample RPD:	N/C	1
Max RPD:	1	6
Dry Weight%	N/A	N/A

Matrix Spike

Sample Spiked:	510178-3	510279-13
Rept Limit:	<1	<1
Sample Result:	<1	9.31
Spiked Result:	54.2	59.5
Spike Added:	55.0	55.0
% Recovery:	99	91
% Rec Limits:	89-110	89-110
Dry Weight%	N/A	N/A

ICV

ICV Result:	94.9	94.9
True Result:	100.0	100.0
% Recovery:	95	95
% Rec Limits:	90-110	90-110

LCS

LCS Result:		
True Result:		
% Recovery:		
% Rec Limits:		

----- Common Footnotes Wet Chem -----

N/A = NOT APPLICABLE.
N/S = NOT SUBMITTED.
N/C = SAMPLE AND DUPLICATE RESULTS ARE AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RPD IS "NOT CALCULABLE" AND NO CONTROL LIMITS APPLY.
ND = NOT DETECTED ABOVE REPORTING LIMIT.
DISS. OR D = DISSOLVED
T & D = TOTAL AND DISSOLVED
R = REACTIVE
T = TOTAL
G = SAMPLE AND/OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE RESULT IS AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "IN CONTROL".
Q = THE ANALYTICAL (POST-DIGESTION) SPIKE IS REPORTED DUE TO THE MATRIX (PRE-DIGESTION) SPIKE BEING OUTSIDE ACCEPTANCE LIMITS.
# = ELEVATED REPORTING LIMIT DUE TO INSUFFICIENT SAMPLE.
+ = ELEVATED REPORTING LIMIT DUE TO DILUTION INTO CALIBRATION RANGE.
* = ELEVATED REPORTING LIMIT DUE TO MATRIX INTERFERENCE.
@ = ADJUSTED REPORTING LIMIT DUE TO SAMPLE MATRIX (DILUTION PRIOR TO PREPARATION).
P = ANALYTICAL (POST-DIGESTION) SPIKE
I = DUPLICATE INJECTION
& = AUTOMATED
F = SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
N/C+ = NOT CALCULABLE
N/C* = NOT CALCULABLE; SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
H = SAMPLE AND/OR DUPLICATE IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE RESULTS EXCEEDS THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL".
A = SAMPLE AND DUPLICATE RESULTS ARE "OUT OF CONTROL".
Z = THE SAMPLE RESULT FOR THE SPIKE IS BELOW REPORTING LIMIT. HOWEVER, THIS RESULT IS REPORTED FOR ACCURATE QC CALCULATIONS.
NH= SAMPLE AND / OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE RESULTS EXCEED THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL" SAMPLE IS NON-HOMOGENOUS.
(*) = DETECTION LIMITS RAISED DUE TO CLP METHOD NOT REQUIRING A CONCENTRATION STEP FOR CN.

(CA) = SEE CORRECTIVE ACTIONS FORM.

SW-846, 3RD EDITION, SEPTEMBER 1986 AND REVISION 1, JULY 1992.
EPA 600/4-79-020, REVISED MARCH 1983.
STANDARD METHODS, 17TH ED., 1989
NIOSH MANUAL OF ANALYTICAL METHODS, 3RD EDITION.
ANNUAL BOOK OF ASTM STANDARDS, VOLUME 11.01, 1991.

1. COLIFORM. COLIFORM PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE LOGARITHM OF COLONIES PER 100 MLS OF SAMPLE ON DUPLICATE PLATES.

2. PH. PH PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND THE DUPLICATE ANALYSIS.

3. FLASHPOINT. FLASHPOINT PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE ANALYSIS. IF FLASHPOINT IS LESS THAN 25 DEGREES CELSIUS, THE DETECTION LIMIT BECOMES THE INITIAL STARTING TEMPERATURE.

RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION).

RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.

DPH = DOLLY P. HWANG
TT = TONY TINEO
MM = MARY MOLONEY
GJ = GARY JACOBS
SG = SCOTT GRESHAM
NSB = NANCY S. BUTLER
CF = CHRISTINE FOSTER
RB = REBECCA BROWN
FB = FREDDIE BROWN
HN = HONG NGUYEN

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	DI10995	AQUEOUS	10/09/95	NA	10/13/95	1
02	PW10995	AQUEOUS	10/09/95	NA	10/13/95	1
03	EB101095	AQUEOUS	10/10/95	NA	10/13/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	0.9
TOLUENE	UG/L	<0.5	<0.5	1.0
ETHYLBENZENE	UG/L	<0.5	<0.5	1.8
TOTAL XYLENES	UG/L	100	0.7	61
SURROGATE:				
BROMOFLUOROBENZENE (%)		103	100	99

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	RB MW-70	AQUEOUS	10/10/95	NA	10/13/95	1
05	MW-70	AQUEOUS	10/10/95	NA	10/13/95	1
06	MW-79	AQUEOUS	10/10/95	NA	10/17/95	5

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	<0.5	16
TOLUENE	UG/L	0.6	<0.5	4.0
ETHYLBENZENE	UG/L	1.2	<0.5	<2.5
TOTAL XYLENES	UG/L	20	<0.5	3.7
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	99	85

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	RB MW-66	AQUEOUS	10/10/95	NA	10/14/95	1
08	MW-66	AQUEOUS	10/10/95	NA	10/14/95	1
09	RB MW-63	AQUEOUS	10/10/95	NA	10/16/95	5

PARAMETER	UNITS	07	08	09
BENZENE	UG/L	0.6	<0.5	<2.5
TOLUENE	UG/L	1.6	<0.5	4.1
ETHYLBENZENE	UG/L	1.3	<0.5	3.1
TOTAL XYLENES	UG/L	15	3.5	10
SURROGATE:				
BROMOFLUOROBENZENE (%)		90	99	104

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
10	MW-67	AQUEOUS	10/11/95	NA	10/14/95	1
11	RB MW-82	AQUEOUS	10/11/95	NA	10/14/95	1
12	MW-82	AQUEOUS	10/11/95	NA	10/19/95	100

PARAMETER	UNITS	10	11	12
BENZENE	UG/L	6.1	2.4	280
TOLUENE	UG/L	1.8	0.9	<50
ETHYLBENZENE	UG/L	0.5	2.5	450
TOTAL XYLENES	UG/L	4.2	54	910
SURROGATE:				
BROMOFLUOROBENZENE (%)		87	105	103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
13	RB MW-57	AQUEOUS	10/11/95	NA	10/14/95	1
14	MW-57	AQUEOUS	10/11/95	NA	10/14/95	1
15	RB MW-55	AQUEOUS	10/11/95	NA	10/14/95	1

PARAMETER	UNITS	13	14	15
BENZENE	UG/L	<0.5	64	2.4
TOLUENE	UG/L	0.5	1.7	0.6
ETHYLBENZENE	UG/L	1.1	0.7	3.4
TOTAL XYLENES	UG/L	45	5.0	20
SURROGATE:				
BROMOFLUOROBENZENE (%)		102	83	102

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
16	MW-55	AQUEOUS	10/11/95	NA	10/14/95	1
17	MW-54	AQUEOUS	10/11/95	NA	10/14/95	1
18	MW-50	AQUEOUS	10/12/95	NA	10/14/95	1

PARAMETER	UNITS	16	17	18
BENZENE	UG/L	100	0.7	<0.5
TOLUENE	UG/L	6.1	<0.5	<0.5
ETHYLBENZENE	UG/L	70	1.7	<0.5
TOTAL XYLENES	UG/L	15	3.0	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		90	103	102

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
19	MW-63	AQUEOUS	10/10/95	NA	10/16/95	1
20	MW-61	AQUEOUS	10/10/95	NA	10/16/95	1
21	RB MW-71	AQUEOUS	10/10/95	NA	10/16/95	1

PARAMETER	UNITS	19	20	21
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	1.3
ETHYLBENZENE	UG/L	<0.5	<0.5	1.4
TOTAL XYLENES	UG/L	<0.5	<0.5	22
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	102	103

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
22	MW-71	AQUEOUS	10/10/95	NA	10/16/95	1
23	RB MW-60	AQUEOUS	10/11/95	NA	10/16/95	1
24	MW-60	AQUEOUS	10/11/95	NA	10/16/95	1

PARAMETER	UNITS	22	23	24
BENZENE	UG/L	<0.5	0.9	<0.5
TOLUENE	UG/L	<0.5	1.3	<0.5
ETHYLBENZENE	UG/L	<0.5	2.6	<0.5
TOTAL XYLENES	UG/L	7.3	19	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		102	101	102

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
25	RB MW-64	AQUEOUS	10/11/95	NA	10/16/95	1
26	MW-64	AQUEOUS	10/11/95	NA	10/16/95	1
27	RB MW-67	AQUEOUS	10/11/95	NA	10/16/95	1

PARAMETER	UNITS	25	26	27
BENZENE	UG/L	1.4	25	<0.5
TOLUENE	UG/L	1.4	1.7	<0.5
ETHYLBENZENE	UG/L	3.4	13	0.7
TOTAL XYLENES	UG/L	16	32	32
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	95	101

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
28	MW-49	AQUEOUS	10/12/95	NA	10/16/95	100
29	MW-44	AQUEOUS	10/12/95	NA	10/16/95	100
30	SUMP-16A	AQUEOUS	10/12/95	NA	10/16/95	25

PARAMETER	UNITS	28	29	30
BENZENE	UG/L	240	120	130
TOLUENE	UG/L	<50	<50	<13
ETHYLBENZENE	UG/L	59	240	98
TOTAL XYLENES	UG/L	130	260	780
SURROGATE:				
BROMOFLUOROBENZENE (%)		104	104	99

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
31	SUMP-A10	AQUEOUS	10/12/95	NA	10/17/95	1
32	MW-41	AQUEOUS	10/12/95	NA	10/17/95	5
33	MW-43	AQUEOUS	10/12/95	NA	10/16/95	1

PARAMETER	UNITS	31	32	33
BENZENE	UG/L	<0.5	1.8	1.2
TOLUENE	UG/L	2.9	8.0	2.4
ETHYLBENZENE	UG/L	<0.5	2.6	3.8
TOTAL XYLENES	UG/L	<0.5	18	5.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		104	104	118

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101795	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/17/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101995	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/19/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		101

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101395B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		98

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101695B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		103

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101695	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034501	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034501	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	12	120	10	100	18
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	0.6	10	10	94	10	94	0
TOTAL XYLENES	1.2	30	30	96	31	99	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034424	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034424	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	10	100	9.9	99	1
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	<0.5	10	10	100	10	100	0
TOTAL XYLENES	<0.5	30	31	103	33	110	6

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034418	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034418	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	9.6	96	9.7	97	1
TOLUENE	<0.5	10	9.8	98	9.6	96	2
ETHYLBENZENE	<0.5	10	10	100	9.9	99	1
TOTAL XYLENES	<0.5	30	32	107	30	100	6

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 10/9-10/95 PAGE 1 OF 4

ATI LAB I.D. 510344

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON
ADDRESS: PO BOX 552
MIDLAND TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
* DI 10995	10/9/95	1215	Water	01	X		2
* PW 10995	↓	1225		02	X		2
EB 10 10 95	10/10/95	1005		03	X		2
RB mw-70		1120		04	X		2
mw-70		1130		05	X	X	3
mw-79		1300		06	X	X	3
RB mw-66		1440		07	X		2
mw-66		1445		08	X	X	3
RB mw-63	↓	1635	↓	09	X		2

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	21
PROJ. NAME: INDIAN BASIN REMEDIATION		CUSTODY SEALS	Y / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments: * DI 10995 & PW 10995 ARE preserved with HCl. All others are preserved with $HgCl_2$

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Keri Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: KERI KOOK Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY:(LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 8:29
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc., Albuquerque, NM

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CHAIN OF CUSTODY

DATE: 10/11-12/95 PAGE 3 OF 4

ATI LAB I.D. 510344

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon
ADDRESS: PO Box 552
Midland, TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: Same as Above
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chlorides	NUMBER OF CONTAINERS
MW-67	10/11/95	1145	WATER	10	X	X	3
RB MW-82		1355		11	X		2
MW-82		1410		12	X	X	3
RB MW-57		1500		13	X		2
MW-57		1510		14	X	X	3
RB MW-55		1605		15	X		2
MW-55		1615		16	X	X	3
MW-54		1730		17	X	X	3
MW-50	10/12/95	1200		18	X	X	3

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	24
PROJ. NAME: Indian Basin Remediation		CUSTODY SEALS	(Y) N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: Kevin Cook Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 8:31
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical**Technologies,**Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 10/10-11/95 PAGE 2 OF 4

ATI LAB I.D. 510344

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: MARATHON
ADDRESS: PO Box 552
Midland, TX. 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
mw-63	10/10/95	1645	WATER	19	X	X	3
mw-61		1845		20	X	X	3
RB mw-71		1900		21	X		2
mw-71		1910		22	X	X	3
RB mw-60	10/11/95	0855		23	X		2
mw-60		0905		24	X	X	3
RB mw-64		1035		25	X		2
mw-64		1045		26	X	X	3
RB mw-67		1140		27	X		2

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	44999	NO. CONTAINERS	23
PROJ. NAME:	Indian Basin Remediation	CUSTODY SEALS	Y (N) NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: Kevin Cook Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 8:31
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical**Technologies,**Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 10/12/95 PAGE 4 OF 4

ATI LAB I.D. 5103444

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON
ADDRESS: PO BOX 552
MIDLAND, TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY:
ADDRESS: SAME AS ABOVE

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
mw-49	10/12/95	1215	WATER	28
mw-44		1235		29
Sump-16A		1340		30
Sump-A10		1355		31
mw-41		1415		32
mw-43		1430		33

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chlorides	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
			X	X																3
			X	X																3
			X	X																3
			X	X																3
			X	X																3
			X	X																3

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	24999	NO. CONTAINERS	18
PROJ. NAME:	Indian Basin Remediation	CUSTODY SEALS	Y (N) NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☑ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0805	Signature: Time:	Signature: Time:
Printed Name: KEVIN Cook Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 8:29
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 1 OF 3

Kim McNeill

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:
Kim McNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	632/632 MOD	619/619 MOD	610/8310	Chloride	8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510344-05	10/10	1130	AQ	1									X													
-06	↓	1300	↓	2									X													
-08	↓	1445	↓	3									X													
-10	10/11	1145	↓	4									X													
-12	↓	1410	↓	5									X													
-14	↓	1510	↓	6									X													
-16	↓	1615	↓	7									X													
-17	↓	1730	↓	8									X													
-18	10/12	1200	↓	9									X													

PROJECT INFORMATION	SAMPLE RECEIPT
PROJECT NUMBER: 510344	TOTAL NUMBER OF CONTAINERS
PROJECT NAME: Indian Basin Remediation-MO	CHAIN OF CUSTODY SEALS
QC LEVEL: ~~STD.~~ IV	INTACT?
QC REQUIRED: MS MSD BLANK	RECEIVED GOOD COND./COLD
TAT: STANDARD RUSH!	LAB NUMBER: 510279

DUE DATE: 10/25
RUSH SURCHARGE: 10
CLIENT DISCOUNT: Quote %

[redacted]

IWO#KM1001

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	X
PORTLAND	
PHOENIX	
FIBERQUANT	

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.
Signature: Andrew Parker	Signature:
Time: 1700	Time:
Printed Name: Andrew Parker	Printed Name:
Date: 10/13	Date
Company: Analytical Technologies, Inc. Albuquerque	Company:
RECEIVED BY: (LAB) 1.	**RECEIVED BY: (LAB) 2.**
Signature: [illegible]	Signature:
Time: 0930	Time:
Printed Name: R. ELSPERMAN	Printed Name:
Date: 10/14/95	Date:
Company: ATI-FL	Company:

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 2 OF 2

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310			8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)		NACE	ASBESTOS		BOD	TOTAL COLIFORM	FECAL COLIFORM		GROSS ALPHA/BETA	RADIUM 226/228		AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510344-19	10/10	1645	AQ	10						X																					
-20	↓	1845	↓	11						X																					
-27	↓	1910	↓	12						X																					
-24	10/11	0905	↓	13						X																					
-26	10/11	1045	↓	14						X																					
-28	10/12	1215	↓	15						X																					
~~-28~~ 29	↓	1235	↓	16						X																					
~~-29~~ 30	↓	1340	↓	17						X																					
~~-30~~ 31	↓	1355	↓	18						X																					

ANALYSIS REQUEST

PROJECT INFORMATION	SAMPLE RECEIPT
PROJECT NUMBER: 510344	TOTAL NUMBER OF CONTAINERS
PROJECT NAME: Indian Basin Remediation: MO	CHAIN OF CUSTODY SEALS
QC LEVEL: (STD) IV	INTACT?
QC REQUIRED: ~~MS~~ MSD BLANK	RECEIVED GOOD COND./COLD
TAT: (STANDARD) RUSH!	LAB NUMBER: 510279

DUE DATE: 10/25
RUSH SURCHARGE: NO
CLIENT DISCOUNT: Quote %
IWO#KM1001

[redacted]

SAMPLES SENT TO:
- SAN DIEGO
- FT. COLLINS
- RENTON
- PENSACOLA X
- PORTLAND
- PHOENIX
- FIBERQUANT

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc.
Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/13
Company: ATI - FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 3 OF 3

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
510344-32	10/12	1415	AQ	19
-33	10/12	1430	AQ	20

ANALYSIS REQUEST

TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310		8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
					X																	
					X																	

PROJECT INFORMATION	SAMPLE RECEIPT
PROJECT NUMBER: 510344	TOTAL NUMBER OF CONTAINERS
PROJECT NAME: Indian Basin Remediation MO	CHAIN OF CUSTODY SEALS
QC LEVEL: (STD) IV	INTACT?
QC REQUIRED: MS MSD BLANK	RECEIVED GOOD COND./COLD
TAT: (STANDARD) RUSH!	LAB NUMBER: 510279

DUE DATE: 10/25
RUSH SURCHARGE:
CLIENT DISCOUNT: Quote %

IWO # KM1001

[redacted]

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	X
PORTLAND	
PHOENIX	
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Robert Esperanza Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/13
Company: ATI-FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

Analytical**Technologies,**Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **510345**

October 26, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702

Project Name/Number: IB REMEDIATION 44999

Attention: Bob Menzie

On **10/13/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA method 325.3 analyses were performed by Analytical Technologies, Inc., 11 East Olive Road, Pensacola, FL.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical Technologies, Inc.

CLIENT	: MARATHON OIL CO.	DATE RECEIVED	: 10/13/95
PROJECT #	: 44999		
PROJECT NAME	: IB REMEDIATION	REPORT DATE	: 10/26/95

ATI ID: 510345

	ATI ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	510345-01	SW-1	AQUEOUS	10/12/95
02	NA	STRIPPER INLET	AQUEOUS	10/12/95
03	NA	STRIPPER OUTLET	AQUEOUS	10/12/95
04	510345-04	LYMAN	AQUEOUS	10/12/95
05	510345-05	ARROYO	AQUEOUS	10/12/95
06	510345-06	BIEBBLE	AQUEOUS	10/12/95
07	NA	TRIP BLANK	AQUEOUS	10/05/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	7

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510345-01			Lab ID: 001		
CHLORIDE (325.3)	MG/L	24	1	CIW040	
Comments:					
Client ID: 510345-04			Lab ID: 002		
CHLORIDE (325.3)	MG/L	12	2	CIW040	#
Comments:					
Client ID: 510345-05			Lab ID: 003		
CHLORIDE (325.3)	MG/L	14	2	CIW040	#
Comments:					
Client ID: 510345-06			Lab ID: 004		
CHLORIDE (325.3)	MG/L	13	2	CIW040	#
Comments:					

AnalyticalTechnologies, Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client ID:	Lab ID:	Matrix:	Date/Time Sampled:	Date Received:
510345-01	001	WATER	12-OCT-95 0958	14-OCT-95
510345-04	002	WATER	12-OCT-95 1015	14-OCT-95
510345-05	003	WATER	12-OCT-95 1025	14-OCT-95
510345-06	004	WATER	12-OCT-95 1035	14-OCT-95

Analytical**Technologies,**Inc.

"Method Report Summary"

Accession Number: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510345-01	CHLORIDE (325.3)	MG/L	24
510345-04	CHLORIDE (325.3)	MG/L	12
510345-05	CHLORIDE (325.3)	MG/L	14
510345-06	CHLORIDE (325.3)	MG/L	13

Analytical**Technologies,** Inc.

"WetChem Quality Control Report"

Parameter:	CHLORIDE
Batch Id:	CIW040
Blank Result:	<1
Anal. Method:	325.3
Prep. Method:	N/A
Analysis Date:	24-OCT-95
Prep. Date:	24-OCT-95

Sample Duplication

Sample Dup:	510279-13
Rept Limit:	<1
Sample Result:	9.31
Dup Result:	9.41
Sample RPD:	1
Max RPD:	6
Dry Weight%	N/A

Matrix Spike

Sample Spiked:	510279-13
Rept Limit:	<1
Sample Result:	9.31
Spiked Result:	59.5
Spike Added:	55.0
% Recovery:	91
% Rec Limits:	89-110
Dry Weight%	N/A

ICV

ICV Result:	94.9
True Result:	100.0
% Recovery:	95
% Rec Limits:	90-110

LCS

LCS Result:	
True Result:	
% Recovery:	
% Rec Limits:	

Analytical**Technologies,**Inc.

----- Common Footnotes Wet Chem -----

N/A = NOT APPLICABLE.
N/S = NOT SUBMITTED.
N/C = SAMPLE AND DUPLICATE RESULTS ARE AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RPD IS "NOT CALCULABLE" AND NO CONTROL LIMITS APPLY.
ND = NOT DETECTED ABOVE REPORTING LIMIT.
DISS. OR D = DISSOLVED
T & D = TOTAL AND DISSOLVED
R = REACTIVE
T = TOTAL
G = SAMPLE AND/OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE RESULT IS AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "IN CONTROL".
Q = THE ANALYTICAL (POST-DIGESTION) SPIKE IS REPORTED DUE TO THE MATRIX (PRE-DIGESTION) SPIKE BEING OUTSIDE ACCEPTANCE LIMITS.
# = ELEVATED REPORTING LIMIT DUE TO INSUFFICIENT SAMPLE.
+ = ELEVATED REPORTING LIMIT DUE TO DILUTION INTO CALIBRATION RANGE.
* = ELEVATED REPORTING LIMIT DUE TO MATRIX INTERFERENCE.
@ = ADJUSTED REPORTING LIMIT DUE TO SAMPLE MATRIX (DILUTION PRIOR TO PREPARATION).
P = ANALYTICAL (POST-DIGESTION) SPIKE
I = DUPLICATE INJECTION
& = AUTOMATED
F = SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
N/C+ = NOT CALCULABLE
N/C* = NOT CALCULABLE; SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
H = SAMPLE AND/OR DUPLICATE IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE RESULTS EXCEEDS THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL".
A = SAMPLE AND DUPLICATE RESULTS ARE "OUT OF CONTROL".
Z = THE SAMPLE RESULT FOR THE SPIKE IS BELOW REPORTING LIMIT. HOWEVER, THIS RESULT IS REPORTED FOR ACCURATE QC CALCULATIONS.
NH= SAMPLE AND / OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE RESULTS EXCEED THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL" SAMPLE IS NON-HOMOGENOUS.
(*) = DETECTION LIMITS RAISED DUE TO CLP METHOD NOT REQUIRING A CONCENTRATION STEP FOR CN.

(CA) = SEE CORRECTIVE ACTIONS FORM.

SW-846, 3RD EDITION, SEPTEMBER 1986 AND REVISION 1, JULY 1992.
EPA 600/4-79-020, REVISED MARCH 1983.
STANDARD METHODS, 17TH ED., 1989
NIOSH MANUAL OF ANALYTICAL METHODS, 3RD EDITION.
ANNUAL BOOK OF ASTM STANDARDS, VOLUME 11.01, 1991.

1. COLIFORM. COLIFORM PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE LOGARITHM OF COLONIES PER 100 MLS OF SAMPLE ON DUPLICATE PLATES.

2. PH. PH PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND THE DUPLICATE ANALYSIS.

3. FLASHPOINT. FLASHPOINT PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE ANALYSIS. IF FLASHPOINT IS LESS THAN 25 DEGREES CELSIUS, THE DETECTION LIMIT BECOMES THE INITIAL STARTING TEMPERATURE.

RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION).

RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.

DPH = DOLLY P. HWANG	SG = SCOTT GRESHAM	RB = REBECCA BROWN
TT = TONY TINEO	NSB = NANCY S. BUTLER	FB = FREDDIE BROWN
MM = MARY MOLONEY	CF = CHRISTINE FOSTER	HN = HONG NGUYEN
GJ = GARY JACOBS		

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)
CLIENT : MARATHON OIL CO. ATI I.D.: 510345
PROJECT # : 44999
PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	SW-1	AQUEOUS	10/12/95	NA	10/13/95	1
02	STRIPPER INLET	AQUEOUS	10/12/95	NA	10/13/95	10
03	STRIPPER OUTLET	AQUEOUS	10/12/95	NA	10/13/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	92	2.8
TOLUENE	UG/L	<0.5	6.2	7.1
ETHYLBENZENE	UG/L	0.6	110	4.1
TOTAL XYLENES	UG/L	1.2	220	20
SURROGATE:				
BROMOFLUOROBENZENE (%)		101	82	79

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510345

PROJECT # : 44999

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	LYMAN	AQUEOUS	10/12/95	NA	10/13/95	1
05	ARROYO	AQUEOUS	10/12/95	NA	10/13/95	1
06	BIEBBLE	AQUEOUS	10/12/95	NA	10/13/95	1

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	1.6	1.2	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		98	99	101

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510345

PROJECT # : 44999

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	TRIP BLANK	AQUEOUS	10/05/95	NA	10/13/95	1

PARAMETER	UNITS	07
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5

SURROGATE:

BROMOFLUOROBENZENE (%) 99

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 510345
BLANK I.D.	: 101395	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		102

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 510345
BLANK I.D.	: 101395B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		98

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 51034501	ATI I.D.	: 510345
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034501	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	12	120	10	100	18
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	0.6	10	10	94	10	94	0
TOTAL XYLENES	1.2	30	30	96	31	99	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

AnalyticalTechnologies, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 10-12-95 PAGE 1 OF 1

ATI LAB I.D. 510345

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON Oil Co
ADDRESS: P.O. Box 552
Midland TX 79702
PHONE: 915 687-8312
FAX: 915 687-8305

BILL TO:
COMPANY: Above
ADDRESS: SAME AS

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	CHLORIDE	NUMBER OF CONTAINERS
SW-1	10/12/95	9:58	water	-01	✓	✓	3
STRIPPER INLET		10:05		-02	✓		2
STRIPPER OUTLET		10:07		-03	✓		2
LYMAN		10:15		-04	✓	✓	3
ARROYO		10:25		-05	✓	✓	3
BIEBLE	↓	10:35	↓	-06	✓	✓	3
TRIP BLANK	10/5	—	AQ	-07	X		1

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION

PROJ. NO.: 44919
PROJ. NAME: FB Remediation
P.O. NO.:
SHIPPED VIA:

SAMPLE RECEIPT

NO. CONTAINERS	APPROV
CUSTODY SEALS	(Y) N / NA
RECEIVED INTACT	Y
RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Rodrigo A Aguilera Time: 11:08	Signature: Kevin Cook Time: 0825	Signature: Time:
Printed Name: Rodrigo AAguilera Date: 10-12-95	Printed Name: KEVIN Cook Date: 10/13/95	Printed Name: Date:
Company: MARATHON Phone: 915 687 8312	Company: GTI	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Kevin Cook Time: 1108	Signature: Time:	Signature: Andrea Baker Time: 0820
Printed Name: Kevin Cook Date: 10-12-95	Printed Name: Date:	Printed Name: Andrea Baker Date: 10/13
Company: GTI (915) 687-8312	Company:	Analytical Technologies, Inc.

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 1 OF 1

Kim McNeill

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
510345-01	10/12	0958	AQ	1
-04	↓	1015	↓	2
-05		1025		3
-06	↓	1035	↓	4

ANALYSIS REQUEST

TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	632/632 MOD	619/619 MOD	610/8310	Chloride	8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
								X													1
								X													2
								X													3
								X													4

PROJECT INFORMATION

PROJECT NUMBER: 510345
PROJECT NAME: Indian Basin Remediation :MO
QC LEVEL: (STD) IV
QC REQUIRED: MS MSD BLANK
TAT: (STANDARD) RUSH!

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS	
INTACT?	
RECEIVED GOOD COND./COLD	
LAB NUMBER	510280

DUE DATE: 10/25
RUSH SURCHARGE: no
CLIENT DISCOUNT: Quote %

~~DO NOT ROUTE TO PHOENIX~~

Jworkm 510345

SAMPLES SENT TO:	
SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	X
PORTLAND	
PHOENIX	
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Robert Elsperman Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/13
Company: ATI - FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

APPENDIX D

LABORATORY RESULTS - NATURAL SPRING AND RANCHER, PLANT SUPPLY WELLS

(DECEMBER)

Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **512408**

January 8, 1996

Marathon Oil Company
P.O. Box 552
Midland, TX 79702-0552

Project Name/Number: IB REMEDIATION

Attention: Bob Menzie

On **12/28/95**, Analytical Technologies, of New Mexico Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA method 8020 analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

All other analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical**Technologies,**Inc.

CLIENT : MARATHON OIL COMPANY
PROJECT # : (NONE)
PROJECT NAME : IB REMEDIATION

DATE RECEIVED : 12/28/95
REPORT DATE : 01/08/96

ATI ID: 512408

	ATI ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	512408-01	SW-1	AQUEOUS	12/27/95
02	512408-02	LYMAN	AQUEOUS	12/27/95
03	512408-03	ARROYO	AQUEOUS	12/27/95
04	512408-04	STRIPPER INLET	AQUEOUS	12/27/95
05	512408-05	STRIPPER OUTLET	AQUEOUS	12/27/95
06	512408-06	TRIP BLANK	AQUEOUS	12/18/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 512971

CLIENT : ANALYTICAL TECHNOLOGIES OF NM, INC. DATE RECEIVED : 12/29/95
PROJECT # : 512408
PROJECT NAME : REMEDIATION REPORT DATE : 01/08/96

PARAMETER	UNITS	01	02	03
CHLORIDE (EPA 325.2)	MG/L	27	10.8	10.3

Analytical**Technologies**, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : ANALYTICAL TECHNOLOGIES OF NM, INC.
PROJECT # : 512408
PROJECT NAME : REMEDIATION ATI I.D. : 512971

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE	MG/L	51286813	2900	2900	0	6900	4000	100

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 512408

PROJECT # : (NONE)

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	SW-1	AQUEOUS	12/27/95	NA	01/02/96	1
02	LYMAN	AQUEOUS	12/27/95	NA	01/02/96	1
03	ARROYO	AQUEOUS	12/27/95	NA	01/02/96	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	<0.5	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		114	94	91

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 512408

PROJECT # : (NONE)

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	STRIPPER INLET	AQUEOUS	12/27/95	NA	01/02/96	200
05	STRIPPER OUTLET	AQUEOUS	12/27/95	NA	01/02/96	100
06	TRIP BLANK	AQUEOUS	12/18/95	NA	01/02/96	1

PARAMETER	UNITS	04	05	06
BENZENE	**UG/L**	**370**	**63**	<0.5
TOLUENE	**UG/L**	**160**	**250**	<0.5
ETHYLBENZENE	**UG/L**	**1000**	**240**	<0.5
TOTAL XYLENES	**UG/L**	**5800**	**2200**	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		115	100	90

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 512408
BLANK I.D.	: 010296	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 01/02/96
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		92

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 51240803	ATI I.D.	: 512408
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 01/02/96
PROJECT NAME	: IB REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51240803	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10.0	9.5	95	9.2	92	3
TOLUENE	<0.5	10.0	9.3	93	9.3	93	0
ETHYLBENZENE	<0.5	10.0	9.2	92	9.2	92	0
TOTAL XYLENES	<0.5	30.0	27.4	91	27.7	92	1

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies** of New Mexico, Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque • Anchorage

CHAIN OF CUSTODY

DATE: 12/27/95 PAGE: 1 OF 1

ATI LAB I.D. 512408

SHADED AREAS ARE FOR LAB USE ONLY.

PLEASE FILL THIS FORM IN COMPLETELY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland TX 79702-0552
PHONE: (915)687-8312 (BJM)/(915)687-8506 (JLV)
FAX: (915)687-8305

BILL TO: SAME
COMPANY:
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB I.D.	Petroleum Hydrocarbons (418.1) TRPH	(MOD.8015) Diesel/Direct/Inject	Chloride	(M8015) Gas/Purge & Trap	Gasoline/BTEX & MTBE (M8015/8020)	(BTXE) MTBE (8020)	BTEX & Chlorinated Aromatics (602/8020)	BTEX/MTBE/EDC & EDB (8020/8010/Short)	Chlorinated Hydrocarbons (601/8010)		504 EDB ☐ / DBCP ☐	Polynuclear Aromatics (610/8310)	Volatile Organics (624/8240) GC/MS	Volatile Organics (8260) GC/MS		Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)		General Chemistry			Priority Pollutant Metals (13)	Target Analyte List Metals (23)	RCRA Metals (8)	RCRA Metals by TCLP (Method 1311)			NUMBER OF CONTAINERS
SW-1	12/27/95	11:44MST	Water	-01			X			X																						3
Lyman		12:18MST		-02			X			X																						3
Arroyo		12:54MST		-03			X			X																						3
Stripper Inlet		11:17MST		-04						X																						2
Stripper Outlet		11:27MST		-05						X																						2
Trip Blank	12/18/95	16:00		-06						X																						1

PROJECT INFORMATION

PROJ. NO.:
PROJ. NAME: IB Remediation
P.O. NO.:
SHIPPED VIA: Greyhound

SAMPLE RECEIPT

NO. CONTAINERS	14
CUSTODY SEALS	Ⓨ N / NA
RECEIVED INTACT	Y
BLUE ICE/ICE	2.8°C

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

CERTIFICATION REQUIRED: ☐ NM ☐ OTHER

METHANOL PRESERVATION ☐

COMMENTS:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.
Signature: JWenzbicki Time: 2:20 MST 12/27/95	Signature: Time:
Printed Name: Jenelle Wenzbicki Date: 12/27/95	Printed Name: Date:
Company: Marathon Oil	Company:
RECEIVED BY: 1.	**RECEIVED BY: (LAB) 2.**
Signature: Time:	Signature: Time: 1210
Printed Name: Date:	Printed Name: Andrew Parker Date: 12/28
Company:	Analytical Technologies of New Mexico

Analytical**Technologies** of New Mexico, Inc.
Albuquerque, New Mexico

Interlab Chain of Custody

512471

DATE: 12/28 PAGE: 1 OF 1

NETWORK PROJECT MANAGER: KIMBERLY D. McNEILL

COMPANY: **Analytical Technologies of New Mexico, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:
Kim McNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Metals - TAL	Metals - PP List	Metals - RCRA	RCRA Metals by TCLP (1311)			TOX	TOC	Gen Chemistry: Cl only		Oil and Grease	BOD	COD	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	8240 (TCLP 1311) ZHE	8270 (TCLP 1311)			TO-14	Gross Alpha/Beta				NUMBER OF CONTAINERS
512408-01	12/27	11:44	AQ	1									X																			1
-02	↓	12:18	↓	2									X																			1
-03	↓	12:54	↓	3									X																			1

PROJECT INFORMATION

PROJECT NUMBER: 512408
PROJECT NAME: IB Remediation
QC LEVEL: (STD.) IV
QC REQUIRED: (MS) MSD BLANK
TAT: (STANDARD) RUSH!

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS
INTACT?
RECEIVED GOOD COND./COLD
LAB NUMBER

IWO # KM1074

DUE DATE: 12/28
RUSH SURCHARGE:
CLIENT DISCOUNT:
SPECIAL CERTIFICATION REQUIRED: ☐YES ☐NO

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	
PORTLAND	
PHOENIX	X

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 12/28
Analytical Technologies of New Mexico, Inc. Albuquerque
Company:

RECEIVED BY: 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY: (LAB) 2.
Signature: Heather L Oerschen Time: 1010
Printed Name: Heather L Oerschen Date: 12/29/95
Company:

APPENDIX E

STATE ENGINEER OFFICE FLUID RECOVERY REPORTS

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

November 14, 1995

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of October. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Monday, November 6, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	10/2/95 Meter Reading	11/6/95 Meter Reading	Oct-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-58	10239118	0	gal	26922	0	7437047	7437047	0	7463969
MW-59	10259114	0	bbl	83454	0	151439	154968	148230.6	6592122.6
MW-61A	10239116	0	gal	130850	0	8823592	9274047	450454.7	9404896.7
MW-62	10239115	0	gal	256553	0	6551836	6762822	210985.5	7019374.5
MW-65A	10239117	0	gal	39774	10000000	637182	794162	156980.2	10833936
MW-68	2209213	122618	gal	2484076	0	4961831	5191233	229402.4	7552691.4
MW-72	2881532	470	gal	12032816	0	13356733	14284010	927276.6	14283539.6
MW-75	2877269	1291	bbl	0	0	18657	31300	531010.2	1260382.2
TOTAL									64410912.2

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Monday, November 6, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	10/2/95 Meter Reading	11/6/95 Meter Reading	Oct-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-1	-	-	gal	6713	0	-	-	0	6713
MW-13	2209212	98236	gal	243999	0	226324	226324	0	243999
MW-14	2209214	0	gal	398391	0	398204	398204	0	398391
MW-21	-	-	gal	189	0	-	-	0	189
MW-35	2209212	1882	gal	98303	0	-	-	0	98303
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0
MW-51	2209214	398208	gal	0	0	398208	398208	0	0
MW-69	-	-	-	80916	0	-	-	1403	82319
TOTAL									829914

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. M. Schweser
File 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

December 4, 1995

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of November. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Monday, December 4, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	11/6/95 Meter Reading	12/4/95 Meter Reading	Nov-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-58	10239118	0	gal	26922	0	7437047	7437047	0	7463969.0
MW-59	10259114	0	bbl	83454	0	154968	158266	138482	6730605.0
MW-61A	10239116	0	gal	130850	0	9274047	9683956	409909	9814806.1
MW-62	10239115	0	gal	256553	0	6762822	6957428	194606	7213980.8
MW-65A	10239117	0	gal	39774	10000000	794162	926253	132091	10966027.0
MW-68	2209213	122618	gal	2484076	0	5191233	5376727	185493	7738184.8
MW-72	2881532	470	gal	12032816	0	14284010	14964176	680166	14963705.5
MW-75	2877269	1291	bbl	0	0	31300	45575	599558	1859940.6
MW-81	209092	0	gal	0	0	0	101168	101156	101168.0
TOTAL									67152384.8

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Monday, December 4, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	11/6/95 Meter Reading	12/4/95 Meter Reading	Nov-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-1	-	-	gal	6713	0	-	-	0	6713
MW-13	2209212	98236	gal	243999	0	226324	226324	0	243999
MW-14	2209214	0	gal	398391	0	398204	398204	0	398391
MW-21	-	-	gal	189	0	-	-	0	189
MW-35	2209212	1882	gal	98303	0	-	-	0	98303
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0
MW-51	2209214	398208	gal	0	0	398208	398208	0	0
MW-69	-	-	-	82319	0	-	-	1109	83428
TOTAL									831023

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. M. Schweser
File 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

January 15, 1996

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of December. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Tuesday, January 2, 1996.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	12/4/95 Meter Reading	1/2/96 Meter Reading	Dec-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)	Cumulative Fluid Removed (Acre ft)
MW-58	10239118	0	gal	26922	0	7437047	removed	0	7463969.0	22.9
MW-59	10259114	0	bbl	83454	0	158266	removed	0	6730605.0	20.7
MW-61A	10239116	0	gal	130850	10000000	9683956	66727	382770	10197576.5	31.3
MW-62	10239115	0	gal	256553	0	6957428	removed	0	7213980.8	22.1
MW-65A	10239117	0	gal	39774	10000000	926253	1146166	219913	11185940.2	34.3
MW-68	2209213	122618	gal	2484076	0	5376727	5542343	165617	7903801.3	24.3
MW-72	2881532	470	gal	12032816	0	14964176	15777312	813137	15776842.2	48.4
MW-75	2877269	1291	bbl	0	0	45575	59629	590255	2450196.0	7.5
MW-81	203092	0	gal	0	1000000	401166	223062	821896	1223062.0	3.8
MW-82	203095	0	gal	0	0	0	255052	255052	255052.0	0.8
MW-83	203091	0	gal	0	0	0	368115	368115	368115.0	1.1
TOTAL									70769140	217.2

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Tuesday, January 2, 1996.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	12/4/95 Meter Reading	1/2/96 Meter Reading	Dec-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)	Cumulative Fluid Removed (Acre ft)
MW-1	-	-	gal	6713	0	-	-	0	6713	0.02
MW-13	2209212	98236	gal	243999	0	226324	removed	0	243999	0.75
MW-14	2209214	0	gal	398391	0	398204	removed	0	398391	1.22
MW-21	-	-	gal	189	0	-	-	0	189	0.00
MW-35	2209212	1882	gal	98303	0	-	-	0	98303	0.30
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0	0.00
MW-51	2209214	398208	gal	0	0	398208	398208	0	0	0.00
MW-69	-	-	-	83428	0	-	-	592	84020	0.26
TOTAL									831618	2.56

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. K. Curlee
T. L. Guillory
C. M. Schweser
File 576-01

GROUNDWATER TECHNOLOGY®

GROUNDWATER TECHNOLOGY ®

Groundwater Technology, Inc.
2501 Yale Boulevard S.E., Suite 204, Albuquerque, NM 87106 USA

WORKPLAN FOR RISK ASSESSMENT TO ESTABLISH ALTERNATIVE ABATEMENT STANDARDS MARATHON OIL COMPANY INDIAN BASIN REMEDIATION PROJECT 18 MILES NORTHWEST OF CARLSBAD NEW MEXICO

Project No. 053350065

September 25, 1995

RECEIVED
DEC 12 1995
Environmental Bureau
Oil Conservation Division

Prepared for:
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Marathon Oil Company
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CONTENTS

FIGURES

CONTENTS (continued)

TABLES

1.0 INTRODUCTION

This document presents the work plan for a site-specific risk assessment. The work plan was prepared by Groundwater Technology, Inc. on behalf of Marathon Oil Company (Marathon). This work plan details the approach, methods, and assumptions to be used in the assessment of human health and environmental risks associated with the presence of natural gas condensate in the vadose zone and groundwater beneath Marathon's Indian Basin Remediation Project (IBRP or the site) located 18 miles northwest of Carlsbad, New Mexico. A site location map is presented in Figure 1.

1.1 Objectives

The purpose of the risk assessment is to evaluate baseline human health and environmental risks associated with the presence of natural gas condensate beneath the site. If the results of the assessment indicate risks exceed acceptable threshold limits, then alternative abatement standards will be developed according to proposed New Mexico regulations and U.S. Environmental Protection Agency guidelines for development of health-based remediation goals.

1.2 Regulatory Framework

The New Mexico Water Quality Control Commission (NMWQCC) has proposed regulations which would allow a party to petition the commission for approval of alternative abatement standards. The proposed regulatory framework will allow establishment of alternative abatement standards acceptable in New Mexico based on risk assessment methodology. The framework was presented in NMWQCC, Regulation Amendments, proposed by the New Mexico Environment Department, Ground Water Protection and Remediation Bureau in 1994.

The criteria established by the NMWQCC for setting groundwater alternative abatement standards include:

- Submittal of a written petition to the commission for approval of alternative abatement standards; and,
- The petition may utilize fate and transport evaluations and risk assessment in accordance with accepted methods to justify the proposed alternative abatement standards.

Commonly accepted methods for human health and environmental risk assessments are presented in the following guidance documents and will be used for this risk assessment:

- Risk Assessment Guidance for Superfund (RAGS) Volume I - Part A: Human Health Evaluation Manual; Part B: Development of Risk-Based Preliminary Remediation Goals; Part C: Evaluation of Remedial Alternatives and all the latest supplemental guidance documents prepared by EPA (USEPA, 1989a; USEPA, 1991a; USEPA, 1991b; USEPA, 1991c);

- Risk Assessment Guidance for Superfund, Volume II - Environmental Evaluation Manual (USEPA, 1989b); and

- Framework for Ecological Risk Assessment (USEPA, 1992a).

Other guidance manuals such as U.S. EPA's Dermal Exposure Assessment: Principles and Applications (U.S. EPA, 1992b) will be used as appropriate.

1.3 Hydrogeologic Setting

The IBRP area is underlain by the Permian-aged Queen Formation, a carbonate facies consisting mainly of limestone, dolomite, and sandstone. The formation approaches 600 feet in thickness. The basal 100 feet of the Queen Formation is sandstone as is the top 50 feet of the formation. The remaining section of the Queen consists of alternating sandstone, dolomite, and limestone (Cox, 1967). Outcrops of the Queen Formation in the vicinity of the IBRP are highly fractured and parted at bedding planes.

Alluvial deposits consisting of clayey silt, large boulders, gravel, and cobbles directly overlie the Queen Formation in the vicinity of the IBRP. These alluvial deposits range from 0 to approximately 25 feet in thickness. The deposits are comprised of 5 to 10 feet of clays and silty clays underlain mainly by boulders which are predominately clast supported with clay, sand, gravel, and cobbles comprising the matrix. The boulders are primarily limestone or dolostone in composition.

Two aquifers have been encountered at the site: 1) The "shallow zone" which is interpreted as occurring in fluvial gravels and the upper Queen Formation at depths between approximately 18 and 60 feet below grade depending upon topography; and 2) the Lower Queen Formation regional aquifer which occurs between 136 and 200 feet below grade depending upon topography. The Lower Queen aquifer occurs in fractured limy sandstone and dolomite, is confined to unconfined, and moderate to high yielding. Gradient of the upper zone is to the southeast (generally aligning

with the top of the dolomite), and the gradient of the Lower Queen is relatively flat and to the northeast.

1.4 Hydrocarbon Distribution

In April 1991, a condensate and produced water gathering line release was discovered by Marathon personnel in Rocky Arroyo south of the Indian Basin Gas Plant. The magnitude of the line release was estimated at 35,000 barrels (bbls) of condensate and 20,000 bbls of brine over a six-month period. Since the discovery of the release, various site assessments have been conducted by Marathon and its consultants. Eighty (80) groundwater monitor wells and 27 shallow zone sumps (for product recovery) have been installed (Figure 2). Quarterly groundwater monitoring is currently conducted in 21 Lower Queen wells and 25 shallow zone wells (if wells contain water). Groundwater samples are analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), and chlorides. These indicator chemicals were selected based on the chemical composition of produced water and condensate. Table 1 presents a summary of the weight contribution of BTEX in natural gas condensate.

Phase-separated condensate and dissolved hydrocarbons (historical maximum benzene concentrations of 6,300 ug/l) have been detected in shallow zone wells located on the western one-half of the project site and mainly north of Rocky Arroyo (Figure 2). As of the second quarter of 1995, phase-separated condensate was detected in two shallow zone wells, product recovery continued in one well, and benzene concentrations in all shallow zone wells ranged from less than 0.5 to 650 ug/l.

The dissolved-phase plume in the Lower Queen aquifer at the site is approximately two miles long and 1.5 miles wide. As of the second quarter of 1995, phase-separated condensate is present in three of the Lower Queen monitor wells and benzene concentrations of less than 0.5 to 16 ug/l were detected in the remaining Lower Queen wells sampled.

Much of the condensate may still be in the soil and/or fractures. Volatile organic compound concentrations, as measured on drill cuttings with an organic vapor analyzer during installation of the wells, ranged from 58 to 418 parts per million (ppm) for samples collected at 18 to 70 feet from the shallow zone wells, and from 34 to greater than 2,000 ppm for samples collected from the Lower Queen at depths of approximately 25 feet to greater than 200 feet.

Cumulative summaries of analytical results for the shallow groundwater zone and the Lower Queen aquifer are presented in Tables 2 and 3 respectively. Table 2 includes data from two private groundwater production wells (designated as Blebelle and Lyman) and a spring (designated as UIH).

1.5 Existing Treatment Systems

1.5.1 Groundwater Treatment and Product Recovery

A product-only skimming system is deployed in shallow zone well MW-69. In addition, contaminated groundwater and free-phase hydrocarbon (condensate) from seven Lower Queen recovery wells are currently recovered as total fluids and transported through underground piping to a treatment compound located east of the Indian Basin Gas Plant. In July 1995, a dual phase product/water table depression pump system was installed in well MW-75. The treatment compound includes two aboveground tanks, an oil/water separator used as a storage vessel, and an air stripper. Condensate is skimmed from one of the two aboveground tanks and transferred to the oil/water separator which serves as a condensate storage vessel. Groundwater containing dissolved-phase hydrocarbon is transferred from the first tank to the second aboveground tank. Groundwater from the second tank is pumped through the air stripper to remove dissolved-phase volatile organic compounds. Stripped volatile organic compounds are vented to the atmosphere through a stack. Treated groundwater is transferred from the air stripper to the 1,200-barrel aboveground steel tank and is used as process water for the gas plant.

The measured volume of condensate recovered from Lower Queen groundwater during the second quarter of 1995 was 10.1 barrels. Cumulative condensate separated from the recovered groundwater since free-phase hydrocarbon separation began in April 1992 through the second quarter of 1995 (three years) is 119.1 barrels.

Total condensate recovery from the Lower Queen and shallow zone for the second quarter of 1995 was 14.7 barrels. Cumulative condensate recovered to date excluding the volume volatilized by the air stripper and vapor extraction system is 3,581.1 barrels or 10.2% of the total estimated 1991 spill volume.

1.5.2 Vapor Extraction System

From March 1992 to May 1994, Marathon operated a soil vapor extraction system (SVES) at various shallow zone wells to remove condensate in the shallow unsaturated zone. An estimated 119 barrels of condensate (equivalent) were removed during system operation (Personal communication, Robert J. Menzie, Jr., Marathon). On May 5, 1994, the vapor extraction system was shut down when Marathon determined that a New Mexico Air Pollution Control Bureau air emission permit is required for system operation. The system has not operated since then and is being stored at the gas plant.

2.0 SCOPE OF WORK

The following section describes the planned scope of work for the risk assessment and documents the approach, methods, and assumptions to be used.

2.1 Data Analysis

All available data will be summarized in tables and analyzed statistically for use in the risk assessment. The data analysis summary table includes (1) minimum detected concentrations, (2) maximum detected concentrations, (3) the arithmetic mean, standard deviation, and 95% Upper Confidence Limits (95% UCL), (4) the number of monitor wells sampled, (5) number of wells in which each chemical has been detected, (6) the total number of samples analyzed, (7) the total number of times each chemical was detected, and (8) the frequency of detects for each chemical.

A preliminary data analysis has been performed to provide an initial "picture" of the groundwater impacts. This preliminary analysis includes all groundwater data available at the time this work plan was completed with the exception of data from two private groundwater production wells (Biebelle and Lyman), because no analytes have ever been detected in samples from these wells. The results of this analysis and a summary of the available data is provided in Tables 4 and 5 for the shallow saturated zone and the Lower Queen Aquifer, respectively. The final data analysis will evaluate (1) the relevance of "old" data (i.e., data collected more than 2 years ago), (2) the appropriateness of including data from each monitor well, and (3) the appropriateness of utilizing "t" statistics such as arithmetic means and 95% UCLs for exposure point concentrations.

In addition to data from the groundwater monitor wells, data have been collected from the treatment system influent and effluent (this data was excluded from the preliminary data analysis). While influent data are not relevant for risk assessment purposes, the treatment system effluent is used at the Indian Basin Gas Plant as process water (personal communication with Mr. Robert Menzie, Marathon). Therefore, effluent data may be used in the estimation of exposure point concentrations for plant workers if the use of this water results in potentially complete exposure pathways, or unless this pathway is eliminated through process changes.

2.2 Selection of Chemicals of Potential Concern

Based on the composition of condensate (see Table 1), availability of toxicity data, and the existing groundwater monitoring results, BTEX are chemicals of potential concern (COPC) for natural gas condensate. Other potential COPCs for many petroleum products include the polynuclear aromatic hydrocarbons (PAHs). However, based on the information presented in Table 1 and the results of

analyses for PAHs in treatment system influent samples (March and September 1994), these chemicals were not detected. Therefore, this risk assessment will utilize BTEX as the only COPCs.

2.3 Toxicity Assessment

Toxicity information for BTEX is readily available from the U.S. EPA's Integrated Risk Information System (IRIS). IRIS is an on-line data base which includes information on the potential effects associated with exposure and toxicity criteria for hundreds of chemicals (e.g., reference doses and cancer slope factors). IRIS contains the most current information for BTEX. Table 6 contains a summary of toxicity information for BTEX.

2.4 Conceptual Exposure Model (Human and Environmental Receptors)

The conceptual exposure model summarizes information on the extent and magnitude of chemical impacts, the properties of the COPCs which affect chemical movement in the environment, the receptors identified as being present or potentially present, the use of the impacted resources (i.e., groundwater), the results of the chemical fate and transport analysis, and other factors which affect potential exposures. This information is then used to identify the potentially complete exposure pathways for each receptor. The conceptual exposure model will exclude unrealistic site uses, receptor populations, and exposure pathways. For example, if residential use of the site is shown to be an unrealistic future property use, then residential exposures to on-site chemicals will not be evaluated.

Currently available information was used to complete a preliminary exposure analysis. All the pathways that were evaluated for completeness are presented in Table 7. The potential exposure to groundwater is based on the locations of the water supply wells in the vicinity of the IBRP (see Table 8 and Figure 3) and the land use. The site information and analytical data support the selection of the pathways that are deemed complete. The exposure routes through which the identified receptors may come in contact with the COPCs are indicated in Table 7.

The exposure analysis indicates that potential human receptors include employees of the IBGP and off-site residents who use the groundwater. Water supply wells and land use in the vicinity of the site are listed in Table 8.

The recreational user is another potential receptor that was evaluated for the risk assessment. The site setting does not support the scenario that the area is or may be a potential site for recreational activities except hunting. The prey generally consist of mammals, birds, and reptiles which suggest that the potential exposure of the hunter is through the food chain. Reptiles have the highest extent

of exposure to surface soil only. Birds are generally transient species and are either granivorous or insectivorous. Exposure to surface soil may occur via incidental ingestion of wind-blown particles during preening activities. The mammals have animal exposure to surface soil, but have more exposure through the food chain.

The evaluation demonstrates that the potential exposure of a hunter to soil COPCs is dependent on the prior exposure of the prey. The high volatility and biodegradability of BTEX indicates that these compounds would not persist long enough in the soil to pose significant exposure. In addition, these compounds have demonstrated a low potential for bioaccumulation in biota. Therefore, the exposure pathway from COPCs in soil to the prey is incomplete. Consequently, the potential exposure of the hunter to soil COPCs is also incomplete. Similar rationale is applied for concluding that the exposure of a hunter to groundwater COPCs is incomplete. The exposure evaluation of a hypothetical hunter is presented in Table 7.

Some of the off-site areas may be used for grazing by cattle. The analysis of the potential exposure of persons consuming cattle is the same as for the hunter consuming his prey. Due to the high volatility and biodegradability of BTEX and the low potential for bioaccumulation, the potential exposure pathway through ingestion of beef products is considered incomplete for both current and future scenarios. This pathway is not presented in Table 7.

An evaluation of the potential exposure to ecological receptors is also presented in the Table 7. Before the risk assessment is conducted, information will be culled from the literature regarding the occurrence or potential occurrence of ecological receptors. The environmental setting will also indicate whether there are suitable ecological habitats in the IBRP site. The site-specific information will determine whether there are complete pathways that will be evaluated to assess biological effects.

2.5 Exposure Assessment: Models and Assumptions

Environmental fate and transport modeling will be performed in order to evaluate the potential migration of COPCs in both the saturated and unsaturated zones. The purpose of the modeling is to (1) verify if potential exposure pathways are complete, (2) verify points of potential exposure, and (3) estimate exposure point concentrations in air and groundwater. Potential exposure points of particular interest for this site include the downgradient private wells (identified in the data base as Biebelle and Lyman) and the downgradient spring (UIH).

An evaluation of available computer models will be completed in order to identify the most appropriate model(s) for this site. The geology/hydrogeology (i.e., fractured bedrock) and the potential for mixed-phase flow (i.e., vapor phase, free phase and dissolved phase) result in unusual complexities for use of computer simulations at this site. Therefore, the model selection process will account for these added complexities. Preliminary evaluations of available models indicate that the TRAFRAP-WT (Transport in Fractured Porous Media Under Water Table Boundary Conditions) numerical model (International Ground Water Modeling Center) is the likely choice for this assessment.

The TRAFRAP-WT program features the following:

(1) Fractured porous media may be represented by a discrete-fracture or a dual porosity approach, or a combination of both.

(2) TRAFRAP-WT can simulate the flow of two-dimensional horizontal or vertical plane using cartesian coordinates or using axisymmetric cylindrical coordinates.

(3) It simulates both the steady and transient state flow and solute transport.

(4) TRAFRAP-WT calculates the steady velocity field prior to solving for the concentration of any solute. This means that the flow and transport can not be solved in a single simulation.

(5) TRAFRAP-WT can handle various model geometries and element shape functions.

(6) In TRAFRAP-WT, the solute transport equation includes both the convection and/or dispersion/diffusion in fractured and/or porous media blocks.

Exposures associated with potentially complete exposure pathways will be estimated for each receptor. Exposure estimates will be made for both realistic (i.e., most likely) and upper bound (i.e., Reasonable Maximum) exposure assumptions for each identified receptor. Where appropriate, USEPA default exposure assumptions for Reasonable Maximum Exposures (RME) and Most Likely Exposures (MLE) will be used. However, if site-specific information indicates that default assumptions are overly conservative, then site-specific information will be compiled and used in the exposure estimates. For example, based on the use of treatment system effluent, exposure parameters for IBGP employees may be identified, documented, and used in the exposure assessment in place of standard USEPA assumptions for commercial workers.

All exposure models will be taken from appropriate USEPA risk assessment guidance manuals including but not limited to:

- Risk Assessment Guidance for Superfund (RAGS) Volume I

  - Part A: Human Health Evaluation Manual (USEPA, 1989a);
  - Part B: Development of Risk-Based Preliminary Remediation Goals (USEPA, 1991b;
  - Part C: Evaluation of Remedial Alternatives (USEPA, 1991c); and
  - the latest supplemental guidance documents prepared by USEPA (USEPA, 1991c).

- Risk Assessment Guidance for Superfund, Volume II - Environmental Evaluation Manual (USEPA, 1989b).

- U.S. EPA's Dermal Exposure Assessment: Principles and Applications (U.S. EPA, 1992b).

The endpoint of the exposure assessment is to estimate the total dose, via all complete exposure pathways, to which each receptor may be exposed.

2.6 Risk Characterization

The risk characterization will present the results of the human health risk assessment in both quantitative and qualitative terms. Quantitative estimates of cancer and non-cancer risks will be calculated by combining the toxicity criteria and exposure estimates. The quantitative endpoints will be cancer risk estimates and non-cancer Hazard Indices (HIs) for each potentially complete exposure pathway. Total cancer risks and HIs for each receptor will be calculated by summing the appropriate pathway-specific cancer risks and HIs. The total estimated cancer risks and HIs for each chemical will be compared to established acceptable threshold limits.

> In New Mexico the acceptable cancer risk threshold = 1 in 100,000.
> (NMWQCC 82-1, Part 1-101)

The commonly accepted thresholds for HIs range from 0.1 to 10. Risk results will also be qualitatively evaluated by incorporating the uncertainties inherent in the risk assessment methods and assumptions.

2.7 Ecological Assessment

The ecological assessment for the site will be conducted according to the guidelines of the "Framework for Ecological Risk Assessment" (EPA, 1992a). The framework outlines three phases of an ecological risk assessment: (1) problem formulation; (2) analysis; and, (3) risk characterization. At this specific site, the ecological risk assessment will be performed qualitatively. Thus, the ecological risk characterization will be based on the result of a qualitative analysis.

2.7.1 Problem Formulation

In the problem formulation phase, the ecological characteristics of the site are defined by identifying the chemicals and the biological receptors that will be evaluated in the ecological assessment. The chemicals of potential ecological concern (COPECs), as stated in Section 2.2, are BTEX. Information collected from a site survey, available literature and public reports, and information from the appropriate State and Federal agencies (e.g., New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service) will provide the basis for the identification of the habitats (aquatic and terrestrial) at the site, and the species occurring at the site, the threatened and endangered species, species which are of economic or social value (e.g., game species), and species identified as "sensitive" receptors. Wildlife that may potentially occur in the area will be extrapolated from the habitats identified at the site and in available published sources.

The receptors to be evaluated in the ecological assessment will be selected based on the following criteria:

a) Representative of guilds or trophic levels;
b) Known occurrence and prevalence in the vicinity of the site;
c) Potential or documented exposure to site-related chemicals;
d) Availability of ecotoxicological information on the ecological receptors or surrogate species;
e) Listed as a federal or state threatened or endangered species;
f) Game species or commercially important species;
g) Species with documented sensitivity to the COPECs;
h) Limited mobility of home range that limits exposure to sources of COPECs;
i) A key component of the food chain.

The endpoint of the problem formulation is the generation of a conceptual site model. The conceptual model is a preliminary, general representation of the relationship between an identified COPEC, the potential ecological receptors, and the potential complete exposure pathways through

which receptors may be affected by the COPECs. The following discussion presents a preliminary conceptual exposure model for the site.

Plants and microbes may be exposed to COPECs in the surface soil (0 to 0.5 feet) and shallow soil (0 to 2.0). Invertebrates and reptiles may be exposed to contaminants in surface soil and burrowers may be exposed to contaminants in the shallow soil. Ingestion of surface and shallow soil is the primary exposure pathway for small mammals. Ingestion occurs during feeding, burrowing, and when animals clean their fur. Birds that feed on the ground will be exposed to COPECs in the surface soil through soil ingestion during feeding and preening. Dermal exposure is not anticipated to result in significant exposures for large or small mammals and birds due to the protective effect of the fur or feathers. Invertebrates and reptiles may be exposed to soil contaminants via the dermal pathway.

Groundwater exposure routes to ecological receptors depend on the availability of groundwater to plants and animals. Only groundwater less than 5 feet below ground surface (bgs) will be assumed to be available to plant roots.

Aquatic biota may be exposed to dissolved contaminants wherever surface water is present. Terrestrial invertebrates are not likely to have any significant exposure to surface water. Both small and large mammals may be exposed to dissolved and particulate contaminants in the water by drinking.

A plant or animal that has been exposed to chemicals may accumulate the compounds in their tissues and transfer the chemical to consumers and predators though the food chain pathway.

2.7.2 Analysis Phase

The analysis phase characterizes the exposure and the ecological effects. The exposure characterization combines information on the spatial distribution of the BTEX and the potentially complete exposure pathways to the ecological receptors. The exposure analysis considers the fate and transport properties of BTEX. BTEX, when released to the soil and water, rapidly volatilize near the surface. BTEX is not expected to significantly adsorb to sediment and does not bioconcentrate in aquatic organisms. Based on the exposure analysis, it is unlikely that there is a complete exposure pathway from the points where BTEX has been detected to the potential ecologic receptors. The fate and transport analysis results will be used to identify if BTEX may migrate to points where ecological receptors may be exposed.

2.7.3 Risk Characterization

The risk characterization is the final phase in an ecological assessment and consists of the evaluation of potential adverse effects on ecological receptors due to exposure to COPECs. Based on the information presented in the preceding phases, problem formulation and analysis, there does not currently appear to be any complete exposure pathways through which receptors may contact the BTEX detected at the IBRP site. Environmental fate and transport modeling results will be used to evaluate the potential for future exposures to occur. Based on the information currently available a quantitative ecological risk assessment does not appear to be warranted for this site.

2.8 Calculation of Alternative Abatement Standards

If the human health or ecological risk assessments indicate risks exist above acceptable threshold levels, then alternative abatement standards will be calculated in a manner consistent with USEPA guidance and New Mexico's proposed regulations for calculation of alternative abatement standards.

3.0 REFERENCES

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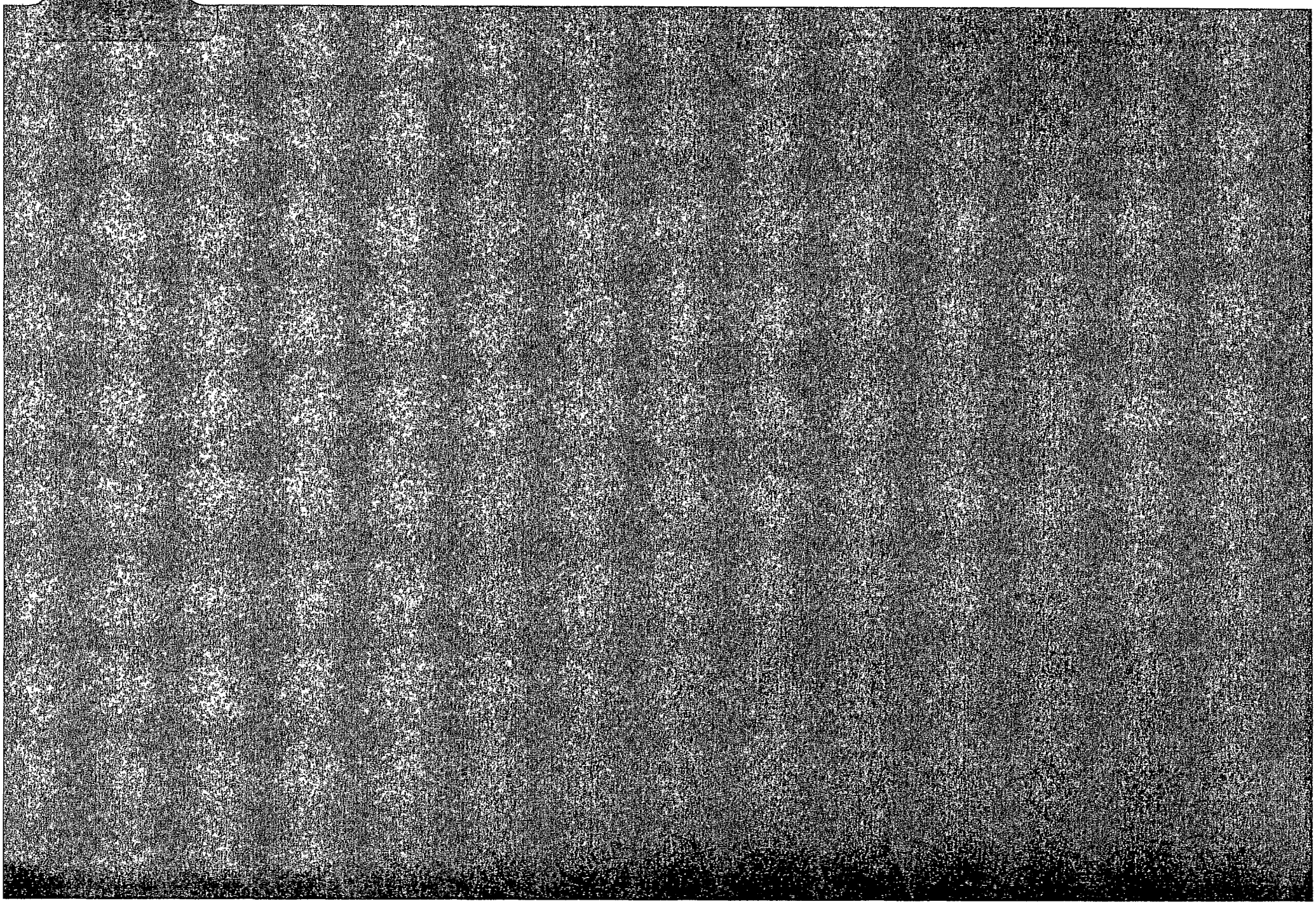
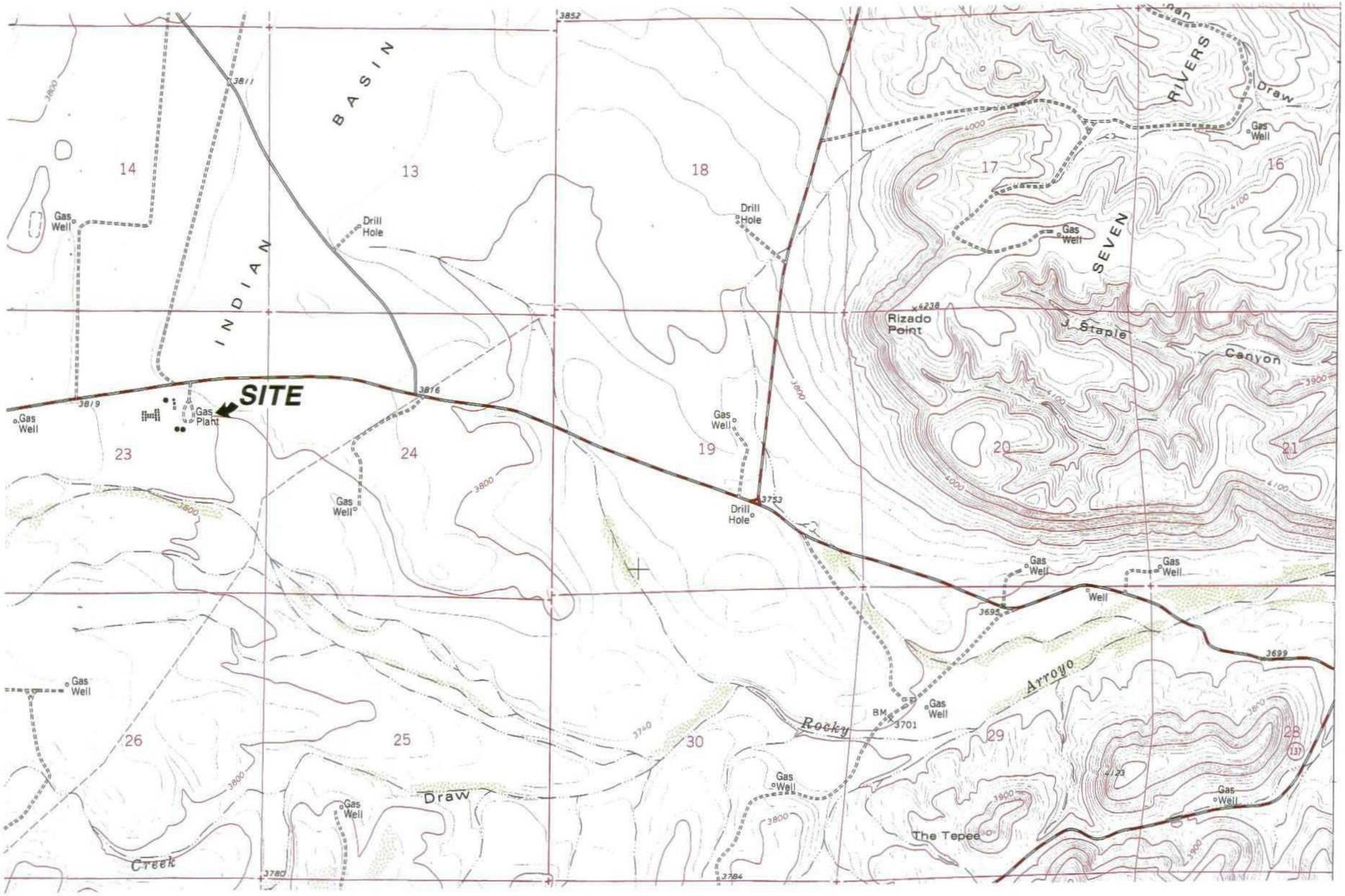
USEPA. 1995. *Integrated Risk Information System (IRIS).* On-line database. United States Environmental Protection Agency, Office of Emergency and Remedial Response: Washington, D.C.

FIGURES





NO.	DATE	BY	REVISION

NEW MEXICO

QUADRANGLE LOCATION

N

1,000 0 2,000

SCALE IN FEET

MARTHA CREEK, N. MEX.

NE/4 BANDANNA POINT 15' QUADRANGLE

N3222.5–W10430/7.5

1978

AMS 5048 I NE – SERIES V881

CLIENT: **MARATHON**

PROJECT: **MARATHON / INDIAN BASIN REMEDIATION PROJECT**

LOCATION: **18 MILES NW OF CARLSBAD, N.M.**

GROUNDWATER TECHNOLOGY

2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

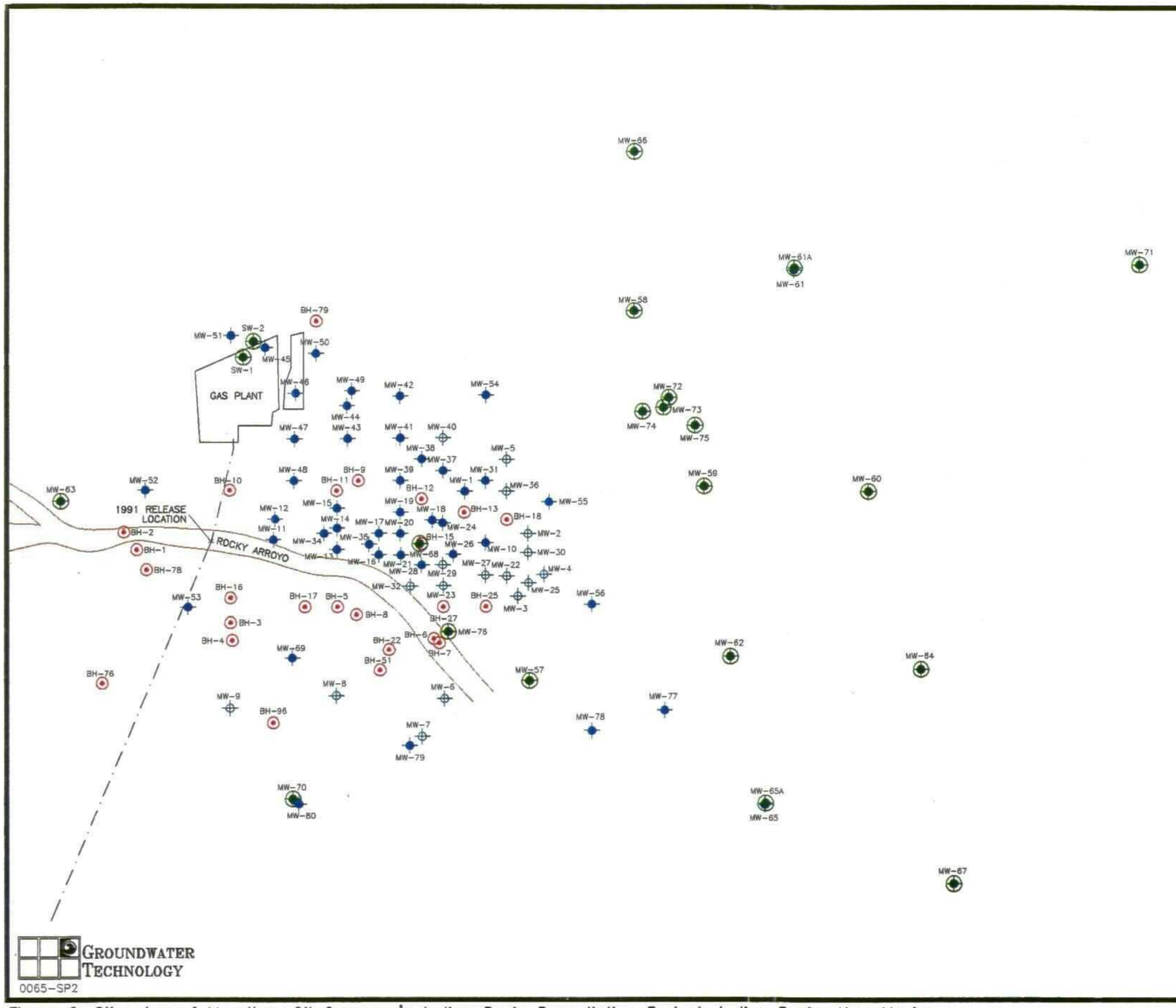
SITE LOCATION/ TOPOGRAPHIC MAP

DESIGNED BY:	DETAILED BY:	CHECKED BY:
VM	JU	VM

DATE:	FILE:
6/26/95	Marathon Oil

PROJECT NO.:	CONTRACT:
053350065	

DRAWING: **FIGURE 1** REVISION:



GROUNDWATER TECHNOLOGY

0065-SP2

EXPLANATION

- UPPER AQUIFER MONITOR WELL
- LOWER AQUIFER MONITOR WELL
- MONITOR WELL (DRY)
- BOREHOLE
- CONDENSATE LINE

N

0 1000 2000

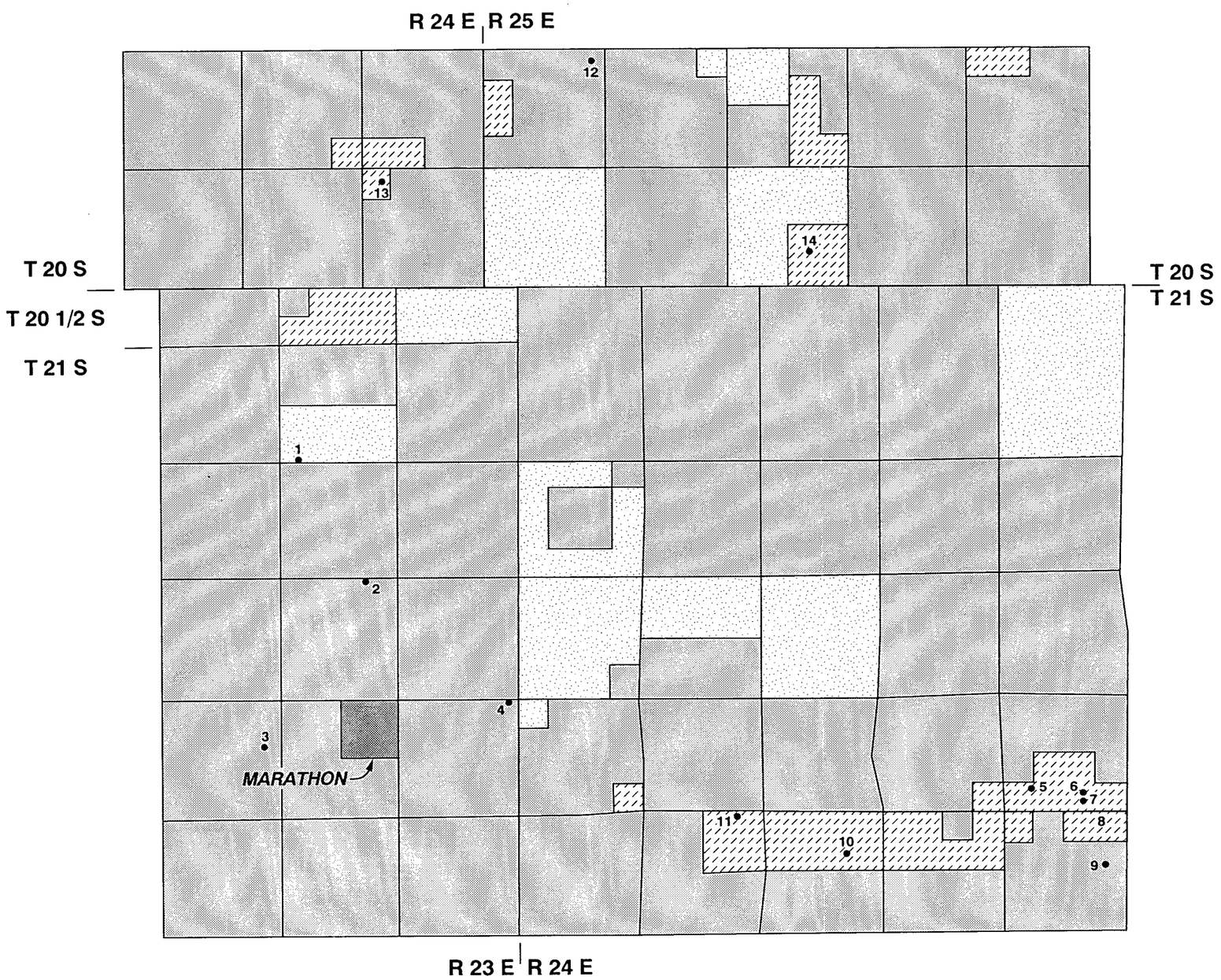
APPROX. SCALE IN FEET

MARATHON OIL COMPANY
INDIAN BASIN REMEDIATION PROJECT
INDIAN BASIN, NEW MEXICO
053350065

DRAWN BY: S. BROTHERS DATE: 08-08-95
DRAFTED BY: DEN HOLMES DATE: 08-08-95
CHECKED BY: ES DATE: 8-8-95

SITE PLAN SHOWING LOCATION OF MONITOR WELLS
FIGURE 2

Figure 2. Site plan of Marathon Oil Company's Indian Basin Remediation Project, Indian Basin, New Mexico.



LEGEND

1● WATER SUPPLY WELL LOCATION (SEE TABLE 8 FOR DETAILS)

MARATHON PROPERTY (INDUSTRIAL)

FEE (PRIVATE) LAND (RESIDENTIAL, GRAZING)

STATE LAND (RECREATIONAL, INDUSTRIAL, GRAZING)

FEDERAL LAND (RECREATIONAL, INDUSTRIAL, GRAZING)

N

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SCALE

INDIAN BASIN REMEDIATION PROJECT

PROJECT NO.: 053350065 | LOC.: 18 MILES NW OF CARLSBAD, NM

LAND USE AND WATER SUPPLY WELLS IN THE VICINITY OF THE INDIAN BASIN REMEDIATION PROJECT

PRIVILEGED & CONFIDENTIAL ATTORNEY WORK PRODUCT

DRAWN BY: JU	DATE: 7/28/95	CHECKED BY: SDB	DATE: 8/8/95
FOLDER: Marathon Oil FILE: LAND USE		APPROVED BY: SDB	DATE: 8/8/95

FIGURE 3

GROUNDWATER TECHNOLOGY

TABLES

Table 1

BTEX Concentration in Natural Gas Condensate[1]
Marathon Oil Company
Indian Basin Remediation Project

Compound	Concentration[2] (mg/kg)	% in Condensate
Benzene	2,200	0.24
Toluene	13,000	1.40
Ethylbenzene	2,800	0.30
Total Xylenes	25,000	2.69
Fuel Hydrocarbons (as condensate)	930,000	--

(1) Sample collected from inlet condensate tank at IBGP, April 7, 1994.
(2) By EPA Method 8015M (C6-C14).

