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By Alameda County Environmental Health at 3:34 pm, Jul 29, 2013

Atlantic Richfield Company

Shannon Couch
Project Manager

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July 26, 2013

Re: Second Quarter 2013 Semi-Annual Groundwater Monitoring Report
Atlantic Richfield Company Station #498
286 South Livermore Avenue, Livermore, California
ACEH Case No. RO0002873

"I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct.

Submitted by,

A handwritten signature in black ink, appearing to read 'Shannon Couch', with a long horizontal line extending to the right.

Shannon Couch
Project Manager

Attachment



**SECOND QUARTER 2013 SEMI-ANNUAL
GROUNDWATER MONITORING REPORT
Atlantic Richfield Company Station #498
286 South Livermore Ave.
Livermore, Alameda County, California**

Prepared for:

Ms. Shannon Couch
Atlantic Richfield Company
P.O. Box 1257
San Ramon, CA 94583

Prepared by:

Broadbent & Associates, Inc.
1370 Ridgewood Dr., Suite 5
Chico, California 95973
(530) 566-1400

July 26, 2013

No. 08-82-603



1370 Ridgewood Drive, Suite 5, Chico, CA 95973

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broadbentinc.com

Creating Solutions. Building Trust.

July 26, 2013

Project No. 08-82-603

Atlantic Richfield Company
P.O. Box 1257
San Ramon, CA 94583
Submitted via ENFOS

Attn.: Ms. Shannon Couch

Re: Second Quarter 2013 Semi-Annual Groundwater Monitoring Report, Atlantic Richfield Company Station #498, 286 South Livermore Avenue, Livermore, California; ACEH Case #RO0002873

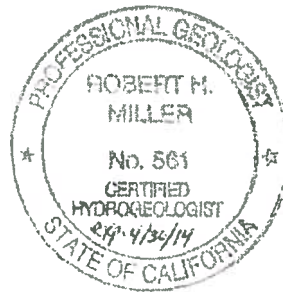
Dear Ms. Couch:

Attached is the Second Quarter 2013 Semi-Annual Groundwater Monitoring Report for Atlantic Richfield Company Station #498 located at 286 South Livermore Avenue, Livermore, California. Should you have questions regarding the work performed or results obtained, please do not hesitate to contact us at (530) 566-1400.

Sincerely,
BROADBENT & ASSOCIATES, INC.

Jason Duda
Project Scientist

Robert H. Miller, P.G., C.HG
Principal Hydrogeologist



Enclosure

cc: Mr. Jerry Wickham, Alameda County Environmental Health, 1131 Harbor Bay Parkway, Suite 250, Alameda, CA 84502 (Submitted via ACEH ftp Site)
Electronic copy uploaded to GeoTracker

**SECOND QUARTER 2013
SEMI-ANNUAL GROUNDWATER MONITORING REPORT
STATION #498, LIVERMORE, CALIFORNIA**

Broadbent & Associates, Inc. (Broadbent) is pleased to present this *Second Quarter 2013 Semi-Annual Groundwater Monitoring Report* on behalf of Atlantic Richfield Company (a BP affiliated company) for Station #498 located in Livermore, Alameda County, California. Reporting is being submitted to Alameda County Environmental Health consistent with the requirements under the legal authority of the California Regional Water Quality Control Board, as codified by the California Code of Regulations Title 23, Section 2652(d). Details of work performed, discussion of results, and recommendations are provided below.

Facility Name / Address:	ARCO Station #498 / 286 South Livermore Avenue
Client Project Manager / Title:	Ms. Shannon Couch / Project Manager
Broadbent Contact:	Jason Duda, (530) 566-1400
Broadbent Project No.:	08-82-603
Primary Regulatory Agency / ID No.:	ACEH, Case #RO0002873
Current phase of project:	Monitoring and Assessment
List of Acronyms / Abbreviations:	See end of report text for list of acronyms/abbreviations used in report.

WORK PERFORMED THIS QUARTER (Second Quarter 2013):

1. Prepared and submitted *First Quarter 2013 Status Report* (Broadbent, 4/30/2013).
2. Conducted groundwater monitoring/sampling for Second Quarter 2013 on April, 24 2013.
3. Prepared and submitted *Soil and Groundwater Investigation Report* (Broadbent, 5/3/2013).

WORK SCHEDULED FOR NEXT QUARTER (Third Quarter 2013):

1. Prepare and submit *Second Quarter 2013 Semi-Annual Groundwater Monitoring Report* (contained herein).
2. Prepare and submit Additional Groundwater Investigation Work Plan and Sensitive Receptor Survey.

GROUNDWATER MONITORING PLAN SUMMARY:

Groundwater level gauging:	MW-1 through MW-4	(2Q and 4Q)
Groundwater sample collection:	MW-1 through MW-4	(2Q and 4Q)
Biodegradation indicator parameter monitoring:	NA	

QUARTERLY RESULTS SUMMARY:

LNAPL

LNAPL observed this quarter:	No	(yes/no)
LNAPL recovered this quarter:	None	(gal)
Cumulative LNAPL recovered:	None	(gal)

Groundwater Elevation and Gradient:

Depth to groundwater:	29.48 (MW-1) to 33.17 (MW-2)	(ft below TOC)
Gradient direction:	West-Northwest	(compass direction)
Gradient magnitude:	0.02	(ft/ft)
Average change in elevation:	8.21	(ft since last measurement)

Laboratory Analytical Data

Summary:

GRO were detected in two of the four wells sampled at a maximum concentration of 3,500 µg/L in well MW-3. Benzene was detected in two of the four wells sampled at a maximum concentration of 960 µg/L in MW-3. MTBE was detected in each of the four wells sampled at a maximum concentration of 89 µg/L in well MW-3.

