Cobb Environmental & Technical Services

QUARTERLY GROUNDWATER MONITORING REPORT
FOURTH QUARTER 1997
E-Z Serve #100877, 525 West A Street, Hayward, CA

BACKGROUND

A total of fifteen monitoring wells (MW-1 through MW-14 plus MW-1A) have been installed; seven on-site(MW-1,1A,2,3,4,5 and 6) and seven off-site(MW-7,8,9,10,11,12,13, and 14). The extent of groundwater contamination has been delineated. A Risk Assessment was submitted in 1995 and calculation of cancer risk from inhalation of indoor air quality submitted in 1996. Each is pending Agency review.

GROUNDWATER MONITORING FIELD ACTIVITIES

Date of Field Activities:	11/25/97
Wells Monitored/Sampled:	MW-1 through MW-7 and MW-14
Analytes Tested:	TPHg, BTEX and MTBE
Analytical Methods:	EPA Methods 8015/8020(modified)
Laboratory:	Entech Analytical Labs, Inc.
Remarks:	All wells were sampled using the no-purge technique.

GROUNDWATER MONITORING RESULTS

Depth to Water:	15.48 to 17.61 feet below grade
Flow Direction/Gradient:	Southwest at 0.002 ft/ft
SPH - wells/thicknesses:	Not Detected
TPHg concentration range:	<50ppb (MW-14) to 51,000ppb(MW-2)
Benzene concentration range:	<0.5ppb (MW-14) to 4,300ppb(MW-4)
MTBE concentration range:	<5.0ppb (MW- 1,1A,5, and 14) to 1,200ppb(MW-2)
Remarks:	Groundwater flow and depths are generally consistent with previous measurements. The site appears to be conducive for the no-purge method of sampling since groundwater concentrations and trends are consistent with historical patterns.

PROJECT STATUS

Additional quarterly monitoring will utilize the no-purge technique for sampling all wells.

ATTACHMENTS:

- Groundwater Elevation Contour Map
- Groundwater Elevations and Analytical Results (Table 1)
- Laboratory Report and Chain-of-Custody form
- Groundwater Monitoring and Sampling Protocols
- Gauge/Purge Calculations and Well Purging Date Sheets
- Purge vs. No-Purge Protocol

P.O. Box 1602 • Tupelo, Mississippi 38802-1602
601-841-0995 (phone) • 601-841-0810 (fax)

CERTIFICATION

This report was prepared under the supervision of a professional registered geologist. All statements, conclusions, and recommendations are based solely upon field observations by Clearwater Group, Inc. and analyses performed by a state-certified laboratory related to the work performed by Clearwater Group Inc./CETS, Inc.

The service performed by Clearwater Group, Inc./CETS, Inc. has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the area of the site. No other warranty, expressed or implied, is made.

Prepared by:
Cobb Environmental & Technical Services, Inc.

Brian Cobb, P.E.
Principal

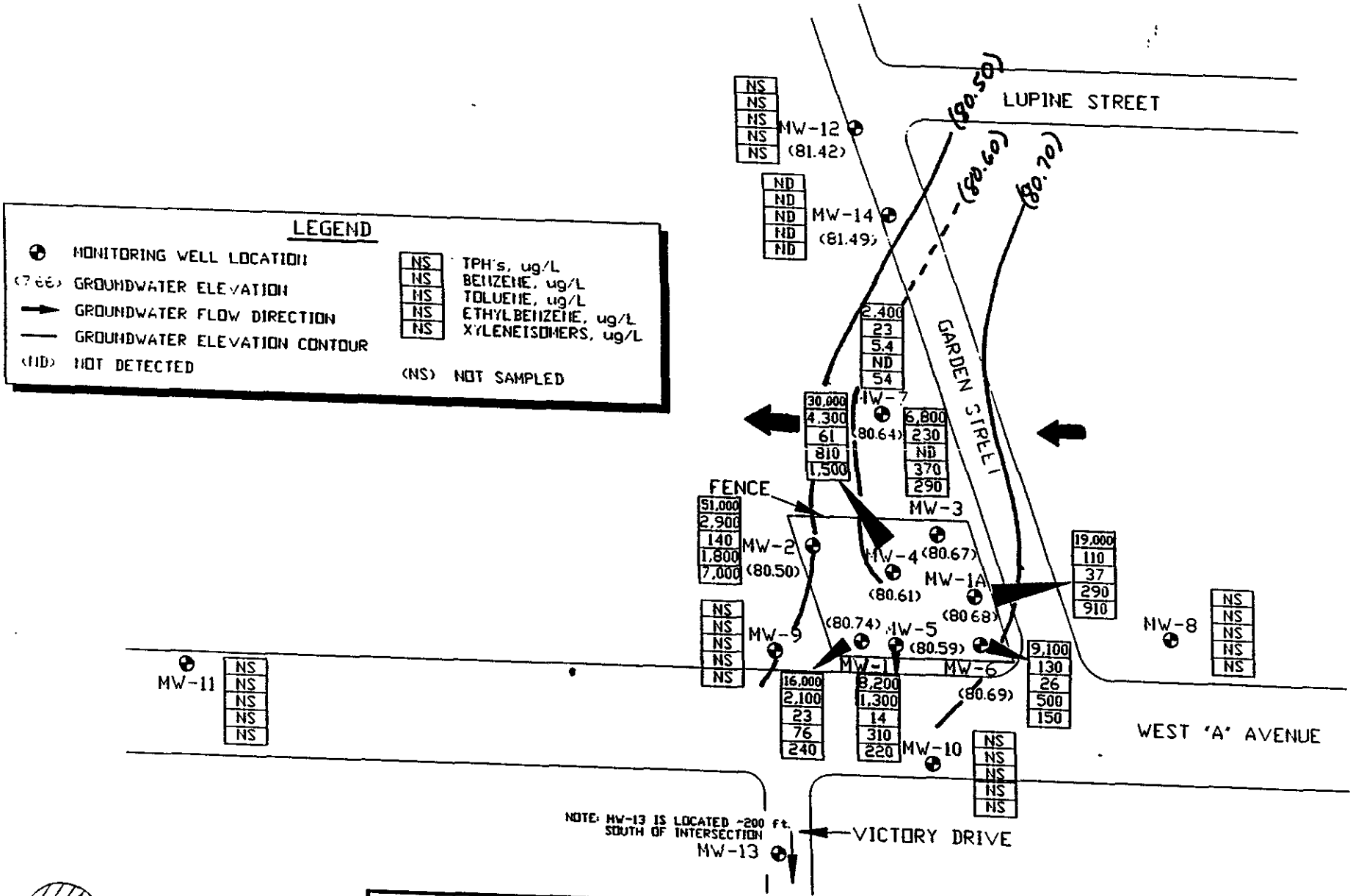
Reviewed by:
Clearwater Group, Inc.

