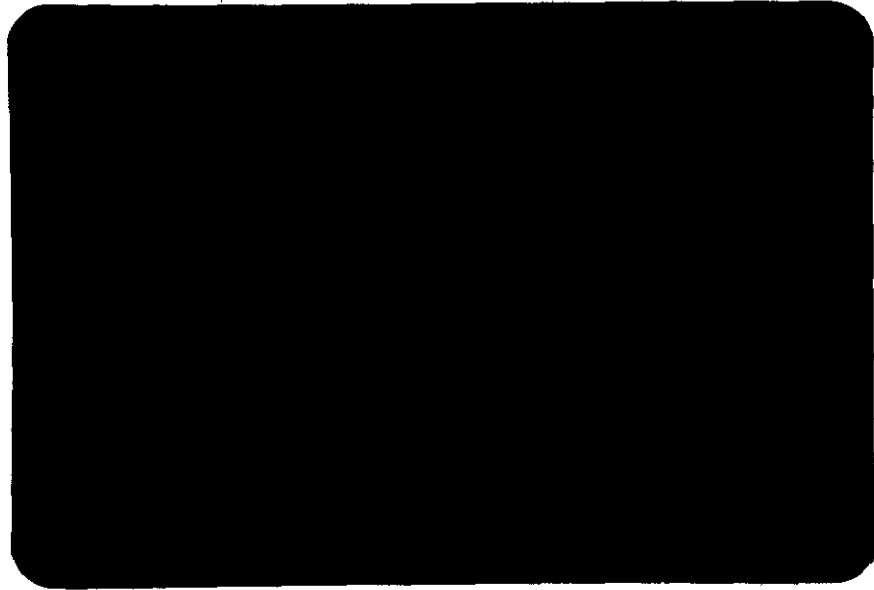


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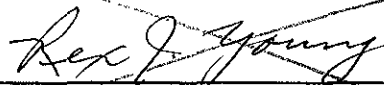
1500 So. Union Avenue
Bakersfield, California 93307
Phone: (805) 835-7700
FAX: (805) 835-7717

**MALIBU GRAND PRIX
8,000 South Coliseum Way
Oakland, California**

**GROUND WATER MONITORING REPORT
THIRD QUARTER 1993
October 12, 1993**

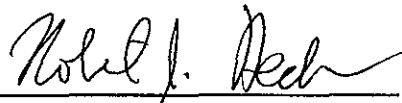
Report Prepared for:
Mr. Barney Chan
Alameda County Department of Environmental Health
Hazardous Materials Division
Oakland, California 94621

By
RESNA INDUSTRIES, INC.



Rex J. Young, R.G. #720
Principal Manager

no longer w/ RESNA



Robert J. Becker, R.G. #5076
Professional Services Supervisor

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EXECUTIVE SUMMARY

Ground water monitoring wells at the Race Track and at the Castle sites were sounded for depth on August 19 and sampled on August 20, 1993. Water table elevations in monitoring wells MW-1 and MW-8, the wells farthest east in the two parking lots, remain higher than elevations in the rest of the well array and continue to define a gradient toward the west. The plume of benzene-impacted ground water in the Castle parking lot has changed again, larger in aerial extent and involving a different array of MWs, since the last monitoring event. Certain monitoring wells down gradient from the former tank locations show ground water impaction by gasoline constituents intermittently.

1.0 INTRODUCTION

RESNA has performed Third Quarter, 1993, monitoring of the ground water at the Malibu Grand Prix Race Track and Castle areas, 8,000 South Coliseum Way, Oakland, California (Plate 1). This report reviews the past history of the site, gives the results of the analysis of ground water samples, and interpretation of findings.

2.0 BACKGROUND

Malibu Grand Prix (MGP) operates two adjacent amusement park facilities, a Racetrack for midget cars and a Fun Center with miniature golf and batting cages on leased property at 8,000 South Coliseum Way, Oakland (Plates 1 & 2). Prior to 1989, the MGP facility maintained two 6,000 gallon underground storage tanks containing marine mix gasoline. The tanks were located in the parking lots adjacent to the MGP Castle and Race Track. The tanks were removed on March 29, 1989 and February 1, 1990 respectively. Closure reports were submitted to the Alameda County Department of Environmental Health with all relevant waste manifests and analysis results. On June 29, 1989 a letter from Alameda County was sent to Malibu Grand Prix Corp. requiring an initial site investigation to determine the extent of soil and ground water contamination present at the MGP Castle while a verbal request was issued for an assessment at the Race Track at the time of the removal. The site assessment at the Castle began on September 21, 1989 and a report was issued on November 15, 1989 recommending further assessment work. The assessment work at the Race Track, and the continued assessment at the Castle began on June 12, 1990. Monitoring Wells 1 through 10 were sampled July 17, 1991. Four additional monitoring wells (MWs) at the Castle and four additional MWs at the Race Track were constructed on August 27-30, 1991. All monitoring wells, MW-1 through -18, were sampled October 9, 10, 11, 1991 for water analyses and pump tests and slug tests were performed on selected wells. Ground water table measurement-data are interpreted to reflect tidal effects and inhomogeneity of the backfill material underlying this site. The analyses of water and sludge samples collected December 2, 1992, from the drainage ditches on the north and west sides of the site indicate that the ditches are not impacted adversely by effluent ground water from the MGP site. A total of twenty borings were made February 9, 10, 11, and August 19, 20, 1993, in the areas of the former USTs to further define the extent of soil impaction and facilitate remediation plans for the soil.

3.0 GROUND WATER MONITORING PROCEDURES

The stabilized water depth was measured in each well with an electrical measuring tape and the depths were recorded on site prior to sampling. During sampling, which followed depth measurement, the wells were purged of three well volumes of water, or until dry, with a bailer and submersible electric pump. A split sample (two simultaneous samples) was taken with a disposable bailer following purging of each well. Samples were labeled and chilled for transporting a State certified laboratory under chain of custody. Purged water was stored on site in marked containers. Sampling procedures are described in Appendix B.

4.0 FINDINGS

4.1 Water Samples Analyses

Water samples collected from the ground water monitoring wells were analyzed for benzene, toluene, ethylbenzene and xylenes plus total petroleum hydrocarbons as gasoline (BTEX-TPHg). Analyses were performed by BC Laboratories of Bakersfield, California. Lines of equal concentrations of TPHg are shown on Plate 2; benzene concentrations are contoured on Plate 3.

Some of the monitoring wells down gradient from the former tank locations, e.g. MW-3, -7, -9, and -13, show ground water impaction by gasoline at much different levels of concentration each time they are sampled, sometimes decreasing to Not Detected (ND). Tidal influences from the ditches adjacent to the site and inhomogeneities in the underlying fill material are possible reasons for the variations in the hydrocarbon concentration levels and the lateral extent of the ground water plumes. Analyses results are presented in Table 1. Laboratory reports are in Appendix A.