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
BIEBBLE	04/01/92	<1	<1	<1	<1	13.5
BIEBBLE	07/01/92	<1	<1	<1	<1	7.8
BIEBBLE	10/01/92	<1	<1	<1	<1	10.1
BIEBBLE	01/01/93	<1	<1	<1	<1	10.6
BIEBBLE	04/01/93	<1	<1	<1	<1	11.4
BIEBBLE	07/01/93	<0.5	<0.5	<0.5	<0.5	13.3
BIEBBLE	10/01/93	---	<0.5	<0.5	<0.5	10.4
BIEBBLE	01/01/94	---	<0.5	<0.5	<0.5	11
BIEBBLE	04/01/94	---	<0.5	<0.5	<0.5	10.5
BIEBBLE	07/01/94	---	<0.5	<0.5	<0.5	15
BIEBBLE	10/01/94	<0.5	<0.5	<0.5	<0.5	13
BIEBBLE	01/01/95	<0.5	<0.5	<0.5	<0.5	8
BIEBBLE	04/01/95	<0.5	<0.5	<0.5	<0.5	---
LYMAN	04/01/92	<1	<1	<1	<1	12.6
LYMAN	07/01/92	<1	<1	<1	<1	14.6
LYMAN	10/01/92	<1	<1	<1	<1	15.5
LYMAN	01/01/93	<1	<1	<1	<1	13.2
LYMAN	04/01/93	<1	<1	<1	<1	13.0
LYMAN	07/01/93	<0.5	<0.5	<0.5	<0.5	15.0
LYMAN	10/01/93	---	<0.5	<0.5	<0.5	14.6
LYMAN	01/01/94	<0.5	<0.5	<0.5	<0.5	13
LYMAN	04/01/94	<0.5	<0.5	<0.5	<0.5	12.5
LYMAN	07/01/94	<0.5	<0.5	<0.5	<0.5	12
LYMAN	10/01/94	<0.5	<0.5	<0.5	<0.5	14
LYMAN	01/01/95	<0.5	<0.5	<0.5	<0.5	11
LYMAN	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-01	09/01/91	250	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-01	12/01/91	200	200	300	100	152
MW-10	09/01/91	2300	---	---	---	---
MW-10	12/01/91	2300	<100	200	2500	323
MW-10	04/01/92	1840	106	<3	2415	319
MW-10	07/01/92	1842	101	482	2183	240
MW-10	10/01/92	2100	144	436	759	312
MW-10	01/01/94	0	---	0	0	0
MW-11	09/01/91	3000	---	---	---	---
MW-11	12/01/91	3800	5800	500	5200	790
MW-11	04/01/92	3573	2979	484	6714	653
MW-11	07/01/92	2199	2440	463	3693	270
MW-11	10/01/92	2755	1896	<3	5196	239
MW-11	01/01/93	2746	1821	475	4280	544
MW-11	10/01/94	1800	<50	450	3500	130
MW-12	09/01/91	3800	---	---	---	---
MW-13	09/01/91	3100	---	---	---	---
MW-13	12/01/91	3000	750	500	3300	780
MW-13	04/01/92	3501	142	<3	7137	1240
MW-13	07/01/92	2708	136	597	2247	269
MW-14	09/01/91	5100	---	---	---	---
MW-15	09/01/91	5100	---	---	---	---
MW-16	09/01/91	1700	---	---	---	---
MW-16	04/01/93	514	53	39	2134	246
MW-17	09/01/91	2000	---	---	---	---
MW-17	04/01/93	1500	58	230	2900	306
MW-18	09/01/91	4300	---	---	---	---
MW-18	04/01/92	2900	82	750	1200	464

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-18	07/01/92	2700	22	600	55	109
MW-18	10/01/92	3300	115	870	187	408
MW-19	09/01/91	4700	---	---	---	---
MW-19	04/01/92	3240	347	807	326	463
MW-19	07/01/92	3000	40	800	41	90
MW-19	10/01/92	2756	73	758	166	420
MW-19	04/01/93	3926	130	16	82	---
MW-20	09/01/91	110	---	---	---	---
MW-21	09/01/91	1000	---	---	---	---
MW-21	12/01/91	1100	<50	<50	1000	343
MW-21	04/01/93	114	19	38	38	283
MW-22	09/01/91	4	---	---	---	---
MW-24	09/01/91	3400	---	---	---	---
MW-24	07/01/92	4353	27	55	708	455
MW-26	09/01/91	3100	---	---	---	---
MW-26	12/01/91	3000	<100	400	3700	356
MW-26	07/01/92	2000	48	390	1400	164
MW-26	10/01/92	1860	59	567	1774	222
MW-26	01/01/93	1708	82	399	1083	177
MW-26	04/01/93	861	62	600	2014	---
MW-28	09/01/91	2200	---	---	---	---
MW-31	09/01/91	<1	---	---	---	---
MW-31	07/01/92	332	36	11	54	337
MW-31	10/01/92	9	32	10	18	296
MW-32	09/01/91	200	---	---	---	---
MW-33	09/01/91	6300	---	---	---	---
MW-34	09/01/91	2500	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-35	09/01/91	5700	---	---	---	---
MW-37	09/01/91	150	---	---	---	---
MW-37	07/01/93	27	7	<3	<3	173
MW-38	09/01/91	15	---	---	---	---
MW-38	12/01/91	15	<1	15	<1	111
MW-38	04/01/92	67	17	55	7	127
MW-38	07/01/92	37	34	25	56	147
MW-38	10/01/92	166	18	242	24	128
MW-39	09/01/91	880	---	---	---	---
MW-39	01/01/93	14	6	<5	<5	231
MW-39	04/01/93	29	15	4	11	---
MW-39	07/01/93	24	3	<3	<3	296
MW-39	10/01/93	---	23	<3	10	277
MW-39	01/01/94	<2.5	<2.5	8.4	70	260
MW-39	04/01/94	<0.5	<0.5	4	38	220
MW-39	07/01/94	<0.5	<0.5	5.9	78	198
MW-39	01/01/95	<5.0	7.1	250	80	194
MW-41	09/01/91	200	---	---	---	---
MW-41	12/01/91	170	30	400	<10	108
MW-41	07/01/93	12	<5.0	22	<5.0	242
MW-41	10/01/93	8.9	<0.5	17	<0.5	264
MW-41	01/01/94	5.3	<5.0	27	140	370
MW-41	04/01/94	0.6	<0.5	3.8	7.4	290
MW-41	07/01/94	1.4	31	4.9	<0.5	259
MW-41	10/01/94	3.2	44	0.7	90	300
MW-41	01/01/95	13	<5.0	42	23	326
MW-41	04/01/95	4.8	<0.5	19	33	---

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For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-42	09/01/91	<1	---	---	---	---
MW-42	12/01/91	<1	<1	<1	<1	571
MW-43	09/01/91	320	---	---	---	---
MW-43	07/01/93	25	17	<3	3	232
MW-43	10/01/93	---	11	<3	<3	230
MW-43	01/01/94	<0.5	<0.5	<0.5	<0.5	260
MW-43	04/01/94	<0.5	<0.5	1.2	14	250
MW-43	07/01/94	<0.5	<0.5	1.5	7.1	266
MW-43	10/01/94	0.8	<0.5	2.3	17	270
MW-43	01/01/95	3.0	<0.5	5.5	15	280
MW-43	04/01/95	0.6	<0.5	2.8	14	---
MW-44	09/01/91	59	---	---	---	---
MW-44	04/01/92	6	22	24	2	660
MW-44	07/01/92	97	25	102	96	263
MW-44	10/01/92	12	34	96	24	356
MW-44	01/01/93	14	18	65	<1	300
MW-44	04/01/93	7	15	18	14	365
MW-44	07/01/93	6	16	<3	18	445
MW-44	10/01/93	3.6	<0.5	19	5.6	543
MW-44	01/01/94	12	<5.0	7.2	14	490
MW-44	04/01/94	22	<2.5	3.3	11	440
MW-44	07/01/94	36	<5.0	12	14	430
MW-44	10/01/94	130	<25	120	77	360
MW-44	01/01/95	63	<5.0	140	26	360
MW-44	04/01/95	19	2.0	71	16	---
MW-45	09/01/91	<1	---	---	---	---
MW-45	12/01/91	<1	<1	<1	<1	354

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For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-45	07/01/93	<3	6	7	4	434
MW-45	10/01/93	<3	3	<3	3	408
MW-45	01/01/94	<0.5	<0.5	<0.5	<0.5	440
MW-45	04/01/94	<0.5	<0.5	<0.5	<0.5	430
MW-45	07/01/94	<0.5	<0.5	<0.5	<0.5	429
MW-46	09/01/91	140	---	---	---	---
MW-47	09/01/91	2600	---	---	---	---
MW-47	12/01/91	2200	<50	<50	<50	433
MW-48	09/01/91	<1	---	---	---	---
MW-48	12/01/91	<1	5	10	<1	400
MW-48	07/01/92	47	18	6	18	431
MW-49	09/01/91	35	---	---	---	---
MW-49	07/01/93	210	27	42	30	399
MW-49	10/01/93	68	26	9	20	397
MW-49	01/01/94	13	<5.0	15	110	400
MW-49	04/01/94	82	<0.5	11	10	380
MW-49	07/01/94	150	<5.0	32	27	368
MW-49	10/01/94	78	49	40	300	380
MW-49	01/01/95	220	<5.0	46	97	389
MW-49	04/01/95	120	<0.5	24	26	---
MW-50	09/01/91	<1	---	---	---	---
MW-50	12/01/91	<1	<1	<1	<1	380
MW-50	04/01/92	7	18	<3	17	397
MW-50	07/01/92	4	167	7	11	379
MW-50	10/01/92	8	10	3	2	370
MW-50	01/01/93	8	5	<3	5	337
MW-50	04/01/93	<1	<1	<1	<1	955

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For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-50	07/01/93	<3	12	10	4	347
MW-50	10/01/93	9	16	<3	<3	292
MW-50	01/01/94	<0.5	<0.5	<0.5	<0.5	320
MW-50	04/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	07/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	10/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	01/01/95	<0.5	<0.5	<0.5	<0.5	314
MW-50	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-51	09/01/91	800	---	---	---	---
MW-51	12/01/91	<1	<1	<1	<1	38
MW-52	09/01/91	<1	---	---	---	---
MW-52	07/01/92	5	31	4	5	3
MW-53	09/01/91	<1	---	---	---	---
MW-54	09/01/91	<1	---	---	---	---
MW-54	12/01/91	<1	<1	<1	<1	87
MW-54	04/01/92	10	10	<3	14	151
MW-54	07/01/92	8	44	23	195	80
MW-54	10/01/92	62	7	195	630	55
MW-54	01/01/93	14	4	15	113	134
MW-54	04/01/93	10	<3	<3	8	145
MW-54	07/01/93	<3	<3	<3	3	146
MW-54	10/01/93	17	35	16	24	122
MW-54	01/01/94	8.6	<0.5	7.4	<0.5	140
MW-54	04/01/94	<0.5	<0.5	<0.5	<0.5	102
MW-54	07/01/94	15	1.2	8.5	8.7	135
MW-54	10/01/94	19	0.6	29	6.3	130
MW-54	01/01/95	<0.5	<0.5	<0.5	<0.5	32.0

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-54	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-55	09/01/91	940	---	---	---	---
MW-55	12/01/91	400	25	<25	<25	501
MW-55	04/01/92	297	24	15	34	385
MW-55	07/01/92	483	36	64	66	273
MW-55	10/01/92	215	56	92	26	292
MW-55	01/01/93	390	68	90	32	300
MW-55	04/01/93	412	20	89	18	301
MW-55	07/01/93	625	21	8	50	312
MW-55	10/01/93	581	27	102	18	287
MW-55	01/01/94	290	<2.5	89	<2.5	320
MW-55	04/01/94	370	<2.5	33	<2.5	310
MW-55	07/01/94	360	5.5	16	120	299
MW-55	10/01/94	910	<5.0	480	<5.0	390
MW-55	01/01/95	650	<5.0	400	41	321
MW-56	09/01/91	2200	---	---	---	---
MW-56	12/01/91	1000	2000	3000	6000	197
MW-56	07/01/92	1114	64	962	49	248
MW-56	10/01/92	1026	47	<3	839	183
MW-56	01/01/93	1128	40	10	804	269
MW-61	09/01/91	<1	---	---	---	---
MW-61	12/01/91	---	<1	<1	<1	413
MW-61	01/01/94	1.4	1.0	1.7	1.1	420
MW-61	04/01/94	<0.5	<0.5	0.5	<0.5	450
MW-61	07/01/94	3.2	<0.5	<0.5	0.8	387
MW-61	10/01/94	<5.0	23	14	160	400
MW-61	01/01/95	<0.5	0.7	2.5	0.8	439

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-65	09/01/91	<1	---	---	---	---
MW-65	12/01/91	---	<1	<1	<1	3
MW-65	04/01/93	---	---	<3	---	---
MW-65	07/01/93	<3	6	<3	3	4
MW-65	10/01/94	<0.5	<0.5	<0.5	<0.5	5.9
MW-69	09/01/91	2400	---	---	---	---
MW-69	12/01/91	2100	1100	150	4200	154
MW-69	07/01/92	568	56	1785	1966	15
MW-69	10/01/92	1598	71	<3	2879	43
MW-69	01/01/93	1284	49	309	1931	---
MW-79	01/01/95	110	<5.0	8.5	61	36.0
MW-79	04/01/95	14	<0.5	10	53	---
UIH	09/01/91	<1	---	---	---	---
UIH	12/01/91	<1	---	---	---	---
UIH	04/01/92	<1	<1	<1	<1	16.2
UIH	07/01/92	<1	<1	<1	<1	8.5
UIH	10/01/92	<1	<1	<1	<1	13.5
UIH	01/01/93	<1	<1	<1	<1	11.4
UIH	04/01/93	<1	<1	---	<1	13.5
UIH	07/01/93	<0.5	<0.5	<0.5	<0.5	12.9
UIH	10/01/93	<1	<0.5	<0.5	<0.5	10.3
UIH	01/01/94	<0.5	<0.5	<0.5	<0.5	11
UIH	04/01/94	<0.5	<0.5	<0.5	<0.5	14
UIH	07/01/94	<0.5	<0.5	<0.5	<0.5	8
UIH	10/01/94	<0.5	<0.5	<0.5	0.6	13
UIH	01/01/95	<0.5	<0.5	<0.5	<0.5	10
UIH	04/01/95	<0.5	<0.5	<0.5	<0.5	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-57	09/01/91	1600	---	---	---	---
MW-57	12/01/91	350	<10	<10	<10	32
MW-57	04/01/92	127	29	<3	16	117
MW-57	07/01/92	948	422	112	876	63
MW-57	10/01/92	15	33	<3	78	67
MW-57	01/01/93	21	40	165	19	131
MW-57	04/01/93	8	21	15	16	80
MW-57	07/01/93	6	8	<3	<3	72
MW-57	10/01/93	<0.5	1.6	<0.5	1.2	73.6
MW-57	01/01/94	<0.5	<0.5	<0.5	<0.5	64
MW-57	04/01/94	<0.5	<0.5	<0.5	<0.5	58
MW-57	07/01/94	0.7	<0.5	<0.5	1.8	48
MW-57	10/01/94	1.1	<0.5	<0.5	4.0	60
MW-57	01/01/95	4.3	<0.5	<0.5	1.3	35
MW-57	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-58	09/01/91	40	---	---	---	---
MW-58	12/01/91	90	40	20	80	124
MW-58	04/01/92	203	32	56	68	156
MW-58	07/01/92	178	58	32	44	149
MW-58	10/01/92	190	49	26	57	155
MW-58	01/01/93	192	30	23	39	175
MW-58	04/01/93	55	16	31	9	133
MW-58	07/01/93	25	42	14	13	133
MW-58	10/01/93	50	21	212	555	59
MW-58	04/01/94	<2.5	<2.5	7.4	27	48
MW-58	07/01/94	2.0	29	4.5	27	38
MW-58	10/01/94	6.7	<5.0	15.0	39	11

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-58	01/01/95	---	---	---	---	26
MW-58	04/01/95	2.2	<0.5	2.1	6.8	---
MW-59	09/01/91	540	---	---	---	---
MW-59	12/01/91	420	40	240	420	149
MW-59	04/01/92	42	12	20	20	52
MW-59	07/01/92	268	45	110	232	55
MW-59	10/01/92	99	37	44	46	69
MW-59	01/01/93	26	<3	55	10	46
MW-59	04/01/93	10	14	12	5	29
MW-59	10/01/93	10	13	89	433	56
MW-59	04/01/94	<2.5	<2.5	3.3	25	30
MW-59	07/01/94	13	69	0.5	73	<5.0
MW-59	10/01/94	4.1	3.7	23	37	25
MW-59	01/01/95	---	---	---	---	12
MW-60	09/01/91	33	---	---	---	---
MW-60	12/01/91	<1	<1	<1	<1	10
MW-60	04/01/92	5	9	<3	4	10
MW-60	07/01/92	17	1	<1	1	10
MW-60	10/01/92	32	109	36	57	14
MW-60	01/01/93	138	4	260	6	6
MW-60	04/01/93	17	16	<3	12	9
MW-60	07/01/93	<0.5	<0.5	<0.5	<0.5	10.7
MW-60	10/01/93	<0.5	1.0	0.5	1.0	13.5
MW-60	01/01/94	<0.5	<0.5	<0.5	<0.5	9.5
MW-60	04/01/94	<0.5	<0.5	<0.5	<0.5	9.0
MW-60	07/01/94	<0.5	1.3	<0.5	3.5	<5.0
MW-60	10/01/94	<0.5	0.6	0.6	4.9	9.1

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-60	01/01/95	<0.5	<0.5	<0.5	0.6	20
MW-60	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-61A	09/01/91	190	---	---	---	---
MW-61A	12/01/91	10	10	5	75	12
MW-61A	04/01/92	6	7	<3	13	12
MW-61A	07/01/92	60	<10	3	8	12
MW-61A	10/01/92	470	17	<3	2351	13
MW-61A	01/01/93	585	82	397	2368	12
MW-61A	04/01/93	2821	173	817	3993	15
MW-61A	04/01/94	<0.5	<0.5	0.5	3.8	10.7
MW-61A	07/01/94	<0.5	<0.5	<0.5	2.5	8
MW-61A	10/01/94	4.8	4.5	3.7	37	11
MW-61A	01/01/95	16	<5.0	30	220	32
MW-62	09/01/91	2200	---	---	---	---
MW-62	12/01/91	1400	<200	400	2400	247
MW-62	04/01/92	263	48	170	298	218
MW-62	07/01/92	357	13	184	301	236
MW-62	10/01/92	212	19	416	1692	285
MW-62	01/01/93	78	18	---	207	202
MW-62	04/01/93	33	15	16	24	207
MW-62	07/01/93	98	12	70	204	459
MW-62	10/01/93	10	20	20	32	181
MW-62	01/01/94	4.1	<2.5	13	44	160
MW-62	04/01/94	<2.5	<2.5	4.4	26	139
MW-62	07/01/94	4.3	32	7.5	26	129
MW-62	10/01/94	13	13	11	39	130
MW-62	01/01/95	---	---	---	---	152

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-62	04/01/95	7.5	30	12	30	---
MW-63	09/01/91	<1	---	---	---	---
MW-63	12/01/91	<1	<1	<1	<1	8
MW-63	04/01/92	5	6	<3	8	14
MW-63	07/01/92	12	28	3	20	7
MW-63	10/01/92	4	7	17	33	1
MW-63	01/01/93	12	4	<3	13	3
MW-63	04/01/93	<1	<1	<1	<1	5.6
MW-63	07/01/93	4	<3	<3	<3	3
MW-63	10/01/93	14	48	11	39	4
MW-63	01/01/94	<0.5	0.7	<0.5	0.7	5.7
MW-63	04/01/94	<0.5	<0.5	<0.5	<0.5	5.5
MW-63	07/01/94	1.0	9.6	1.4	13	<5.0
MW-63	10/01/94	<0.5	2.6	1.0	8.0	6.2
MW-63	01/01/95	<0.5	<0.5	<0.5	<0.5	9
MW-63	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-64	09/01/91	150	---	---	---	---
MW-64	12/01/91	130	<10	40	160	18
MW-64	04/01/92	245	32	82	331	13
MW-64	07/01/92	115	19	10	40	13
MW-64	10/01/92	37	61	<3	96	12
MW-64	01/01/93	6	2	1	4	10.2
MW-64	04/01/93	5	11	5	9	10
MW-64	07/01/93	2	<0.5	<0.5	<0.5	12.0
MW-64	10/01/93	18	12	<3	71	8
MW-64	01/01/94	1.7	<0.5	<0.5	0.9	10
MW-64	04/01/94	<0.5	<0.5	<0.5	<0.5	10

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-64	07/01/94	<0.5	0.5	<0.5	3.6	<5.0
MW-64	10/01/94	<0.5	0.5	0.6	5.6	10.2
MW-64	01/01/95	12	<0.5	5.1	13	20
MW-64	04/01/95	18	<0.5	18	41	---
MW-65A	09/01/91	680	---	---	---	---
MW-65A	12/01/91	150	15	<1	15	22
MW-65A	04/01/92	26	15	<3	12	33
MW-65A	07/01/92	413	235	93	551	18
MW-65A	10/01/92	11	<3	<3	67	35
MW-65A	01/01/93	3	<3	<3	11	35
MW-65A	04/01/93	4	9	3	8	26
MW-65A	07/01/93	<1	3	<3	<3	19
MW-65A	10/01/93	7	3	<3	<3	17
MW-65A	01/01/94	<0.5	<0.5	<0.5	<0.5	18
MW-65A	04/01/94	<0.5	<0.5	<0.5	<0.5	15
MW-65A	07/01/94	<0.5	<0.5	<0.5	<0.5	10
MW-65A	10/01/94	1.7	<0.5	<0.5	<0.5	18
MW-65A	01/01/95	<0.5	<0.5	<0.5	0.7	12
MW-65A	04/01/95	<0.5	<0.5	<0.5	0.5	---
MW-66	09/01/91	<1	---	---	---	---
MW-66	12/01/91	<1	<1	<1	<1	9
MW-66	04/01/92	4	7	<3	4	8
MW-66	07/01/92	8	25	7	11	8
MW-66	10/01/92	12	36	<3	34	8
MW-66	01/01/93	3	6	3	20	12
MW-66	04/01/93	<3	5	5	<3	8
MW-66	07/01/93	8	4	<3	<3	15

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-66	10/01/93	13	60	4	29	7
MW-66	01/01/94	<0.5	<0.5	<0.5	0.6	9.0
MW-66	04/01/94	<0.5	<0.5	<0.5	<0.5	8.7
MW-66	07/01/94	<0.5	0.6	<0.5	0.8	<5.0
MW-66	10/01/94	<0.5	3.0	1.5	17	8.8
MW-66	01/01/95	<0.5	<0.5	<0.5	<0.5	6
MW-67	09/01/91	280	---	---	---	---
MW-67	12/01/91	320	<10	<10	<10	7
MW-67	04/01/92	5	8	<3	12	6
MW-67	07/01/92	69	<10	20	116	3
MW-67	10/01/92	3	9	<3	73	9
MW-67	01/01/93	8	3	<3	12	4
MW-67	04/01/93	7	18	7	19	8
MW-67	07/01/93	7	<3	<3	<3	6
MW-67	10/01/93	<0.5	0.9	<0.5	1.1	9.5
MW-67	01/01/94	<0.5	<0.5	<0.5	<0.5	8.6
MW-67	04/01/94	<0.5	<0.5	<0.5	<0.5	7.6
MW-67	07/01/94	<0.5	0.6	<0.5	3.0	<5.0
MW-67	10/01/94	<0.5	<0.5	<0.5	4.3	7.9
MW-67	01/01/95	1.0	<0.5	<0.5	1.1	<5.0
MW-67	04/01/95	1.8	<0.5	<0.5	1.3	---
MW-68	09/01/91	240	---	---	---	---
MW-68	12/01/91	1900	4500	500	4000	39
MW-68	04/01/92	2470	3370	550	3866	82
MW-68	07/01/92	160	267	49	746	15
MW-68	10/01/92	2205	3327	<3	4721	30
MW-68	01/01/93	376	944	246	2376	27

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-68	04/01/93	650	1900	330	4000	27
MW-68	07/01/93	150	230	110	1100	28
MW-68	10/01/93	374	628	286	2398	27
MW-68	01/01/94	3000	820	1000	7700	31
MW-68	04/01/94	120	61	170	1300	30
MW-68	07/01/94	260	170	220	2000	29
MW-68	10/01/94	---	---	---	---	32
MW-68	01/01/95	---	---	---	---	34
MW-70	09/01/91	<1	---	---	---	---
MW-70	12/01/91	<1	<1	<1	<1	10
MW-70	04/01/92	3	17	<3	8	8
MW-70	07/01/92	<1	3	1	13	9.2
MW-70	10/01/92	11	40	63	60	17
MW-70	01/01/93	<3	<3	8	5	8
MW-70	04/01/93	9	20	<3	4	8
MW-70	07/01/93	<1	11	3	<3	8
MW-70	10/01/93	25	19	19	18	11
MW-70	01/01/94	<0.5	0.6	<0.5	<0.5	10
MW-70	04/01/94	<0.5	<0.5	<0.5	<0.5	9.5
MW-70	07/01/94	<0.5	<0.5	<0.5	<0.5	8.0
MW-70	10/01/94	1.2	4.3	1.3	12	9.5
MW-70	01/01/95	<0.5	2.3	<0.5	2.4	9.0
MW-70	04/01/95	<0.5	<0.5	<0.5	1.1	---
MW-71	10/01/93	8	5	4	16	15
MW-71	01/01/94	<0.5	1.3	<0.5	0.5	18
MW-71	04/01/94	<0.5	<0.5	<0.5	<0.5	17
MW-71	07/01/94	<0.5	3.0	0.7	6.2	<5.0

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-71	10/01/94	1.1	6.8	2.7	31	22
MW-71	01/01/95	<0.5	<0.5	<0.5	<0.5	<5.0
MW-72	04/01/94	<2.5	<2.5	4.7	15	32
MW-72	07/01/94	18	<0.5	5.1	2.8	32
MW-72	01/01/95	---	---	---	---	52
SW-01	09/01/91	<1	---	---	---	---
SW-01	12/01/91	<1	---	---	---	---
SW-01	04/01/92	5	6	<3	14	16
SW-01	07/01/92	17.5	69	<3	67	19
SW-01	10/01/92	16	15	<3	10	25
SW-01	01/01/93	6	<3	<3	<3	---
SW-01	04/01/93	<1	<1	<1	<1	20
SW-01	07/01/93	<0.5	<0.5	<0.5	<0.5	21
SW-01	10/01/93	<0.5	<0.5	<0.5	<0.5	21.3
SW-01	01/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	04/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	07/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	10/01/94	<0.5	<0.5	<0.5	0.6	22
SW-01	01/01/95	<0.5	<0.5	<0.5	<0.5	33
SW-01	04/01/95	<0.5	<0.5	<0.5	<0.5	---
SW-02	09/01/91	<1	---	---	---	---
SW-02	12/01/91	<1	---	---	---	---
SW-02	04/01/92	11	12	<3	5	10
SW-02	07/01/92	7	38	<1	24	20
SW-02	10/01/92	69	37	25	61	252
SW-02	01/01/93	47	6	7	9	344
SW-02	04/01/93	<1	<1	<1	<1	363

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

Date: 06/12/95

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
SW-02	01/01/95	<0.5	<0.5	<0.5	<0.5	81

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

Table 4
Data Analysis Summary for Shallow Groundwater
Marathon Oil Company
Indian Basin Remediation Project, New Mexico

	Benzene	Ethylbenzene	Toluene	Xylenes
Case Number	71-43-2	100-41-4	108-88-3	1330-20-7
Minimum Detected Concentration (µg/L)	0.6	0.5	0.6	0.8
Maximum Detected Concentration (µg/L)	6300	3000	5800	7137
Mean Concentration (µg/L)	874	145	224	738
Number of Wells Sampled	47	35	35	35
Number of Wells In Which Chemical Was Detected	43	30	31	31
Number of Samples	210	169	168	168
Number of Detects	165	118	103	127
Percent Detects	79	70	61	76

Table 5
Data Analysis Summary for Lower Queen Aquifer
Marathon Oil Company
Indian Basin Remediation Project, New Mexico

	Benzene	Ethylbenzene	Toluene	Xylenes
Case Number	71-43-2	100-41-4	108-88-3	1330-20-7
Minimum Detected Concentration (µg/L)	0.7	0.5	0.5	0.5
Maximum Detected Concentration (µg/L)	3000	1000	4500	7700
Mean Concentration (µg/L)	141	43	99	280
Number of Wells Sampled	17	17	17	17
Number of Wells In Which Chemical Was Detected	17	16	16	17
Number of Samples	211	193	194	194
Number of Detects	133	93	116	143
Percent Detects	63	48	60	74

Table 6
Summary of Toxicity Values
Indian Basin Remediation Project
Carlsbad, New Mexico

Chemical of Concern	CASE #	US EPA Cancer Class	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Type of Cancer	Oral Reference Dose (mg/kg-day)	Critical Toxic Effect/ Uncertainty Factor	Inhalation Reference Dose (mg/kg-day)	Critical Toxic Effect (Uncertainty Factor)
Benzene	71-43-2	A	2.9×10^{-2}	2.9×10^{-2} (a)	leukemia	NA	NA	NA	NA
Toluene	108-88-3	D	NA	NA	NA	2.0×10^{-1}	liver & kidney/1000	1.1×10^{-1} (b)	neurological
Ethylbenzene	100-41-4	D	NA	NA	NA	1.0×10^{-1}	liver & kidney/1000	2.9×10^{-1} (c)	developmental (300)
Xylenes	1330-20-7	D	NA	NA	NA	2.0	neurological/100	2.0 (d)	NA

Notes:

* All values from US EPA, 1994a; 1994b except where noted.
(a) Derived from inhalation unit risk of 8.3×10^{-6} $(\mu g/m^3)^{-1}$.
(b) Derived from reference concentration of 0.4 mg/m^3.
(c) Derived from reference concentration of 1.0 mg/m^3.
(d) Used oral reference dose for inhalation reference dose.
NA Not Applicable.

Table 7
Preliminary Exposure Pathway Matrix
Indian Basin Remediation Project
Carlsbad, New Mexico

Exposure Medium	Exposure Route	RECEPTORS										Remarks
		On-Site Worker		On-Site Resident[a]		Off-Site Resident		Hunter		Ecological Receptors		
		Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	
SOIL	Incidental ingestion	•	•	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	•	•	a Site is likely to remain industrial b Off-site soils are not impacted c No detectable COPC levels in off-site wells d Based on potential migration of COPCs to off-site ranch wells for domestic water supply e Groundwater is used for process water only. This exposure pathway is considered insignificant. Potential exposure only through accidental spills, discharges, and spray from cooling tower f Based on potential migration of COPCs to off-site natural spring g On-site surface soils outside of gas plant are not impacted h Soil COPCs are highly volatile
	Inhalation of volatiles/dust emissions	•	•	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	INC[h]	INC[h]	
	Dermal contact	•	•	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	•	•	
GROUNDWATER	Incidental ingestion	•[e]	•[e]	INC	INC	INC[c]	•[d]	INC[g]	INC[g]	NA	NA	
	Inhalation of volatiles	•[e]	•[e]	INC	INC	INC[c]	•[d]	INC[g]	INC[g]	NA	NA	
	Dermal contact	•[e]	•[e]	INC	INC	INC[c]	•[d]	INC[g]	INC[g]	NA	NA	
SURFACE WATER	Incidental ingestion	NA	NA	NA	NA	NA	NA	NA	NA	•[f]	•[f]	
	Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	INC	INC	
	Dermal contact	NA	NA	NA	NA	NA	NA	NA	NA	INC	INC	

• = Potentially complete NA = Not Applicable INC = Incomplete

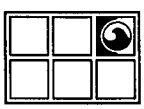
GROUNDWATER TECHNOLOGY

Table 8
Water Supply Wells in the Vicinity of the Indian Basin Remediation Project
Carlsbad, New Mexico

Figure 3 Designation	SEO Location Description	Well Owner	Well Depth (ft)	Use	Formation/Aquifer	Depth-to-water (ft)	Date of Msrmnt
1	21.23.2.33434	Forrest Lee	NS	Stock	possible Queen	146.8	10/6/87
2	21.23.14.21221	Forrest Lee	25	Stock	alluvial of Roswell Basin*	14.6	1/12/54
3	21.23.22.241444	Dean Lee	256	Stock	lower Queen	213	11/3/92
4	21.23.24.22221	David Bradley	>31	Stock	alluvial of Carlsbad Basin	13	11/3/92
5	21.24.23.332232	Walter Biebelle	145	Stock/Domestic	alluvial of Carlsbad Basin/Seven Rivers	NS	NS
6	21.24.23.43233	William Shafer	300	Domestic	alluvial of Carlsbad Basin/Yates	50	8/17/65
7	21.24.23.43411	Earnest Shafer, Sr.	60	Domestic	alluvial of Carlsbad Basin	54	10/6/87
8	21.24.26.22230	Gerold Elmore	66	Domestic	alluvial of Carlsbad Basin	38	8/17/65
9	21.24.26.24323	William Shafer	69	NS	alluvial of Carlsbad Basin?	40	11/19/92
10	21.24.28.23232	William Shafer	138	Stock	alluvial of Carlsbad Basin/upper Queen	83	11/4/92
11	21.24.29.221112	Shafer (Biebelle)	70	Commercial OWD/ stock/domestic	alluvial of Carlsbad Basin	37	11/3/92
12	20.24.25.22233	Foster	275	Stock	Queen?**	265	2/11/94
13	20.24.35.11231	Foster	NS	Stock	Unknown	167	1/17/63
14	20.25.32.41	Howell	NS	NS	Unknown	NS	NS

Notes:

Data based on well logs on file at NMSEO, Roswell office (information provided by Marathon).
NS = Not specified
SEO = State Engineer's Office
* = SEO files indicate completion in Grayburg
** = SEO files indicated completion in Artesia Group, but SEO field representative indicates that this formation designation is used when the aquifer is unknown



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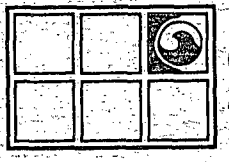

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WORKPLAN FOR RISK ASSESSMENT TO ESTABLISH ALTERNATIVE ABATEMENT STANDARDS MARATHON OIL COMPANY INDIAN BASIN REMEDIATION PROJECT 18 MILES NORTHWEST OF CARLSBAD NEW MEXICO

Project No. 053350065

September 25, 1995

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FIGURES

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TABLES

1.0 INTRODUCTION

This document presents the work plan for a site-specific risk assessment. The work plan was prepared by Groundwater Technology, Inc. on behalf of Marathon Oil Company (Marathon). This work plan details the approach, methods, and assumptions to be used in the assessment of human health and environmental risks associated with the presence of natural gas condensate in the vadose zone and groundwater beneath Marathon's Indian Basin Remediation Project (IBRP or the site) located 18 miles northwest of Carlsbad, New Mexico. A site location map is presented in Figure 1.

1.1 Objectives

The purpose of the risk assessment is to evaluate baseline human health and environmental risks associated with the presence of natural gas condensate beneath the site. If the results of the assessment indicate risks exceed acceptable threshold limits, then alternative abatement standards will be developed according to proposed New Mexico regulations and U.S. Environmental Protection Agency guidelines for development of health-based remediation goals.

1.2 Regulatory Framework

The New Mexico Water Quality Control Commission (NMWQCC) has proposed regulations which would allow a party to petition the commission for approval of alternative abatement standards. The proposed regulatory framework will allow establishment of alternative abatement standards acceptable in New Mexico based on risk assessment methodology. The framework was presented in NMWQCC, Regulation Amendments, proposed by the New Mexico Environment Department, Ground Water Protection and Remediation Bureau in 1994.

The criteria established by the NMWQCC for setting groundwater alternative abatement standards include:

- Submittal of a written petition to the commission for approval of alternative abatement standards; and,
- The petition may utilize fate and transport evaluations and risk assessment in accordance with accepted methods to justify the proposed alternative abatement standards.

Commonly accepted methods for human health and environmental risk assessments are presented in the following guidance documents and will be used for this risk assessment:

- Risk Assessment Guidance for Superfund (RAGS) Volume I - Part A: Human Health Evaluation Manual; Part B: Development of Risk-Based Preliminary Remediation Goals; Part C: Evaluation of Remedial Alternatives and all the latest supplemental guidance documents prepared by EPA (USEPA, 1989a; USEPA, 1991a; USEPA, 1991b; USEPA, 1991c);

- Risk Assessment Guidance for Superfund, Volume II - Environmental Evaluation Manual (USEPA, 1989b); and

- Framework for Ecological Risk Assessment (USEPA, 1992a).

Other guidance manuals such as U.S. EPA's Dermal Exposure Assessment: Principles and Applications (U.S. EPA, 1992b) will be used as appropriate.

1.3 Hydrogeologic Setting

The IBRP area is underlain by the Permian-aged Queen Formation, a carbonate facies consisting mainly of limestone, dolomite, and sandstone. The formation approaches 600 feet in thickness. The basal 100 feet of the Queen Formation is sandstone as is the top 50 feet of the formation. The remaining section of the Queen consists of alternating sandstone, dolomite, and limestone (Cox, 1967). Outcrops of the Queen Formation in the vicinity of the IBRP are highly fractured and parted at bedding planes.

Alluvial deposits consisting of clayey silt, large boulders, gravel, and cobbles directly overlie the Queen Formation in the vicinity of the IBRP. These alluvial deposits range from 0 to approximately 25 feet in thickness. The deposits are comprised of 5 to 10 feet of clays and silty clays underlain mainly by boulders which are predominately clast supported with clay, sand, gravel, and cobbles comprising the matrix. The boulders are primarily limestone or dolostone in composition.

Two aquifers have been encountered at the site: 1) The "shallow zone" which is interpreted as occurring in fluvial gravels and the upper Queen Formation at depths between approximately 18 and 60 feet below grade depending upon topography; and 2) the Lower Queen Formation regional aquifer which occurs between 136 and 200 feet below grade depending upon topography. The Lower Queen aquifer occurs in fractured limy sandstone and dolomite, is confined to unconfined, and moderate to high yielding. Gradient of the upper zone is to the southeast (generally aligning

with the top of the dolomite), and the gradient of the Lower Queen is relatively flat and to the northeast.

1.4 Hydrocarbon Distribution

In April 1991, a condensate and produced water gathering line release was discovered by Marathon personnel in Rocky Arroyo south of the Indian Basin Gas Plant. The magnitude of the line release was estimated at 35,000 barrels (bbls) of condensate and 20,000 bbls of brine over a six-month period. Since the discovery of the release, various site assessments have been conducted by Marathon and its consultants. Eighty (80) groundwater monitor wells and 27 shallow zone sumps (for product recovery) have been installed (Figure 2). Quarterly groundwater monitoring is currently conducted in 21 Lower Queen wells and 25 shallow zone wells (if wells contain water). Groundwater samples are analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), and chlorides. These indicator chemicals were selected based on the chemical composition of produced water and condensate. Table 1 presents a summary of the weight contribution of BTEX in natural gas condensate.

Phase-separated condensate and dissolved hydrocarbons (historical maximum benzene concentrations of 6,300 ug/l) have been detected in shallow zone wells located on the western one-half of the project site and mainly north of Rocky Arroyo (Figure 2). As of the second quarter of 1995, phase-separated condensate was detected in two shallow zone wells, product recovery continued in one well, and benzene concentrations in all shallow zone wells ranged from less than 0.5 to 650 ug/l.

The dissolved-phase plume in the Lower Queen aquifer at the site is approximately two miles long and 1.5 miles wide. As of the second quarter of 1995, phase-separated condensate is present in three of the Lower Queen monitor wells and benzene concentrations of less than 0.5 to 16 ug/l were detected in the remaining Lower Queen wells sampled.

Much of the condensate may still be in the soil and/or fractures. Volatile organic compound concentrations, as measured on drill cuttings with an organic vapor analyzer during installation of the wells, ranged from 58 to 418 parts per million (ppm) for samples collected at 18 to 70 feet from the shallow zone wells, and from 34 to greater than 2,000 ppm for samples collected from the Lower Queen at depths of approximately 25 feet to greater than 200 feet.

Cumulative summaries of analytical results for the shallow groundwater zone and the Lower Queen aquifer are presented in Tables 2 and 3 respectively. Table 2 includes data from two private groundwater production wells (designated as Biebelle and Lyman) and a spring (designated as UIH).

1.5 Existing Treatment Systems

1.5.1 Groundwater Treatment and Product Recovery

A product-only skimming system is deployed in shallow zone well MW-69. In addition, contaminated groundwater and free-phase hydrocarbon (condensate) from seven Lower Queen recovery wells are currently recovered as total fluids and transported through underground piping to a treatment compound located east of the Indian Basin Gas Plant. In July 1995, a dual phase product/water table depression pump system was installed in well MW-75. The treatment compound includes two aboveground tanks, an oil/water separator used as a storage vessel, and an air stripper. Condensate is skimmed from one of the two aboveground tanks and transferred to the oil/water separator which serves as a condensate storage vessel. Groundwater containing dissolved-phase hydrocarbon is transferred from the first tank to the second aboveground tank. Groundwater from the second tank is pumped through the air stripper to remove dissolved-phase volatile organic compounds. Stripped volatile organic compounds are vented to the atmosphere through a stack. Treated groundwater is transferred from the air stripper to the 1,200-barrel aboveground steel tank and is used as process water for the gas plant.

The measured volume of condensate recovered from Lower Queen groundwater during the second quarter of 1995 was 10.1 barrels. Cumulative condensate separated from the recovered groundwater since free-phase hydrocarbon separation began in April 1992 through the second quarter of 1995 (three years) is 119.1 barrels.

Total condensate recovery from the Lower Queen and shallow zone for the second quarter of 1995 was 14.7 barrels. Cumulative condensate recovered to date excluding the volume volatilized by the air stripper and vapor extraction system is 3,581.1 barrels or 10.2% of the total estimated 1991 spill volume.

1.5.2 Vapor Extraction System

From March 1992 to May 1994, Marathon operated a soil vapor extraction system (SVES) at various shallow zone wells to remove condensate in the shallow unsaturated zone. An estimated 119 barrels of condensate (equivalent) were removed during system operation (Personal communication, Robert J. Menzie, Jr., Marathon). On May 5, 1994, the vapor extraction system was shut down when Marathon determined that a New Mexico Air Pollution Control Bureau air emission permit is required for system operation. The system has not operated since then and is being stored at the gas plant.

2.0 SCOPE OF WORK

The following section describes the planned scope of work for the risk assessment and documents the approach, methods, and assumptions to be used.

2.1 Data Analysis

All available data will be summarized in tables and analyzed statistically for use in the risk assessment. The data analysis summary table includes (1) minimum detected concentrations, (2) maximum detected concentrations, (3) the arithmetic mean, standard deviation, and 95% Upper Confidence Limits (95% UCL), (4) the number of monitor wells sampled, (5) number of wells in which each chemical has been detected, (6) the total number of samples analyzed, (7) the total number of times each chemical was detected, and (8) the frequency of detects for each chemical.

A preliminary data analysis has been performed to provide an initial "picture" of the groundwater impacts. This preliminary analysis includes all groundwater data available at the time this work plan was completed with the exception of data from two private groundwater production wells (Biebelle and Lyman), because no analytes have ever been detected in samples from these wells. The results of this analysis and a summary of the available data is provided in Tables 4 and 5 for the shallow saturated zone and the Lower Queen Aquifer, respectively. The final data analysis will evaluate (1) the relevance of "old" data (i.e., data collected more than 2 years ago), (2) the appropriateness of including data from each monitor well, and (3) the appropriateness of utilizing "t" statistics such as arithmetic means and 95% UCLs for exposure point concentrations.

In addition to data from the groundwater monitor wells, data have been collected from the treatment system influent and effluent (this data was excluded from the preliminary data analysis). While influent data are not relevant for risk assessment purposes, the treatment system effluent is used at the Indian Basin Gas Plant as process water (personal communication with Mr. Robert Menzie, Marathon). Therefore, effluent data may be used in the estimation of exposure point concentrations for plant workers if the use of this water results in potentially complete exposure pathways, or unless this pathway is eliminated through process changes.

2.2 Selection of Chemicals of Potential Concern

Based on the composition of condensate (see Table 1), availability of toxicity data, and the existing groundwater monitoring results, BTEX are chemicals of potential concern (COPC) for natural gas condensate. Other potential COPCs for many petroleum products include the polynuclear aromatic hydrocarbons (PAHs). However, based on the information presented in Table 1 and the results of

analyses for PAHs in treatment system influent samples (March and September 1994), these chemicals were not detected. Therefore, this risk assessment will utilize BTEX as the only COPCs.

2.3 Toxicity Assessment

Toxicity information for BTEX is readily available from the U.S. EPA's Integrated Risk Information System (IRIS). IRIS is an on-line data base which includes information on the potential effects associated with exposure and toxicity criteria for hundreds of chemicals (e.g., reference doses and cancer slope factors). IRIS contains the most current information for BTEX. Table 6 contains a summary of toxicity information for BTEX.

2.4 Conceptual Exposure Model (Human and Environmental Receptors)

The conceptual exposure model summarizes information on the extent and magnitude of chemical impacts, the properties of the COPCs which affect chemical movement in the environment, the receptors identified as being present or potentially present, the use of the impacted resources (i.e., groundwater), the results of the chemical fate and transport analysis, and other factors which affect potential exposures. This information is then used to identify the potentially complete exposure pathways for each receptor. The conceptual exposure model will exclude unrealistic site uses, receptor populations, and exposure pathways. For example, if residential use of the site is shown to be an unrealistic future property use, then residential exposures to on-site chemicals will not be evaluated.

Currently available information was used to complete a preliminary exposure analysis. All the pathways that were evaluated for completeness are presented in Table 7. The potential exposure to groundwater is based on the locations of the water supply wells in the vicinity of the IBRP (see Table 8 and Figure 3) and the land use. The site information and analytical data support the selection of the pathways that are deemed complete. The exposure routes through which the identified receptors may come in contact with the COPCs are indicated in Table 7.

The exposure analysis indicates that potential human receptors include employees of the IBGP and off-site residents who use the groundwater. Water supply wells and land use in the vicinity of the site are listed in Table 8.

The recreational user is another potential receptor that was evaluated for the risk assessment. The site setting does not support the scenario that the area is or may be a potential site for recreational activities except hunting. The prey generally consist of mammals, birds, and reptiles which suggest that the potential exposure of the hunter is through the food chain. Reptiles have the highest extent

of exposure to surface soil only. Birds are generally transient species and are either granivorous or insectivorous. Exposure to surface soil may occur via incidental ingestion of wind-blown particles during preening activities. The mammals have animal exposure to surface soil, but have more exposure through the food chain.

The evaluation demonstrates that the potential exposure of a hunter to soil COPCs is dependent on the prior exposure of the prey. The high volatility and biodegradability of BTEX indicates that these compounds would not persist long enough in the soil to pose significant exposure. In addition, these compounds have demonstrated a low potential for bioaccumulation in biota. Therefore, the exposure pathway from COPCs in soil to the prey is incomplete. Consequently, the potential exposure of the hunter to soil COPCs is also incomplete. Similar rationale is applied for concluding that the exposure of a hunter to groundwater COPCs is incomplete. The exposure evaluation of a hypothetical hunter is presented in Table 7.

Some of the off-site areas may be used for grazing by cattle. The analysis of the potential exposure of persons consuming cattle is the same as for the hunter consuming his prey. Due to the high volatility and biodegradability of BTEX and the low potential for bioaccumulation, the potential exposure pathway through ingestion of beef products is considered incomplete for both current and future scenarios. This pathway is not presented in Table 7.

An evaluation of the potential exposure to ecological receptors is also presented in the Table 7. Before the risk assessment is conducted, information will be culled from the literature regarding the occurrence or potential occurrence of ecological receptors. The environmental setting will also indicate whether there are suitable ecological habitats in the IBRP site. The site-specific information will determine whether there are complete pathways that will be evaluated to assess biological effects.

2.5 Exposure Assessment: Models and Assumptions

Environmental fate and transport modeling will be performed in order to evaluate the potential migration of COPCs in both the saturated and unsaturated zones. The purpose of the modeling is to (1) verify if potential exposure pathways are complete, (2) verify points of potential exposure, and (3) estimate exposure point concentrations in air and groundwater. Potential exposure points of particular interest for this site include the downgradient private wells (identified in the data base as Biebelle and Lyman) and the downgradient spring (UIH).

An evaluation of available computer models will be completed in order to identify the most appropriate model(s) for this site. The geology/hydrogeology (i.e., fractured bedrock) and the potential for mixed-phase flow (i.e., vapor phase, free phase and dissolved phase) result in unusual complexities for use of computer simulations at this site. Therefore, the model selection process will account for these added complexities. Preliminary evaluations of available models indicate that the TRAFRAP-WT (Transport in Fractured Porous Media Under Water Table Boundary Conditions) numerical model (International Ground Water Modeling Center) is the likely choice for this assessment.

The TRAFRAP-WT program features the following:

(1) Fractured porous media may be represented by a discrete-fracture or a dual porosity approach, or a combination of both.

(2) TRAFRAP-WT can simulate the flow of two-dimensional horizontal or vertical plane using cartesian coordinates or using axisymmetric cylindrical coordinates.

(3) It simulates both the steady and transient state flow and solute transport.

(4) TRAFRAP-WT calculates the steady velocity field prior to solving for the concentration of any solute. This means that the flow and transport can not be solved in a single simulation.

(5) TRAFRAP-WT can handle various model geometries and element shape functions.

(6) In TRAFRAP-WT, the solute transport equation includes both the convection and/or dispersion/diffusion in fractured and/or porous media blocks.

Exposures associated with potentially complete exposure pathways will be estimated for each receptor. Exposure estimates will be made for both realistic (i.e., most likely) and upper bound (i.e., Reasonable Maximum) exposure assumptions for each identified receptor. Where appropriate, USEPA default exposure assumptions for Reasonable Maximum Exposures (RME) and Most Likely Exposures (MLE) will be used. However, if site-specific information indicates that default assumptions are overly conservative, then site-specific information will be compiled and used in the exposure estimates. For example, based on the use of treatment system effluent, exposure parameters for IBGP employees may be identified, documented, and used in the exposure assessment in place of standard USEPA assumptions for commercial workers.

All exposure models will be taken from appropriate USEPA risk assessment guidance manuals including but not limited to:

- Risk Assessment Guidance for Superfund (RAGS) Volume I

  - Part A: Human Health Evaluation Manual (USEPA, 1989a);
  - Part B: Development of Risk-Based Preliminary Remediation Goals (USEPA, 1991b;
  - Part C: Evaluation of Remedial Alternatives (USEPA, 1991c); and
  - the latest supplemental guidance documents prepared by USEPA (USEPA, 1991c).

- Risk Assessment Guidance for Superfund, Volume II - Environmental Evaluation Manual (USEPA, 1989b).

- U.S. EPA's Dermal Exposure Assessment: Principles and Applications (U.S. EPA, 1992b).

The endpoint of the exposure assessment is to estimate the total dose, via all complete exposure pathways, to which each receptor may be exposed.

2.6 Risk Characterization

The risk characterization will present the results of the human health risk assessment in both quantitative and qualitative terms. Quantitative estimates of cancer and non-cancer risks will be calculated by combining the toxicity criteria and exposure estimates. The quantitative endpoints will be cancer risk estimates and non-cancer Hazard Indices (HIs) for each potentially complete exposure pathway. Total cancer risks and HIs for each receptor will be calculated by summing the appropriate pathway-specific cancer risks and HIs. The total estimated cancer risks and HIs for each chemical will be compared to established acceptable threshold limits.

> In New Mexico the acceptable cancer risk threshold = 1 in 100,000.
> (NMWQCC 82-1, Part 1-101)

The commonly accepted thresholds for HIs range from 0.1 to 10. Risk results will also be qualitatively evaluated by incorporating the uncertainties inherent in the risk assessment methods and assumptions.

2.7 Ecological Assessment

The ecological assessment for the site will be conducted according to the guidelines of the "Framework for Ecological Risk Assessment" (EPA, 1992a). The framework outlines three phases of an ecological risk assessment: (1) problem formulation; (2) analysis; and, (3) risk characterization. At this specific site, the ecological risk assessment will be performed qualitatively. Thus, the ecological risk characterization will be based on the result of a qualitative analysis.

2.7.1 Problem Formulation

In the problem formulation phase, the ecological characteristics of the site are defined by identifying the chemicals and the biological receptors that will be evaluated in the ecological assessment. The chemicals of potential ecological concern (COPECs), as stated in Section 2.2, are BTEX. Information collected from a site survey, available literature and public reports, and information from the appropriate State and Federal agencies (e.g., New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service) will provide the basis for the identification of the habitats (aquatic and terrestrial) at the site, and the species occurring at the site, the threatened and endangered species, species which are of economic or social value (e.g., game species), and species identified as "sensitive" receptors. Wildlife that may potentially occur in the area will be extrapolated from the habitats identified at the site and in available published sources.

The receptors to be evaluated in the ecological assessment will be selected based on the following criteria:

a) Representative of guilds or trophic levels;
b) Known occurrence and prevalence in the vicinity of the site;
c) Potential or documented exposure to site-related chemicals;
d) Availability of ecotoxicological information on the ecological receptors or surrogate species;
e) Listed as a federal or state threatened or endangered species;
f) Game species or commercially important species;
g) Species with documented sensitivity to the COPECs;
h) Limited mobility of home range that limits exposure to sources of COPECs;
i) A key component of the food chain.

The endpoint of the problem formulation is the generation of a conceptual site model. The conceptual model is a preliminary, general representation of the relationship between an identified COPEC, the potential ecological receptors, and the potential complete exposure pathways through

which receptors may be affected by the COPECs. The following discussion presents a preliminary conceptual exposure model for the site.

Plants and microbes may be exposed to COPECs in the surface soil (0 to 0.5 feet) and shallow soil (0 to 2.0). Invertebrates and reptiles may be exposed to contaminants in surface soil and burrowers may be exposed to contaminants in the shallow soil. Ingestion of surface and shallow soil is the primary exposure pathway for small mammals. Ingestion occurs during feeding, burrowing, and when animals clean their fur. Birds that feed on the ground will be exposed to COPECs in the surface soil through soil ingestion during feeding and preening. Dermal exposure is not anticipated to result in significant exposures for large or small mammals and birds due to the protective effect of the fur or feathers. Invertebrates and reptiles may be exposed to soil contaminants via the dermal pathway.

Groundwater exposure routes to ecological receptors depend on the availability of groundwater to plants and animals. Only groundwater less than 5 feet below ground surface (bgs) will be assumed to be available to plant roots.

Aquatic biota may be exposed to dissolved contaminants wherever surface water is present. Terrestrial invertebrates are not likely to have any significant exposure to surface water. Both small and large mammals may be exposed to dissolved and particulate contaminants in the water by drinking.

A plant or animal that has been exposed to chemicals may accumulate the compounds in their tissues and transfer the chemical to consumers and predators though the food chain pathway.

2.7.2 Analysis Phase

The analysis phase characterizes the exposure and the ecological effects. The exposure characterization combines information on the spatial distribution of the BTEX and the potentially complete exposure pathways to the ecological receptors. The exposure analysis considers the fate and transport properties of BTEX. BTEX, when released to the soil and water, rapidly volatilize near the surface. BTEX is not expected to significantly adsorb to sediment and does not bioconcentrate in aquatic organisms. Based on the exposure analysis, it is unlikely that there is a complete exposure pathway from the points where BTEX has been detected to the potential ecologic receptors. The fate and transport analysis results will be used to identify if BTEX may migrate to points where ecological receptors may be exposed.

2.7.3 Risk Characterization

The risk characterization is the final phase in an ecological assessment and consists of the evaluation of potential adverse effects on ecological receptors due to exposure to COPECs. Based on the information presented in the preceding phases, problem formulation and analysis, there does not currently appear to be any complete exposure pathways through which receptors may contact the BTEX detected at the IBRP site. Environmental fate and transport modeling results will be used to evaluate the potential for future exposures to occur. Based on the information currently available a quantitative ecological risk assessment does not appear to be warranted for this site.

2.8 Calculation of Alternative Abatement Standards

If the human health or ecological risk assessments indicate risks exist above acceptable threshold levels, then alternative abatement standards will be calculated in a manner consistent with USEPA guidance and New Mexico's proposed regulations for calculation of alternative abatement standards.

3.0 REFERENCES

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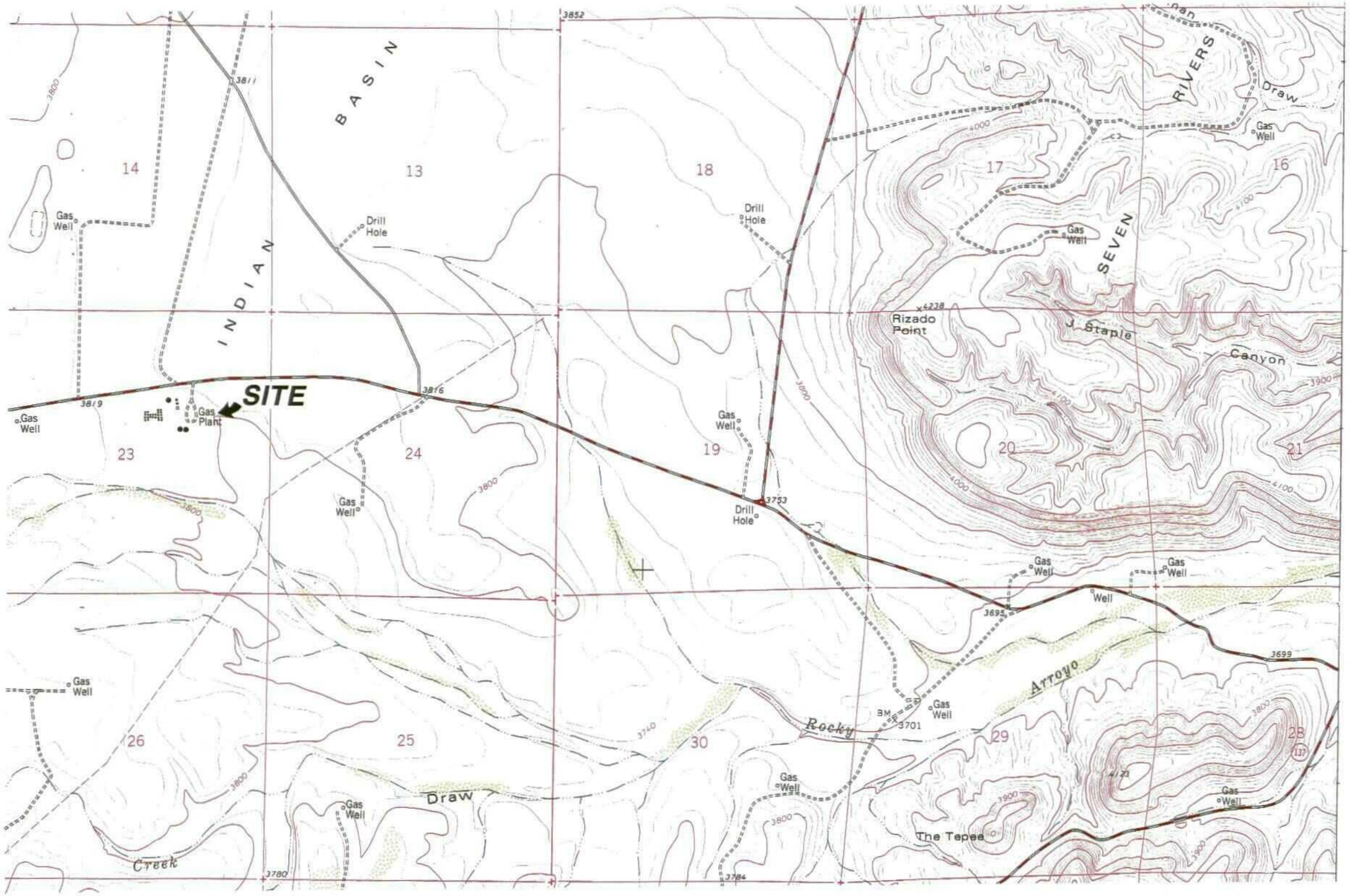
FIGURES

NO.	DATE	BY	REVISION



NEW MEXICO

QUADRANGLE LOCATION

N

1,000 0 2,000

SCALE IN FEET

MARTHA CREEK, N. MEX.

NE/4 BANDANNA POINT 15' QUADRANGLE

N3222.5–W10430/7.5

1978

AMS 5048 I NE – SERIES V881

CLIENT: **MARATHON**

PROJECT: **MARATHON / INDIAN BASIN REMEDIATION PROJECT**

LOCATION: **18 MILES NW OF CARLSBAD, N.M.**

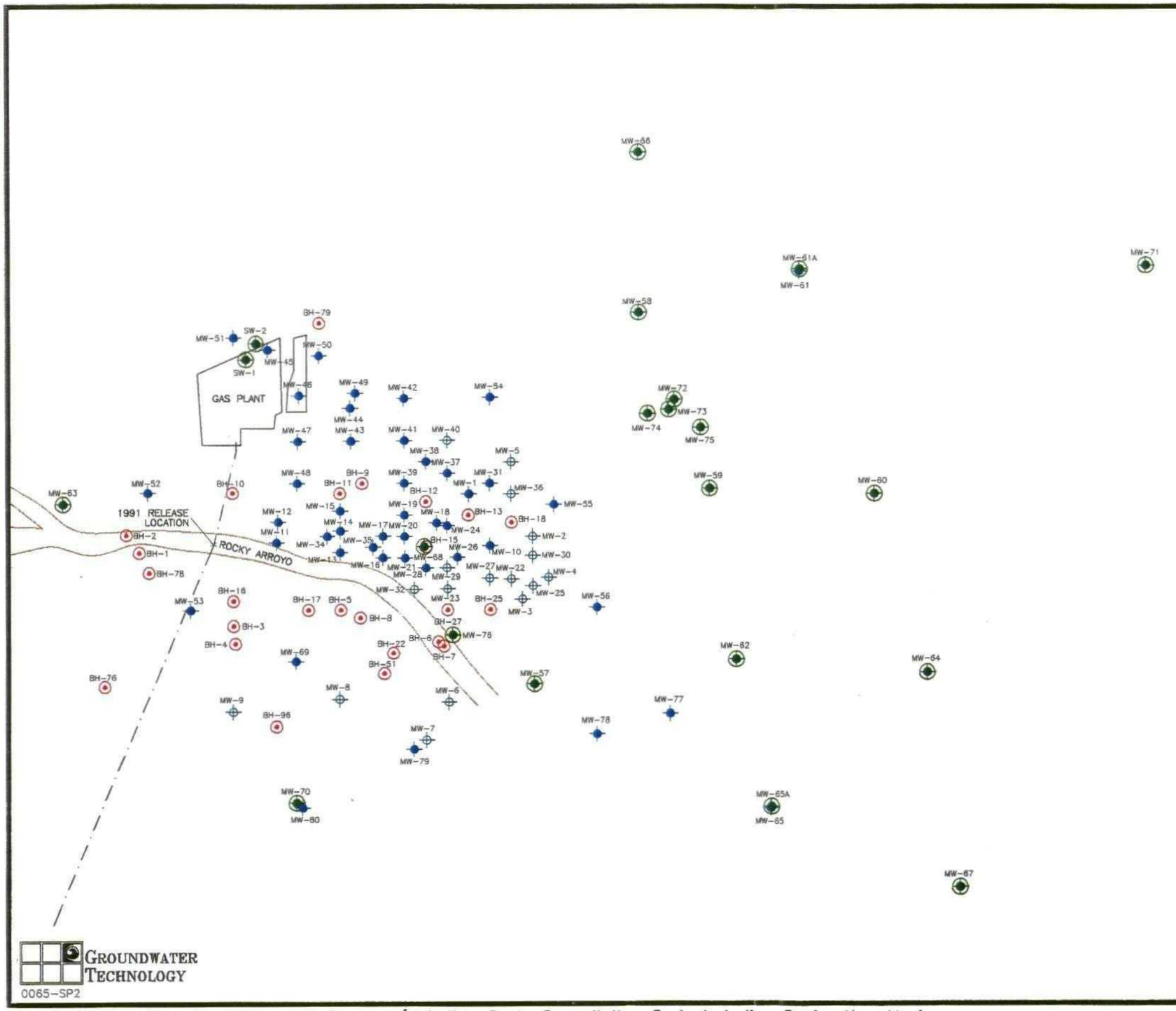
GROUNDWATER TECHNOLOGY

2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

SITE LOCATION/ TOPOGRAPHIC MAP

DESIGNED BY:	DETAILED BY:	CHECKED BY:
VM	JU	VM
DATE: 6/26/95	FILE: Marathon Oil	
PROJECT NO.: 053350065	CONTRACT:	
DRAWING:	REVISION:	

FIGURE 1



EXPLANATION

- UPPER AQUIFER MONITOR WELL
- LOWER AQUIFER MONITOR WELL
- MONITOR WELL (DRY)
- BOREHOLE
- CONDENSATE LINE

GROUNDWATER TECHNOLOGY

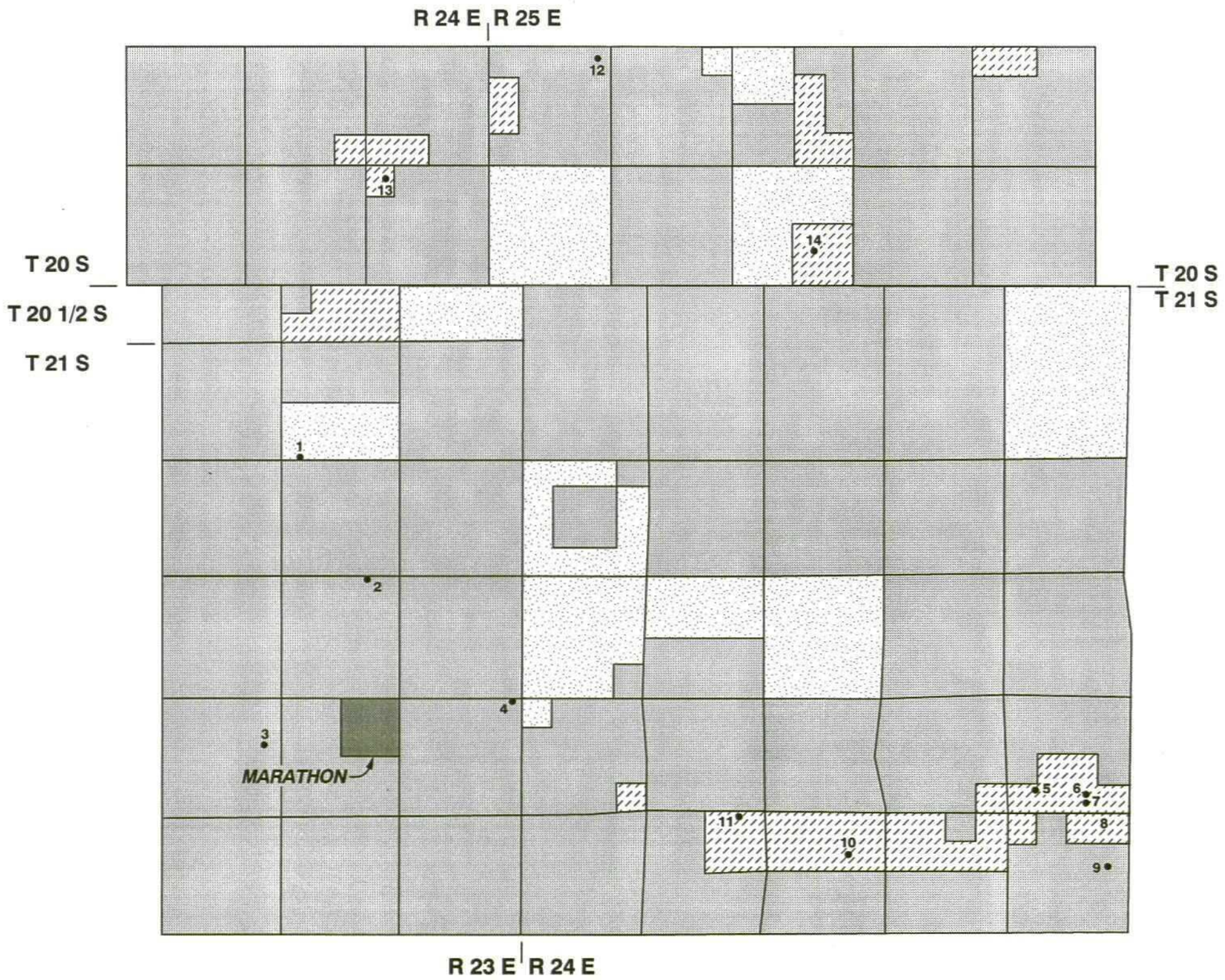
0065-SP2

MARATHON OIL COMPANY
INDIAN BASIN REMEDIATION PROJECT
INDIAN BASIN, NEW MEXICO
053350065

DRAWN BY: S. BROTHERS DATE: 08-08-95
DRAFTED BY: DEN HOLMES DATE: 08-08-95
CHECKED BY: DATE: 8.8.95

SITE PLAN SHOWING LOCATION OF MONITOR WELLS
FIGURE 2

Figure 2. Site plan of Marathon Oil Company's Indian Basin Remediation Project, Indian Basin, New Mexico.



LEGEND

1● WATER SUPPLY WELL LOCATION (SEE TABLE 8 FOR DETAILS)

MARATHON PROPERTY (INDUSTRIAL)

FEE (PRIVATE) LAND (RESIDENTIAL, GRAZING)

STATE LAND (RECREATIONAL, INDUSTRIAL, GRAZING)

FEDERAL LAND (RECREATIONAL, INDUSTRIAL, GRAZING)

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SCALE

INDIAN BASIN REMEDIATION PROJECT

PROJECT NO.: 053350065 | LOC.: 18 MILES NW OF CARLSBAD, NM

LAND USE AND WATER SUPPLY WELLS IN THE VICINITY OF THE INDIAN BASIN REMEDIATION PROJECT

PRIVILEGED & CONFIDENTIAL
ATTORNEY WORK PRODUCT

DRAWN BY: JU	DATE: 7/28/95	CHECKED BY: SDB	DATE: 8/8/95
FOLDER: Marathon Oil FILE: LAND USE		APPROVED BY: SDB	DATE: 8/8/95

FIGURE 3

GROUNDWATER TECHNOLOGY

TABLES

Table 1

BTEX Concentration in Natural Gas Condensate[1]
Marathon Oil Company
Indian Basin Remediation Project

Compound	Concentration[2] (mg/kg)	% in Condensate
Benzene	2,200	0.24
Toluene	13,000	1.40
Ethylbenzene	2,800	0.30
Total Xylenes	25,000	2.69
Fuel Hydrocarbons (as condensate)	930,000	--

(1) Sample collected from inlet condensate tank at IBGP, April 7, 1994.
(2) By EPA Method 8015M (C6-C14).

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
BIEBBLE	04/01/92	<1	<1	<1	<1	13.5
BIEBBLE	07/01/92	<1	<1	<1	<1	7.8
BIEBBLE	10/01/92	<1	<1	<1	<1	10.1
BIEBBLE	01/01/93	<1	<1	<1	<1	10.6
BIEBBLE	04/01/93	<1	<1	<1	<1	11.4
BIEBBLE	07/01/93	<0.5	<0.5	<0.5	<0.5	13.3
BIEBBLE	10/01/93	---	<0.5	<0.5	<0.5	10.4
BIEBBLE	01/01/94	---	<0.5	<0.5	<0.5	11
BIEBBLE	04/01/94	---	<0.5	<0.5	<0.5	10.5
BIEBBLE	07/01/94	---	<0.5	<0.5	<0.5	15
BIEBBLE	10/01/94	<0.5	<0.5	<0.5	<0.5	13
BIEBBLE	01/01/95	<0.5	<0.5	<0.5	<0.5	8
BIEBBLE	04/01/95	<0.5	<0.5	<0.5	<0.5	---
LYMAN	04/01/92	<1	<1	<1	<1	12.6
LYMAN	07/01/92	<1	<1	<1	<1	14.6
LYMAN	10/01/92	<1	<1	<1	<1	15.5
LYMAN	01/01/93	<1	<1	<1	<1	13.2
LYMAN	04/01/93	<1	<1	<1	<1	13.0
LYMAN	07/01/93	<0.5	<0.5	<0.5	<0.5	15.0
LYMAN	10/01/93	---	<0.5	<0.5	<0.5	14.6
LYMAN	01/01/94	<0.5	<0.5	<0.5	<0.5	13
LYMAN	04/01/94	<0.5	<0.5	<0.5	<0.5	12.5
LYMAN	07/01/94	<0.5	<0.5	<0.5	<0.5	12
LYMAN	10/01/94	<0.5	<0.5	<0.5	<0.5	14
LYMAN	01/01/95	<0.5	<0.5	<0.5	<0.5	11
LYMAN	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-01	09/01/91	250	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-01	12/01/91	200	200	300	100	152
MW-10	09/01/91	2300	---	---	---	---
MW-10	12/01/91	2300	<100	200	2500	323
MW-10	04/01/92	1840	106	<3	2415	319
MW-10	07/01/92	1842	101	482	2183	240
MW-10	10/01/92	2100	144	436	759	312
MW-10	01/01/94	0	---	0	0	0
MW-11	09/01/91	3000	---	---	---	---
MW-11	12/01/91	3800	5800	500	5200	790
MW-11	04/01/92	3573	2979	484	6714	653
MW-11	07/01/92	2199	2440	463	3693	270
MW-11	10/01/92	2755	1896	<3	5196	239
MW-11	01/01/93	2746	1821	475	4280	544
MW-11	10/01/94	1800	<50	450	3500	130
MW-12	09/01/91	3800	---	---	---	---
MW-13	09/01/91	3100	---	---	---	---
MW-13	12/01/91	3000	750	500	3300	780
MW-13	04/01/92	3501	142	<3	7137	1240
MW-13	07/01/92	2708	136	597	2247	269
MW-14	09/01/91	5100	---	---	---	---
MW-15	09/01/91	5100	---	---	---	---
MW-16	09/01/91	1700	---	---	---	---
MW-16	04/01/93	514	53	39	2134	246
MW-17	09/01/91	2000	---	---	---	---
MW-17	04/01/93	1500	58	230	2900	306
MW-18	09/01/91	4300	---	---	---	---
MW-18	04/01/92	2900	82	750	1200	464

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-18	07/01/92	2700	22	600	55	109
MW-18	10/01/92	3300	115	870	187	408
MW-19	09/01/91	4700	---	---	---	---
MW-19	04/01/92	3240	347	807	326	463
MW-19	07/01/92	3000	40	800	41	90
MW-19	10/01/92	2756	73	758	166	420
MW-19	04/01/93	3926	130	16	82	---
MW-20	09/01/91	110	---	---	---	---
MW-21	09/01/91	1000	---	---	---	---
MW-21	12/01/91	1100	<50	<50	1000	343
MW-21	04/01/93	114	19	38	38	283
MW-22	09/01/91	4	---	---	---	---
MW-24	09/01/91	3400	---	---	---	---
MW-24	07/01/92	4353	27	55	708	455
MW-26	09/01/91	3100	---	---	---	---
MW-26	12/01/91	3000	<100	400	3700	356
MW-26	07/01/92	2000	48	390	1400	164
MW-26	10/01/92	1860	59	567	1774	222
MW-26	01/01/93	1708	82	399	1083	177
MW-26	04/01/93	861	62	600	2014	---
MW-28	09/01/91	2200	---	---	---	---
MW-31	09/01/91	<1	---	---	---	---
MW-31	07/01/92	332	36	11	54	337
MW-31	10/01/92	9	32	10	18	296
MW-32	09/01/91	200	---	---	---	---
MW-33	09/01/91	6300	---	---	---	---
MW-34	09/01/91	2500	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-35	09/01/91	5700	---	---	---	---
MW-37	09/01/91	150	---	---	---	---
MW-37	07/01/93	27	7	<3	<3	173
MW-38	09/01/91	15	---	---	---	---
MW-38	12/01/91	15	<1	15	<1	111
MW-38	04/01/92	67	17	55	7	127
MW-38	07/01/92	37	34	25	56	147
MW-38	10/01/92	166	18	242	24	128
MW-39	09/01/91	880	---	---	---	---
MW-39	01/01/93	14	6	<5	<5	231
MW-39	04/01/93	29	15	4	11	---
MW-39	07/01/93	24	3	<3	<3	296
MW-39	10/01/93	---	23	<3	10	277
MW-39	01/01/94	<2.5	<2.5	8.4	70	260
MW-39	04/01/94	<0.5	<0.5	4	38	220
MW-39	07/01/94	<0.5	<0.5	5.9	78	198
MW-39	01/01/95	<5.0	7.1	250	80	194
MW-41	09/01/91	200	---	---	---	---
MW-41	12/01/91	170	30	400	<10	108
MW-41	07/01/93	12	<5.0	22	<5.0	242
MW-41	10/01/93	8.9	<0.5	17	<0.5	264
MW-41	01/01/94	5.3	<5.0	27	140	370
MW-41	04/01/94	0.6	<0.5	3.8	7.4	290
MW-41	07/01/94	1.4	31	4.9	<0.5	259
MW-41	10/01/94	3.2	44	0.7	90	300
MW-41	01/01/95	13	<5.0	42	23	326
MW-41	04/01/95	4.8	<0.5	19	33	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-42	09/01/91	<1	---	---	---	---
MW-42	12/01/91	<1	<1	<1	<1	571
MW-43	09/01/91	320	---	---	---	---
MW-43	07/01/93	25	17	<3	3	232
MW-43	10/01/93	---	11	<3	<3	230
MW-43	01/01/94	<0.5	<0.5	<0.5	<0.5	260
MW-43	04/01/94	<0.5	<0.5	1.2	14	250
MW-43	07/01/94	<0.5	<0.5	1.5	7.1	266
MW-43	10/01/94	0.8	<0.5	2.3	17	270
MW-43	01/01/95	3.0	<0.5	5.5	15	280
MW-43	04/01/95	0.6	<0.5	2.8	14	---
MW-44	09/01/91	59	---	---	---	---
MW-44	04/01/92	6	22	24	2	660
MW-44	07/01/92	97	25	102	96	263
MW-44	10/01/92	12	34	96	24	356
MW-44	01/01/93	14	18	65	<1	300
MW-44	04/01/93	7	15	18	14	365
MW-44	07/01/93	6	16	<3	18	445
MW-44	10/01/93	3.6	<0.5	19	5.6	543
MW-44	01/01/94	12	<5.0	7.2	14	490
MW-44	04/01/94	22	<2.5	3.3	11	440
MW-44	07/01/94	36	<5.0	12	14	430
MW-44	10/01/94	130	<25	120	77	360
MW-44	01/01/95	63	<5.0	140	26	360
MW-44	04/01/95	19	2.0	71	16	---
MW-45	09/01/91	<1	---	---	---	---
MW-45	12/01/91	<1	<1	<1	<1	354

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-45	07/01/93	<3	6	7	4	434
MW-45	10/01/93	<3	3	<3	3	408
MW-45	01/01/94	<0.5	<0.5	<0.5	<0.5	440
MW-45	04/01/94	<0.5	<0.5	<0.5	<0.5	430
MW-45	07/01/94	<0.5	<0.5	<0.5	<0.5	429
MW-46	09/01/91	140	---	---	---	---
MW-47	09/01/91	2600	---	---	---	---
MW-47	12/01/91	2200	<50	<50	<50	433
MW-48	09/01/91	<1	---	---	---	---
MW-48	12/01/91	<1	5	10	<1	400
MW-48	07/01/92	47	18	6	18	431
MW-49	09/01/91	35	---	---	---	---
MW-49	07/01/93	210	27	42	30	399
MW-49	10/01/93	68	26	9	20	397
MW-49	01/01/94	13	<5.0	15	110	400
MW-49	04/01/94	82	<0.5	11	10	380
MW-49	07/01/94	150	<5.0	32	27	368
MW-49	10/01/94	78	49	40	300	380
MW-49	01/01/95	220	<5.0	46	97	389
MW-49	04/01/95	120	<0.5	24	26	---
MW-50	09/01/91	<1	---	---	---	---
MW-50	12/01/91	<1	<1	<1	<1	380
MW-50	04/01/92	7	18	<3	17	397
MW-50	07/01/92	4	167	7	11	379
MW-50	10/01/92	8	10	3	2	370
MW-50	01/01/93	8	5	<3	5	337
MW-50	04/01/93	<1	<1	<1	<1	955

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-50	07/01/93	<3	12	10	4	347
MW-50	10/01/93	9	16	<3	<3	292
MW-50	01/01/94	<0.5	<0.5	<0.5	<0.5	320
MW-50	04/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	07/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	10/01/94	<0.5	<0.5	<0.5	<0.5	290
MW-50	01/01/95	<0.5	<0.5	<0.5	<0.5	314
MW-50	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-51	09/01/91	800	---	---	---	---
MW-51	12/01/91	<1	<1	<1	<1	38
MW-52	09/01/91	<1	---	---	---	---
MW-52	07/01/92	5	31	4	5	3
MW-53	09/01/91	<1	---	---	---	---
MW-54	09/01/91	<1	---	---	---	---
MW-54	12/01/91	<1	<1	<1	<1	87
MW-54	04/01/92	10	10	<3	14	151
MW-54	07/01/92	8	44	23	195	80
MW-54	10/01/92	62	7	195	630	55
MW-54	01/01/93	14	4	15	113	134
MW-54	04/01/93	10	<3	<3	8	145
MW-54	07/01/93	<3	<3	<3	3	146
MW-54	10/01/93	17	35	16	24	122
MW-54	01/01/94	8.6	<0.5	7.4	<0.5	140
MW-54	04/01/94	<0.5	<0.5	<0.5	<0.5	102
MW-54	07/01/94	15	1.2	8.5	8.7	135
MW-54	10/01/94	19	0.6	29	6.3	130
MW-54	01/01/95	<0.5	<0.5	<0.5	<0.5	32.0

Values represent total concentrations unless noted < =Not detected at indicated reporting limit --- =Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-54	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-55	09/01/91	940	---	---	---	---
MW-55	12/01/91	400	25	<25	<25	501
MW-55	04/01/92	297	24	15	34	385
MW-55	07/01/92	483	36	64	66	273
MW-55	10/01/92	215	56	92	26	292
MW-55	01/01/93	390	68	90	32	300
MW-55	04/01/93	412	20	89	18	301
MW-55	07/01/93	625	21	8	50	312
MW-55	10/01/93	581	27	102	18	287
MW-55	01/01/94	290	<2.5	89	<2.5	320
MW-55	04/01/94	370	<2.5	33	<2.5	310
MW-55	07/01/94	360	5.5	16	120	299
MW-55	10/01/94	910	<5.0	480	<5.0	390
MW-55	01/01/95	650	<5.0	400	41	321
MW-56	09/01/91	2200	---	---	---	---
MW-56	12/01/91	1000	2000	3000	6000	197
MW-56	07/01/92	1114	64	962	49	248
MW-56	10/01/92	1026	47	<3	839	183
MW-56	01/01/93	1128	40	10	804	269
MW-61	09/01/91	<1	---	---	---	---
MW-61	12/01/91	---	<1	<1	<1	413
MW-61	01/01/94	1.4	1.0	1.7	1.1	420
MW-61	04/01/94	<0.5	<0.5	0.5	<0.5	450
MW-61	07/01/94	3.2	<0.5	<0.5	0.8	387
MW-61	10/01/94	<5.0	23	14	160	400
MW-61	01/01/95	<0.5	0.7	2.5	0.8	439