Markus Niebanck, R.G.
Senior Geologist

REGISTERED GEOLOGIST
MARKUS B. NIEBANCK
#5607
STATE OF CALIFORNIA

GROUNDWATER ELEVATION

CONTOUR MAP



DRWG: 100877SM

E-Z SERVE No. 100877
4901 525 West Avenue
Hayward, California

Cobb Environmental and Technical Services, Inc.
779B Hollyhill Drive
Tupelo, Mississippi 38801

GROUNDWATER ANALYTICAL CONCENTRATIONS AND WATER TABL ELEVATION CONTOURS

CETS Job No.: 100877-98-CA

Figure 1

GROUDWATER ELEVATIONS

AND

ANALYTICAL RESULTS

Table 1
Historical Depth to Groundwater/LPH Thickness Measurements and Analytical Testing Results

Former E-Z Serve Facility No. 100877
525 West A Street, Hayward, California

Well I.D.	T.O.C. Elevation (feet)*	Date	Depth to LPHs (feet)	Depth to G.W. (feet)	LPHs Thickness (feet)	G.W. Elevation (feet)	Gasoline (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	MTBE (ug/L)
MW-1	96.73	11/25/97	*	15.99	*	80.74	16000	2100	23	76	240	ND
		6/30/97	*	14.68	*	82.05	10000	2100	ND	ND	320	ND
		4/8/97	*	13.25	*	84.34	2100	430	15	52	85	100
		12/4/96	*	15.61	*	81.12	17000	3100	64	610	1200	280
		9/23/96	*	14.92	*	81.81	20000	5200	860	700	1100	270
MW-1A	97.59	11/25/97	*	16.91	*	80.68	19000	110	37	290	910	ND
		6/30/97	*	15.57	*	82.02	17000	180	ND	140	1100	ND
		4/8/97	Sheen	14.15	<.01	83.44	NS	NS	NS	NS	NS	NS
		12/4/96	*	16.55	*	81.04	52000	420	140	1000	3500	130
		9/23/96	15.99	16	0.01	81.59	NS	NS	NS	NS	NS	NS
MW-2	98.06	11/25/97	*	17.56	*	80.5	51000	2900	140	1800	7000	1200
		6/30/97	*	16.28	*	81.78	41000	2700	130	1200	4000	890
		4/8/97	*	14.86	*	83.2	20000	2500	80	1300	3400	880
		12/4/96	*	17.19	*	80.87	31000	3800	140	2000	5100	690
		9/23/96	*	16.61	*	81.45	29000	3700	150	1000	4300	860
MW-3	97.66	11/25/97	*	16.99	*	80.67	6800	230	ND	370	290	130
		6/30/97	*	15.7	*	81.96	3500	280	ND	32	180	ND
		4/8/97	*	14.25	*	83.41	3800	210	4.6	270	280	56
		12/4/96	*	16.63	*	81.03	13000	1100	25	1000	1100	67
		9/23/96	*	16.11	*	81.55	10000	950	20	700	780	80
MW-4	97.1	11/25/97	*	16.49	*	80.61	30000	4300	61	810	1500	880
		6/30/97	*	15.19	*	81.91	63000	7000	430	1400	4400	1700
		4/8/97	*	13.73	*	83.37	16000	3900	680	850	2300	980
		12/4/96	*	16.11	*	80.99	23000	7800	140	1200	1200	1900
		9/23/96	*	15.56	*	81.54	32000	7400	540	1500	2800	2100