I don't buy this explanation

TABLE 1

MALIBU GRAND PRIX -- OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

Well #	Date	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg
MW-1	09/22/89	410	1800	1100	7100	35000
	06/14/90	.66	<.05	1.3	2.3	210
	07/17/91	<.05	.06	<.05	<.05	270
	10/09/91	<.05	<.05	<.05	<.05	370
	08/05/92	<0.5	<0.5	<0.5	<0.5	600
	12/02/92	<0.5	<0.5	<0.5	<0.5	190
	02/11/93	<0.5	<0.5	<0.5	<0.5	75
	05/26/93	<0.5	<0.5	<0.5	<1.0	110
	08/20/93	<0.5	<0.5	<0.5	<1.0	70
MW-2	09/22/89	<.05	<.05	<.05	<.05	<50
	06/14/90	<.05	<.05	<.05	<.05	<50
	07/17/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	<.05	<50
	08/05/92	<0.5	<0.5	<0.5	<0.5	<50
	12/01/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	0.8	<0.5	0.6	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	1.5	<1.0	<50
MW-3	09/22/89	1.2	<.05	<.05	<.05	<50
	06/14/90	0.90	4	<.05	<.05	<50
	07/17/91	3.8	<.05	<.05	<.05	<50

TABLE 1 - CONTINUED

MALIBU GRAND PRIX - OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

Well #	Date	Benzene	Toluene	Ethly- benzene	Total Xylenes	TPHg
	10/10/91	<.05	<.05	<.05	<.05	<50
	08/05/92	9.7	1.4	1.0	0.9	110
	12/02/92	1.3	ND	ND	0.84	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	2.6	<0.5	<0.5	<1.0	<50
	08/20/93	0.7	0.5	<0.5	1.6	<50
MW-4	09/22/89	410	430	78	324	4000
	06/14/90	200	3.7	1.2	9.5	660
	07/17/91	49	4.3	1.5	38	1100
duplicate	07/17/91	45	2.7	1.0	33	1000
	10/09/91	0.8	<.05	<.05	<.05	88
	08/05/92	11	8.9	2.4	4.7	5800
	12/02/92	6.5	4.3	0.6	1.4	1500
	02/11/93	6.6	1.1	0.8	2.4	2000
	05/26/93	<0.5	<0.5	13	49	1500
	08/20/93	1.8	<0.5	<0.5	1.4	1100
MW-5	06/14/90	<.05	<.05	<.05	<.05	<50
	07/17/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	<.05	110
	08/05/92	<0.5	<0.5	2.0	0.9	210
	12/02/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	72
	08/20/93	<0.5	<0.5	<0.5	1.0	61
MW-6	06/14/90	73	<.05	17	29.7	1800
	07/17/91	7.4	<.05	<.05	5.6	1200
	10/09/91	<.05	<.05	<.05	<.05	<50
	08/05/92	1.4	<0.5	12	4.1	1900
	12/01/92	<0.5	<0.5	2.5	1.3	140
	02/11/93	1.1	<0.5	<0.5	1.9	970
	05/26/93	0.6	<0.5	1.9	10.0	230
	08/20/93	<0.5	<0.5	0.91	4.9	140
MW-7	06/14/90	0.84	<.05	1.2	1.8	58
	07/17/91	12	1.7	4.7	3.8	120
	10/09/91	<.05	<.05	<.05	<.05	<50
	08/05/92	<0.5	<0.5	0.6	<0.5	<50
	12/01/92	0.9	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	3.6	<0.5	200
	05/26/93	<0.5	0.7	<0.5	3.5	78
	08/20/93	7.2	1.2	<0.5	2.1	63

TABLE 1 - CONTINUED

MALIBU GRAND PRIX - OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

Well #	Date	Benzene	Toluene	Ethly- benzene	Total Xylenes	TPHg
MW-8 duplicate	06/14/90	680	36	150	1060	13000
	07/17/91	330	1.8	1.7	3.6	1300
	10/10/91	3.1	0.6	0.7	<.05	76
	10/10/91	3.2	0.6	0.7	<.05	72
	08/05/92	35	1.2	0.6	2.4	1700
	12/02/92	5.5	0.9	<0.5	1.8	450
	02/11/93	77	<0.5	11	11	2000
	05/26/93	130	4.8	1.9	<1.0	670
	08/20/93	0.71	<0.5	<0.5	<0.5	230
MW-9	06/14/90	12	0.78	4.5	2.54	3200
	07/17/91	3.4	<.05	<.05	<.05	87
	10/10/91	1.8	<.05	<.05	<.05	100
	08/05/92	1.7	<0.5	<0.5	1.3	150
	12/02/92	1.3	<0.5	<0.5	<0.5	62
	02/11/93	0.7	ND	ND	ND	55
	05/26/93	0.6	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	<0.5	<1.0	<50
MW-10	06/14/90	20	.69	4.3	7.7	400
	07/17/91	4.2	<.05	<.05	<.05	290
	10/10/91	<.05	<.05	<.05	<.05	90
	08/05/92	<0.5	<0.5	<0.5	<0.5	790
	12/02/92	<0.5	<0.5	<0.5	<0.5	85
	02/11/93	23	ND	14	11	1000
	05/26/93	<0.5	<0.5	<0.5	<1.0	130
	08/20/93	<0.5	0.5	<0.5	<1.0	180
MW-11	10/09/91	<.05	1.2	1.0	6.4	430
	08/05/92	<0.5	<0.5	3.2	3.2	580
	12/01/92	<0.5	<0.5	2.2	1.5	140
	02/11/93	1.2	<0.5	3.0	1.8	340
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	<0.5	<1.0	<50
MW-12	10/09/91	<.05	2.6	0.8	5.1	1500
	08/05/92	<0.5	<0.5	9.1	1.1	53
	12/01/92	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	210
	08/20/93	<0.5	<0.5	<0.5	1.7	540
MW-13	10/09/91	<.05	0.9	0.6	3.0	720
	08/05/92	<0.5	2.7	<0.5	0.69	1400

TABLE 1 - CONTINUED

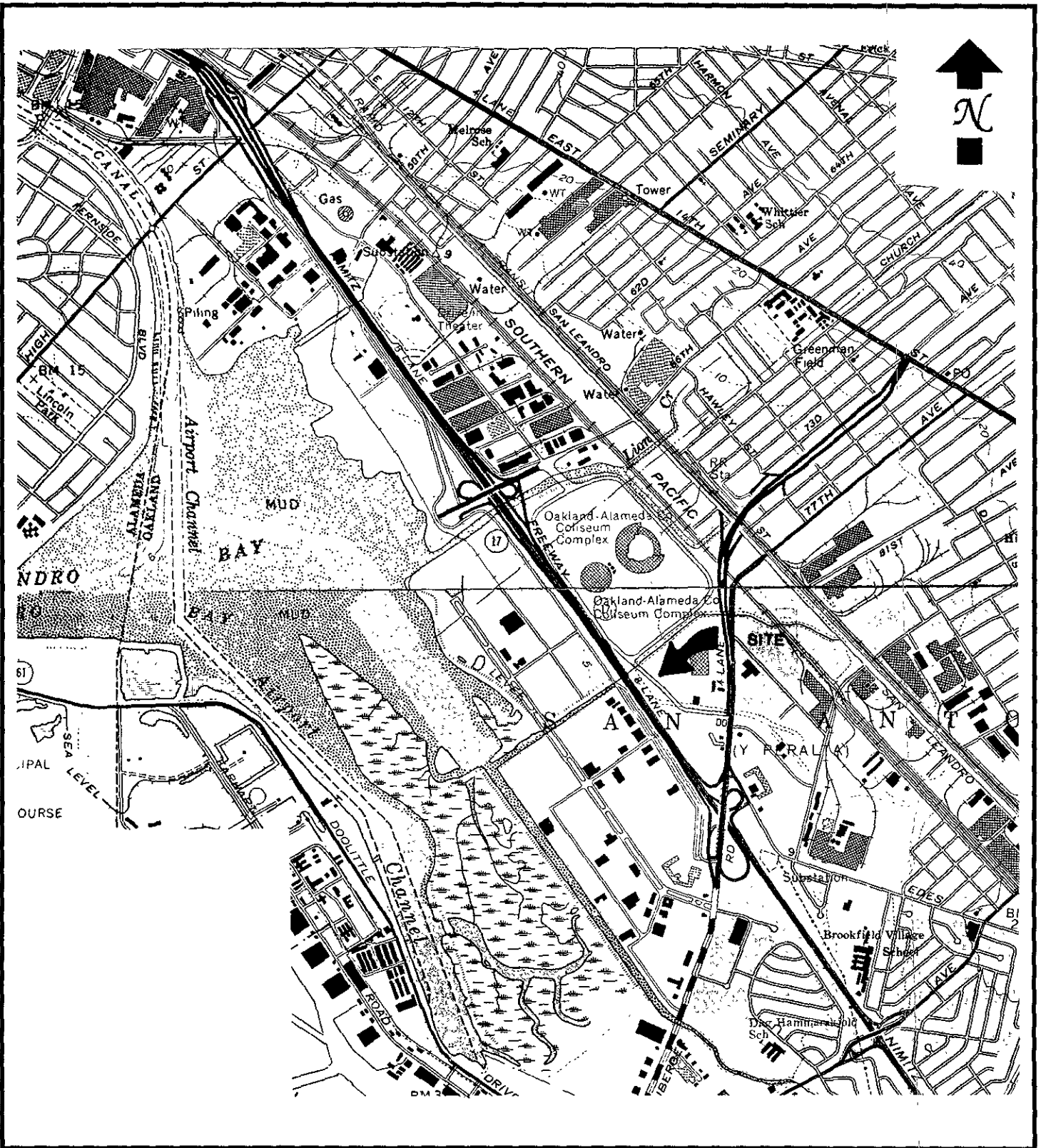
MALIBU GRAND PRIX - OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