ACTIVITIES CONDUCTED & RESULTS:

Second Quarter 2013 groundwater monitoring was conducted on April, 24 2013 by Broadbent personnel in accordance with the monitoring plan summary detailed above. No irregularities were noted during water level gauging. Light, Non-Aqueous Phase Liquid (LNAPL, or free product) was not noted to be present in the wells monitored during this event. Depth to water measurements ranged from 29.48 ft at MW-1 to 33.17 ft at MW-2. Resulting groundwater surface elevations ranged from 462.18 ft at MW-2 to 467.24 ft at MW-1. Groundwater elevations are summarized in Table 1. Water level elevations yielded a groundwater gradient to the west-northwest at approximately 0.02 ft/ft. Field methods used during groundwater monitoring are provided in Appendix A. Field data sheets are included in Appendix B. A Site Location Map is presented as Drawing 1. Potentiometric groundwater elevation contours are presented in Drawing 2.

Groundwater samples were collected on April, 24 2013 from wells MW-1 through MW-4, consistent with the current monitoring schedule. No irregularities were reported during sampling. Samples were submitted under chain-of-custody protocol to TestAmerica Laboratories, Inc. (Irvine, California) for analysis of GRO (C6-C12) by EPA Method 8015M; for BTEX, MTBE, ETBE, TAME, DIPE, EDB, 1,2-DCA, TBA, and Ethanol by EPA Method 8260. No significant irregularities were encountered during analysis of the samples. The laboratory analytical report, including chain-of-custody documentation, is provided in Appendix C.

Hydrocarbons in the GRO range were detected above the laboratory reporting limit in two of the four wells sampled at concentrations up to 3,500 µg/L in well MW-3. Benzene was detected above the laboratory reporting limit in two of the four wells sampled at a maximum concentration of 960 µg/L in well MW-3. Toluene was detected above the laboratory reporting limit in two of the four wells sampled at a maximum concentration of 12 µg/L in well MW-1. Ethylbenzene was detected above the laboratory reporting limit in two of the four wells sampled at a maximum concentration of 110 µg/L in well MW-3. Total Xylenes were detected above the laboratory reporting limits in two of the four wells sampled at a maximum concentration of 15 µg/L in well MW-1. MTBE was detected above the laboratory reporting limit in each of the four wells sampled at a maximum concentration of 89 µg/L in well MW-3. TBA was detected above the laboratory reporting limit in three of the four wells sampled at a maximum concentration of 71 µg/L in well MW-3. The remaining analytes were not detected above their laboratory reporting limits in the wells sampled this monitoring event. Groundwater monitoring laboratory analytical results are summarized in Table 1 and Table 2. The most recent GRO, Benzene, and MTBE concentrations are also presented in Drawing 2. Groundwater monitoring data (GEO_WELL) and laboratory analytical results (EDF) were uploaded to the GeoTracker AB2886 database. Upload confirmation receipts are provided in Appendix D.

DISCUSSION:

Groundwater levels were between historic minimum and maximum elevations for each well gauged this quarter. Groundwater elevations yielded a groundwater gradient to the west-northwest at approximately 0.02 ft/ft, generally consistent with the historic gradient data presented in Table 3.

This event's detected analytical concentrations were within the historic minimum and maximum ranges recorded for each well with the following exceptions: Total Xylenes reached a historic minimum concentration and MTBE and Benzene reached historic maximum concentrations in well MW-3; and Ethylbenzene reached a historic maximum concentration in well MW-1. Recent and historic laboratory analytical results are summarized in Table 1 and Table 2. The next semi-annual groundwater monitoring and sampling event is scheduled to be conducted during the Fourth Quarter 2013.

RECOMMENDATIONS:

Broadbent submitted the *Soil and Groundwater Investigation Report* dated May 3, 2013, which provided data from the on-site soil and groundwater assessment activities conducted March 18 through 22, 2013 to define the site stratigraphy and vertical and lateral distribution of contamination using Cone Penetration Testing (CPT) drilling techniques. The report recommended conduct of additional groundwater investigation activities based on the data obtained in the March investigations and preparation of a Sensitive Receptor Survey. A letter from the ACEH dated June 18, 2013 concurred with these recommendations. The Additional Groundwater Investigation Work Plan and Sensitive Receptor Survey is anticipated to be completed during Third Quarter 2013. In addition, regular groundwater monitoring and sampling will take place during the Fourth Quarter 2013 according to the previously discussed schedule.