Table 1
Historical Depth to Groundwater/LPH Thickness Measurements and Analytical Testing Results

Former E-Z Serve Facility No. 100877
525 West A Street, Hayward, California

Well I.D.	T.O.C. Elevation (feet)*	Date	Depth to LPHs (feet)	Depth to G.W. (feet)	LPHs Thickness (feet)	G.W. Elevation (feet)	Gasoline (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	MTBE (ug/L)
MW-5	96.73	11/25/97	*	16.14	*	80.59	8200	1300	14	310	220	ND
		6/30/97	*	14.83	*	81.9	3800	500	ND	75	84	ND
		4/8/97	*	13.39	*	83.34	11000	1300	15	450	720	180
		12/4/96	*	15.78	*	80.95	10000	2200	9	550	430	70
		9/23/96	*	15.19	*	81.54	9800	1800	11	470	510	100
MW-6	97.09	11/25/97	*	16.4	*	80.69	9100	130	26	500	150	310
		6/30/97	*	15.08	*	82.01	11000	270	37	590	450	ND
		4/8/97	*	13.64	*	83.45	17000	700	92	1400	900	2700
		12/4/96	*	16.06	*	81.03	11000	390	25	680	170	130
		9/23/96	*	15.5	*	81.59	12000	520	55	930	350	51
MW-7	97.44	11/25/97	*	16.8	*	80.64	2400	23	5.4	ND	54	120
		6/30/97	*	15.51	*	81.93	5500	ND	79	ND	44	280
		4/8/97	*	14.1	*	83.34	5600	42	ND	240	96	ND
		12/4/96	*	16.43	*	81.01	7800	67	ND	600	350	22
		9/23/96	*	15.94	*	81.5	6300	76	ND	420	270	15
MW-8	97.61	11/25/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		6/30/97	Well	Not	Found	*	NS	NS	NS	NS	NS	NS
		4/8/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		12/4/96	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		9/23/96	*	15.83	*	81.78	ND	ND	ND	ND	ND	ND
MW-9	95.41	11/25/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		6/30/97	Well	Not	Found	*	NS	NS	NS	NS	NS	NS
		4/8/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		12/4/96	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		9/23/96	*	NM	*	NM	NS	NS	NS	NS	NS	NS

Table 1
Historical Depth to Groundwater/LPH Thickness Measurements and Analytical Testing Results

Former E-Z Serve Facility No. 100877
525 West A Street, Hayward, California

Well I.D.	T.O.C. Elevation (feet)*	Date	Depth to LPHs (feet)	Depth to G.W. (feet)	LPHs Thickness (feet)	G.W. Elevation (feet)	Gasoline (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	MTBE (ug/L)
MW-10	97.11	11/25/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		6/30/97	Well	Not	Found	*	NS	NS	NS	NS	NS	NS
		4/8/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		12/4/96	*	16.15	*	80.96	4600	1.6	7.7	260	150	20
		9/23/96	*	15.59	*	81.52	3800	4	2.9	220	170	397
MW-11	92.68	11/25/97	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		6/30/97	Well	Not	Found	*	NS	NS	NS	NS	NS	NS
		4/8/97	*	10.51	*	82.17	24000	280	130	3000	3700	ND
		12/4/96	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		9/23/96	*	12.29	*	80.39	27000	55	81	3000	3500	40
MW-12	99.03	11/25/97	*	17.61	*	81.42	NS	NS	NS	NS	NS	NS
		6/30/97	*	16.33	*	82.7	NS	NS	NS	NS	NS	NS
		4/8/97	*	14.88	*	84.15	ND	ND	ND	ND	ND	ND
		12/4/96	*	17.16	*	81.87	ND	3.2	ND	1.9	3.4	ND
		9/23/96	*	16.67	*	82.36	ND	ND	1.6	ND	ND	ND
MW-13	96.8	11/25/97	*	15.48	*	81.32	NS	NS	NS	NS	NS	NS
		6/30/97	*	14.13	*	82.67	NS	NS	NS	NS	NS	NS
		4/8/97	*	12.75	*	84.05	ND	ND	ND	ND	ND	ND
		12/4/96	*	NM	*	NM	NS	NS	NS	NS	NS	NS
		9/23/96	*	14.6	*	82.2	ND	ND	0.8	1	ND	ND

Table 1
Historical Depth to Groundwater/LPH Thickness Measurements and Analytical Testing Results

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Well I.D.	T.O.C. Elevation (feet)*	Date	Depth to LPHs (feet)	Depth to G.W. (feet)	LPHs Thickness (feet)	G.W. Elevation (feet)	Gasoline (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	MTBE (ug/L)
MW-14	99.01	11/25/97	*	17.52	*	81.49	ND	ND	ND	ND	ND	ND
		6/30/97	*	16.22	*	82.79	74	1.3	ND	0.51	0.68	ND
		4/8/97	*	14.77	*	84.24	2900	ND	2.7	220	21	ND
		12/4/96	*	17.06	*	81.95	9500	6.3	ND	1100	400	30
		9/23/96	*	16.67	*	82.34	6400	2.8	ND	690	96	9.6