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 2

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
SHALLOW ZONE WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-65	09/01/91	<1	---	---	---	---
MW-65	12/01/91	---	<1	<1	<1	3
MW-65	04/01/93	---	---	<3	---	---
MW-65	07/01/93	<3	6	<3	3	4
MW-65	10/01/94	<0.5	<0.5	<0.5	<0.5	5.9
MW-69	09/01/91	2400	---	---	---	---
MW-69	12/01/91	2100	1100	150	4200	154
MW-69	07/01/92	568	56	1785	1966	15
MW-69	10/01/92	1598	71	<3	2879	43
MW-69	01/01/93	1284	49	309	1931	---
MW-79	01/01/95	110	<5.0	8.5	61	36.0
MW-79	04/01/95	14	<0.5	10	53	---
UIH	09/01/91	<1	---	---	---	---
UIH	12/01/91	<1	---	---	---	---
UIH	04/01/92	<1	<1	<1	<1	16.2
UIH	07/01/92	<1	<1	<1	<1	8.5
UIH	10/01/92	<1	<1	<1	<1	13.5
UIH	01/01/93	<1	<1	<1	<1	11.4
UIH	04/01/93	<1	<1	---	<1	13.5
UIH	07/01/93	<0.5	<0.5	<0.5	<0.5	12.9
UIH	10/01/93	<1	<0.5	<0.5	<0.5	10.3
UIH	01/01/94	<0.5	<0.5	<0.5	<0.5	11
UIH	04/01/94	<0.5	<0.5	<0.5	<0.5	14
UIH	07/01/94	<0.5	<0.5	<0.5	<0.5	8
UIH	10/01/94	<0.5	<0.5	<0.5	0.6	13
UIH	01/01/95	<0.5	<0.5	<0.5	<0.5	10
UIH	04/01/95	<0.5	<0.5	<0.5	<0.5	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-57	09/01/91	1600	---	---	---	---
MW-57	12/01/91	350	<10	<10	<10	32
MW-57	04/01/92	127	29	<3	16	117
MW-57	07/01/92	948	422	112	876	63
MW-57	10/01/92	15	33	<3	78	67
MW-57	01/01/93	21	40	165	19	131
MW-57	04/01/93	8	21	15	16	80
MW-57	07/01/93	6	8	<3	<3	72
MW-57	10/01/93	<0.5	1.6	<0.5	1.2	73.6
MW-57	01/01/94	<0.5	<0.5	<0.5	<0.5	64
MW-57	04/01/94	<0.5	<0.5	<0.5	<0.5	58
MW-57	07/01/94	0.7	<0.5	<0.5	1.8	48
MW-57	10/01/94	1.1	<0.5	<0.5	4.0	60
MW-57	01/01/95	4.3	<0.5	<0.5	1.3	35
MW-57	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-58	09/01/91	40	---	---	---	---
MW-58	12/01/91	90	40	20	80	124
MW-58	04/01/92	203	32	56	68	156
MW-58	07/01/92	178	58	32	44	149
MW-58	10/01/92	190	49	26	57	155
MW-58	01/01/93	192	30	23	39	175
MW-58	04/01/93	55	16	31	9	133
MW-58	07/01/93	25	42	14	13	133
MW-58	10/01/93	50	21	212	555	59
MW-58	04/01/94	<2.5	<2.5	7.4	27	48
MW-58	07/01/94	2.0	29	4.5	27	38
MW-58	10/01/94	6.7	<5.0	15.0	39	11

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-58	01/01/95	---	---	---	---	26
MW-58	04/01/95	2.2	<0.5	2.1	6.8	---
MW-59	09/01/91	540	---	---	---	---
MW-59	12/01/91	420	40	240	420	149
MW-59	04/01/92	42	12	20	20	52
MW-59	07/01/92	268	45	110	232	55
MW-59	10/01/92	99	37	44	46	69
MW-59	01/01/93	26	<3	55	10	46
MW-59	04/01/93	10	14	12	5	29
MW-59	10/01/93	10	13	89	433	56
MW-59	04/01/94	<2.5	<2.5	3.3	25	30
MW-59	07/01/94	13	69	0.5	73	<5.0
MW-59	10/01/94	4.1	3.7	23	37	25
MW-59	01/01/95	---	---	---	---	12
MW-60	09/01/91	33	---	---	---	---
MW-60	12/01/91	<1	<1	<1	<1	10
MW-60	04/01/92	5	9	<3	4	10
MW-60	07/01/92	17	1	<1	1	10
MW-60	10/01/92	32	109	36	57	14
MW-60	01/01/93	138	4	260	6	6
MW-60	04/01/93	17	16	<3	12	9
MW-60	07/01/93	<0.5	<0.5	<0.5	<0.5	10.7
MW-60	10/01/93	<0.5	1.0	0.5	1.0	13.5
MW-60	01/01/94	<0.5	<0.5	<0.5	<0.5	9.5
MW-60	04/01/94	<0.5	<0.5	<0.5	<0.5	9.0
MW-60	07/01/94	<0.5	1.3	<0.5	3.5	<5.0
MW-60	10/01/94	<0.5	0.6	0.6	4.9	9.1

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-60	01/01/95	<0.5	<0.5	<0.5	0.6	20
MW-60	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-61A	09/01/91	190	---	---	---	---
MW-61A	12/01/91	10	10	5	75	12
MW-61A	04/01/92	6	7	<3	13	12
MW-61A	07/01/92	60	<10	3	8	12
MW-61A	10/01/92	470	17	<3	2351	13
MW-61A	01/01/93	585	82	397	2368	12
MW-61A	04/01/93	2821	173	817	3993	15
MW-61A	04/01/94	<0.5	<0.5	0.5	3.8	10.7
MW-61A	07/01/94	<0.5	<0.5	<0.5	2.5	8
MW-61A	10/01/94	4.8	4.5	3.7	37	11
MW-61A	01/01/95	16	<5.0	30	220	32
MW-62	09/01/91	2200	---	---	---	---
MW-62	12/01/91	1400	<200	400	2400	247
MW-62	04/01/92	263	48	170	298	218
MW-62	07/01/92	357	13	184	301	236
MW-62	10/01/92	212	19	416	1692	285
MW-62	01/01/93	78	18	---	207	202
MW-62	04/01/93	33	15	16	24	207
MW-62	07/01/93	98	12	70	204	459
MW-62	10/01/93	10	20	20	32	181
MW-62	01/01/94	4.1	<2.5	13	44	160
MW-62	04/01/94	<2.5	<2.5	4.4	26	139
MW-62	07/01/94	4.3	32	7.5	26	129
MW-62	10/01/94	13	13	11	39	130
MW-62	01/01/95	---	---	---	---	152

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-62	04/01/95	7.5	30	12	30	---
MW-63	09/01/91	<1	---	---	---	---
MW-63	12/01/91	<1	<1	<1	<1	8
MW-63	04/01/92	5	6	<3	8	14
MW-63	07/01/92	12	28	3	20	7
MW-63	10/01/92	4	7	17	33	1
MW-63	01/01/93	12	4	<3	13	3
MW-63	04/01/93	<1	<1	<1	<1	5.6
MW-63	07/01/93	4	<3	<3	<3	3
MW-63	10/01/93	14	48	11	39	4
MW-63	01/01/94	<0.5	0.7	<0.5	0.7	5.7
MW-63	04/01/94	<0.5	<0.5	<0.5	<0.5	5.5
MW-63	07/01/94	1.0	9.6	1.4	13	<5.0
MW-63	10/01/94	<0.5	2.6	1.0	8.0	6.2
MW-63	01/01/95	<0.5	<0.5	<0.5	<0.5	9
MW-63	04/01/95	<0.5	<0.5	<0.5	<0.5	---
MW-64	09/01/91	150	---	---	---	---
MW-64	12/01/91	130	<10	40	160	18
MW-64	04/01/92	245	32	82	331	13
MW-64	07/01/92	115	19	10	40	13
MW-64	10/01/92	37	61	<3	96	12
MW-64	01/01/93	6	2	1	4	10.2
MW-64	04/01/93	5	11	5	9	10
MW-64	07/01/93	2	<0.5	<0.5	<0.5	12.0
MW-64	10/01/93	18	12	<3	71	8
MW-64	01/01/94	1.7	<0.5	<0.5	0.9	10
MW-64	04/01/94	<0.5	<0.5	<0.5	<0.5	10

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-64	07/01/94	<0.5	0.5	<0.5	3.6	<5.0
MW-64	10/01/94	<0.5	0.5	0.6	5.6	10.2
MW-64	01/01/95	12	<0.5	5.1	13	20
MW-64	04/01/95	18	<0.5	18	41	---
MW-65A	09/01/91	680	---	---	---	---
MW-65A	12/01/91	150	15	<1	15	22
MW-65A	04/01/92	26	15	<3	12	33
MW-65A	07/01/92	413	235	93	551	18
MW-65A	10/01/92	11	<3	<3	67	35
MW-65A	01/01/93	3	<3	<3	11	35
MW-65A	04/01/93	4	9	3	8	26
MW-65A	07/01/93	<1	3	<3	<3	19
MW-65A	10/01/93	7	3	<3	<3	17
MW-65A	01/01/94	<0.5	<0.5	<0.5	<0.5	18
MW-65A	04/01/94	<0.5	<0.5	<0.5	<0.5	15
MW-65A	07/01/94	<0.5	<0.5	<0.5	<0.5	10
MW-65A	10/01/94	1.7	<0.5	<0.5	<0.5	18
MW-65A	01/01/95	<0.5	<0.5	<0.5	0.7	12
MW-65A	04/01/95	<0.5	<0.5	<0.5	0.5	---
MW-66	09/01/91	<1	---	---	---	---
MW-66	12/01/91	<1	<1	<1	<1	9
MW-66	04/01/92	4	7	<3	4	8
MW-66	07/01/92	8	25	7	11	8
MW-66	10/01/92	12	36	<3	34	8
MW-66	01/01/93	3	6	3	20	12
MW-66	04/01/93	<3	5	5	<3	8
MW-66	07/01/93	8	4	<3	<3	15

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-66	10/01/93	13	60	4	29	7
MW-66	01/01/94	<0.5	<0.5	<0.5	0.6	9.0
MW-66	04/01/94	<0.5	<0.5	<0.5	<0.5	8.7
MW-66	07/01/94	<0.5	0.6	<0.5	0.8	<5.0
MW-66	10/01/94	<0.5	3.0	1.5	17	8.8
MW-66	01/01/95	<0.5	<0.5	<0.5	<0.5	6
MW-67	09/01/91	280	---	---	---	---
MW-67	12/01/91	320	<10	<10	<10	7
MW-67	04/01/92	5	8	<3	12	6
MW-67	07/01/92	69	<10	20	116	3
MW-67	10/01/92	3	9	<3	73	9
MW-67	01/01/93	8	3	<3	12	4
MW-67	04/01/93	7	18	7	19	8
MW-67	07/01/93	7	<3	<3	<3	6
MW-67	10/01/93	<0.5	0.9	<0.5	1.1	9.5
MW-67	01/01/94	<0.5	<0.5	<0.5	<0.5	8.6
MW-67	04/01/94	<0.5	<0.5	<0.5	<0.5	7.6
MW-67	07/01/94	<0.5	0.6	<0.5	3.0	<5.0
MW-67	10/01/94	<0.5	<0.5	<0.5	4.3	7.9
MW-67	01/01/95	1.0	<0.5	<0.5	1.1	<5.0
MW-67	04/01/95	1.8	<0.5	<0.5	1.3	---
MW-68	09/01/91	240	---	---	---	---
MW-68	12/01/91	1900	4500	500	4000	39
MW-68	04/01/92	2470	3370	550	3866	82
MW-68	07/01/92	160	267	49	746	15
MW-68	10/01/92	2205	3327	<3	4721	30
MW-68	01/01/93	376	944	246	2376	27

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-68	04/01/93	650	1900	330	4000	27
MW-68	07/01/93	150	230	110	1100	28
MW-68	10/01/93	374	628	286	2398	27
MW-68	01/01/94	3000	820	1000	7700	31
MW-68	04/01/94	120	61	170	1300	30
MW-68	07/01/94	260	170	220	2000	29
MW-68	10/01/94	---	---	---	---	32
MW-68	01/01/95	---	---	---	---	34
MW-70	09/01/91	<1	---	---	---	---
MW-70	12/01/91	<1	<1	<1	<1	10
MW-70	04/01/92	3	17	<3	8	8
MW-70	07/01/92	<1	3	1	13	9.2
MW-70	10/01/92	11	40	63	60	17
MW-70	01/01/93	<3	<3	8	5	8
MW-70	04/01/93	9	20	<3	4	8
MW-70	07/01/93	<1	11	3	<3	8
MW-70	10/01/93	25	19	19	18	11
MW-70	01/01/94	<0.5	0.6	<0.5	<0.5	10
MW-70	04/01/94	<0.5	<0.5	<0.5	<0.5	9.5
MW-70	07/01/94	<0.5	<0.5	<0.5	<0.5	8.0
MW-70	10/01/94	1.2	4.3	1.3	12	9.5
MW-70	01/01/95	<0.5	2.3	<0.5	2.4	9.0
MW-70	04/01/95	<0.5	<0.5	<0.5	1.1	---
MW-71	10/01/93	8	5	4	16	15
MW-71	01/01/94	<0.5	1.3	<0.5	0.5	18
MW-71	04/01/94	<0.5	<0.5	<0.5	<0.5	17
MW-71	07/01/94	<0.5	3.0	0.7	6.2	<5.0

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
MW-71	10/01/94	1.1	6.8	2.7	31	22
MW-71	01/01/95	<0.5	<0.5	<0.5	<0.5	<5.0
MW-72	04/01/94	<2.5	<2.5	4.7	15	32
MW-72	07/01/94	18	<0.5	5.1	2.8	32
MW-72	01/01/95	---	---	---	---	52
SW-01	09/01/91	<1	---	---	---	---
SW-01	12/01/91	<1	---	---	---	---
SW-01	04/01/92	5	6	<3	14	16
SW-01	07/01/92	17.5	69	<3	67	19
SW-01	10/01/92	16	15	<3	10	25
SW-01	01/01/93	6	<3	<3	<3	---
SW-01	04/01/93	<1	<1	<1	<1	20
SW-01	07/01/93	<0.5	<0.5	<0.5	<0.5	21
SW-01	10/01/93	<0.5	<0.5	<0.5	<0.5	21.3
SW-01	01/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	04/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	07/01/94	<0.5	<0.5	<0.5	<0.5	22
SW-01	10/01/94	<0.5	<0.5	<0.5	0.6	22
SW-01	01/01/95	<0.5	<0.5	<0.5	<0.5	33
SW-01	04/01/95	<0.5	<0.5	<0.5	<0.5	---
SW-02	09/01/91	<1	---	---	---	---
SW-02	12/01/91	<1	---	---	---	---
SW-02	04/01/92	11	12	<3	5	10
SW-02	07/01/92	7	38	<1	24	20
SW-02	10/01/92	69	37	25	61	252
SW-02	01/01/93	47	6	7	9	344
SW-02	04/01/93	<1	<1	<1	<1	363

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

TABLE 3

MARATHON INDIAN BASIN
HISTORICAL SUMMARY OF BTEX & CHLORIDE
GROUNDWATER QUALITY DATA
LOWER QUEEN WELLS

SITE	DATE	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Xylenes (ug/l)	Chloride (mg/l)
SW-02	01/01/95	<0.5	<0.5	<0.5	<0.5	81

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL BTEX/CHLOR

Table 4
Data Analysis Summary for Shallow Groundwater
Marathon Oil Company
Indian Basin Remediation Project, New Mexico

	Benzene	Ethylbenzene	Toluene	Xylenes
Case Number	71-43-2	100-41-4	108-88-3	1330-20-7
Minimum Detected Concentration (µg/L)	0.6	0.5	0.6	0.8
Maximum Detected Concentration (µg/L)	6300	3000	5800	7137
Mean Concentration (µg/L)	874	145	224	738
Number of Wells Sampled	47	35	35	35
Number of Wells In Which Chemical Was Detected	43	30	31	31
Number of Samples	210	169	168	168
Number of Detects	165	118	103	127
Percent Detects	79	70	61	76

Table 5
Data Analysis Summary for Lower Queen Aquifer
Marathon Oil Company
Indian Basin Remediation Project, New Mexico

	Benzene	Ethylbenzene	Toluene	Xylenes
Case Number	71-43-2	100-41-4	108-88-3	1330-20-7
Minimum Detected Concentration (µg/L)	0.7	0.5	0.5	0.5
Maximum Detected Concentration (µg/L)	3000	1000	4500	7700
Mean Concentration (µg/L)	141	43	99	280
Number of Wells Sampled	17	17	17	17
Number of Wells In Which Chemical Was Detected	17	16	16	17
Number of Samples	211	193	194	194
Number of Detects	133	93	116	143
Percent Detects	63	48	60	74

Table 6
Summary of Toxicity Values
Indian Basin Remediation Project
Carlsbad, New Mexico

Chemical of Concern	CASE #	US EPA Cancer Class	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Type of Cancer	Oral Reference Dose (mg/kg-day)	Critical Toxic Effect/ Uncertainty Factor	Inhalation Reference Dose (mg/kg-day)	Critical Toxic Effect (Uncertainty Factor)
Benzene	71-43-2	A	2.9×10^{-2}	2.9×10^{-2} (a)	leukemia	NA	NA	NA	NA
Toluene	108-88-3	D	NA	NA	NA	2.0×10^{-1}	liver & kidney/1000	1.1×10^{-1} (b)	neurological
Ethylbenzene	100-41-4	D	NA	NA	NA	1.0×10^{-1}	liver & kidney/1000	2.9×10^{-1} (c)	developmental (300)
Xylenes	1330-20-7	D	NA	NA	NA	2.0	neurological/100	2.0 (d)	NA

Notes:

* All values from US EPA, 1994a; 1994b except where noted.
(a) Derived from inhalation unit risk of 8.3×10^{-6} $(\mu g/m^3)^{-1}$.
(b) Derived from reference concentration of 0.4 mg/m^3.
(c) Derived from reference concentration of 1.0 mg/m^3.
(d) Used oral reference dose for inhalation reference dose.
NA Not Applicable.

Table 7
Preliminary Exposure Pathway Matrix
Indian Basin Remediation Project
Carlsbad, New Mexico

Exposure Medium	Exposure Route	RECEPTORS										Remarks
		On-Site Worker		On-Site Resident[a]		Off-Site Resident		Hunter		Ecological Receptors		
		Current	Future	Current	Future	Current	Future	Current	Future	Current	Future	
SOIL	Incidental ingestion	●	●	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	●	●	a Site is likely to remain industrial b Off-site soils are not impacted c No detectable COPC levels in off-site wells d Based on potential migration of COPCs to off-site ranch wells for domestic water supply e Groundwater is used for process water only. This exposure pathway is considered insignificant. Potential exposure only through accidental spills, discharges, and spray from cooling tower f Based on potential migration of COPCs to off-site natural spring g On-site surface soils outside of gas plant are not impacted h Soil COPCs are highly volatile
	Inhalation of volatiles/dust emissions	●	●	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	INC[h]	INC[h]	
	Dermal contact	●	●	INC	INC	INC[b]	INC[b]	INC[g]	INC[g]	●	●	
GROUNDWATER	Incidental ingestion	●[e]	●[e]	INC	INC	INC[c]	●[d]	INC[g]	INC[g]	NA	NA	
	Inhalation of volatiles	●[e]	●[e]	INC	INC	INC[c]	●[d]	INC[g]	INC[g]	NA	NA	
	Dermal contact	●[e]	●[e]	INC	INC	INC[c]	●[d]	INC[g]	INC[g]	NA	NA	
SURFACE WATER	Incidental ingestion	NA	NA	NA	NA	NA	NA	NA	NA	●[f]	●[f]	
	Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	INC	INC	
	Dermal contact	NA	NA	NA	NA	NA	NA	NA	NA	INC	INC	

● = Potentially complete NA = Not Applicable INC = Incomplete

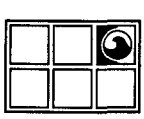
GROUNDWATER TECHNOLOGY ®

Table 8
Water Supply Wells in the Vicinity of the Indian Basin Remediation Project
Carlsbad, New Mexico

Figure 3 Designation	SEO Location Description	Well Owner	Well Depth (ft)	Use	Formation/Aquifer	Depth-to-water (ft)	Date of Mermnt
1	21.23.2.33434	Forrest Lee	NS	Stock	possible Queen	146.8	10/6/87
2	21.23.14.21221	Forrest Lee	25	Stock	alluvial of Roswell Basin*	14.6	1/12/54
3	21.23.22.241444	Dean Lee	256	Stock	lower Queen	213	11/3/92
4	21.23.24.22221	David Bradley	>31	Stock	alluvial of Carlsbad Basin	13	11/3/92
5	21.24.23.332232	Walter Biebelle	145	Stock/Domestic	alluvial of Carlsbad Basin/Seven Rivers	NS	NS
6	21.24.23.43233	William Shafer	300	Domestic	alluvial of Carlsbad Basin/Yates	50	8/17/65
7	21.24.23.43411	Earnest Shafer, Sr.	60	Domestic	alluvial of Carlsbad Basin	54	10/6/87
8	21.24.26.22230	Gerold Elmore	66	Domestic	alluvial of Carlsbad Basin	38	8/17/65
9	21.24.26.24323	William Shafer	69	NS	alluvial of Carlsbad Basin?	40	11/19/92
10	21.24.28.23232	William Shafer	138	Stock	alluvial of Carlsbad Basin/upper Queen	83	11/4/92
11	21.24.29.221112	Shafer (Biebelle)	70	Commercial OWD/ stock/domestic	alluvial of Carlsbad Basin	37	11/3/92
12	20.24.25.22233	Foster	275	Stock	Queen?**	265	2/11/94
13	20.24.35.11231	Foster	NS	Stock	Unknown	167	1/17/63
14	20.25.32.41	Howell	NS	NS	Unknown	NS	NS

Notes:

Data based on well logs on file at NMSEO, Roswell office (information provided by Marathon).
NS = Not specified
SEO = State Engineer's Office
* = SEO files indicate completion in Grayburg
** = SEO files indicated completion in Artesia Group, but SEO field representative indicates that this formation designation is used when the aquifer is unknown



GROUNDWATER
TECHNOLOGY ®

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Telephone 915/682-1626

August 8, 1995

Mr. Roger C. Anderson
State of New Mexico, Oil Conservation Division
2040 S. Pacheco St.
Santa Fe, New Mexico 87505

Dear Mr. Anderson:

Enclosed is the Second Quarter 1995 Indian Basin Remediation Project Report. This report is submitted on behalf of the Indian Basin Gas Plant owners in accordance with the Indian Basin Treatment Project Plan prepared by Marathon and approved by the Oil Conservation Division on April 2, 1992. If you have any questions, please contact me at (915) 687-8312.

Sincerely,

Robert J. Menzie, Jr.
Production Environmental & Safety Representative

Attachment

c: William C. Olson, Oil Conservation Division, Santa Fe

INDIAN BASIN GAS PLANT
REMEDIATION PROJECT
QUARTERLY REPORT

SECOND QUARTER 1995
APRIL, MAY, AND JUNE

Submitted by
Marathon Oil Company
on behalf of the
Indian Basin Gas Plant Owners

August 8, 1995

EXECUTIVE SUMMARY

The pump-and-treat groundwater remediation system is fully operational and functioning as set forth in the Treatment Project Plan (March 1992). During the quarterly sampling event in April 1995, light nonaqueous phase liquid (condensate) was observed in eight Lower Queen wells. During the quarter, total fluid recovery from seven Lower Queen recovery wells averaged 9438 barrels per week or 39.6 gallons per minute with volatile hydrocarbon compounds being removed by air stripping. Lower Queen dissolved benzene concentrations in five downgradient wells range from less than 0.5 to 18 micrograms per liter (ug/L) or parts per billion. Chloride concentrations in all Lower Queen wells are below the State maximum allowable concentration of 250 milligrams per liter (mg/L).

Two Shallow zone wells contained condensate in April. Shallow zone pumping continues from one well. Fluid recovery from the Shallow zone aquifer averaged 32 barrels per week. Shallow zone dissolved benzene concentrations range from 0.5 to 420 ug/L. Seven Shallow zone wells sampled in April indicate chloride concentrations above the State maximum allowable concentration of 250 mg/L.

Concentrations of benzene, toluene, ethylbenzene, total xylene, and chloride in groundwater collected from a rancher well completed in the Shallow alluvium, a rancher well completed in the Seven Rivers Formation, and surface water from the Upper Indian Hills Spring West (Rocky Arroyo spring) have not exceeded State or Federal drinking water standards.

Condensate recovery from the Lower Queen and Shallow zone for the Second Quarter was 14.7 barrels. Excluding the volume volatilized by the air stripper and vapor extraction system, cumulative recovery is 3,581.1 barrels or 10.2% of the total estimated spill volume.

The vapor extraction system was not operated during the Second Quarter.

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INTRODUCTION

This report summarizes groundwater and unsaturated zone treatment activities conducted during the Second Quarter of 1995 in accordance with the Indian Basin Environmental Treatment Project Plan submitted on March 5, 1992 by Marathon Oil Company on behalf of the Indian Basin Gas Plant owners. Preparation of this report is also in accordance with the April 2, 1992 New Mexico Oil Conservation Division (OCD) directive for quarterly reporting of remediation project activities. Remediation activities are continuing to reduce the impact of a liquid gas condensate and brine production pipeline spill discovered in April 1991 near the Indian Basin Gas Plant.

GROUNDWATER ELEVATION

Lower Queen Aquifer

Depth-to-water measurements were acquired from nonpumping Lower Queen monitoring wells in April 1995. Table 1 presents groundwater and product elevations calculated from casing elevation data, depth-to-water measurements, and depth-to-product (light nonaqueous phase liquid; LNAPL) measurements. Figure 1 is a potentiometric map of the Lower Queen aquifer based on April gauging data. Second Quarter data indicate both increasing and decreasing groundwater elevations (Figure 2).

Shallow Zone

A potentiometric map was constructed using depth-to-water measurements collected from Shallow zone monitoring wells in April 1995 (Figure 3). Table 2 shows depth-to-water and depth-to-LNAPL measurements, calculated groundwater and LNAPL elevations, and LNAPL thickness in Shallow zone wells. These Shallow zone data indicate decreasing groundwater elevations during the quarter (Figure 4). Decreasing groundwater elevations are the result of reduced recharge from rainfall and less subsurface and surface inflow to the project area.

Groundwater Recharge (Rainfall)

Daily rainfall is gauged at the gas plant. Monthly rainfall for April, May, and June was 0.13, 0.75, and 2.40 inches, respectively (Tables 1 and 2). Cumulative rainfall for the Second Quarter was 3.28 inches.

QUARTERLY SAMPLING LABORATORY RESULTS

Thirty-four Shallow zone and twelve Lower Queen monitoring wells were gauged on April 4, 5, and 6, 1995. Twenty Lower Queen wells were sampled including plant water supply well, SW-1. Four of the seven Lower Queen recovery wells yielded condensate when sampled

through downhole pumps set near the total depth of the recovery wells (MW-59, MW-61A, MW-68, and MW-72). Four Lower Queen monitoring wells contain condensate (MW-73, MW-74, MW-75, and MW-76).

Nine Shallow zone wells were sampled in April. Four of the twenty-five Shallow zone monitoring wells (including two sumps) designated for quarterly sampling in the Treatment Project Plan were sampled (see ***bolded and italicized*** well designations in Table 4). The remaining 21 Shallow zone compliance wells were either dry or bailed dry during sampling (19) or contain condensate (MW-13 and MW-69). Five Shallow zone wells other than those designated in the Treatment Project Plan were sampled (MW-41, MW-43, MW-49, MW-61, and MW-79). Seven Shallow zone wells sampled in April indicate chloride concentrations above the State maximum allowable concentration of 250 mg/L (MW-41, MW-43, MW-44, MW-49, MW-50, MW-55, and MW-61.

Samples were collected by Groundwater Technology, Inc. using Environmental Protection Agency (EPA) sampling protocol. Analytical Technologies, Inc. performed the BTEX (EPA Method 8020) and chloride (EPA Method 325.2) analyses. Appendix A contains summary tables of groundwater monitoring and sampling data prepared by Groundwater Technology, Inc. from notes recorded during field activities.

Tables 3 and 4 are historical summaries of quarterly benzene concentration data since September 1991 for the Lower Queen and Shallow zone wells, respectively. Benzene concentration (in ug/l) versus time graphs for each routinely sampled monitoring well are provided in Appendix B.

RANCHER WELLS, SPRING, AND PLANT WELL LABORATORY RESULTS

Monthly groundwater samples from the closest downgradient rancher well (Lyman) to the Shallow zone plume and from the Upper Indian Hills Spring West (Hendrickson and Jones, 1952) were collected on April 7 and May 18, 1995. In addition, the Biebelle rancher well, which is sampled quarterly, was sampled on April 7. The plant water supply well (SW-1), completed in the Lower Queen aquifer, is sampled and analyzed monthly. Concentrations of BTEX and chloride in groundwater collected from the Lyman and Biebelle wells and surface water from the Upper Indian Hills Spring West (Rocky Arroyo spring) did not exceed State or Federal drinking water standards during the quarter (Table 5).

The rancher well and natural spring samples were obtained using EPA sampling and handling procedures. Analytical Technologies, Inc. performed the BTEX and chloride analyses using EPA-approved methods. Laboratory results of groundwater from the rancher wells and the surface water from the natural spring are transmitted to the local ranchers with letters of

explanation. Copies of these letters are also provided to the OCD and the Bureau of Land Management (BLM) in Santa Fe and Roswell, New Mexico, respectively. Laboratory reports for the rancher wells, Rocky Arroyo spring, and SW-1 are included in Appendices C (April) and D (May).

GROUNDWATER PUMPING

Lower Queen

Fluid recovery from the Lower Queen aquifer and Shallow zone is metered and reported to the State Engineer Office (SEO) in Roswell, New Mexico on a monthly basis per SEO directive. The reports filed with the SEO for Second Quarter 1995 are attached in Appendix E. Figures 5, 6, and 7 are stacked bar graphs depicting weekly Lower Queen fluid recovery, weekly Shallow zone fluid recovery, and combined weekly fluid recovery from both zones, respectively.

Seven Lower Queen wells (MW-58, MW-59, MW-61A, MW-62, MW-65A, MW-68, and MW-72) were pumped for plume control during the quarter. Monthly fluid recovery for each well and the plant supply well, SW-1, is listed in the following table.

LOWER QUEEN FLUID RECOVERY

Well Number	April (Bbls)	May (Bbls)	June (Bbls)	Quarter Total (Bbls)	Average Pumping Rate (gpm)
MW-58	2267	2713	1866	6846	2.2
MW-59	2858	3174	1191	7223	2.3
MW-61A	9262	11108	4409	24779	8.0
MW-62	3485	4410	2436	10331	3.3
MW-65A	5521	7285	4621	17427	5.6
MW-68	3154	4358	2010	9522	3.1
MW-72	11232	22728	12564	46524	15.1
SW-1	35	447	24018	24500	7.9
TOTAL	**37,814**	**56,222**	**53,155**	**147,191**	**47.7**

Shallow Zone

Monthly Shallow zone fluid recovery during the Second Quarter from MW-69 is listed in the following table. Free-phase hydrocarbon (condensate) recovery from MW-69 during the Second Quarter totaled 4.6 barrels.

SHALLOW ZONE FLUID RECOVERY

Well Number	April (Bbls) Cond./Water	May (Bbls) Cond./Water	June (Bbls) Cond./Water	Quarter Total (Bbls) Cond./Water
MW-69	1.5/71.8	1.7/152.7	1.4/192.9	4.6/417.4

GROUNDWATER TREATMENT AND PRODUCT RECOVERY

Contaminated groundwater and free-phase hydrocarbon (condensate) from seven Lower Queen recovery wells are pumped through underground piping to the treatment compound. The treatment compound includes two aboveground tanks, an oil/water separator used as a storage vessel, and an air stripper. Condensate is skimmed from one of the two aboveground tanks and transferred to the oil/water separator which serves as a condensate storage vessel. Groundwater containing dissolved-phase hydrocarbon is transferred from the first tank to the second aboveground tank. Groundwater from the second tank is pumped through the air stripper to remove dissolved-phase volatile organic compounds. Stripped volatile organic compounds are vented to the atmosphere through a stack. Treated groundwater is transferred from the air stripper to the 1200-barrel aboveground steel tank and is used as process water for the gas plant.

The measured volume of condensate recovered from Lower Queen groundwater during the Second Quarter was 10.1 barrels. Cumulative condensate recovered by the total fluids system since treatment system startup in April 1992 is 119.1 barrels.

Total condensate recovery from the Lower Queen and Shallow zone during the Second Quarter was 14.7 barrels. Cumulative condensate recovered to date excluding the volume volatilized by the air stripper and vapor extraction system is 3,581.1 barrels or 10.2% of the total estimated spill volume.

VAPOR EXTRACTION SYSTEM

The vapor extraction system was not operated during the Second Quarter. On May 5, 1994, the vapor extraction system ceased operation when Marathon determined that a New Mexico Air Pollution Control Bureau air emission permit is required for system operation. The system has not operated since then and is being stored at the gas plant.

OTHER ACTIVITIES

Step-rate and constant-rate pumping tests of the Lower Queen aquifer were conducted using MW-72 on June 20 to 23. Preliminary results indicate the optimum pumping rate for the eight-inch diameter well is approximately 20 gpm. During the constant-rate test the product thickness in MW-72 increased from less than one foot to greater than six feet. Drawdown response was observed in nearby wells MW-73, MW-74, and MW-75.

REFERENCES CITED

Hendrickson, G. E., and Jones, R. S., 1952, Geology and Ground-water Resources of Eddy County, New Mexico: New Mexico Bureau of Mines & Mineral Resources Ground-water Report 3, 169 p., 4 pls.

TABLES

TABLE 1. LOWER QUEEN DEPTH-TO-WATER, GROUNDWATER ELEVATION, CONDENSATE THICKNESS, AND RAINFALL DATA SECOND QUARTER 1995

LOWER QUEEN WELL	Top of Casing (TOC) Elev. (ft AMSL)	Total Depth from TOC (ft)	Apr-4-95				May-95		Jun-95	
			Depth to water (ft)	Ground-water Elev. (ft)	Depth to product (ft)	Condensate thickness (in)	Depth to water (ft)	Ground-water Elev. (ft)	Depth to water (ft)	Ground-water Elev. (ft)
MW-57	3787.70	177.20	158.96	3628.74			NG		NG	
MW-58	3824.31	218.03	p				p		p	
MW-59	3819.59	211.29	p				p		p	
MW-60	3815.28	223.00	187.01	3628.27			NG		NG	
MW-61A	3815.97	215.67	p				p		p	
MW-62	3819.90	224.69	p				p		p	
MW-63	3826.16	220.49	198.46	3627.70			NG		NG	
MW-64	3798.57	201.89	170.13	3628.44			NG		NG	
MW-65A	3763.26	168.56	p				p		p	
MW-66	3828.98	235.18	202.26	3626.72			NG		NG	
MW-67	3765.87	165.77	137.29	3628.58			NG		NG	
MW-68	3797.83	203.43	p				p		p	
MW-70	3822.57	225.07	194.11	3628.46			NG		NG	
MW-71	3778.05	233.49	150.88	3627.17			NG		NG	
MW-72	3819.32	236.55	p				p		p	
MW-73	3820.09	~222.5	192.33	3627.76	191.62	8.52	NG		NG	
MW-74	3820.82	~222.5	188.48	3632.34	188.44	0.48	NG		NG	
MW-75	3816.12	~222.5	189.89	3626.23	186.94	35.40	NG		NG	
MW-76	3796.01	~222.5	NG				NG		NG	
SW-1	3808.19	255.00	p				p		p	
SW-2	3808.79	292.00	181.50	3627.29			NG		NG	
Monthly Rainfall (in)			0.13				0.75		2.40	

p = pump present in well
NG = Not Gauged

AMSL = Above Mean Sea Level
FP = Free Product (condensate) being recovered

TABLE 2
SHALLOW ZONE DEPTH-TO-WATER, GROUNDWATER ELEVATION, CONDENSATE THICKNESS, AND RAINFALL DATA
SECOND QUARTER 1995

Shallow Zone Well	TOC Elev. (ft AMSL)	Total Depth from TOC (ft)	Apr-4-95				May-95		Jun-95	
			Depth to water (ft)	Ground-water Elev. (ft)	Depth to product (ft)	Condensate thickness (in)	Depth to water (ft)	Ground-water Elev. (ft)	Depth to water (ft)	Ground-water Elev. (ft)
MW-1	3792.50	16.10	NG				NG		NG	
MW-2	3788.82	15.52	NG				NG		NG	
MW-3	3787.50	16.97	DRY				NG		NG	
MW-4	3785.88	18.68	NG				NG		NG	
MW-5	3801.69	13.05	DRY				NG		NG	
MW-6	3785.17	14.25	DRY				NG		NG	
MW-7	3784.46	17.35	DRY				NG		NG	
MW-8	3795.04	17.38	DRY				NG		NG	
MW-9	3807.85	13.79	DRY				NG		NG	
MW-10	3790.78	18.20	DRY				NG		NG	
MW-11	3806.96	24.85	24.23	3782.73			NG		NG	
MW-12	3809.86	25.21	NG				NG		NG	
MW-13	3801.58	22.07	20.34	3781.24	20.05	3.48	NG		NG	
MW-14	3803.93	24.30	NG				NG		NG	
MW-15	3803.59	19.47	NG				NG		NG	
MW-16	3801.04	22.66	NG				NG		NG	
MW-17	3799.55	19.75	NG				NG		NG	
MW-18	3795.82	17.42	NG				NG		NG	
MW-19	3797.21	19.11	NG				NG		NG	
MW-20	3797.59	16.89	NG				NG		NG	
MW-21	3798.21	23.31	NG				NG		NG	
MW-22	3799.20	17.30	NG				NG		NG	
MW-23	3794.48	12.08	NG				NG		NG	
MW-24	3794.09	14.09	DRY				NG		NG	
MW-25	3786.97	10.27	NG				NG		NG	
MW-26	3793.01	21.11	NG				NG		NG	
MW-27	3790.93	18.23	NG				NG		NG	
MW-28	3797.03	18.59	NG				NG		NG	
MW-29	3794.06	14.76	DRY				NG		NG	
MW-30	3788.30	14.82	NG				NG		NG	
Monthly Rainfall (in)			0.13				0.75		2.40	

p = pump present in well
NG = Not Gauged

AMSL = Above Mean Sea Level
TOC = Top of Casing datum

TABLE 2. (CONTINUED)
SHALLOW ZONE DEPTH-TO-WATER, GROUNDWATER ELEVATION, CONDENSATE THICKNESS, & RAINFALL DATA

Shallow Zone Well	TOC Elev. (ft AMSL)	Total Depth from TOC (ft)	Apr-4-95				May-95		Jun-95	
			Depth to water (ft)	Ground-water Elev. (ft)	Depth to product (ft)	Condensate thickness (in)	Depth to water (ft)	Ground-water Elev. (ft)	Depth to water (ft)	Ground-water Elev. (ft)
MW-31	3791.15	19.93	NG				NG		NG	
MW-32	3797.47	15.70	DRY				NG		NG	
MW-33	3802.48	20.29	NG				NG		NG	
MW-34	3806.00	19.97	NG				NG		NG	
MW-35	3800.81	20.71	NG				NG		NG	
MW-36	3792.94	8.77	NG				NG		NG	
MW-37	3795.03	20.83	NG				NG		NG	
MW-38	3797.32	20.57	DRY				NG		NG	
MW-39	3796.20	20.54	19.84	3776.36			NG		NG	
MW-40	3803.12	14.07	NG				NG		NG	
MW-41	3799.04	24.04	19.82	3779.22			NG		NG	
MW-42	3804.73	23.59	NG				NG		NG	
MW-43	3802.05	24.55	21.53	3780.52			NG		NG	
MW-44	3804.14	25.24	22.26	3781.88			NG		NG	
MW-45	3808.68	26.62	22.13	3786.55			NG		NG	
MW-46	3805.54	20.24	19.55	3785.99			NG		NG	
MW-47	3805.09	21.79	DRY				NG		NG	
MW-48	3806.18	19.98	DRY				NG		NG	
MW-49	3805.61	25.91	22.94	3782.67			NG		NG	
MW-50	3813.35	37.15	27.37	3785.98			NG		NG	
MW-51	3810.86	20.06	NG				NG		NG	
MW-52	3817.49	21.44	DRY				NG		NG	
MW-53	3809.92	15.32	DRY				NG		NG	
MW-54	3823.86	78.15	46.96	3776.90			NG		NG	
MW-55	3794.40	66.32	30.65	3763.75			NG		NG	
MW-56	3782.45	43.76	DRY				NG		NG	
MW-61	3816.20	57.97	36.72	3779.48			NG		NG	
MW-65	3763.31	57.35	57.14	3706.17			NG		NG	
MW-69p	3805.11	51.27	NG			present	NG		NG	
MW-77	3775.48	82.20	80.04	3695.44			NP		DRY	
MW-78	3785.82	86.62	86.32	3699.50			NP		DRY	
MW-79	3788.39	82.90	77.32	3711.07			NP		DRY	
MW-80	3821.64	91.80	DRY				NP		DRY	
Sump A10		13.32	DRY				NG		NG	
Sump 16A	3785.14	17.45	17.32	3767.82			NG		NG	
Monthly Rainfall (in)				0.13				0.75		2.40

p = pump present in well
NG = Not Gauged

AMSL = Above Mean Sea Level
TOC = Top of Casing datum

TABLE 3
HISTORICAL SUMMARY OF BENZENE CONCENTRATION IN LOWER QUEEN GROUNDWATER
SECOND QUARTER 1995

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise														
WELL	Sep-91	Dec-91	Apr-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Jan-94	Apr-94	Jul-94	Oct-94	Jan-95	Apr-95
MW-57	1600	350	150	948**	15.1*	21*	8*	6*	<0.5	<0.5	<0.5	0.7	1.1	4.3	<0.5
MW-58	40	90	202**	178**	190*	192*	55*	25*	50*	FP	<2.5	2.0	6.7	FP	2.2
MW-59	540	420	40.4**	268**	98.8*	26*	10*	FP	10*	FP	<2.5	13	4.1	FP	FP
MW-60	33	<1	3.5**	19**	31.7*	138*	17*	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-61A	190	10	5.0**	359**	470.1*	585*	2821*	FP	FP	FP	<0.5	<0.5	4.8	16	FP
MW-62	2200	1400	257.5**	357**	212.3*	78*	33*	98*	10*	4.1	<2.5	4.3	13	FP	7.5
MW-63	<1	<1	4.1**	12**	4.3*	12*	7*	4*	14*	<0.5	<0.5	1.0	<0.5	<0.5	<0.5
MW-64	150	130	233**	115**	14	15*	5*	2	18*	1.7	<0.5	<0.5	<0.5	12	18
MW-65A	680	150	25.3**	413**	10.6*	3*	4*	<1*	7*	<0.5	<0.5	<0.5	1.7	<0.5	<0.5
MW-66	<1	<1	3.3**	8**	12.1*	3*	<3*	8*	13*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-67	280	320	4.3*	103**	2.6*	8*	7*	7*	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	1.8
MW-68	550	1900	1865**	160**	2208.2**	376*	1890*	150	374*	3000	120	260	FP	FP	FP
MW-70	<1	<1	1.7**	<1	10.7*	<3*	9*	<1*	25*	<0.5	<0.5	<0.5	1.2	<0.5	<0.5
MW-71	NI	NI	NI	NI	NI	NI	NI	NI	8*	<0.5	<0.5	<0.5	1.1	<0.5	<0.5
MW-72	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	<2.5	18	FP	FP	FP
MW-73	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP
MW-74	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP
MW-75	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP
MW-76	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP
SW-1	<1	<1	5*	17.5*	15.7*	6*	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SW-2	<1	<1	7.9*	7*	69.4*	47*	4	NS	NS	NS	NS	NS	NS	<0.5	NS
Max. Conc.	2200	1900	1865	948	2208	585	2821	2821	2821	3000	120	260	FP	FP	FP

* High Performance Liquid Chromatography (HPLC)
** Average of more than one sample result using HPLC.

FP = Free Product (Condensate)
NS = Not Sampled
NI = Not Installed

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER
SECOND QUARTER 1995

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise														
WELL	**Sep-91**	**Dec-91**	**Apr-92**	**Jul-92**	**Oct-92**	**Jan-93**	**Apr-93**	**Jul-93**	**Oct-93**	**Jan-94**	**Apr-94**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**
MW-1	250	200	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-2	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-3	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-4	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-5	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-6	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***DRY***	***DRY***	***DRY***
MW-7	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-8	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-9	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-10	***2300***	***2300***	***1780****	***1842****	***2100***	***NS***	***NS***	***DRY***	***DRY***	***BD***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-11	***3000***	***3800***	***3087****	***2199****	***2942****	***2746****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***1800***	***DRY***	***NS***
MW-12	3800	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-13	***3100***	***3000***	***3492****	***2708****	***NS***	***NS***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***FP***	***FP***
MW-14	5100**	NS	NS	NS	NS	NS	PUMP	PUMP	FP	FP	NS	NS	NS	NS	NS
MW-15	5100	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-16	1700	NS	NS	NS	NS	NS	514*	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-17	2000	NS	NS	NS	NS	NS	1500	DRY	DRY	NS	NS	NS	NS	NS	NS
MW-18	4300	NS	2639**	2700	3300	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS
MW-19	***4700***	***NS***	***3195****	***3000***	***3032****	***NS***	***3926****	***DRY***	***VE***	***VE***	***VE***	***VE***	***NS***	***NS***	***NS***
MW-20	110	NS	NS	NS	NS	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS
MW-21	1000	1100	NS	NS	NS	NS	114*	FP	NS	DRY	NS	NS	NS	NS	NS
MW-22	4	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-23	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-24	***3400***	***NS***	***NS***	***4353****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-25	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-26	3100	3000	NS	2000	1992*	1708*	861*	FP	FP	FP	NS	NS	NS	NS	NS
MW-27	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-28	2200	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-29	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-30	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-31	<1	NS	NS	332**	9*	NS	NS	DRY	DRY	NS	NS	NS	NS	NS	NS
MW-32	***200***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-33	6300	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-34	2500	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-35	5700	NS	NS	NS	NS	NS	NS	FP	FP	FP	NS	NS	NS	NS	NS

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCl = only Chloride sample

FP = Free Product (condensate) ndensate)

NS = Not Sampled Sampled

VE = Vapor Extraction well ction well

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER (Continued)

SECOND QUARTER 1995

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise														
WELL	Sep-91	Dec-91	Apr-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Jan-94	Apr-94	Jul-94	Oct-94	Jan-95	Apr-95
MW-36	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-37	150	NS	NS	NS	NS	NS	NS	27*	DRY	NS	NS	NS	NS	NS	NS
MW-38	***15***	***15***	***51****	***37****	***166****	***NS***	***NS***	***DRY***	***BD***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-39	880	NS	NS	NS	NS	14	29*	24*	DRY	<2.5	<0.5	<0.5	DRY	<5.0	NS
MW-40	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-41	200	170	NS	NS	NS	NS	NS	22*	DRY	5.3	0.6	1.4	3.2	13	4.8
MW-42	<1	<1	NS	NS	NS	NS	NS	NS	DRY	NS	NS	NS	NS	NS	NS
MW-43	320	NS	NS	NS	NS	NS	NS	25*	DRY	<0.5	<0.5	<0.5	0.8	3	0.6
MW-44	***59***	***NS***	***10****	***97****	***12***	***14***	***7****	***6****	***3****	***12***	***22***	***36***	***130***	***63***	***19***
MW-45	<1	<1	NS	NS	NS	NS	NS	<3*	<3*	<0.5	<0.5	<0.5	NS	NS	NS
MW-46	140	25	NS	NS	NS	NS	NS	NS	DRY	NS	NS	DRY	NS	NS	NS
MW-47	2600	2200	NS	NS	NS	NS	NS	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-48	***<1***	***<1***	***NS***	***47****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-49	35	NS	NS	NS	NS	NS	NS	210*	68*	13	82	150	78	220	120
MW-50	***<1***	***<1***	***4****	***4****	***8****	***8****	***<1***	***<3****	***9****	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***
MW-51	800	<1	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
MW-52	***<1***	***NS***	***NS***	***5****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-53	***<1***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-54	***<1***	***<1***	***9****	***8****	***62****	***14****	***10****	***<3****	***17****	***8.6***	***<0.5***	***15***	***19***	***<0.5***	***<0.5***
MW-55	***940***	***400***	***296****	***483****	***215****	***390***	***412****	***625****	***581****	***290***	***370***	***360***	***910***	***650***	***420***
MW-56	***2200***	***1000***	***NS***	***1114****	***1026****	***1128****	***VE***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-61	<1	<1	NS	NS	NS	NS	NS	NS	NS	1.4	<0.5	3.2	<5.0	<0.5	<0.5
MW-65	<1	NS	NS	NS	NS	NS	NS	<3*	DRY	DRY	DRY	NS	<0.5	NS	NS
MW-69	***2400***	***2100***	***NS***	***568****	***1598****	***1284****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***
MW-79	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	110	14
SUMP A10	***940***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***OCI***	***DRY***	***DRY***
SUMP A11	1400	2900	3033**	1258**	2815*	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS
SUMP 16A	***240***	***2000***	***1233****	***1495****	***632****	***741****	***707****	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***170***	***2.0***	***NS***
Lyman										<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U. Indian Hills Spring West	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCI = only Chloride sample

FP = Free Product (condensate) densate)

NS = Not Sampled Sampled

VE = Vapor Extraction well tion well

TABLE 5
RANCHER WELL GROUNDWATER AND NATURAL SPRING WATER SAMPLE RESULTS
SECOND QUARTER 1995

		1995														
	Probable	Apr-7					May-18					June				
WELL/ SPRING	Aquifer	Benzene	Toluene	Ethylbenzene	Xylenes	Chloride	Benzene	Toluene	Ethylbenzene	Xylenes	Chloride	Benzene	Toluene	Ethylbenzene	Xylenes	Chloride
Lyman	Shallow Alluvial	ND	ND	ND	ND	13	ND	ND	ND	ND	10	NS	NS	NS	NS	NS
Upper Indian Hills	Shallow Alluvial	ND	ND	ND	ND	13	ND	ND	ND	ND	9	NS	NS	NS	NS	NS
Biebelle	Seven Rivers	ND	ND	ND	ND	10.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Benzene, Toluene, Ethylbenzene, and total Xylene concentration in ug/L.

Chloride concentration in mg/L.

ND = Not Detected at method detection limit of 0.5 ug/L.

NS = Not Sampled.

FIGURES

Figure 1.
April 1995 Lower Queen Potentiometric Surface
SURFER 5.0 Kriging Function
(assumes 10 ft of drawdown in MW-72 and
<3 feet of drawdown in other recovery wells)

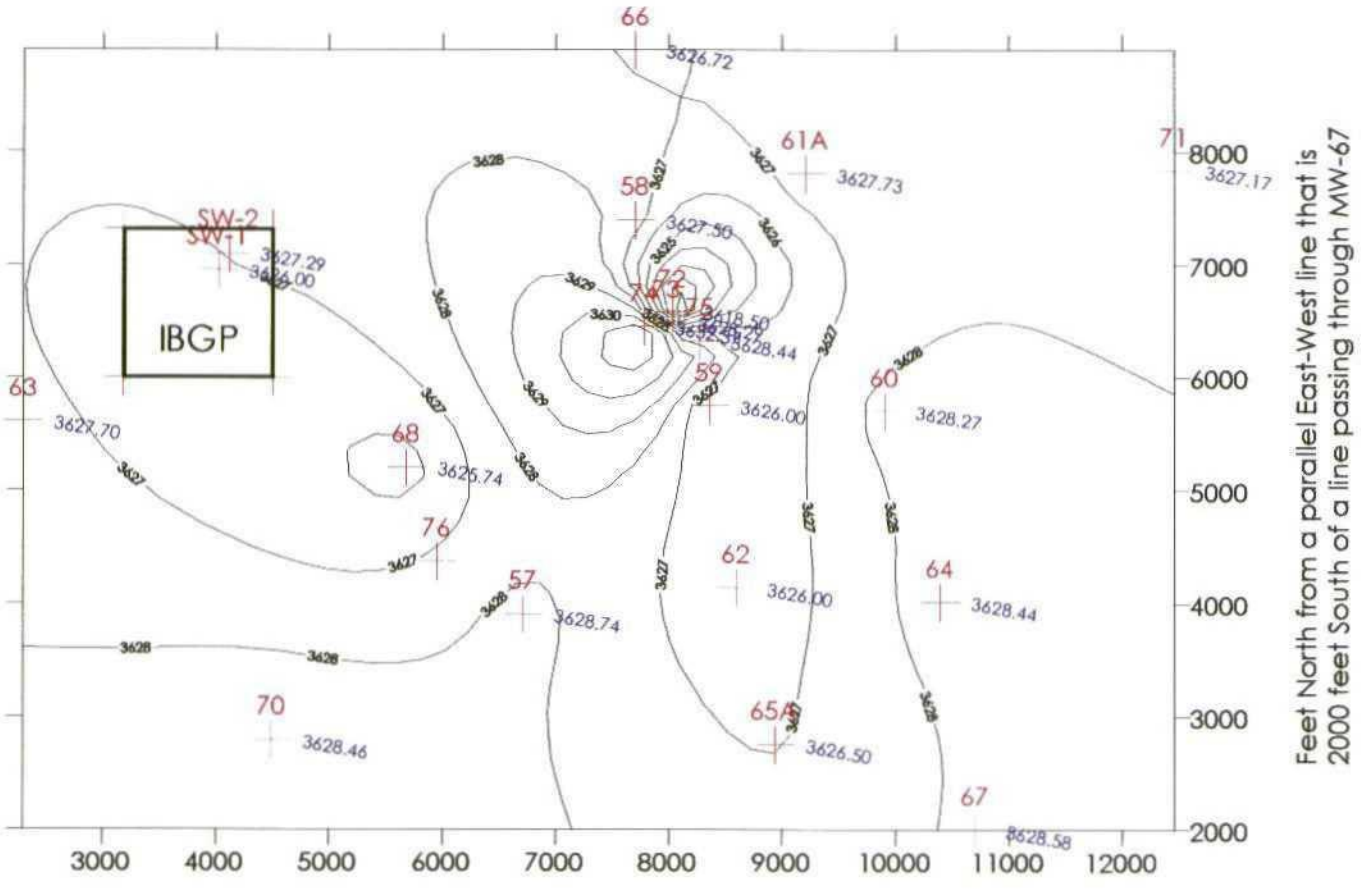


Figure 2. Lower Queen Groundwater Elevation vs. Time

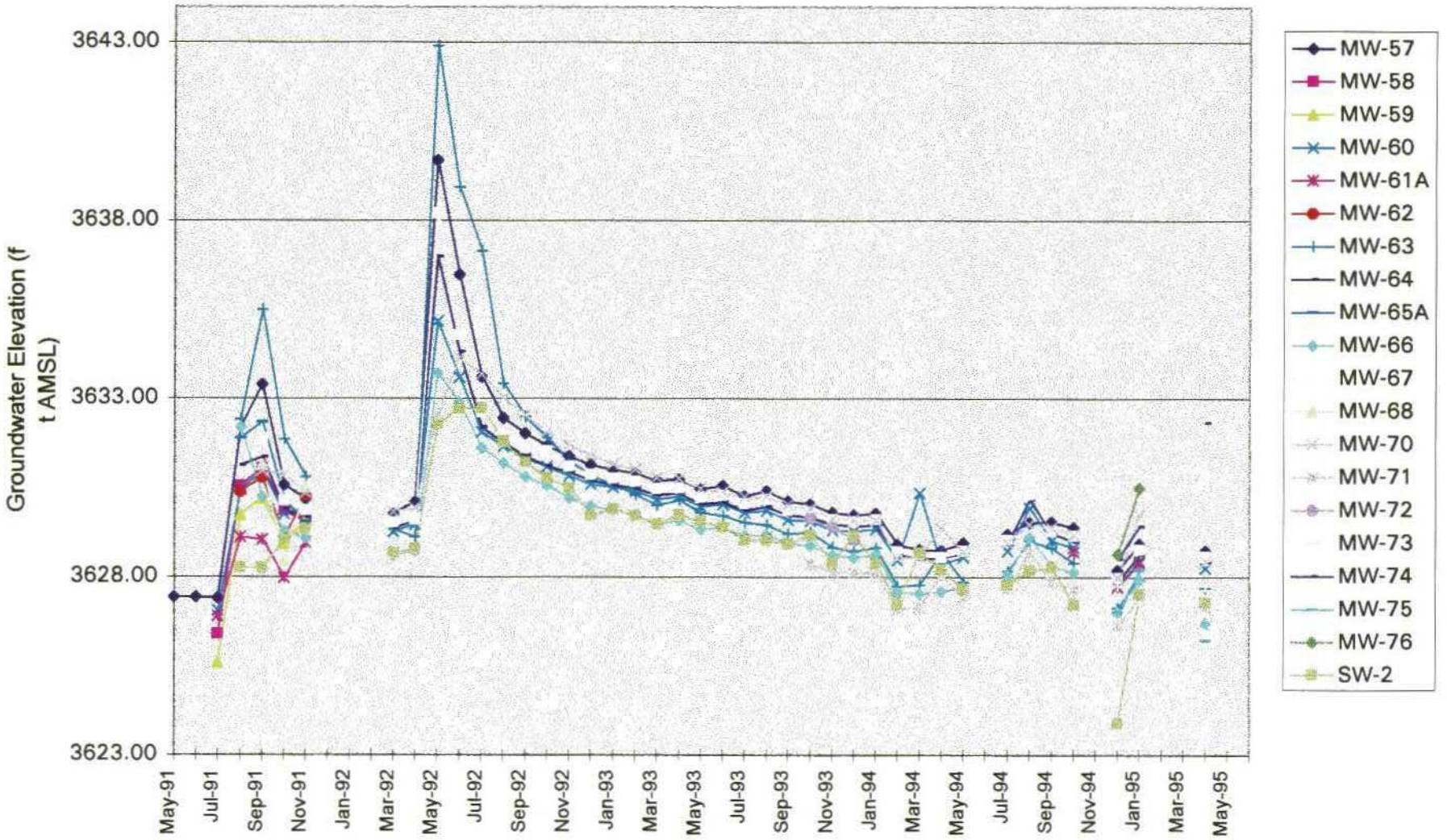


Figure 3.
April 1995 Shallow zone Potentiometric Surface
SURFER 5.0 Kriging Function

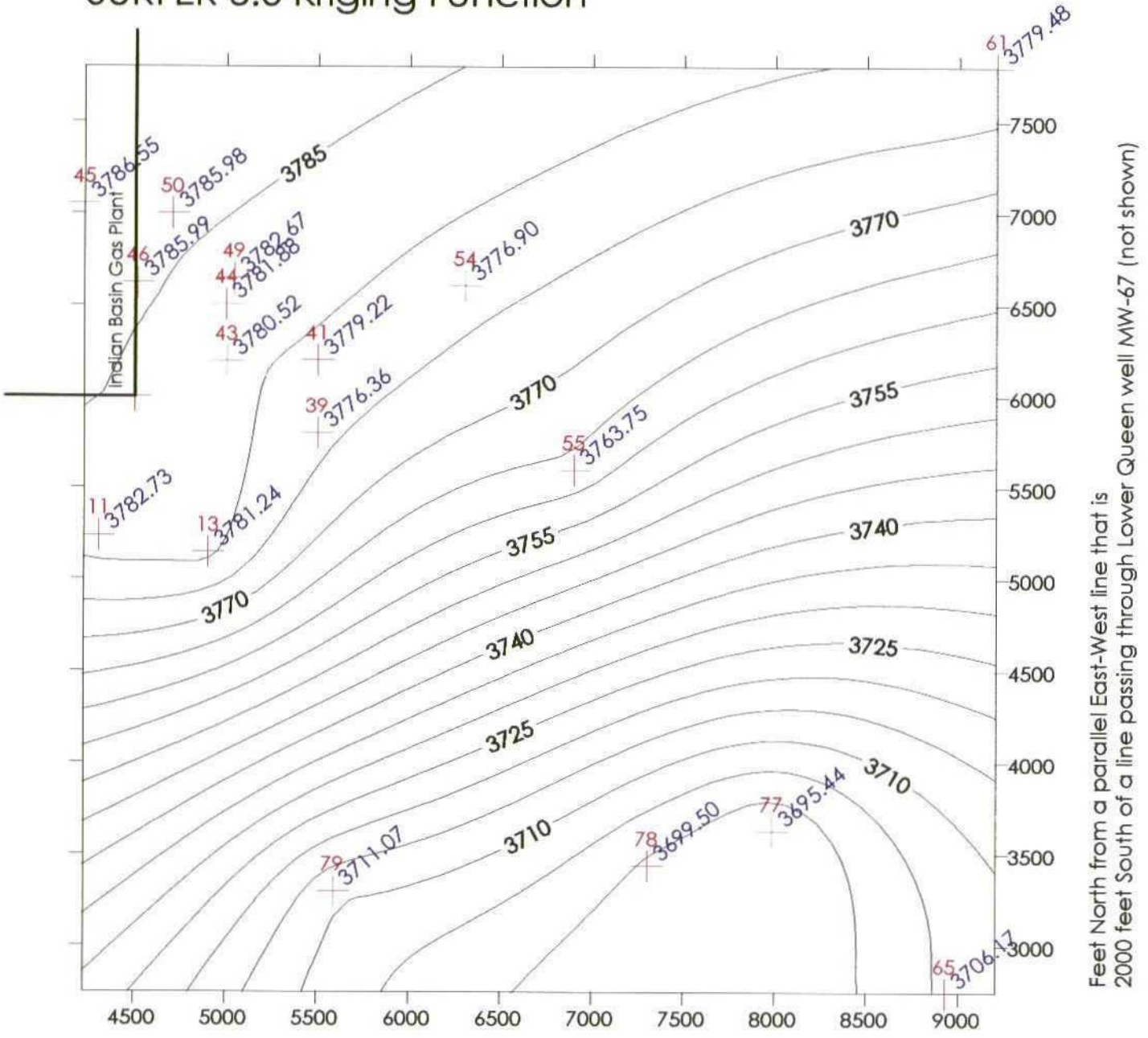


Figure 4. Shallow zone Groundwater Elevation vs. Time

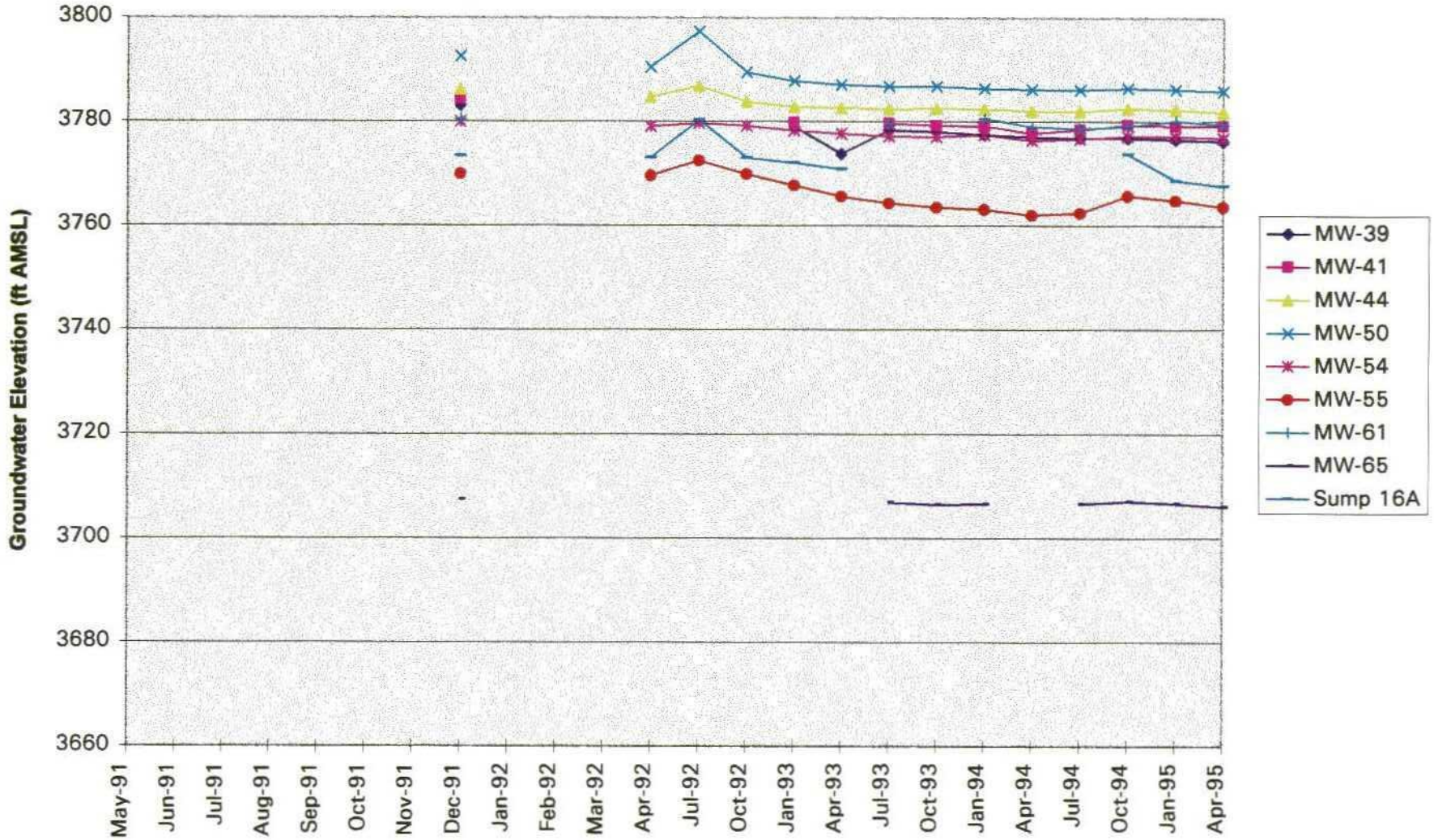
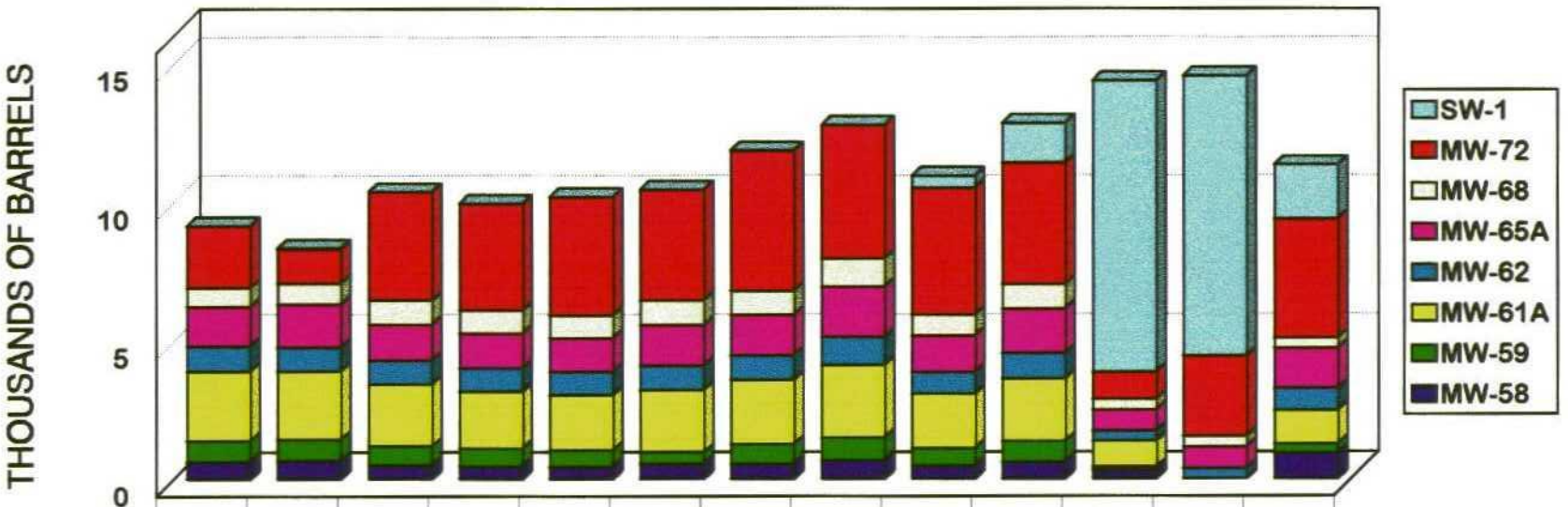


FIG4

FIGURE 5

WEEKLY LOWER QUEEN FLUID RECOVERY
SECOND QUARTER 1995



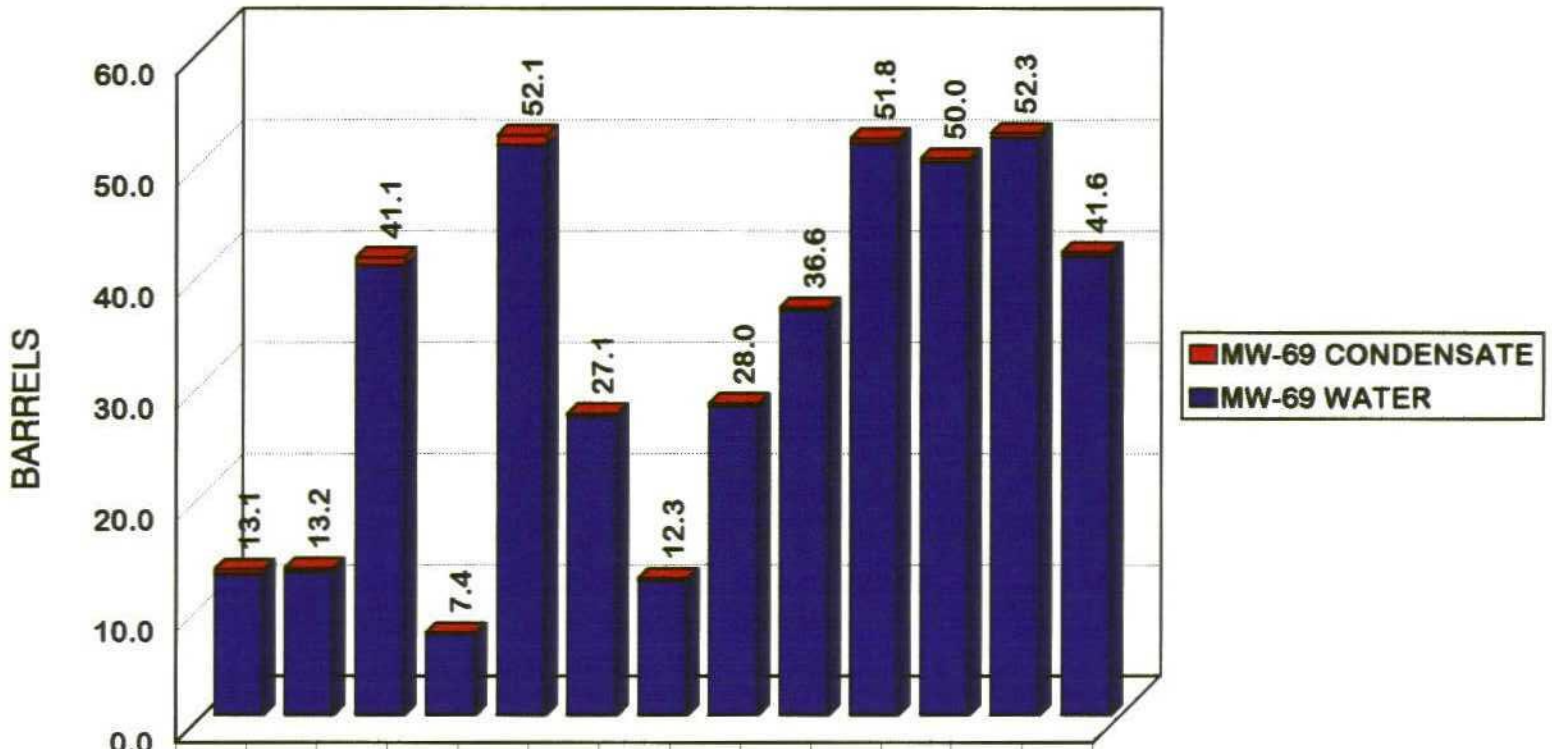
	4/10	4/17	4/24	5/1	5/8	5/15	5/22 95	5/30	6/5	6/12	6/19	6/26	7/3
SW-1	0	0.029	0	0.0061	0	0.0007	0.0095	0	0.4368	1.4397	0.5122	0.1175	1.9485
MW-72	2.2439	1.2448	3.9109	3.8326	4.2847	3.9888	5.048	4.8243	4.5822	4.3795	0.985	2.8954	4.3041
MW-68	0.6782	0.7429	0.8779	0.8554	0.8301	0.89	0.8694	1.017	0.7511	0.876	0.3754	0.3858	0.3731
MW-65A	1.4323	1.5562	1.2944	1.2379	1.2076	1.4749	1.478	1.801	1.3238	1.6163	0.7761	0.7802	1.4487
MW-62	0.9029	0.8749	0.8632	0.8442	0.8484	0.8732	0.8788	1.0201	0.7893	0.9099	0.3668	0.3685	0.7903
MW-61A	2.5086	2.4549	2.2351	2.0631	1.9694	2.242	2.3251	2.6208	1.9505	2.265	0.9284	0.0003	1.2152
MW-59	0.7591	0.7686	0.6914	0.6385	0.6066	0.4165	0.7022	0.8209	0.6276	0.7432	0.1303	0.0021	0.315
MW-58	0.6322	0.6674	0.498	0.4692	0.447	0.553	0.5491	0.675	0.4889	0.6172	0.3002	0.0009	0.9479

METER RECORDING DATE

WKLQREC2Q

FIGURE 6

WEEKLY SHALLOW ZONE FLUID RECOVERY
SECOND QUARTER 1995



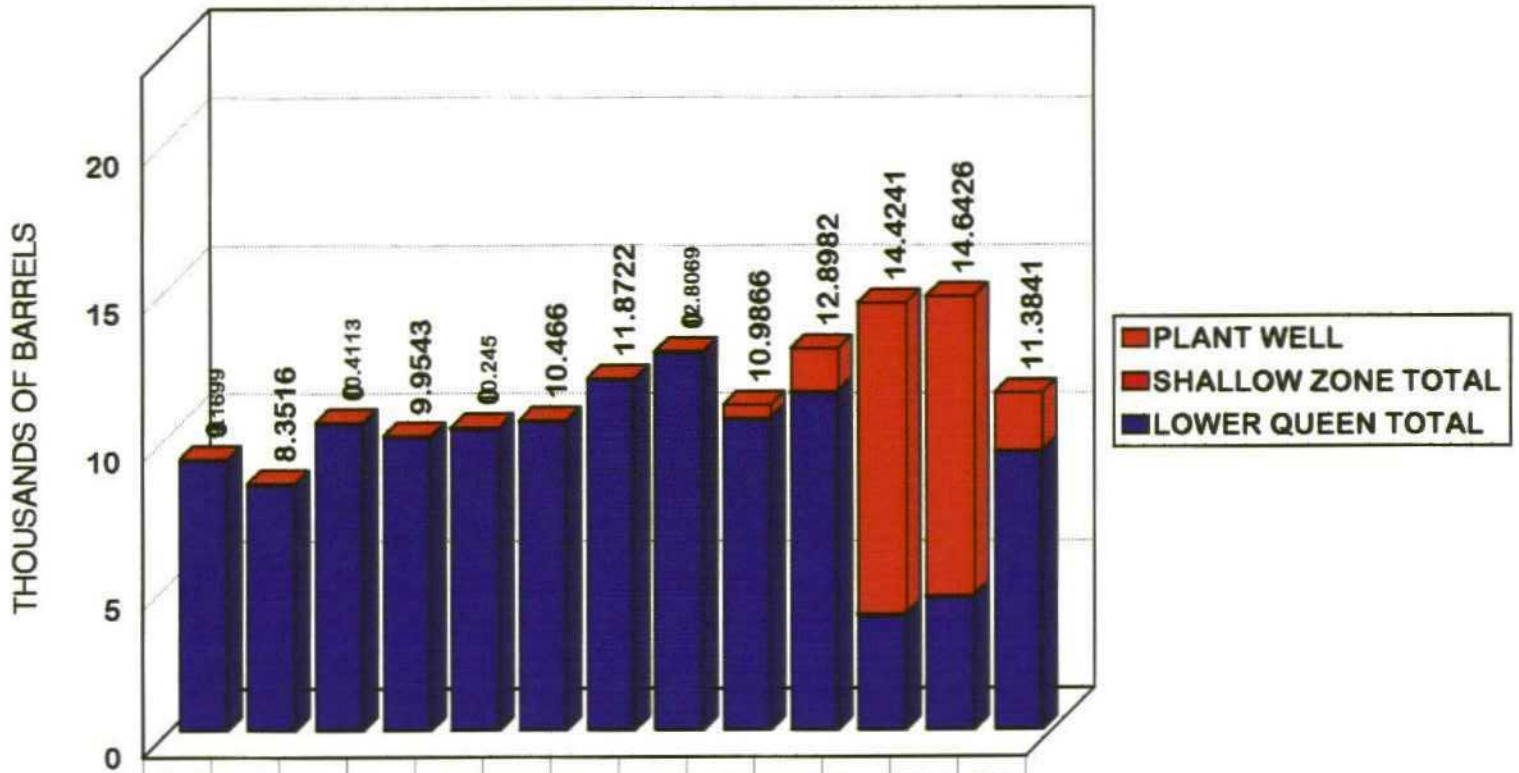
	4/10/95	4/17/95	4/24/95	5/1/95	5/8/95	5/15/95	5/22/95	5/30/95	6/5/95	6/12/95	6/19/95	6/26/95	7/3/95
MW-69 CONDENSATE	0.4	0.3	0.7	0.1	0.9	0.2	0.2	0.2	0.2	0.4	0.3	0.4	0.3
MW-69 WATER	12.7	12.9	40.4	7.3	51.2	26.9	12.1	27.8	36.4	51.4	49.7	51.9	41.3

METER RECORDING DATE

WKSZREC2Q

FIGURE 7

WEEKLY TOTAL FLUID RECOVERY
SECOND QUARTER 1995



	4/10	4/17	4/24	5/1	5/8	5/15	5/22 95	5/30	6/5	6/12	6/19	6/26	7/3
PLANT WELL	0	0.029	0.0061	0	0.0007	0.0095	0	0.4368	0.4391	0.5129	2.1175	5.9485	
SHALLOW ZONE TOTAL	0.0126	0.0129	0.0404	0.0078	0.0512	0.0269	0.0126	0.0278	0.0364	0.0514	0.0496	0.0519	0.0413
LOWER QUEEN TOTAL	9.1578	8.3097	10.3709	9.9409	9.1938	8.4384	4.8508	2.7799	0.5134	4.4073	3.8628	8.4739	3.3943

METER RECORDING DATE

WKREC2Q

APPENDIX A

APRIL 1995 GAUGING, PURGING, AND SAMPLING FIELD SUMMARY

GROUNDWATER TECHNOLOGY ®

Groundwater Technology, Inc.
2501 Yale Boulevard, SE, Suite 204, Albuquerque, NM 87106 USA
Tel: (505) 242-3113 Fax: (505) 242-1103

August 1, 1995

Project No. 023350059

Mr. Robert J. Menzie, Jr.
Marathon Oil Company
P.O. Box 552
Midland, TX 79702-5233

RE: Transmittal of Groundwater Monitoring and Sampling Reports

Dear Mr. Menzie:

Enclosed for your use are revised summary tables of groundwater monitoring and sampling data collected in April and June 1995 during the 2nd Quarter Groundwater Sampling. The revised tables reflect the addition of data for well MW-71, and other corrections noted in your facsimile of July 27, 1995. If you have any questions regarding this data, or require any additional information or services, please do not hesitate to contact me at (505) 242-3113.

Sincerely,

Groundwater Technology, Inc.