Well #	Date	Benzene	Toluene	Ethly- benzene	Total Xylenes	TPHg
duplicate	08/05/92	<0.5	3.0	<0.5	0.7	1100
	12/01/92	<0.5	2.9	<0.5	0.9	670
	02/11/93	4.1	0.9	<0.5	<0.5	600
	05/26/93	<0.5	<0.5	<0.5	<1.0	220
	08/20/93	0.6	0.5	<0.5	<1.0	230
MW-14 hydropunch	08/27/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	0.9	<50
	08/05/92	<0.5	<0.5	<0.5	<0.5	<50
	12/01/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	0.5	<0.5	<1.0	<50
MW-15	10/10/91	<.05	<.05	<.05	<.05	<50
	08/05/92	0.8	<0.5	<0.5	<0.5	<50
	12/02/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	77
	08/20/93	<0.5	<0.5	<0.5	<1.0	56
MW-16	10/09/91	<.05	<.05	<.05	<.05	78
	08/05/92	<0.5	<0.5	<0.5	<0.5	<50
	12/02/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	<0.5	<1.0	<50
MW-17	10/09/91	<.05	<.05	<.05	<.05	<50
	08/05/92	<0.5	<0.5	<0.5	<0.5	<50
	12/02/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	<0.5	<1.0	<50
MW-18	10/09/91	<.05	<.05	<.05	<.05	<50
	08/05/92	<0.5	<0.5	<0.5	<0.5	<50
	12/02/92	<0.5	<0.5	<0.5	<0.5	<50
	02/11/93	<0.5	<0.5	<0.5	<0.5	<50
	05/26/93	<0.5	<0.5	<0.5	<1.0	<50
	08/20/93	<0.5	<0.5	<0.5	<1.0	<50

4.2 Water Table Elevation Measurements

Tables of elevation and depth to water in the wells at the Race Track and Castle areas, measured August 19 1993, are tabulated in Plate 4 with the Water Table Contours. The depth to water in the MWs is affected by daily tides but the phase of the tide in the ground water below the parking lots was not determined on August 19. Relative to the daily, six-hour period between high and low tides, the data were collected from all of the Race Track MWs within a brief time interval, 29 minutes. The Castle MWs were measured and recorded in 46 minutes.

The water level in MW-1 in the Castle parking lot remains consistently high, suggesting there is still a nearby source of recharge to the water table, such as a possible leaking underground water pipe.



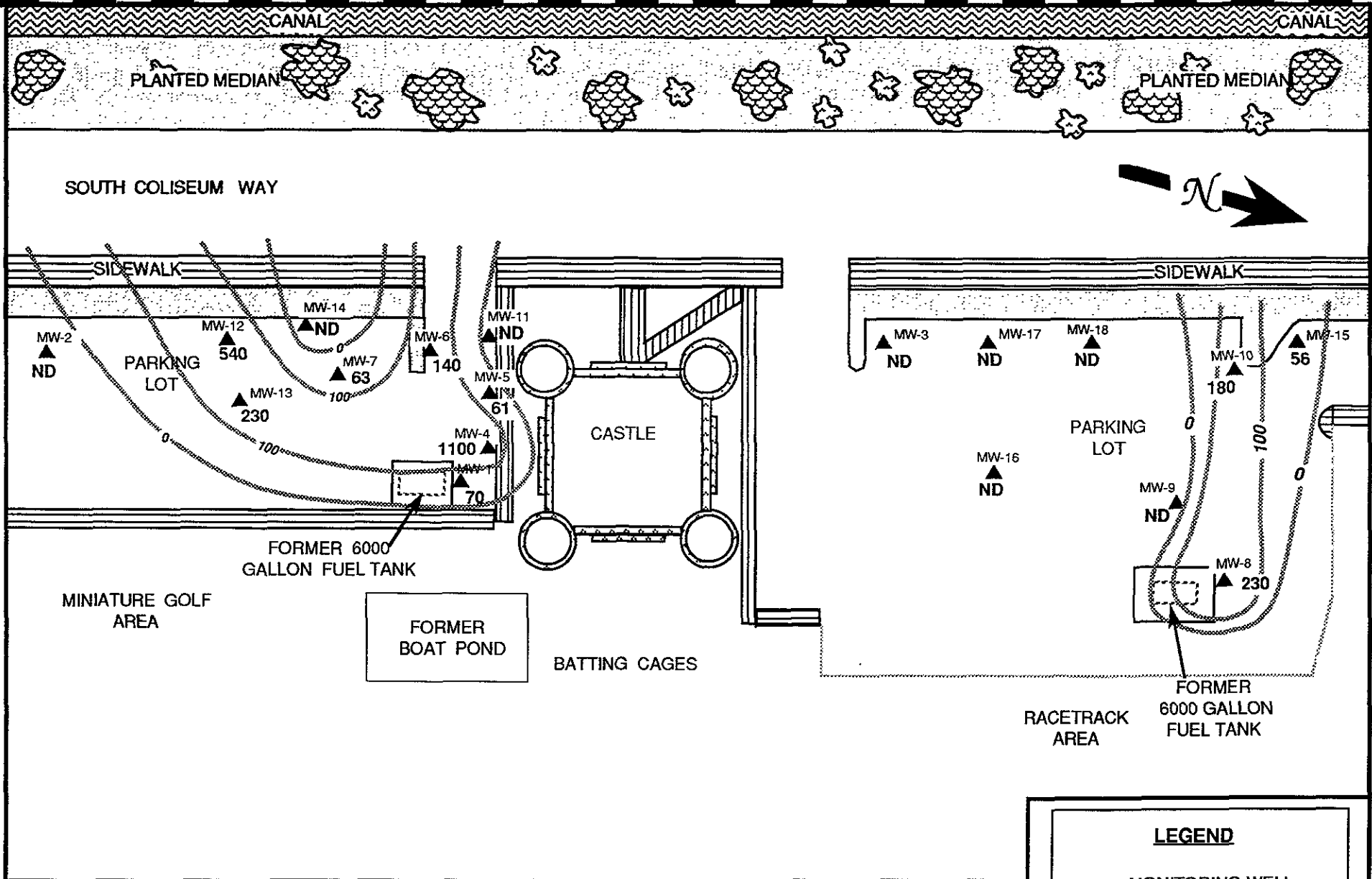
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DATE: 10-14-93
 PROJECT NO. B 2481.41