* Elevation of top of casing (TOC). TOC elevations based on an assumed benchmark elevation of 965.00 feet above mean sea level (MSL) interpolated from the U.S. Geological Survey Topographic Map for the site.
ug/L - micrograms per liter (parts per billion [ppb]).
MTBE - Methyl-tert-Butyl Ether
NA - Not Analyzed, constituent not analyzed for.
ND - Not Detected, below laboratory method detection limits.
NS- Not Sampled
NM-Not Measured

LABORATORY REPORT

AND

CHAIN-OF-CUSTODY

FORM

Entech Analytical Labs, Inc.

CA ELAP# 2224

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

Attn: Brian Cobb
Cobb Environmental
P.O. Box 1602
Tupelo, MS 38802

Date:	12/9/97
Date Received:	11/26/97
Date Analyzed:	12/3-12/4/97
Project:	100877
Sampled By:	Client

Certified Analytical Report

Water Sample Analysis:

Test	*MW-1A*	*MW-1*	*MW-2*	*MW-3*	*Units*	*PQL*	*EPA Method #*
Sample Matrix	Water	Water	Water	Water			
Sample Date	11/25/97	11/25/97	11/25/97	11/25/97			
Sample Time	1240	1205	1235	1155			
Lab #	D18389	D18390	D18391	D18392			
DF-Gas/BTEX	20	40	80	20			
TPH-Gas	**19,000**	**16,000**	**51,000**	**6,800**	µg/liter	50.0 µg/l	8015M
MTBE	**ND**	**ND**	**1,200**	**130**	µg/liter	5.0 µg/l	8020
Benzene	**110**	**2,100**	**2,900**	**230**	µg/liter	0.5 µg/l	8020
Toluene	**37**	**23**	**140**	**ND**	µg/liter	0.5 µg/l	8020
Ethyl Benzene	**290**	**76**	**1,800**	**370**	µg/liter	0.5 µg/l	8020
Xylenes	**910**	**240**	**7,000**	**290**	µg/liter	0.5 µg/l	8020

1. DLR=DF x PQL
2. Analysis performed by Entech Analytical Labs, Inc. (CAELAP #2224)

Michael N. Golden, Lab Director

DF=Dilution Factor
DLR=Detection Reporting Limit

PQL=Practical Quantitation Limit
ND=None Detected at or above DLR

Entech Analytical Labs, Inc.

CA ELAP# 2224

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

Attn: Brian Cobb
Cobb Environmental
P.O. Box 1602
Tupelo, MS 38802

Date:	12/9/97
Date Received:	11/26/97
Date Analyzed:	12/4-12/5/97
Project:	100877
Sampled By:	Client

Certified Analytical Report

Water Sample Analysis:

Test	*MW-4*	*MW-5*	*MW-6*	*MW-7*	*Units*	*PQL*	*EPA Method #*
Sample Matrix	Water	Water	Water	Water			
Sample Date	11/25/97	11/25/97	11/25/97	11/25/97			
Sample Time	1230	1220	1225	1215			
Lab #	D18393	D18394	D18395	D18396			
DF-Gas/BTEX	80	20	20	4			
TPH-Gas	**30,000**	**8,200**	**9,100**	**2,400**	µg/liter	50.0 µg/l	8015M
MTBE	**880**	**ND**	**310**	**120**	µg/liter	5.0 µg/l	8020
Benzene	**4,300**	**1,300**	**130**	**23**	µg/liter	0.5 µg/l	8020
Toluene	**61**	**14**	**26**	**5.4**	µg/liter	0.5 µg/l	8020
Ethyl Benzene	**810**	**310**	**500**	**ND**	µg/liter	0.5 µg/l	8020
Xylenes	**1,500**	**220**	**150**	**54**	µg/liter	0.5 µg/l	8020

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Michael N. Golden, Lab Director

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Entech Analytical Labs, Inc.

CA ELAP# 2224

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

Attn: Brian Cobb
Cobb Environmental
P.O. Box 1602
Tupelo, MS 38802

Date:	12/9/97
Date Received:	11/26/97
Date Analyzed:	12/3/97
Project:	100877
Sampled By:	Client

Certified Analytical Report

Water Sample Analysis:

Test	*MW-14*	*Units*	*PQL*	*EPA Method #*
Sample Matrix	Water			
Sample Date	11/25/97			
Sample Time	1105			
Lab #	D18397			
DF-Gas/BTEX	1			
TPH-Gas	**ND**	µg/liter	50.0 µg/l	8015M
MTBE	**ND**	µg/liter	5.0 µg/l	8020
Benzene	**ND**	µg/liter	0.5 µg/l	8020
Toluene	**ND**	µg/liter	0.5 µg/l	8020
Ethyl Benzene	**ND**	µg/liter	0.5 µg/l	8020
Xylenes	**ND**	µg/liter	0.5 µg/l	8020

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2. Analysis performed by Entech Analytical Labs, Inc. (CAELAP #2224)

Michael N. Golden, Lab Director

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PQL=Practical Quantitation Limit
ND=None Detected at or above DLR

Entech Analytical Labs, Inc.