Sara C. Brothers
Project Manager
Operations Manager, New Mexico

cc: Project File

Well Gauging Data Form

Client:	**Marathon Oil Company**	**Recorded By:**	**Charles Madewell & Kevin Cook**
Site:	**Indian Basin Gas Plant**	**Interface Probe (IP)#:**	**1663**
Project #:	***023350059.6002***	***IP Correcton:***	***NA***
Date:	**4/4/95**	**Weather:**	**Cloudy, windy, cool, rainy**

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-29	2	12:48	14.76	DRY	NA	0.00	0.00	0.00	0	0	
SUMP-16A	24	12:44	17.45	17.32	NA	0.00	0.00	17.32	0	0	
MW-54	4	15:41	78.15	46.96	NA	0.00	0.00	46.96	0	0	
MW-05	2	14:34	12.77	DRY	NA	0.00	0.00	0.00	0	0	
MW-24	2	14:31	13.18	DRY	NA	0.00	0.00	0.00	0	0	
MW-39	4	14:57	20.54	19.84	NA	0.00	0.00	19.84	0	0	
MW-38	4	14:55	20.57	DRY	NA	0.00	0.00	0.00	0	0	
MW-41	4	14:50	24.04	19.82	NA	0.00	0.00	19.82	0	100	
MW-43	4	14:46	24.55	21.53	NA	0.00	0.00	21.53	0	0	
MW-44	4	14:42	25.24	22.26	NA	0.00	0.00	22.26	0	0	
MW-49	2	14:38	25.91	22.94	NA	0.00	0.00	22.94	0	0	
MW-32	2	13:51	15.70	DRY	NA	0.00	0.00	0.00	0	0	
MW-11	4	14:17	24.77	24.23	NA	0.00	0.00	24.23	0	400	
SUMP-A10	24	14:09	13.42	DRY	NA	0.00	0.00	0.00	0	0	
MW-48	2	15:02	19.98	DRY	NA	0.00	0.00	0.00	0	0	
MW-47	2	15:07	21.79	DRY	NA	0.00	0.00	0.00	0	0	
MW-46	4	15:18	19.70	19.55	NA	0.00	0.00	19.55	0	1000	
MW-50	2	15:37	37.15	27.37	NA	0.00	0.00	27.37	0	0	
MW-45	2	15:33	26.62	22.13	NA	0.00	0.00	22.13	0	0	
MW-76	8		220.00	--	--	--	--	--			Not Gauged per Bob Menzie
MW-74	8	16:04	220.00	188.48	--	0.00	0.00	0.00	0	>10,000	* Product on Probe
MW-73	8	16:09	220.00	192.33	191.62	0.71	0.52	192.85	0	>10,000	
MW-75	8	16:20	220.00	189.89	186.94	2.95	2.15	192.04	0	1500	
MW-13	2	14:25	22.07	20.34	20.05	0.29	0.21	20.55	0	0	

Well Gauging Data Form

Client:	Marathon Oil Company	**Recorded By:**	Charles Madewell & Kevin Cook
Site:	Indian Basin Gas Plant	**Interface Probe (IP)#:**	1663
Project #:	023350059.6002	**IP Correcton:**	NA
Date:	4/4/95	**Weather:**	Cloudy, windy, cool, rainy

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-70	4	09:33	228.14	194.11	NA	0.00	0.00	194.11	0	0	
MW-80	8	09:38	91.80	DRY	NA	0.00	0.00	DRY	0	0	
MW-53	2	09:49	15.20	DRY	NA	0.00	0.00	DRY	0	0	
MW-69	4	--	*	--	NA	0.00	0.00	DRY	--	--	Pump
MW-09	2	09:54	13.65	DRY	NA	0.00	0.00	DRY	0	0	
MW-08	2	09:59	17.24	DRY	NA	0.00	0.00	DRY	0	200	
MW-79	8	10:07	82.90	77.32	NA	0.00	0.00	77.32	0	900	
MW-07	2	10:10	17.33	DRY	NA	0.00	0.00	DRY	0	0	
MW-06	2	10:14	14.18	DRY	NA	0.00	0.00	DRY	0	0	
MW-63	4	13:59	221.88	198.46	NA	0.00	0.00	198.46	0	0	
SW-02	10	15:21	292.00	181.50	NA	0.00	0.00	181.50	0	0	
MW-52	2	14:04	21.19	DRY	NA	0.00	0.00	DRY	0	0	
MW-71	4	11:18	235.41	150.88	NA	0.00	0.00	150.88	0	0	
MW-61A	4	--	215.67	--	NA	--	--	DRY	--	--	Pump
MW-61	4	11:04	57.97	36.72	NA	0.00	0.00	36.72	0	0	
MW-66	4	15:50	237.66	202.26	NA	0.00	0.00	202.26			Pump-Probe #18575
MW-60	4	11:27	226.08	187.01	NA	0.00	0.00	187.01	0	0	
MW-64	4	11:39	204.38	170.13	NA	0.00	0.00	170.13	0	0	
MW-67	4	11:45	168.54	137.29	NA	0.00	0.00	137.29	0	2000	
MW-65	4	12:18	57.35	57.14	NA	0.00	0.00	57.14	0	0	
MW-77	8	12:22	82.20	80.04	NA	0.00	0.00	80.04	0	0	
MW-78	8	12:28	86.62	86.32	NA	0.00	0.00	86.32	0	100	Solinst #8195
MW-57	4	12:35	179.30	158.96	NA	0.00	0.00	158.96	0	0	
MW-55	4	13:16	66.32	30.65	NA	0.00	0.00	30.65	0	0	
MW-56	4	12:56	43.76	DRY	NA	0.00	0.00	DRY	0	>10,000	Solinst #8195
MW-03	2	13:06	16.90	DRY	NA	0.00	0.00	DRY	0	0	
MW-10	4	13:10	18.21	DRY	NA	0.00	0.00	DRY	0	0	

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 4/4-8/95

Project Number 023350059.6002 Technician: Charles Madewell and Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-41	4	24.04	19.82	8.5	Bail	11:15	5.5	NA	NA	4/6/95, 14:00	6.96	2490	73.3	1.5	MW-41
MW-43	4	24.55	21.53	6	Bail	11:05	2.5	NA	NA	4/6/95, 13:55	6.98	2480	67.9	2.4	MW-43
MW-44	4	25.24	22.26	6	Bail	10:50	6	NA	NA	4/6/95, 13:50	6.95	2220	71.2	2.2	MW-44
MW-49	2	25.91	22.94	1.5	Bail	10:40	1.5	NA	NA	4/6/95, 13:45	6.76	4560	72.6	--	MW-49
MW-50	2	37.15	27.37	5	Bail	10:25	5	NA	NA	4/6/95, 13:40	6.99	5080	71.4	4.6	MW-50
MW-55	4	66.32	30.65	71.5	Bail	14:15	55	NA	NA	4/11/95, 15:20	7.02	1880	62.0	3.8	MW-55
MW-57	4	179.30	158.96	41	Pump	08:45	42.9	173	2.85	4/8/95, 09:20	7.24	824	68.8	1.4	MW-57
MW-61	4	57.97	36.72	42.5	Bail	10:30	43	NA	NA	4/11/95, 10:55	6.87	4000	59.7	2.2	MW-61
MW-65	4	57.35	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-67	4	168.54	137.29	62.5	Pump	17:35	63	160	3.15	4/7/95, 18:20	7.23	750	68.0	1.4	MW-67
MW-77	8	82.20	80.04	17	Bail	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-79	8	82.90	77.32	44	Bail	12:25	14	NA	NA	4/6/95, 14:45	7.20	953	73.2	3.8	MW-79

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 4/4-8/95

Project Number 023350059.6002 Technician: Charles Madewell and Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-63	4	221.88	198.46	47	Pump	18:50	48	215	1.5	4/7/95, 19:40	7.35	571	66.8	6.6	MW-63
MW-66	*4*	*237.66*	*202.26*	*71*	*Pump**	12:20	*72*	215	*3*	4/11/95, 12:20	7.33	1053	63.5	3.8	MW-66
MW-70	4	228.14	194.11	68	Pump	13:45	68	201	1.0	4/4/95, 15:20	7.40	581	73.0	4.9	MW-70

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
*Dedicated 2" Grundfos pump

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 4/4-8/95

Project Number 023350059.6002 Technician: Charles Madewell and Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-39	4	20.54	19.84	1.5	Bail	11:25	0.5	NA	NA	NS	6.97	2110	71.8	--	NS*
MW-54	4	78.15	46.96	62	Pump	09:30	43	NA	NA	4/6/95, 13:30	7.00	2870	66.5	4.9	MW-54
MW-60	4	226.08	187.01	78	Pump	15:10	79.18	215	2.14	4/7/95, 16:05	7.18	976	72.4	2.5	MW-60
MW-61A	4	215.67	NA	NS	Pump dedicated	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-64	4	204.38	170.13	68.5	Pump	16:30	70.2	195	2.60	4/7/95, 17:15	7.18	918	69.6	1.8	MW-64
MW-71	4	235.41	150.88	170	Pump	16:35	168	212	6.7/2.7	6/23/95 18:15	7.36	1405	75.9	NS	MW-71

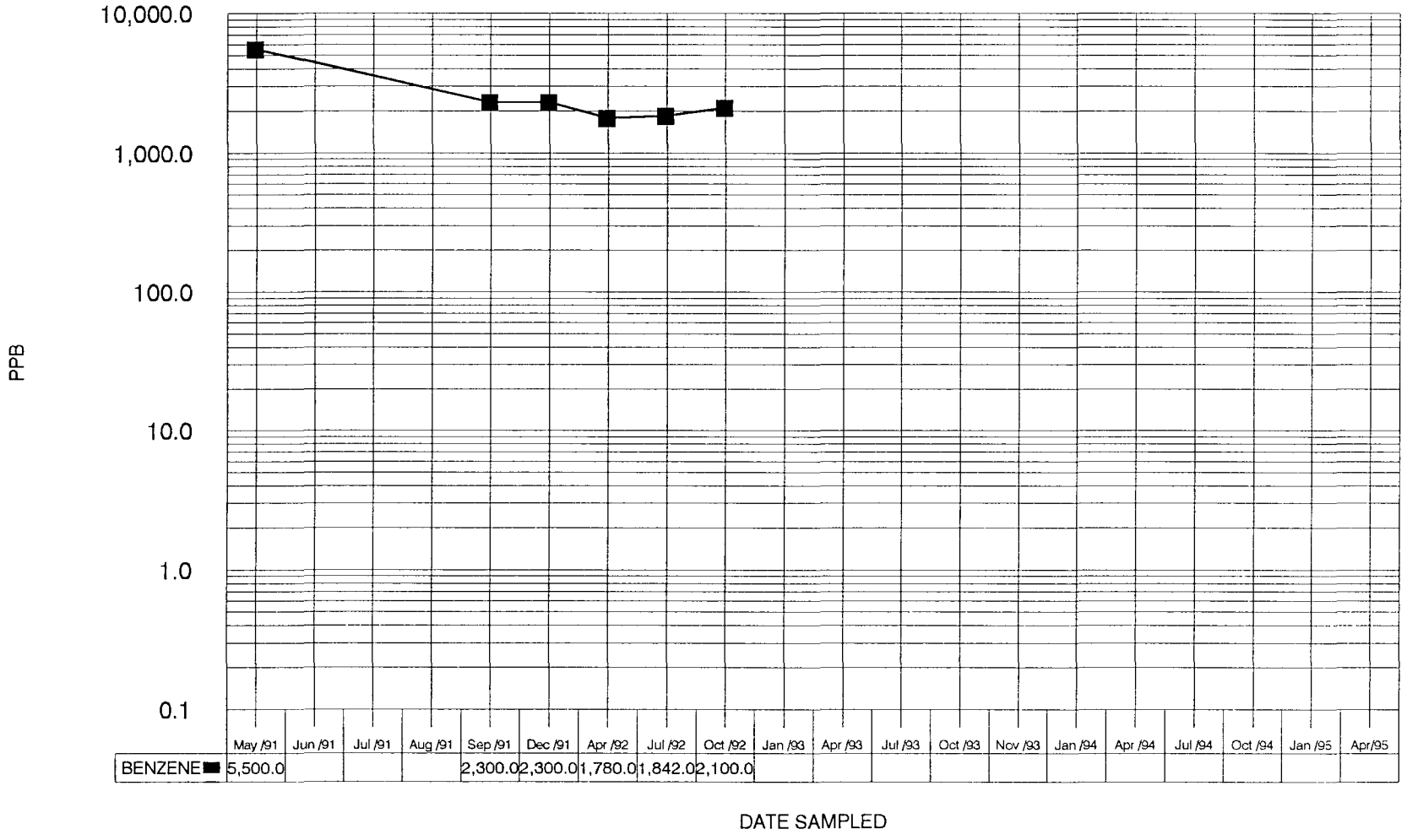
Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
4 - *Well MW-39 not sampled due to insufficient recharge.

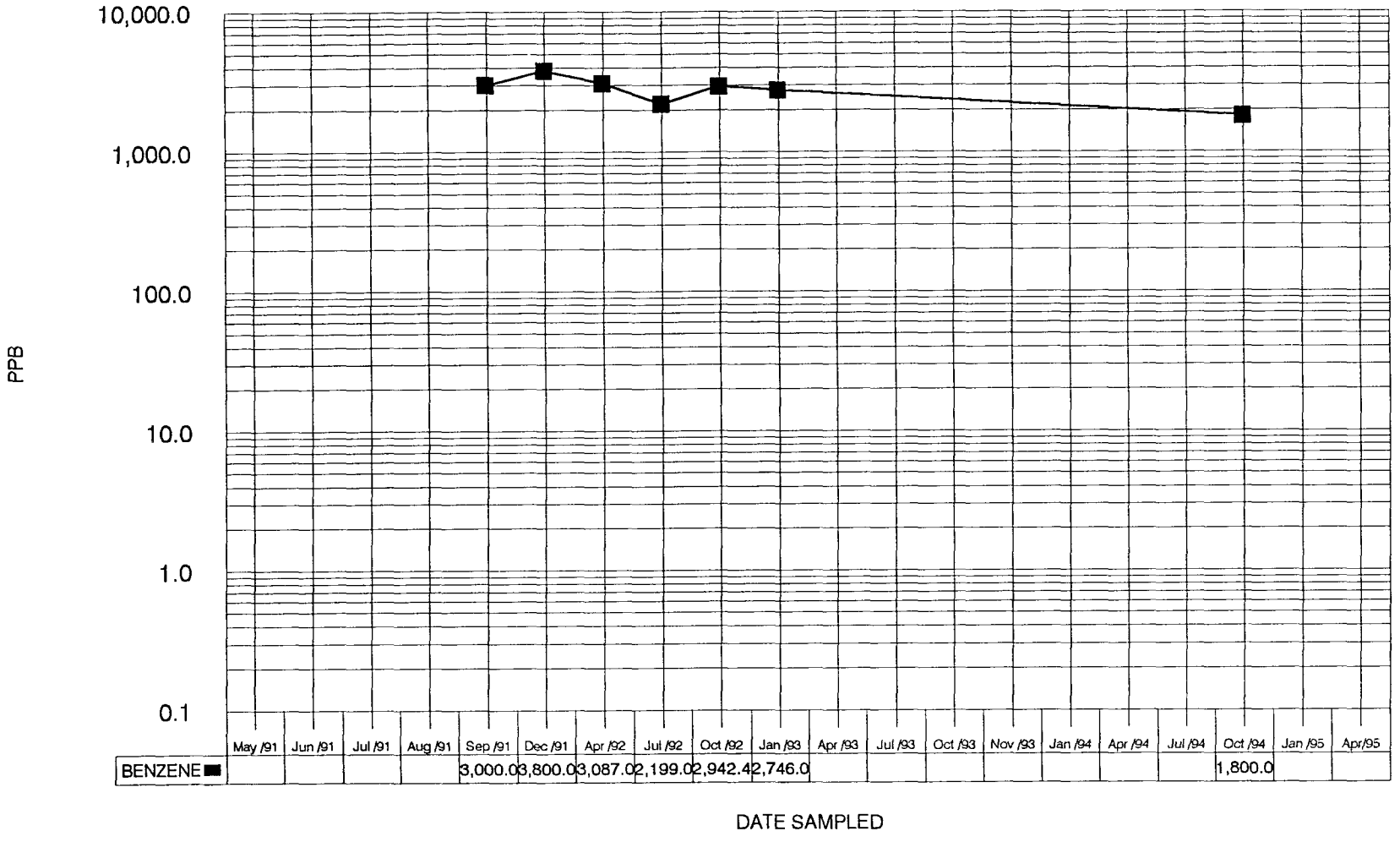
APPENDIX B

BENZENE CONCENTRATION IN GROUNDWATER VS. TIME GRAPHS

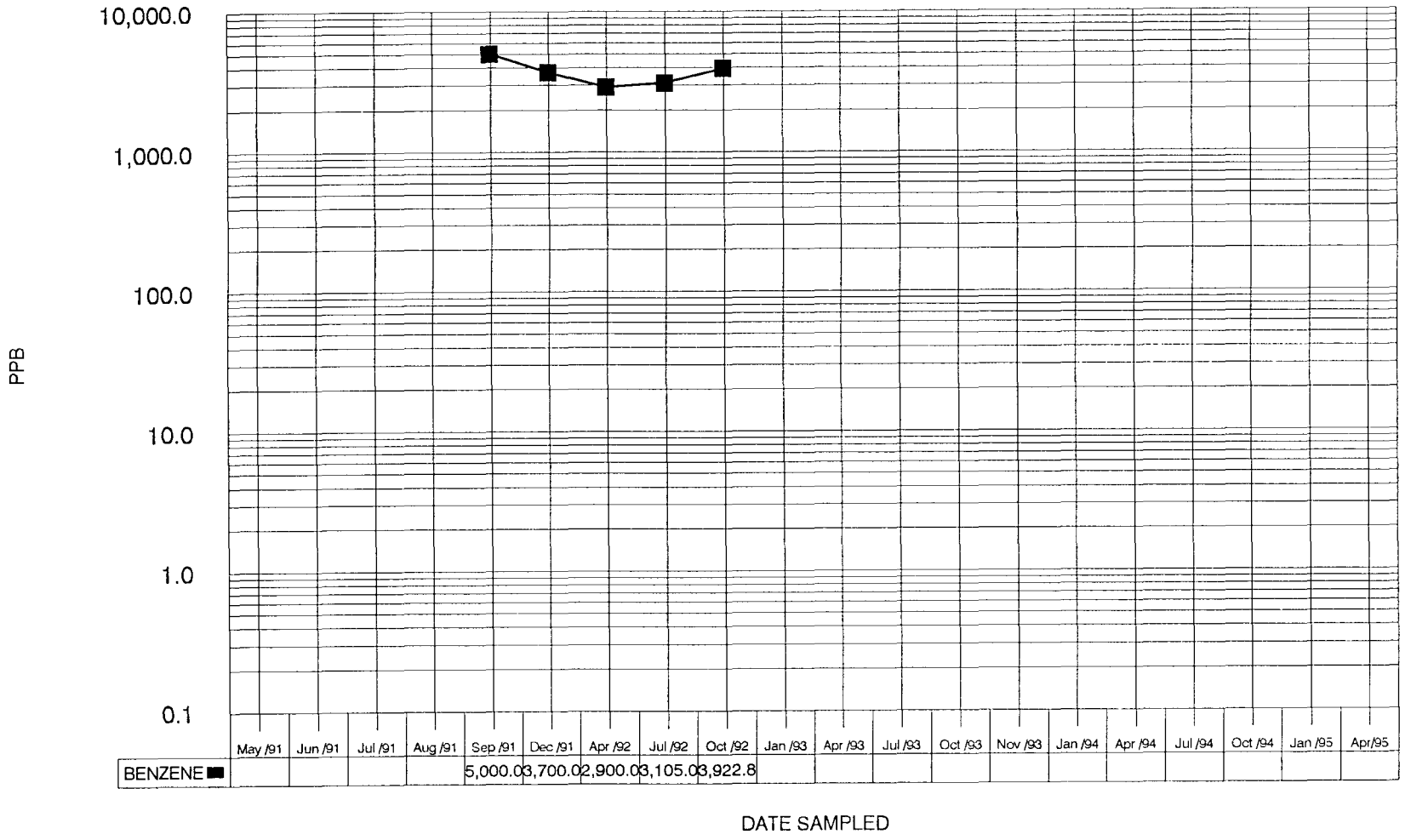
BENZENE IN GROUNDWATER
MW-10



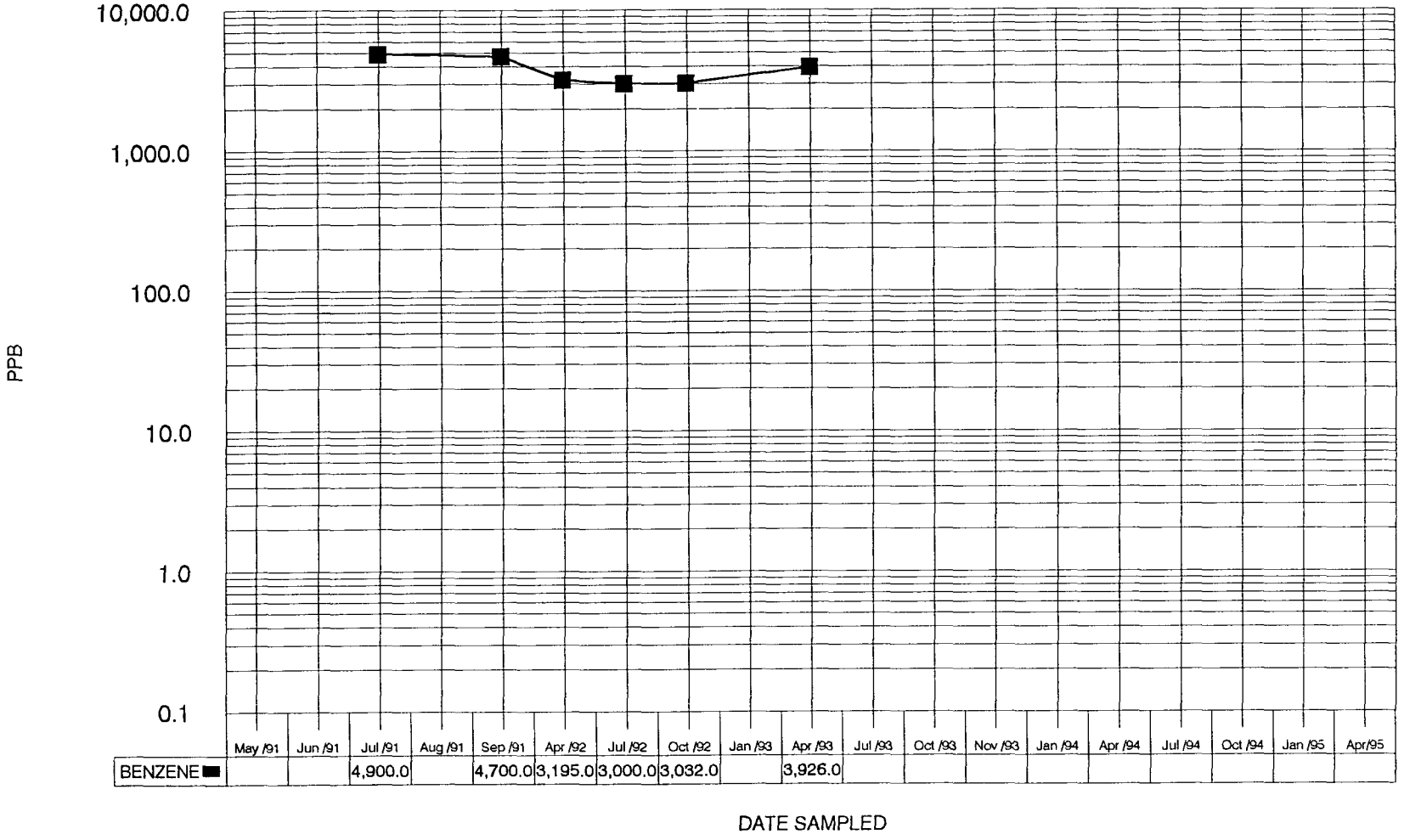
BENZENE IN GROUNDWATER
MW-11



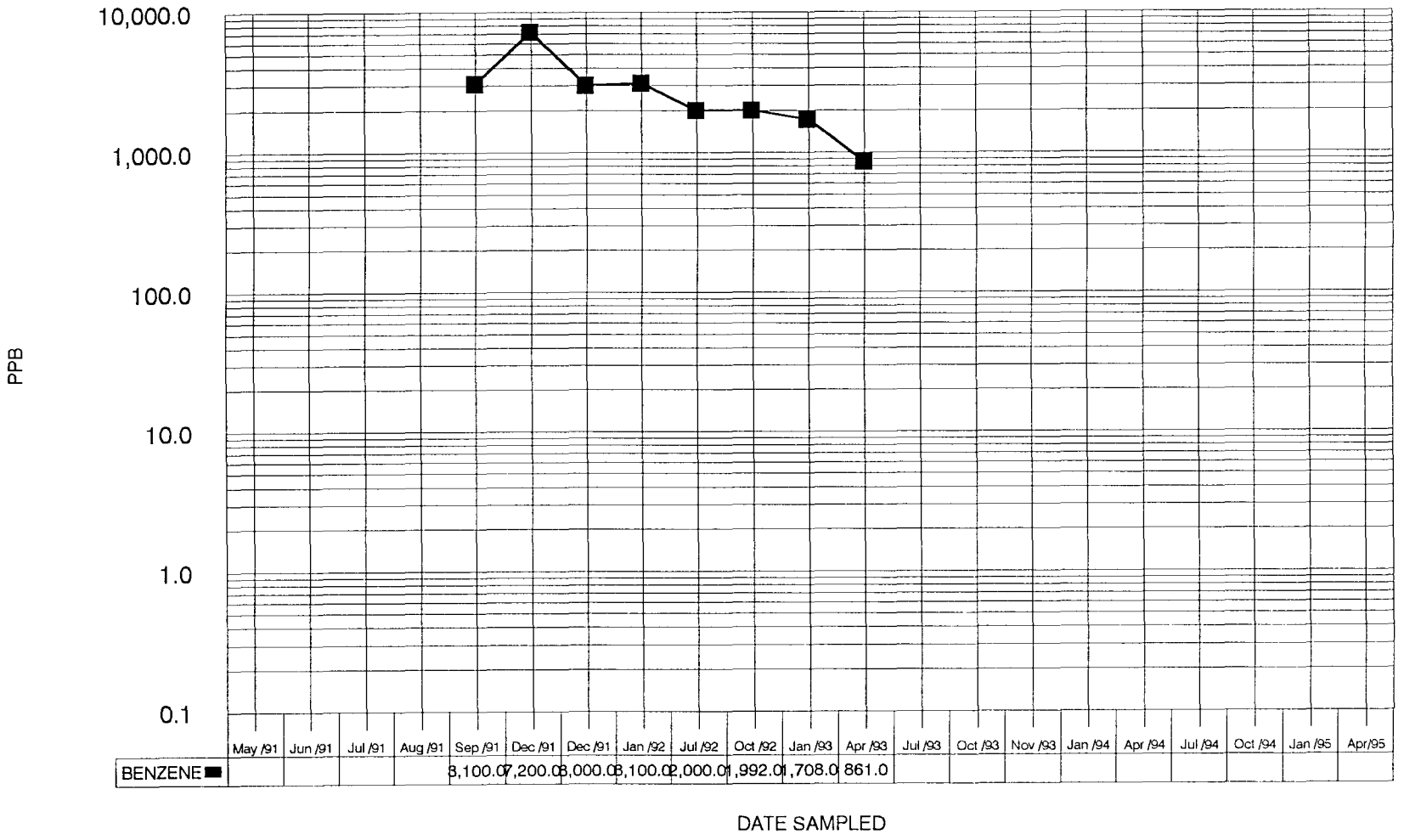
BENZENE IN GROUNDWATER
MW-18



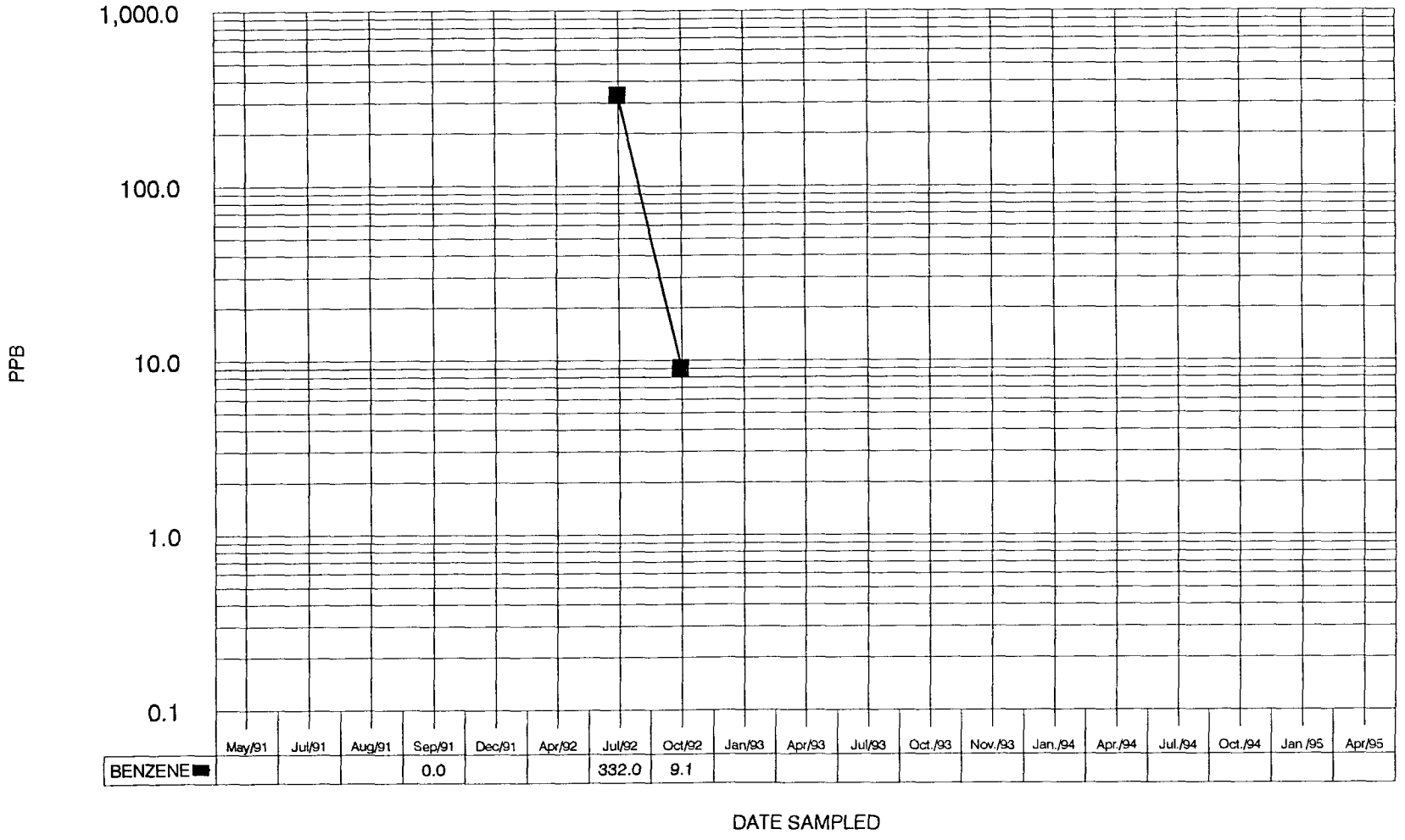
BENZENE IN GROUNDWATER
MW-19



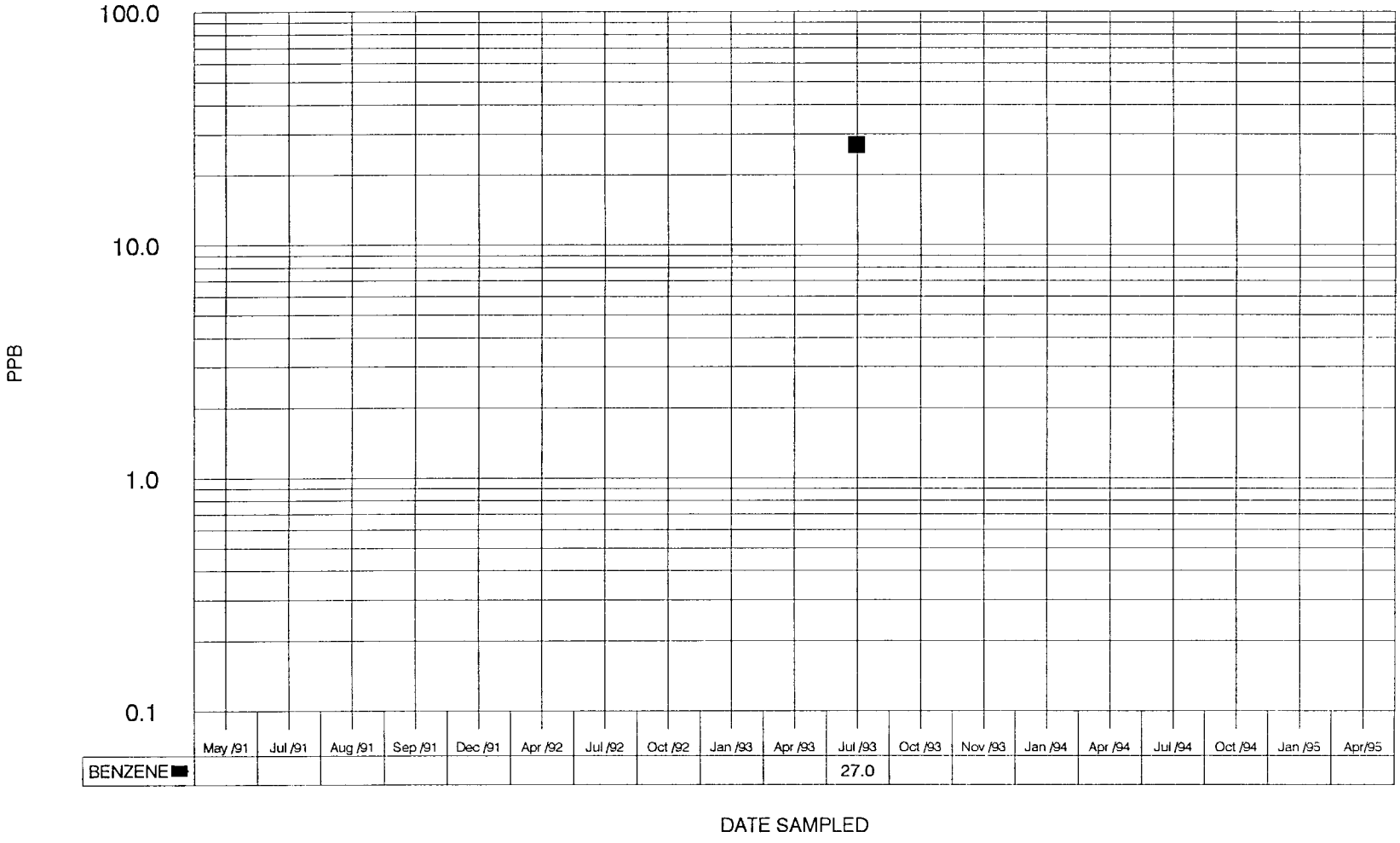
BENZENE IN GROUNDWATER
MW-26



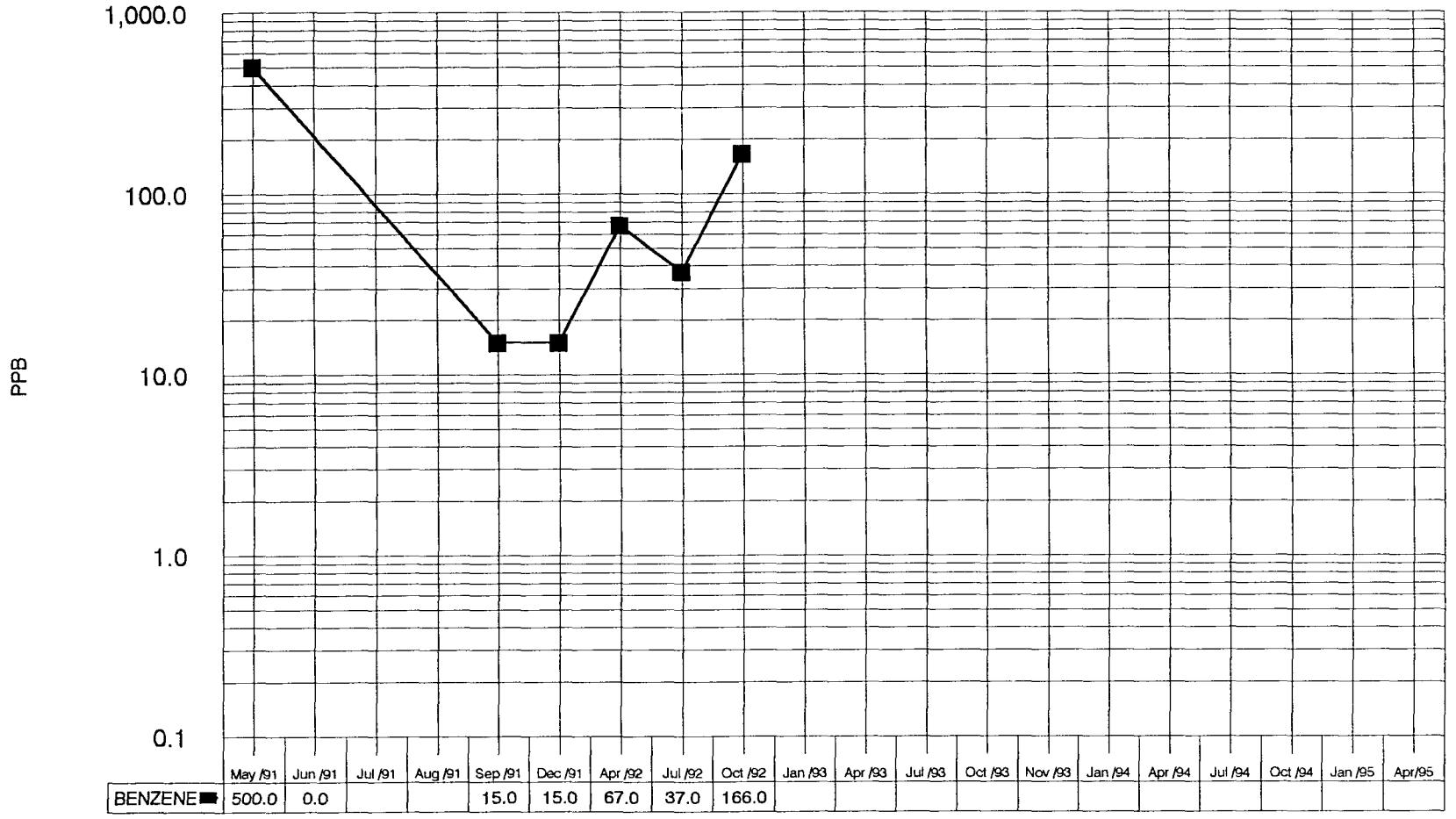
BENZENE IN GROUNDWATER
MW-31



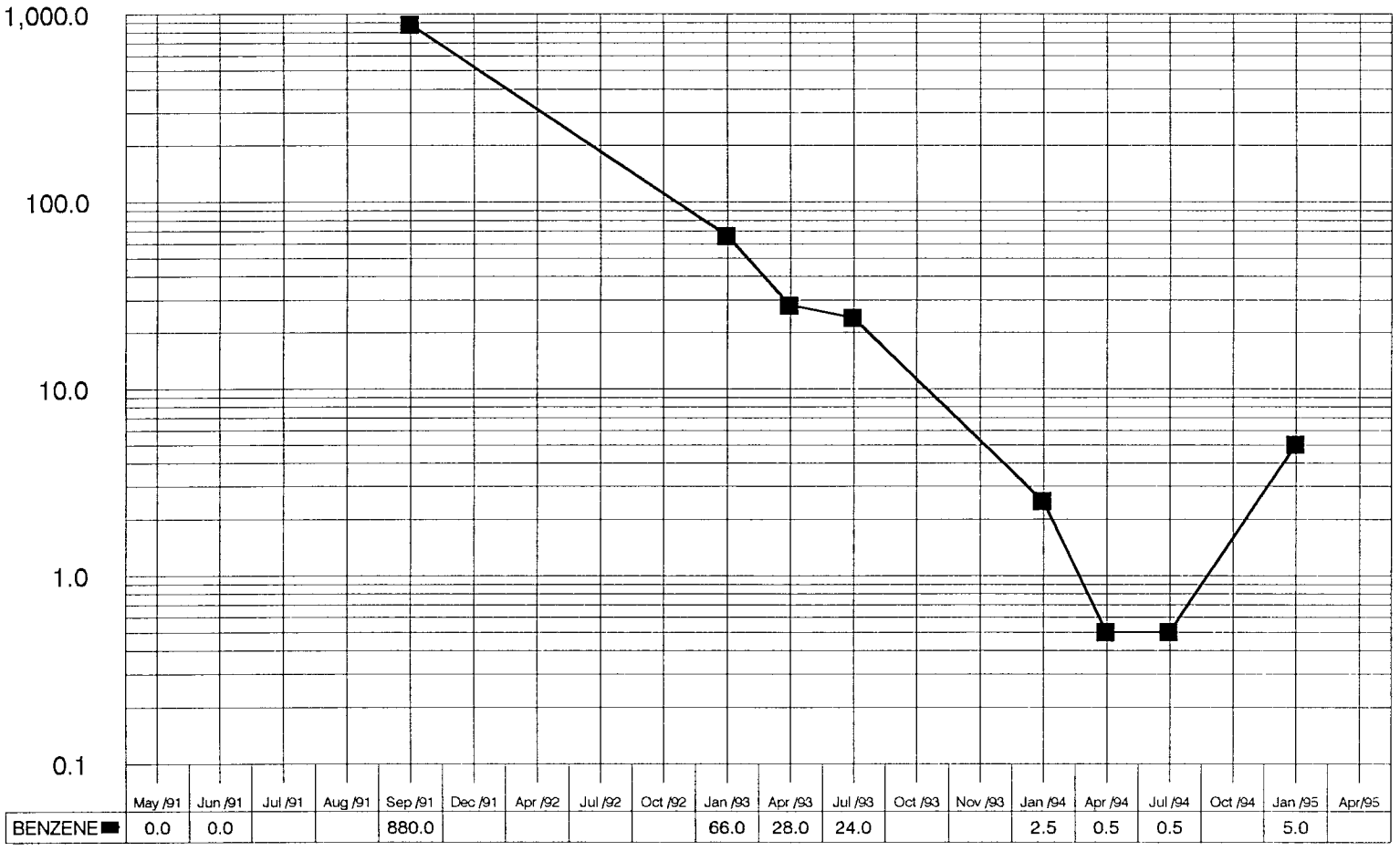
BENZENE IN GROUNDWATER
MW-37



BENZENE IN GROUNDWATER
MW-38



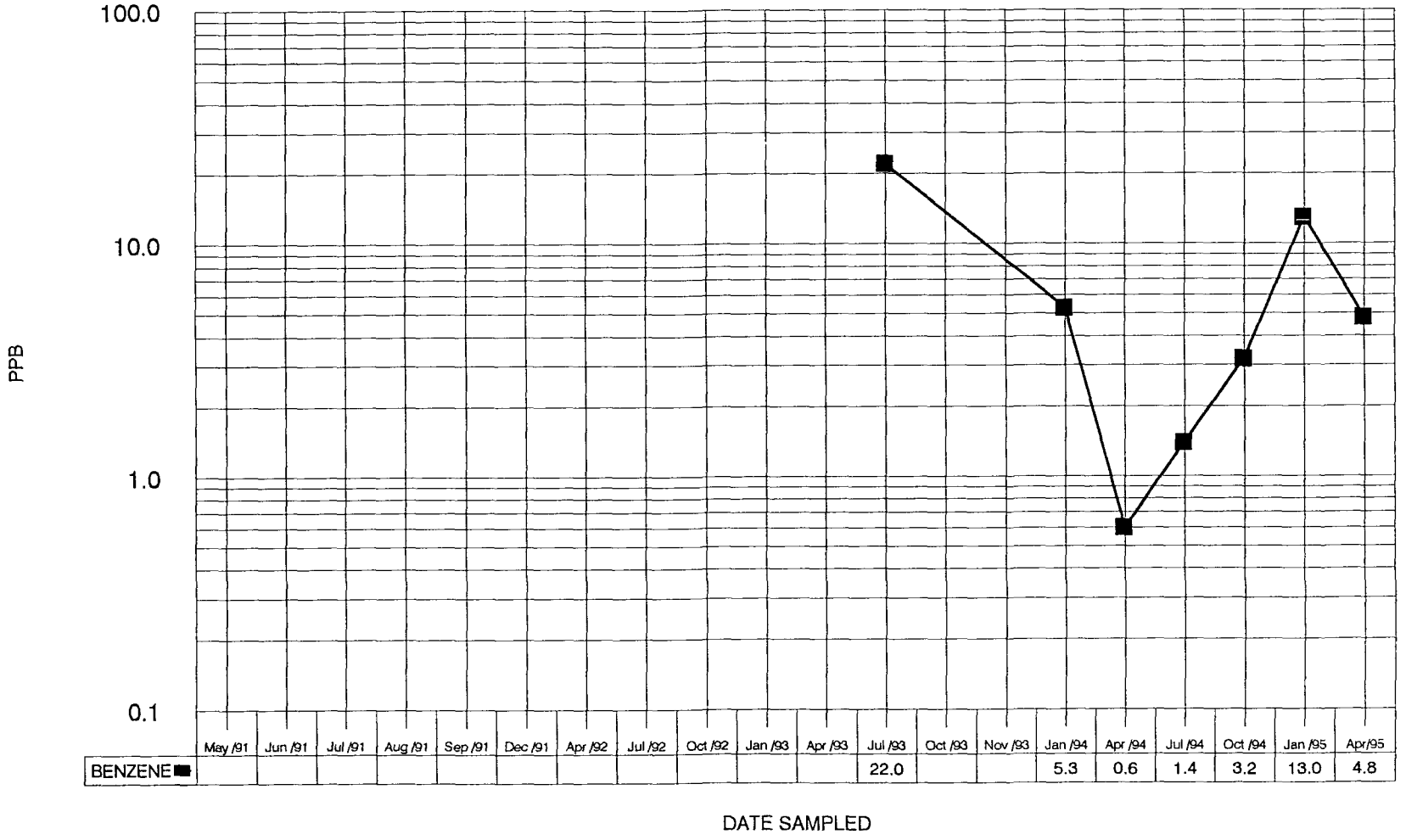
BENZENE IN GROUNDWATER
MW-39



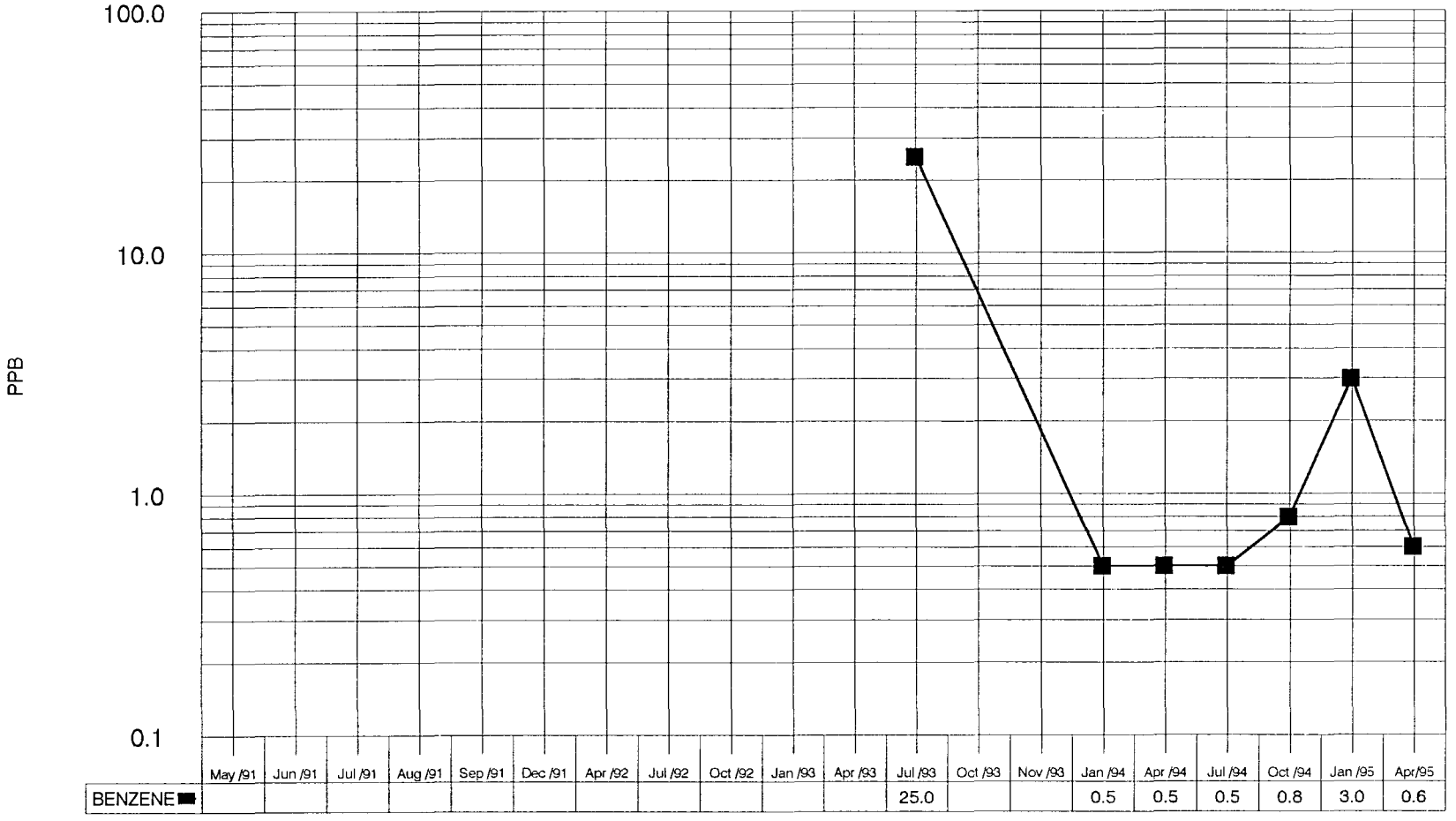
	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE	0.0	0.0			880.0					66.0	28.0	24.0			2.5	0.5	0.5		5.0	

DATE SAMPLED

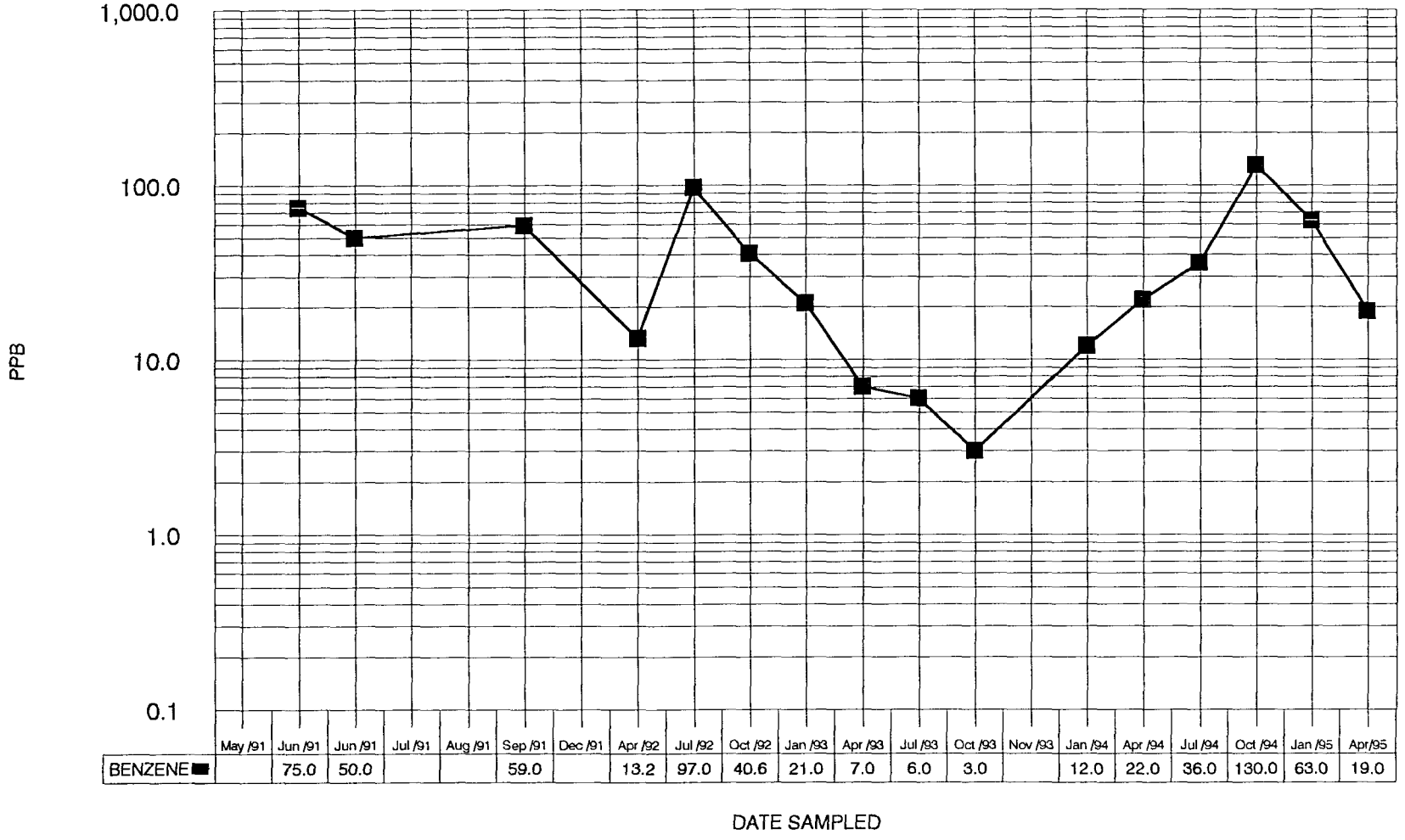
BENZENE IN GROUNDWATER
MW-41



BENZENE IN GROUNDWATER
MW-43



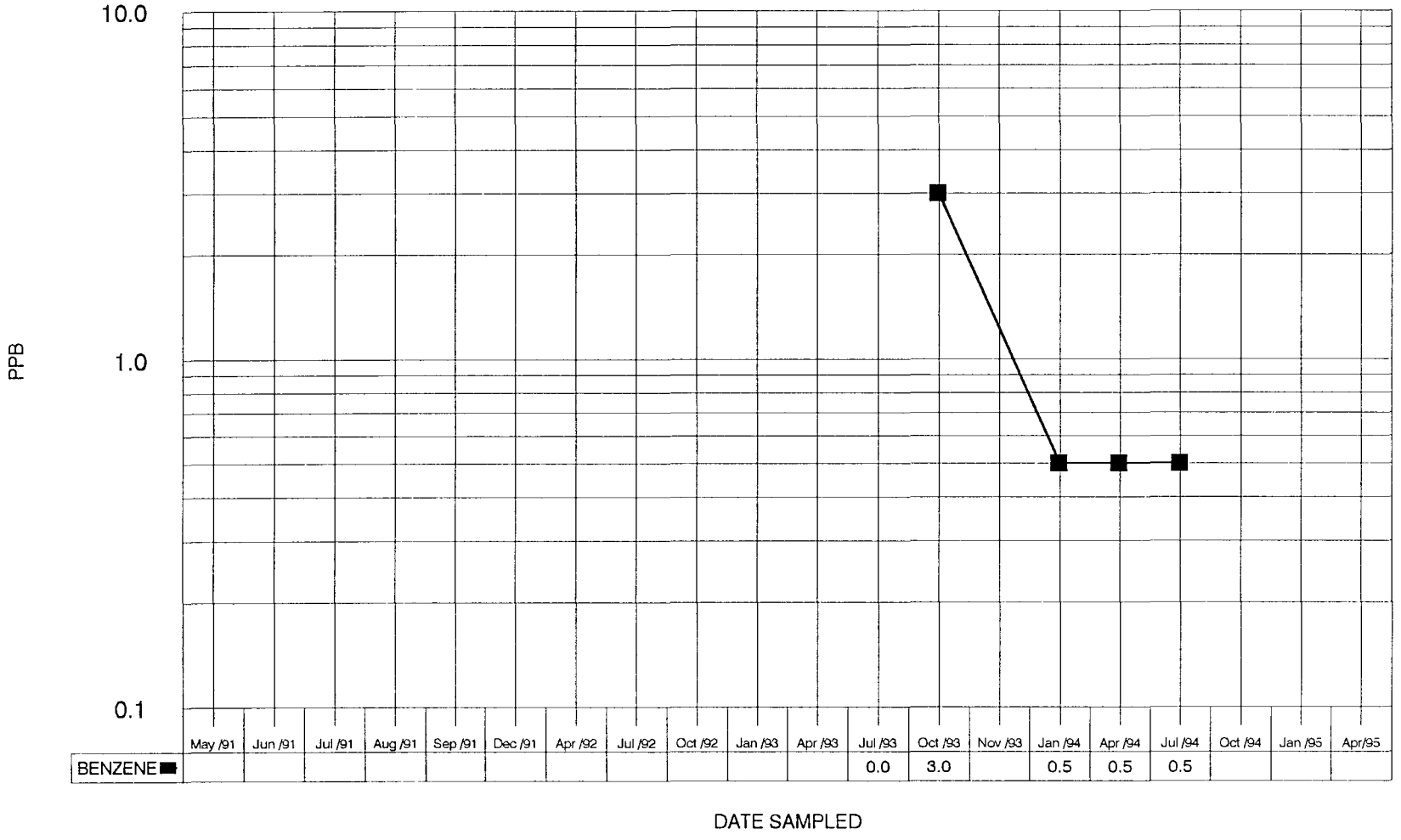
BENZENE IN GROUNDWATER
MW-44



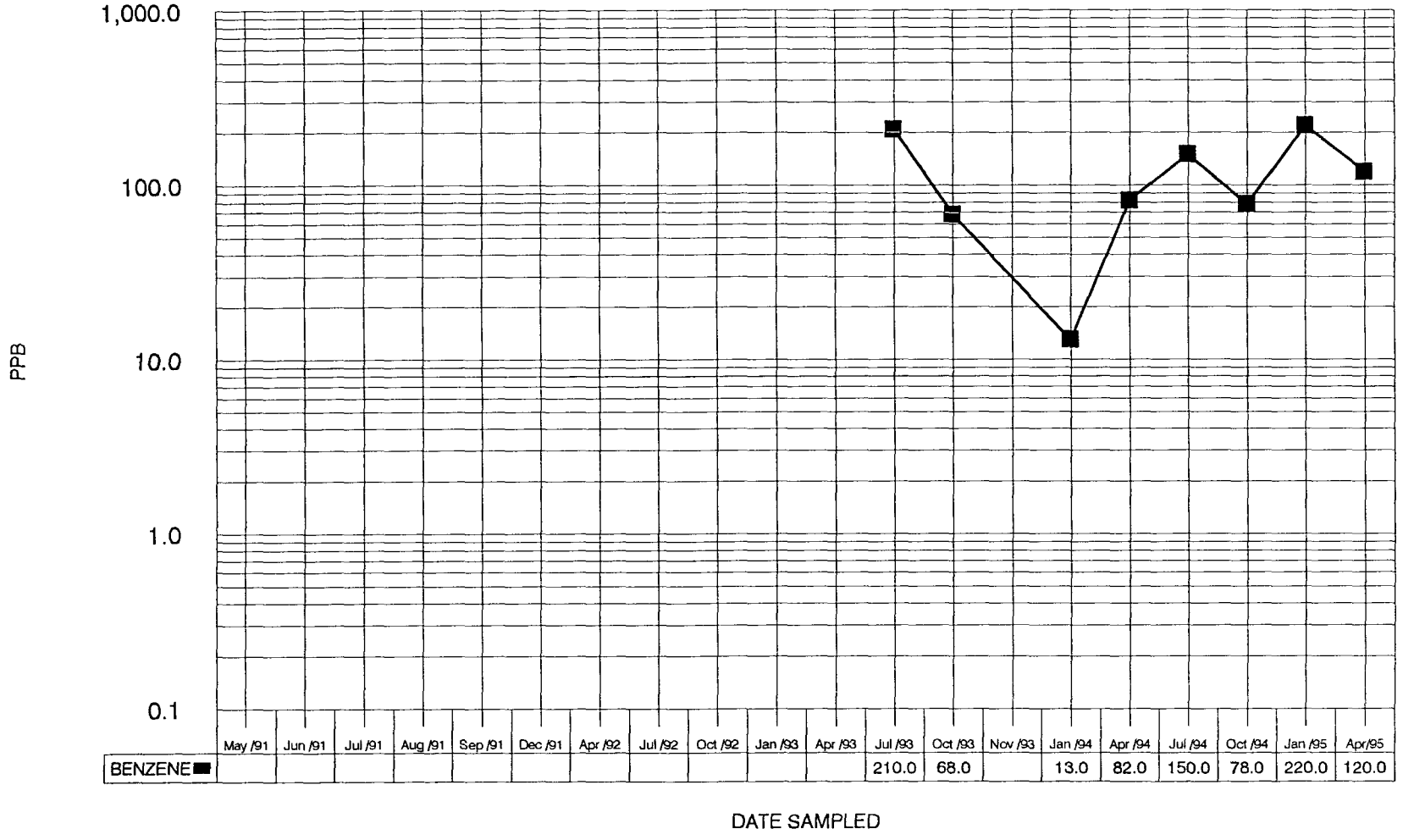
	May /91	Jun /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE ■		75.0	50.0			59.0		13.2	97.0	40.6	21.0	7.0	6.0	3.0		12.0	22.0	36.0	130.0	63.0	19.0

DATE SAMPLED

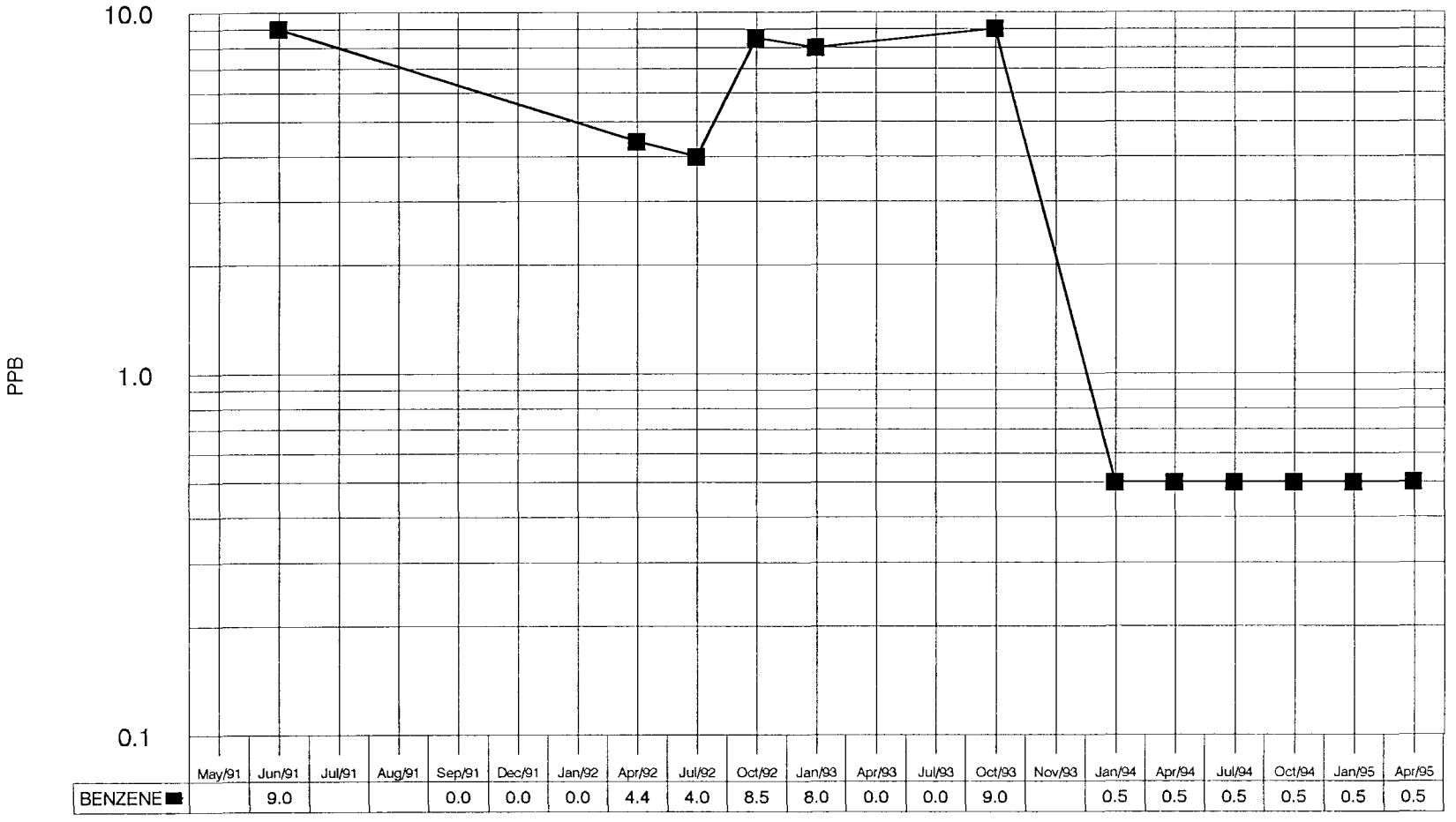
BENZENE IN GROUNDWATER
MW-45



BENZENE IN GROUNDWATER
MW-49



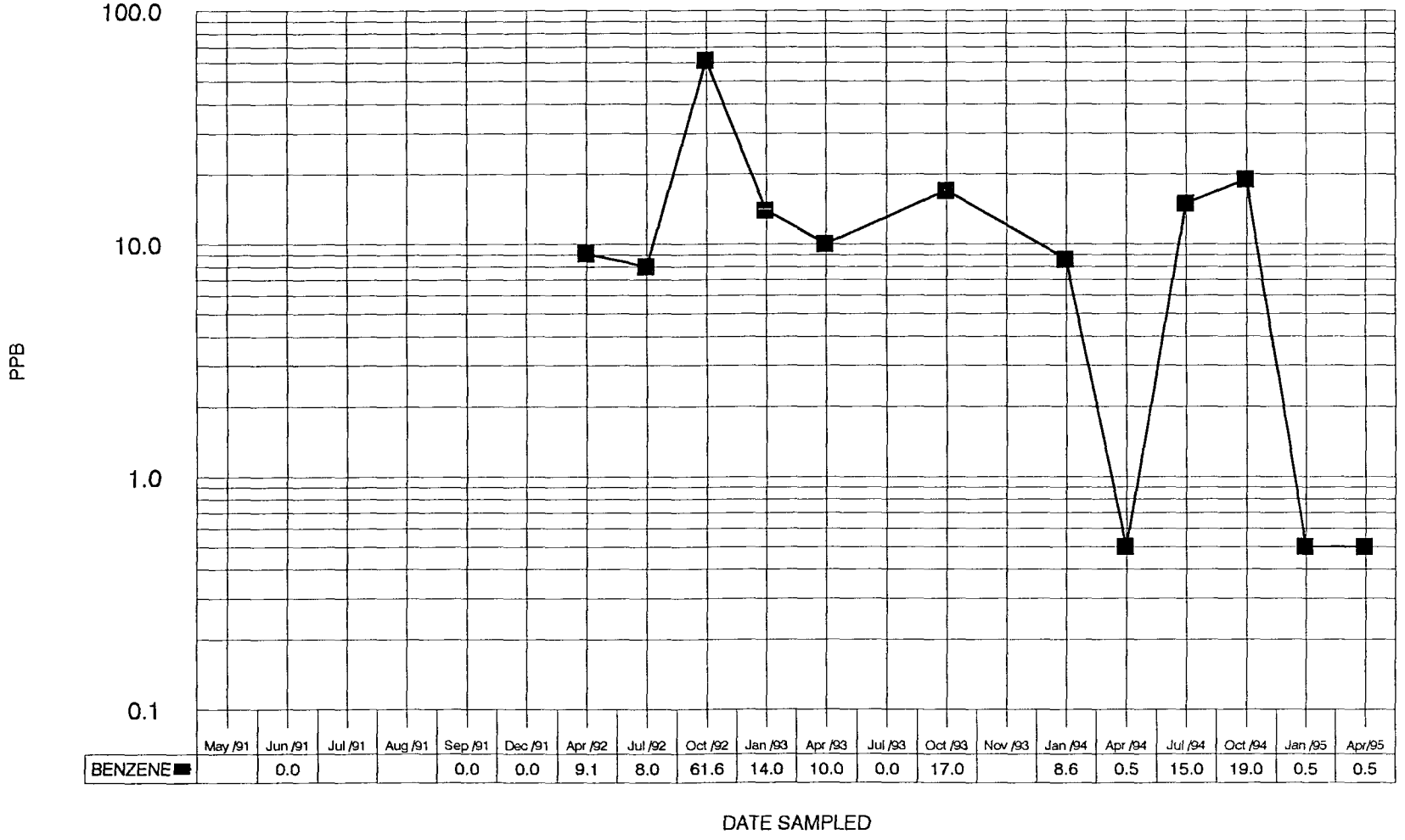
BENZENE IN GROUNDWATER
MW-50



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95
BENZENE		9.0			0.0	0.0	0.0	4.4	4.0	8.5	8.0	0.0	0.0	9.0		0.5	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

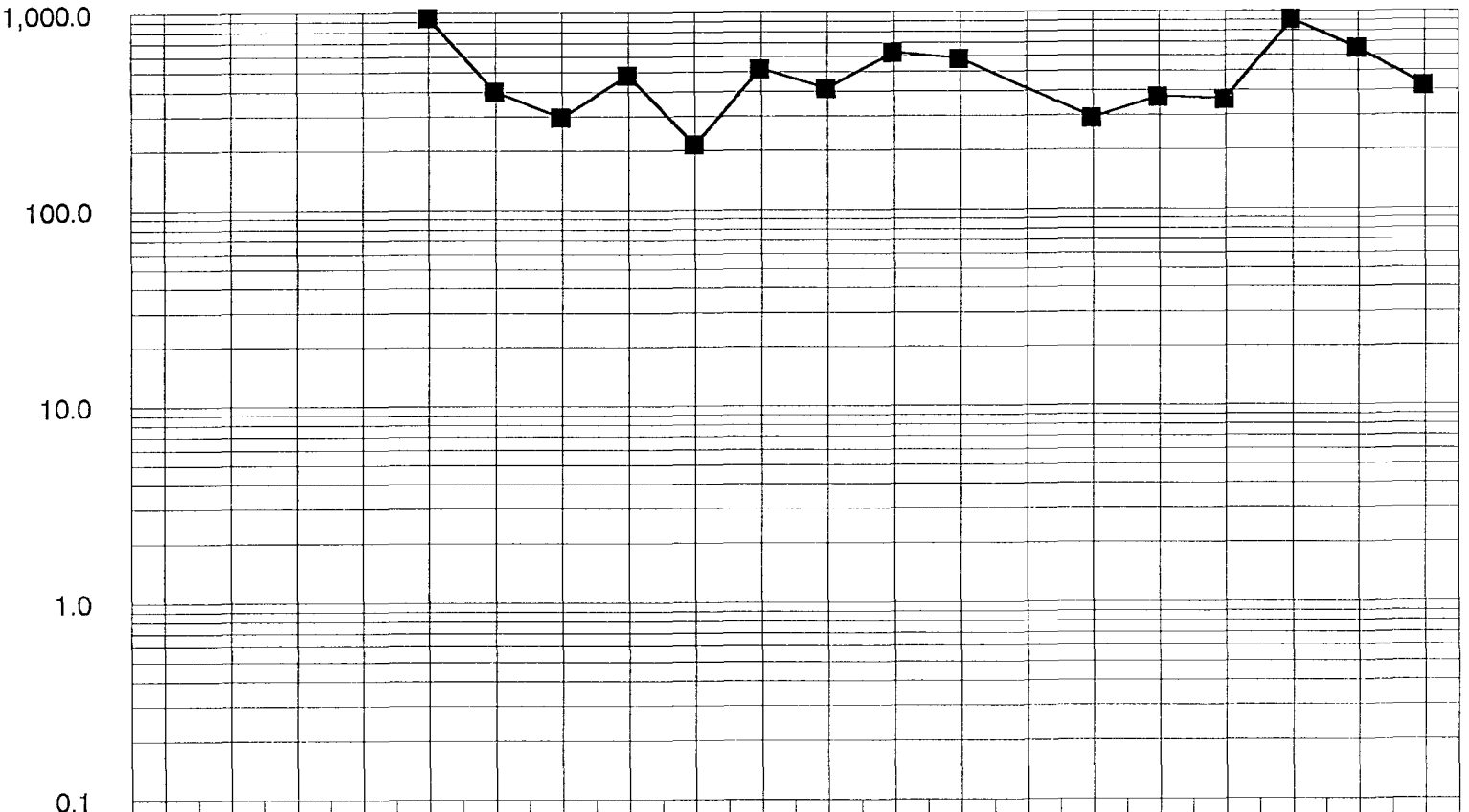
BENZENE IN GROUNDWATER
MW-54



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE		0.0			0.0	0.0	9.1	8.0	61.6	14.0	10.0	0.0	17.0		8.6	0.5	15.0	19.0	0.5	0.5

DATE SAMPLED

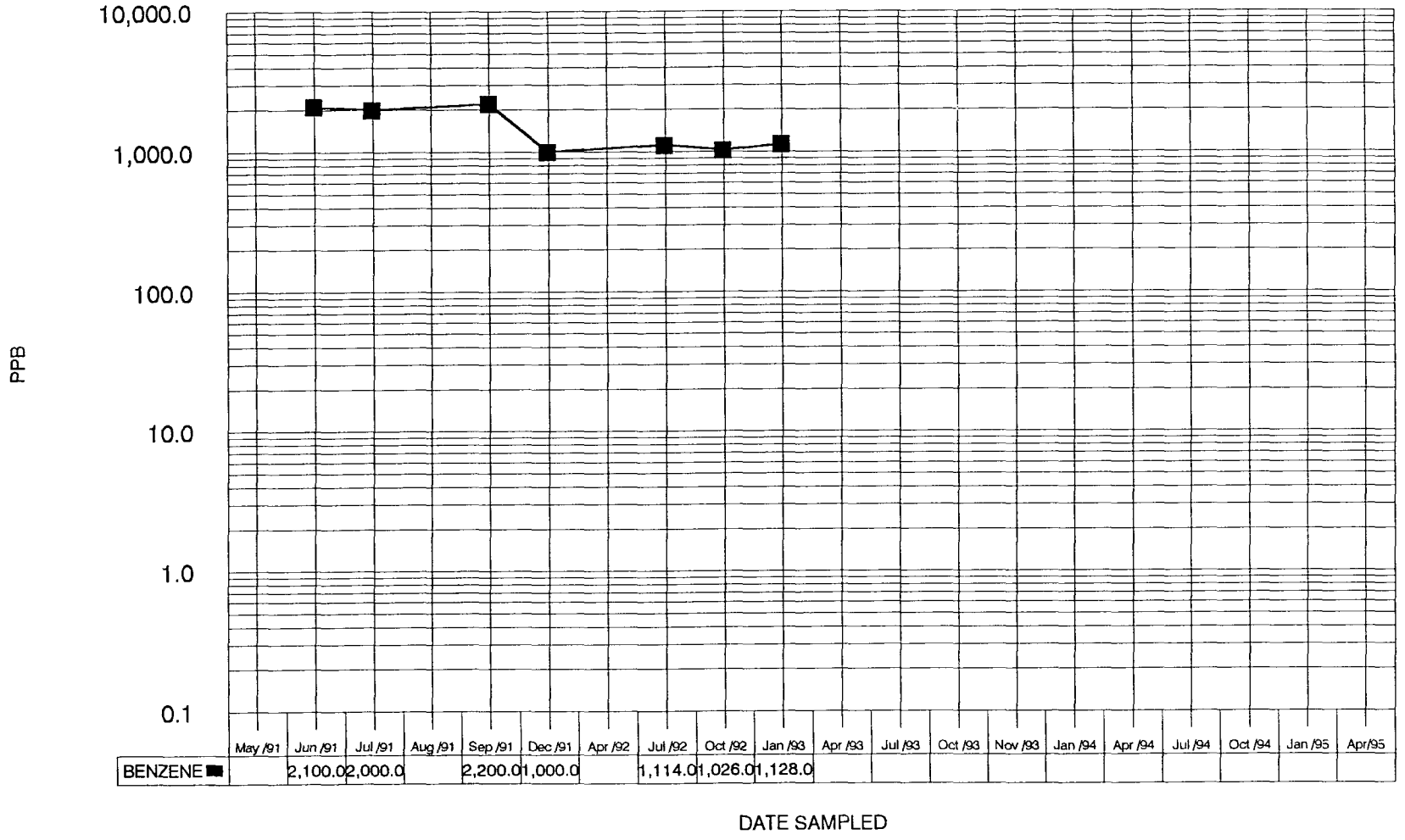
BENZENE IN GROUNDWATER
MW-55



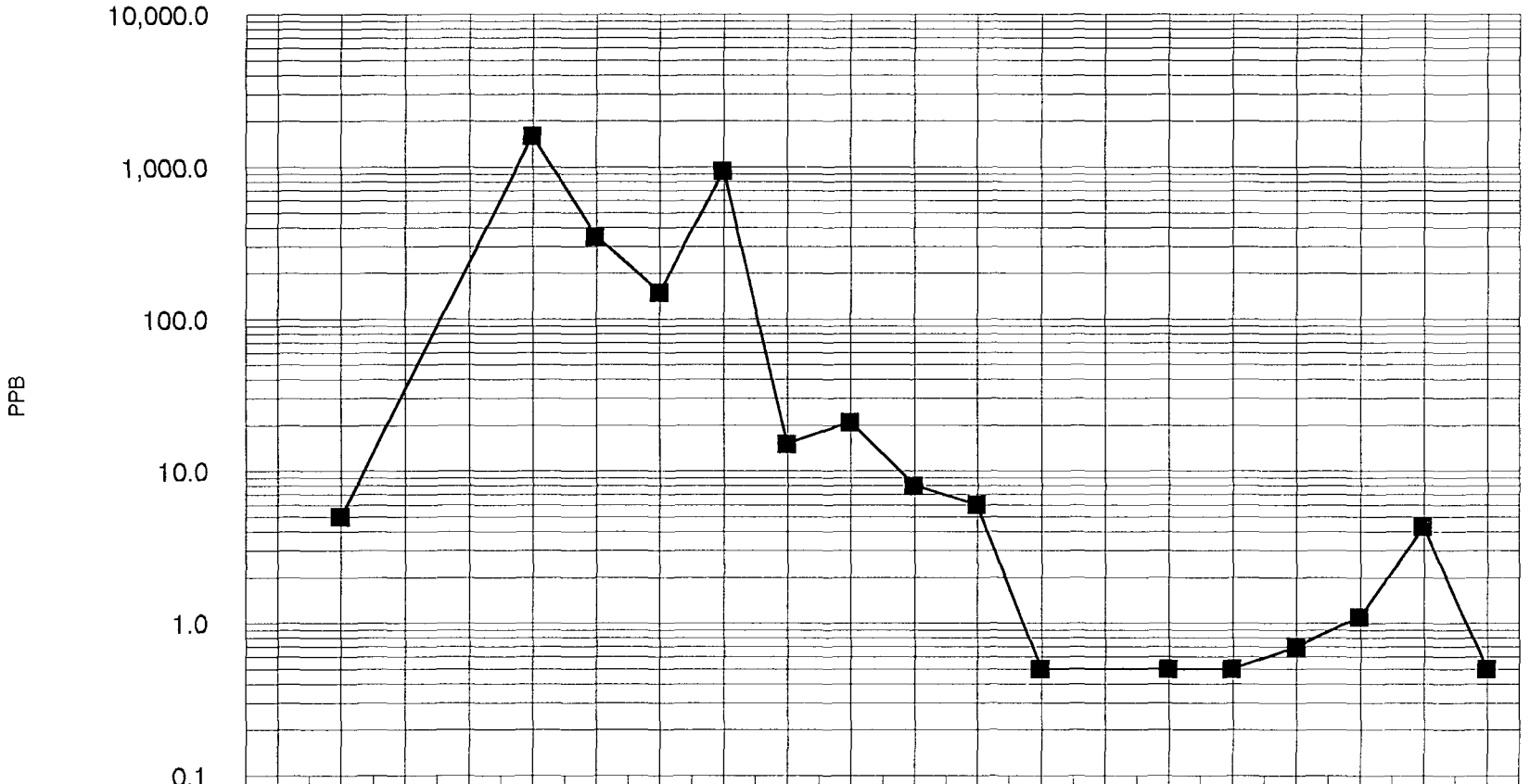
	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE		0.0			940.0	400.0	295.5	483.0	214.7	518.0	412.0	625.0	581.0		290.0	370.0	360.0	910.0	650.0	420.0

DATE SAMPLED

BENZENE IN GROUNDWATER
MW-56



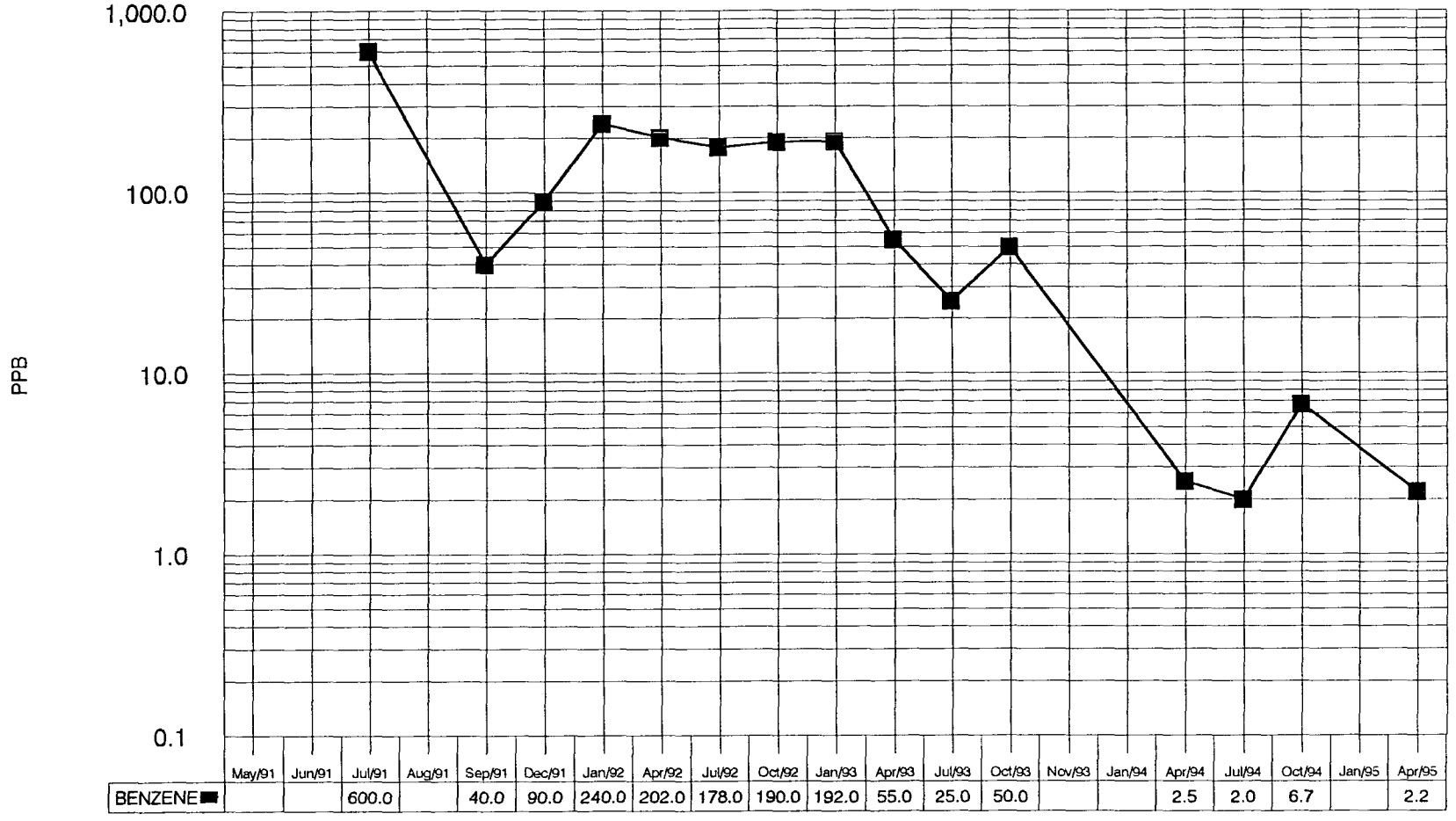
BENZENE IN GROUNDWATER
MW-57



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE		5.0	0.0		1,600.0	350.0	150.0	948.0	15.1	21.0	8.0	6.0	0.5		0.5	0.5	0.7	1.1	4.3	0.5

DATE SAMPLED

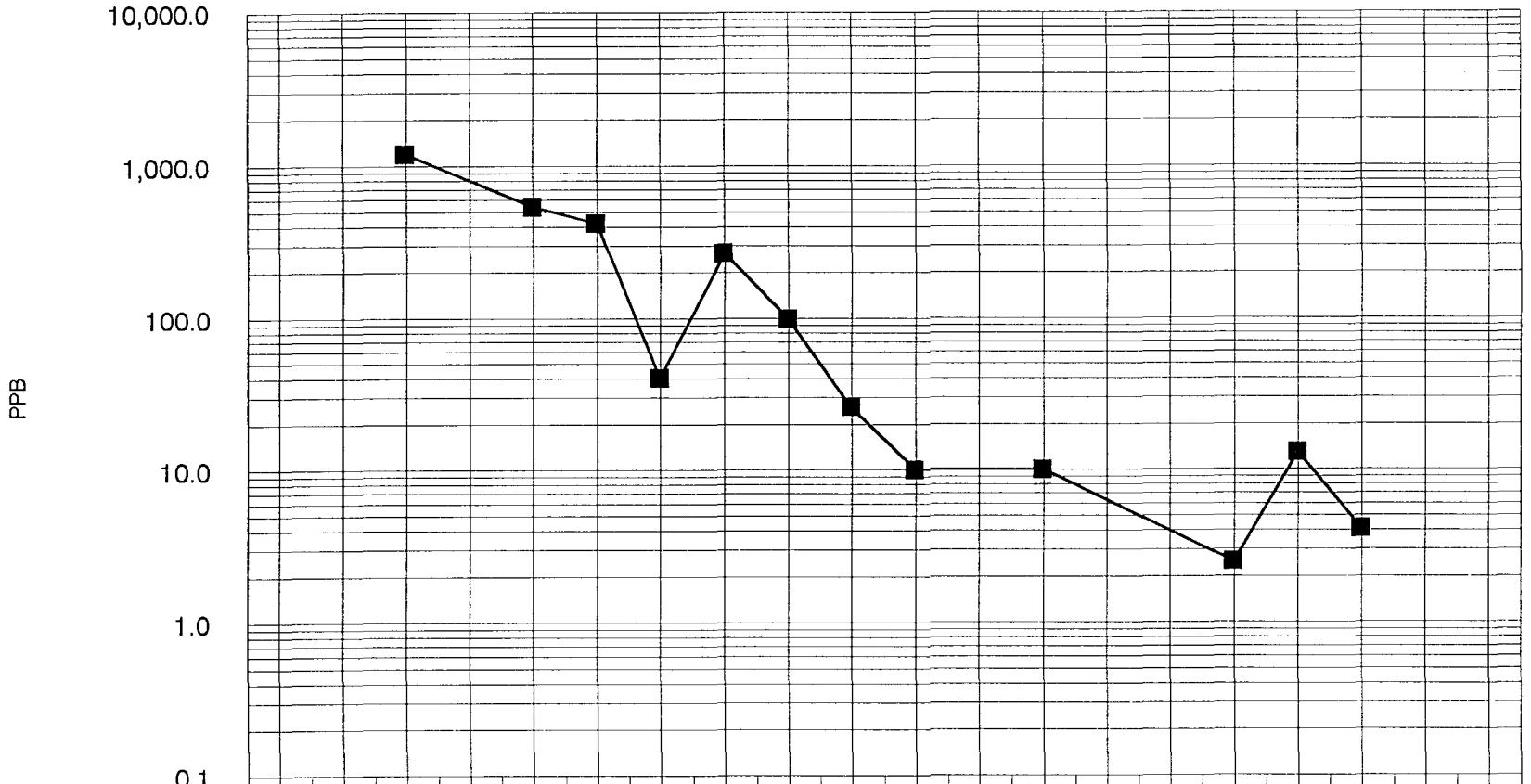
BENZENE IN GROUNDWATER
MW-58



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95
BENZENE			600.0		40.0	90.0	240.0	202.0	178.0	190.0	192.0	55.0	25.0	50.0			2.5	2.0	6.7		2.2