MALIBU GRAND PRIX
 8000 South Coliseum Way
 Oakland, California

LOCATION MAP

PLATE
1



RESNA
Working to Restore Nature

DATE: 10/6/93
 PROJECT NUMBER: B 2481-41

MALIBU GRAND PRIX
 8000 SOUTH COLISEUM WAY
 OAKLAND, CALIFORNIA

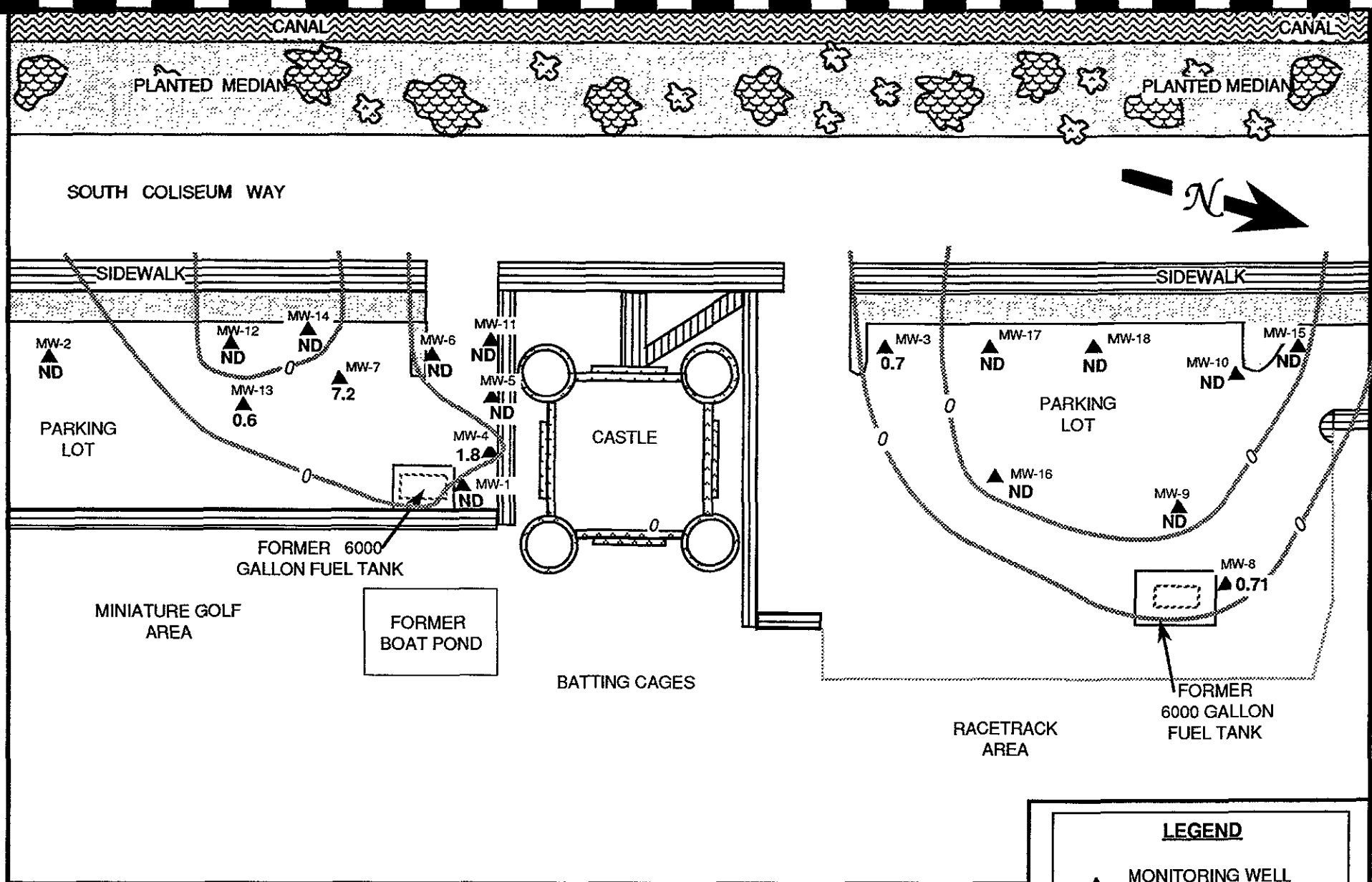
GROUNDWATER PLUME CONCENTRATIONS
 TPHg, ppb 8/20/93

PLATE
2

LEGEND

▲ MONITORING WELL LOCATION

SCALE
 ONE INCH = 50 FEET



RESNA
Working to Restore Nature

DATE: 10/6/93
PROJECT NUMBER: B 2481-41

MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

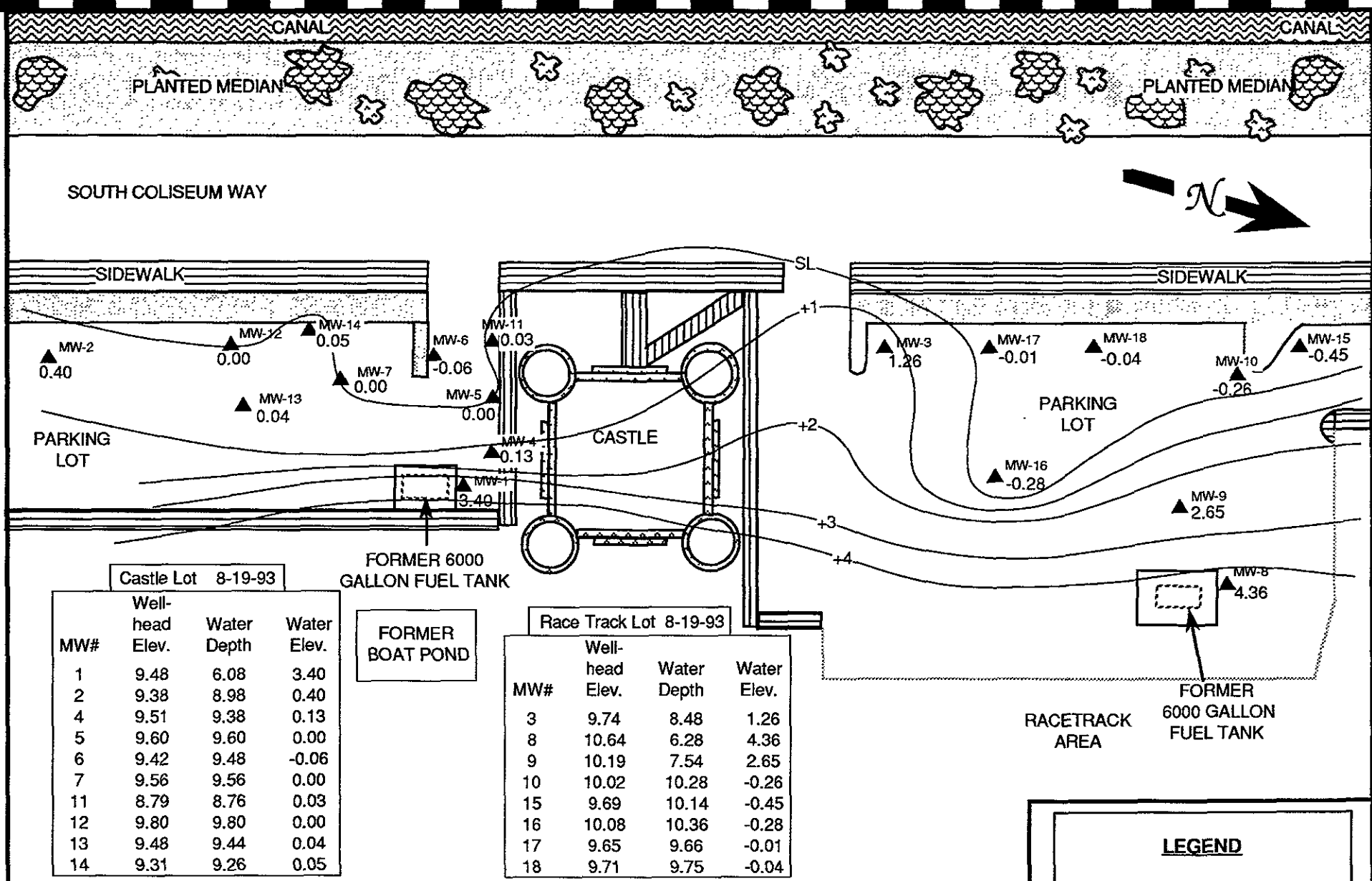
GROUNDWATER PLUME CONCENTRATIONS
BENZENE, ppb 8/20/93