LIMITATIONS:

The findings presented in this report are based upon observations of field personnel, points investigated, and results of laboratory tests performed by TestAmerica Laboratories, Inc. (Irvine, California). Our services were performed in accordance with the generally accepted standard of practice at the time this report was written. No other warranty, expressed or implied was made. This report has been prepared for the exclusive use of the Atlantic Richfield Company. It is possible that variations in soil or groundwater conditions could exist beyond points explored in this investigation. Also, changes in site conditions could occur in the future due to variations in rainfall, temperature, regional water usage, or other factors.

ATTACHMENTS:

- Drawing 1: Site Location Map
- Drawing 2: Groundwater Elevation Contour and Analytical Summary Map, Second Quarter, 2013

- Table 1: Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
- Table 2: Summary of Fuel Additives Analytical Data
- Table 3: Historic Groundwater Gradient – Direction and Magnitude

- Appendix A: Field Methods
- Appendix B: Field Data Sheets and Non-Hazardous Waste Data Form
- Appendix C: Laboratory Report and Chain-of-Custody Documentation
- Appendix D: GeoTracker Upload Confirmation Receipt

LIST OF COMMONLY USED ACCRONYMS/ABBREVIATIONS:

ACEH:	Alameda County Environmental Health	gal:	Gallons
BTEX:	Benzene, Toluene, Ethylbenzene, Total Xylenes	GRO:	Gasoline-Range Organics
1,2-DCA:	1,2-Dichloroethane	LNAPL:	Light Non-Aqueous Phase Liquid
DIPE:	Di-Isopropyl Ether	MTBE:	Methyl Tertiary Butyl Ether
DO:	Dissolved Oxygen	NO ₃ :	Nitrate as Nitrogen
DRO:	Diesel-Range Organics	ppb:	parts per billion
EDB:	1,2-Dibromomethane	SO ₄ :	Sulfate
Eh:	Oxidation Reduction Potential	TAME:	Tert-Amyl Methyl Ether
EPA:	Environmental Protection Agency	TBA:	Tertiary Butyl Ether
ETBE:	Ethyl Tertiary Butyl Ether	TOC:	Top of Casing
Fe ²⁺ :	Ferrous Iron	µg/L:	micrograms per liter
ft/ft:	feet per foot		