DATE SAMPLED

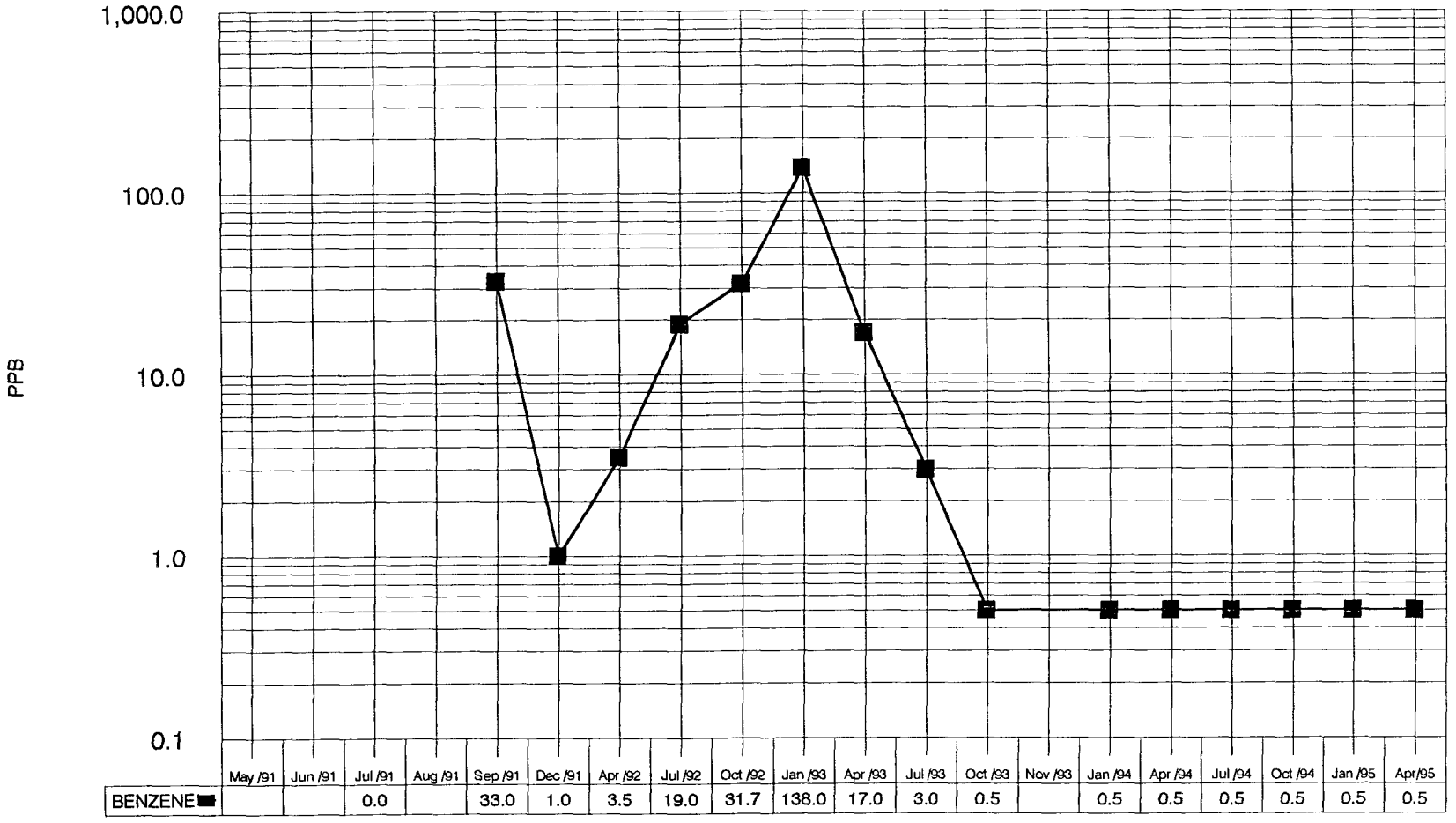
BENZENE IN GROUNDWATER
MW-59



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE			1,200.0		540.0	420.0	40.4	268.0	98.8	26.0	10.0		10.0			2.5	13.0	4.1		

DATE SAMPLED

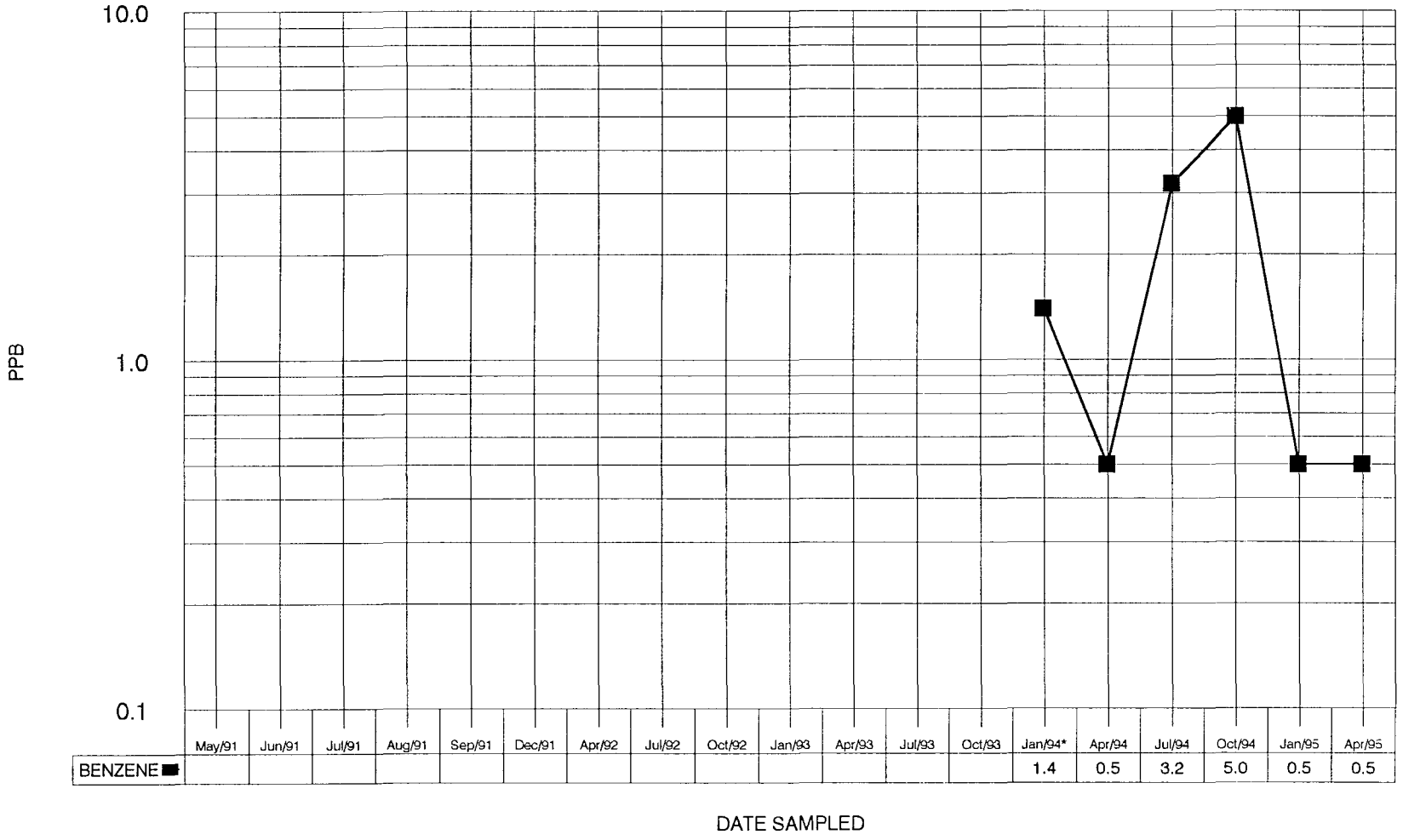
BENZENE IN GROUNDWATER
MW-60



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE			0.0		33.0	1.0	3.5	19.0	31.7	138.0	17.0	3.0	0.5		0.5	0.5	0.5	0.5	0.5	0.5

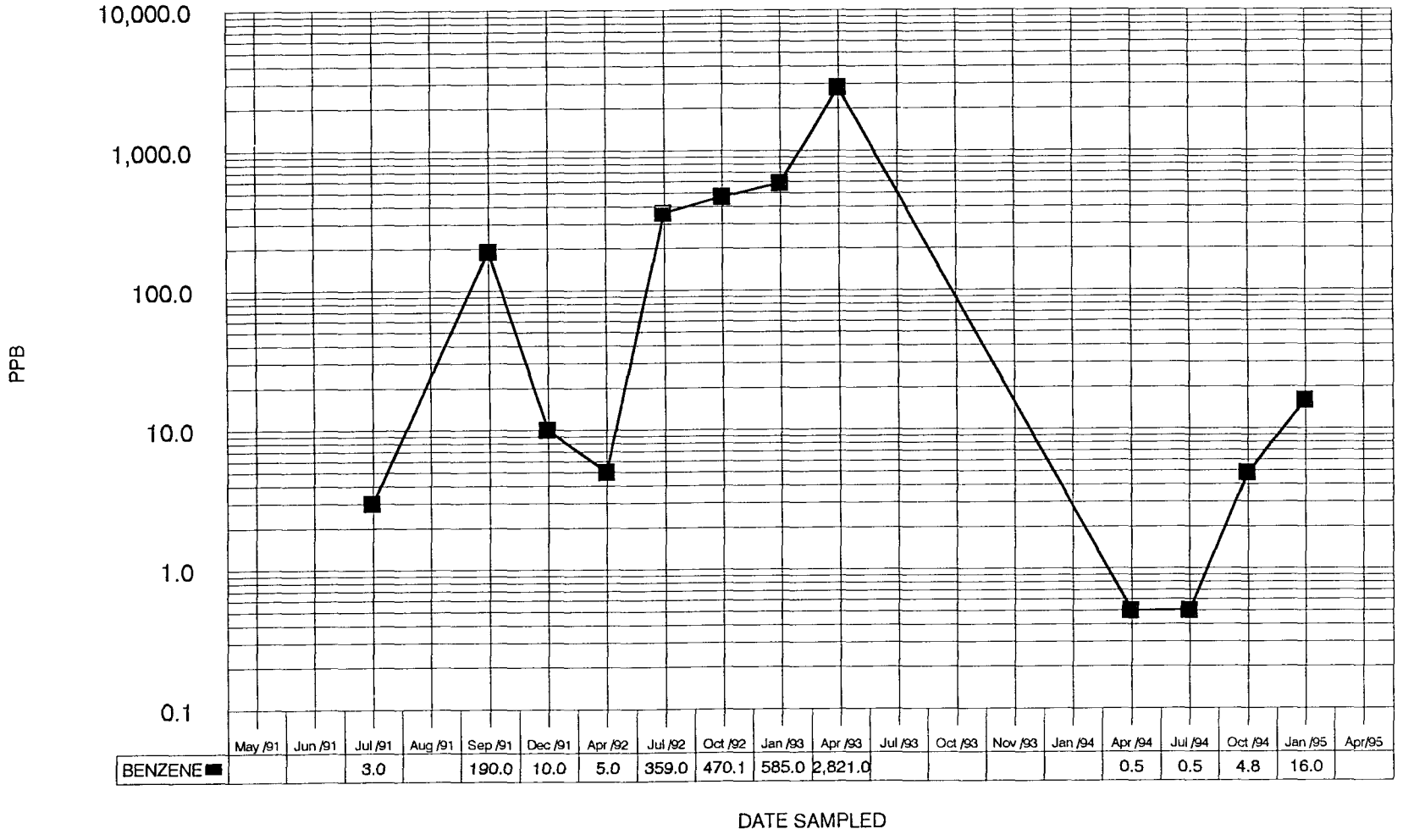
DATE SAMPLED

BENZENE IN GROUNDWATER
MW-61

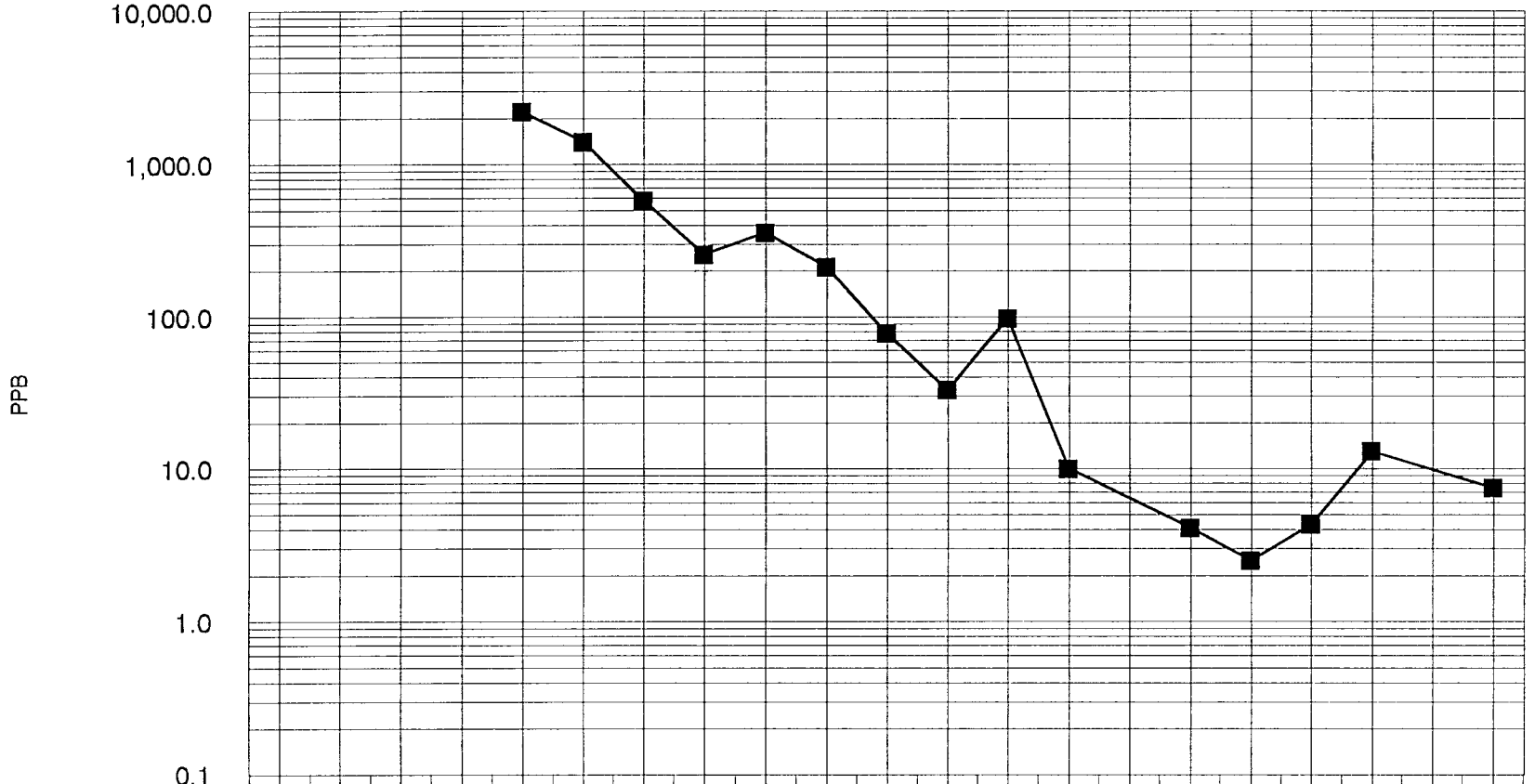


*- Jan. 1994 was the first time this well was sampled.

BENZENE IN GROUNDWATER
MW-61A



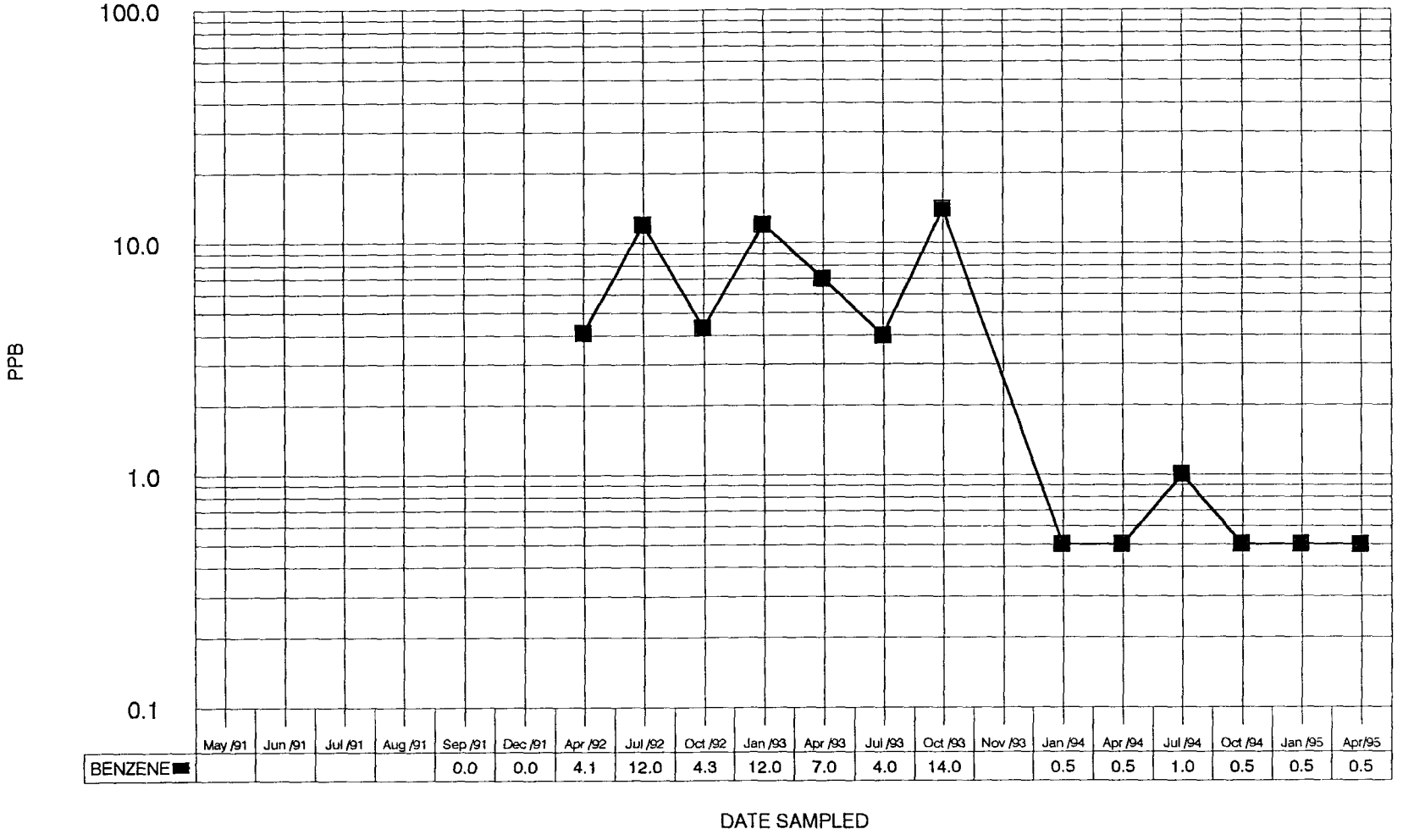
BENZENE IN GROUNDWATER
MW-62



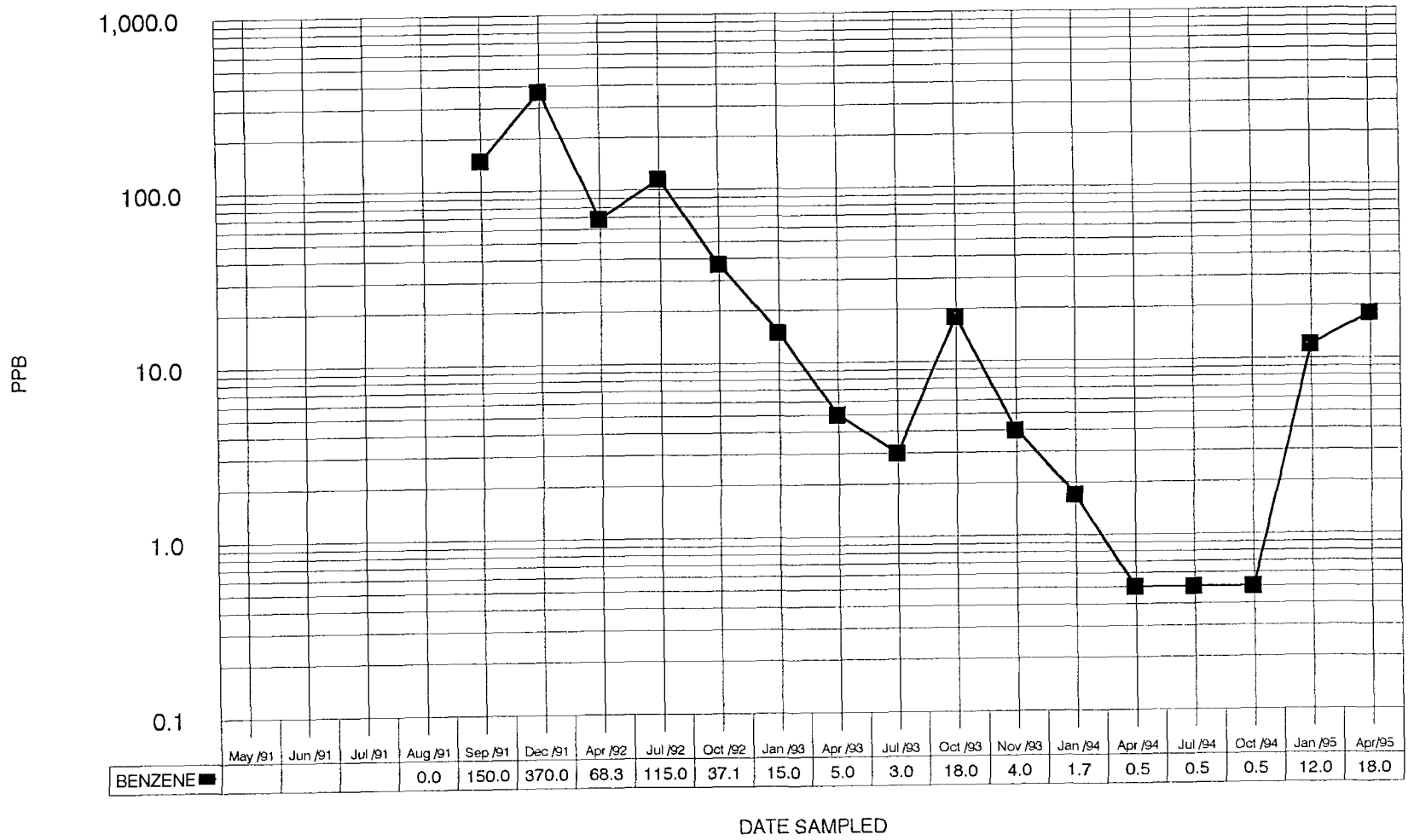
	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95
BENZENE					2,200.0	1,400.0	580.0	257.5	357.0	212.3	78.0	33.0	98.0	10.0		4.1	2.5	4.3	13.0		7.5

DATE SAMPLED

BENZENE IN GROUNDWATER
MW-63



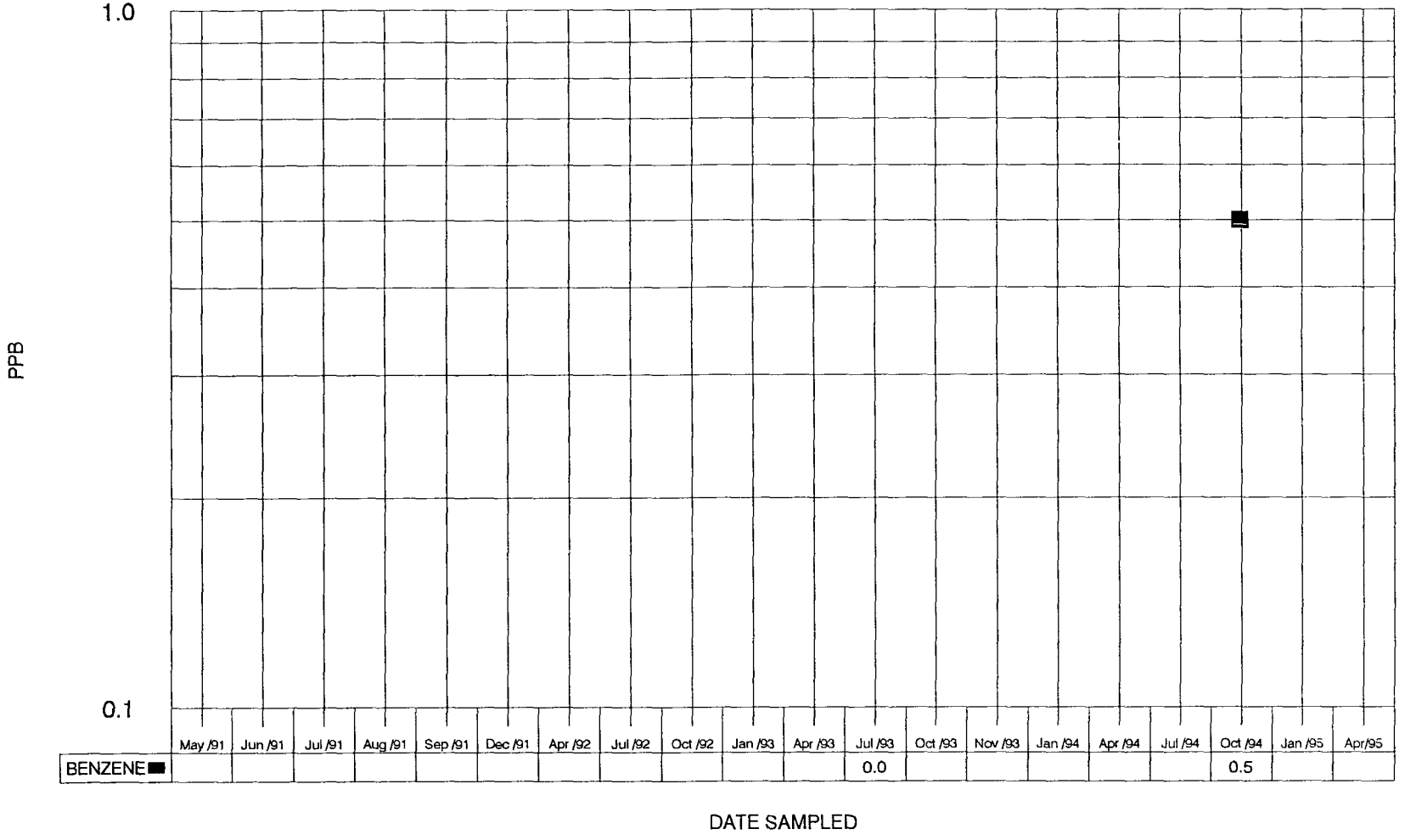
BENZENE IN GROUNDWATER
MW-64



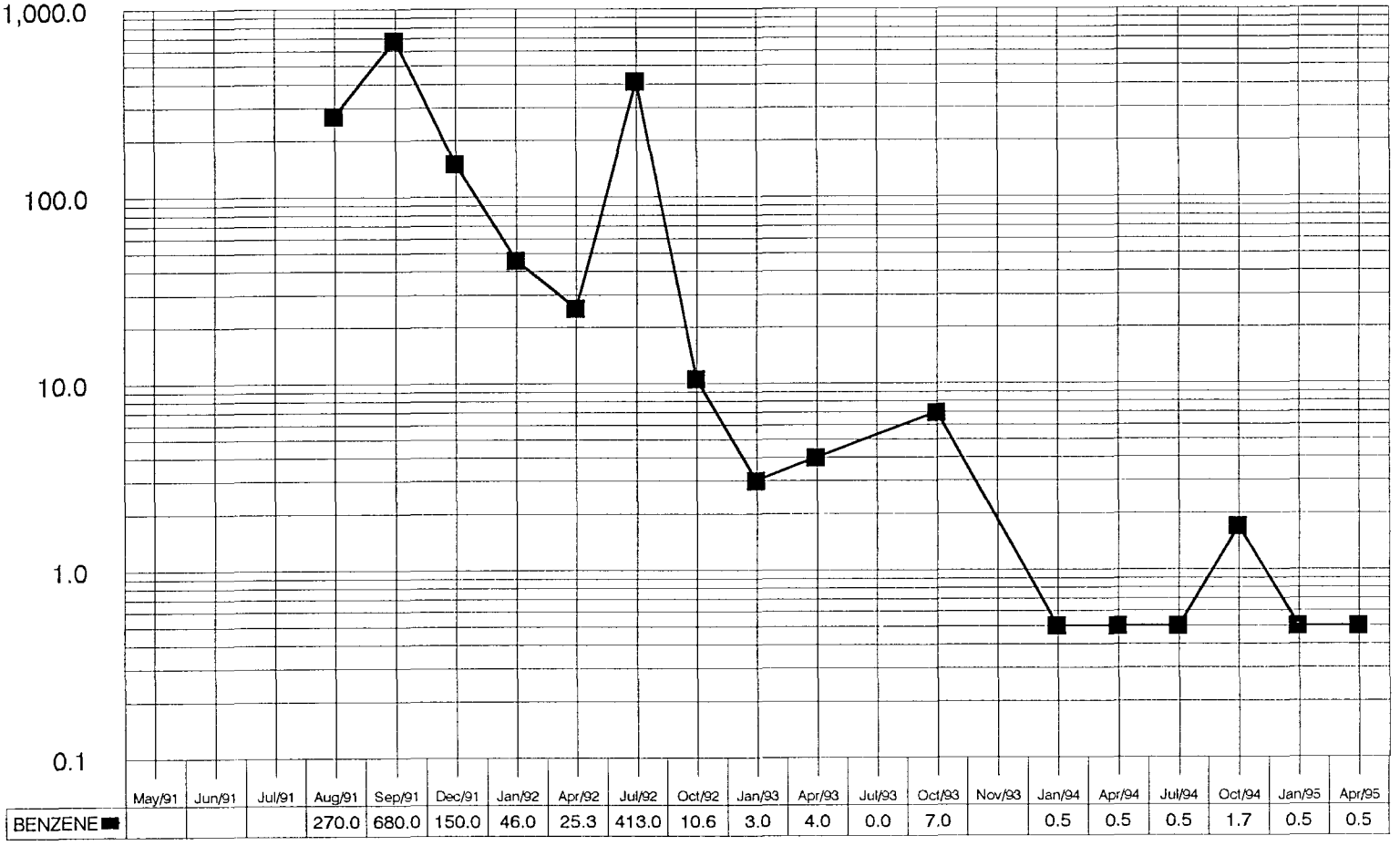
	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE				0.0	150.0	370.0	68.3	115.0	37.1	15.0	5.0	3.0	18.0	4.0	1.7	0.5	0.5	0.5	12.0	18.0

DATE SAMPLED

BENZENE IN GROUNDWATER
MW-65



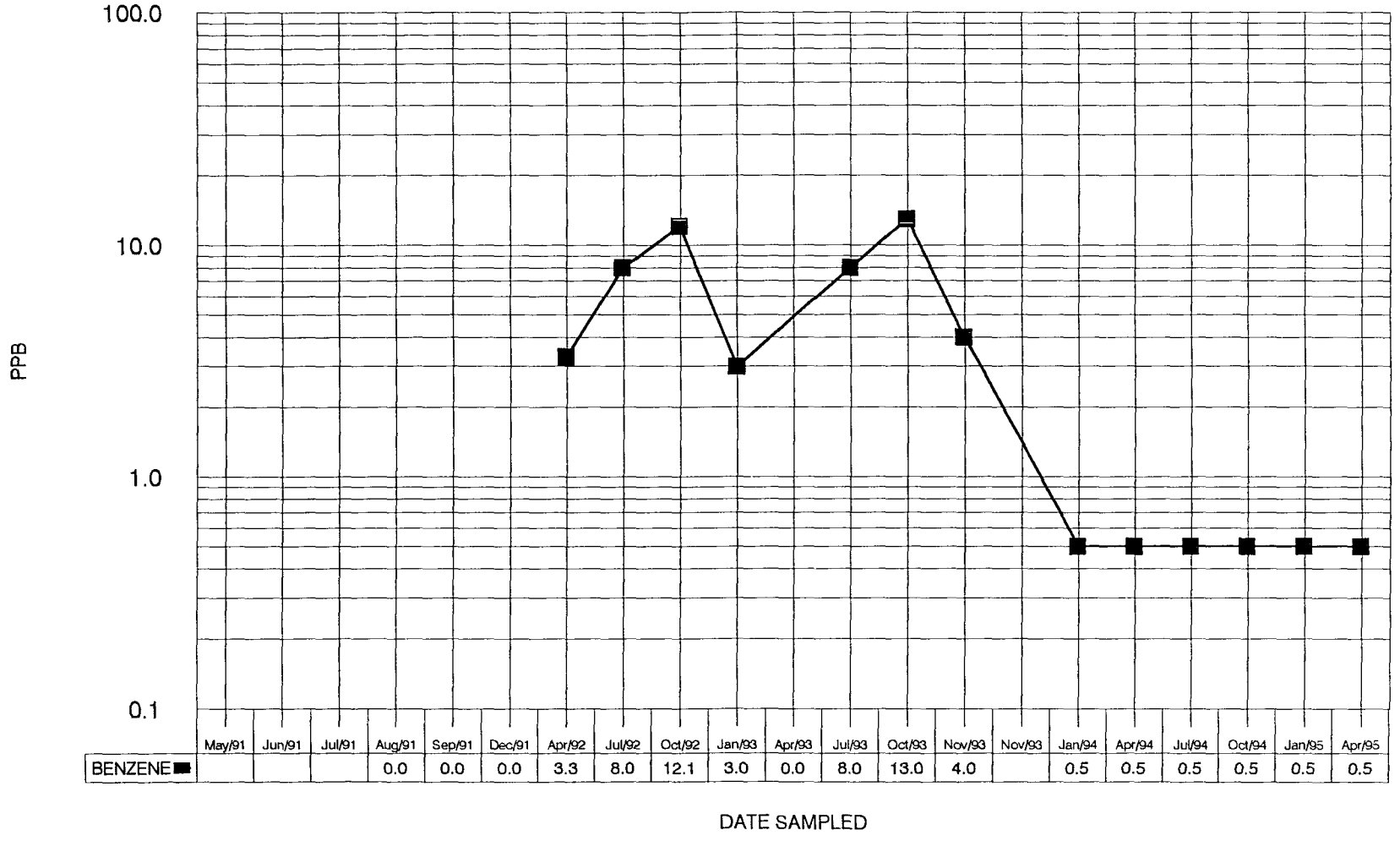
BENZENE IN GROUNDWATER
MW-65A



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95
BENZENE				270.0	680.0	150.0	46.0	25.3	413.0	10.6	3.0	4.0	0.0	7.0		0.5	0.5	0.5	1.7	0.5	0.5

DATE SAMPLED

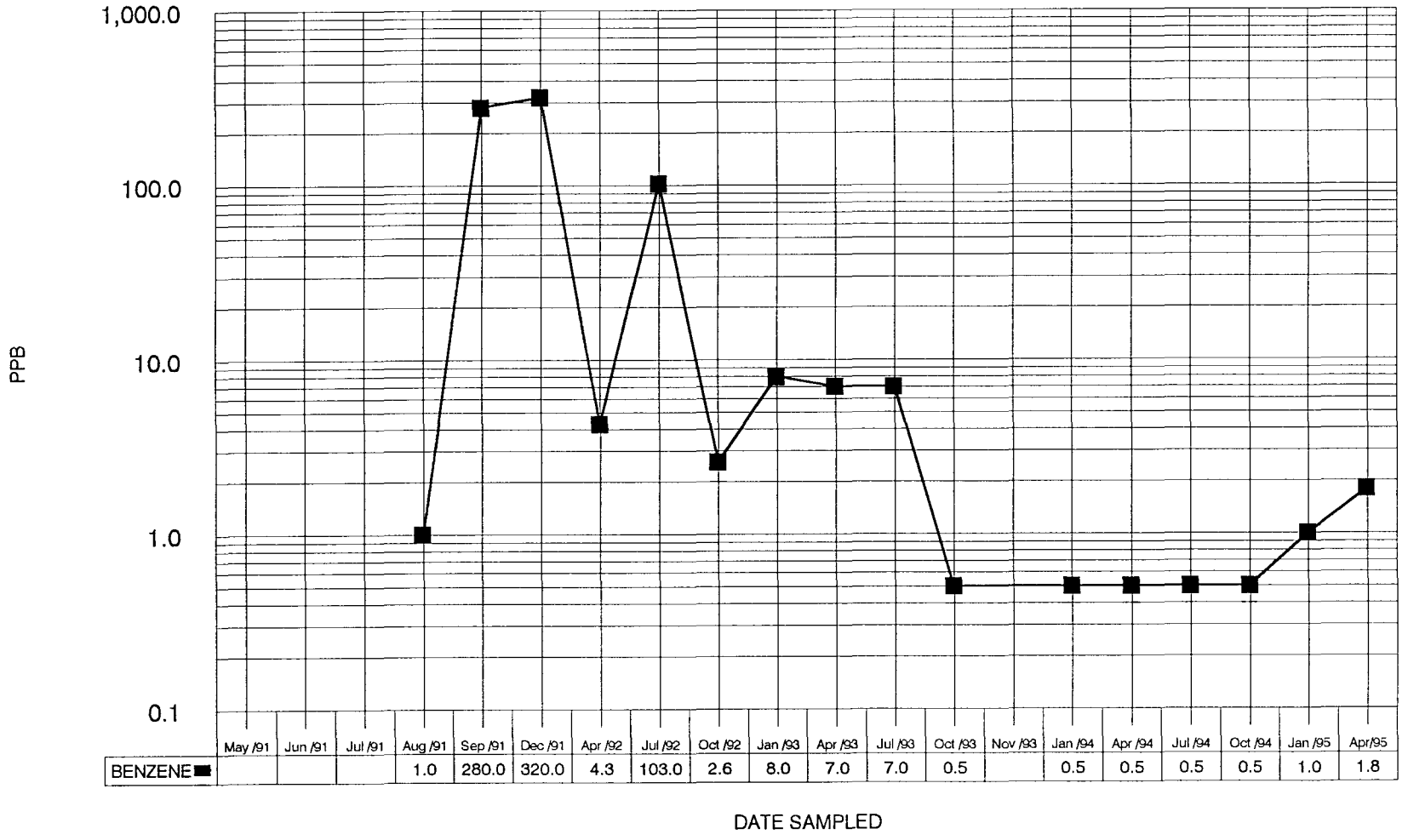
BENZENE IN GROUNDWATER
MW-66



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95
BENZENE				0.0	0.0	0.0	3.3	8.0	12.1	3.0	0.0	8.0	13.0	4.0		0.5	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

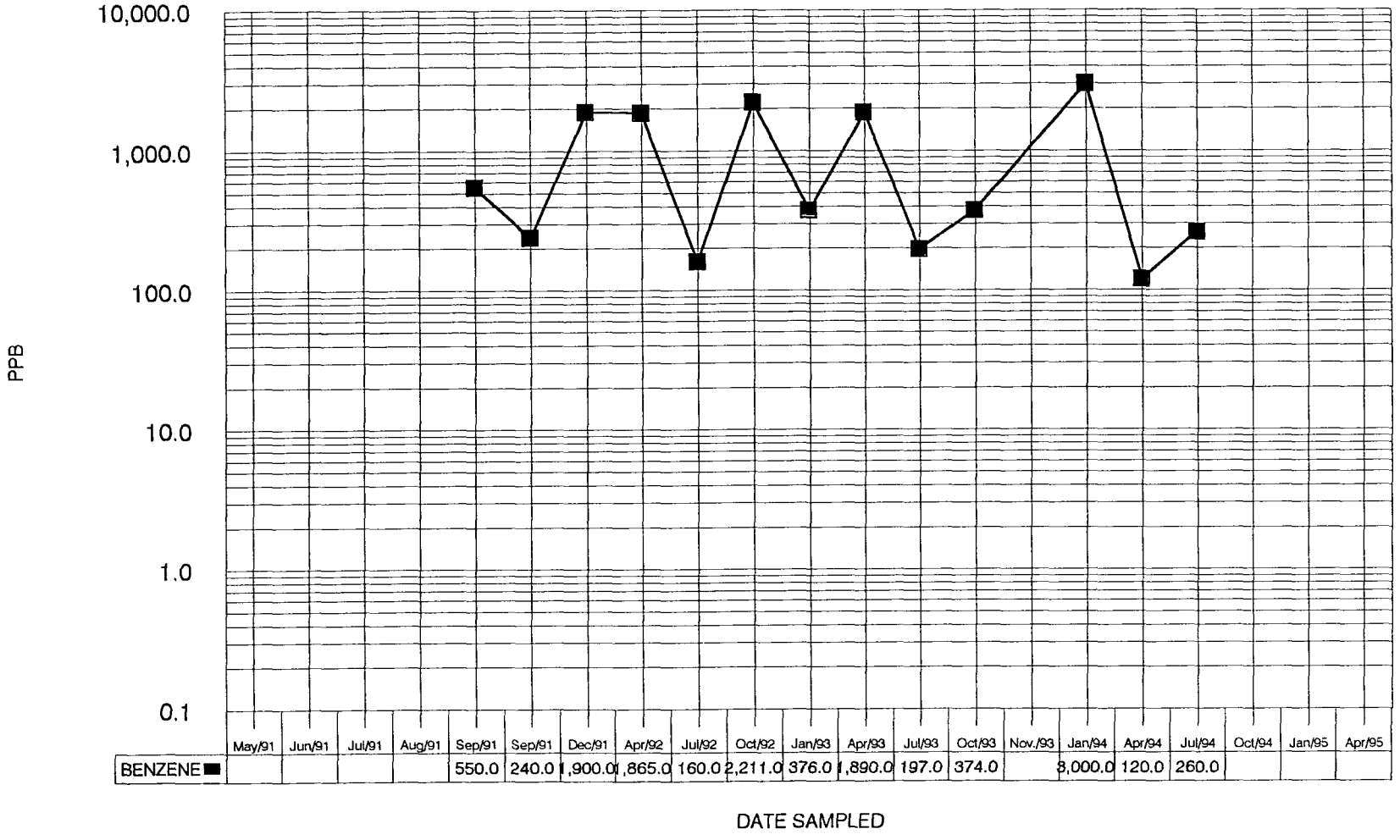
BENZENE IN GROUNDWATER
MW-67



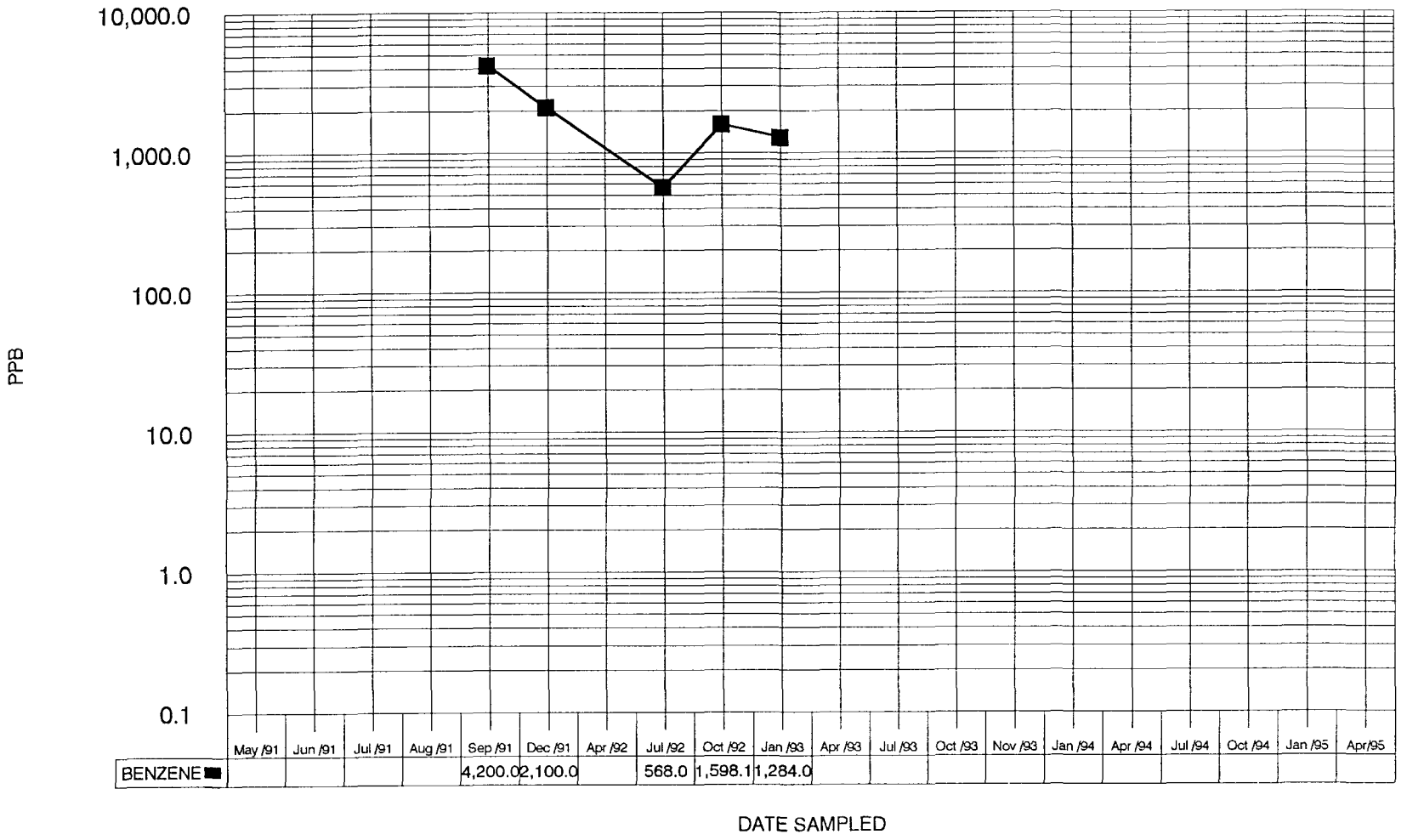
	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE				1.0	280.0	320.0	4.3	103.0	2.6	8.0	7.0	7.0	0.5		0.5	0.5	0.5	0.5	1.0	1.8

DATE SAMPLED

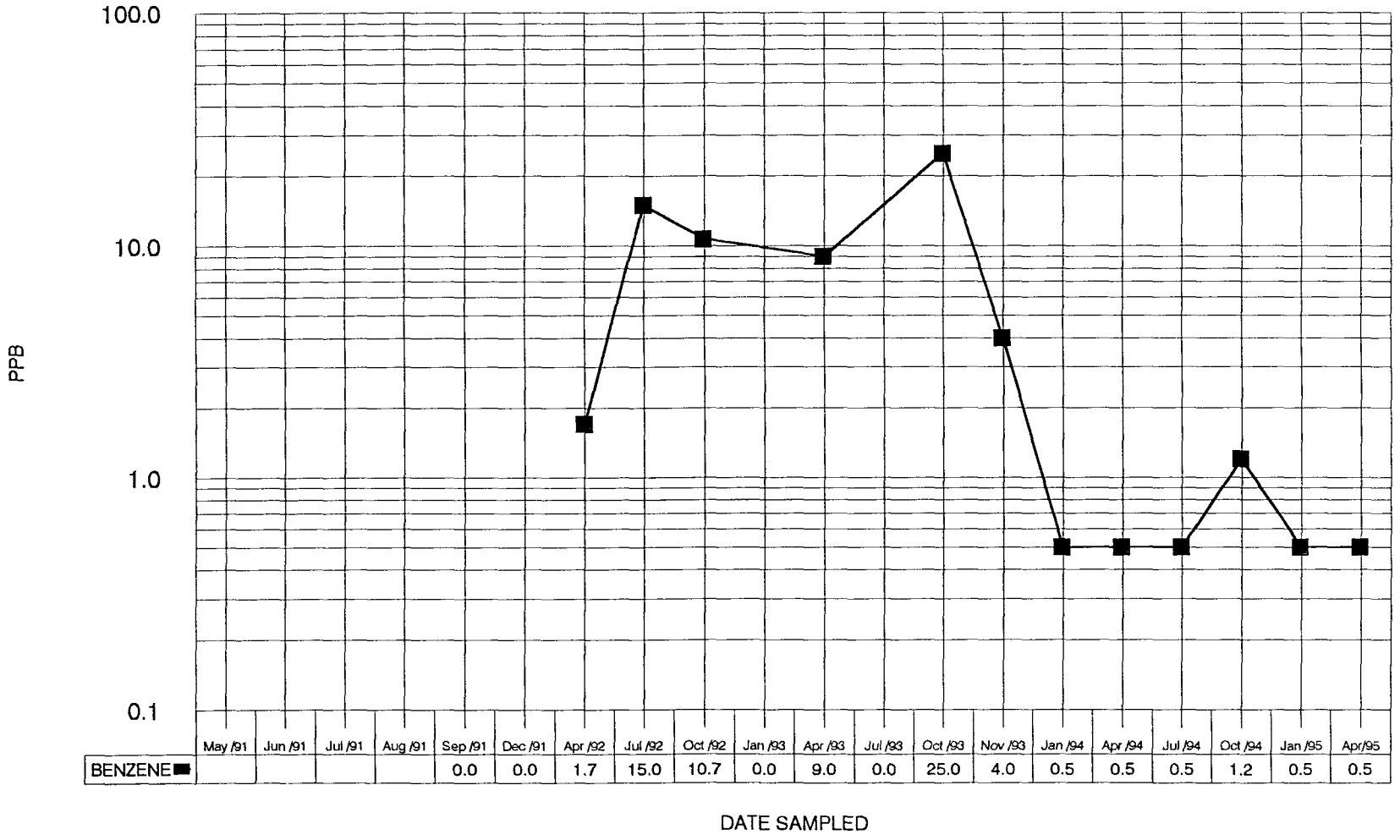
BENZENE IN GROUNDWATER
MW-68



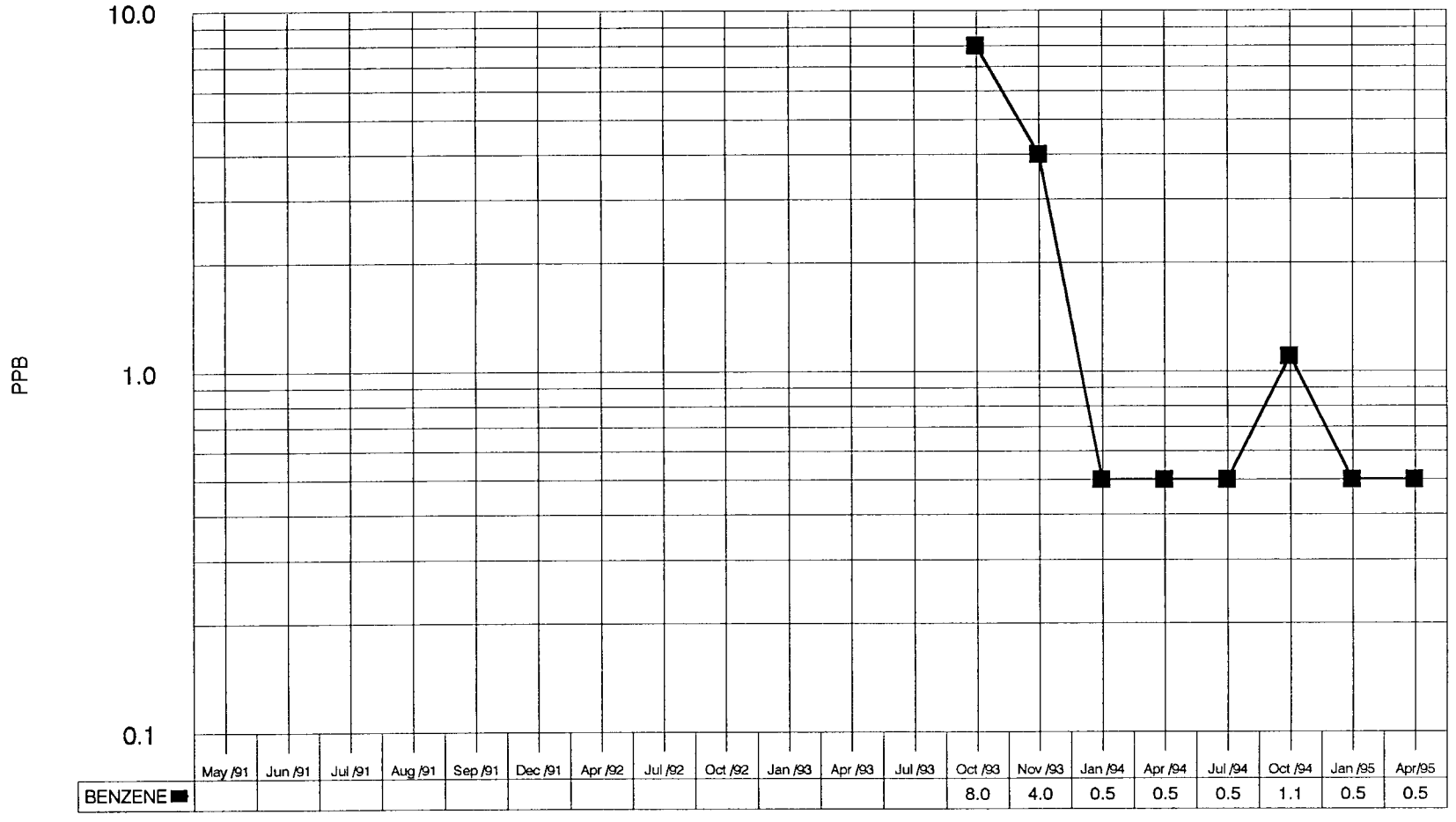
BENZENE IN GROUNDWATER
MW-69



BENZENE IN GROUNDWATER
MW-70



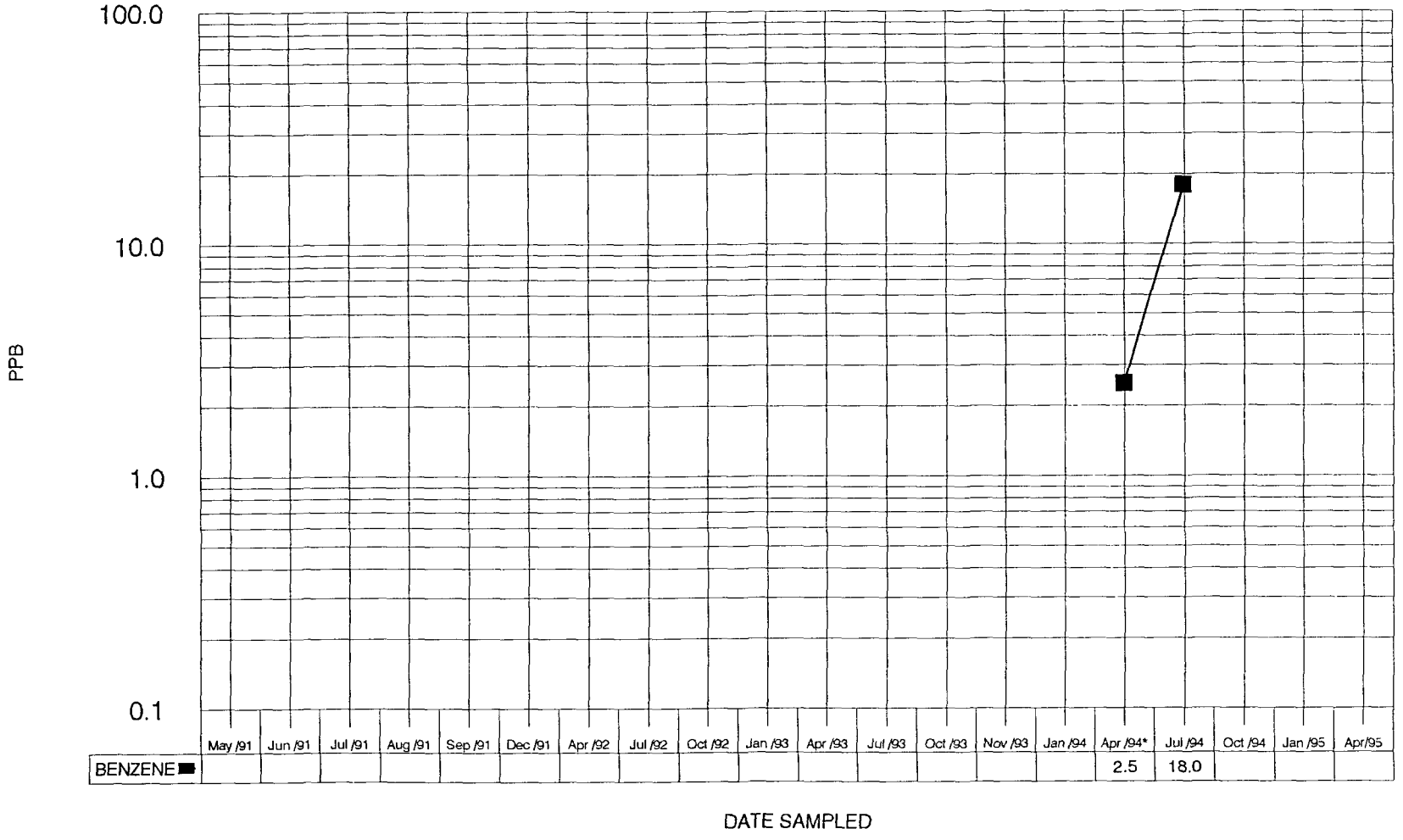
BENZENE IN GROUNDWATER
MW-71



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95
BENZENE													8.0	4.0	0.5	0.5	0.5	1.1	0.5	0.5

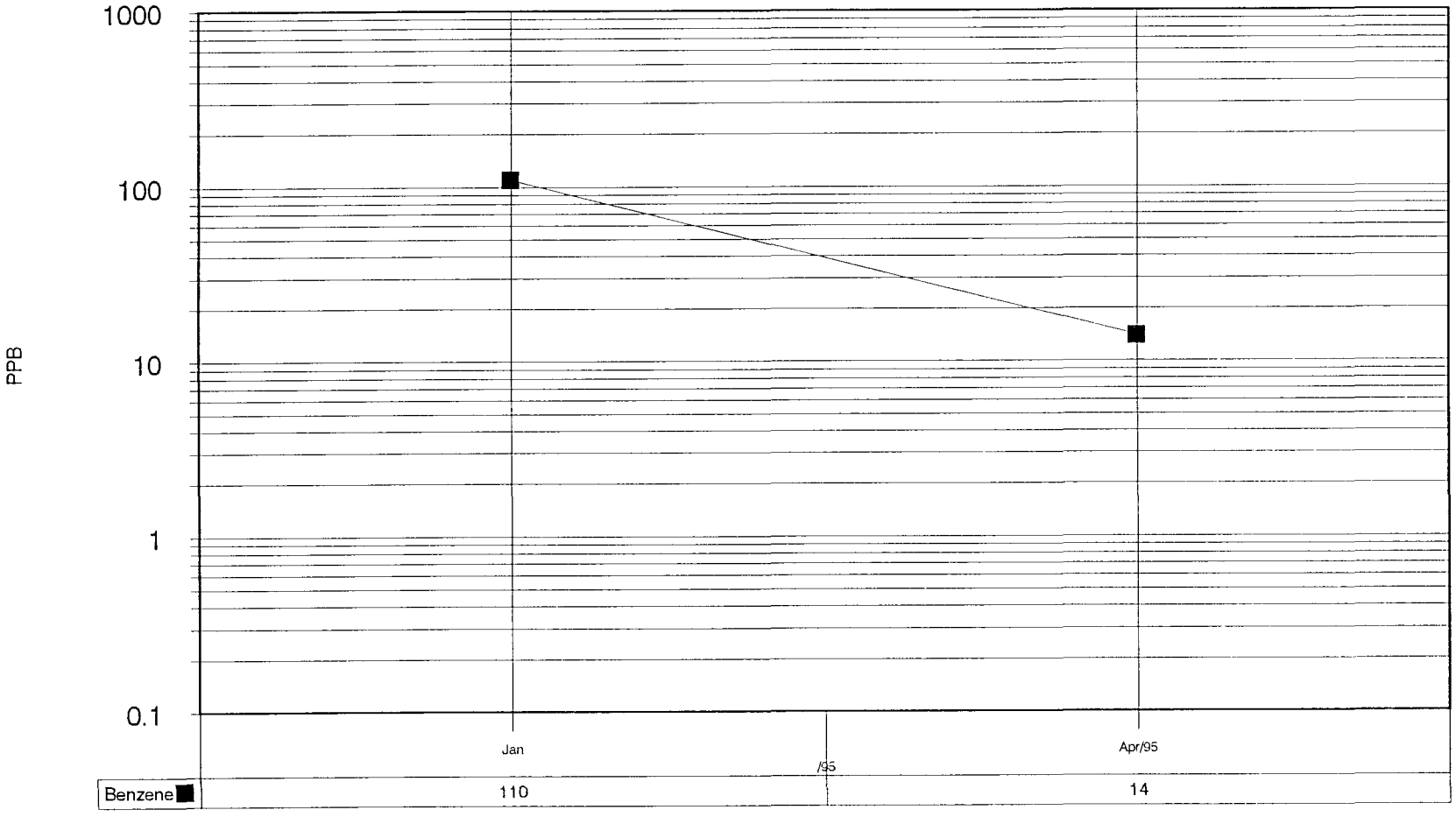
DATE SAMPLED

BENZENE IN GROUNDWATER
MW-72



*April 1994 was the first time this well was sampled.

BENZENE IN GROUNDWATER
MW-79



APPENDIX C

APRIL 1995 LABORATORY RESULTS - GROUNDWATER

AND

RANCHER WELL, PLANT WELL, AND NATURAL SPRING

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **504358**

April 28, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702-0552

Project Name/Number: I.B. REMEDIATION 44999

Attention: Bob Menzie

On **04/13/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Chloride analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Environmental & Safety

Analytical Technologies, Inc.

CLIENT	: MARATHON OIL COMPANY	DATE RECEIVED	: 04/13/95
PROJECT #	: 44999		
PROJECT NAME	: I.B. REMEDIATION	REPORT DATE	: 04/28/95

ATI ID: 504358

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	EB041195	AQUEOUS	04/11/95
02	MW-55RB	AQUEOUS	04/11/95
03	MW-61	AQUEOUS	04/11/95
04	MW-66	AQUEOUS	04/11/95
05	MW-66RB	AQUEOUS	04/11/95
06	MW-55	AQUEOUS	04/11/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504358

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

DATE RECEIVED : 04/13/95
REPORT DATE : 04/28/95

PARAMETER	UNITS	03	04	06
CHLORIDE (EPA 325.2)	MG/L	420	8.9	320

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION ATI I.D. : 504358

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE	MG/L	50470101	6.2	6.1	2	16.2	10.0	100

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 504358

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	EB041195	AQUEOUS	04/11/95	NA	04/15/95	1
02	MW-55RB	AQUEOUS	04/11/95	NA	04/15/95	1
03	MW-61	AQUEOUS	04/11/95	NA	04/17/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	7.0	24	<0.5
TOLUENE	UG/L	<0.5	1.3	<0.5
ETHYLBENZENE	UG/L	7.8	30	<0.5
TOTAL XYLENES	UG/L	35	170	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		95	92	98

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 504358

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	MW-66	AQUEOUS	04/11/95	NA	04/15/95	1
05	MW-66RB	AQUEOUS	04/11/95	NA	04/15/95	1
06	MW-55	AQUEOUS	04/11/95	NA	04/17/95	5

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	1.2	420
TOLUENE	UG/L	<0.5	<0.5	<2.5
ETHYLBENZENE	UG/L	<0.5	7.4	260
TOTAL XYLENES	UG/L	<0.5	53	21
SURROGATE:				
BROMOFLUOROBENZENE (%)		94	101	82

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504358
BLANK I.D.	: 041595	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/15/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		93

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504358
BLANK I.D.	: 041795	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/17/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		104

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 50435804	ATI I.D.	: 504358
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/17/95
PROJECT NAME	: I.B. REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 50435804	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	10	100	10	100	0
TOLUENE	<0.5	10	10	100	9.9	99	1
ETHYLBENZENE	<0.5	10	10	100	10	100	0
TOTAL XYLENES	<0.5	30	30	100	30	100	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc., Albuquerque, NM
San Diego ▪ Phoenix ▪ Seattle ▪ Pensacola ▪ Ft. Collins ▪ Portland ▪ Albuquerque

CHAIN OF CUSTODY

DATE: 4-11-95 PAGE 1 OF 1

ATI LAB I.D. 504358

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland, TX 79702-0552
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO:
COMPANY: SAME
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/~~MTBE~~ (8020)	Chloride	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
EB041195	4/11/95	0945	water	01				X																	2
MW-55RB	↓	1020	↓	02				X																	2
MW-61	↓	1055	↓	03				X	X																3
MW-66	↓	1220	↓	04				X	X																3
MW-66RB	↓	1330	↓	05				X																	2
MW-55	↓	1520	↓	06				X	X																3

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	44999	NO. CONTAINERS	15
PROJ. NAME:	I.B. Remediation	CUSTODY SEALS	Y (N) NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments: Seals on cooler

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 0900	Signature: Time:	Signature: Time:
Printed Name: Charles Madewell Date: 4-13-95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: 505-242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: [signature] Time: 0900
Printed Name: Date:	Printed Name: Date:	Printed Name: Dianne Cutter Date: 4/13/95
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc. Albuquerque, NM

Chain of Custody

DATE 4/13/95 PAGE 1 OF 1

NETWORK PROJECT MANAGER: LETITIA KRAKOWSKI

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310			8240 (TCLP 1311) ZHE		Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)		NACE	ASBESTOS		BOD	TOTAL COLIFORM	FECAL COLIFORM		GROSS ALPHA/BETA	RADIUM 226/228		AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
504358-03	4/11	1055	AQ	3						X																						1
-04	4/11	1220		4						X																						1
-06	4/11	1520		6						X																						1

PROJECT INFORMATION

PROJECT NUMBER: 504358
PROJECT NAME: MO
QC LEVEL: (STD) IV
QC REQUIRED: (MS) MSD BLANK
TAT: (STANDARD) RUSH!

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	3
CHAIN OF CUSTODY SEALS	NA
INTACT?	Y
RECEIVED GOOD COND./COLD	Y
LAB NUMBER	504358

SAMPLES SENT TO:
SAN DIEGO
FT. COLLINS
RENTON
PENSACOLA
PORTLAND
PHOENIX X
FIBERQUANT

RELINQUISHED BY: 1.
Signature: D Litter Time: 1730
Printed Name: Diana Litter Date: 4/13/95
Analytical Technologies, Inc.
Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time: 1003
Printed Name: Linda Eskelund Date: 4/14/95
Company: ATI

DUE DATE: 4/27
RUSH SURCHARGE: 0
CLIENT DISCOUNT: ~~10%~~
160 each

WOFLK392

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **504339**

April 28, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702-0552

Project Name/Number: I.B. REMEDIATION 44999

Attention: Bob Menzie

On **04/10/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Chloride analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

MAY 1 1995

Analytical Technologies, Inc.

CLIENT : MARATHON OIL CO. DATE RECEIVED : 04/10/95

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION REPORT DATE : 04/28/95

ATI ID: 504339

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	EB040595	AQUEOUS	04/05/95
02	MW-70RB	AQUEOUS	04/05/95
03	MW-70	AQUEOUS	04/05/95
04	MW-54	AQUEOUS	04/06/95
05	MW-50	AQUEOUS	04/06/95
06	MW-49	AQUEOUS	04/06/95
07	MW-44	AQUEOUS	04/06/95
08	MW-43	AQUEOUS	04/06/95
09	MW-41	AQUEOUS	04/06/95
10	MW-79	AQUEOUS	04/06/95
11	EB040795	AQUEOUS	04/07/95
12	MW-60RB	AQUEOUS	04/07/95
13	MW-60	AQUEOUS	04/07/95
14	MW-64RB	AQUEOUS	04/07/95
15	MW-64	AQUEOUS	04/07/95
16	MW-67RB	AQUEOUS	04/07/95
17	MW-67	AQUEOUS	04/07/95
18	MW-63	AQUEOUS	04/07/95
19	SW-1	AQUEOUS	04/07/95
20	LYMAN	AQUEOUS	04/07/95
21	ARROYO	AQUEOUS	04/07/95
22	BIEBBLE	AQUEOUS	04/07/95
23	STRIP INLET	AQUEOUS	04/07/95
24	STRIP OUTLET	AQUEOUS	04/07/95
25	MW-65A	AQUEOUS	04/08/95
26	MW-58	AQUEOUS	04/08/95
27	MW-62	AQUEOUS	04/08/95
28	MW-63RB	AQUEOUS	04/08/95
29	MW-57RB	AQUEOUS	04/08/95
30	MW-57	AQUEOUS	04/08/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	30

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504339

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

DATE RECEIVED : 04/10/95
REPORT DATE : 04/28/9

PARAMETER	UNITS	01	03	04	05	06
CHLORIDE (EPA 325.2)	MG/L	<0.5	9.7	102	320	390

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504339

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : **I.B. REMEDIATION**

DATE RECEIVED : 04/10/95
REPORT DATE : **04/28/95**

PARAMETER	UNITS	07	08	09	10	13
CHLORIDE (EPA 325.2)	MG/L	410	280	300	33	8.8

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504339

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

DATE RECEIVED : 04/10/95
REPORT DATE : 04/28/9

PARAMETER	UNITS	15	17	18	19	20
CHLORIDE (EPA 325.2)	MG/L	12	13	6.9	23	13

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504339

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

DATE RECEIVED : 04/10/95
REPORT DATE : 04/28/95

PARAMETER	UNITS	21	22	25	26	27
CHLORIDE (EPA 325.2)	MG/L	13	10.8	13	29	128

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 504339

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

DATE RECEIVED : 04/10/95
REPORT DATE : 04/28/9

PARAMETER	UNITS	30
CHLORIDE (EPA 325.2)	MG/L	31

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : MARATHON OIL COMPANY
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

ATI I.D. : 504339

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE	MG/L	50433904	102	102	0	203	100	101
CHLORIDE	MG/L	50433919	23	23	0	49	25	104
CHLORIDE	MG/L	50470101	6.2	6.1	2	16.2	10.0	100

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	EB040595	AQUEOUS	04/05/95	NA	04/12/95	1
02	MW-70RB	AQUEOUS	04/05/95	NA	04/12/95	1
03	MW-70	AQUEOUS	04/05/95	NA	04/13/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	0.9	<0.5
ETHYLBENZENE	UG/L	<0.5	0.7	<0.5
TOTAL XYLENES	UG/L	1.0	4.3	1.1
SURROGATE:				
BROMOFLUOROBENZENE (%)		101	91	111

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	MW-54	AQUEOUS	04/06/95	NA	04/13/95	1
05	MW-50	AQUEOUS	04/06/95	NA	04/13/95	1
06	MW-49	AQUEOUS	04/06/95	NA	04/13/95	1

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	<0.5	120
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	24
TOTAL XYLENES	UG/L	<0.5	<0.5	26
SURROGATE:				
BROMOFLUOROBENZENE (%)		105	103	78

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)
CLIENT : MARATHON OIL CO. ATI I.D.: 504339
PROJECT # : 44999
PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	MW-44	AQUEOUS	04/06/95	NA	04/13/95	1
08	MW-43	AQUEOUS	04/06/95	NA	04/13/95	1
09	MW-41	AQUEOUS	04/06/95	NA	04/13/95	1

PARAMETER	UNITS	07	08	09
BENZENE	UG/L	19	0.6	4.8
TOLUENE	UG/L	2.0	<0.5	<0.5
ETHYLBENZENE	UG/L	71	2.8	19
TOTAL XYLENES	UG/L	16	14	33
SURROGATE:				
BROMOFLUOROBENZENE (%)		71	105	103

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
10	MW-79	AQUEOUS	04/06/95	NA	04/13/95	5
11	EB040795	AQUEOUS	04/07/95	NA	04/13/95	1
12	MW-60RB	AQUEOUS	04/07/95	NA	04/14/95	1

PARAMETER	UNITS	10	11	12
BENZENE	UG/L	14	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	10	<0.5	<0.5
TOTAL XYLENES	UG/L	53	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		87	97	96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
13	MW-60	AQUEOUS	04/07/95	NA	04/14/95	1
14	MW-64RB	AQUEOUS	04/07/95	NA	04/14/95	1
15	MW-64	AQUEOUS	04/07/95	NA	04/14/95	1

PARAMETER	UNITS	13	14	15
BENZENE	UG/L	<0.5	<0.5	18
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	18
TOTAL XYLENES	UG/L	<0.5	<0.5	41
SURROGATE:				
BROMOFLUOROBENZENE (%)		111	101	107

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
16	MW-67RB	AQUEOUS	04/07/95	NA	04/14/95	1
17	MW-67	AQUEOUS	04/07/95	NA	04/14/95	1
18	MW-63	AQUEOUS	04/07/95	NA	04/14/95	1

PARAMETER	UNITS	16	17	18
BENZENE	UG/L	<0.5	1.8	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	0.8	1.3	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		99	91	96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
19	SW-1	AQUEOUS	04/07/95	NA	04/14/95	1
20	LYMAN	AQUEOUS	04/07/95	NA	04/14/95	1
21	ARROYO	AQUEOUS	04/07/95	NA	04/14/95	1

PARAMETER	UNITS	19	20	21
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	<0.5	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		105	98	95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
22	BIEBBLE	AQUEOUS	04/07/95	NA	04/14/95	1
23	STRIP INLET	AQUEOUS	04/07/95	NA	04/14/95	50
24	STRIP OUTLET	AQUEOUS	04/07/95	NA	04/14/95	1

PARAMETER	UNITS	22	23	24
BENZENE	UG/L	<0.5	42	<0.5
TOLUENE	UG/L	<0.5	<25	<0.5
ETHYLBENZENE	UG/L	<0.5	46	<0.5
TOTAL XYLENES	UG/L	<0.5	400	2.3
SURROGATE:				
BROMOFLUOROBENZENE (%)		89	84	89

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
25	MW-65A	AQUEOUS	04/08/95	NA	04/14/95	1
26	MW-58	AQUEOUS	04/08/95	NA	04/14/95	1
27	MW-62	AQUEOUS	04/08/95	NA	04/15/95	1

PARAMETER	UNITS	25	26	27
BENZENE	UG/L	<0.5	2.2	7.5
TOLUENE	UG/L	<0.5	<0.5	30
ETHYLBENZENE	UG/L	<0.5	2.1	12
TOTAL XYLENES	UG/L	0.5	6.8	30
SURROGATE:				
BROMOFLUOROBENZENE (%)		92	71	82

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 504339

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
28	MW-63RB	AQUEOUS	04/08/95	NA	04/14/95	1
29	MW-57RB	AQUEOUS	04/08/95	NA	04/15/95	1
30	MW-57	AQUEOUS	04/08/95	NA	04/15/95	1

PARAMETER	UNITS	28	29	30
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	0.6	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		102	93	92

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504339
BLANK I.D.	: 041295	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/12/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		105

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504339
BLANK I.D.	: 041395	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/13/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		94

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504339
BLANK I.D.	: 041395B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/13/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504339
BLANK I.D.	: 041495	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/14/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		98

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 504339
BLANK I.D.	: 041595	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/15/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		93

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 50433604	ATI I.D.	: 504339
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/12/95
PROJECT NAME	: I.B. REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 50433604	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	9.8	98	10	100	2
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	<0.5	10	10	100	11	110	10
TOTAL XYLENES	<0.5	30	31	103	32	107	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 50433601	ATI I.D.	: 504339
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 04/13/95
PROJECT NAME	: I.B. REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 50433601	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	9.6	96	9.8	98	2
TOLUENE	<0.5	10	9.9	99	9.9	99	0
ETHYLBENZENE	<0.5	10	10	100	10	100	0
TOTAL XYLENES	<0.5	30	30	100	30	100	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 4/5/95 PAGE 1 OF 4

ATI LAB I.D. 504339

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Co.
ADDRESS: P.O. Box 522
Midland, TX 79702
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO:
COMPANY: SAME
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
EB040595	4/5/95	0920	H_2O	01	X	X	3
MW-70RB	↓	1510	↓	02	X		2
MW-70	↓	1520	↓	03	X	X	3
MW-54	4/6/95	1330	↓	04	X	X	3
MW-50	↓	1340	↓	05	X	X	3
MW-49	↓	1345	↓	06	X	X	3
MW-44	↓	1350	↓	07	X	X	3
MW-43	↓	1355	↓	08	X	X	3
MW-41	↓	1400	↓	09	X	X	3

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	26
PROJ. NAME: F.B. Remediation		CUSTODY SEALS	Y / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments: Seals on cooler

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: 1250	Signature: Time:	Signature: Time:
Printed Name: Charles Madewell Date: 4-10-95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: 505-242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 1250
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: 4/10/95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

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CHAIN OF CUSTODY

DATE: 4/6/95 PAGE 2 OF 4

ATI LAB I.D. 504339

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Co.
ADDRESS: P.O. Box 552
Midland, TX 79702
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO:
COMPANY:
ADDRESS: SAME

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTEX (8020)	Chlorides	NUMBER OF CONTAINERS
MW-79	4/6/95	1445	H_2O	10	X	X	3
EB040795	4/6/95	1450		11	X		2
MW-60RB		1600		12	X		2
MW-60		1605		13	X	X	3
MW-64RB		1710		14	X		2
MW-64		1715		15	X	X	3
MW-67RB		1810		16	X		2
MW-67		1820		17	X	X	3
MW-63		1940		18	X	X	3

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1)
(MOD 8015) Gas/Diesel
Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)
Chlorinated Hydrocarbons (601/8010)
Aromatic Hydrocarbons (602/8020)
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.
Pesticides/PCB (608/8080)
Herbicides (615/8150)
Base/Neutral/Acid Compounds GC/MS (625/8270)
Volatile Organics GC/MS (624/8240)
Polynuclear Aromatics (610/8310)
SDWA Primary Standards - Arizona
SDWA Secondary Standards - Arizona
SDWA Primary Standards - Federal
SDWA Secondary Standards - Federal
The 13 Priority Pollutant Metals
RCRA Metals by Total Digestion
RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	44999	NO. CONTAINERS	23
PROJ. NAME:	I.B. Remediation	CUSTODY SEALS	Y / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: 1250	Signature: Time:	Signature: Time:
Printed Name: Charles Mackewell Date: 4-10-95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: 505-247-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 1250
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: 4/10/95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary, Pink - CLIENT

Analytical Technologies, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 4-7-95 PAGE 3 OF 4

ATI LAB I.D. 504339

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland, TX 79702-0552
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO:
COMPANY: same
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
SW-1	4-7-95	12:50p	water	19	✓	✓	3
Lyman		1:05p		20	✓	✓	3
Arroyo		1:18p		21	✓	✓	3
Biebble		4:40p		22	✓	✓	3
Strip Inlet		5:00p		23	✓		2
Strip Outlet		5:10p		24	✓		2
MW-65A	4-8-95	9:00a		25	✓	✓	3
MW-58		9:30a		26	✓	✓	3
MW-62		9:50a		27	✓	✓	3

PROJECT INFORMATION

PROJ. NO.: IR Remediation
PROJ. NAME: 4494(1)
P.O. NO.:
SHIPPED VIA:

SAMPLE RECEIPT

NO. CONTAINERS	28
CUSTODY SEALS	(Y) N / NA
RECEIVED INTACT	Y
RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.

Signature: Robert J. Menzie Time: 11:10am
Printed Name: R.J. Menzie Jr. Date: 4-8-95
Company: Marathon Phone: 915-687-8312

RELINQUISHED BY: 2.

Signature: Time: 1250
Printed Name: Charles Madewell Date: 4-10-95
Company: GTI

RELINQUISHED BY: 3.

Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY: 1.

Signature: Time: 1110
Printed Name: Charles Madewell Date: 4-8-95
Company: GTI

RECEIVED BY: 2.

Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY:(LAB) 3.

Signature: Time: 1250
Printed Name: Date:
Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical Technologies, Inc., Albuquerque, NM

San Diego ▪ Phoenix ▪ Seattle ▪ Pensacola ▪ Ft. Collins ▪ Portland ▪ Albuquerque

CHAIN OF CUSTODY

DATE: 4/8/95 PAGE 4 OF 4

ATI LAB I.D. 50433 5

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland, TX 79702-0552
PHONE: 915-687-832
FAX: 915-687-8337

BILL TO:
COMPANY: SAME
ADDRESS:

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	NUMBER OF CONTAINERS
MW-63RB	4/8/95	0830	Water	28	2
MW-57RB	↓	0915	↓	29	2
MW-57	↓	0920	↓	30	3

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)
		X	X															

PROJECT INFORMATION

PROJ. NO.: 44969
PROJ. NAME: IB Remediation
P.O. NO.:
SHIPPED VIA:

SAMPLE RECEIPT

NO. CONTAINERS	5
CUSTODY SEALS	(Y) N / NA
RECEIVED INTACT	Y
RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: 1250	Signature: Time:	Signature: Time:
Printed Name: Charles Medewell Date: 4-10-95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: 505-242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 1250
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: 4/10/95
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 ▪ Phoenix (602) 496-4400 ▪ Seattle (206) 228-8335 ▪ Pensacola (904) 474-1001 ▪ Portland (503) 684-0447 ▪ Albuquerque (505) 344-3975 DISTRIBUTION: White Canary Pink NATO

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 4/10/05 PAGE 1 OF 3

NETWORK PROJECT MANAGER: LETITIA KRAKOWSKI

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310		8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)		NACE	ASBESTOS		BOD	TOTAL COLIFORM	FECAL COLIFORM		GROSS ALPHA/BETA	RADIUM 226/228		AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
504339 -01	4/5	0820	AQ	1						X																					1
-03	↓	1520	|	3						X																					1
-04	4/6	1330	|	4						X																					1
-05	|	1410	|	5						X																					1
-06	|	1345	|	6						X																					1
-07	|	1350	|	7						X																					1
-08	|	1355	|	8						X																					1
-09	|	1400	|	9						X																					1
-10	↓	1445	↓	10						X																					1

PROJECT INFORMATION	
PROJECT NUMBER:	504339
PROJECT NAME:	NM
QC LEVEL:	(STD) IV
QC REQUIRED:	(MS) MSD BLANK
TAT:	(STANDARD) RUSH!