PLATE
3

LEGEND

▲ MONITORING WELL LOCATION

SCALE
ONE INCH = 50 FEET



Castle Lot 8-19-93

MW#	Well-head Elev.	Water Depth	Water Elev.
1	9.48	6.08	3.40
2	9.38	8.98	0.40
4	9.51	9.38	0.13
5	9.60	9.60	0.00
6	9.42	9.48	-0.06
7	9.56	9.56	0.00
11	8.79	8.76	0.03
12	9.80	9.80	0.00
13	9.48	9.44	0.04
14	9.31	9.26	0.05

FORMER BOAT POND

Race Track Lot 8-19-93

MW#	Well-head Elev.	Water Depth	Water Elev.
3	9.74	8.48	1.26
8	10.64	6.28	4.36
9	10.19	7.54	2.65
10	10.02	10.28	-0.26
15	9.69	10.14	-0.45
16	10.08	10.36	-0.28
17	9.65	9.66	-0.01
18	9.71	9.75	-0.04

RACETRACK AREA
FORMER 6000 GALLON FUEL TANK

LEGEND

▲ MONITORING WELL LOCATIONS

SCALE
ONE INCH = 50 FEET

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DATE: 9-15-93
PROJECT NUMBER: B2481-42

MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

8-19-93 WATER TABLE CONTOURS
ELEVATION IN FEET ABOVE SEA LEVEL

PLATE
4

APPENDIX A

Laboratory Analyses Reports

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

PROJECT NO. B2481.41		PROJECT NAME/SITE MGP OAKLAND		ANALYSIS REQUESTED												P.O. #: A9654									
SAMPLERS <i>Mark G. Voris</i> (SIGN)		(PRINT) MARK G. VORIS		NO. CONTAINERS	SAMPLE TYPE	/												REMARKS							
SAMPLE IDENTIFICATION	DATE	TIME	COMP			GRAB	PRES. USED	ICED	BTEX (602/8020)	TPH _g (8015)	TPH _d (8015)	TOG 418 1/5520	601/8010	624/8240	625/8270										
-1 MW-1	8-20-93	9:55		X	HCl	Y	2	W	X	X															
-2 MW-2		9:30																							
-3 MW-3		7:45																							
-4 MW-4		10:15																							
-5 MW-5		9:45																							
-6 MW-6		10:10																							
-7 MW-7		9:50																							
-8 MW-8		8:25																							
-9 MW-9		8:10																							
-10 MW-10		8:20																							
-11 MW-11		9:40																							
-12 MW-12		10:00																							
-13 MW-13		10:05																							
-14 MW-14		9:35																							
-15 MW-15		8:15																							

RELINQUISHED BY: <i>Mark G. Voris</i>	DATE 8/20/93	TIME 5:00	RECEIVED BY: <i>T. Neal</i>	LABORATORY: BC LABS	PLEASE SEND RESULTS TO RESNA BAKERSFIELD
RELINQUISHED BY: <i>T. Neal</i>	DATE 8-23-93	TIME 12:41	RECEIVED BY:		
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	REQUESTED TURNAROUND TIME: NORMAL	
RELINQUISHED BY:	DATE 8-23-93	TIME 12:41	RECEIVED BY LABORATORY: <i>Jean Matisoff</i>	RECEIPT CONDITION:	PROJECT MANAGER: REX YOUNG

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

PROJECT NO. B2481.41		PROJECT NAME/SITE MGP OAKLAND						ANALYSIS REQUESTED														P.O. # A9654						
SAMPLERS <i>Mark G. Voris</i> (SIGN)		(PRINT) MARK G. VORIS						NO. CONTAINERS	SAMPLE TYPE	/														REMARKS				
SAMPLE IDENTIFICATION	DATE	TIME	COMP	GRAB	PRES. USED	ICED																						
16 MW-16	8-20-93	8:05		X	HCL	Y	2	W	X	X																		
17 MW-17		7:47					2																					
18 MW-18		8:00					2																					
19 TRAVEL BLANK							1																					
20 B-36-5	8-19-93	11:40		X			1	S																				
21 B-37-5		12:55		X																								
22 B-37-7		12:25		X																								
23 B-39-5	8-23-93	10:00		X																								
RELINQUISHED BY: <i>Mark G. Voris</i>	DATE 8/20/93	TIME 5:00	RECEIVED BY: <i>Ti Neal</i>	LABORATORY: BC LAB				PLEASE SEND RESULTS TO: RESNA BAKERSFIELD																				
RELINQUISHED BY: <i>Ti Neal</i>	DATE 8-23-93	TIME 12:47	RECEIVED BY:	REQUESTED TURNAROUND TIME: NORMAL																								
RELINQUISHED BY:	DATE:	TIME	RECEIVED BY:	RECEIPT CONDITION: <i>color & UV test</i>				PROJECT MANAGER: REX YOUNG																				
RELINQUISHED BY:	DATE 8-23-93	TIME 12:41	RECEIVED BY: <i>Jean Malotte</i>																									

REC
SEP 07 1993

Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-1

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-1, SAMPLED ON 08-20-93 @ 9:55AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
Collected:
08/20/93

Date Sample
Received @ Lab:
08/23/93

Date Analysis
Completed:
08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	70.	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Nutbeam
Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-2

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-2, SAMPLED ON 08-20-93 @ 9:30AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water


Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	1.5	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186


 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-3

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-3, SAMPLED ON 08-20-93 @
 7:45AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water


Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	0.7	µg/L	0.5
Toluene	0.5	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	1.6	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186


 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-4

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-4, SAMPLED ON 08-20-93 @ 10:15AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	1.8	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	1.4	µg/L	1.
Total Petroleum Hydrocarbons (gas)	1100.	µg/L	50.

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Stuart S. Cuttiam
 Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-5

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-5, SAMPLED ON 08-20-93 @ 9:45AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	1.0	µg/L	1.
Total Petroleum Hydrocarbons (gas)	61.	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Latham
Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-6

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-6, SAMPLED ON 08-20-93 @ 10:10AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water


Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	0.91	µg/L	0.5
Total Xylenes	4.9	µg/L	1.
Total Petroleum Hydrocarbons (gas)	140.	µg/L	50.