DRAWINGS

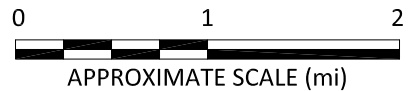
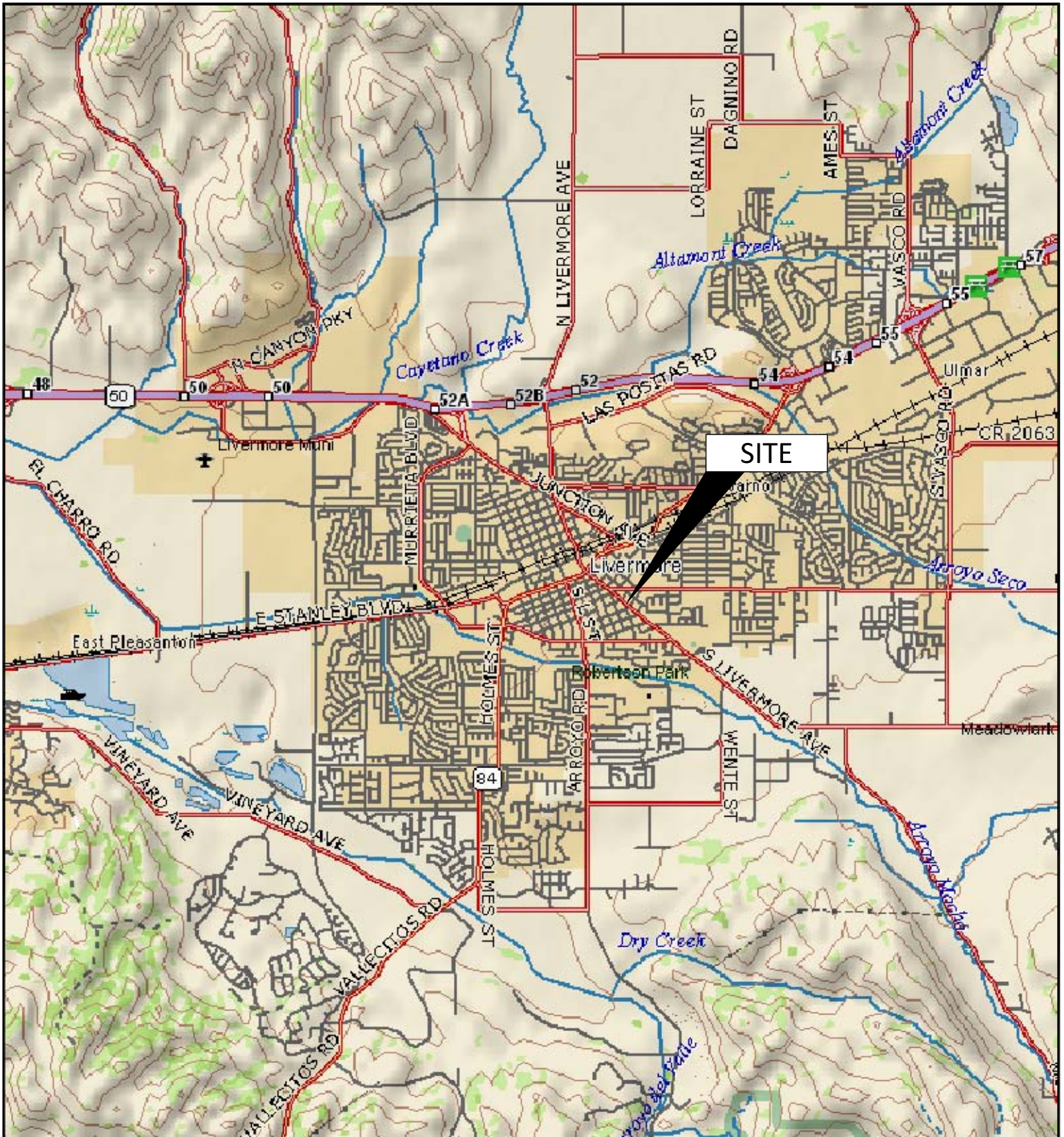
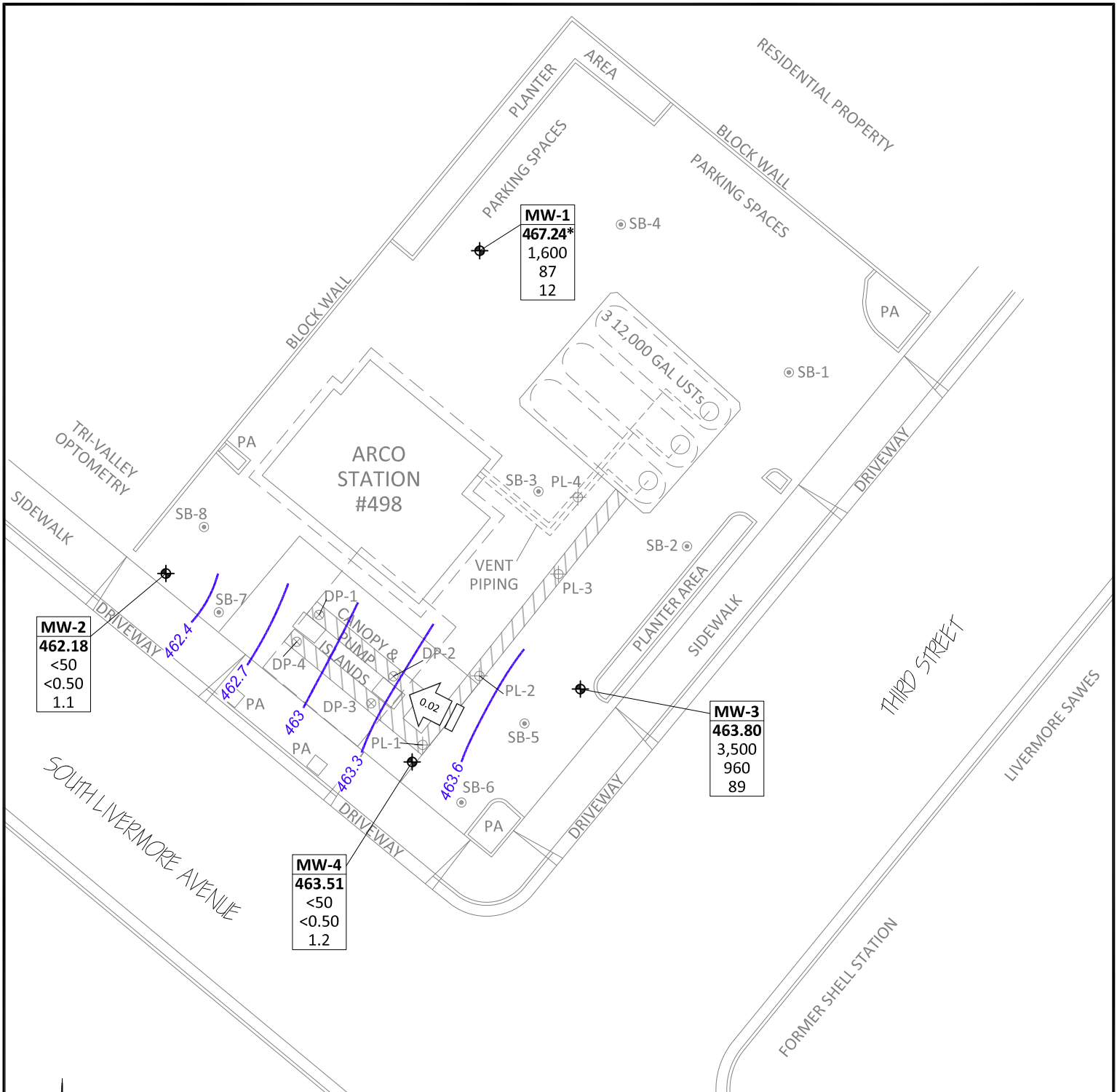


IMAGE SOURCE: DELORME

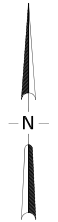


MW-2
462.18
<50
<0.50
1.1

MW-1
467.24*
1,600
87
12

MW-3
463.80
3,500
960
89

MW-4
463.51
<50
<0.50
1.2



LEGEND	
	Monitor Well Location
	Soil Boring (URS 2005)
	Product Line Soil Sample (Delta 2001)
	Dispenser Pump Soil Sample (Delta 2001)
	Well designation
	Groundwater elevation
	Concentration of GRO, Benzene, and MTBE in groundwater (µg/L)
	Product Line Excavation Trench
	Groundwater Elevation Contour (Feet Above Site Datum)
	Groundwater Gradient (ft/ft)
<	Not detected at or above laboratory reporting limits
NS	Not sampled
*	Not used in contouring

NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES. WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.