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	9
CHAIN OF CUSTODY SEALS	4
INTACT?	Y
RECEIVED GOOD COND./COLD	Y
LAB NUMBER	564339

DUE DATE: 4/24
RUSH SURCHARGE: ~~0~~
CLIENT DISCOUNT: ~~0~~ %
160.00 each

WO# 1375

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	
PORTLAND	
PHOENIX	X
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Time: 1730
Printed Name: Date: 4/10/05
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time: 1001
Printed Name: Melanie Giangrasso Date: 4/11/05
Company: ATI-Phoenix

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 4/10/95 PAGE 2 OF 3

NETWORK PROJECT MANAGER: LETITIA KRAKOWSKI

COMPANY: **Analytical Technologies, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310	8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
504339-13	4/7	1605	AQ	13						X																1
-15	4/7	1715		15						X																1
-17	4/7	1820		17						X																1
-18	4/7	1940		18						X																1
-19	4/7	1250		19						X																1
-20	4/7	1305		20						X																1
-21	4/7	1318		21						X																1
-22	4/7	1640		22						X																1
-25	4/8	0900	↓	25						X																1

PROJECT INFORMATION	
PROJECT NUMBER:	504339
PROJECT NAME:	MD
QC LEVEL:	(STD) IV
QC REQUIRED:	MS MSD BLANK
TAT:	(STANDARD) RUSH!

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	9
CHAIN OF CUSTODY SEALS	Y
INTACT?	Y
RECEIVED GOOD COND./COLD	Y
LAB NUMBER	504339

DUE DATE: 4/24
RUSH SURCHARGE: 0
CLIENT DISCOUNT: ~~10~~ %
160.00 each

WO# 1375

SAMPLES SENT TO:
- SAN DIEGO
- FT. COLLINS
- RENTON
- PENSACOLA
- PORTLAND
- PHOENIX X
- FIBERQUANT

RELINQUISHED BY: 1.
Signature: Time: 1730
Printed Name: Date: 4/10/95
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time: 1661
Printed Name: Melanie Giangrizzo Date: 4/11/95
Company: ATL-Phoenix

Analytical Technologies, Inc. Albuquerque, NM

Chain of Custody

DATE 4/6/95 PAGE 3 OF 3

NETWORK PROJECT MANAGER: LETITIA KRAKOWSKI

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310		8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
504339-26	4/8	0930	AQ	26						X																	1
-27	↓	0950	↓	27						X																	1
-30	↓	0920	↓	30						X																	1

PROJECT INFORMATION

PROJECT NUMBER: 504339
PROJECT NAME: IMO
QC LEVEL: STD? IV
QC REQUIRED: MS MSD BLANK
TAT: STANDARD RUSH!

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	3
CHAIN OF CUSTODY SEALS	4
INTACT?	4
RECEIVED GOOD COND./COLD	4
LAB NUMBER	504339

DUE DATE: 4/24
RUSH SURCHARGE: 0
CLIENT DISCOUNT: 10 %
160 each

WELL 1375

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	
PORTLAND	
PHOENIX	X
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Time: 1730
Printed Name: Date: 4/6/95
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time: 601
Printed Name: Melanie Giangrzo Date: 4/11/95
Company: ATI-Phoenix

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **506415**

July 20, 1995

Marathon Oil Company
P.O. Box 522
Midland, TX 79702

Project Name/Number: I.B. REMEDIATION 44999

Attention: Bob Menzie

On **06/26/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA method 8020 analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

All other analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical Technologies, Inc.

CLIENT	: MARATHON OIL	DATE RECEIVED	: 06/26/95
PROJECT #	: 44999		
PROJECT NAME	: I.B. REMEDIATION	REPORT DATE	: 07/20/95

ATI ID: 506415

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	MW-71	AQUEOUS	06/23/95
02	TRIP BLANK	AQUEOUS	03/30/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	2

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL ATI I.D.: 506415

PROJECT # : 44999

PROJECT NAME : I.B. REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	MW-71	AQUEOUS	06/23/95	NA	06/28/95	1
02	TRIP BLANK	AQUEOUS	03/30/95	NA	06/28/95	1

PARAMETER	UNITS	01	02
BENZENE	UG/L	<0.5	<0.5
TOLUENE	UG/L	66	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5
TOTAL XYLENES	UG/L	<0.5	<0.5
SURROGATE:			
BROMOFLUOROBENZENE (%)		109	108

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 506415
BLANK I.D.	: 062795B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 06/27/95
PROJECT NAME	: I.B. REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		106

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 50640811	ATI I.D.	: 506415
CLIENT	: MARATHON OIL	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 06/28/95
PROJECT NAME	: I.B. REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 50640811	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	11	110	11	110	0
TOLUENE	<0.5	10	11	110	11	110	0
ETHYLBENZENE	<0.5	10	12	120	11	110	9
TOTAL XYLENES	<0.5	30	35	117	34	113	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 506998

CLIENT : ANALYTICAL TECHNOLOGIES, INC-NM
PROJECT # : 506415
PROJECT NAME : MARATHON

DATE RECEIVED : 06/27/95
REPORT DATE : 07/20/95

PARAMETER	UNITS	01
CHLORIDE (EPA 325.2)	MG/L	16

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : ANALYTICAL TECHNOLOGIES, INC-NM
PROJECT # : 506415
PROJECT NAME : MARATHON ATI I.D. : 506998

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE	MG/L	50601014	180	180	0	380	200	100

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 6/23/95 PAGE 1 OF 1

ATI LAB I.D. 506415

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon
ADDRESS: P.O. Box 552
Midland TX 79702
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO:
COMPANY:
ADDRESS: SAME

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/~~MTBE~~ (8020)	Cl. Iorida	NUMBER OF CONTAINERS
MW-71	6/23/95	1815	Water	01	X	X	3
Trip Blank	6/23/95	0835		02	X		1

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1)
(MOD 8015) Gas/Diesel
Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)
Chlorinated Hydrocarbons (601/8010)
Aromatic Hydrocarbons (602/8020)
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.
Pesticides/PCB (608/8080)
Herbicides (615/8150)
Base/Neutral/Acid Compounds GC/MS (625/8270)
Volatile Organics GC/MS (624/8240)
Polynuclear Aromatics (610/8310)
SDWA Primary Standards - Arizona
SDWA Secondary Standards - Arizona
SDWA Primary Standards - Federal
SDWA Secondary Standards - Federal
The 13 Priority Pollutant Metals
RCRA Metals by Total Digestion
RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	449909	NO. CONTAINERS	4
PROJ. NAME:	I.B. Remediation	CUSTODY SEALS	(Y) N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:	GTI	RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: 1000	Signature: Time:	Signature: Time:
Printed Name: Charles Mallowell Date: 6/26/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: 212-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 10:00
Printed Name: Date:	Printed Name: Date:	Printed Name: C.F. Froehlich Date: 6/26/95
Company:	Company:	Analytical Technologies, Inc.

Analytical**Technologies**, Inc. Albuquerque, NM

Chain of Custody

DATE 6/26 PAGE ___ OF ___

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: KMcNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	+ Chloride	632/632 MOD	619/619 MOD	610/8310		8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)		NACE	ASBESTOS		BOD	TOTAL COLIFORM	FECAL COLIFORM		GROSS ALPHA/BETA	RADIUM 226/228		AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
506415-01	6/23	1815	AQ	1																											1

PROJECT INFORMATION

PROJECT NUMBER: 506415
PROJECT NAME: IB Remediation
QC LEVEL: (STD) IV
QC REQUIRED: MS MSD BLANK
TAT: (STANDARD) RUSH!

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	1
CHAIN OF CUSTODY SEALS	Y
INTACT?	Y
RECEIVED GOOD COND./COLD	Y
LAB NUMBER	506998

DUE DATE: 7/10
RUSH SURCHARGE: Ø
CLIENT DISCOUNT: QUOTE % (16%)

IWO
LK536

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	
PORTLAND	
PHOENIX	X
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: KMcNeill Time: 5:5
Printed Name: KMcNeill Date 6/26
Analytical Technologies, Inc. Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Marcia Smith 0956
Printed Name: MARCIA SMITH Date: 6/27/95
Company: ATI - PHX

ORIGINATOR

APPENDIX D

RANCHER WELL, PLANT WELL, AND NATURAL SPRING

MONTHLY LABORATORY RESULTS

(MAY)

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **505376**

June 6, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702-0552

Project Name/Number: IB REMEDIATION

Attention: Bob Menzie

On **05/22/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Per client request raw data for sample "STRIPPER OUTLET" is included in this report.

Chloride analyses were performed by Analytical Technologies, Inc., 225 Commerce Drive, Fort Collins, CO.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

JUN 9 1995

Analytical Technologies, Inc.

CLIENT	: MARATHON OIL CO.	DATE RECEIVED	: 05/22/95
PROJECT #	: (NONE)		
PROJECT NAME	: IB REMEDIATION	REPORT DATE	: 06/06/95

ATI ID: 505376

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	SW-1	AQUEOUS	05/18/95
02	LYMAN	AQUEOUS	05/18/95
03	ARROYO	AQUEOUS	05/18/95
04	STRIPPER INLET	AQUEOUS	05/18/95
05	STRIPPER OUTLET	AQUEOUS	05/18/95
06	TRIP BLANK	AQUEOUS	05/04/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

INORGANIC ANALYSES
NONMETALS

Sample ID

Reagent Blank

Lab Name: Analytical Technologies, Inc.

Client Name: Analytical Technologies, Inc. New Mexico

Client Project ID: 505376

Lab Sample ID: 95-05-154-RB

Date Collected: N/A

Sample Matrix: Water

Analyte	Method*	Concentration (mg/L)	Detection Limit (mg/L)	Analysis Date
Chloride	4500-Cl B.	ND	5	05/25/95

ND = Not Detected

* Methods are from Standard Methods for the Examination of Water and Wastewater, 17th edition 1989

Analytical Technologies, Inc.

INORGANIC ANALYSES
NONMETALS

Lab Name: Analytical Technologies, Inc.

Client Name: Analytical Technologies, Inc. New Mexico

Client Project ID: 505376

Lab Sample ID: 95-05-154-01

Sample ID

SW-1

Date Collected: 05/18/95

Sample Matrix: Water

Analyte	Method*	Concentration (mg/L)	Detection Limit (mg/L)	Analysis Date
Chloride	4500-Cl B.	25	5	05/25/95

ND = Not Detected

* Methods are from Standard Methods for the Examination of Water and Wastewater, 17th edition 1989

Analytical **Technologies,** Inc.

INORGANIC ANALYSES
NONMETALS

Sample ID

Lyman

Lab Name: Analytical Technologies, Inc.

Client Name: Analytical Technologies, Inc. New Mexico

Client Project ID: 505376

Lab Sample ID: 95-05-154-02

Date Collected: 05/18/95

Sample Matrix: Water

Analyte	Method*	Concentration (mg/L)	Detection Limit (mg/L)	Analysis Date
Chloride	4500-Cl B.	10	5	05/25/95

ND = Not Detected

* Methods are from Standard Methods for the Examination of Water and Wastewater, 17th edition 1989

Analytical Technologies, Inc.

INORGANIC ANALYSES
NONMETALS

Lab Name: Analytical Technologies, Inc.

Client Name: Analytical Technologies, Inc. New Mexico

Client Project ID: 505376

Lab Sample ID: 95-05-154-03

Sample ID

Arroyo

Date Collected: 05/18/95

Sample Matrix: Water

Analyte	Method*	Concentration (mg/L)	Detection Limit (mg/L)	Analysis Date
Chloride	4500-Cl B.	9	5	05/25/95

ND = Not Detected

* Methods are from Standard Methods for the Examination of Water and Wastewater, 17th edition 1989

Analytical Technologies, Inc.

MATRIX SPIKE DATA FOR INORGANIC ANALYSES
NONMETALS

Lab Name: Analytical Technologies, Inc. Sample Matrix: Water

Client Name: Analytical Technologies, Inc. New Mexico

Client Project ID: 505376

Analyte	Client Sample ID	ATI Lab Sample ID	Spike Added (mg/L)	Sample Conc. (mg/L)	MS Conc. (mg/L)	MS Rec. %	Analysis Date
Chloride	In House	95-05-101-02	121	19	137	98	05/25/95

ND = Not Detected

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)
CLIENT : MARATHON OIL CO. ATI I.D.: 505376
PROJECT # : (NONE)
PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	SW-1	AQUEOUS	05/18/95	NA	05/22/95	1
02	LYMAN	AQUEOUS	05/18/95	NA	05/22/95	1
03	ARROYO	AQUEOUS	05/18/95	NA	05/22/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	<0.5	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		92	101	97

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 505376

PROJECT # : (NONE)

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	STRIPPER INLET	AQUEOUS	05/18/95	NA	05/23/95	20
05	STRIPPER OUTLET	AQUEOUS	05/18/95	NA	05/24/95	10
06	TRIP BLANK	AQUEOUS	05/04/95	NA	05/22/95	1

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	68	<5.0	<0.5
TOLUENE	UG/L	<10	18	<0.5
ETHYLBENZENE	UG/L	110	5.3	<0.5
TOTAL XYLENES	UG/L	150	24	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		89	94	101

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 505376
BLANK I.D.	: 052395	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 05/23/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		94

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 505376
BLANK I.D.	: 052295	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 05/22/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		117

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 505376
BLANK I.D.	: 052495	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 05/24/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		93

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 50538601	ATI I.D.	: 505376
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 05/24/95
PROJECT NAME	: IB REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 50538601	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	9.1	91	8.8	88	3
TOLUENE	<0.5	10	10	100	9.8	98	2
ETHYLBENZENE	<0.5	10	11	110	10	100	10
TOTAL XYLENES	<0.5	30	34	113	33	110	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc. Albuquerque, NM

Chain of Custody 95-05-154

DATE _____ PAGE ___ OF ___

NETWORK PROJECT MANAGER: LETITIA KRAKOWSKI

COMPANY: **Analytical Technologies, Inc.**

ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:
BOB MONZIE

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	632/632 MOD	619/619 MOD	610/8310	8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
505376-01	5/12	840	AQ	01								+													1
-02	5/12	1007		02								+													1
-03	5/12	940		03								+													1

for

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJECT NUMBER:		TOTAL NUMBER OF CONTAINERS	3
PROJECT NAME:		CHAIN OF CUSTODY SEALS	n/a
QC LEVEL: STD. IV		INTACT?	NA
QC REQUIRED: MS MSD BLANK		RECEIVED GOOD COND./COLD	Y
TAT: STANDARD RUSH!		LAB NUMBER	

DUE DATE: 6/12
RUSH SURCHARGE: 0
CLIENT DISCOUNT: 10 %

SAMPLES SENT TO:
- SAN DIEGO
- FT. COLLINS X
- RENTON
- PENSACOLA
- PORTLAND
- PHOENIX
- FIBERQUANT

RELINQUISHED BY: 1.
Signature: _____ Time: 6:15p
Printed Name: _____ Date 5/22
Analytical Technologies, Inc/ Albuquerque
Company: FED-X

RECEIVED BY: (LAB) 1.
Signature: _____ Time: _____
Printed Name: _____ Date: _____
Company: FED-X

RELINQUISHED BY: 2.
Signature: _____ Time: _____
Printed Name: _____ Date
Company: FED-X

RECEIVED BY: (LAB) 2.
Signature: _____ Time: 5-23-95 10:00
Printed Name: I. Kelly Date: 5-23-95
Company: ATI

Analytical Technologies, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 5/18/95 PAGE 1 OF 1

ATI LAB I.D. 505376

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland, TX 79702-0552
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY:
ADDRESS: SAME

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chloride	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
SW-1	5/15/95	8:40AM	WATER	01				X	X																3
Lyman		10:07AM		02				X	X																3
Arroyo		9:40AM		03				X	X																3
Stripper Inlet		9:00AM		04				X																	2
Stripper Outlet	↓	9:02AM		05				X																	2
Trip Blank	5/4/95	10:15A	↓	06				X																	1

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:		NO. CONTAINERS	14
PROJ. NAME:	IR Remediation	CUSTODY SEALS	Y / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:	Greyhound	RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:
ONE OF THE "ARROYO" BOTTLES HAS AN "X" ON THE LABEL, INDICATING IT WAS SLIGHTLY OVERFILLED.

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: Jvierzbicki 11:20AM	Signature: Time:	Signature: Time:
Printed Name: Date: Jenelle Vierzbicki 5/18/95	Printed Name: Date:	Printed Name: Date:
Company: Phone: Marathon Oil (915) 687-8306	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: C.F. Freehlich Time: 10:20
Printed Name: Date:	Printed Name: Date:	Printed Name: C.F. Freehlich Date: 5/22/95
Company:	Company:	Analytical Technologies, Inc.

C.O.C. TO CHEMIST

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

APPENDIX E

STATE ENGINEER OFFICE FLUID RECOVERY REPORTS

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

May 9, 1995

Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

Re: Indian Basin Remediation Project

Dear Mr. Torres:

The following table indicates the recorded meter readings for fluid removed from the Lower Queen monitoring wells under permit RA-5131 as of Monday, May 1, 1995. Cumulative Lower Queen fluid removal through that date is 51,573,450 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	05/01/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-58	10239118	0	6934078	6,934,078 26,922*	6,961,000
MW-59	10259114	0	138761*	5,827,962 83,454*	5,836,320
MW-61A	10239116	0	7145520	7,145,520 130,850*	7,276,370
MW-62	10239115	0	5766543	5,766,543 256,553*	6,023,096
MW-65A	10239117	0	9541069	9,541,069 39,774*	9,580,843
MW-68	02209213	122618	4255765	4,133,147 2,484,076*	6,617,223
MW-72	02881532	470	9203972	9,203,502	9,203,502
LOWER QUEEN TOTAL 51,573,450 Gallons					

* Metered units are barrels.
Previously metered recovered volumes.

The following table indicates the meter readings for fluid removed from Shallow zone monitoring wells under permit RA-8015 as of Monday, May 1, 1995. The cumulative shallow fluid removal through that date is 805,087 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	05/01/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-1	——	—	——	6,713[1]	6,713
MW-13	02209212	98236.2	226324	243,999[1]	243,999
MW-14	02209214	0	398204.3	398,391[1]	398,391
MW-21	——	—	——	189[1]	189
MW-35	02209212	1881.8	——	98,303[1]	98,303
MW-45	10239114	2421861	2421861	0	0
MW-51	02209214	398208	398208	0	0
MW-69	-----	----	----	3079[2] 54,413[1]	57,492
SHALLOW TOTAL				805,087 Gallons	

[1] Previously metered recovered volumes
[2] Gauged in portable fiberglass tank.

Please note the above tables have been revised to show only the meter serial numbers and readings for the meters currently installed on each well. Earlier readings from meters that have been replaced or switched to other wells have been summarized as "previously metered recovered volumes" to simplify the tables and associated footnotes.

If more information is required, please contact me at (915) 687-8312.

Sincerely,

Robert J. Menzie, Jr.
Environmental Representative

RJM50995/nrt

cc: L. J. Oswald - Midland
C. M. Schweser - IBGP, Lakewood
File: 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

June 6, 1995

Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

Re: Indian Basin Remediation Project

Dear Mr. Torres:

The following table indicates the recorded meter readings for fluid removed from the Lower Queen monitoring wells under permit RA-5131 as of Monday, June 5, 1995. Cumulative Lower Queen fluid removal through that date is 53,925,863 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	06/05/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-58	10239118	0	7048019	7,048,019 26,922[1]	7,074,941
MW-59	10259114	0	142198*	5,972,316 83,454[1]	6,055,770
MW-61A	10239116	0	7612053	7,612,053 130,850[1]	7,742,903
MW-62	10239115	0	5950554	5,950,554 256,553[1]	6,207,107
MW-65A	10239117	0	9847047	9,847,047 39,774[1]	9,886,821
MW-68	02209213	122618	4438784	4,316,166 2,484,076[1]	6,800,242
MW-72	02881532	470	10158549	10,158,079	10,158,079
LOWER QUEEN TOTAL 53,925,863 Gallons					

* Metered units are barrels.
[1] Previously metered recovered volumes.

The following table indicates the meter readings for fluid removed from Shallow zone monitoring wells under permit RA-8015 as of Monday, June 5, 1995. The cumulative shallow fluid removal through that date is 811,572 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	06/05/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-1	——	—	—	6,713[1]	6,713
MW-13	02209212	98236.2	226324	243,999[1]	243,999
MW-14	02209214	0	398204.3	398,391[1]	398,391
MW-21	—	—	—	189[1]	189
MW-35	02209212	1881.8	—	98,303[1]	98,303
MW-45	10239114	2421861	2421861	0	0
MW-51	02209214	398208	398208	0	0
MW-69	—	—	—	6485[2] 57,492[1]	63,977
SHALLOW TOTAL				811,572 Gallons	

[1] Previously metered recovered volumes
[2] Gauged in portable fiberglass tank.

Please note the above tables have been revised to show only the meter serial numbers and readings for the meters currently installed on each well. Earlier readings from meters that have been replaced or switched to other wells have been summarized as "previously metered recovered volumes" to simplify the tables and associated footnotes.

If more information is required, please contact me at (915) 687-8312.

Sincerely,

Robert J. Menzie, Jr.
Environmental Representative

RJM50995/nrt

xc: L. J. Oswald - Midland
C. M. Schweser - IBGP, Lakewood
File: 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

July 10, 1995

Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

Re: Indian Basin Remediation Project

Dear Mr. Torres:

The following table indicates the recorded meter readings for fluid removed from the Lower Queen monitoring wells under permit RA-5131 as of Monday, July 3, 1995. Cumulative Lower Queen fluid removal through that date is 55,142,629 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	07/03/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-58	10239118	0	7126407	7,126,407 26,922[1]	7,153,329
MW-59	10259114	0	143389*	6,022,338 83,454[1]	6,105,792
MW-61A	10239116	0	7797227	7,797,227 130,850[1]	7,928,077
MW-62	10239115	0	6051960	6,051,960 256,553[1]	6,308,513
MW-65A	10239117	0	41145**	10,041,145 39,774[1]	10,080,919
MW-68	02209213	122618	4523218	4,400,600 2,484,076[1]	6,884,676
MW-72	02881532	470	10681793	10,681,323	10,681,323
LOWER QUEEN TOTAL 55,142,629 Gallons					

* Metered units are barrels.
[1] Previously metered recovered volumes.
** Meter rolled over.

The following table indicates the meter readings for fluid removed from Shallow zone monitoring wells under permit RA-8015 as of Monday, July 3, 1995. The cumulative shallow fluid removal through that date is 819,733 gallons.

MONITORING WELL	METER SERIAL NUMBER	INIT'L METER START	07/03/95 METER READING	FLUID REMOVED (Gal)	PER-WELL FLUID REMOVED (Gal)
MW-1	——	—	——	6,713[1]	6,713
MW-13	02209212	98236.2	226324	243,999[1]	243,999
MW-14	02209214	0	398204.3	398,391[1]	398,391
MW-21	——	—	—	189[1]	189
MW-35	02209212	1881.8	—	98,303[1]	98,303
MW-45	10239114	2421861	2421861	0	0
MW-51	02209214	398208	398208	0	0
MW-69	——	—	—	8161[2] 63,977[1]	72,138
SHALLOW TOTAL				819,733 Gallons	

[1] Previously metered recovered volumes
[2] Gauged in portable fiberglass tank.

Please note the above tables have been revised to show only the meter serial numbers and readings for the meters currently installed on each well. Earlier readings from meters that have been replaced or switched to other wells have been summarized as "previously metered recovered volumes" to simplify the tables and associated footnotes.

If more information is required, please contact me at (915) 687-8312.

Sincerely,

Robert J. Menzie, Jr.
Environmental Representative

RJM50995/nrt

xc: L. J. Oswald - Midland
C. M. Schweser - IBGP, Lakewood
File: 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

April 3, 1996

Mr. Roger C. Anderson
Environmental Bureau Chief
State of New Mexico
Oil Conservation Division
2040 S. Pacheco St.
Santa Fe, New Mexico 87505

Dear Mr. Anderson:

Enclosed is the Fourth Quarter 1995 Indian Basin Remediation Project Report. This report is submitted on behalf of the Indian Basin Gas Plant owners in accordance with the Indian Basin Treatment Project Plan prepared by Marathon and approved by the Oil Conservation Division on April 2, 1992. Preparation of this report is also in accordance with the April 2, 1992 New Mexico Oil Conservation Division (OCD) directive for quarterly reporting of remediation project activities.

Please note that as a result of the increased recoveries of three Lower Queen recovery wells drilled late 1995, recovery of condensate from the Lower Queen has increased substantially in the First Quarter of 1996. These data will be presented in our First Quarter 1996 report to follow in a few weeks. If you have any questions, please contact me (915) 687-8312 or Terry Guillory (915) 687-8450.

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental & Safety Representative

Attachment

c: F. D. Searle
T. C. Lowry
T. L. Guillory
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INDIAN BASIN GAS PLANT
REMEDIATION PROJECT
QUARTERLY REPORT

FOURTH QUARTER 1995
OCTOBER, NOVEMBER, AND DECEMBER

Submitted by
Marathon Oil Company
on behalf of the
Indian Basin Gas Plant Owners

March 21, 1996

EXECUTIVE SUMMARY

The pump-and-treat groundwater remediation system is fully operational and functioning as set forth in the Treatment Project Plan (March 1992). During the quarterly sampling event in October 1995, light nonaqueous phase liquid (condensate) was observed in 13 Lower Queen wells. During the quarter, total fluid recovery from 10 Lower Queen recovery wells averaged 70 gallons per minute (16,662 barrels per week), a 38% increase from the prior quarter as a result of three additional groundwater extraction wells being installed. Dissolved-phase volatile hydrocarbon compounds were removed by air stripping. Lower Queen dissolved benzene concentrations in five downgradient wells range from less than 0.5 to 25 micrograms per liter (μg/L) or parts per billion. Chloride concentrations in all Lower Queen wells are below the State maximum allowable concentration of 250 milligrams per liter (mg/L).

Two Shallow zone wells contained condensate in October. Shallow zone pumping continues from one well. During the quarter, fluid recovery from this well averaged 0.02 gallons per minute (5.7 barrels per week). Dissolved benzene concentrations in the Shallow zone aquifer range from less than 0.5 to 240 μg/L. Four Shallow zone wells sampled in October indicate chloride concentrations at or above the State maximum allowable concentration of 250 mg/L.

Concentrations of benzene, toluene, ethylbenzene, total xylene, and chloride in groundwater collected from a rancher well completed in the Shallow alluvium, a rancher well completed in the Seven Rivers Formation, and surface water from the Upper Indian Hills Spring West (Rocky Arroyo spring) have not exceeded State or Federal drinking water standards.

Condensate recovery from the Lower Queen and Shallow zone for the Fourth Quarter was 28.3 barrels, a 42% increase from the prior quarter. Excluding the volume volatilized by the air stripper and vapor extraction system, cumulative recovery is 3,629.4 barrels or 10.4% of the total estimated spill volume.

The vapor extraction system was not operated during the Fourth Quarter.

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INTRODUCTION

This report summarizes groundwater and unsaturated zone treatment activities conducted during the Fourth Quarter of 1995 in accordance with the Indian Basin Environmental Treatment Project Plan submitted on March 5, 1992 by Marathon Oil Company on behalf of the Indian Basin Gas Plant owners. Preparation of this report is also in accordance with the April 2, 1992 New Mexico Oil Conservation Division (OCD) directive for quarterly reporting of remediation project activities. Remediation activities are continuing to reduce the impact of a liquid gas condensate and brine production pipeline spill discovered in April 1991 near the Indian Basin Gas Plant.

GROUNDWATER ELEVATION

Lower Queen Aquifer

Depth-to-water measurements were acquired from nonpumping Lower Queen monitoring wells in October 1995. Table 1 presents groundwater and product elevations calculated from casing elevation data, depth-to-water measurements, and depth-to-product (light nonaqueous phase liquid; LNAPL) measurements. Figure 1 is a potentiometric map of the Lower Queen aquifer based on October gauging data. Fourth Quarter data indicate both increasing and decreasing groundwater elevations (Figure 2).

Shallow Zone

A potentiometric map was constructed using depth-to-water measurements collected from Shallow zone monitoring wells in October 1995 (Figure 3). Table 2 shows depth-to-water and depth-to-LNAPL measurements, calculated groundwater and LNAPL elevations, and LNAPL thickness in Shallow zone wells. These Shallow zone data indicate increasing and decreasing groundwater elevations during the quarter (Figure 4). Groundwater elevation changes are the result of changes in recharge from rainfall and subsurface and surface inflow to the project area.

Groundwater Recharge (Rainfall)

Daily rainfall is gauged at the gas plant. Monthly rainfall for October, November, and December was 0.0, 0.0, and 0.70 inches, respectively (Table 1). Cumulative rainfall for the Fourth Quarter was 0.70 inches.

QUARTERLY SAMPLING LABORATORY RESULTS

On October 9, 10, 11, and 12, 1995, 36 Shallow zone and 17 Lower Queen monitoring wells were gauged. Appendix A contains summary tables of groundwater gauging, purging, and sampling data prepared by Groundwater Technology, Inc. from notes recorded during field

activities. Water samples were collected by Groundwater Technology, Inc. using Environmental Protection Agency (EPA) sampling protocol. Analytical Technologies. Inc. performed BTEX (EPA Method 8020) and chloride (EPA Method 325.2) analyses.

Twenty-three Lower Queen wells were sampled in October including the plant water supply well, SW-1. All Lower Queen groundwater recovery wells contained measurable condensate (measurements from piezometers installed in select large-diameter wells) or yielded condensate when a sample was drawn from the wellhead sampling port (Table 1). Lower Queen monitoring wells MW-73, MW-74, and MW-76 contain condensate.

Twelve Shallow zone wells were sampled in October. Eight of the twenty-five Shallow zone monitoring wells (including two sumps in Rocky Arroyo) designated for quarterly sampling (compliance wells) in the Treatment Project Plan were sampled (see ***bolded and italicized*** well designations in Table 4). The remaining 18 Shallow zone compliance wells were either dry or bailed dry during purging and did not recharge enough to be sampled. Five Shallow zone wells other than those designated in the Treatment Project Plan were sampled (MW-41, MW-43, MW-49, MW-61, and MW-79). Four Shallow zone wells sampled in October indicate chloride concentrations at or above the State maximum allowable concentration of 250 mg/L (MW-44, MW-49, MW-55, and MW-61).

Tables 3 and 4 are historical summaries of quarterly benzene concentration data since September 1991 for the Lower Queen and Shallow zone wells, respectively. Benzene concentration (in μg/l) versus time graphs for each routinely sampled monitoring well are provided in Appendix B.

Groundwater samples were also collected from two downgradient off-site wells and a natural spring in Rocky Arroyo where the Shallow zone aquifer discharges (Upper Indian Hills Spring West; Hendrickson and Jones, 1952). Concentrations of BTEX and chloride in groundwater collected from the Lyman and Biebelle wells and surface water from the natural spring did not exceed State or Federal drinking water standards during the quarter (Table 4). Laboratory reports for the off site wells and natural spring for October are included in Appendix C. Appendix D are the laboratory reports for the off-site wells and natural spring for December sampling.

GROUNDWATER PUMPING

Fluid recovery from the Lower Queen aquifer and Shallow zone is metered and reported to the State Engineer Office (SEO) in Roswell, New Mexico on a monthly basis per SEO directive. The reports filed with the SEO for Fourth Quarter 1995 are attached in Appendix E. Figures 5,

6, and 7 are stacked bar graphs depicting weekly Lower Queen fluid recovery, weekly Shallow zone fluid recovery, and combined weekly fluid recovery from both zones, respectively.

Ten Lower Queen wells (MW-59, MW-61A, MW-62, MW-65A, MW-68, MW-72, MW-75, MW-81, MW-82 and MW-83) were pumped for the purpose of plume containment and free-phase condensate recovery. Weekly fluid recovery for each well and the plant supply well, SW-1, is shown in Figure 5. Free-phase hydrocarbon recovered from these wells during the quarter totaled 28.3 barrels. Weekly Shallow zone water and condensate recovery from MW-69 is shown in Figure 6. Although gauging indicates free-phase hydrocarbon (condensate) is present in MW-69 (Table 2 and Appendix A, p. 2), none was recovered during the Fourth Quarter.

GROUNDWATER TREATMENT AND PRODUCT RECOVERY

Contaminated groundwater and free-phase hydrocarbon (condensate) from 10 Lower Queen recovery wells are pumped through underground piping to the treatment compound. The treatment compound includes two aboveground tanks, an oil/water separator used as a storage vessel, and an air stripper. Condensate is skimmed from one of the two aboveground tanks and transferred to the oil/water separator which serves as a condensate storage vessel. Groundwater containing dissolved-phase hydrocarbon is transferred from the first tank to the second aboveground tank. Groundwater from the second tank is pumped through the air stripper to remove dissolved-phase volatile organic compounds. Stripped volatile organic compounds are vented to the atmosphere through a stack. Treated groundwater is transferred from the air stripper to the 1200-barrel aboveground steel tank and is used as process water for the gas plant.

The measured volume of condensate recovered from Lower Queen groundwater during the Fourth Quarter was 28.3 barrels. Cumulative condensate recovered by the total fluids system since treatment system startup in April 1992 is 165.3 barrels. Cumulative condensate recovered to date excluding the volume volatilized by the air stripper and vapor extraction system is 3,629.4 barrels or 10.4% of the total estimated spill volume.

VAPOR EXTRACTION SYSTEM

The vapor extraction system was not operated during the Fourth Quarter. On May 5, 1994, the vapor extraction system ceased operation when Marathon determined that a New Mexico Air Pollution Control Bureau 702 air emission permit for is required for system operation. The system has not operated since then and is being stored at the gas plant.

OTHER ACTIVITIES

On August 14, 1995, the PVC casing in Lower Queen groundwater recovery well MW-58 collapsed. The collapsed well was discovered because the downhole pump ceased operating. During the Fourth Quarter sampling event in October, the tubing, flow meter, and pump were removed from the well. The well was partially cleaned out using a bailer to a depth of approximately 218 feet below the top of casing. Some filter-pack sand, bentonite, and pieces of broken PVC pipe were recovered with the bailer. The static water level in October was several feet above the bottom of the well; therefore, the well can be utilized as a monitoring well. The exposed water column is not sufficient, however, to continue to use this well as a recovery well.

In September 1995, three additional Lower Queen groundwater recovery wells were drilled, completed, and developed. Recovery well MW-81 commenced pumping on November 19 and MW-82 and MW-83 commenced pumping on December 11.

REFERENCES CITED

Hendrickson, G. E., and Jones, R. S., 1952, Geology and Ground-water Resources of Eddy County, New Mexico: New Mexico Bureau of Mines & Mineral Resources Ground-water Report 3, 169 p., 4 pls.

TABLES

TABLE 1. LOWER QUEEN DEPTH-TO-WATER, GROUNDWATER ELEVATION, CONDENSATE THICKNESS, AND RAINFALL DATA

LOWER QUEEN WELL	Well Use	Top of Casing (TOC) Elev. (ft AMSL)	Top of 1.25-inch Piezometer Piping Elev. (ft AMSL)	Total Depth from TOC (ft)	Oct./9, 10, 11, 12/1995					Nov-95	Dec-95
					Depth to water (ft)	Ground-water Elev. (ft)	Corrected Groundwater Elev. (ft)	Depth to product (ft)	Condensate thickness (ft)		
MW-57	monitor	3787.70		177.20	159.23	3628.47					
MW-58	monitor	3824.31		218.00	collapsed*				present		
MW-59	recovery	3819.59		211.29					present		
MW-60	monitor	3815.28		223.00	187.29	3627.99					
MW-61A	recovery	3815.97		215.67					present		
MW-62	recovery	3819.90		224.69					present		
MW-63	monitor	3826.16		220.49	198.57	3627.59					
MW-64	monitor	3798.57		201.89	170.33	3628.24					
MW-65A	recovery	3763.26		168.56	136.00	3627.26		134.90	1.10		
MW-66	monitor	3828.98		235.18	201.62	3627.36					
MW-67	monitor	3765.87		165.77	137.54	3628.33					
MW-68	recovery	3797.83		203.43					present		
MW-70	monitor	3822.57		225.07	194.19	3628.38					
MW-71	monitor	3778.05		233.49	151.15	3626.90					
MW-72	recovery	3819.32		236.55					present		
MW-73	monitor	3820.09		222.5	192.35	3627.74		?	present		
MW-74	monitor	3820.82		222.5	187.31	3633.51		?	present		
MW-75	recovery	3816.12		222.5	192.31	3623.81		188.02	4.29		
MW-76	monitor	3796.01		222.5	167.51	3628.50	3628.87	167.10	0.41		
MW-81	recovery	3816.99	3817.03	228.45	190.99	3626.00	3628.47	188.25	2.74		
MW-82	recovery	3825.04	3825.07	231.30	196.62	3628.42					
MW-83	recovery	3794.09	3794.12	205.80	166.55	3627.54	3629.04	164.88	1.67		
SW-1	recovery	3808.19		255.00							
SW-2	monitor	3808.79		292.00	181.70	3627.09					
Monthly Rainfall (in)							0.00			0.00	0.70

* PVC in well collapsed in August 14, 1995 due to chemical injection. Well was cleaned out to 218 ft below top of casing. Well contained free-phase condensate.

AMSL = Above Mean Sea Level

FP = Free Product (condensate) present

NG = Not Gauged

TABLE 2. SHALLOW ZONE DEPTH-TO-WATER, GROUNDWATER ELEVATION, AND CONDENSATE THICKNESS

Shallow Zone Well	TOC Elev. (ft AMSL)	Total Depth from TOC (ft)	October 9, 10, 11, 12, 1995				
			Depth to water (ft)	Ground-water Elev. (ft)	Corrected Groundwater Elev. (ft)	Depth to product (ft)	Condensate thickness (ft)
MW-1	3792.50	16.10	not gauged				
MW-2	3788.82	15.52	not gauged				
MW-3	3787.50	16.97	DRY				
MW-4	3785.88	18.68	not gauged				
MW-5	3801.69	13.05	DRY				
MW-6	3785.17	14.25	DRY				
MW-7	3784.46	17.35	DRY				
MW-8	3795.04	17.38	DRY				
MW-9	3807.85	13.79	DRY				
MW-10	3790.78	18.52	DRY				
MW-11	3806.96	24.85	22.01	3784.95			
MW-12	3809.86	25.21	not gauged				
MW-13	3801.58	22.07	18.46	3783.12	3783.17	18.40	0.06
MW-14	3803.93	24.30	not gauged				
MW-15	3803.59	19.47	not gauged				
MW-16	3801.04	22.66	not gauged				
MW-17	3799.55	19.75	not gauged				
MW-18	3795.82	17.42	not gauged				
MW-19	3797.21	19.11	not gauged				
MW-20	3797.59	16.89	not gauged				
MW-21	3798.21	23.31	not gauged				
MW-22	3799.20	17.30	not gauged				
MW-23	3794.48	12.08	not gauged				
MW-24	3794.09	13.30	DRY				
MW-25	3786.97	10.27	not gauged				
MW-26	3793.01	21.11	not gauged				
MW-27	3790.93	18.23	not gauged				
MW-28	3797.03	18.59	not gauged				
MW-29	3794.06	14.76	DRY				
MW-30	3788.30	14.82	not gauged				
MW-31	3791.15	19.93	not gauged				
MW-32	3797.47	15.70	DRY				
MW-33	3802.48	20.29	not gauged				
MW-34	3806.00	19.97	not gauged				
MW-35	3800.81	20.71	not gauged				
MW-36	3792.94	8.77	not gauged				
MW-37	3795.03	20.83	not gauged				
MW-38	3797.32	20.57	DRY				
MW-39	3796.20	20.54	20.03	3776.17			
MW-40	3803.12	14.07	not gauged				
MW-41	3799.04	24.04	20.58	3778.46			
MW-42	3804.73	23.59	not gauged				
MW-43	3802.05	24.55	21.80	3780.25			
MW-44	3804.14	25.24	21.84	3782.30			
MW-45	3808.68	26.62	not gauged				
MW-46	3805.54	20.24	DRY				
MW-47	3805.09	21.79	DRY				
MW-48	3806.18	19.98	DRY				
MW-49	3805.61	25.91	22.68	3782.93			
MW-50	3813.35	37.15	26.85	3786.50			
MW-51	3810.86	20.06	not gauged				
MW-52	3817.49	21.44	DRY				
MW-53	3809.92	15.32	DRY				
MW-54	3823.86	78.15	47.40	3776.46			
MW-55	3794.40	66.32	32.20	3762.20			
MW-56	3782.45	43.76	DRY				
MW-61	3816.20	57.97	37.38	3778.82			
MW-65	3763.31	57.35	57.07	3706.24			
MW-69p	3805.11	51.27	34.57	3770.54	3772.60	32.28	2.29
MW-77	3775.48	82.20	79.70	3695.78			
MW-78	3785.82	86.62	86.19	3699.63			
MW-79	3788.39	82.90	79.57	3708.82			
MW-80	3821.64	91.80	DRY				
Sump A10	3800.99	13.42	12.80	3788.19			
Sump 16A	3785.14	17.45	14.60	3770.54			
Lyman	3670	70	36	3634			

p = pump present in well

AMSL = Above Mean Sea Level
TOC = Top of Casing datum

TABLE 3. HISTORICAL SUMMARY OF BENZENE CONCENTRATION IN LOWER QUEEN GROUNDWATER

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	Sep-91	Dec-91	Apr-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Jan-94	Apr-94	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95
MW-57	1600	350	150	948**	15.1*	21*	8*	6*	<0.5	<0.5	<0.5	0.7	1.1	4.3	<0.5	<0.5	64
MW-58	40	90	202**	178**	190*	192*	55*	25*	50*	FP	<2.5	2.0	6.7	FP	2.2	FP	FP
MW-59	540	420	40.4**	268**	98.8*	26*	10*	FP	10*	FP	<2.5	13	4.1	FP	FP	FP	FP
MW-60	33	<1	3.5**	19**	31.7*	138*	17*	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-61A	190	10	5.0**	359**	470.1*	585*	2821*	FP	FP	FP	<0.5	<0.5	4.8	16	FP	FP	FP
MW-62	2200	1400	257.5**	357**	212.3*	78*	33*	98*	10*	4.1	<2.5	4.3	13	FP	7.5	FP	FP
MW-63	<1	<1	4.1**	12**	4.3*	12*	7*	4*	14*	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	<0.5	<0.5
MW-64	150	130	233**	115**	14	15*	5*	2	18*	1.7	<0.5	<0.5	<0.5	12	18	17	25
MW-65A	680	150	25.3**	413**	10.6*	3*	4*	<1*	7*	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	NS	FP
MW-66	<1	<1	3.3**	8**	12.1*	3*	<3*	8*	13*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MW-67	280	320	4.3*	103**	2.6*	8*	7*	7*	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	1.8	<0.5	6.1
MW-68	240	1900	1865**	160**	2208.2**	376*	1890*	150	374*	3000	120	260	FP	FP	FP	FP	FP
MW-70	<1	<1	1.7**	<1	10.7*	<3*	9*	<1*	25*	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5
MW-71	NI	NI	NI	NI	NI	NI	NI	NI	8*	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
MW-72	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	<2.5	18	FP	FP	FP	FP	FP
MW-73	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-74	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-75	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-76	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP	FP	FP	FP
MW-81	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP
MW-82	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	280
MW-83	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	FP
SW-1	<1	<1	5*	17.5*	15.7*	6*	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SW-2	<1	<1	7.9*	7*	69.4*	47*	4	NS	NS	NS	NS	NS	NS	<0.5	NS	NS	NS
Max. Conc.	2200	1900	1865	948	2208	585	2821	2821	2821	3000	120	260	FP	FP	FP	FP	FP

* High Performance Liquid Chromatography (HPLC)
** Average of more than one sample result using HPLC.

FP = Free Product (Condensate)
NS = Not Sampled
NI = Not Installed

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	**Sep-91**	**Dec-91**	**Apr-92**	**Jul-92**	**Oct-92**	**Jan-93**	**Apr-93**	**Jul-93**	**Oct-93**	**Jan-94**	**Apr-94**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**
MW-1	250	200	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-2	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-3	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-4	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-5	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-6	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-7	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-8	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-9	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-10	***2300***	***2300***	***1780*****	***1842*****	***2100***	***NS***	***NS***	***DRY***	***DRY***	***BD***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-11	***3000***	***3800***	***3087*****	***2199*****	***2942****	***2746****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***1800***	***DRY***	***NS***	***95***	***NS***
MW-12	3800	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-13	***3100***	***3000***	***3492*****	***2708*****	***NS***	***NS***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***PUMP***	***FP***	***FP***	***FP***	***FP***
MW-14	5100**	NS	NS	NS	NS	NS	PUMP	PUMP	FP	FP	NS	NS	NS	NS	NS	NS	NS
MW-15	5100	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-16	1700	NS	NS	NS	NS	NS	514*	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-17	2000	NS	NS	NS	NS	NS	1500	DRY	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-18	4300	NS	2639**	2700	3300	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS	NS	NS
MW-19	***4700***	***NS***	***3195*****	***3000***	***3032****	***NS***	***3926****	***DRY***	***VE***	***VE***	***VE***	***VE***	***NS***	***NS***	***NS***	***NS***	***NS***
MW-20	110	NS	NS	NS	NS	NS	NS	DRY	VE	VE	VE	VE	NS	NS	NS	NS	NS
MW-21	1000	1100	NS	NS	NS	NS	114*	FP	NS	DRY	NS	NS	NS	NS	NS	NS	NS
MW-22	4	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-23	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-24	***3400***	***NS***	***NS***	***4353*****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-25	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-26	3100	3000	NS	2000	1992*	1708*	861*	FP	FP	FP	NS	NS	NS	NS	NS	NS	NS
MW-27	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-28	2200	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-29	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-30	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-31	<1	NS	NS	332**	9*	NS	NS	DRY	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-32	***200***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-33	6300	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-34	2500	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-35	5700	NS	NS	NS	NS	NS	NS	FP	FP	FP	NS	NS	NS	NS	NS	NS	NS

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCl = only Chloride sample

FP = Free Product (condensate)

NS = Not Sampled

VE = Vapor Extraction well

TABLE 4. HISTORICAL SUMMARY OF BENZENE IN SHALLOW GROUNDWATER (Continued)

	Benzene (ug/L) using EPA Method 8020 unless indicated otherwise																
WELL	**Sep-91**	**Dec-91**	**Apr-92**	**Jul-92**	**Oct-92**	**Jan-93**	**Apr-93**	**Jul-93**	**Oct-93**	**Jan-94**	**Apr-94**	**Jul-94**	**Oct-94**	**Jan-95**	**Apr-95**	**Jul-95**	**Oct-95**
MW-36	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-37	150	NS	NS	NS	NS	NS	NS	27*	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-38	***15***	***15***	***51****	***37****	***166****	***NS***	***NS***	***DRY***	***BD***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-39	880	NS	NS	NS	NS	14	29*	24*	DRY	<2.5	<0.5	<0.5	DRY	<5.0	NS	NS	NS
MW-40	NS	NS	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-41	200	170	NS	NS	NS	NS	NS	22*	DRY	5.3	0.6	1.4	3.2	13	4.8	<0.5	1.8
MW-42	<1	<1	NS	NS	NS	NS	NS	NS	DRY	NS	NS	NS	NS	NS	NS	NS	NS
MW-43	320	NS	NS	NS	NS	NS	NS	25*	DRY	<0.5	<0.5	<0.5	0.8	3	0.6	3	1.2
MW-44	***59***	***NS***	***10****	***97****	***12***	***14***	***7****	***6****	***3****	***12***	***22***	***36***	***130***	***63***	***19***	***5.8***	***120***
MW-45	<1	<1	NS	NS	NS	NS	NS	<3*	<3*	<0.5	<0.5	<0.5	NS	NS	NS	NS	NS
MW-46	140	25	NS	NS	NS	NS	NS	NS	DRY	NS	NS	DRY	NS	NS	NS	NS	NS
MW-47	2600	2200	NS	NS	NS	NS	NS	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-48	***<1***	***<1***	***NS***	***47****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-49	35	NS	NS	NS	NS	NS	NS	210*	68*	13	82	150	78	220	120	17	240
MW-50	***<1***	***<1***	***4****	***4****	***8****	***8****	***<1***	***<3****	***9****	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***	***<0.5***
MW-51	800	<1	NS	NS	NS	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
MW-52	***<1***	***NS***	***NS***	***5****	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-53	***<1***	***NS***	***NS***	***NS***	***NS***	***NS***	***NS***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-54	***<1***	***<1***	***9****	***8****	***62****	***14****	***10****	***<3****	***17****	***8.6***	***<0.5***	***15***	***19***	***<0.5***	***<0.5***	***<0.5***	***0.7***
MW-55	***940***	***400***	***296****	***483****	***215****	***390***	***412****	***625****	***581****	***290***	***370***	***360***	***910***	***650***	***420***	***350***	***100***
MW-56	***2200***	***1000***	***NS***	***1114****	***1026****	***1128****	***VE***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***
MW-61	<1	NS	NS	NS	NS	NS	NS	NS	NS	1.4	<0.5	3.2	<5.0	<0.5	<0.5	<0.5	<0.5
MW-65	<1	NS	NS	NS	NS	NS	NS	<3*	DRY	DRY	DRY	NS	<0.5	NS	NS	NS	NS
MW-69	***2400***	***2100***	***NS***	***568****	***1598****	***1284****	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***
MW-77	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NS	NS	<0.5	NS
MW-78	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	DRY	DRY	DRY	DRY
MW-79	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	110	14	<5	16
MW-80	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	DRY	DRY	DRY	DRY
SUMP A10	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***FP***	***DRY***	***DRY***	***DRY***	***DRY***	***NS***	***OCI***	***DRY***	***DRY***	***DRY***	***<0.5***
SUMP A11	1400	2900	3033**	1258**	2815*	NS	NS	DRY	DRY	DRY	NS	NS	NS	NS	NS	NS	NS
SUMP 16A	***240***	***2000***	***1233****	***1495****	***632****	***741****	***707****	***DRY***	***DRY***	***DRY***	***DRY***	***DRY***	***170***	***2.0***	***NS***	***DRY***	***130***
Lyman								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
U. Indian Hills Spring West	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Biebelle								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Bolded Italicized well numbers = Designated wells for quarterly sampling in Marathon Treatment Plan (March 1992)

* High Performance Liquid Chromatography (HPLC)

** Average of more than one sample result using HPLC.

NI = Not Installed

OCI = only Chloride sample

FP = Free Product (condensate)

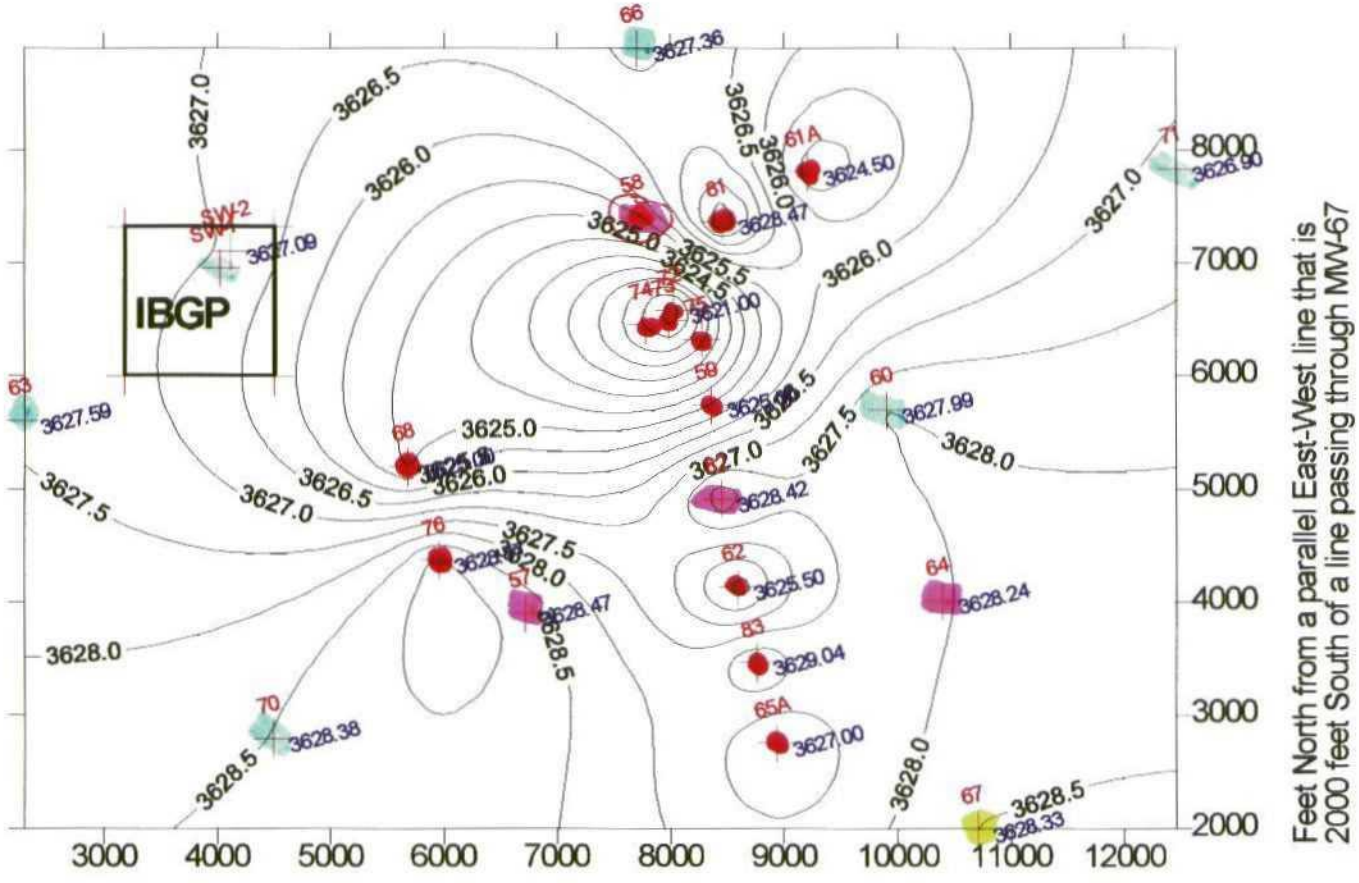
NS = Not Sampled

VE = Vapor Extraction well

FIGURES

Figure 1.
October 1995 Lower Queen Potentiometric Surface (assumes 6 ft of drawdown in MW-72 and ~3 ft of drawdown in other recovery wells)

Contoured using SURFER 5.0 Kriging Function
Contour Interval = 0.5 feet
Datum is Mean Sea Level



Feet East from a parallel North-South line that is 2000 feet West of a line passing through MW-63

Feet North from a parallel East-West line that is 2000 feet South of a line passing through MW-67

Figure 2. Lower Queen Groundwater Elevation vs. Time

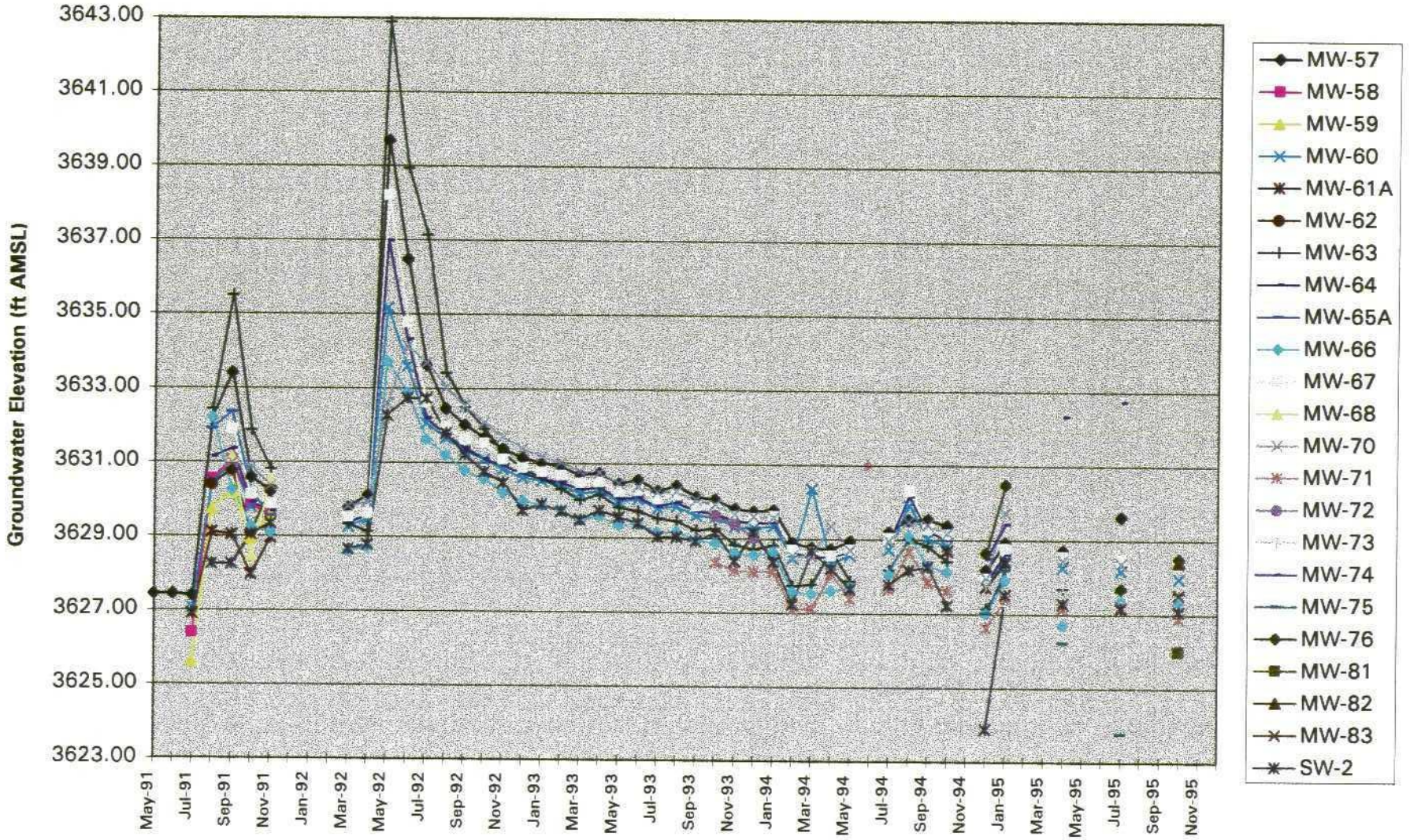


Figure 3.
October 1995 Shallow zone Potentiometric Surface
Contoured using SURFER 5.0 Kriging Function
Contour Interval = 10 feet
Datum is Mean Sea Level

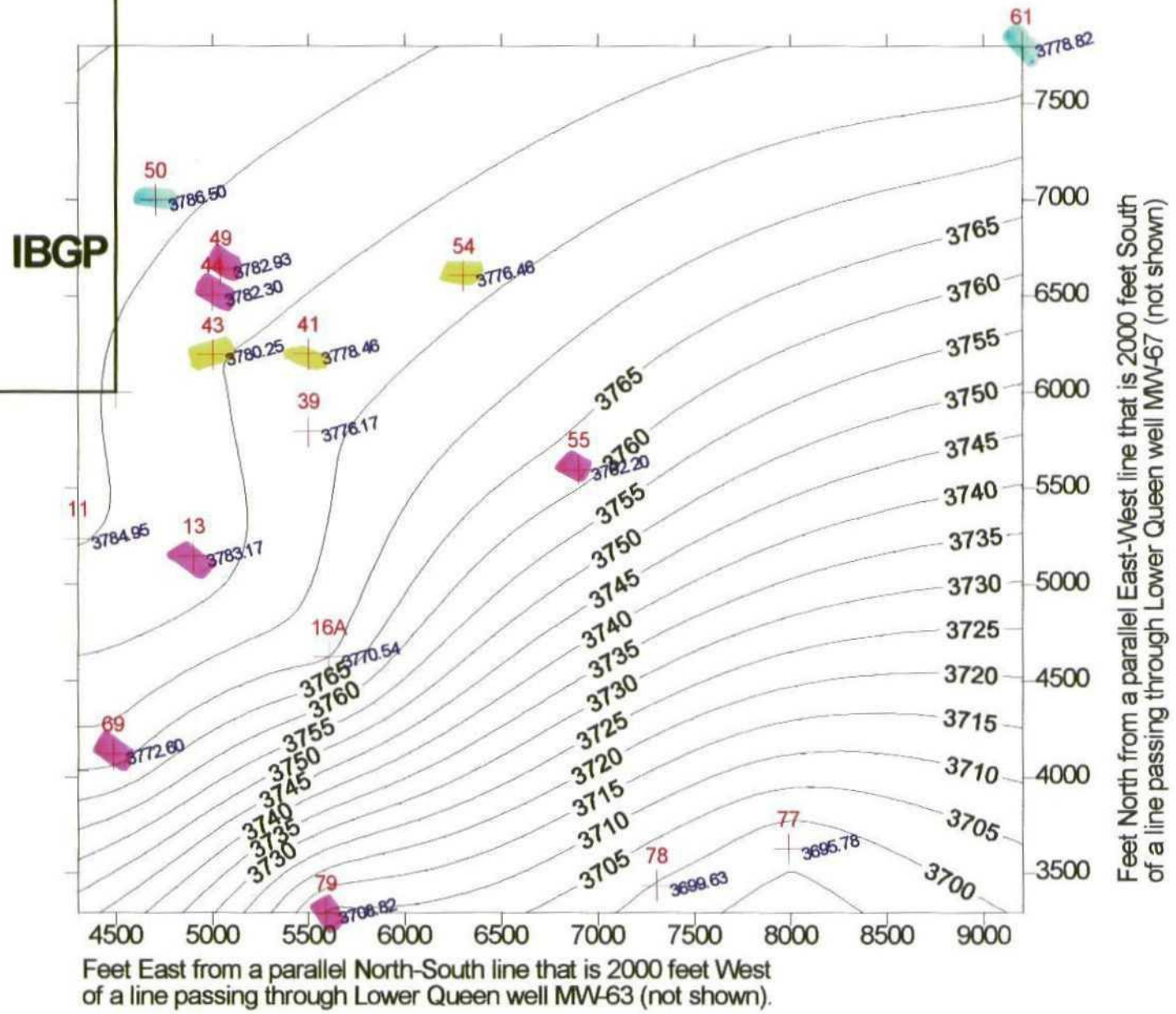


Figure 4. Shallow zone Groundwater Elevation vs. Time

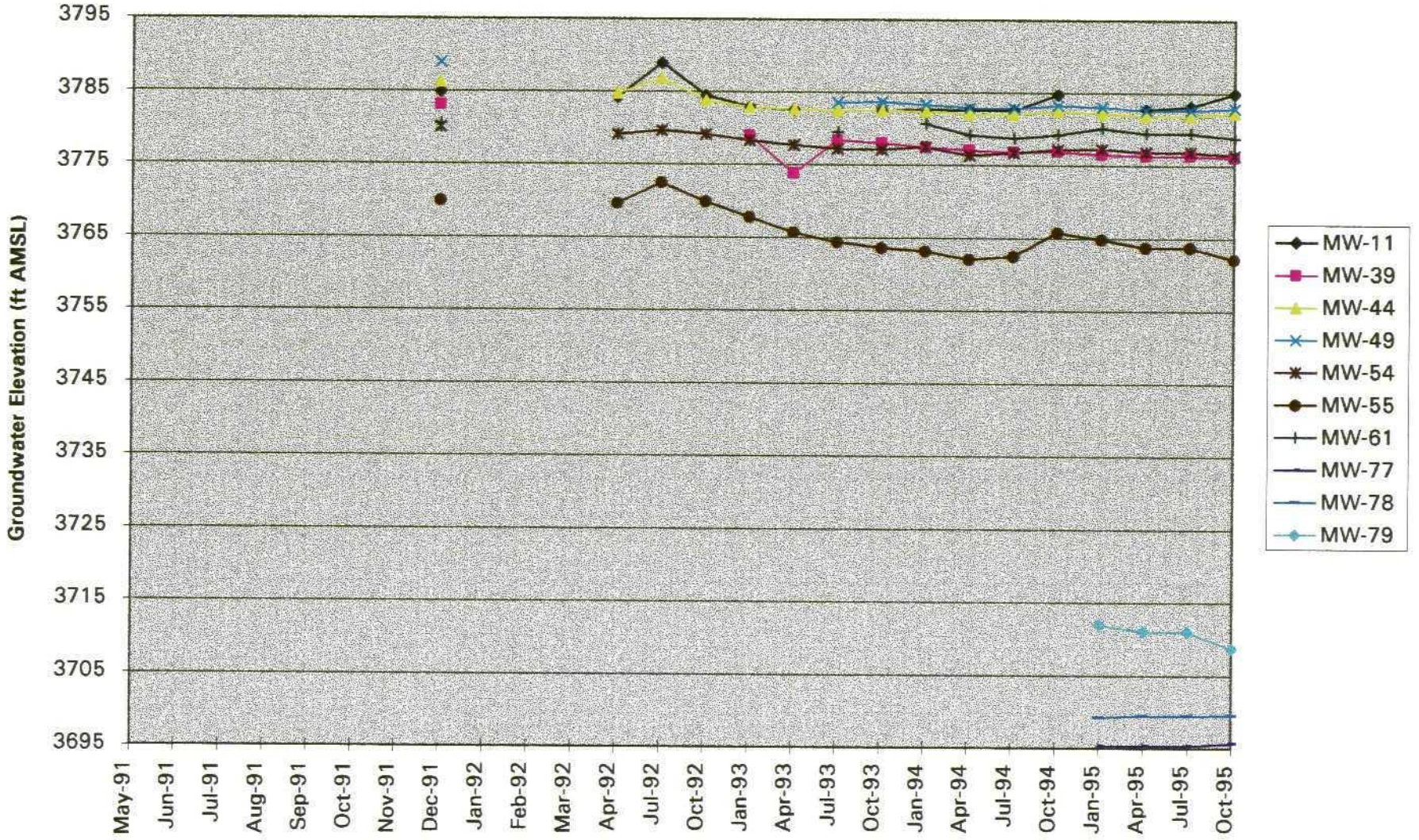
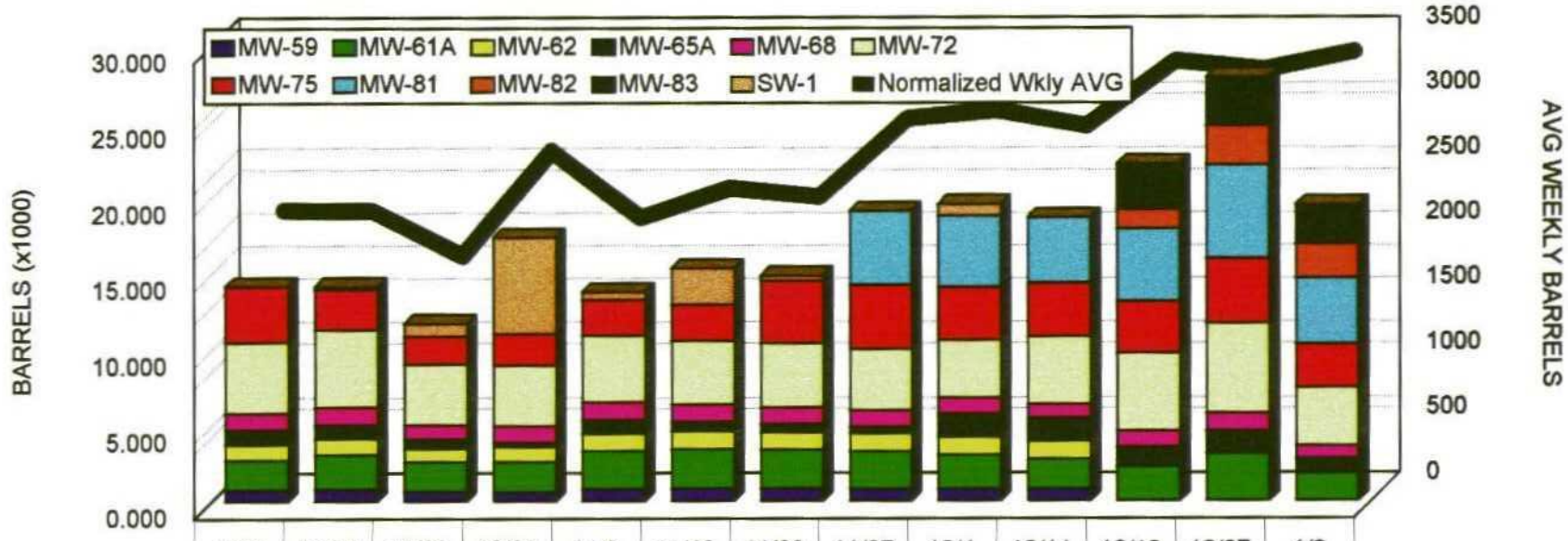


FIGURE 5

WEEKLY LOWER QUEEN FLUID RECOVERY
FOURTH QUARTER 1995

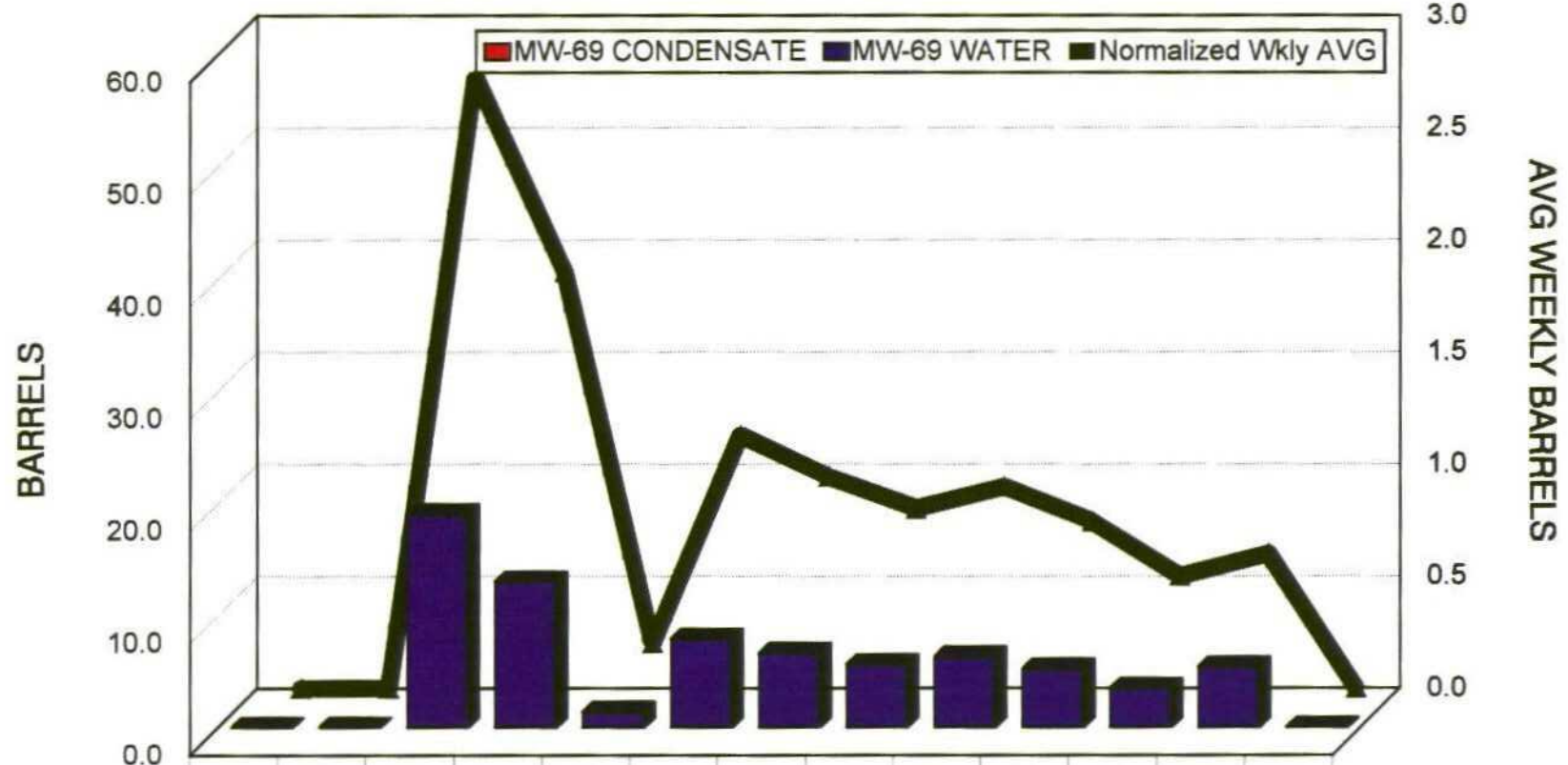


	10/9	10/16	10/23	10/30	11/6	11/13 95	11/20	11/27	12/4	12/11	12/18	12/27	1/2 96
Normalized Wkly AVG	2019	2017	1670	2477	1962	2189	2119	2726	2789	2665	3167	3097	3242
SW-1	0.000	0.168	0.813	6.347	0.481	2.384	0.318	0.000	0.779	0.000	0.009	0.000	0.013
MW-83	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.014	3.190	2.560
MW-82	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.245	2.609	2.216
MW-81	0.000	0.000	0.000	0.000	0.000	0.000	0.003	4.873	4.676	4.319	4.783	6.122	4.345
MW-75	3.686	2.667	1.871	2.057	2.362	2.409	4.139	4.229	3.501	3.521	3.406	4.280	2.847
MW-72	4.637	5.088	3.969	3.986	4.399	4.167	4.208	4.032	3.788	4.463	5.113	5.909	3.875
MW-68	1.122	1.161	0.942	1.086	1.151	1.149	1.116	1.087	1.064	0.912	1.054	1.180	0.797
MW-65A	0.957	0.927	0.648	0.283	0.924	0.640	0.538	0.437	1.531	1.518	1.262	1.479	0.977
MW-62	1.005	1.046	0.862	1.006	1.106	1.145	1.148	1.169	1.172	1.177	0.029	0.000	0.000
MW-61A	1.980	2.284	1.955	1.986	2.520	2.586	2.528	2.442	2.204	1.950	2.239	3.104	1.820
MW-59	0.748	0.777	0.627	0.592	0.795	0.843	0.833	0.812	0.809	0.791	0.016	0.000	0.000

METER RECORDING DATE

FIGURE 6

WEEKLY SHALLOW ZONE FLUID RECOVERY
FOURTH QUARTER 1995

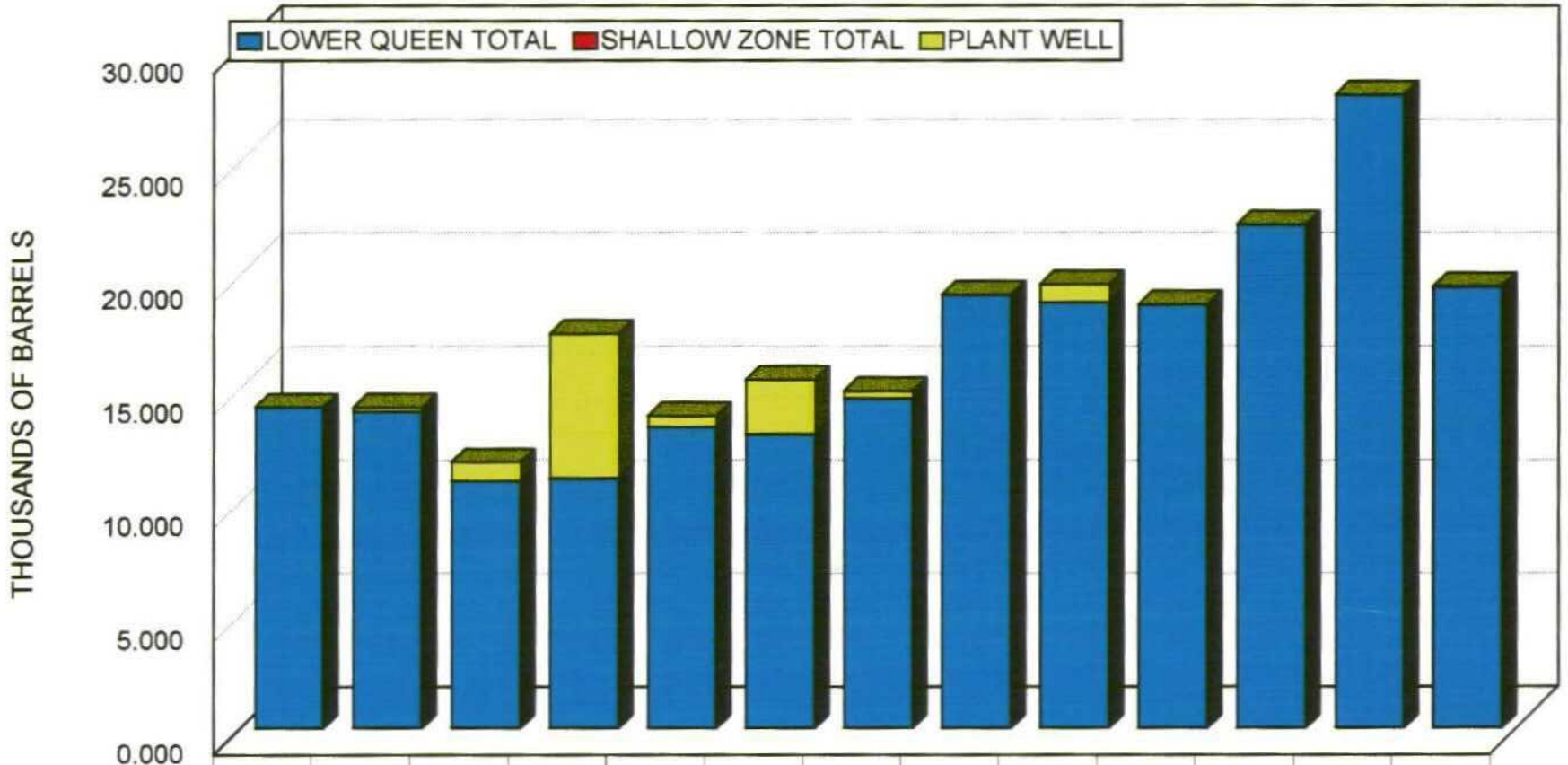


	10/9/95	10/16/95	10/23/95	10/30/95	11/6/95	11/13/95	11/20/95	11/27/95	12/4/95	12/11/95	12/18/95	12/27/95	1/2/96
Normalized Wkly AVG	0.0	0.0	2.7	1.9	0.2	1.1	0.9	0.8	0.9	0.7	0.5	0.6	0.0
MW-69 WATER	0.0	0.0	19.0	13.0	1.4	7.9	6.6	5.6	6.3	5.2	3.5	5.4	0.0
MW-69 CONDENSATE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

METER RECORDING DATE

FIGURE 7

WEEKLY TOTAL FLUID RECOVERY
FOURTH QUARTER 1995



	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/11	12/18	12/27	1/2 96
PLANT WELL	0.000	0.168	0.813	6.347	0.481	2.384	0.318	0.000	0.779	0.000	0.009	0.000	0.013
SHALLOW ZONE TOTAL	0.000	0.000	0.019	0.013	0.001	0.008	0.007	0.006	0.006	0.005	0.004	0.005	0.000
LOWER QUEEN TOTAL	14.135	13.950	10.874	10.995	13.255	12.940	14.512	19.079	18.746	18.652	22.162	27.873	19.437

95

METER RECORDING DATE

APPENDIX A

OCTOBER 1995 GAUGING, PURGING, AND SAMPLING FIELD SUMMARY

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/9/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental -06-02432
IP Correcton: NA
Weather: Sunny & windy

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-80	8	15:01		DRY					0	0	
MW-70	4	15:06		194.19					0	0	
MW-09	2	15:20		DRY					0	0	
MW-79	8	15:32	82.90	79.57					0	356	Sample
MW-06	2	15:56		DRY					0	0	
MW-08	2	16:17		DRY					0	87.9	
MW-53	2	16:34		DRY					0	0	
MW-66	4	16:55		201.62					0	0	
MW-58	4	17:13	172.70	DRY					0	0	No lock or cap, mud on probe

moc/excel/1095dta.xls

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/10/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental 06-02432
IP Correcton: NA
Weather: Sunny/hot

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-69	4	11:55		34.57	32.28	2.29			0	38.7	Pulled pump to measure/reinstalled
MW-07	2	12:20		DRY					0	0	
MW-81	8	13:36	228.45	190.99	188.25	2.64			0	0	
MW-63	4	15:20	221.88	198.57					0	0	
SW-02	10	15:50		181.70					0	0	
MW-71	4	15:59	235.41	151.15					0	0	
MW-52	2	16:10		DRY					0	0	
MW-61	4	17:08	57.97	37.38					0	0	
MW-60	4	17:21	226.08	187.29					0	0	
MW-61A	--								--	--	Pump in well
MW-64	4	17:30	204.38	170.33					0	0	
MW-67	4	17:43	168.54	137.54					0	329	98% LEL

Well Gauging Data Form

Client: Marathon Oil Company
Site: Indian Basin Gas Plant
Project #: 053350059.6004
Date: 10/11/95

Recorded By: Kevin Cook
Interface Probe (IP)#: ORS Rental 06-02432
IP Correcton: NA
Weather: Sunny

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-83	8	08:11	205.80	166.55	164.88	1.67			0	0	N/S Product
MW-65	4	08:22	57.45	57.07					0	0	N/S Insufficient water
MW-65A	4	08:28		136.00	134.90	1.10			0	0	N/S Product
MW-77	8	08:37	82.20	79.70					0	63.3	N/S didn't recover
MW-78	8	08:46	86.62	86.19					0	46.8	No sample, insufficient water
MW-82	8	10:01	231.30	196.62					0	0	Sample (pump)
MW-75	8	10:19		192.31	188.02				--	--	N/S Product
MW-57	4	12:18		159.23					0	0	Sample (pump)
MW-03	2	12:29		DRY					0	18.8	No sample, insufficient water
MW-56	4	12:36		DRY					0	28.0	LEL 100%F
MW-29	2	12:42		DRY					0	0	N/S insufficient water
MW-10	4	12:48		DRY					0	0	N/S insufficient water
MW-55	4	12:55	66.32	32.20					0	0	
MW-74	8	13:05	220.00	187.31					0	35.5	27% LEL N/S due to Condensate in Well
MW-73	8	13:13		192.35					0	0	N/S due to Condensate in Well
MW-72	8	13:21		NM							Water level below 200', pump operational
MW-54	4	10:25		47.40					0	0	Sample

Well Gauging Data Form

Client: Marathon Oil Company
Site: *Indian Basin Gas Plant*
Project #: 053350059.6004
Date: 10/12/95

Recorded By: Kevin Cook
Interface Probe (IP)#: *ORS Renatl 06-02432*
IP Correcton: NA
Weather: Sunny

WELL NUMBER	WELL DIA. (inch)	TIME OF READING (HH:MM)	TOTAL DEPTH (feet)	DTW (feet)	DTP (feet)	PT (feet)	PTx0.73 (feet)	ADJ DTW (feet)	H_2S CONC. (ppm)	HYDROCARBON VAPOR CONC. (ppm)	COMMENTS
MW-05	2	08:50		DRY					0	0	N/S
MW-24	2	08:57	13.30	13.25					0	0	N/S insufficient water
MW-32	2	09:03		DRY					0	0	N/S
SUMP-16A	24	09:09	17.45	14.60					0	0	Sample
MW-13	2	09:20	21.80	18.46	18.40	0.06			0	0	Product is light
MW-11	4	09:25	25	22.01					0	0	N/S
SUMP-A10	24	09:40	13.42	12.80					0	0	Sample
MW-48	2	09:45		DRY					0	0	N/S
MW-47	2	09:52		DRY					0	32.5	N/S
MW-46	2	09:56		DRY					0	27.7	N/S
MW-50	2	10:00	37.15	26.85					0	0	Sample
MW-45	2	--							--	--	Piping in well/no gauge
MW-49	2	10:05	25.91	22.68					0	0	Sample
MW-44	4	10:09	25.24	21.84					0	0	Sample
MW-43	4	10:13	24.55	21.80					0	0	Sample
MW-41	4	10:17	24.04	20.58					0	0	Sample
MW-38	4	10:20		DRY					0	0	N/S dry
MW-39	4	10:24	20.45	20.03					0	0	N/S insufficnet water
MW-76	8	10:41		167.51	167.10	0.41			0	0	N/S product

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico

Date: 10/10-11/95

Project Number 023350059.6004

Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-63	4	221.88	198.57	46	Pump	15:59	46	215	3	10-10-95 16:35	7.67	627	72.2	-	MW-63
MW-66	4	237.66	201.62	72	Pump*	13:50	72	230	3	10-10-95 14:40	7.86	1106	71.9	--	MW-66
MW-70	4	228.14	194.19	68	Pump	10:35	68	220	4	10-10-95 11:20	8.06	618	69.2	--	MW-70
MW-54	4	78.15	47.40	62	Pump	16:32	20	70	1	10-11-95 17:30	7.00	3900	80.2	-	MW-54
MW-60	4	226.08	187.29	80	Pump	0805	80	215	5	10-11-95 09:05	7.61	985	65.6	-	MW-60
MW-61A	4	215.67			Pump dedicated					NS					NS
MW-64	4	204.38	170.33	68	Pump	09:32	68	200	6	10-11-95 10:45	7:38	904	69.5	-	MW-64
MW-71	4	235.41	151.15	168	Pump	17:42	168	220	2-3	10-10-95 19:10					MW-71
MW-57	4	179.30	159.23	40	Pump	14:35	40	170	5	10-11-95 15:10	7.37	770	73.7	-	MW-57
MW-67	4	168.54	137.54	62	Pump	11:09	62	160	8	10-11-95 11:45	7.67	761	71.0	-	MW-67

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 10/10-12/95

Project Number 023350059.6004 Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
MW-41	4	24.04	20.58	8	Bail	13:00	2.5	--	--	10/12/95; 14:15	--	--	--	--	MW-41
MW-43	4	24.55	21.80	5	Bail	12:45	2.5	--	--	10/12/95; 14:30	--	--	--	--	MW-43
MW-44	4	25.24	21.84	7	Bail	12:20	7	--	--	10/12/95; 12:35	--	--	--	--	MW-44
MW-49	2	25.91	22.68	1.5	Bail	12:05	1.5	--	--	10/12/95; 12:15	--	--	--	--	MW-49
MW-50	2	37.15	26.85	5	Bail	11:35	5	--	--	10/12/95; 12:00	--	--	--	--	MW-50
MW-55	4	66.32	32.20	68	Pump	15:34	68	60	5	10/11/95; 16:15	6.95	2520	71.5	--	MW-55
MW-61	4	57.97	37.38	40	Bail	18:05	40	NA	NA	10/10/95; 18:45	--	--	--	--	MW-61
MW-39	4	20.54			NS					NS					NS*
MW-65	4	57.35			NS					NS					NS
MW-11	4	25.00	22.01	6	NS					NS					NS
MW-77	8	82.20	79.70	20	Bail		5			NS					NS*
MW-79	8	82.90	79.57		Bail	12:30		--	--	10/10/95; 13:00	--	--	--	--	MW-79

Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
4 - *Well MW-39 and MW-77 not sampled due to insufficient recharge.