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 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-7

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-7, SAMPLED ON 08-20-93 @ 9:50AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	7.2	µg/L	0.5
Toluene	1.2	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	2.1	µg/L	1.
Total Petroleum Hydrocarbons (gas)	63.	µg/L	50.

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 Department Supervisor

BC

LABORATORIES

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-8

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-8, SAMPLED ON 08-20-93 @
 8:25AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	0.71	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	230.	µg/L	50.

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Stuart S. Buttram
 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-9

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-9, SAMPLED ON 08-20-93 @ 8:10AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Nuttram
 Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-10

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-10, SAMPLED ON 08-20-93 @ 8:20AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	0.5	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	180.	µg/L	50.

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Stuart S. Pittman
Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-11

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-11, SAMPLED ON 08-20-93 @ 9:40AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected:	Date Sample Received @ Lab:	Date Analysis Completed:
08/20/93	08/23/93	08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart J. Pittman
 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-12

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-12, SAMPLED ON 08-20-93 @ 10:00AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected:	Date Sample Received @ Lab:	Date Analysis Completed:
08/20/93	08/23/93	08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	1.7	µg/L	1.
Total Petroleum Hydrocarbons (gas)	540.	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Buttram
 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-13

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-13, SAMPLED ON 08-20-93 @ 10:05AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:
 08/20/93

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	0.6	µg/L	0.5
Toluene	0.5	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	230.	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Costello
 Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-14

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-14, SAMPLED ON 08-20-93 @ 9:35AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/26/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	0.5	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Cuttman
Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-15

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-15, SAMPLED ON 08-20-93 @ 8:15AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/27/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	56.	µg/L	50.

California D.O.H.S. Cert. #1186

Stuart S. Buttram
Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-16

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-16, SAMPLED ON 08-20-93 @ 8:05AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/27/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

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Department Supervisor



Purgeable Aromatics

RESNA
1500 S. UNION AVENUE
BAKERSFIELD, CA 93307
Attn.: REX YOUNG 805-835-7700

Date of
Report: 08/31/93
Lab #: 93-08502-17

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-17, SAMPLED ON 08-20-93 @ 7:47AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93
Date Sample Received @ Lab: 08/23/93
Date Analysis Completed: 08/27/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

California D.O.H.S. Cert. #1186

Steven S. Nuttram
Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-18

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: MW-18, SAMPLED ON 08-20-93 @ 8:00AM BY MARK G. VORIS.

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample Collected: 08/20/93	Date Sample Received @ Lab: 08/23/93	Date Analysis Completed: 08/27/93
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<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

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Stewart S. Rutnam
 Department Supervisor

Purgeable Aromatics

RESNA
 1500 S. UNION AVENUE
 BAKERSFIELD, CA 93307
 Attn.: REX YOUNG 805-835-7700

Date of
 Report: 08/31/93
 Lab #: 93-08502-19TB

Sample Description: PROJECT #B2481.41 PROJECT MGP OAKLAND: TRAVEL BLANK

TEST METHOD: TPH by D.O.H.S. / L.U.F.T. Manual Method - Modified EPA 8015
 Individual constituents by EPA Method 5030/8020.

Sample Matrix: Water

Date Sample
 Collected:

Date Sample
 Received @ Lab:
 08/23/93

Date Analysis
 Completed:
 08/27/93

<u>Constituents</u>	<u>Analysis Results</u>	<u>Reporting Units</u>	<u>Minimum Reporting Level</u>
Benzene	None Detected	µg/L	0.5
Toluene	None Detected	µg/L	0.5
Ethyl Benzene	None Detected	µg/L	0.5
Total Xylenes	None Detected	µg/L	1.
Total Petroleum Hydrocarbons (gas)	None Detected	µg/L	50.

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 Department Supervisor

APPENDIX B

Quality Assurance and Quality Control Program—Sampling Protocol

1500 So. Union Avenue
Bakersfield, California 93307
Phone: (805) 835-7700
FAX: (805) 835-7717

**RESNA INDUSTRIES INC.
1500 SOUTH UNION AVENUE
BAKERSFIELD, CALIFORNIA 93307**

**SAMPLING PROTOCOL
QUALITY ASSURANCE & QUALITY CONTROL**

(QAQC)

Revised April 1991

SAMPLING PROTOCOL - QUALITY ASSURANCE AND QUALITY CONTROL

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SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

RESNA Industries Inc. (RESNA) has adopted the following Site Investigation Quality Assurance/Quality Control (QA/QC) program intended to facilitate the acquisition of accurate and reliable data. Environmental data gathered during the investigation shall be collected and analyzed following procedures prescribed in the Quality Control Program. A Quality Assurance Program has been established to assure that the Quality Control Program is effective. Both programs are necessary to provide accurate data and documentation for investigations and laboratory analyses. The following field and laboratory procedures shall be implemented to ensure that QA/QC objectives are met.

1.0 RECORDING OF FIELD DATA

All information pertinent to the field investigation shall be kept in a field log book. In addition, boring log and chain-of-custody comprise the field documents in which all of the pertinent information about bore hole soil samples are recorded. Information to be documented includes at least the following:

- Sample number.
- Locations of sample collection.
- Soil boring or well numbers, as applicable.
- Depths at which samples were obtained.
- Names of collectors.
- Dates and times of collection.
- Purpose of sample.
- Sample distribution (e.g., laboratory, archive, etc.).
- Field observations.
- Field measurements (e.g., PID readings, pH, conductivity, water levels).
- Other data records (e.g., development log, soil sampling report, well log, etc.).

2.0 SAMPLE CONTAINERS

Groundwater samples shall be placed in containers supplied by RESNA or an analytical laboratory. Table 1 summarizes the required sample containers.

Soil samples shall be collected in either 8-ounce widemouth glass jars with screw-on caps lined with teflon or in brass or stainless steel tubes (Table 1). Screw-on caps for the tubes shall be fitted with teflon liners. Tubes shall be tightly capped and sealed with integrity tape.

3.0 QUALITY CONTROL OF WATER SAMPLES

A QC program independent from the laboratory's program shall be maintained. The program entails submittals of travel blanks, duplicates, and field blanks to a certified laboratory. No spiked samples shall be supplied from the field; the laboratory in-house QC program shall include analysis of spiked samples. Field blanks shall be assigned independent sample numbers and made indistinguishable from non quality control samples.

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3.1 Travel Blanks

When sampling groundwater, travel blanks shall be used to detect the introduction of contaminants during transportation from the field to the laboratory. The travel blanks shall be provided by RESNA or the analytical laboratory. They shall be taken to the field and accompany the collected groundwater samples to the laboratory for analysis. The blanks shall consist of deionized water or analytically confirmed organic-free water. The blank is numbered, packaged, and sealed in the same manner as the other samples.

3.2 Duplicates

Five percent (1 in 20) or one (1) per sampling set, whichever is more, shall be submitted to the laboratory for analysis as duplicates. Therefore, if a job site has one (1) and up to twenty (20) wells to be sampled, one (1) duplicate shall be analyzed. If twenty-one (21) wells are to be sampled then two (2) duplicates shall be analyzed. The duplicate is acquired by filling two sample bottles from the same well bailer. If more than one bailer volume is required, each bailer volume shall be split between containers. The duplicates shall be labeled as duplicate without identifying the actual well location either on the chain-of-custody or on the actual sample. The actual well location of the duplicate shall be noted in the field log book.

3.3 Field Blanks

Field blanks shall be prepared and submitted to the analytical laboratory for analysis on the same frequency stated for duplicates. A field blank shall be acquired by sampling the deionized water used to rinse the sampling bailer in between sample points.