BROADBENT
 1370 Ridgewood Dr., Suite 5
 Chico, California 95973
 Project No.: 08-82-603 Date: 7/18/2013

Station #498
 286 South Livermore Avenue
 Livermore, California

Groundwater Elevation Contour
 and Analytical Summary Map
 Second Quarter, 2013

Drawing
2

TABLES

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Product Thickness (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
								GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-1																
12/29/2008	P	496.72	20.00	40.00	28.81	0.00	467.91	1,100	38	1.2	4.0	3.3	17	2.72	6.83	
3/20/2009	P		20.00	40.00	28.95	0.00	467.77	640	9.1	<0.50	4.1	<0.50	21	0.35	7.28	
6/2/2009	P		20.00	40.00	30.90	0.00	465.82	600	1.6	<0.50	<0.50	<0.50	32	0.59	7.17	
9/2/2009	P		20.00	40.00	32.00	0.00	464.72	570	<0.50	<0.50	<0.50	<0.50	5.3	1.02	7.38	
11/9/2009	P		20.00	40.00	31.82	0.00	464.90	1,000	130	12	35	39	140	1.39	7.02	
5/20/2010	P		20.00	40.00	28.94	0.00	467.78	1,000	4.4	<0.50	0.76	0.73	22	0.59	6.6	
11/2/2010	P		20.00	40.00	32.03	0.00	464.69	1,300	83	20	40	61	39	0.72	6.0	b (GRO), c
5/25/2011	P		20.00	40.00	26.69	0.00	470.03	2,900	32	3.1	20	2.9	<0.50	0.68	7.0	lw (GRO)
10/25/2011	P		20.00	40.00	30.11	0.00	466.61	1,100	20	3.7	<0.50	5.4	21	0.78	7.4	lw (GRO)
4/10/2012	P		20.00	40.00	30.35	0.00	466.37	1,300	13	2.0	7.0	7.1	5.0	0.20	6.71	lw (GRO)
10/9/2012	NP		20.00	40.00	37.61	0.00	459.11	700	<0.50	<0.50	<0.50	<1.0	3.2	2.79	7.93	
4/24/2013	P		20.00	40.00	29.48	0.00	467.24	1,600	87	12	87	15	12	1.49	7.22	
MW-2																
12/29/2008	P	495.35	37.00	57.00	48.76	0.00	446.59	110	7.1	<0.50	<0.50	0.76	16	1.04	7.67	
3/20/2009	P		37.00	57.00	38.78	0.00	456.57	200	3.9	<1.0	<1.0	<1.0	56	0.41	7.51	
6/2/2009	P		37.00	57.00	43.98	0.00	451.37	110	5.1	<1.0	<1.0	<1.0	44	1.87	7.42	
9/2/2009	P		37.00	57.00	50.25	0.00	445.10	88	0.79	<0.50	<0.50	<0.50	12	1.55	6.91	
11/9/2009	P		37.00	57.00	43.79	0.00	451.56	58	2.0	<0.50	<0.50	<0.50	13	0.86	7.14	
5/20/2010	P		37.00	57.00	32.07	0.00	463.28	<50	<0.50	<0.50	<0.50	<0.50	27	0.61	6.8	
11/2/2010	P		37.00	57.00	39.23	0.00	456.12	<50	<0.50	<0.50	<0.50	<0.50	57	1.34	6.8	
5/25/2011	P		37.00	57.00	28.19	0.00	467.16	<50	<0.50	<0.50	<0.50	<0.50	15	3.74	7.1	
10/25/2011	P		37.00	57.00	33.33	0.00	462.02	<50	<0.50	<0.50	<0.50	<0.50	5.7	1.28	7.8	
4/10/2012	P		37.00	57.00	39.25	0.00	456.10	<50	<0.50	<0.50	<0.50	<0.50	1.1	1.04	7.13	
10/9/2012	P		37.00	57.00	41.84	0.00	453.51	<50	<0.50	<0.50	<0.50	<1.0	0.60	2.76	7.71	
4/24/2013	P		37.00	57.00	33.17	0.00	462.18	<50	<0.50	<0.50	<0.50	<1.0	1.1	2.51	7.53	
MW-3																
12/29/2008	P	496.32	37.00	57.00	48.21	0.00	448.11	28,000	310	200	840	6,200	71	1.95	7.39	
3/20/2009	P		37.00	57.00	38.48	0.00	457.84	11,000	360	84	600	1,500	71	0.56	7.25	
6/2/2009	P		37.00	57.00	43.33	0.00	452.99	5,100	310	14	180	310	66	2.06	7.18	a