Well Gauging, Purging, and Sampling Monitoring Form

Project Name/Location MOC/IBGP Carlsbad, New Mexico Date: 10/10-12/95

Project Number 023350059.6004 Technician: Kevin Cook

Well Number	Well Diameter (in)	Well Depth (ft)	DTW from TOC (ft)	Purge volume (gal)	Purge Method (pump/bail)	Time purging began (hh:mm)	Actual volume purged (gal)	Depth of pump (ft)	Pumping rate (gpm)	Date/time sample collected (dd/mm/yy, HH:MM)	Final pH	Final Spec. Cond. (us/cm)	Final Temp. (F)	Final DO (mg/l)	Sample ID
SUMP-16A	24	17.45	14.6	--	NS	--	--	--	--	10/12/95; 13:40	--	--	--	--	SUMP-16A
SW-02	10	292.00	--	--	NS	--	--	--	--	NS	--	--	--	--	NS
MW-58		DRY	--	--	NS	DRY	--	--	--	NS	--	--	--	--	NS
MW-65A	4	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
MW-81	8	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
MW-82	8	231.30	196.62	280	Pump	12:26	280	220	5	10/11/95; 14:10	7.46	938	68.7	--	MW-82
MW-83	8	NS	--	--	NS	Product	--	--	--	NS	--	--	--	--	NS
SUMP-A10	24	13.42	12.80	--	--	--	--	--	--	10/12/95; 13:55	--	--	--	--	SUMP-A10

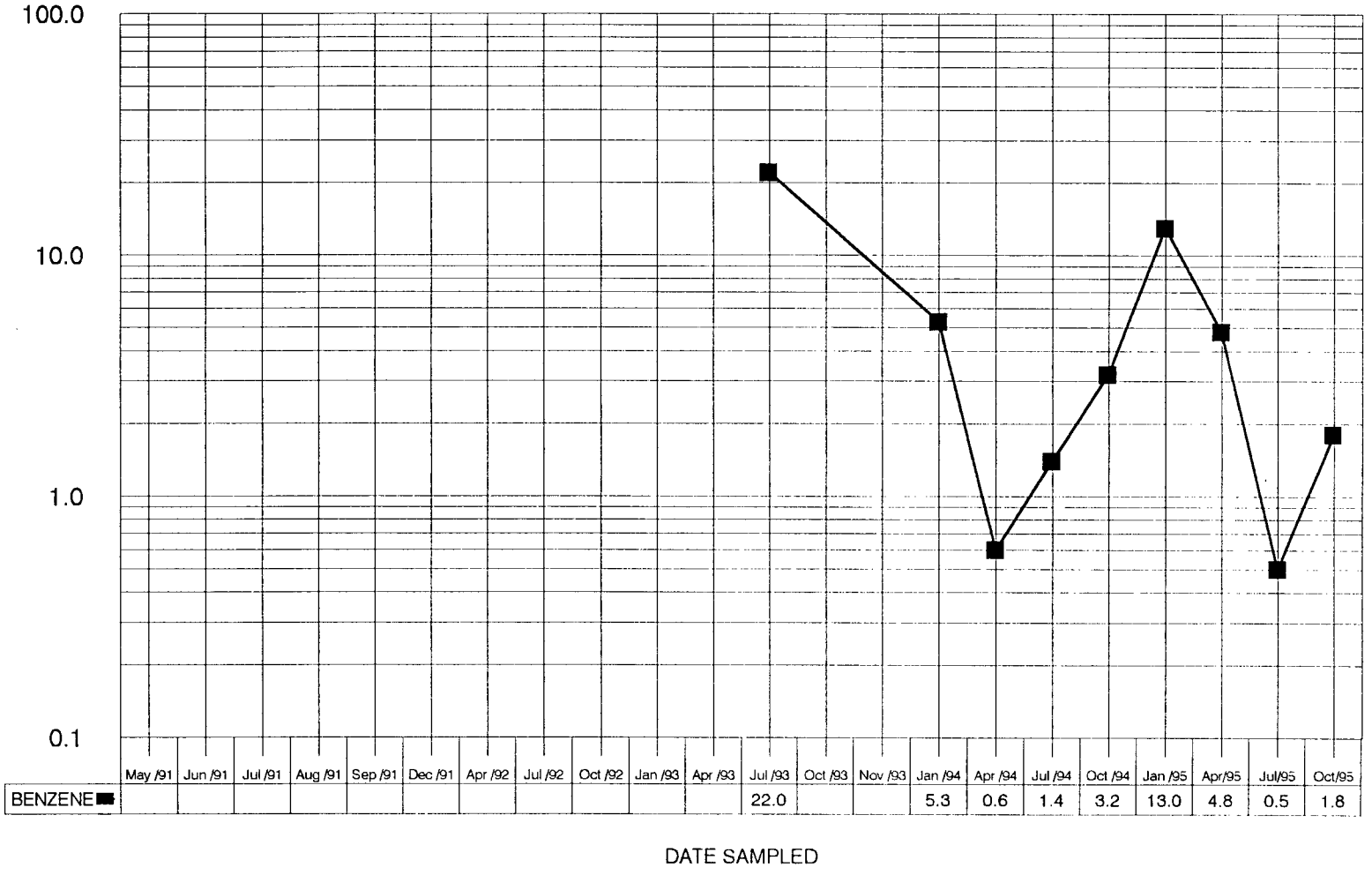
Comments:

1 - All wells sampled with Teflon bailers for BTEX by EPA Method 8020 (2 x 40 ml VOA's) and Chloride (1 x 250 ml plastic).
2 - Purge amounts are 3 well casing volumes
3 - NS: Not sampled; NA: Not Applicable
4 - NS*: Well not sampled due to insufficient recharge

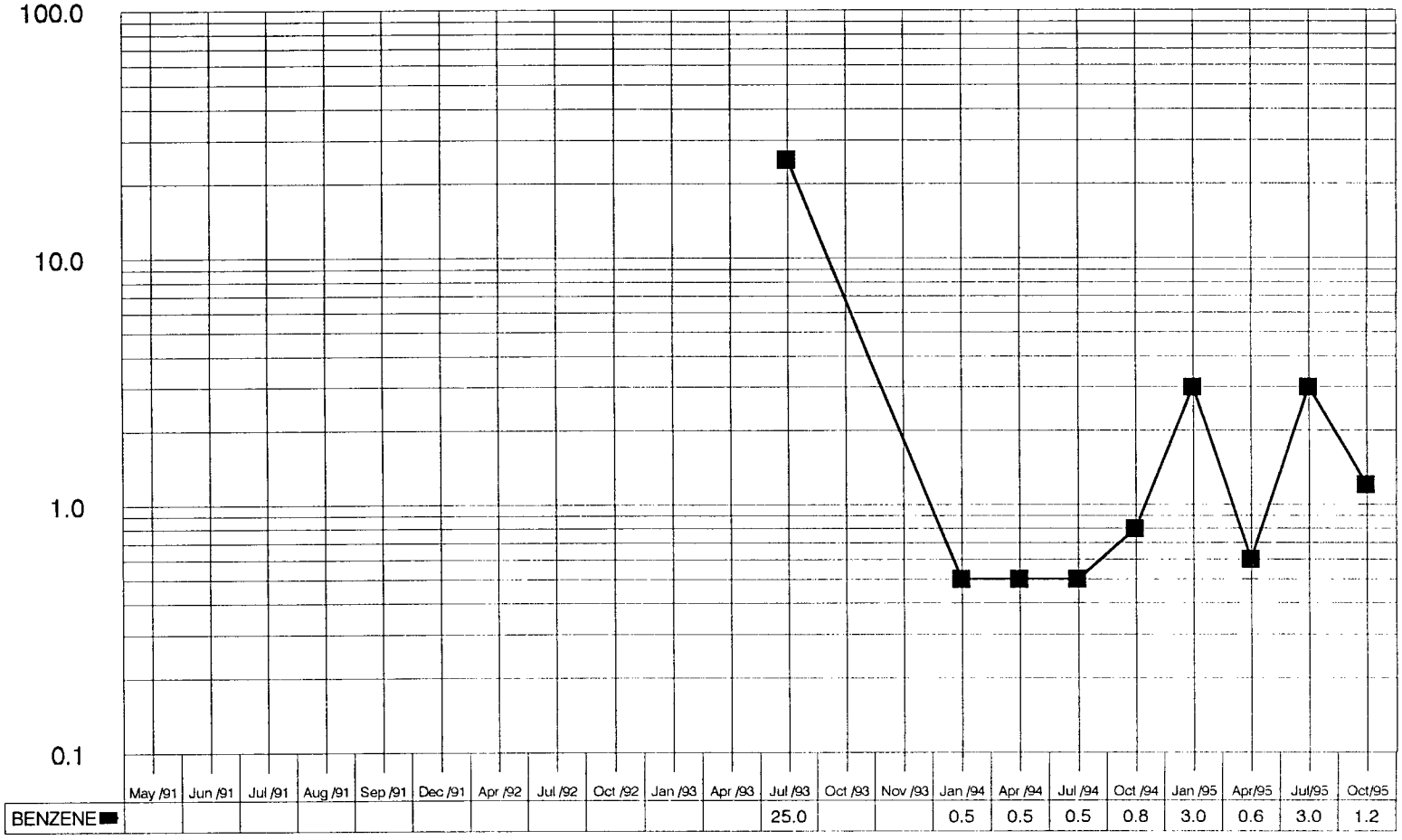
APPENDIX B

BENZENE CONCENTRATION IN GROUNDWATER VS. TIME GRAPHS

BENZENE IN GROUNDWATER
MW-41



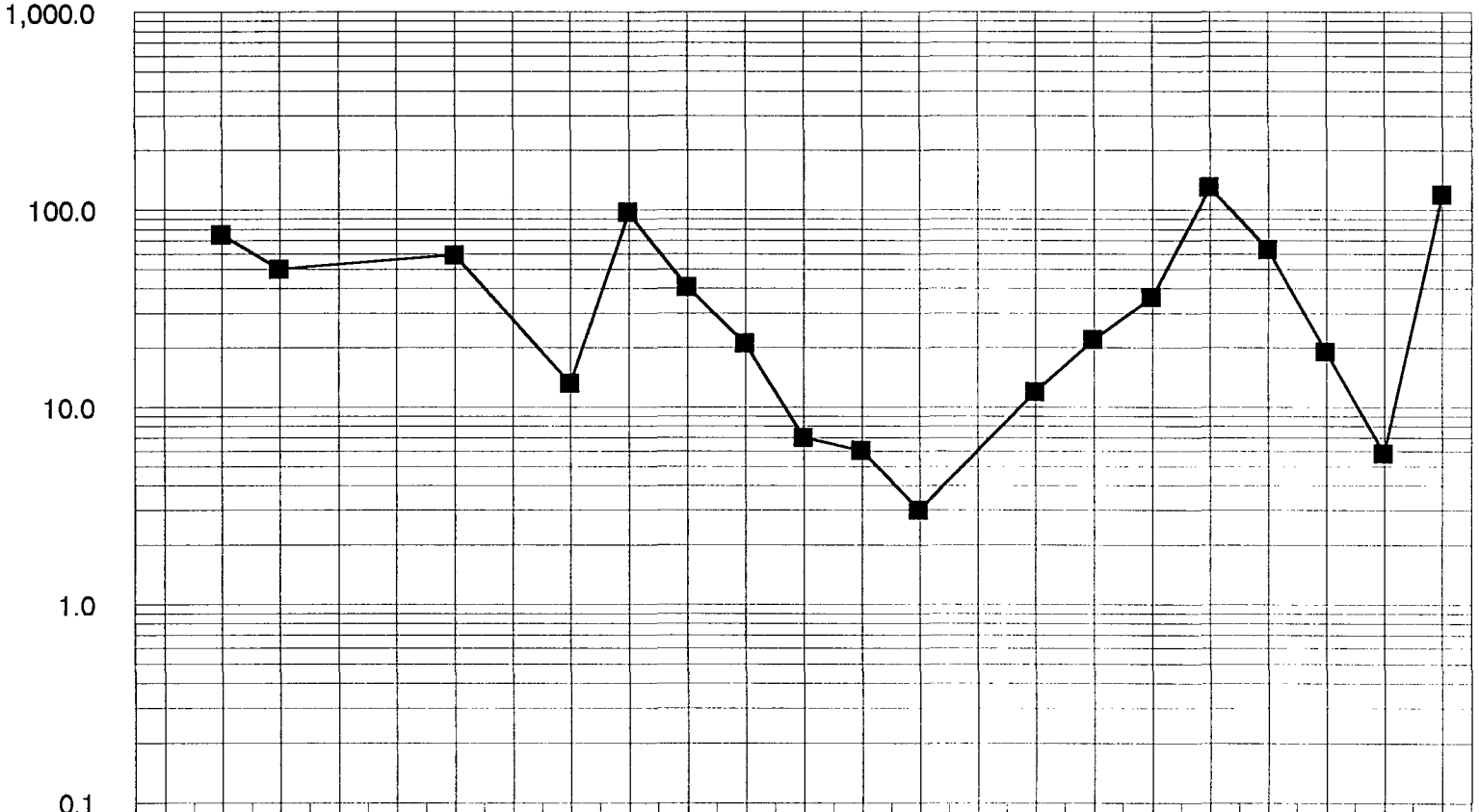
BENZENE IN GROUNDWATER
MW-43



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE												25.0			0.5	0.5	0.5	0.8	3.0	0.6	3.0	1.2

DATE SAMPLED

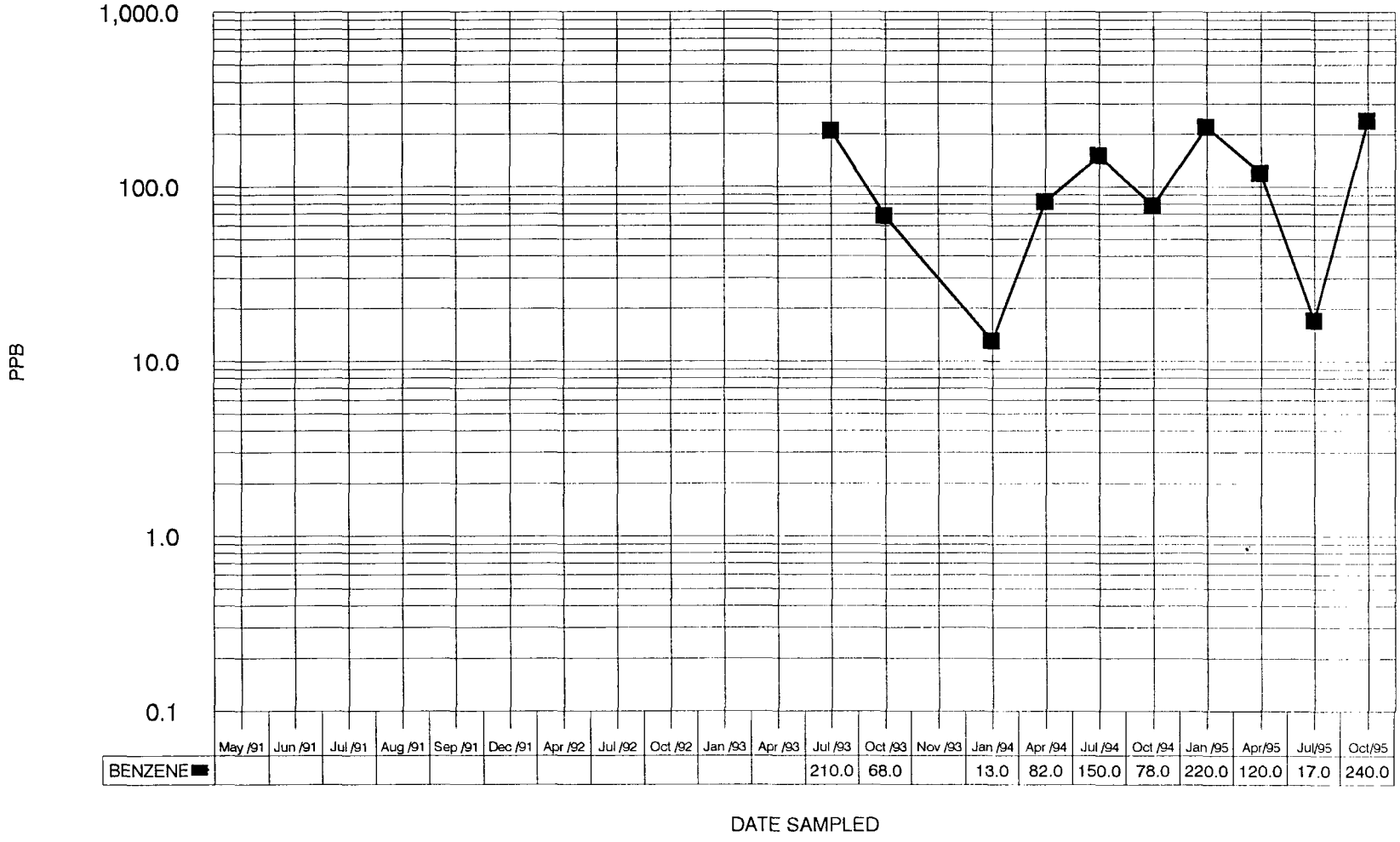
BENZENE IN GROUNDWATER
MW-44



	May /91	Jun /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		75.0	50.0			59.0		13.2	97.0	40.6	21.0	7.0	6.0	3.0		12.0	22.0	36.0	130.0	63.0	19.0	5.8	120.0

DATE SAMPLED

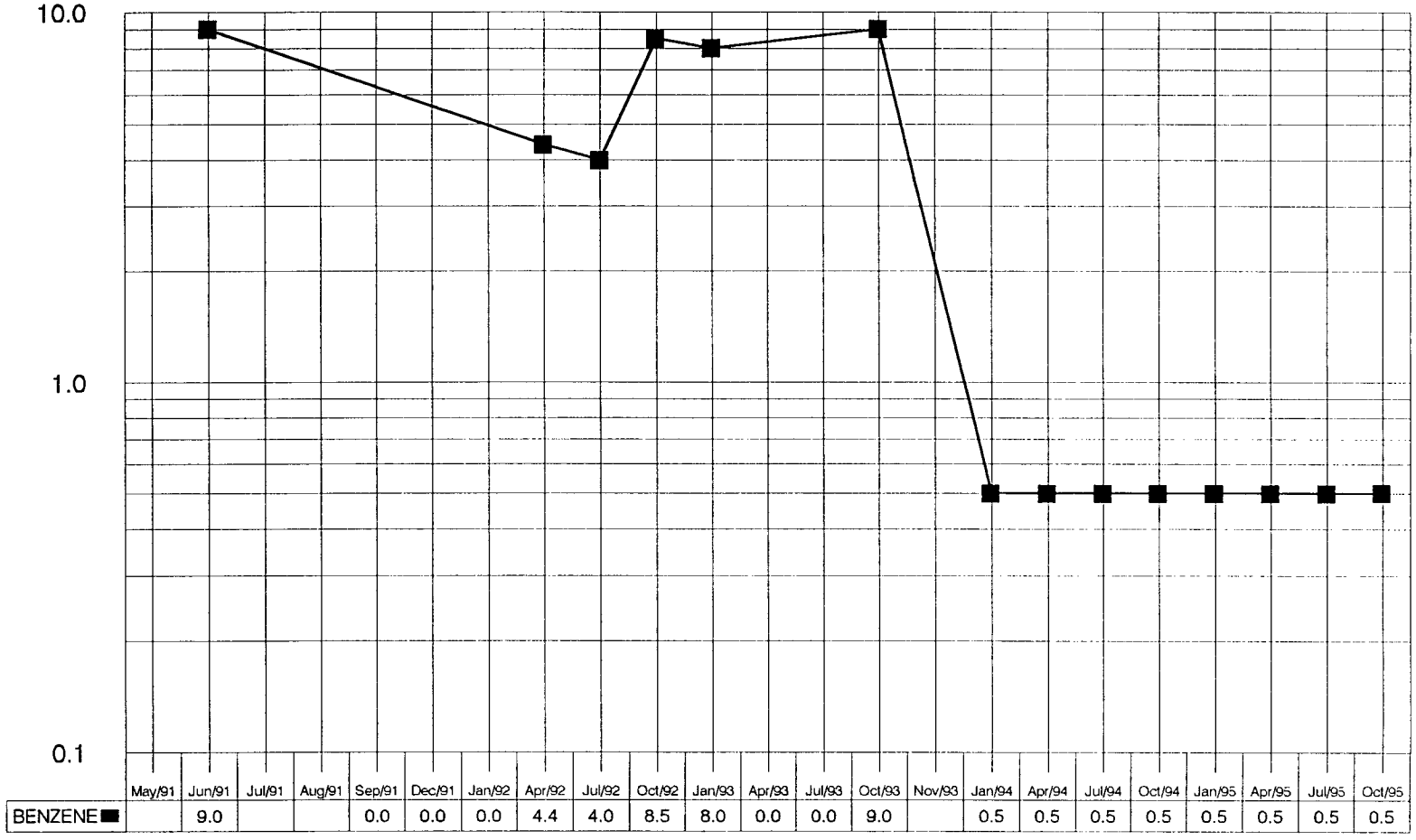
BENZENE IN GROUNDWATER
MW-49



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE												210.0	68.0		13.0	82.0	150.0	78.0	220.0	120.0	17.0	240.0

DATE SAMPLED

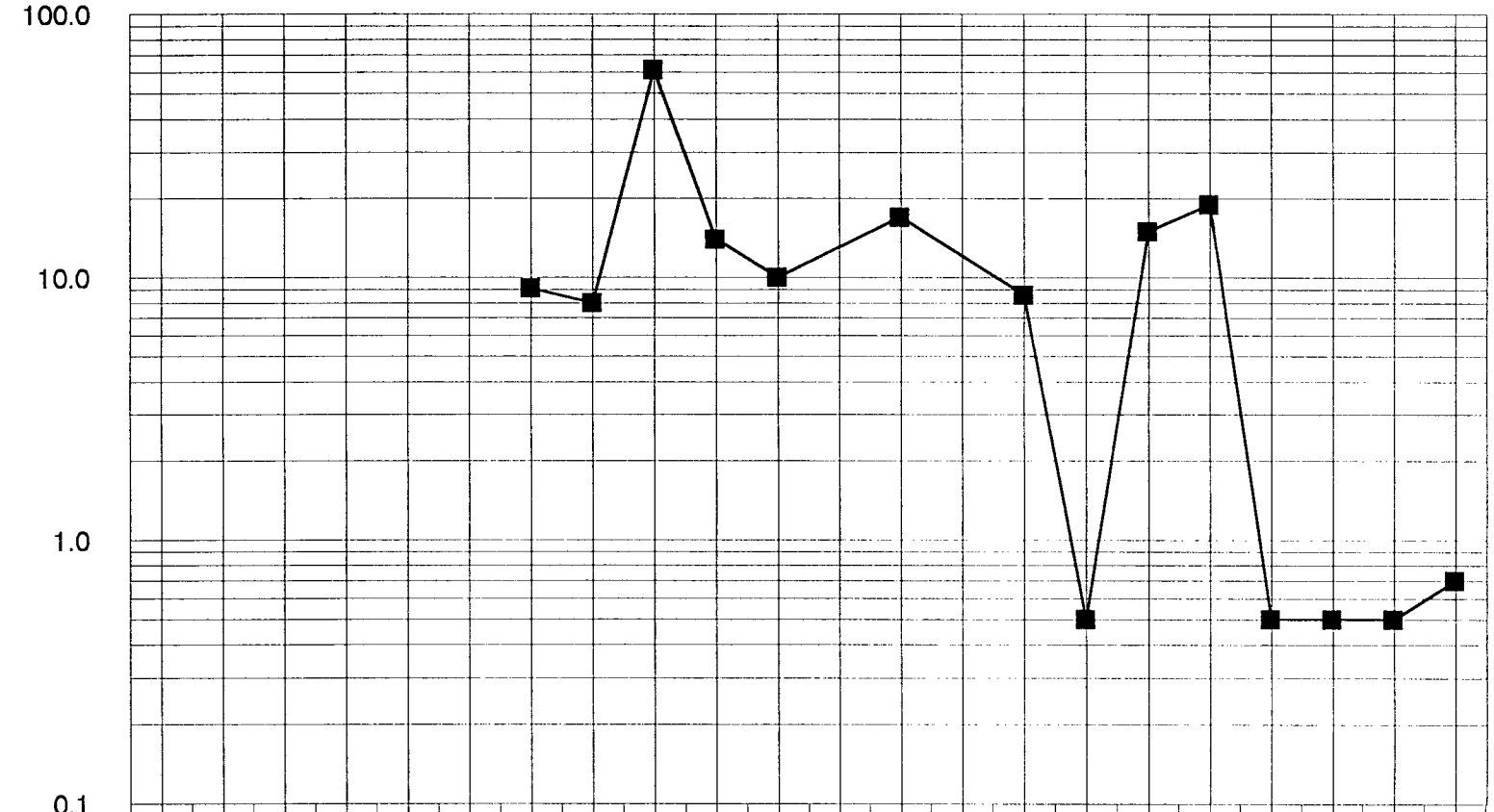
BENZENE IN GROUNDWATER
MW-50



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE ■		9.0			0.0	0.0	0.0	4.4	4.0	8.5	8.0	0.0	0.0	9.0		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

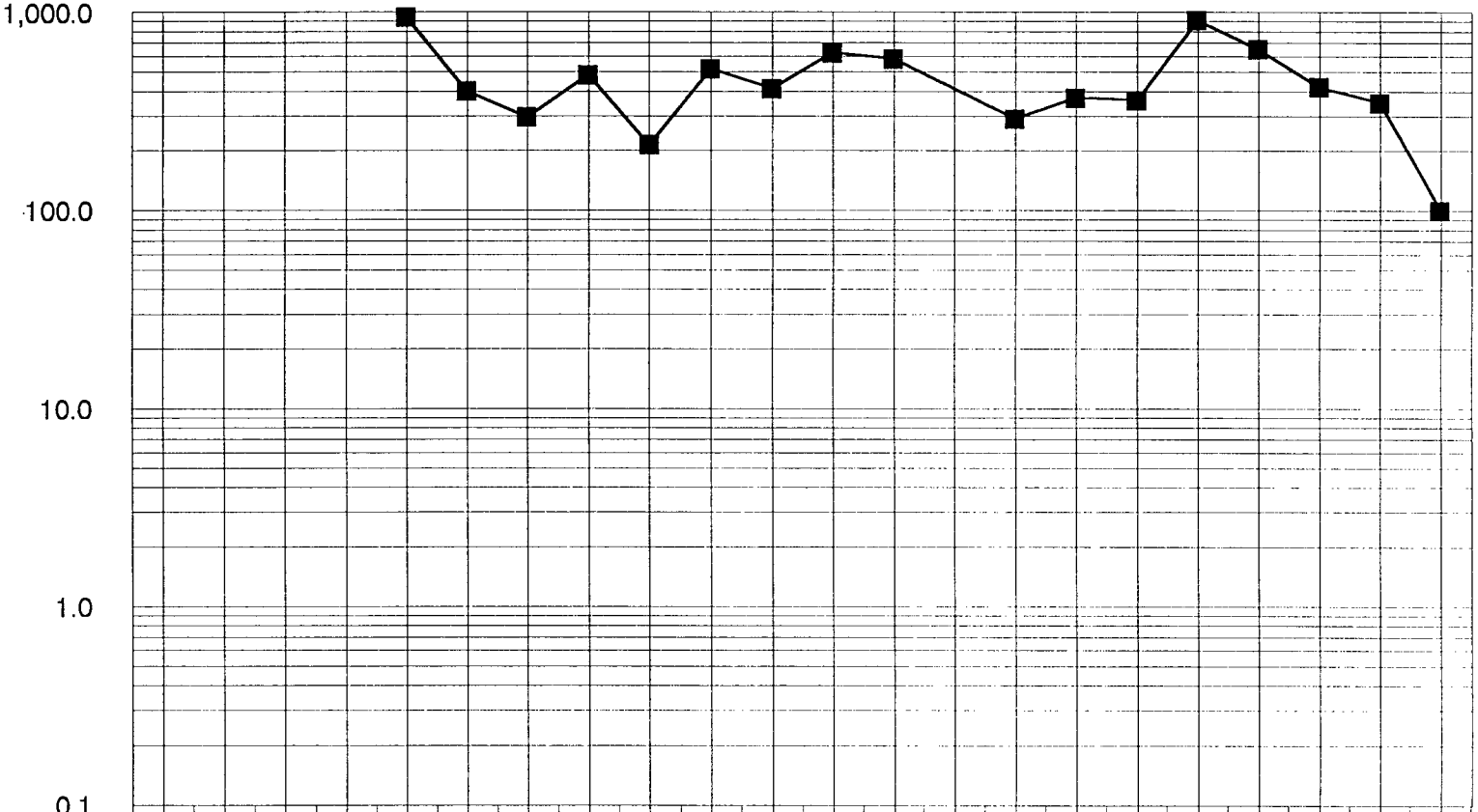
BENZENE IN GROUNDWATER
MW-54



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		0.0			0.0	0.0	9.1	8.0	61.6	14.0	10.0	0.0	17.0		8.6	0.5	15.0	19.0	0.5	0.5	0.5	0.7

DATE SAMPLED

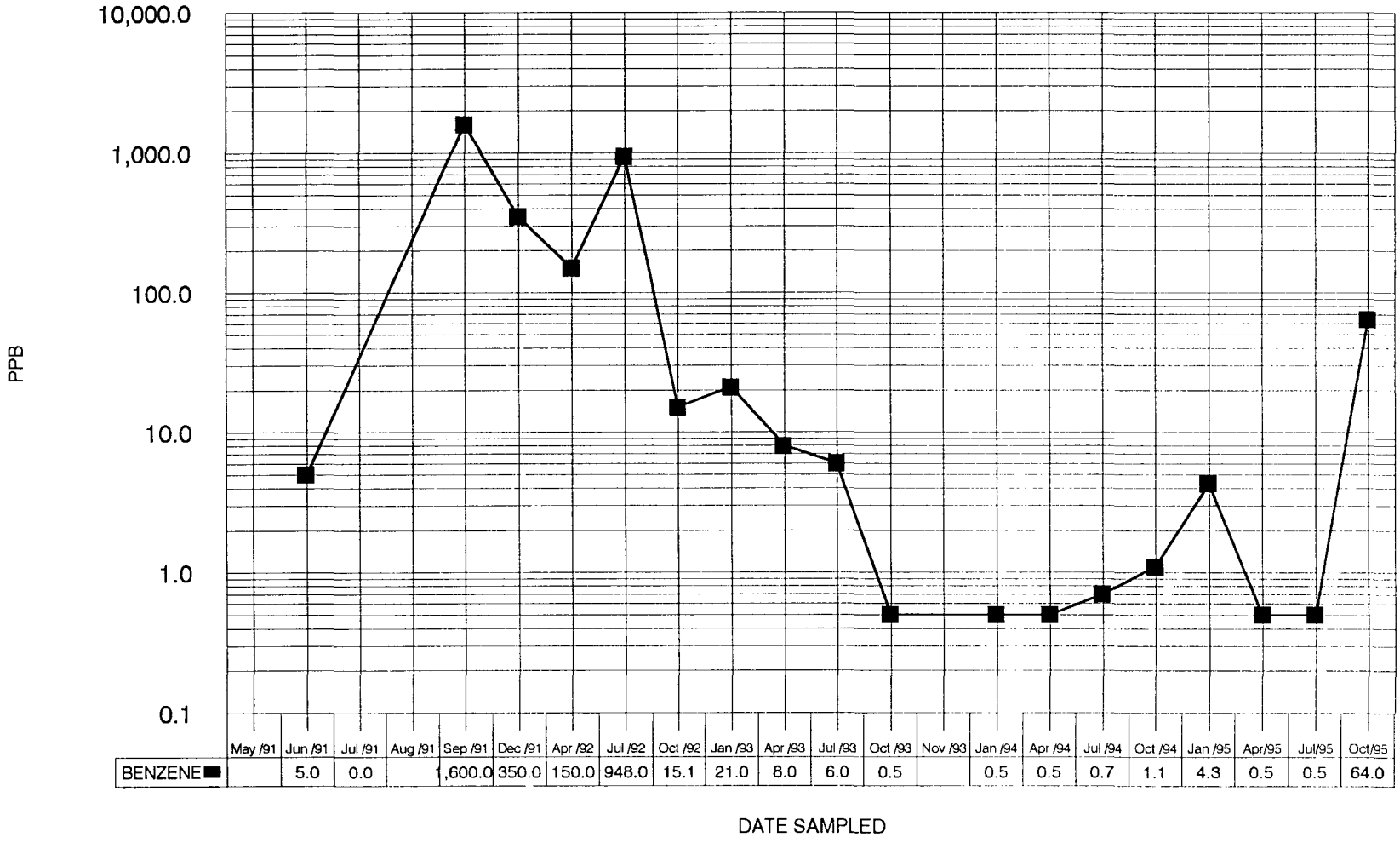
BENZENE IN GROUNDWATER
MW-55



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		0.0			940.0	400.0	295.5	483.0	214.7	518.0	412.0	625.0	581.0		290.0	370.0	360.0	910.0	650.0	420.0	350.0	100.0

DATE SAMPLED

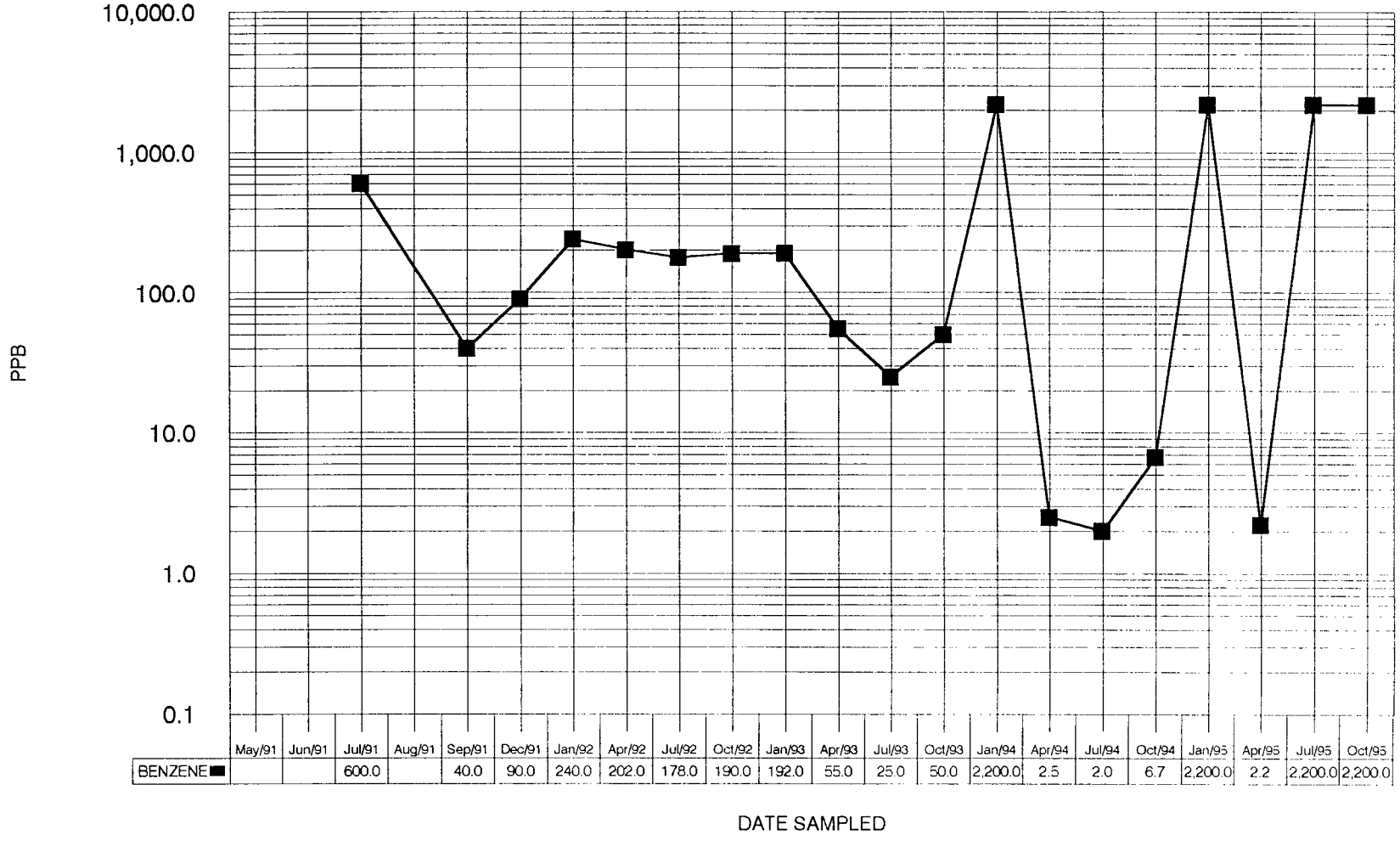
BENZENE IN GROUNDWATER
MW-57



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE		5.0	0.0		1,600.0	350.0	150.0	948.0	15.1	21.0	8.0	6.0	0.5		0.5	0.5	0.7	1.1	4.3	0.5	0.5	64.0

DATE SAMPLED

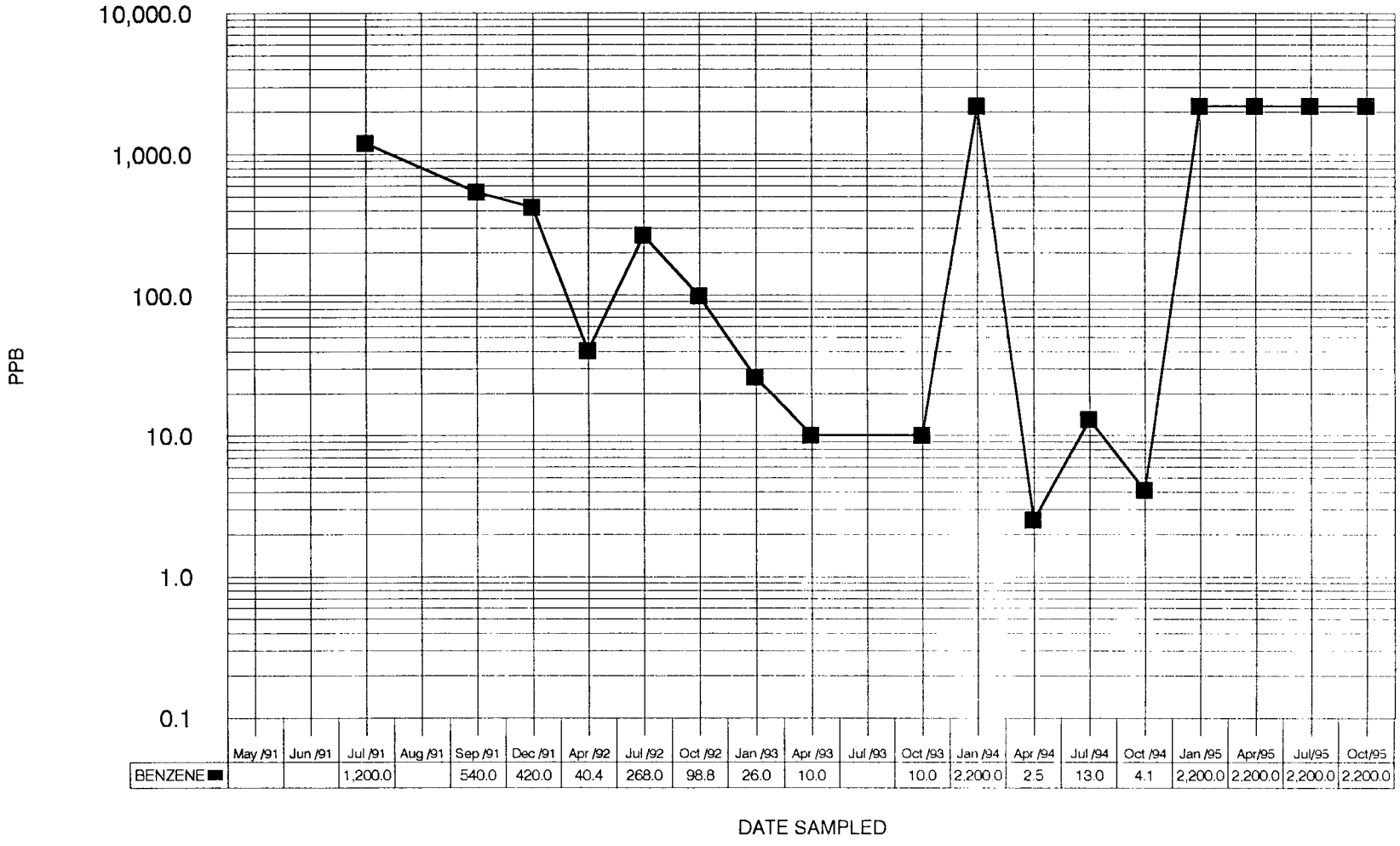
BENZENE IN GROUNDWATER
MW-58



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE			600.0		40.0	90.0	240.0	202.0	178.0	190.0	192.0	55.0	25.0	50.0	2,200.0	2.5	2.0	6.7	2,200.0	2.2	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

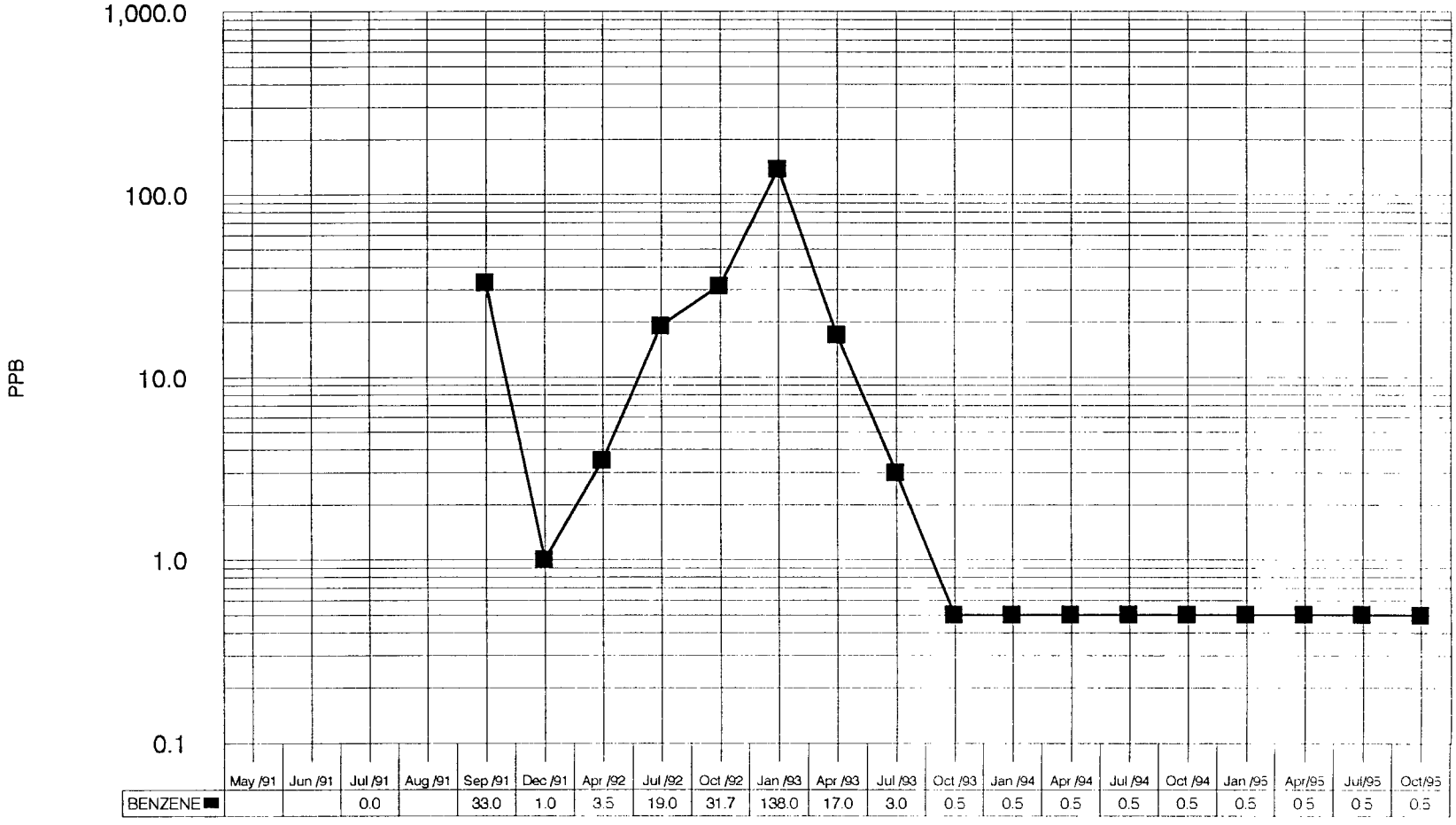
BENZENE IN GROUNDWATER
MW-59



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			1,200.0		540.0	420.0	40.4	268.0	98.8	26.0	10.0		10.0	2,200.0	2.5	13.0	4.1	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

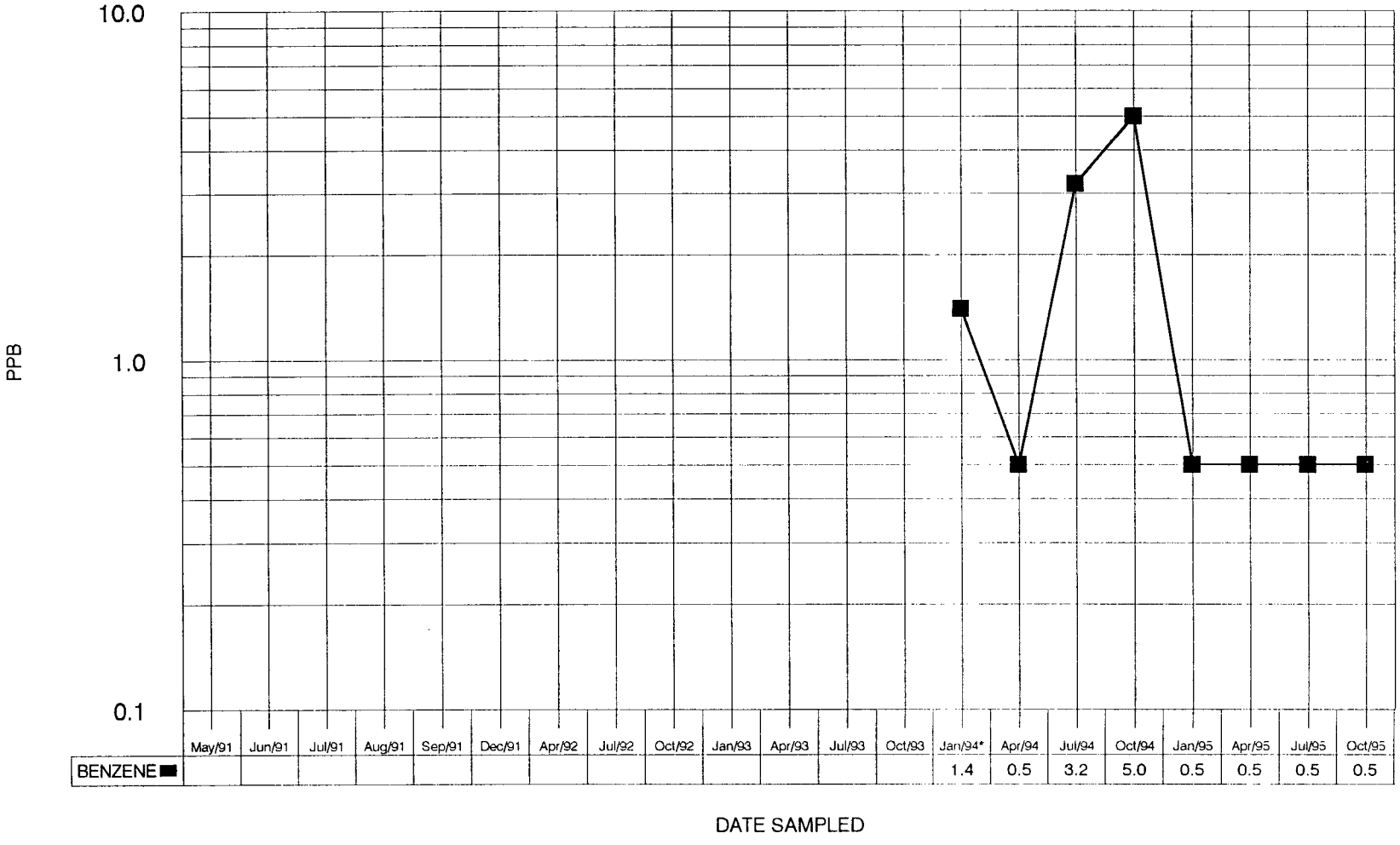
BENZENE IN GROUNDWATER
MW-60



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			0.0		33.0	1.0	3.5	19.0	31.7	138.0	17.0	3.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

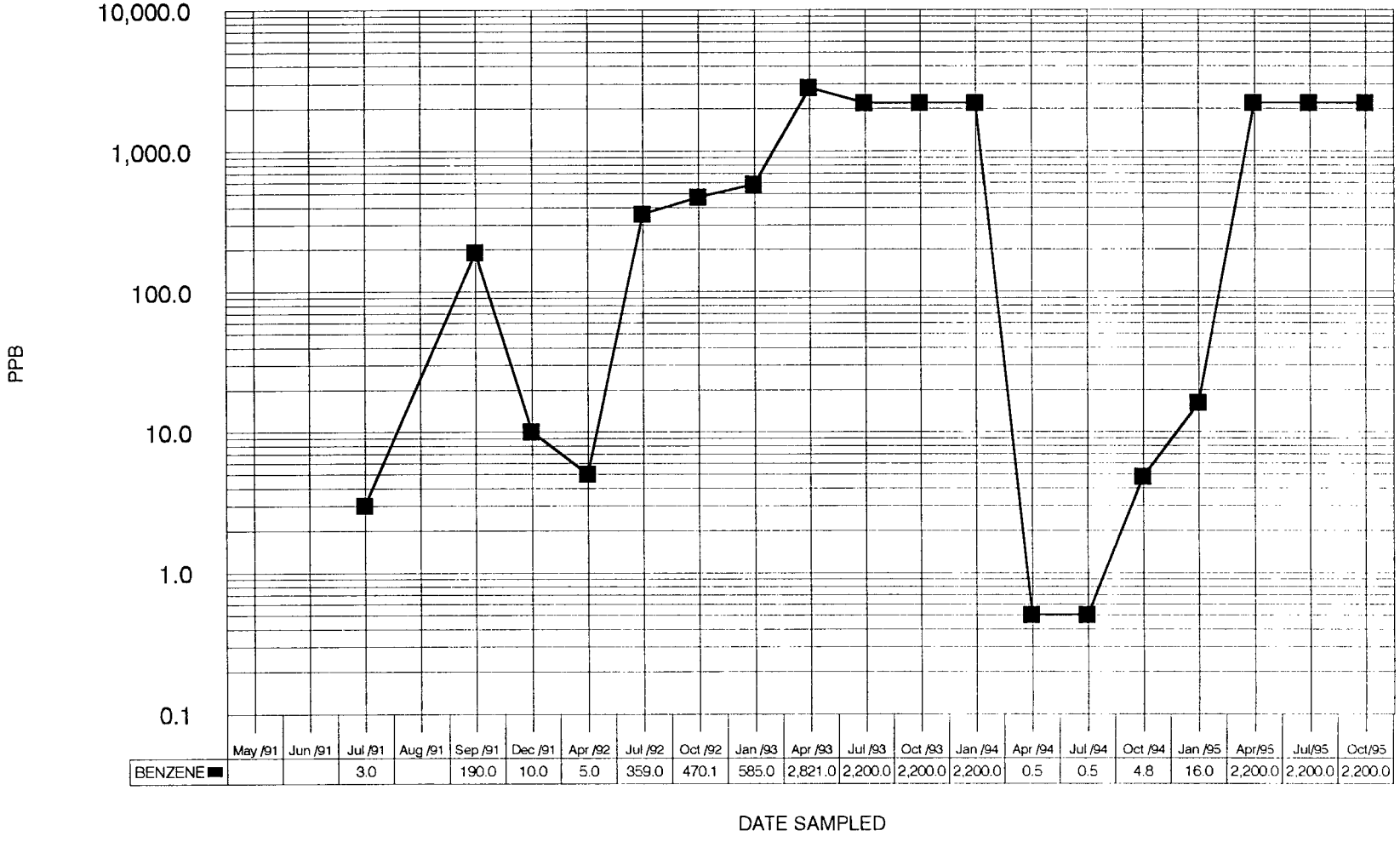
DATE SAMPLED

BENZENE IN GROUNDWATER
MW-61



*- Jan. 1994 was the first time this well was sampled.

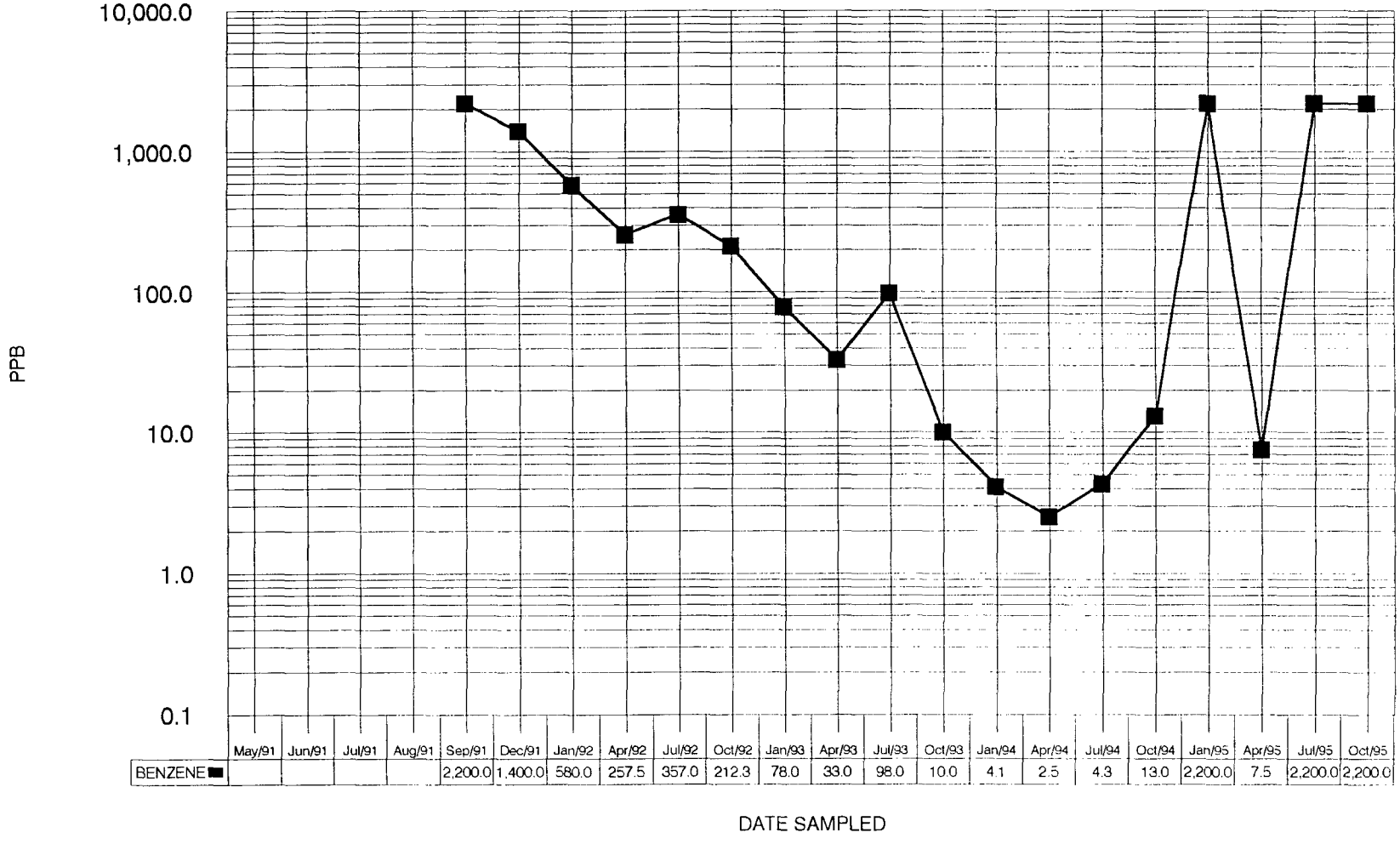
BENZENE IN GROUNDWATER
MW-61A



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE			3.0		190.0	10.0	5.0	359.0	470.1	585.0	2,821.0	2,200.0	2,200.0	2,200.0	0.5	0.5	4.8	16.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

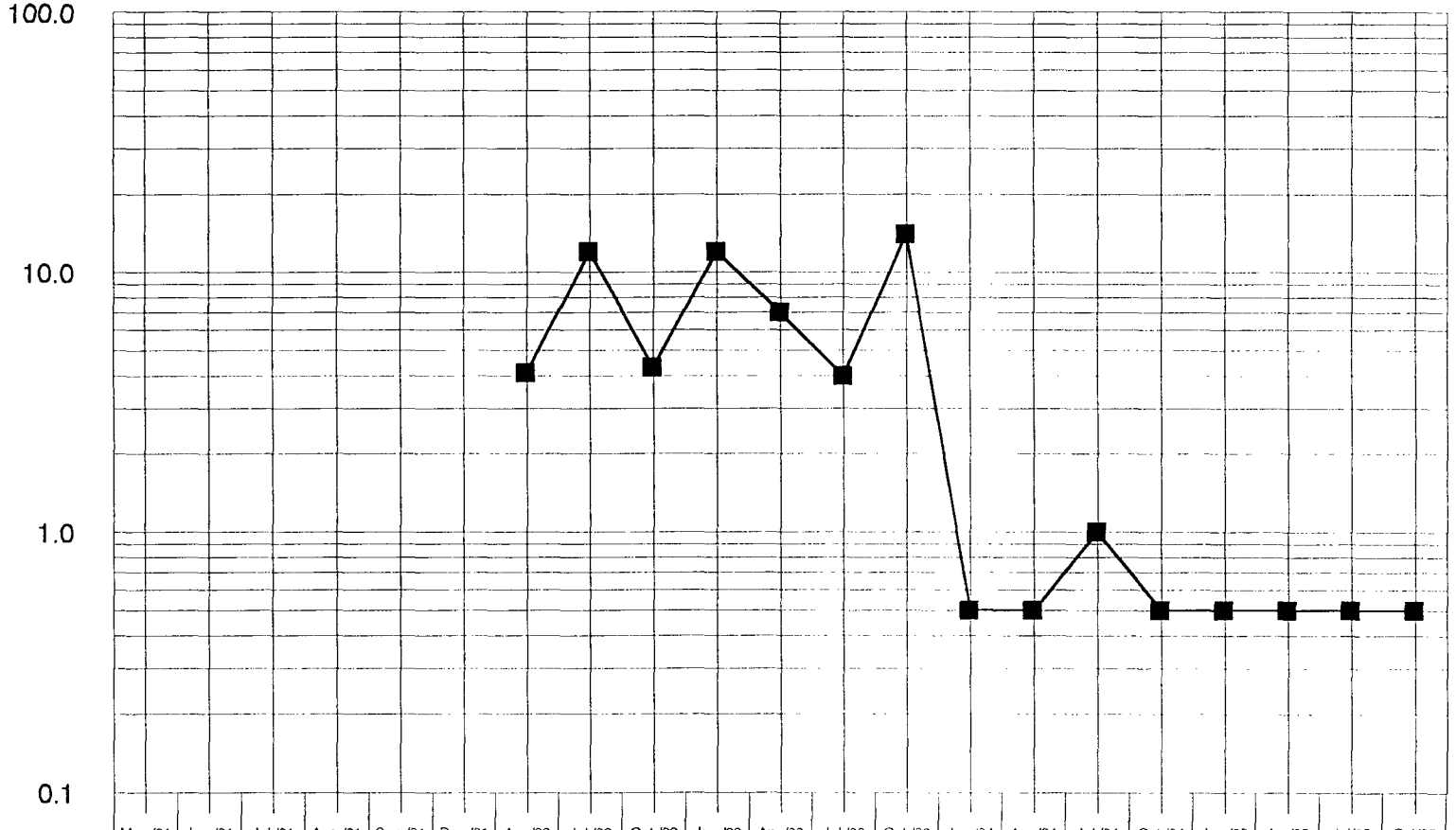
BENZENE IN GROUNDWATER
MW-62



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE					2,200.0	1,400.0	580.0	257.5	357.0	212.3	78.0	33.0	98.0	10.0	4.1	2.5	4.3	13.0	2,200.0	7.5	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

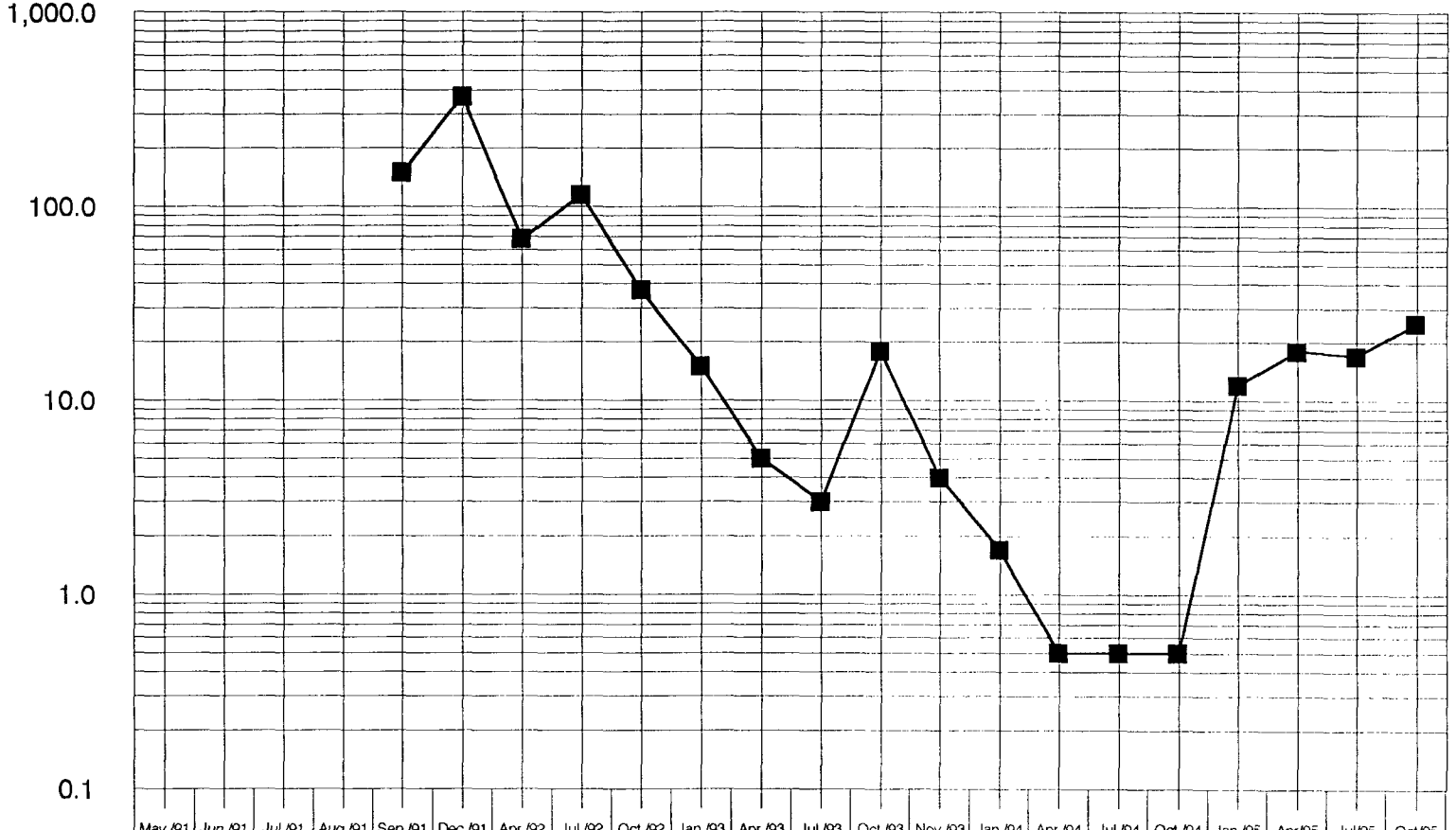
BENZENE IN GROUNDWATER
MW-63



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					0.0	0.0	4.1	12.0	4.3	12.0	7.0	4.0	14.0	0.5	0.5	1.0	0.5	0.5	0.5	0.5	0.5

DATE SAMPLED

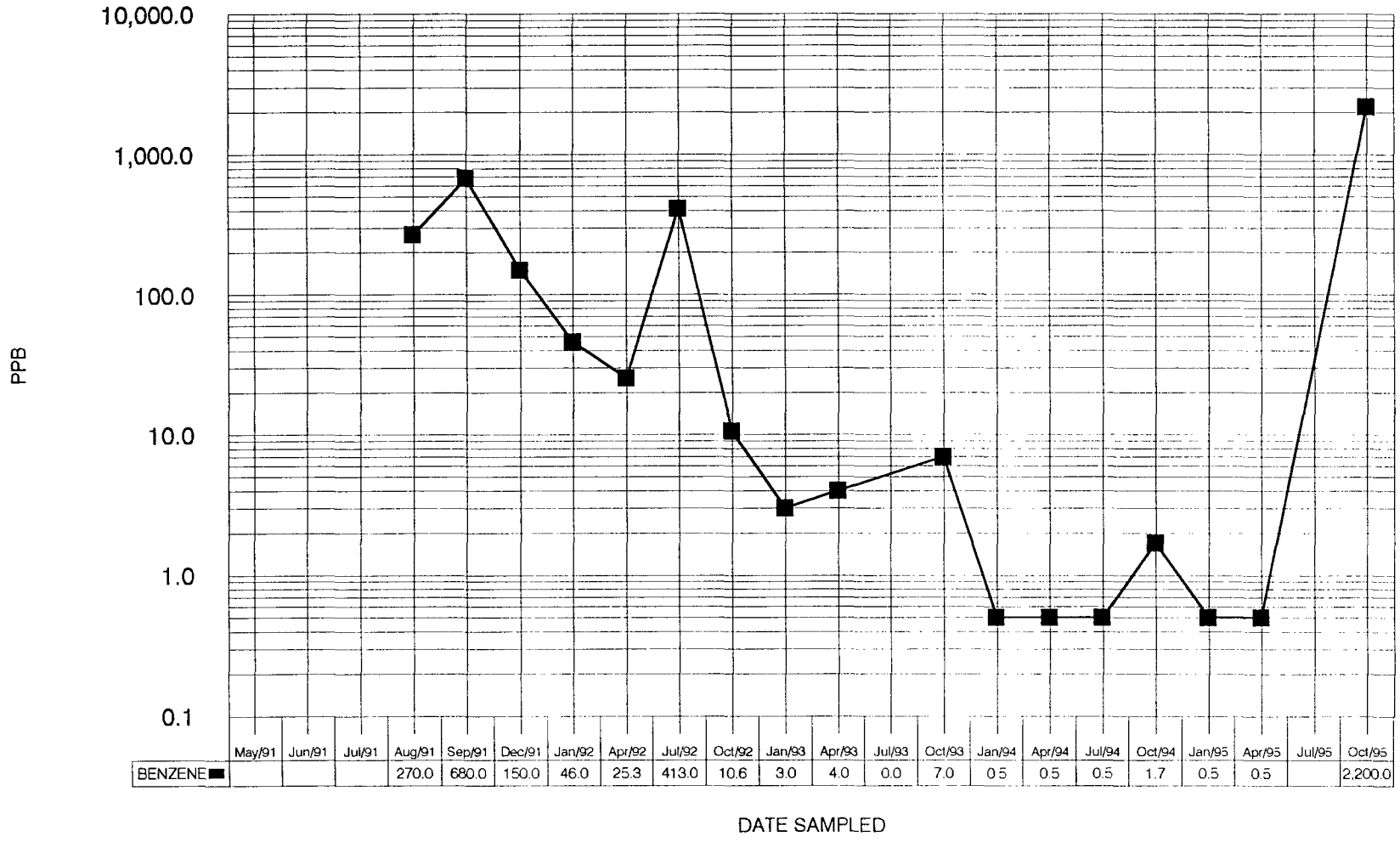
BENZENE IN GROUNDWATER
MW-64



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE				0.0	150.0	370.0	68.3	115.0	37.1	15.0	5.0	3.0	18.0	4.0	1.7	0.5	0.5	0.5	12.0	18.0	17.0	25.0

DATE SAMPLED

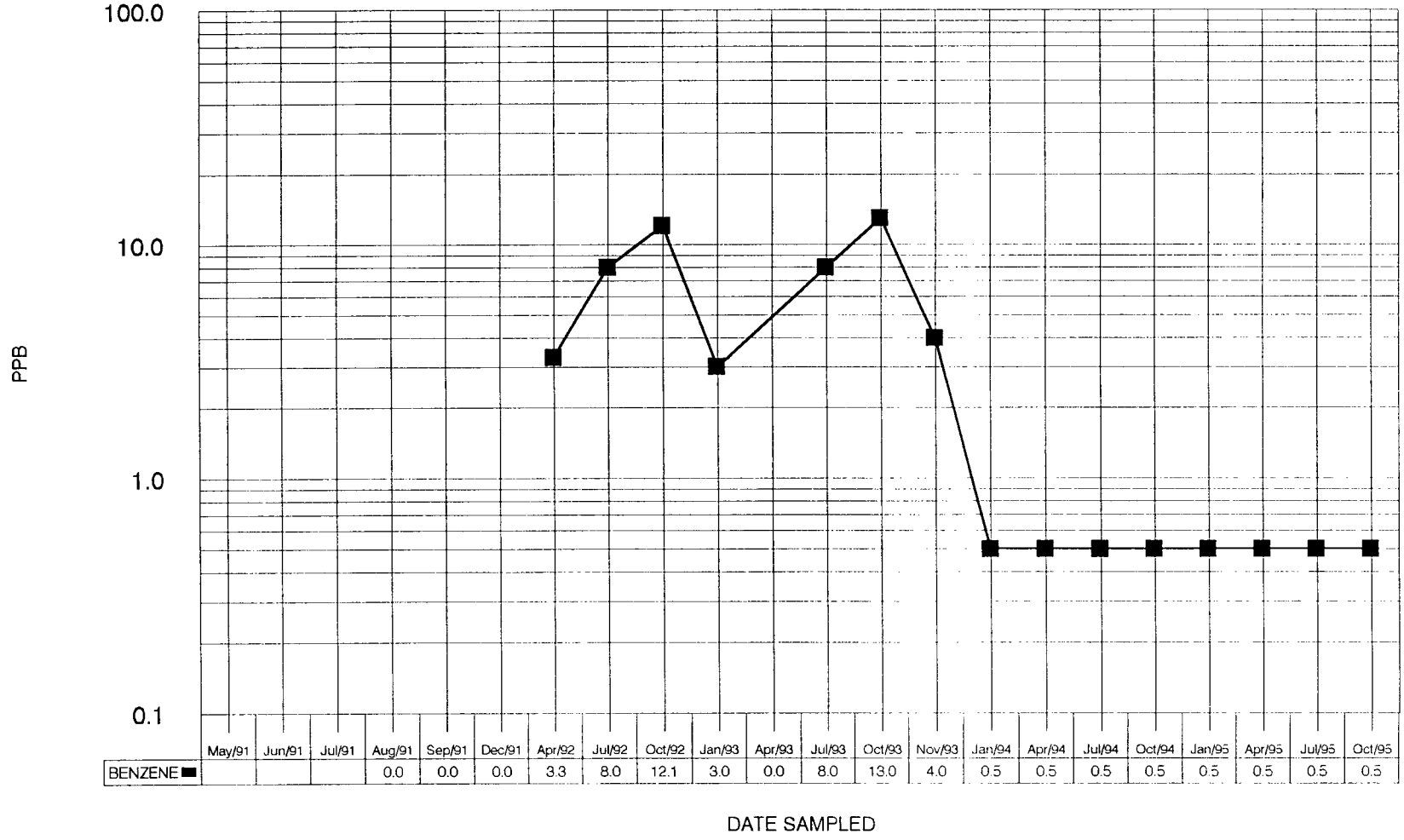
BENZENE IN GROUNDWATER
MW-65A



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Jan/92	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE				270.0	680.0	150.0	46.0	25.3	413.0	10.6	3.0	4.0	0.0	7.0	0.5	0.5	0.5	1.7	0.5	0.5		2,200.0

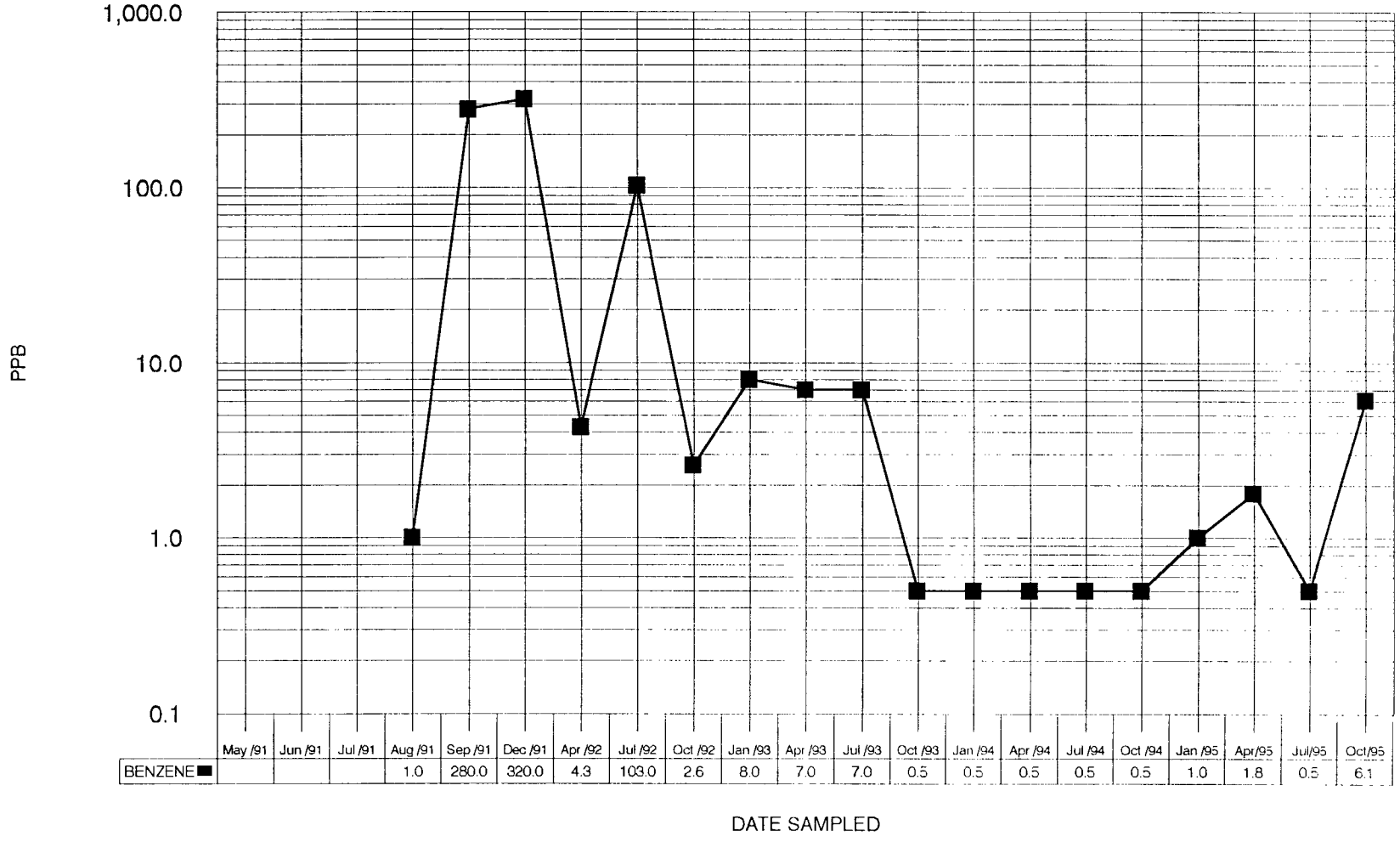
Note: Free-phase condensate = 2200 ppb benzene

BENZENE IN GROUNDWATER
MW-66



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Dec/91	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Nov/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE				0.0	0.0	0.0	3.3	8.0	12.1	3.0	0.0	8.0	13.0	4.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