3.4 Sample Preservation

Sample containers shall be pre-cooled and transported to the site in coolers. All samples shall be preserved as indicated on Table 1 and placed in coolers immediately after collection. Sealed chemical ice shall be used in the coolers to maintain samples at a temperature of 4 degrees celsius. A high level recording thermometer shall accompany the samples during transport conditions.

4.0 GROUNDWATER SAMPLING PROTOCOL

Immediately prior to sampling, the depth to water (DTW) in the well shall be recorded. If there is free product in the well, the thickness of product on top of the groundwater shall be measured using an interface probe.

If free product is detected, analysis of groundwater at the interface for dissolved product shall not be conducted. A product sample shall be collected for source identification. If all free product cannot be removed, an interval-specific sampling device may be utilized to collect a sample from below the

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zone of free product. The well shall be purged until indicator parameters (temperature, conductivity and pH) are stabilized. This shall entail the removal of at least four well-casing volumes by bailing or pumping. The criteria for determining well-casing volumes and temporary storage of purged water is outlined in Section 9.0, (Well Development Protocol). The indicator parameter measurements shall be taken both before and after purging of each well-casing volume. Once the well is purged and indicator parameters have stabilized, a sample may be collected after the water level has reached 80 percent of its initial elevation. Where water level recovery is slow, the sample may be collected after stabilization is achieved and enough water is present to fill sample containers.

Cross contamination from transferring pumps (or bailers) from well to well shall be avoided by utilizing dedicated equipment. Where this is not feasible, thorough cleaning of equipment shall be performed between sampling rounds. Sampling shall proceed from the least contaminated to the most contaminated well, if that information is available before sample collection, or if it is indicated by field evidence. Where several types of analysis shall be performed for a given well, individual samples shall be collected in the following order:

1. Volatile organics
2. Purgeable organics
3. Purgeable organic halogens
4. Total organics
5. Total organic halogens
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide

The specific analytical methods to be utilized for the common volatile/semi-volatile analyses are shown on Table 2.

Duplicate samples shall be transferred to vials or containers that meet Regional Board specifications (Table 1). Groundwater from the bailer shall be transferred to the sample container by allowing the fluid to flow slowly along the sides of the vessel. All containers shall be filled above the top of the opening to form a positive meniscus. No head space should be present in the sample container once it is sealed. After the vial is capped it should be inverted to check for air bubbles. If bubbles are present the sample should be discarded and replaced. If it is not possible to collect a sample without air bubbles, the problem shall be noted in the field log book.

5.0 CHAIN-OF-CUSTODY PROCEDURES

5.1 Sample Labels

Each sample container shall be labeled prior to filling to prevent misidentification. The label shall contain at least the following information:

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- Sample number which uniquely identifies the sample
- Project title or number
- Location of sample collection
- Soil boring or well number, as applicable
- Name of collector
- Date and time of collection

5.2 Chain-of-Custody Record and Sample Analysis Request Form

A chain-of-custody record for each container or sample shall be used to track possession of the samples from the time they were collected in the field until the time they are analyzed in the laboratory.

The chain-of-custody record shall contain the following information:

1. Site name or project number
2. Signature of collector
3. Date and time of collection
4. Sample identification number(s)
5. Number of containers in sample set
6. Description of sample and container(s)
7. Name and signature of persons, and the companies or agencies they represent, who are involved in the chain-of-custody
8. Inclusive dates and times of possession
9. Type of analysis requested

5.3 Delivery of Samples to Laboratory

Samples shall be delivered to the laboratory on a daily basis. Samples shall be maintained at approximately 4 degrees celsius for shipping. Shipping containers shall be sealed with security tape to assure sample integrity during shipping. Delivered samples shall be accompanied by a chain-of-custody record. The laboratory shall note on the chain-of-custody that samples were properly preserved and security tape was intact upon arrival.

6.0 SAMPLING AND DRILLING EQUIPMENT DECONTAMINATION

Prior to arriving at the sampling site, all sampling equipment shall be cleaned with laboratory grade detergent (Alconox or equivalent) and rinsed twice with tap water. This procedure shall also be carried out on-site before sampling of any additional monitoring wells.

All decontamination shall be conducted on an impermeable surface and all decontamination effluent shall be contained. All surfaces of the equipment shall be thoroughly decontaminated using a steam cleaner. The equipment shall be placed on a drying rack for air drying. The water used for decontamination shall be stored in containers certified for hazardous materials storage and disposed of in an approved manner.

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7.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

The following measuring equipment may be used during the Site Investigation and/or sample collection. Calibration procedures and frequency are listed for each piece.

Soil Borings and Well Dimensions - Steel and coated cloth tape. Calibration: none.

Water Level Measurements in Wells - Water Sensing tape. Calibration: Manufacturer supplied temperature correction shall be applied as applicable for field conditions. Electrical well sounders.

Total Organic Vapors - Foxboro OVA, flame ionization detector (FID). Calibration: Daily field calibration using manufacturer recommended procedures.

Organic Vapors - Photovac, photoionization detector (PID). Calibration: Daily field calibration using an isobutylene standard as per manufacturer instructions.

Groundwater pH Measurement - Digital pH meter. Calibration: Standard pH solutions of 4, 7, and 10 shall be utilized for daily field calibration according to manufacturer instructions.

Electrical Conductivity - Electrical conductivity meter. Calibration: Factory-calibrated annually and periodically calibrated against laboratory prepared standard calibration solution.

Water Temperature - Alcohol or digital thermometers. Calibration: Factory-calibrated once.

Combustible Gas/Oxygen - Gastech LEL, combustible gas/oxygen meter calibration: Factory calibrated, field calibrated monthly, zeroed daily according to manufacturer's instructions.

Miscellaneous Measuring Devices - Calibration procedures for any other measuring device used shall be documented at the request of the regulatory authority.

All equipment shall be checked before use and replaced as necessary. Instrument manuals and an instrument log book shall accompany equipment into the field. Any calibrations, repairs or related information shall be recorded in the log book.

8.0 GROUNDWATER MONITORING PROTOCOL

Monitoring of depth to water and free product thickness within wells at the site shall be conducted using an interface probe or conductivity meter. For consistency, all measurements shall be taken from

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the north side of the wellhead at the survey mark. To assess potential infiltration of fine-grained sediments, total well depth shall also be sounded.

Newly installed wells shall be allowed to stabilize for 24 hours after development prior to free product inspection. A clean bailer or sampler shall be used for visual inspection of the groundwater in order to note sheens (difficult to detect with the interface probe), odors, microbial action and sediments.

To reduce the potential for cross contamination between wells, the monitoring shall take place in order from the least to the most contaminated, if known. Wells containing free product shall be monitored last. Between each well monitoring, the equipment shall be decontaminated.

Water level data collected from the wells shall be used to develop a groundwater contour map for the project site. Groundwater flow shall be estimated to be perpendicular to equipotential lines drawn on the map.

9.0 WELL DEVELOPMENT PROTOCOL

Groundwater monitoring wells shall be surged and developed prior to setting the surface seal. Approximately 3 to 5 times the volume of water in the casing shall be withdrawn if possible. Casing volumes shall be calculated in the following manner:

Volume of Schedule 40 PVC Pipe

Diameter (inches)	I.D. (inches)	Volume (gal/linear ft.)
2	2.067	0.17
4	4.026	0.66

If the aquifer is slow to recharge, development shall continue until recharge is too slow to practically continue. The volume of water produced, versus time, shall be recorded.

All withdrawn groundwater shall be stored on-site in 55-gallon waste drums unless permission is granted by the appropriate regulatory agency to discharge the water to the ground surface or sanitary sewer. Drummed water shall be labeled with the source of the water to help ensure appropriate disposal based on contamination levels.