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Product Thickness (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
								GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-3 Cont.																
9/2/2009	P	496.32	37.00	57.00	49.60	0.00	446.72	25,000	380	150	930	2,900	75	1.35	6.93	
11/9/2009	P		37.00	57.00	43.25	0.00	453.07	6,900	390	27	480	680	69	0.54	6.9	
5/20/2010	P		37.00	57.00	31.56	0.00	464.76	9,400	690	<10	300	83	77	0.36	6.8	
11/2/2010	P		37.00	57.00	38.68	0.00	457.64	4,400	420	<10	110	33	70	0.59	6.8	b (GRO)
5/25/2011	P		37.00	57.00	27.56	0.00	468.76	4,500	560	<10	210	22	74	0.70	9.8	lw (GRO)
10/25/2011	P		37.00	57.00	32.77	0.00	463.55	2,700	190	<4.0	82	51	33	0.69	7.6	
4/10/2012	P		37.00	57.00	38.69	0.00	457.63	3,000	440	<4.0	69	10	46	0.28	6.57	lw (GRO)
10/9/2012	P		37.00	57.00	41.19	0.00	455.13	1,600	210	<2.0	28	7.4	33	1.23	7.39	
4/24/2013	P		37.00	57.00	32.52	0.00	463.80	3,500	960	3.6	110	6.0	89	1.15	7.21	
MW-4																
12/29/2008	--	496.01	20.00	40.00	--	--	--	--	--	--	--	--	--	--	--	Dry
3/20/2009	P		20.00	40.00	37.82	0.00	458.19	410	0.78	<0.50	<0.50	0.64	16	0.52	7.16	
6/2/2009	--		20.00	40.00	--	--	--	--	--	--	--	--	--	--	--	Dry
9/2/2009	--		20.00	40.00	--	--	--	--	--	--	--	--	--	--	--	Dry
11/9/2009	--		20.00	40.00	--	--	--	--	--	--	--	--	--	--	--	Dry
5/20/2010	P		20.00	40.00	31.29	0.00	464.72	290	<2.0	<2.0	<2.0	<2.0	10	0.82	6.6	
11/2/2010	NP		20.00	40.00	38.42	0.00	457.59	51	<2.0	<2.0	<2.0	<2.0	5.1	1.12	6.4	b (GRO), c
5/25/2011	P		20.00	40.00	27.58	0.00	468.43	94	<1.0	<1.0	<1.0	<1.0	6.2	0.86	6.9	lw (GRO)
10/25/2011	P		20.00	40.00	32.51	0.00	463.50	73	<0.50	<0.50	<0.50	<0.50	4.3	0.49	7.4	lw (GRO)
4/10/2012	--		20.00	40.00	38.47	0.00	457.54	<50	<0.50	<0.50	<0.50	<0.50	0.85	--	7.06	
10/9/2012	--		20.00	40.00	39.86	0.00	456.15	--	--	--	--	--	--	--	--	d
4/24/2013	P		20.00	40.00	32.50	0.00	463.51	<50	<0.50	<0.50	<0.50	<1.0	1.2	1.32	7.01	
SB-9																
3/22/2013	--	NS	--	--	--	--	--	--	<0.50	<0.50	<0.50	<1.0	1.9	--	--	
SB-10																
3/18/2013	--	NS	--	--	--	--	--	<50	<2.0	<2.0	<2.0	<4.0	520	--	--	
SB-11																
3/20/2013	--	NS	--	--	--	--	--	73	<5.0	<5.0	<5.0	<10	1,700	--	--	

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Product Thickness (feet)	Water Level Elevation (feet)	Concentrations in µg/L					DO (mg/L)	pH	Footnote	
								GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes				MTBE
SB-12 3/20/2013	--	NS	--	--	--	--	--	<50	<1.0	<1.0	<1.0	<2.0	570	--	--	
SB-13 3/21/2013	--	NS	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	100	--	--	
SB-14 3/22/2013	--	NS	--	--	--	--	--	--	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	
SB-15 3/21/2013	--	NS	--	--	--	--	--	6,300	4.7	8.2	110	52	<1.0	--	--	
SB-16 3/21/2013	--	NS	--	--	--	--	--	26,000	180	360	1,500	9,300	<25	--	--	

Symbols & Abbreviations:

-- = Not sampled/analyzed/applicable/measured/ available

< = Not detected at or above specified laboratory reporting limit

DO = Dissolved oxygen

DTW = Depth to water in ft bgs

ft bgs= feet below ground surface

ft MSL= feet above mean sea level

GRO = Gasoline range organics

GWE = Groundwater elevation measured in ft MSL

mg/L = Milligrams per liter

MTBE = Methyl tert-butyl ether

NP = Not purged before sampling

P = Purged before sampling

TOC = Top of casing measured in ft MSL

µg/L = Micrograms per liter

Footnotes:

a = Sample preserved improperly

b = Quantitation of unknown hydrocarbon(s) in sample based on gasoline

c = Hydrocarbon odor

d = Insufficient water within well casing to collect sample

lw = Quantitated against gasoline

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-1									
12/29/2008	<300	<10	17	<0.50	<0.50	<0.50	<0.50	<0.50	
3/20/2009	<300	25	21	<0.50	<0.50	<0.50	<0.50	<0.50	
6/2/2009	<300	28	32	<0.50	<0.50	<0.50	<0.50	<0.50	
9/2/2009	<300	17	5.3	<0.50	<0.50	<0.50	<0.50	<0.50	
11/9/2009	<300	47	140	<0.50	<0.50	3.1	<0.50	<0.50	
5/20/2010	<300	75	22	<0.50	<0.50	<0.50	<0.50	<0.50	
11/2/2010	<300	50	39	<0.50	<0.50	<0.50	<0.50	<0.50	
5/25/2011	<300	32	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
10/25/2011	<300	78	21	<0.50	<0.50	0.72	<0.50	<0.50	
4/10/2012	<300	49	5.0	<0.50	<0.50	<0.50	<0.50	<0.50	
10/9/2012	<150	47	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	
4/24/2013	<150	43	12	<0.50	<0.50	<0.50	<0.50	<0.50	
MW-2									
12/29/2008	<300	22	16	<0.50	<0.50	<0.50	<0.50	<0.50	
3/20/2009	<600	62	56	<1.0	<1.0	<1.0	<1.0	<1.0	
6/2/2009	<600	83	44	<1.0	<1.0	<1.0	<1.0	<1.0	
9/2/2009	<300	37	12	<0.50	<0.50	<0.50	<0.50	<0.50	
11/9/2009	<300	41	13	<0.50	<0.50	<0.50	<0.50	<0.50	
5/20/2010	<300	22	27	<0.50	<0.50	<0.50	<0.50	<0.50	
11/2/2010	<300	26	57	<0.50	<0.50	<0.50	<0.50	<0.50	
5/25/2011	<300	<10	15	<0.50	<0.50	<0.50	<0.50	<0.50	
10/25/2011	<300	<10	5.7	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/2012	<300	<10	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	
10/9/2012	<150	<10	0.60	<0.50	<0.50	<0.50	<0.50	<0.50	
4/24/2013	<150	<10	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	
MW-3									
12/29/2008	<30,000	<1,000	71	<50	<50	<50	<50	<50	
3/20/2009	<7,500	<250	71	<12	<12	<12	<12	<12	
6/2/2009	<3,000	100	66	<5.0	<5.0	<5.0	<5.0	<5.0	
9/2/2009	<7,500	<250	75	<12	<12	<12	<12	<12	

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-3 Cont.									
11/9/2009	<3,000	<100	69	<5.0	<5.0	<5.0	<5.0	<5.0	
5/20/2010	<6,000	<200	77	<10	<10	<10	<10	<10	
11/2/2010	<6,000	<200	70	<10	<10	<10	<10	<10	
5/25/2011	<6000	<200	74	<10	<10	<10	<10	<10	
10/25/2011	<2,400	<80	33	<4.0	<4.0	<4.0	<4.0	<4.0	
4/10/2012	<2,400	<80	46	<4.0	<4.0	<4.0	<4.0	<4.0	
10/9/2012	<600	56	33	<2.0	<2.0	<2.0	<2.0	<2.0	
4/24/2013	<380	71	89	<1.3	<1.3	<1.3	<1.3	<1.3	
MW-4									
3/20/2009	<300	2,000	16	<0.50	<0.50	<0.50	<0.50	<0.50	
5/20/2010	<1,200	1,000	10	<2.0	<2.0	<2.0	<2.0	<2.0	
11/2/2010	<1,200	500	5.1	<2.0	<2.0	<2.0	<2.0	<2.0	
5/25/2011	<600	230	6.2	<1.0	<1.0	<1.0	<1.0	<1.0	
10/25/2011	<300	150	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/2012	<300	<10	0.85	<0.50	<0.50	<0.50	<0.50	<0.50	
4/24/2013	<150	24	1.2	<0.50	<0.50	<0.50	<0.50	<0.50	
SB-9									
3/22/2013	<150	<10	1.9	<0.50	<0.50	<0.50	<0.50	<0.50	
SB-10									
3/18/2013	<600	67	520	<2.0	<2.0	<2.0	<2.0	<2.0	
SB-11									
3/20/2013	<1,500	570	1,700	<5.0	<5.0	7.5	<5.0	<5.0	
SB-12									
3/20/2013	<300	21	570	<1.0	<1.0	4.0	<1.0	<1.0	
SB-13									
3/21/2013	<150	<10	100	<0.50	<0.50	<0.50	<0.50	<0.50	
SB-14									

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
SB-14 Cont.									
3/22/2013	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
SB-15									
3/21/2013	<300	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SB-16									
3/21/2013	<7,500	<500	<25	<25	<25	<25	<25	<25	

Symbols & Abbreviations:

--/-- = Not sampled/analyzed/applicable/measured/available

< = Not detected at or above specified laboratory reporting limit

1,2-DCA = 1,2-Dichloroethane

DIPE = Diisopropyl ether

EDB = 1,2-Dibromoethane

ETBE = Ethyl tert-butyl ether

MTBE = Methyl tert-butyl ether

TAME = tert-Amyl methyl ether

TBA = tert-Butyl alcohol

µg/L = Micrograms per liter

Table 3. Historical Groundwater Gradient - Direction and Magnitude
ARCO Service Station #498, 286 South Livermore Avenue, Livermore, CA