525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

QUALITY CONTROL RESULTS SUMMARY

METHOD: Gas Chromatography

QC Batch #: GBG5971203
Matrix: Water
Units: µg/L

Date Analyzed: 12/03/97
Quality Control Sample: Blank Spike

PARAMETER	Method #	MB µg/L	SA µg/L	SR µg/L	SP µg/L	SP % R	SPD µg/L	SPD %R	RPD	QC LIMITS (ADVISORY) RPD	QC LIMITS (ADVISORY) %R
Benzene	8020	<0.50	10.0	ND	9.4	**94**	11.3	**113**	19.1	25	50-150
Toluene	8020	<0.50	10.0	ND	10.3	**103**	10.5	**105**	2.2	25	50-150
Ethyl Benzene	8020	<0.50	10.0	ND	10.4	**104**	10.8	**108**	4.0	25	50-150
Xylenes	8020	<0.50	30	ND	33	**112**	34	**113**	0.9	25	50-150
Gasoline	8015	<50.0	625	ND	626	**100**	607	**97**	3.1	25	50-150

Definition of Terms:

- na: Not Analyzed in QC batch
- MB: Method Blank
- SA: Spike Added
- SR: Sample Result
- RPD(%): Duplicate Analysis - Relative Percent Difference
- SP: Spike Result
- SP (%R): Spike % Recovery
- SPD: Spike Duplicate Result
- SPD (%R): Spike % Recovery
- NC: Not Calculated

Entech Analytical Labs, Inc.

525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

QUALITY CONTROL RESULTS SUMMARY

METHOD: Gas Chromatography

QC Batch #: GBG5971204
Matrix: Water
Units: µg/L

Date Analyzed: 12/04/97
Quality Control Sample: Blank Spike

PARAMETER	Method #	MB µg/L	SA µg/L	SR µg/L	SP µg/L	**SP % R**	SPD µg/L	**SPD %R**	RPD	QC LIMITS (ADVISORY) RPD	QC LIMITS (ADVISORY) %R
Benzene	8020	<0.50	10.0	ND	11.1	**111**	9.4	**94**	16.6	25	50-150
Toluene	8020	<0.50	10.0	ND	10.5	**105**	10.1	**101**	3.9	25	50-150
Ethyl Benzene	8020	<0.50	10.0	ND	10.6	**106**	10.2	**102**	3.8	25	50-150
Xylenes	8020	<0.50	30	ND	33	**111**	32	**108**	2.1	25	50-150
Gasoline	8015	<50.0	625	ND	605	**97**	610	**98**	0.8	25	50-150

Definition of Terms:

- na: Not Analyzed in QC batch
- MB: Method Blank
- SA: Spike Added
- SR: Sample Result
- RPD(%): Duplicate Analysis - Relative Percent Difference
- SP: Spike Result
- SP (%R): Spike % Recovery
- SPD: Spike Duplicate Result
- SPD (%R): Spike % Recovery
- NC: Not Calculated

Entech Analytical Labs, Inc.

525 Del Rey Avenue, Suite E
Sunnyvale, CA 94086

QUALITY CONTROL RESULTS SUMMARY

METHOD: Gas Chromatography

QC Batch #: GBG5971205
Matrix: Water
Units: µg/L

Date Analyzed: 12/05/97
Quality Control Sample: Blank Spike

PARAMETER	Method #	MB µg/L	SA µg/L	SR µg/L	SP µg/L	SP % R	SPD µg/L	SPD %R	RPD	QC LIMITS (ADVISORY) RPD	QC LIMITS (ADVISORY) %R
Benzene	8020	<0.50	10.0	ND	11.3	**113**	11.4	**114**	1.7	25	50-150
Toluene	8020	<0.50	10.0	ND	11.2	**112**	11.5	**115**	2.9	25	50-150
Ethyl Benzene	8020	<0.50	10.0	ND	11.5	**115**	11.8	**118**	3.2	25	50-150
Xylenes	8020	<0.50	30	ND	35	**118**	37	**124**	4.7	25	50-150
Gasoline	8015	<50.0	625	ND	614	**98**	614	**98**	0.0	25	50-150

Definition of terms:

- na: Not Analyzed in QC batch
- MB: Method Blank
- SA: Spike Added
- SR: Sample Result
- RPD(%): Duplicate Analysis - Relative Percent Difference
- SP: Spike Result
- SP (%R): Spike % Recovery
- SPD: Spike Duplicate Result
- SPD (%R): Spike % Recovery
- NC: Not Calculated

Entech Analytical Labs, Inc.