10.0 QUALITY CONTROL OF SOIL SAMPLES

10.1 Travel Blanks

Travel blanks shall not be used for soil sample transportation due to problems associated with obtaining a blank material.

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10.2 Duplicates

The effort to collect duplicate soil samples from a bore hole may be compromised by variations of soil texture. This shall be minimized by selecting a duplicate sample location as near as possible to the actual sample. In a split-spoon sampler the lowest tube shall be a duplicate when needed. The middle tube shall be the actual sample. All soil sample tubes shall be marked to show from which end the tube is to be sampled. The ends, where the two sample tubes joined shall be marked. The laboratory shall be instructed to sample the marked end. The upper tube shall be used for soil characterization.

The frequency with which soil duplicates are taken shall be at a minimum five (5) percent (1 in 20). In bore-holes the samples are best collected below the five foot depth in zones of either low or no transition.

When sampling soil piles or tank pits the top inch or two shall be removed before sampling. Efforts shall be made to avoid areas where soil texture changes. Fill the sample jar completely full avoiding any unnecessary head space in the sample jar.

Duplicate soil samples shall be labeled as duplicate without any other identification. A record of its actual sampling point shall be kept in the field log book.

10.3 Field Blanks

A soil field-blank from a bore hole would be best sampled from the top of the bore hole i.e. the first sample depth (not to be greater than five feet) and only if there is no indication of contaminants. The blank should be labeled as to the boring number, depth, and B for blank. For example, a blank obtained from soil boring number two (2), at a depth of five feet would be labeled as SB2-5B. The frequency of blanks may differ than that of duplicates, but when possible they shall be of the same frequency, five (5) percent (1 in 20).

A blank from a soil pile or tank pit shall be taken from the surface material only. It shall be taken in a zone where no contamination is indicated.

11.0 SOIL SAMPLING PROTOCOL

11.1 Sample Collection During Drilling Activities

A proposal shall be submitted to the lead Regulatory Authority with proposed boring/sampling locations. The exact location and number of borings at each site shall be determined in the field by the Project Geologist/Engineer.

Prior to arriving at the sample site, the drill rig/augers shall be steam cleaned and all sample equipment shall be cleaned. Cleaning between samples shall be conducted on-site on all sampling equipment.

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Soil samples shall be obtained using a California modified split-spoon sampler containing three, six inch long, two inch diameter brass tubes. The sampler shall be driven 18 inches ahead of the hollow stem auger by a 140-pound hammer with a 30-inch drop in accordance with American Society for Testing and Materials (ASTM Method D 1586-84) for split-barrel sampling of soil and (ASTM Method D 1587-83) for thin-walled tube sampling of soils. The blows required to drive the sampler each six-inch interval shall be recorded on the boring log. The sampler shall be removed from the boring and opened to reveal the brass tubes. The middle tube shall be covered with teflon and plastic end caps, taped, labeled, and placed into a cooler containing frozen chemical. A high level temperature recording thermometer shall accompany sample shipments to ensure proper temperature maintenance. The samples shall be delivered to a state certified laboratory, with a chain-of-custody, following all protocols, within 48 hours of sampling.

Soil in the uppermost brass tube shall be described according to ASTM standard practice for physical description and identification of soils (ASTM Method D 2488-84). Stratigraphic, genetic and other data/interpretations shall also be recorded on a log prepared for each boring/well. The second sample tube may be used with the lowermost tube for preparation of duplicates.

Soil samples shall be collected at five foot intervals, at significant changes in lithology and intervals of obvious contamination in order to develop a complete profile of soil contamination.

11.2 Sample Collection During Tank Removal

Soil samples shall be collected as soon as possible after removal of the tank. Where feasible, all preparations for soil sampling shall be made prior to tank removal. Soil samples collected from a backhoe bucket or directly from the excavation floor shall be collected in glass sampling jar with a Teflon lined screw cap. When sampling, the jar should be filled with soil as completely as possible.

11.3 Sampling from Soil Piles or Shallow Soil Pits

Soil samples shall be collected and transported from excavated material in the manner described in the previous section, however, a backhoe shall not be utilized. If composite samples are collected, four sample jars shall be collected for every 50 cubic yards of material to be sampled unless otherwise specified by the lead regulatory agency. The samples shall be composited by the state certified analytical laboratory personnel prior to testing.

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TABLE 1

Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Total Petroleum Hydrocarbons	Soil	3" stainless steel or brass cylinder	14 days ¹ 40 days ³	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Benzene Toluene Xylene Ethylbenzene	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Purgeable Hydrocarbon	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Organiclead	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	14 days ¹	4°C
Ethylene Dibromide	Soil	3" stainless steel or brass cylinder	14 days ³	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	14 days ¹	4°C
Polynuclear Aromatic Hydrocarbons	Soil	8 oz. wide mouth glass with teflon seal	14 days ² 40 days ³	4°C
	Water	1000 ml amber glass with teflon seal	7 days ¹ 40 days ³	4°C

Notes:

- 1 Maximum holding time for sample (sample must be extracted within this time or analyze if extraction is not required).
- 2 Maximum holding time for sample if preserved with HCl,
Caution: HCl is a strong acid, avoid eye and skin contact
- 3 Maximum holding time for extract (sample must be analyzed within this time)

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TABLE 1
Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Poly-Chlorinated Biphenyls	Soil	8 oz. wide mouth glass with teflon seal	7 days ¹ 40 days ³	4°C
	Water	1000 ml amber glass with teflon seal	7 days ¹ 40 days ³	4°C
Total Metals	Soil	3" stainless steel or brass cylinder	6 months	
	Water	1000 ml plastic	6 months	pH < 2 HNO ₃
Dissolved Metals	Water	1000 ml plastic .45 Micron Filtration	6 months	pH < 2 HNO ₃
Pesticides	Soil	3" stainless steel or brass cylinder	14 days ³	4°C
	Water	1000 ml amber glass	7 days ¹ 40 days ³	4°C

Notes:

- ¹ Maximum holding time for sample (sample must be extracted within this time or analyze if extraction is not required).
- ² Maximum holding time for sample if preserved with HCl,
Caution: HCl is a strong acid, avoid eye and skin contact
- ³ Maximum holding time for extract (sample must be analyzed within this time)

TABLE 3
ABBREVIATIONS

TPH-G	=	Total Petroleum Hydrocarbon as Gasoline
TPH-D	=	Total Petroleum Hydrocarbon as Diesel
BTX&E	=	Benzene, Toluene, Xylenes, & Ethylbenzene
GCFID	=	Gas Chromatograph with a Flame Ionization Detector
Cl HC	=	Chlorinated Hydrocarbons
ICAP	=	Inductively Coupled Argon Plasma
AA	=	Atomic Absorption
O&G	=	Oil & Grease
DHS	=	Department of Health Services
AB1803	=	Assembly Bill 1803
418.1	=	EPA Method for Total Recoverable Petroleum Hydrocarbons
601	=	EPA Method for Volatile Halogenated Organics
602	=	EPA Method for Volatile Aromatics
624	=	EPA Method for Purgeables Halogenated & Aromatics
3510	=	EPA Method Extraction by Liquid-Liquid Separatory Funnel
3550	=	EPA Method Extraction by Sonication
5030	=	EPA Method Extraction by Purge and Trap
8010	=	EPA Method for Halogenated Volatile Organics
8015	=	EPA Method for Nonhalogenated Volatile Organics
8020	=	EPA Method for Aromatic Volatile Organics
8240	=	EPA Method for Volatile Organics/Mass Spectrometry
8270	=	EPA Method for Semivolatile Organic/Capillary Column