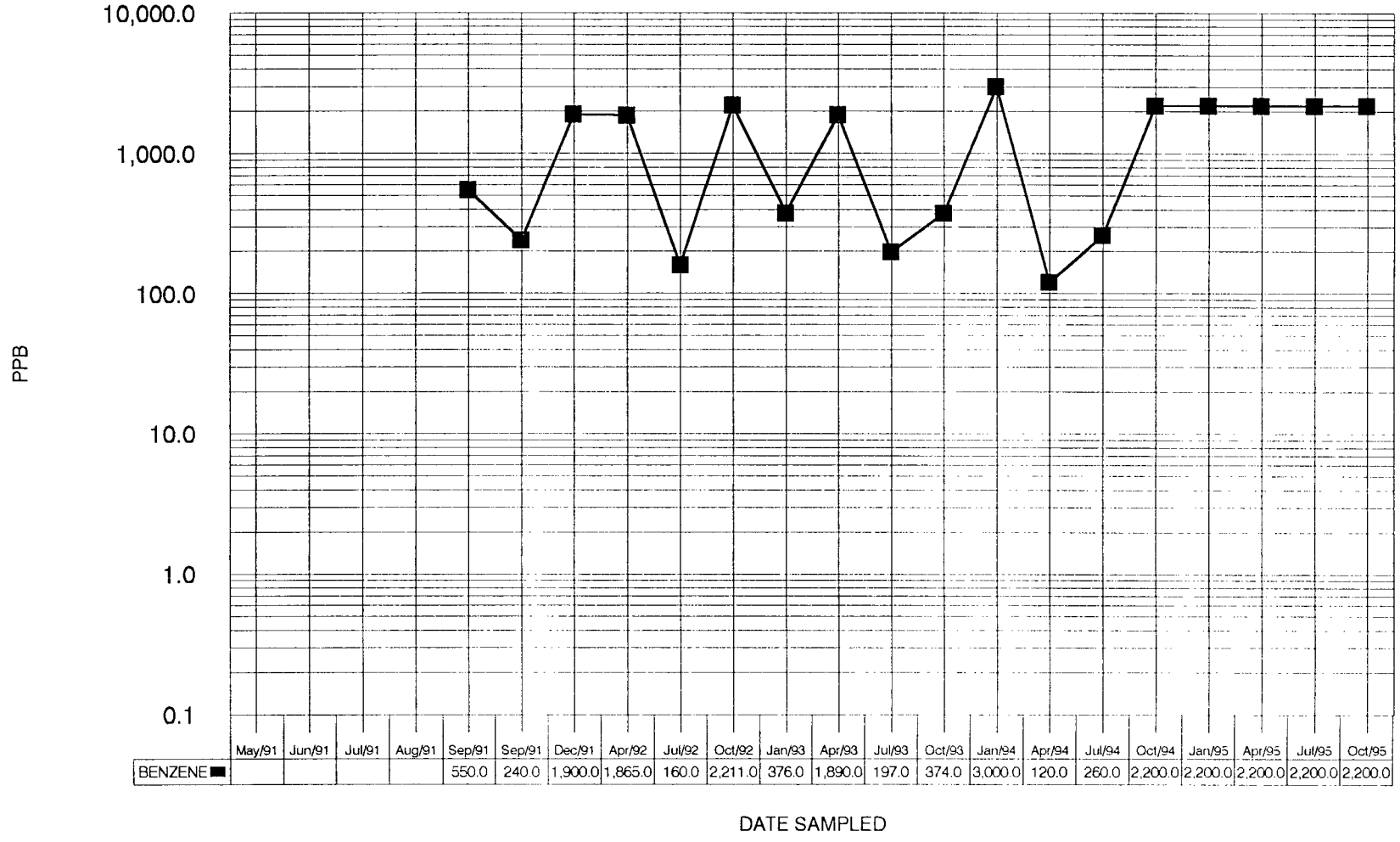
BENZENE IN GROUNDWATER
MW-67



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE				1.0	280.0	320.0	4.3	103.0	2.6	8.0	7.0	7.0	0.5	0.5	0.5	0.5	0.5	1.0	1.8	0.5	6.1

DATE SAMPLED

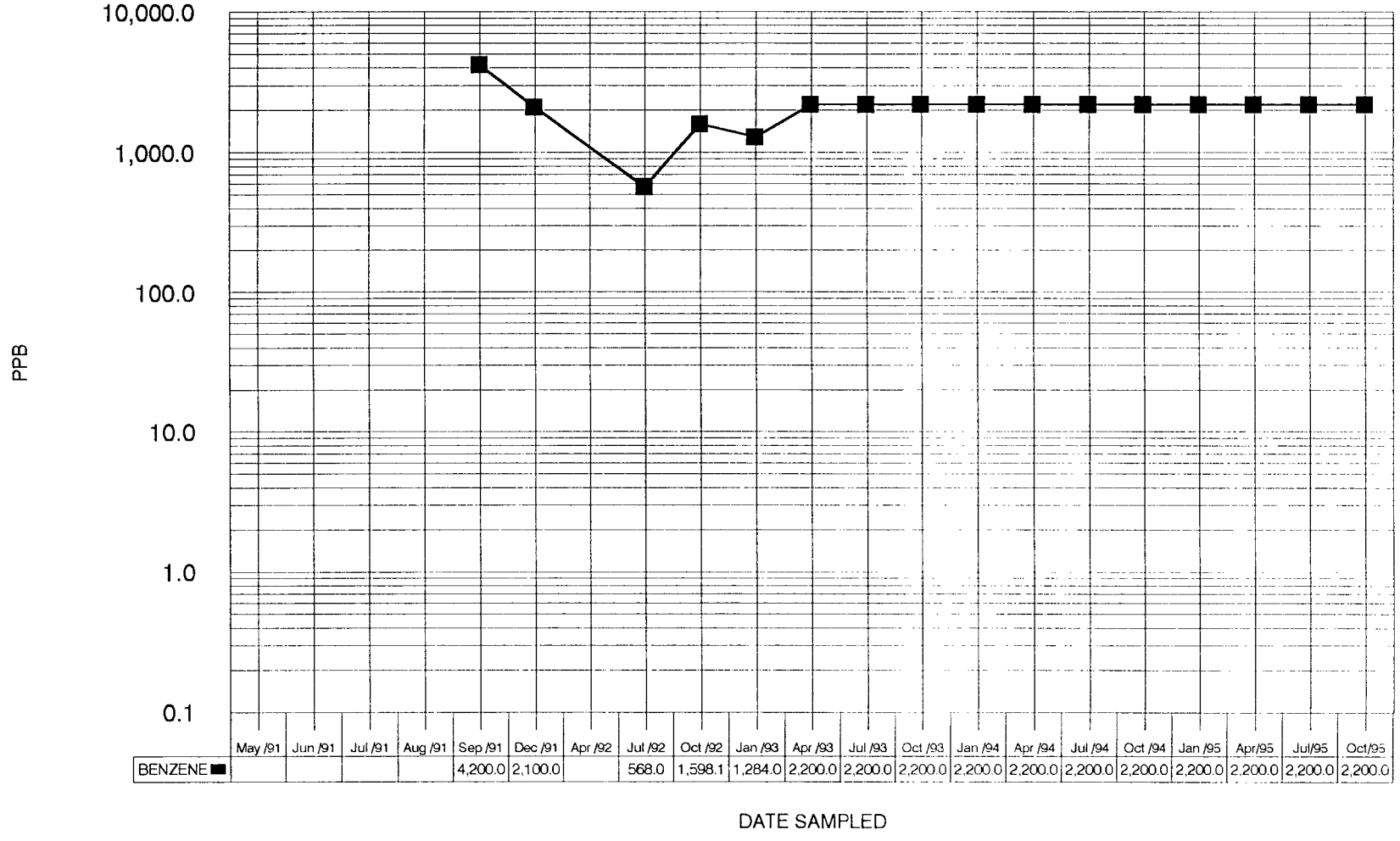
BENZENE IN GROUNDWATER
MW-68



	May/91	Jun/91	Jul/91	Aug/91	Sep/91	Sep/91	Dec/91	Apr/92	Jul/92	Oct/92	Jan/93	Apr/93	Jul/93	Oct/93	Jan/94	Apr/94	Jul/94	Oct/94	Jan/95	Apr/95	Jul/95	Oct/95
BENZENE					550.0	240.0	1,900.0	1,865.0	160.0	2,211.0	376.0	1,890.0	197.0	374.0	3,000.0	120.0	260.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

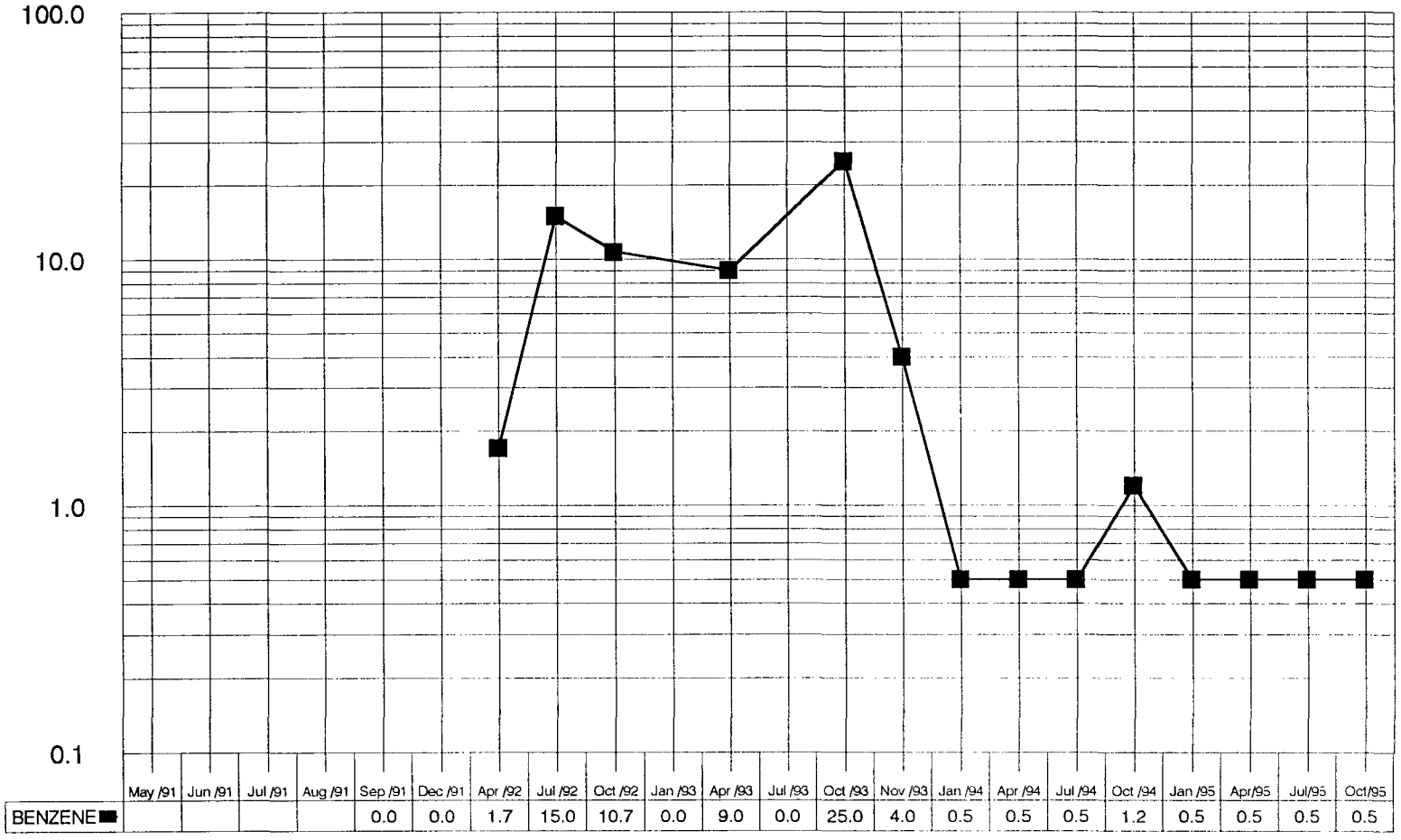
BENZENE IN GROUNDWATER
MW-69



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					4,200.0	2,100.0		568.0	1,598.1	1,284.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0	2,200.0

Note: Free-phase condensate = 2200 ppb benzene

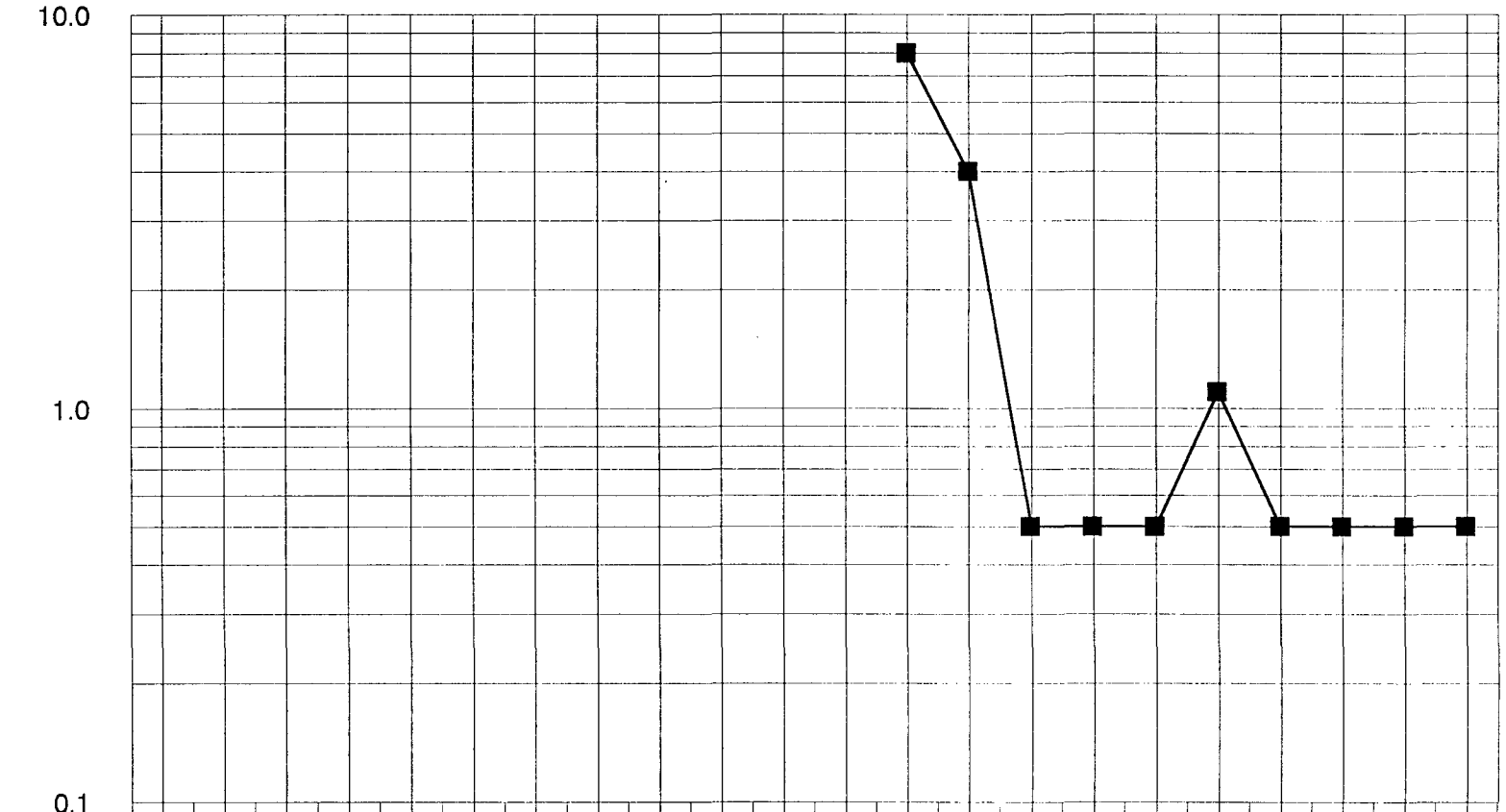
BENZENE IN GROUNDWATER
MW-70



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE					0.0	0.0	1.7	15.0	10.7	0.0	9.0	0.0	25.0	4.0	0.5	0.5	0.5	1.2	0.5	0.5	0.5	0.5

DATE SAMPLED

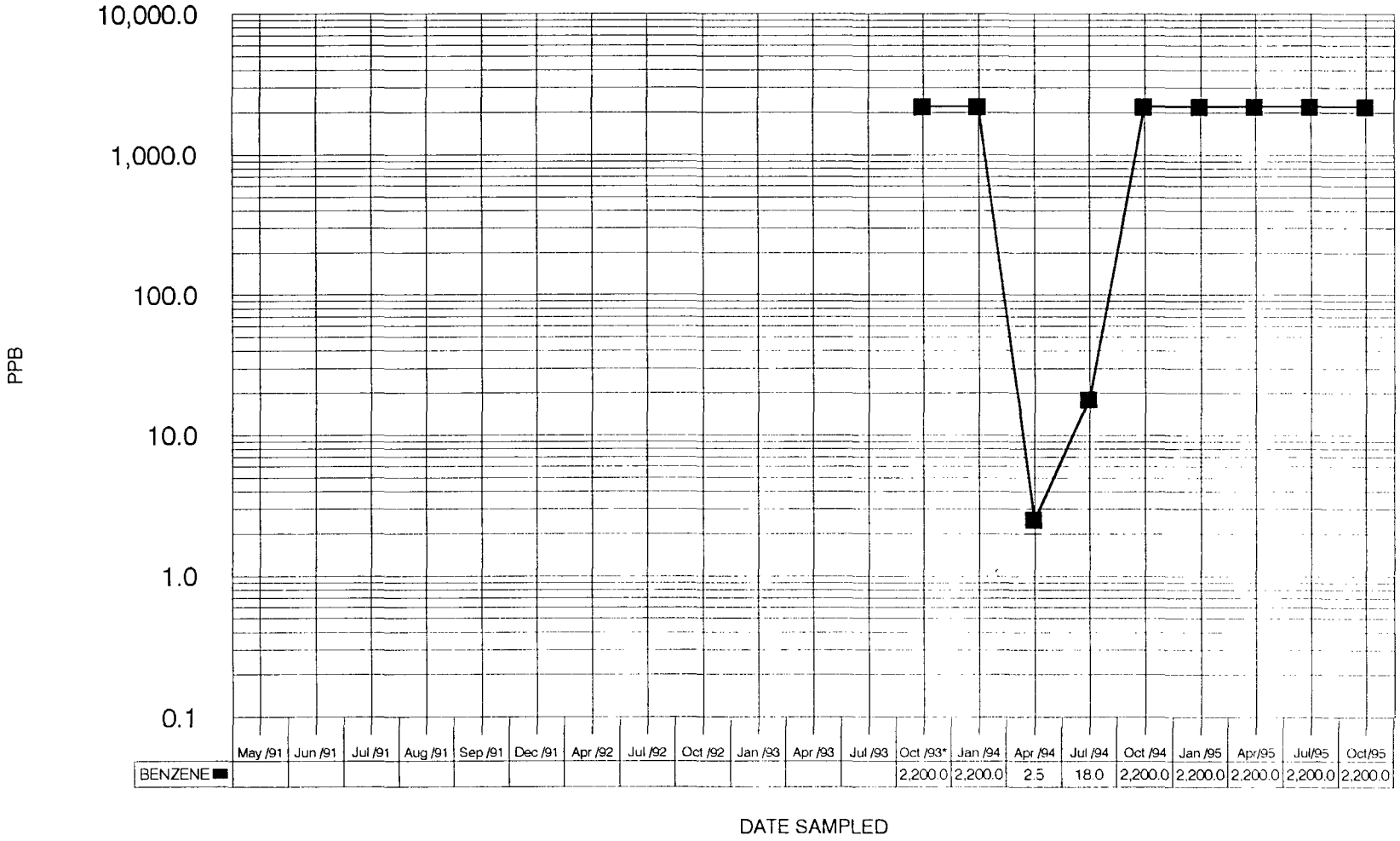
BENZENE IN GROUNDWATER
MW-71



	May /91	Jun /91	Jul /91	Aug /91	Sep /91	Dec /91	Apr /92	Jul /92	Oct /92	Jan /93	Apr /93	Jul /93	Oct /93	Nov /93	Jan /94	Apr /94	Jul /94	Oct /94	Jan /95	Apr/95	Jul/95	Oct/95
BENZENE													8.0	4.0	0.5	0.5	0.5	1.1	0.5	0.5	0.5	0.5

DATE SAMPLED

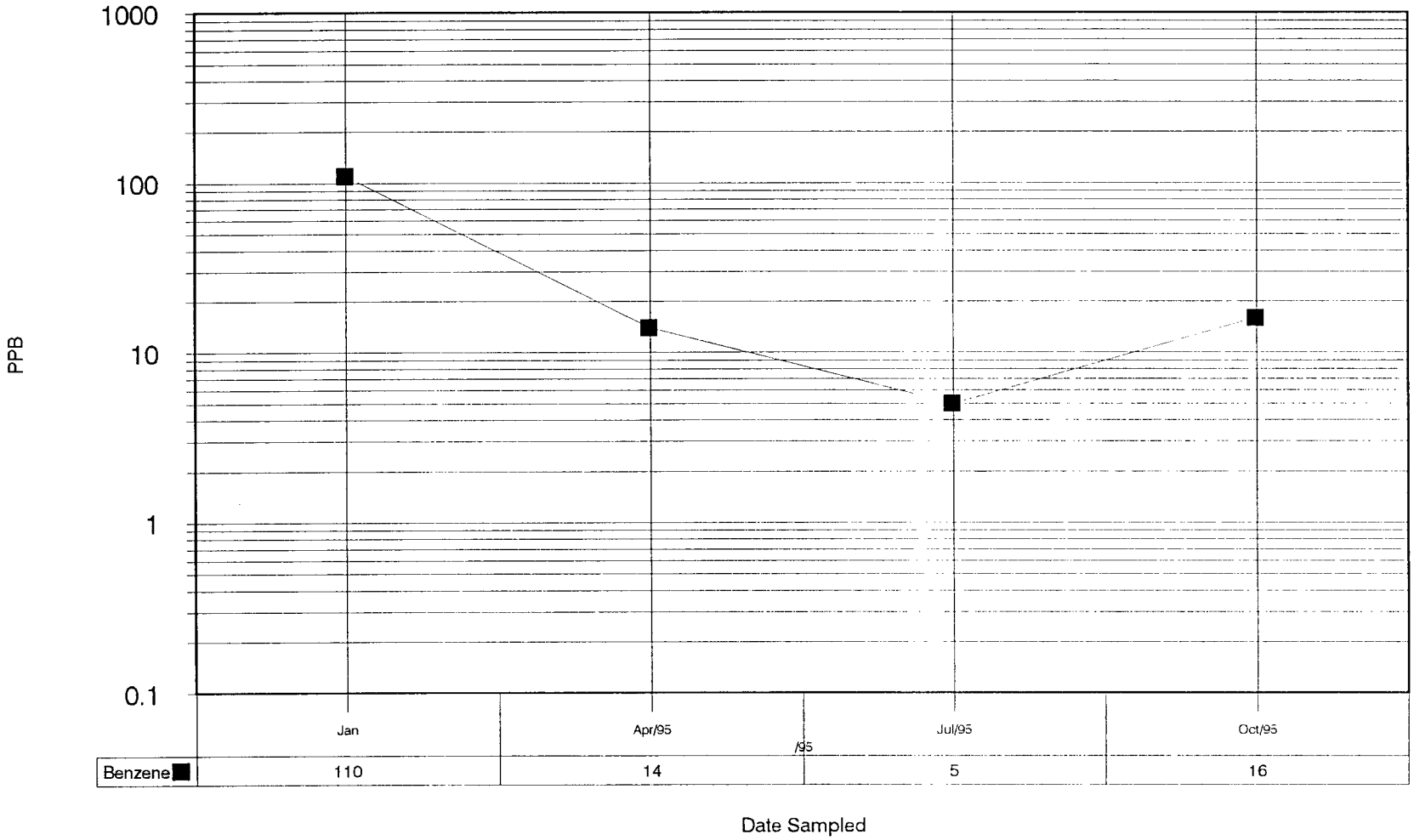
BENZENE IN GROUNDWATER
MW-72



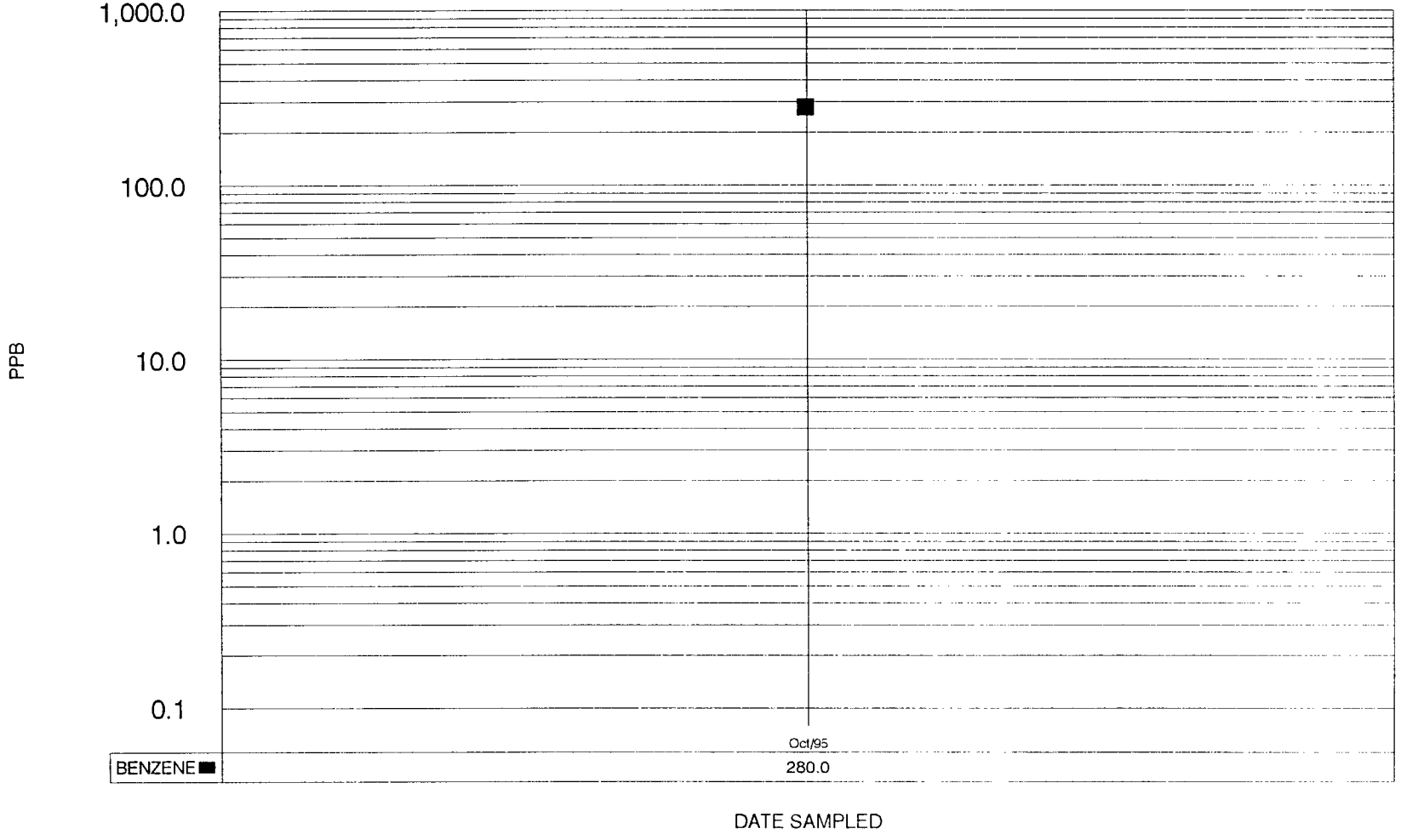
*October 1993 was the first time this well was sampled.

Note: Free-phase condensate = 2200 ppb benzene

BENZENE IN GROUNDWATER
MW-79



BENZENE IN GROUNDWATER
MW-82



*October 1995 was the first time this well was sampled.

APPENDIX C

OCTOBER 1995 LABORATORY RESULTS -

NATURAL SPRING, MONITORING, RANCHER, AND PLANT SUPPLY WELLS

Analytical**Technologies,**Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **510344**

October 30, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702

Project Name/Number: INDIAN BASIN REMEDIATION 44999

Attention: Bob Menzie

On **10/13/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

This report is being reissued per client request to meet reporting specifications.

Due to matrix interferences, EPA Method 8020 analysis for sample "MW-79" was analyzed at a dilution. The detection limits have been raised accordingly.

EPA Method 325.3 analyses were performed by Analytical Technologies, Inc., 11 East Olive Road, Pensacola, FL.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

MCR

NOV 1 1995

Environmental & Safety

Analytical Technologies, Inc.

CLIENT : MARATHON OIL CO. DATE RECEIVED : 10/13/95

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION REPORT DATE : 10/27/95

ATI ID: 510344

	ATI PENSACOLA ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	NA	DI10995	AQUEOUS	10/09/95
02	NA	PW10995	AQUEOUS	10/09/95
03	NA	EB101095	AQUEOUS	10/10/95
04	NA	RB MW-70	AQUEOUS	10/10/95
05	510344-05	MW-70	AQUEOUS	10/10/95
06	510344-06	MW-79	AQUEOUS	10/10/95
07	NA	RB MW-66	AQUEOUS	10/10/95
08	510344-08	MW-66	AQUEOUS	10/10/95
09	NA	RB MW-63	AQUEOUS	10/10/95
10	510344-10	MW-67	AQUEOUS	10/11/95
11	NA	RB MW-82	AQUEOUS	10/11/95
12	510344-12	MW-82	AQUEOUS	10/11/95
13	NA	RB MW-57	AQUEOUS	10/11/95
14	510344-14	MW-57	AQUEOUS	10/11/95
15	NA	RB MW-55	AQUEOUS	10/11/95
16	510344-16	MW-55	AQUEOUS	10/11/95
17	510344-17	MW-54	AQUEOUS	10/11/95
18	510344-18	MW-50	AQUEOUS	10/12/95
19	510344-19	MW-63	AQUEOUS	10/10/95
20	510344-20	MW-61	AQUEOUS	10/10/95
21	NA	RB MW-71	AQUEOUS	10/10/95
22	510344-22	MW-71	AQUEOUS	10/10/95
23	NA	RB MW-60	AQUEOUS	10/11/95
24	510344-24	MW-60	AQUEOUS	10/11/95
25	NA	RB MW-64	AQUEOUS	10/11/95
26	510344-26	MW-64	AQUEOUS	10/11/95
27	NA	RB MW-67	AQUEOUS	10/11/95
28	510344-28	MW-49	AQUEOUS	10/12/95
29	510344-29	MW-44	AQUEOUS	10/12/95
30	510344-30	SUMP-16A	AQUEOUS	10/12/95
31	510344-31	SUMP-10A	AQUEOUS	10/12/95
32	510344-32	MW-41	AQUEOUS	10/12/95
33	510344-33	MW-43	AQUEOUS	10/12/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	33

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-05			Lab ID: 001		
CHLORIDE (325.3)	MG/L	10	1	CIW039	
Comments:					
Client ID: 510344-06			Lab ID: 002		
CHLORIDE (325.3)	MG/L	30	1	CIW039	
Comments:					
Client ID: 510344-08			Lab ID: 003		
CHLORIDE (325.3)	MG/L	9	1	CIW039	
Comments:					
Client ID: 510344-10			Lab ID: 004		
CHLORIDE (325.3)	MG/L	6	1	CIW039	
Comments:					
Client ID: 510344-12			Lab ID: 005		
CHLORIDE (325.3)	MG/L	76	1	CIW039	
Comments:					
Client ID: 510344-14			Lab ID: 006		
CHLORIDE (325.3)	MG/L	47	1	CIW039	
Comments:					
Client ID: 510344-16			Lab ID: 007		
CHLORIDE (325.3)	MG/L	250	10	CIW039	+
Comments:					
Client ID: 510344-17			Lab ID: 008		
CHLORIDE (325.3)	MG/L	110	1	CIW039	

AnalyticalTechnologies, Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-18			Lab ID: 009		
CHLORIDE (325.3)	MG/L	240	10	CIW039	+
Comments:					
Client ID: 510344-19			Lab ID: 010		
CHLORIDE (325.3)	MG/L	12	1	CIW039	
Comments:					
Client ID: 510344-20			Lab ID: 011		
CHLORIDE (325.3)	MG/L	300	10	CIW039	+
Comments:					
Client ID: 510344-22			Lab ID: 012		
CHLORIDE (325.3)	MG/L	21	1	CIW039	
Comments:					
Client ID: 510344-24			Lab ID: 013		
CHLORIDE (325.3)	MG/L	9	1	CIW040	
Comments:					
Client ID: 510344-26			Lab ID: 014		
CHLORIDE (325.3)	MG/L	12	1	CIW040	
Comments:					
Client ID: 510344-28			Lab ID: 015		
CHLORIDE (325.3)	MG/L	350	10	CIW040	+
Comments:					
Client ID: 510344-29			Lab ID: 016		
CHLORIDE (325.3)	MG/L	520	10	CIW040	+

AnalyticalTechnologies, Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510344-30			Lab ID: 017		
CHLORIDE (325.3)	MG/L	63	1	CIW040	
Comments:					
Client ID: 510344-31			Lab ID: 018		
CHLORIDE (325.3)	MG/L	3	1	CIW040	
Comments:					
Client ID: 510344-32			Lab ID: 019		
CHLORIDE (325.3)	MG/L	240	10	CIW040	+
Comments:					
Client ID: 510344-33			Lab ID: 020		
CHLORIDE (325.3)	MG/L	220	10	CIW040	+
Comments:					

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: *Group of Single Wetchem*

Client ID:	Lab ID:	Matrix:	Date/Time Sampled:	Date Received:
510344-05	001	WATER	10-OCT-95 1130	14-OCT-95
510344-06	002	WATER	10-OCT-95 1300	14-OCT-95
510344-08	003	WATER	10-OCT-95 1445	14-OCT-95
510344-10	004	WATER	11-OCT-95 1145	14-OCT-95
510344-12	005	WATER	11-OCT-95 1410	14-OCT-95
510344-14	006	WATER	11-OCT-95 1510	14-OCT-95
510344-16	007	WATER	11-OCT-95 1615	14-OCT-95
510344-17	008	WATER	11-OCT-95 1730	14-OCT-95
510344-18	009	WATER	12-OCT-95 1200	14-OCT-95
510344-19	010	WATER	10-OCT-95 1645	14-OCT-95
510344-20	011	WATER	10-OCT-95 1845	14-OCT-95
510344-22	012	WATER	10-OCT-95 1910	14-OCT-95
510344-24	013	WATER	11-OCT-95 0905	14-OCT-95
510344-26	014	WATER	11-OCT-95 1045	14-OCT-95
510344-28	015	WATER	12-OCT-95 1215	14-OCT-95
510344-29	016	WATER	12-OCT-95 1235	14-OCT-95
510344-30	017	WATER	12-OCT-95 1340	14-OCT-95
510344-31	018	WATER	12-OCT-95 1355	14-OCT-95
510344-32	019	WATER	12-OCT-95 1415	14-OCT-95
510344-33	020	WATER	12-OCT-95 1430	14-OCT-95

AnalyticalTechnologies, Inc.

"Method Report Summary"

Accession Number: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510344-05	CHLORIDE (325.3)	MG/L	10
510344-06	CHLORIDE (325.3)	MG/L	30
510344-08	CHLORIDE (325.3)	MG/L	9
510344-10	CHLORIDE (325.3)	MG/L	6
510344-12	CHLORIDE (325.3)	MG/L	76
510344-14	CHLORIDE (325.3)	MG/L	47
510344-16	CHLORIDE (325.3)	MG/L	250
510344-17	CHLORIDE (325.3)	MG/L	110
510344-18	CHLORIDE (325.3)	MG/L	240
510344-19	CHLORIDE (325.3)	MG/L	12
510344-20	CHLORIDE (325.3)	MG/L	300
510344-22	CHLORIDE (325.3)	MG/L	21
510344-24	CHLORIDE (325.3)	MG/L	9
510344-26	CHLORIDE (325.3)	MG/L	12
510344-28	CHLORIDE (325.3)	MG/L	350
510344-29	CHLORIDE (325.3)	MG/L	520
510344-30	CHLORIDE (325.3)	MG/L	63
510344-31	CHLORIDE (325.3)	MG/L	3
510344-32	CHLORIDE (325.3)	MG/L	240

Analytical**Technologies,** Inc.

"Method Report Summary"

Accession Number: 510279
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510344
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510344-33	CHLORIDE (325.3)	MG/L	220

Analytical**Technologies,**Inc.

"WetChem Quality Control Report"

Parameter:	CHLORIDE	CHLORIDE
Batch Id:	CIW039	CIW040
Blank Result:	<1	<1
Anal. Method:	325.3	325.3
Prep. Method:	N/A	N/A
Analysis Date:	24-OCT-95	24-OCT-95
Prep. Date:	24-OCT-95	24-OCT-95
Sample Duplication		
Sample Dup:	510178-3	510279-13
Rept Limit:	<1	<1
Sample Result:	<1	9.31
Dup Result:	<1	9.41
Sample RPD:	N/C	1
Max RPD:	1	6
Dry Weight%	N/A	N/A
Matrix Spike		
Sample Spiked:	510178-3	510279-13
Rept Limit:	<1	<1
Sample Result:	<1	9.31
Spiked Result:	54.2	59.5
Spike Added:	55.0	55.0
% Recovery:	99	91
% Rec Limits:	89-110	89-110
Dry Weight%	N/A	N/A
ICV		
ICV Result:	94.9	94.9
True Result:	100.0	100.0
% Recovery:	95	95
% Rec Limits:	90-110	90-110
LCS		
LCS Result:		
True Result:		
% Recovery:		
% Rec Limits:		

Analytical**Technologies,**Inc.

----- Common Footnotes Wet Chem -----

N/A = NOT APPLICABLE.
N/S = NOT SUBMITTED.
N/C = SAMPLE AND DUPLICATE RESULTS ARE AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RPD IS "NOT CALCULABLE" AND NO CONTROL LIMITS APPLY.
ND = NOT DETECTED ABOVE REPORTING LIMIT.
DISS. OR D = DISSOLVED
T & D = TOTAL AND DISSOLVED
R = REACTIVE
T = TOTAL
G = SAMPLE AND/OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE RESULT IS AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "IN CONTROL".
Q = THE ANALYTICAL (POST-DIGESTION) SPIKE IS REPORTED DUE TO THE MATRIX (PRE-DIGESTION) SPIKE BEING OUTSIDE ACCEPTANCE LIMITS.
# = ELEVATED REPORTING LIMIT DUE TO INSUFFICIENT SAMPLE.
+ = ELEVATED REPORTING LIMIT DUE TO DILUTION INTO CALIBRATION RANGE.
* = ELEVATED REPORTING LIMIT DUE TO MATRIX INTERFERENCE.
@ = ADJUSTED REPORTING LIMIT DUE TO SAMPLE MATRIX (DILUTION PRIOR TO PREPARATION).
P = ANALYTICAL (POST-DIGESTION) SPIKE
I = DUPLICATE INJECTION
& = AUTOMATED
F = SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
N/C+ = NOT CALCULABLE
N/C* = NOT CALCULABLE; SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
H = SAMPLE AND/OR DUPLICATE IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE RESULTS EXCEEDS THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL".
A = SAMPLE AND DUPLICATE RESULTS ARE "OUT OF CONTROL".
Z = THE SAMPLE RESULT FOR THE SPIKE IS BELOW REPORTING LIMIT. HOWEVER, THIS RESULT IS REPORTED FOR ACCURATE QC CALCULATIONS.
NH= SAMPLE AND / OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE RESULTS EXCEED THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL" SAMPLE IS NON-HOMOGENOUS.
(*) = DETECTION LIMITS RAISED DUE TO CLP METHOD NOT REQUIRING A CONCENTRATION STEP FOR CN.

(CA) = SEE CORRECTIVE ACTIONS FORM.

SW-846, 3RD EDITION, SEPTEMBER 1986 AND REVISION 1, JULY 1992.
EPA 600/4-79-020, REVISED MARCH 1983.
STANDARD METHODS, 17TH ED., 1989
NIOSH MANUAL OF ANALYTICAL METHODS, 3RD EDITION.
ANNUAL BOOK OF ASTM STANDARDS, VOLUME 11.01, 1991.

1. COLIFORM. COLIFORM PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE LOGARITHM OF COLONIES PER 100 MLS OF SAMPLE ON DUPLICATE PLATES.

2. PH. PH PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND THE DUPLICATE ANALYSIS.

3. FLASHPOINT. FLASHPOINT PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE ANALYSIS. IF FLASHPOINT IS LESS THAN 25 DEGREES CELSIUS, THE DETECTION LIMIT BECOMES THE INITIAL STARTING TEMPERATURE.

RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION).

RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.

DPH = DOLLY P. HWANG
TT = TONY TINEO
MM = MARY MOLONEY
GJ = GARY JACOBS
SG = SCOTT GRESHAM
NSB = NANCY S. BUTLER
CF = CHRISTINE FOSTER
RB = REBECCA BROWN
FB = FREDDIE BROWN
HN = HONG NGUYEN

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	DI10995	AQUEOUS	10/09/95	NA	10/13/95	1
02	PW10995	AQUEOUS	10/09/95	NA	10/13/95	1
03	EB101095	AQUEOUS	10/10/95	NA	10/13/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	0.9
TOLUENE	UG/L	<0.5	<0.5	1.0
ETHYLBENZENE	UG/L	<0.5	<0.5	1.8
TOTAL XYLENES	UG/L	100	0.7	61
SURROGATE:				
BROMOFLUOROBENZENE (%)		103	100	99

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	RB MW-70	AQUEOUS	10/10/95	NA	10/13/95	1
05	MW-70	AQUEOUS	10/10/95	NA	10/13/95	1
06	MW-79	AQUEOUS	10/10/95	NA	10/17/95	5

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	<0.5	16
TOLUENE	UG/L	0.6	<0.5	4.0
ETHYLBENZENE	UG/L	1.2	<0.5	<2.5
TOTAL XYLENES	UG/L	20	<0.5	3.7
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	99	85

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	RB MW-66	AQUEOUS	10/10/95	NA	10/14/95	1
08	MW-66	AQUEOUS	10/10/95	NA	10/14/95	1
09	RB MW-63	AQUEOUS	10/10/95	NA	10/16/95	5

PARAMETER	UNITS	07	08	09
BENZENE	UG/L	0.6	<0.5	<2.5
TOLUENE	UG/L	1.6	<0.5	4.1
ETHYLBENZENE	UG/L	1.3	<0.5	3.1
TOTAL XYLENES	UG/L	15	3.5	10
SURROGATE:				
BROMOFLUOROBENZENE (%)		90	99	104

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
10	MW-67	AQUEOUS	10/11/95	NA	10/14/95	1
11	RB MW-82	AQUEOUS	10/11/95	NA	10/14/95	1
12	MW-82	AQUEOUS	10/11/95	NA	10/19/95	100

PARAMETER	UNITS	10	11	12
BENZENE	UG/L	6.1	2.4	280
TOLUENE	UG/L	1.8	0.9	<50
ETHYLBENZENE	UG/L	0.5	2.5	450
TOTAL XYLENES	UG/L	4.2	54	910
SURROGATE:				
BROMOFLUOROBENZENE (%)		87	105	103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
13	RB MW-57	AQUEOUS	10/11/95	NA	10/14/95	1
14	MW-57	AQUEOUS	10/11/95	NA	10/14/95	1
15	RB MW-55	AQUEOUS	10/11/95	NA	10/14/95	1

PARAMETER	UNITS	13	14	15
BENZENE	UG/L	<0.5	64	2.4
TOLUENE	UG/L	0.5	1.7	0.6
ETHYLBENZENE	UG/L	1.1	0.7	3.4
TOTAL XYLENES	UG/L	45	5.0	20
SURROGATE:				
BROMOFLUOROBENZENE (%)		102	83	102

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
16	MW-55	AQUEOUS	10/11/95	NA	10/14/95	1
17	MW-54	AQUEOUS	10/11/95	NA	10/14/95	1
18	MW-50	AQUEOUS	10/12/95	NA	10/14/95	1

PARAMETER	UNITS	16	17	18
BENZENE	UG/L	100	0.7	<0.5
TOLUENE	UG/L	6.1	<0.5	<0.5
ETHYLBENZENE	UG/L	70	1.7	<0.5
TOTAL XYLENES	UG/L	15	3.0	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		90	103	102

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
19	MW-63	AQUEOUS	10/10/95	NA	10/16/95	1
20	MW-61	AQUEOUS	10/10/95	NA	10/16/95	1
21	RB MW-71	AQUEOUS	10/10/95	NA	10/16/95	1

PARAMETER	UNITS	19	20	21
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	1.3
ETHYLBENZENE	UG/L	<0.5	<0.5	1.4
TOTAL XYLENES	UG/L	<0.5	<0.5	22
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	102	103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
22	MW-71	AQUEOUS	10/10/95	NA	10/16/95	1
23	RB MW-60	AQUEOUS	10/11/95	NA	10/16/95	1
24	MW-60	AQUEOUS	10/11/95	NA	10/16/95	1

PARAMETER	UNITS	22	23	24
BENZENE	UG/L	<0.5	0.9	<0.5
TOLUENE	UG/L	<0.5	1.3	<0.5
ETHYLBENZENE	UG/L	<0.5	2.6	<0.5
TOTAL XYLENES	UG/L	7.3	19	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		102	101	102

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
25	RB MW-64	AQUEOUS	10/11/95	NA	10/16/95	1
26	MW-64	AQUEOUS	10/11/95	NA	10/16/95	1
27	RB MW-67	AQUEOUS	10/11/95	NA	10/16/95	1

PARAMETER	UNITS	25	26	27
BENZENE	UG/L	1.4	25	<0.5
TOLUENE	UG/L	1.4	1.7	<0.5
ETHYLBENZENE	UG/L	3.4	13	0.7
TOTAL XYLENES	UG/L	16	32	32
SURROGATE:				
BROMOFLUOROBENZENE (%)		100	95	101

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
28	MW-49	AQUEOUS	10/12/95	NA	10/16/95	100
29	MW-44	AQUEOUS	10/12/95	NA	10/16/95	100
30	SUMP-16A	AQUEOUS	10/12/95	NA	10/16/95	25

PARAMETER	UNITS	28	29	30
BENZENE	UG/L	240	120	130
TOLUENE	UG/L	<50	<50	<13
ETHYLBENZENE	UG/L	59	240	98
TOTAL XYLENES	UG/L	130	260	780
SURROGATE:				
BROMOFLUOROBENZENE (%)		104	104	99

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX, MTBE (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510344

PROJECT # : 44999

PROJECT NAME : INDIAN BASIN REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
31	SUMP-A10	AQUEOUS	10/12/95	NA	10/17/95	1
32	MW-41	AQUEOUS	10/12/95	NA	10/17/95	5
33	MW-43	AQUEOUS	10/12/95	NA	10/16/95	1

PARAMETER	UNITS	31	32	33
BENZENE	UG/L	<0.5	1.8	1.2
TOLUENE	UG/L	2.9	8.0	2.4
ETHYLBENZENE	UG/L	<0.5	2.6	3.8
TOTAL XYLENES	UG/L	<0.5	18	5.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		104	104	118

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101795	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/17/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101995	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/19/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		101

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101395B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		98

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101695B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		103

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX, MTBE (EPA 8020)	ATI I.D.	: 510344
BLANK I.D.	: 101695	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034501	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034501	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	12	120	10	100	18
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	0.6	10	10	94	10	94	0
TOTAL XYLENES	1.2	30	30	96	31	99	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034424	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034424	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	10	100	9.9	99	1
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	<0.5	10	10	100	10	100	0
TOTAL XYLENES	<0.5	30	31	103	33	110	6

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX, MTBE (EPA 8020)		
MSMSD #	: 51034418	ATI I.D.	: 510344
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/16/95
PROJECT NAME	: INDIAN BASIN REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034418	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	9.6	96	9.7	97	1
TOLUENE	<0.5	10	9.8	98	9.6	96	2
ETHYLBENZENE	<0.5	10	10	100	9.9	99	1
TOTAL XYLENES	<0.5	30	32	107	30	100	6

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc., Albuquerque, NM
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CHAIN OF CUSTODY

DATE: 10/9-10/95 PAGE 1 OF 4

ATI LAB I.D. 510344

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON
ADDRESS: PO BOX 552
MIDLAND TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
* DI 10995	10/9/95	1215	Water	01	X		2
* PW 10995	↓	1225		02	X		2
EB 10995	10/10/95	1005		03	X		2
RB MW-70		1120		04	X		2
MW-70		1130		05	X	X	3
MW-79		1300		06	X	X	3
RB MW-66		1440		07	X		2
MW-66		1445		08	X	X	3
RB MW-63	↓	1635	↓	09	X		2

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	21
PROJ. NAME: INDIAN BASIN REMEDIATION		CUSTODY SEALS	Y / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments: * DI 10995 & PW 10995 ARE preserved with HCl. All others are preserved with $HgCl_2$

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Ken Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: KEN COOK Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: KFT Phone: (505) 242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY:(LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 8:29
Printed Name: Date:	Printed Name: Date:	Printed Name: Pam Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc., Albuquerque, NM

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CHAIN OF CUSTODY

DATE: 10/11-12/95 PAGE 3 OF 4

ATI LAB I.D. 510344

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob MENZIE

COMPANY: MARATHON
ADDRESS: PO BOX 552
MIDLAND, TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY:
ADDRESS: SAME AS ABOVE

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chlorides	NUMBER OF CONTAINERS
MW-67	10/11/95	1145	WATER	10	X	X	3
RB MW-82		1355		11	X	X	2
MW-82		1410		12	X	X	3
RB MW-57		1500		13	X	X	2
MW-57		1510		14	X	X	3
RB MW-55		1605		15	X	X	2
MW-55		1615		16	X	X	3
MW-54		1730		17	X	X	3
MW-50	10/12/95	1200		18	X	X	3

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1)
(MOD 8015) Gas/Diesel
Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)
Chlorinated Hydrocarbons (601/8010)
Aromatic Hydrocarbons (602/8020)
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.
Pesticides/PCB (608/8080)
Herbicides (615/8150)
Base/Neutral/Acid Compounds GC/MS (625/8270)
Volatile Organics GC/MS (624/8240)
Polynuclear Aromatics (610/8310)
SDWA Primary Standards - Arizona
SDWA Secondary Standards - Arizona
SDWA Primary Standards - Federal
SDWA Secondary Standards - Federal
The 13 Priority Pollutant Metals
RCRA Metals by Total Digestion
RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	24
PROJ. NAME: Indian Basin Remediation		CUSTODY SEALS	(Y) N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ~~☐ 2 WEEK~~

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: Kevin Cook Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Dan Johnson Time: 8:31
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc., Albuquerque, NM

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CHAIN OF CUSTODY

DATE: 10/10-11/95 PAGE 2 OF 4

ATI LAB I.D. 5103444

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon
ADDRESS: PO Box 552
Midland, Tx. 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: Same As Above
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
mw-63	10/10/95	1645	WATER	19	X	X	3
mw-61		1845		20	X	X	3
RBmw-71		1900		21	X		2
mw-71		1910		22	X	X	3
RB mw-60	10/11/95	0855		23	X		2
mw-60		0905		24	X	X	3
RBmw-64		1035		25	X		2
mw-64		1045		26	X	X	3
RBmw-67		1140		27	X		2

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:	44999	NO. CONTAINERS	23
PROJ. NAME:	Indian Basin Remediation	CUSTODY SEALS	Y (N) NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: Kevin Cook Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 8:31
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

Analytical**Technologies,**Inc., Albuquerque, NM
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CHAIN OF CUSTODY

DATE: 10/12/95 PAGE 4 OF 4

ATI LAB I.D. 5103444

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON
ADDRESS: PO BOX 552
MIDLAND, TX 79702
PHONE: (915) 687-8312
FAX: (915) 687-8337

BILL TO:
COMPANY: SAME AS ABOVE
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
mw-49	10/12/95	1215	WATER	28	X	X	3
mw-44		1235		29	X	X	3
Sump-16A		1340		30	X	X	3
Sump-A10		1355		31	X	X	3
mw-41		1415		32	X	X	3
mw-43		1430		33	X	X	3

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 4999		NO. CONTAINERS	18
PROJ. NAME: Indian Basin Remediation		CUSTODY SEALS	Y (N) NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☑ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Kevin Cook Time: 0825	Signature: Time:	Signature: Time:
Printed Name: KEVIN COOK Date: 10/13/95	Printed Name: Date:	Printed Name: Date:
Company: GTI Phone: (505) 242-3113	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 8:29
Printed Name: Date:	Printed Name: Date:	Printed Name: Dan Johnson Date: 10-13-95
Company:	Company:	Analytical Technologies, Inc.

AnalyticalTechnologies,Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 1 OF 3

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	632/632 MOD	619/619 MOD	610/8310	Chloride	8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 225/223	AIR - 02, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510344-05	10/10	1130	AQ	1									X													
-06	↓	1300	↓	2									X													
-08	↓	1445	↓	3									X													
-10	10/11	1145	↓	4									X													
-12	↓	1410	↓	5									X													
-14	↓	1510	↓	6									X													
-16	↓	1615	↓	7									X													
-17	↓	1730	↓	8									X													
-18	10/12	1200	↓	9									X													

PROJECT INFORMATION

PROJECT NUMBER: 510344
PROJECT NAME: Indian Basin Remediation-MO
QC LEVEL: (STD.) IV
(QC REQUIRED:) MS MSD BLANK
TAT: (STANDARD) RUSH!

DUE DATE: 10/25
RUSH SURCHARGE: NO
CLIENT DISCOUNT: Quote %
IWO#KM1001

[redacted]

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS
INTACT?
RECEIVED GOOD COND./COLD
LAB NUMBER: 510279

SAMPLES SENT TO:
SAN DIEGO
FT. COLLINS
RENTON
PENSACOLA X
PORTLAND
PHOENIX
FIBERQUANT

RELINQUISHED BY: 1.
Signature: [signature] Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc.
Albuquerque

RECEIVED BY: (LAB) 1.
Signature: [signature] Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/95
Company: ATI-FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

AnalyticalTechnologies,Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 2 OF 2

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310	8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - 02, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510344-19	10/10	1645	AQ	10						X																
-20	↓	1845	↓	11						X																
-22	↓	1910	↓	12						X																
-24	10/11	0905	↓	13						X																
-26	10/11	1045	↓	14						X																
-28	10/12	1215	↓	15						X																
~~-28~~ 29	↓	1235	↓	16						X																
~~-29~~ 30	↓	1340	↓	17						X																
~~-30~~ 31	↓	1355	↓	18						X																

PROJECT INFORMATION

PROJECT NUMBER: 510344
PROJECT NAME: Indian Basin Remediation: MO
QC LEVEL: (STD.) IV
QC REQUIRED: MS MSD BLANK
TAT: (STANDARD) RUSH!

DUE DATE: 10/25
RUSH SURCHARGE: NO
CLIENT DISCOUNT: Quote %
IWO#KM1001

[redacted]

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS	
INTACT?	
RECEIVED GOOD COND./COLD	
LAB NUMBER	510279

SAMPLES SENT TO:

SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	X
PORTLAND	
PHOENIX	
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date 10/13
Analytical Technologies, Inc.
Albuquerque

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 1.
Signature: [signature] Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/95
Company: ATI-FL

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

Analytical**Technologies,**Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 3 OF 3

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
510344-32	10/12	1415	AQ	19
-33	10/12	1430	AQ	20

ANALYSIS REQUEST

SAMPLE ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	Chloride	632/632 MOD	619/619 MOD	610/8310		8240 /TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510344-32						X																	
-33						X																	

PROJECT INFORMATION	SAMPLE RECEIPT
PROJECT NUMBER: 510344	TOTAL NUMBER OF CONTAINERS
PROJECT NAME: Indian Basin Remediation: MO	CHAIN OF CUSTODY SEALS
QC LEVEL: (STD) IV	INTACT?
QC REQUIRED: MS MSD BLANK	RECEIVED GOOD COND./COLD
TAT: (STANDARD) RUSH!	LAB NUMBER: 510279

DUE DATE: 10/25
RUSH SURCHARGE:
CLIENT DISCOUNT: Quote %

IWO # KM1001

[redacted]

SAMPLES SENT TO:	
SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	X
PORTLAND	
PHOENIX	
FIBERQUANT	

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc.
Albuquerque

RECEIVED BY: (LAB) 1.
Signature: Robert Elsperman Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/13
Company: ATI-FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

Analytical**Technologies,**Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **510345**

October 26, 1995

Marathon Oil Company
P.O. Box 552
Midland, TX 79702

Project Name/Number: IB REMEDIATION 44999

Attention: Bob Menzie

On **10/13/95**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA method 325.3 analyses were performed by Analytical Technologies, Inc., 11 East Olive Road, Pensacola, FL.

All other analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical**Technologies,**Inc.

CLIENT	:MARATHON OIL CO.	DATE RECEIVED	:10/13/95
PROJECT #	:44999		
PROJECT NAME	:IB REMEDIATION	REPORT DATE	:10/26/95

ATI ID: 510345

	ATI ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	510345-01	SW-1	AQUEOUS	10/12/95
02	NA	STRIPPER INLET	AQUEOUS	10/12/95
03	NA	STRIPPER OUTLET	AQUEOUS	10/12/95
04	510345-04	LYMAN	AQUEOUS	10/12/95
05	510345-05	ARROYO	AQUEOUS	10/12/95
06	510345-06	BIEBBLE	AQUEOUS	10/12/95
07	NA	TRIP BLANK	AQUEOUS	10/05/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	7

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem
QcLevel: II

Parameter:	Unit:	Result:	R.L:	Batch:	Q:
Client ID: 510345-01			Lab ID: 001		
CHLORIDE (325.3)	MG/L	24	1	CIW040	
Comments:					
Client ID: 510345-04			Lab ID: 002		
CHLORIDE (325.3)	MG/L	12	2	CIW040	#
Comments:					
Client ID: 510345-05			Lab ID: 003		
CHLORIDE (325.3)	MG/L	14	2	CIW040	#
Comments:					
Client ID: 510345-06			Lab ID: 004		
CHLORIDE (325.3)	MG/L	13	2	CIW040	#
Comments:					

Analytical**Technologies,**Inc.

"FINAL REPORT FORMAT - MULTIPLE"

Accession: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client ID:	Lab Matrix: ID:	Date/Time Sampled:	Date Received:
510345-01	001 WATER	12-OCT-95 0958	14-OCT-95
510345-04	002 WATER	12-OCT-95 1015	14-OCT-95
510345-05	003 WATER	12-OCT-95 1025	14-OCT-95
510345-06	004 WATER	12-OCT-95 1035	14-OCT-95

Analytical**Technologies,**Inc.

"Method Report Summary"

Accession Number: 510280
Client: ANALYTICAL TECHNOLOGIES, INC.
Project Number: 510345
Project Name: MARATHON OIL
Project Location: INDIAN BASIN REMEDIATION-MO
Test: Group of Single Wetchem

Client Sample Id:	Parameter:	Unit:	Result:
510345-01	CHLORIDE (325.3)	MG/L	24
510345-04	CHLORIDE (325.3)	MG/L	12
510345-05	CHLORIDE (325.3)	MG/L	14
510345-06	CHLORIDE (325.3)	MG/L	13

Analytical**Technologies,**Inc.

"WetChem Quality Control Report"

Parameter:	CHLORIDE
Batch Id:	CIW040
Blank Result:	<1
Anal. Method:	325.3
Prep. Method:	N/A
Analysis Date:	24-OCT-95
Prep. Date:	24-OCT-95

Sample Duplication

Sample Dup:	510279-13
Rept Limit:	<1
Sample Result:	9.31
Dup Result:	9.41
Sample RPD:	1
Max RPD:	6
Dry Weight%	N/A

Matrix Spike

Sample Spiked:	510279-13
Rept Limit:	<1
Sample Result:	9.31
Spiked Result:	59.5
Spike Added:	55.0
% Recovery:	91
% Rec Limits:	89-110
Dry Weight%	N/A

ICV

ICV Result:	94.9
True Result:	100.0
% Recovery:	95
% Rec Limits:	90-110

LCS

LCS Result:	
True Result:	
% Recovery:	
% Rec Limits:	

Analytical**Technologies,**Inc.

----- Common Footnotes Wet Chem -----

N/A = NOT APPLICABLE.
N/S = NOT SUBMITTED.
N/C = SAMPLE AND DUPLICATE RESULTS ARE AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RPD IS "NOT CALCULABLE" AND NO CONTROL LIMITS APPLY.
ND = NOT DETECTED ABOVE REPORTING LIMIT.
DISS. OR D = DISSOLVED
T & D = TOTAL AND DISSOLVED
R = REACTIVE
T = TOTAL
G = SAMPLE AND/OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE RESULT IS AT OR BELOW ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "IN CONTROL".
Q = THE ANALYTICAL (POST-DIGESTION) SPIKE IS REPORTED DUE TO THE MATRIX (PRE-DIGESTION) SPIKE BEING OUTSIDE ACCEPTANCE LIMITS.
# = ELEVATED REPORTING LIMIT DUE TO INSUFFICIENT SAMPLE.
+ = ELEVATED REPORTING LIMIT DUE TO DILUTION INTO CALIBRATION RANGE.
* = ELEVATED REPORTING LIMIT DUE TO MATRIX INTERFERENCE.
@ = ADJUSTED REPORTING LIMIT DUE TO SAMPLE MATRIX (DILUTION PRIOR TO PREPARATION).
P = ANALYTICAL (POST-DIGESTION) SPIKE
I = DUPLICATE INJECTION
& = AUTOMATED
F = SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
N/C+ = NOT CALCULABLE
N/C* = NOT CALCULABLE; SAMPLE SPIKED > 4 X SPIKE CONCENTRATION.
H = SAMPLE AND/OR DUPLICATE IS BELOW 5 X ATI REPORTING LIMIT AND THE ABSOLUTE DIFFERENCE BETWEEN THE RESULTS EXCEEDS THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL".
A = SAMPLE AND DUPLICATE RESULTS ARE "OUT OF CONTROL".
Z = THE SAMPLE RESULT FOR THE SPIKE IS BELOW REPORTING LIMIT. HOWEVER, THIS RESULT IS REPORTED FOR ACCURATE QC CALCULATIONS.
NH= SAMPLE AND / OR DUPLICATE RESULT IS BELOW 5 X ATI REPORTING LIMIT AND THE RESULTS EXCEED THE ATI REPORTING LIMIT; THEREFORE, THE RESULTS ARE "OUT OF CONTROL" SAMPLE IS NON-HOMOGENOUS.
(*) = DETECTION LIMITS RAISED DUE TO CLP METHOD NOT REQUIRING A CONCENTRATION STEP FOR CN.

(CA) = SEE CORRECTIVE ACTIONS FORM.

SW-846, 3RD EDITION, SEPTEMBER 1986 AND REVISION 1, JULY 1992.
EPA 600/4-79-020, REVISED MARCH 1983.
STANDARD METHODS, 17TH ED., 1989
NIOSH MANUAL OF ANALYTICAL METHODS, 3RD EDITION.
ANNUAL BOOK OF ASTM STANDARDS, VOLUME 11.01, 1991.

1. COLIFORM. COLIFORM PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE LOGARITHM OF COLONIES PER 100 MLS OF SAMPLE ON DUPLICATE PLATES.

2. PH. PH PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND THE DUPLICATE ANALYSIS.

3. FLASHPOINT. FLASHPOINT PRECISION IS MEASURED BY THE ABSOLUTE DIFFERENCE BETWEEN THE SAMPLE AND DUPLICATE ANALYSIS. IF FLASHPOINT IS LESS THAN 25 DEGREES CELSIUS, THE DETECTION LIMIT BECOMES THE INITIAL STARTING TEMPERATURE.

RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION).

RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.

DPH = DOLLY P. HWANG
TT = TONY TINEO
MM = MARY MOLONEY
GJ = GARY JACOBS
SG = SCOTT GRESHAM
NSB = NANCY S. BUTLER
CF = CHRISTINE FOSTER
RB = REBECCA BROWN
FB = FREDDIE BROWN
HN = HONG NGUYEN

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510345

PROJECT # : 44999

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	SW-1	AQUEOUS	10/12/95	NA	10/13/95	1
02	STRIPPER INLET	AQUEOUS	10/12/95	NA	10/13/95	10
03	STRIPPER OUTLET	AQUEOUS	10/12/95	NA	10/13/95	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	92	2.8
TOLUENE	UG/L	<0.5	6.2	7.1
ETHYLBENZENE	UG/L	0.6	110	4.1
TOTAL XYLENES	UG/L	1.2	220	20
SURROGATE:				
BROMOFLUOROBENZENE (%)		101	82	79

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510345

PROJECT # : 44999

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	LYMAN	AQUEOUS	10/12/95	NA	10/13/95	1
05	ARROYO	AQUEOUS	10/12/95	NA	10/13/95	1
06	BIEBBLE	AQUEOUS	10/12/95	NA	10/13/95	1

PARAMETER	UNITS	04	05	06
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	1.6	1.2	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		98	99	101

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 510345

PROJECT # : 44999

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	TRIP BLANK	AQUEOUS	10/05/95	NA	10/13/95	1

PARAMETER	UNITS	07
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5

SURROGATE:

BROMOFLUOROBENZENE (%) 99

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 510345
BLANK I.D.	: 101395	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		102

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 510345
BLANK I.D.	: 101395B	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		98

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 51034501	ATI I.D.	: 510345
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: 44999	DATE ANALYZED	: 10/13/95
PROJECT NAME	: IB REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51034501	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10	12	120	10	100	18
TOLUENE	<0.5	10	10	100	10	100	0
ETHYLBENZENE	0.6	10	10	94	10	94	0
TOTAL XYLENES	1.2	30	30	96	31	99	3

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

AnalyticalTechnologies, Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 10-12-95 PAGE 1 OF 1

ATI LAB I.D. 510345

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MENZIE

COMPANY: MARATHON Oil Co
ADDRESS: P.O. Box 552
Midland TX 79702
PHONE: 915 687-8312
FAX: 915 687-8305

BILL TO:
COMPANY: SAME AS Above
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	BTXE/MTBE (8020)	Chloride	NUMBER OF CONTAINERS
SW-1	10/12/95	9:58	water	-01	✓	✓	3
STRIPPER INLET		10:05		-02	✓		2
STRIPPER OUTLET		10:07		-03	✓		2
LYMAN		10:15		-04	✓	✓	3
ARROYO		10:25		-05	✓	✓	3
BIEBBIE	↓	10:35	↓	-06	✓	✓	3
Trip Blank	10/5	—	AQ	-07	X		1

Petroleum Hydrocarbons (418.1); (MOD 8015) Gas/Diesel; Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020); Chlorinated Hydrocarbons (601/8010); Aromatic Hydrocarbons (602/8020); SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral/Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); SDWA Primary Standards - Arizona; SDWA Secondary Standards - Arizona; SDWA Primary Standards - Federal; SDWA Secondary Standards - Federal; The 13 Priority Pollutant Metals; RCRA Metals by Total Digestion; RCRA Metals by TCLP (1311)

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.: 44999		NO. CONTAINERS	APPROP 17
PROJ. NAME: FB Remediation		CUSTODY SEALS	(Y) N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:		RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Rodrigo AAguilera Time: 11:08	Signature: Kevin Cook Time: 0825	Signature: Time:
Printed Name: Rodrigo AAguilera Date: 10-12-95	Printed Name: KEVIN Cook Date: 10/13/95	Printed Name: Date:
Company: MARATHON Phone: 915 687-8312	Company: GTI	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Kevin Cook Time: 1108	Signature: Time:	Signature: Andrea Tafoya Time: 0820
Printed Name: Kevin Cook Date: 10-12-95	Printed Name: Date:	Printed Name: Andrea Tafoya Date: 10/13
Company: GTI (915) 687-8312	Company:	Analytical Technologies, Inc.

AnalyticalTechnologies,Inc. Albuquerque, NM

Chain of Custody

DATE 10/13 PAGE 1 OF 1

NETWORK PROJECT MANAGER: ~~LETITIA KRAKOWSKI~~ Kim McNeill

COMPANY: **Analytical Technologies, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER: Kim McNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TOX	TOC	ORGANIC LEAD	SULFIDE	SURFACTANTS (MBAS)	632/532 MOD	619/619 MOD	610/8310	Chloride	8240 (TCLP 1311) ZHE	Diesel/Gasoline/BTXE/MTBE/ (MOD 8015/8020)	Volatile Organics GC/MS (624/8240)	NACE	ASBESTOS	BOD	TOTAL COLIFORM	FECAL COLIFORM	GROSS ALPHA/BETA	RADIUM 226/228	AIR - O2, CO2, METHANE	AIR/Diesel/Gasoline/BTXE/ (MOD 8015/8020)	NUMBER OF CONTAINERS
510345-01	10/13	0958	AQ	1									X													
-04	↓	1015	↓	2									X													
-05	↓	1025	↓	3									X													
-06	↓	1035	↓	4									X													

PROJECT INFORMATION

PROJECT NUMBER: 510345
PROJECT NAME: Indian Basin Remediation :MO
QC LEVEL: (STD) IV
(QC REQUIRED): MS MSD BLANK
TAT: (STANDARD) RUSH!

DUE DATE: 10/25
RUSH SURCHARGE: no
CLIENT DISCOUNT: Quote %

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
CHAIN OF CUSTODY SEALS
INTACT?
RECEIVED GOOD COND./COLD
LAB NUMBER: 510280

~~DO NOT ROUTE TO PHOENIX~~

IWO#KM 510345

SAMPLES SENT TO:
SAN DIEGO
FT. COLLINS
RENTON
PENSACOLA X
PORTLAND
PHOENIX
FIBERQUANT

RELINQUISHED BY: 1.
Signature: [signature] Time: 1700
Printed Name: Andrew Parker Date: 10/13
Analytical Technologies, Inc.
Albuquerque

RECEIVED BY: (LAB) 1.
Signature: [signature] Time: 0930
Printed Name: R. ELSPERMAN Date: 10/14/95
Company: ATI- FL

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date
Company:

RECEIVED BY: (LAB) 2.
Signature: Time:
Printed Name: Date:
Company:

APPENDIX D

LABORATORY RESULTS - NATURAL SPRING AND RANCHER, PLANT SUPPLY WELLS

(DECEMBER)

Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **512408**

January 8, 1996

Marathon Oil Company
P.O. Box 552
Midland, TX 79702-0552

Project Name/Number: IB REMEDIATION

Attention: Bob Menzie

On **12/28/95**, Analytical Technologies, of New Mexico Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

EPA method 8020 analyses were performed by Analytical Technologies, Inc., Albuquerque, NM.

All other analyses were performed by Analytical Technologies, Inc., 9830 S. 51st Street, Suite B-113, Phoenix, AZ.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical**Technologies,**Inc.

CLIENT : MARATHON OIL COMPANY
PROJECT # : (NONE)
PROJECT NAME : IB REMEDIATION

DATE RECEIVED : 12/28/95
REPORT DATE : 01/08/96

ATI ID: 512408

	ATI ID #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	512408-01	SW-1	AQUEOUS	12/27/95
02	512408-02	LYMAN	AQUEOUS	12/27/95
03	512408-03	ARROYO	AQUEOUS	12/27/95
04	512408-04	STRIPPER INLET	AQUEOUS	12/27/95
05	512408-05	STRIPPER OUTLET	AQUEOUS	12/27/95
06	512408-06	TRIP BLANK	AQUEOUS	12/18/95

---TOTALS---

MATRIX	#SAMPLES
AQUEOUS	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies**, Inc.

GENERAL CHEMISTRY RESULTS

ATI I.D. : 512971

CLIENT : ANALYTICAL TECHNOLOGIES OF NM, INC. DATE RECEIVED : 12/29/95
PROJECT # : 512408
PROJECT NAME : REMEDIATION REPORT DATE : 01/08/96

PARAMETER	UNITS	01	02	03
CHLORIDE (EPA 325.2)	MG/L	27	10.8	10.3

Analytical**Technologies,**Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : ANALYTICAL TECHNOLOGIES OF NM, INC.
PROJECT # : 512408
PROJECT NAME : REMEDIATION ATI I.D. : 512971

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CHLORIDE	MG/L	51286813	2900	2900	0	6900	4000	100

$$\%\ \text{Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 512408

PROJECT # : (NONE)

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	SW-1	AQUEOUS	12/27/95	NA	01/02/96	1
02	LYMAN	AQUEOUS	12/27/95	NA	01/02/96	1
03	ARROYO	AQUEOUS	12/27/95	NA	01/02/96	1

PARAMETER	UNITS	01	02	03
BENZENE	UG/L	<0.5	<0.5	<0.5
TOLUENE	UG/L	<0.5	<0.5	<0.5
ETHYLBENZENE	UG/L	<0.5	<0.5	<0.5
TOTAL XYLENES	UG/L	<0.5	<0.5	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		114	94	91

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 512408

PROJECT # : (NONE)

PROJECT NAME : IB REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	STRIPPER INLET	AQUEOUS	12/27/95	NA	01/02/96	200
05	STRIPPER OUTLET	AQUEOUS	12/27/95	NA	01/02/96	100
06	TRIP BLANK	AQUEOUS	12/18/95	NA	01/02/96	1

PARAMETER	UNITS	04	05	06
BENZENE	**UG/L**	**370**	**63**	<0.5
TOLUENE	**UG/L**	**160**	**250**	<0.5
ETHYLBENZENE	**UG/L**	**1000**	**240**	<0.5
TOTAL XYLENES	**UG/L**	**5800**	**2200**	<0.5
SURROGATE:				
BROMOFLUOROBENZENE (%)		115	100	90

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 512408
BLANK I.D.	: 010296	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 01/02/96
PROJECT NAME	: IB REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		92

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 51240803	ATI I.D.	: 512408
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 01/02/96
PROJECT NAME	: IB REMEDIATION	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 51240803	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.5	10.0	9.5	95	9.2	92	3
TOLUENE	<0.5	10.0	9.3	93	9.3	93	0
ETHYLBENZENE	<0.5	10.0	9.2	92	9.2	92	0
TOTAL XYLENES	<0.5	30.0	27.4	91	27.7	92	1

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies of New Mexico, Inc., Albuquerque, NM

San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque • Anchorage

CHAIN OF CUSTODY

DATE: 12/27/95 PAGE: 1 OF 1

ATI LAB I.D. 512408

SHADED AREAS ARE FOR LAB USE ONLY.

PLEASE FILL THIS FORM IN COMPLETELY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland TX 79702-0552
PHONE: (915)687-8512 (BJM)/(915)687-8506 (JLW)
FAX: (915)687-8305

BILL TO: SAME
COMPANY:
ADDRESS:

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB I.D.	Chloride	BTXE	NUMBER OF CONTAINERS
SW-1	12/27/95	11:44MST	Water	-01	X	X	3
Lyman		12:18MST		-02	X	X	3
Arroyo		12:54MST		-03	X	X	3
Stripper Inlet		11:17MST		-04		X	2
Stripper Outlet		11:27MST		-05		X	2
Trip Blank	12/18/95	16:00		-06		X	1

Petroleum Hydrocarbons (418.1) TRPH
(MOD.8015) Diesel/Direct/Inject
(M8015) Gas/Purge & Trap
Gasoline/BTEX & MTBE (M8015/8020)
BTEX & Chlorinated Aromatics (602/8020)
BTEX/MTBE/EDC & EDB (8020/8010/Short)
Chlorinated Hydrocarbons (601/8010)
504 EDB ☐ / DBCP ☐
Polynuclear Aromatics (610/8310)
Volatile Organics (624/8240) GC/MS
Volatile Organics (8260) GC/MS
Pesticides/PCB (608/8080)
Herbicides (615/8150)
Base/Neutral/Acid Compounds GC/MS (625/8270)
General Chemistry
Priority Pollutant Metals (13)
Target Analyte List Metals (23)
RCRA Metals (8)
RCRA Metals by TCLP (Method 1311)

PROJECT INFORMATION	
PROJ. NO.:	
PROJ. NAME: IBRemediation	
P.O. NO.:	
SHIPPED VIA: Greyhound	

SAMPLE RECEIPT	
NO. CONTAINERS	14
CUSTODY SEALS	Y N / NA
RECEIVED INTACT	Y
BLUE ICE/ICE	2.8°C

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

CERTIFICATION REQUIRED: ☐ NM ☐ OTHER

METHANOL PRESERVATION ☐

COMMENTS:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.
Signature: Time: 2:20 MST	Signature: Time:
Printed Name: Date: Jenelle Vierzbicki 12/27/95	Printed Name: Date:
Company: Marathon Oil	Company:
RECEIVED BY: 1.	**RECEIVED BY: (LAB) 2.**
Signature: Time:	Signature: Time: 1210
Printed Name: Date:	Printed Name: Date: Andrew Parker 12/28
Company:	Analytical Technologies of New Mexico

Analytical**Technologies** of New Mexico, Inc.
Albuquerque, New Mexico

Interlab Chain of Custody

5124T1

DATE: 12/28 PAGE: 1 OF 1

NETWORK PROJECT MANAGER: KIMBERLY D. McNEILL

COMPANY: **Analytical Technologies of New Mexico, Inc.**
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:
Kim McNeill

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Gen Chemistry: Cl only	NUMBER OF CONTAINERS
512408-01	12/27	11:44	AQ	1	X	1
-02	↓	12:18	↓	2	X	1
-03	↓	12:54	↓	3	X	1

Metals - TAL; Metals - PP List; Metals - RCRA; RCRA Metals by TCLP (1311); TOX; TOC; Oil and Grease; BOD; COD; Pesticides/PCB (608/8080); Herbicides (615/8150); Base/Neutral Acid Compounds GC/MS (625/8270); Volatile Organics GC/MS (624/8240); Polynuclear Aromatics (610/8310); 8240 (TCLP 1311) ZHE; 8270 (TCLP 1311); TO-14; Gross Alpha/Beta

PROJECT INFORMATION

PROJECT NUMBER: 512408
PROJECT NAME: IB Remediation
QC LEVEL: (STD.) IV
QC REQUIRED: (MS) MSD BLANK
TAT: (STANDARD) RUSH!

IWO # KM1074

DUE DATE: 12/28
RUSH SURCHARGE:
CLIENT DISCOUNT:
SPECIAL CERTIFICATION REQUIRED: ☐YES ☐NO

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS	
INTACT?	
RECEIVED GOOD COND./COLD	
LAB NUMBER	

SAMPLES SENT TO:	
SAN DIEGO	
FT. COLLINS	
RENTON	
PENSACOLA	
PORTLAND	
PHOENIX	X

RELINQUISHED BY: 1.
Signature: Andrew Parker Time: 1700
Printed Name: Andrew Parker Date: 12/28
Analytical Technologies of New Mexico, Inc. Albuquerque

RECEIVED BY: 1.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY: (LAB) 2.
Signature: Heather L Ceschker Time: 1010
Printed Name: Heather L Ceschker Date: 12/29/95
Company:

APPENDIX E

STATE ENGINEER OFFICE FLUID RECOVERY REPORTS

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

November 14, 1995

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of October. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Monday, November 6, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	10/2/95 Meter Reading	11/6/95 Meter Reading	Oct-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-58	10239118	0	gal	26922	0	7437047	7437047	0	7463969
MW-59	10259114	0	bbl	83454	0	151439	154968	148230.6	6592122.6
MW-61A	10239116	0	gal	130850	0	8823592	9274047	450454.7	9404896.7
MW-62	10239115	0	gal	256553	0	6551836	6762822	210985.5	7019374.5
MW-65A	10239117	0	gal	39774	10000000	637182	794162	156980.2	10833936
MW-68	2209213	122618	gal	2484076	0	4961831	5191233	229402.4	7552691.4
MW-72	2881532	470	gal	12032816	0	13356733	14284010	927276.6	14283539.6
MW-75	2877269	1291	bbl	0	0	18657	31300	531010.2	1260382.2
TOTAL									64410912.2

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Monday, November 6, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	10/2/95 Meter Reading	11/6/95 Meter Reading	Oct-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-1	-	-	gal	6713	0	-	-	0	6713
MW-13	2209212	98236	gal	243999	0	226324	226324	0	243999
MW-14	2209214	0	gal	398391	0	398204	398204	0	398391
MW-21	-	-	gal	189	0	-	-	0	189
MW-35	2209212	1882	gal	98303	0	-	-	0	98303
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0
MW-51	2209214	398208	gal	0	0	398208	398208	0	0
MW-69	-	-	-	80916	0	-	-	1403	82319
TOTAL									829914

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. M. Schweser
File 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

December 4, 1995

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of November. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Monday, December 4, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	11/6/95 Meter Reading	12/4/95 Meter Reading	Nov-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-58	10239118	0	gal	26922	0	7437047	7437047	0	7463969.0
MW-59	10259114	0	bbl	83454	0	154968	158266	138482	6730605.0
MW-61A	10239116	0	gal	130850	0	9274047	9683956	409909	9814806.1
MW-62	10239115	0	gal	256553	0	6762822	6957428	194606	7213980.8
MW-65A	10239117	0	gal	39774	10000000	794162	926253	132091	10966027.0
MW-68	2209213	122618	gal	2484076	0	5191233	5376727	185493	7738184.8
MW-72	2881532	470	gal	12032816	0	14284010	14964176	680166	14963705.5
MW-75	2877269	1291	bbl	0	0	31300	45575	599558	1859940.6
MW-81	209292	0	gal	0	0	0	101168	101168	101168.0
TOTAL									67152384.8

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Monday, December 4, 1995.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	11/6/95 Meter Reading	12/4/95 Meter Reading	Nov-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)
MW-1	-	-	gal	6713	0	-	-	0	6713
MW-13	2209212	98236	gal	243999	0	226324	226324	0	243999
MW-14	2209214	0	gal	398391	0	398204	398204	0	398391
MW-21	-	-	gal	189	0	-	-	0	189
MW-35	2209212	1882	gal	98303	0	-	-	0	98303
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0
MW-51	2209214	398208	gal	0	0	398208	398208	0	0
MW-69	-	-	-	82319	0	-	-	1109	83428
TOTAL									831023

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. M. Schweser
File 576-01

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

January 15, 1996

Mr. Ramon Torres
State Engineer Office
1900 West Second Street
Roswell, New Mexico 88201

RE: Report for SEO permits RA-5131 and RA-8015

Dear Mr. Torres:

This is a report for SEO permits RA-5131 and RA-8015 for the month of December. The following table indicates recorded meter readings for fluid removed from Lower Queen recovery wells under permit RA-5131 as of Tuesday, January 2, 1996.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	12/4/95 Meter Reading	1/2/96 Meter Reading	Dec-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)	Cumulative Fluid Removed (Acre ft)
MW-58	10239118	0	gal	26922	0	7437047	removed	0	7463969.0	22.9
MW-59	10259114	0	bbl	83454	0	158266	removed	0	6730605.0	20.7
MW-61A	10239116	0	gal	130850	10000000	9683956	66727	382770	10197576.5	31.3
MW-62	10239115	0	gal	256553	0	6957428	removed	0	7213980.8	22.1
MW-65A	10239117	0	gal	39774	10000000	926253	1146166	219913	11185940.2	34.3
MW-68	2209213	122618	gal	2484076	0	5376727	5542343	165617	7903801.3	24.3
MW-72	2881532	470	gal	12032816	0	14964176	15777312	813137	15776842.2	48.4
MW-75	2877269	1291	bbl	0	0	45575	59629	590255	2450196.0	7.5
MW-81	203092	0	gal	0	1000000	401166	223062	821896	1223062.0	3.8
MW-82	203095	0	gal	0	0	0	255052	255052	255052.0	0.8
MW-83	203091	0	gal	0	0	0	368115	368115	368115.0	1.1
TOTAL									70769140	217.2

The following table indicates recorded meter readings for fluid removed from Shallow zone recovery wells under permit RA-8015 as of Tuesday, January 2, 1996.

Recovery Well	Meter Serial Number	Initial Meter Start	Meter Units	Previously Metered Fluid Removed (gal)	Meter Turnover Additional Fluid Removed (gal)	12/4/95 Meter Reading	1/2/96 Meter Reading	Dec-95 Fluid Removed (gal)	Per-well Cumulative Fluid Removed (gal)	Cumulative Fluid Removed (Acre ft)
MW-1	-	-	gal	6713	0	-	-	0	6713	0.02
MW-13	2209212	98236	gal	243999	0	226324	removed	0	243999	0.75
MW-14	2209214	0	gal	398391	0	398204	removed	0	398391	1.22
MW-21	-	-	gal	189	0	-	-	0	189	0.00
MW-35	2209212	1882	gal	98303	0	-	-	0	98303	0.30
MW-45	10239114	2421861	gal	0	0	2421861	2421861	0	0	0.00
MW-51	2209214	398208	gal	0	0	398208	398208	0	0	0.00
MW-69	-	-	-	83428	0	-	-	592	84020	0.26
TOTAL									831618	2.55

If you have any questions or require additional information, please contact me (915-687-8312).

Sincerely,

Robert J. Menzie, Jr.
Advanced Environmental Representative

c: C. K. Curlee
T. L. Guillory
C. M. Schweser
File 576-01