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • Telephone: (408) 735-1550 (800) 287-1799 • Fax: (408) 735-1554

Chain of Custody/Analysis Work Order

Client: Cobb Environmental
Address: PO Box 1602
Tupelo, MS 38802
Contact: Brian Cobb / Markus Niebanck
Telephone #: (601) 841-0995 / (510) 893-5160
Date Received:
Turn Around: standard

Project ID: 100877
Purchase Order #:

Sampler/Company: Henry Hurkmans / Karen Schiller / Clearwater Group Inc.
Telephone #: (510) 893-5160

Special Instructions/Comments: cc: Clearwater fax results
Site Address: Fmr. EZ Serve # 100877, 525 West "A" St, Hayward, CA

LAB USE ONLY
Samples arrived chilled and intact: Yes No
Notes:

Sample Information / Requested Analysis

Lab #	Sample ID	Grab/ Composite	Matrix	Date Collected	Time Collected	Pres.	Sample Container	TPHg 8015	BTEX/ MTBE 8020					
018389	MW-1A	Grab	H_2O	11-25-97	1240	HCl	3 VOA's	X	X					
018390	MW-1	↓	↓	↓	1205	↓	↓	X	X					
018391	MW-2	↓	↓	↓	1235	↓	↓	X	X					
018392	MW-3	↓	↓	↓	1155	↓	↓	X	X					
018393	MW-4	↓	↓	↓	1230	↓	↓	X	X					
018394	MW-5	↓	↓	↓	1220	↓	↓	X	X					
018395	MW-6	↓	↓	↓	1225	↓	↓	X	X					
018396	MW-7	↓	↓	↓	1215	↓	↓	X	X					
018397	MW-14	↓	↓	↓	1105	↓	↓	X	X					

Relinq. By:	Received By:	Date	Time
[signature]	[signature] T. Marsh #951	11-26-97	12:00
[signature]	[signature]	11/26/97	2:15pm

GROUNDWATER MONITORING

AND

SAMPLING PROTOCOLS

Groundwater Monitoring

Prior to beginning, a decontamination area is established. Decontamination procedures consist of scrubbing downhole equipment in an Alconox® solution wash (wash solution is pumped through any purging pumps used), and rinsing in a first rinse of potable water and a second rinse of potable water or deionized water if the latter is required. Any non-dedicated down hole equipment is decontaminated prior to use.

Prior to purging and sampling a well, the static water level is measured to the nearest 0.01 feet with an electronic water sounder. Depth to bottom is typically measured once per year, at the request of the project manager, and during Clearwater's first visit to a site. If historical analytical data are not available, with which to establish a reliable order of increasing well contamination, the water sounder and tape will be decontaminated between each well. If floating separate-phase hydrocarbons (SPH) are suspected or observed, SPH is collected using a clear, open-ended product bailer, and the thickness is measured to the nearest 0.01 feet in the bailer. SPH may alternatively be measured with an electronic interface probe. Any monitoring well containing a measurable thickness of SPH before or during purging is not additionally purged and no sample is collected from that well. Wells containing a hydrocarbon sheen are sampled unless otherwise specified by the project manager. Field observations such as well integrity as well as water level measurements and floating product thicknesses are noted on the Gauging Data/Purge Calculations form.

Well Purging

Each monitoring well to be sampled is purged using either a PVC bailer or a submersible pump. Physical parameters (pH, temperature and conductivity) of the purge water are monitored during purging activities to assess if the water sample collected is representative of the aquifer. If required, parameters such as dissolved oxygen, turbidity, salinity etc. are also measured. Samples are considered representative if parameter stability is achieved. Stability is defined as a change of less than 0.25 pH units, less than 10% change in conductivity in micro mhos, and less than 1.0 degree centigrade (1.8 degrees Fahrenheit) change in temperature. Parameters are measured in a discreet sample decanted from the bailer separately from the rest of the purge water. Parameters are measured at least four times during purging; initially, and at volume intervals of one well volume. Purging continues until three well casing volumes have been removed or until the well completely dewaters. Wells which dewater or demonstrate a slow recharge, may be sampled after fewer than three well volumes have been removed. Well purging information is recorded on the Purge Data sheet. All meters used to measure parameters are calibrated daily. Purge water is sealed, labeled, and stored on site in D.O.T.-approved 55-gallon drums. After being chemically profiled, the water is removed to an appropriate disposal facility by a licensed waste hauler.

Groundwater Sample Collection

Groundwater samples are collected immediately after purging or, if purging rate exceeds well recharge rate, when the well has recharged to at least 80% of its static water level. If recharge is extremely slow, the well is allowed to recharge for at least two hours, if practicable, or until sufficient volume has accumulated for sampling. The well is sampled within 24 hours of purging or repurged. Samples are collected using polyethylene bailers, either disposable or dedicated to the well. Samples being analyzed for compounds most sensitive to volatilization are collected first. Water samples are placed in appropriate laboratory-supplied containers, labeled, documented on a chain of custody form and placed on ice in a cooler for transport to a state-certified analytical laboratory. Analytical detection limits match or surpass standards required by relevant local or regional guidelines.

Quality Assurance Procedures

To prevent contamination of the samples, CGI personnel adhere to the following procedures in the field:

- A new, clean pair of latex gloves are put on prior to sampling each well.
- Wells are gauged, purged and groundwater samples are collected in the expected order of increasing degree of contamination based on historical analytical results.
- All purging equipment will be thoroughly decontaminated between each well, using the procedures previously described at the beginning of this section.
- During sample collection for volatile organic analysis, the amount of air passing through the sample is minimized. This helps prevent the air from stripping the volatiles from the water. Sample bottles are filled by slowly running the sample down the side of the bottle until there is a convex meniscus over the mouth of the bottle. The lid is carefully screwed onto the bottle such that no air bubbles are present within the bottle. If a bubble is present, the cap is removed and additional water is added to the sample container. After resealing the sample container, if bubbles still are present inside, the sample container is discarded and the procedure is repeated with a new container.

Laboratory and field handling procedures may be monitored, if required by the client or regulators, by including quality control (QC) samples for analysis with the groundwater samples. Examples of different types of QC samples are as follows:

- Trip blanks are prepared at the analytical laboratory by laboratory personnel to check field handling procedures. Trip blanks are transported to the project site in the same manner as the laboratory-supplied sample containers to be filled. They are not opened, and are returned to the laboratory with the samples collected. Trip blanks are analyzed for purgable organic compounds.

- Equipment blanks are prepared in the field to determine if decontamination of field sampling equipment has been effective. The sampling equipment used to collect the groundwater samples is rinsed with distilled water which is then decanted into laboratory-supplied containers. The equipment blanks are transported to the laboratory, and are analyzed for the same chemical constituents as the samples collected at the site.

- Duplicates are collected at the same time that the standard groundwater samples are being collected and are analyzed for the same compounds in order to check the reproducibility of laboratory data. They are typically only collected from one well per sampling event. The duplicate is assigned an identification number that will not associate it with the source well.

Generally, trip blanks and field blanks check field handling and transportation procedures. Duplicates check laboratory procedures. The configuration of QC samples is determined by CGI depending on site conditions and regulatory requirements.

GAUGE/PURGE CALCULATIONS

AND

WELL PURGING DATA SHEETS

WELL GAUGING DATA/PURGE CALCULATIONS

for E-2 serve # 100877

Job No.: 100877 Location: 525 west "A" Street Hayward, CA Date: 11-25-97 Tech(s): HH/KS

WELL NO.	DIAM (in)	DTB (ft)	DTW (ft)	ST (ft)	CV (gal)	PV (gal)	SPL (ft)	NOTES
MW-1A	2	—	16.91	—	—	—	slight sheen	pho
MW-1	4	—	15.99	—	—	—	ø	pho
MW-2	4	—	17.56	—	—	—	ø	
MW-3	4	—	16.99	—	—	—	ø	pho
MW-4	4	—	16.49	—	—	—	ø	pho
MW-5	4	—	16.14	—	—	—	ø	pho
MW-6	4	—	16.40	—	—	—	ø	pho
MW-7	2	—	~~17.61~~ 16.80	—	—	—	ø	
MW-12	2	—	17.61	—	—	—	ø	
MW-13	2	—	15.48	—	—	—	ø	
MW-14	2	—	17.52	—	—	—	ø	

Explanation:

DIAM = Well Diameter
DTB = Depth to Bottom
DTW = Depth to Water
ST = Saturated Thickness (DTB-DTW)
CV = Casing Volume (ST x cf)
PV = Purge Volume (standard 3 x CV, well development 10 x CV)
SPL = Thickness of Separate Phase Liquid

pho= petroleum hydrocarbon odor

Conversion Factors (cf)

2 inch diameter well cf = 0.16 gal/ft
4 inch diameter well cf = 0.65 gal/ft
6 inch diameter well cf = 1.44 gal/ft

CLEARWATER GROUP, INC.
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Oakland, California 94607
Phone: (510) 893-5160
Fax: (510) 893-5947

PURGE VERSUS NO-PURGE

PROTOCOL

Cal/EPA

Los Angeles
Regional Water
Quality Control
Board

101 Centre Plaza Drive
Monterey Park, CA
91754-2156
(213) 266-7500
FAX (213) 266-7600

To: Interested Parties

April 23, 1997

SUBJECT: USE OF NON-PURGE METHOD FOR SAMPLING OF GROUNDWATER MONITORING WELLS AT GASOLINE IMPACTED SITES.

Purpose

The purpose of this letter is to set forth the minimum conditions that must be met in order to implement the non-purge method of sampling as well as to identify conditions where purging of groundwater monitoring wells are required at leaking UST gasoline sites within the Los Angeles Regional Board area.

Background

A report entitled "The California Groundwater Purging Study for Petroleum Hydrocarbons", prepared by SECOR International Incorporated (October 28, 1996) was commissioned by the Western States Petroleum Association (WSPA). Eleven of the 110 sites included in the WSPA study were selected from the Los Angeles Regional Board geographic area. These sites were located in the cities of Whittier, Reseda, Lakewood, Oxnard, Agoura, Redondo Beach, Gardena, Torrance, Los Angeles, and Tarzana. This represents a limited, but adequate cross section of hydrogeologic regimes impacted by leaking Underground Storage Tank (UST) gasoline sites to evaluate the non-purge method. Groundwater monitoring wells at these sites were all reportedly screened across the water table in unconfined aquifers and had been monitored for at least four quarters prior to non-purged sampling. The results of the study suggest that the non-purge method of sampling groundwater monitoring wells is a valid alternative to the purge method commonly accepted as standard practice at leaking UST gasoline sites in California.

Regional Board staff have completed the review of the WSPA report and a report entitled "Groundwater Sampling-A Pilot Study of the Effects of Well Purging" by Ken Williams et al. (1996). Staff concluded that for groundwater monitoring wells screened in unconfined zones at leaking UST gasoline sites, purging is not routinely required under certain conditions.

The State Water Resources Control Board UST Program Manager, Mr. Allan Patton, issued a guidance letter to Local Oversight Programs and Local Implementing Agencies on March 26, 1997, regarding "The California Groundwater Purging Study For Petroleum Hydrocarbons." The letter acknowledged the results of the WSPA report, stated that there were limitations to the non-purge method, and concluded that non-purge methods, where applicable, should be implemented in order to reduce costs whenever possible. The discussion which follow describes the conditions under which purging is and is not necessary.

Purging Not Necessary

Under the following conditions, groundwater monitoring wells do not need to be purged prior to sampling. The minimum reporting requirement for a site using the non-purge method of

groundwater sampling is contained in the attached Appendix A (Items To Be Submitted For Sites Where Non-purge Method Of Groundwater Sampling Is Used).

1. The groundwater monitoring well must be screened in an unconfined aquifer. UST sites located in the San Fernando Valley, San Gabriel Valley, Los Angeles Coastal Plain, Oxnard Coastal Plain, and other groundwater basins with documentation cited in site assessment reports, can qualify as leaking UST gasoline sites overlying unconfined aquifers.

2. The top screened area of the groundwater monitoring well must be screened above the water table at all times during the monitoring period; the well must be permitted; and well construction details including boring logs signed by a registered engineer/geologist are contained in the UST case file for review.

3. Monitoring wells are completed in moderate to high recovery aquifers and formations consisting predominantly of coarse grained sediments (sands and gravels).

4. A site specific pre-purged and non-purged groundwater monitoring study may be used to evaluate sites not meeting the above minimum criteria. On a case by case basis, should the results of pre-purge/non-purge study indicate that no significant variance in petroleum hydrocarbon concentrations (TPH_G, BTEX, and MTBE) exists and hydrogeologic reports on file contain such analyses, then the groundwater monitoring wells at the site may not need to be purged prior to sampling for routine groundwater monitoring programs.

5. Prior to implementation of the non-purge sampling method at a site, notify the Regional Board, or other appropriate regulatory agency, in writing of the intent to implement the non-purge sampling method. The information listed on the attached Appendix A must be submitted with your notification.

Purging Is Required

Under the following conditions, groundwater monitoring wells must be purged prior to sampling:

1. All newly installed groundwater monitoring wells must be rigorously developed and purged for the initial two sampling events. This practice is to ensure removal of any entrained, fine-grained material remaining from well construction and development procedures, as well as to provide data for comparison to non-purge testing. Data on turbidity, pH, specific conductance, temperature, and recharge rate must still be recorded and provided with groundwater monitoring reports.

2. The groundwater sampling and testing program includes analysis for chlorinated hydrocarbons, metals, polycyclic aromatic hydrocarbons, and diesel.

3. In fine grained sediments (predominately clayey/silty materials) where the groundwater gradient is relatively flat and wells are slow to recover (i.e., groundwater monitoring wells routinely become dry prior to evacuating minimum purge volumes). These wells can be sampled after groundwater in the monitoring well recovers to a minimum of 90% of the original groundwater elevation or 24 hours, whichever is less

4. The groundwater monitoring well is in use for air sparging and/or vapor extraction.

If a leaking UST case is evaluated by Regional Board staff as a low-risk site or if a responsible party requests site closure, Regional Board staff may require that a final purged groundwater sample(s) be taken from monitoring wells.

In areas where municipal supply wells have been impacted by gasoline and/or gasoline additives, purging of groundwater monitoring wells may be required.

Groundwater wells with measurable free product should be on a regular program of free product removal. If a monitoring wells is determined to contain free product at the time monitoring is anticipated, it should be bailed to remove any standing free product, purged to remove minimum well volumes (4-10 casing volumes), allowed to equilibrate back to pre-purged levels, then free product thickness measured and reported.

All reports containing the results of groundwater sampling and testing must adhere to QA/QC protocols and be submitted on this Regional Board's Laboratory Report Forms.

As new or updated information becomes available regarding the use and effectiveness of the non-purge method of groundwater sampling, changes and/or updates to this document will be made.

If you have any general questions please contact Mr. Jay Huang at (213) 266-7608, or contact the Regional Board staff assigned to your UST case at (213) 266-7500.

Lawrence P. Kolb

LAWRENCE P. KOLB
Acting Executive Officer

cc: Regional Board Members
Allan Patton, Underground Storage Tank Program, SWRCB
Regional Board UST Program Managers
Ventura County Local Oversight Program
Local Implementing Agencies