Date Measured	Approximate Gradient Direction	Approximate Gradient Magnitude (ft/ft)
12/29/2008	NA	NA
3/20/2009	North-Northwest	0.02
6/2/2009	NA	NA
9/2/2009	NA	NA
11/9/2009	NA	NA
5/20/2010	West-Northwest	0.02
11/2/2010	West-Northwest	0.02
5/25/2011	West-Northwest	0.02
10/25/2011	West-Northwest	0.02
4/10/2012	West-Northwest	0.01
10/9/2012	West-Northwest	0.02
4/24/2013	West-Northwest	0.02

Symbols & Abbreviations:
 NA = Not Available

APPENDIX A

FIELD METHODS



QUALITY ASSURANCE/QUALITY CONTROL FIELD METHODS

Field methods discussed herein were implemented to provide for accuracy and reliability of field activities, data collection, sample collection, and handling. Discussion of these methods is provided below.

1.0 EQUIPMENT CALIBRATION

Equipment calibration was performed per equipment manufacturer specifications before use.

2.0 DEPTH TO GROUNDWATER AND LIGHT NON-AQUEOUS PHASE LIQUID MEASUREMENT

Depth to groundwater was measured in wells identified for gauging in the scope of work using a decontaminated water level indicator. The depth to water measurement was taken from a cut notch or permanent mark at the top of the well casing to which the well head elevation was originally surveyed.

Once depth to water was measured, an oil/water interface meter or a new disposable bailer was utilized to evaluate the presence and, if present, to measure the “apparent” thickness of light non-aqueous phase liquid (LNAPL) in the well. If LNAPL was present in the well, groundwater purging and sampling were not performed, unless sampling procedures in the scope of work specified collection of samples in the presence of LNAPL. Otherwise, time allowing, LNAPL was bailed from the well using either a new disposable bailer, or the disposal bailer previously used for initial LNAPL assessment. Bailing of LNAPL continued until the thickness of LNAPL (or volume) stabilized in each bailer pulled from the well, or LNAPL was no longer present. After LNAPL thickness either stabilized or was eliminated, periodic depth to water and depth to LNAPL measurements were collected as product came back into the well to evaluate product recovery rate and to aid in further assessment of LNAPL in the subsurface. LNAPL thickness measurements were recorded as “apparent.” If a bailer was used for LNAPL thickness measurement, the field sampler noted the bailer entry diameter and chamber diameter to enable correction of thickness measurements. Recovered LNAPL was stored on-site in a labeled steel drum(s) or other appropriate container(s) prior to disposal.

3.0 WELL PURGING AND GROUNDWATER SAMPLE COLLECTION

Well purging and groundwater sampling were performed in wells specified in the scope of work after measuring depth to groundwater and evaluating the presence of LNAPL. Purging and sampling were performed using one of the methods detailed below. The method used was noted in the field records. Purge water was stored on-site in labeled steel drum(s) or other appropriate container(s) prior to disposal or on-site treatment (in cases where treatment using an on-site system is authorized).

3.1 Purging a Predetermined Well Volume

Purging a predetermined well volume is performed per ASTM International (ASTM) D4448-01. This purging method has the objective of removing a predetermined volume of stagnant water from the well prior to sampling. The volume of stagnant water is defined as either the volume of water contained within the well casing, or the volume within the well casing and sand/gravel in the annulus if natural flow through these is deemed insufficient to keep them flushed out.

This purging method involves removal of a minimum of three stagnant water volumes from the well using a decontaminated pump with new disposable plastic discharge or suction tubing, dedicated well tubing, or using a new disposable or decontaminated reusable bailer. If a new disposable bailer was used for assessment of LNAPL, that bailer may be used for purging. The withdrawal rate used is one that minimizes drawdown while satisfying time constraints.

To evaluate when purging is complete, one or more groundwater stabilization parameters are monitored and recorded during purging activities until stabilization is achieved. Most commonly, stabilization parameters include temperature, conductivity, and pH, but field procedures detailed in the scope of work may also include monitoring of dissolved oxygen concentrations, oxidation reduction potential, and/or turbidity¹. Parameters are considered stable when two (2) consecutive readings recorded three (3) minutes apart fall within ranges provided below in Table 1. In the event that the parameters have not stabilized and five (5) well casing volumes have been removed, purging activities will cease and be considered complete. Once the well is purged, a groundwater sample(s) is collected from the well using a new disposable bailer. If a new disposable bailer was used for purging, that bailer may be used to collect the sample(s). A sample is not collected if the well is inadvertently purged dry.

Table 1. Criteria for Defining Stabilization of Water-Quality Indicator Parameters

Parameter	Stabilization Criterion
Temperature	± 0.2°C (± 0.36°F)
pH	± 0.1 standard units
Conductivity	± 3%
Dissolved oxygen	± 10%
Oxidation reduction potential	± 10 mV
Turbidity ¹	± 10% or 1.0 NTU (whichever is greater)

3.2 Low-Flow Purging and Sampling

“Low-Flow”, “Minimal Drawdown”, or “Low-Stress” purging is performed per ASTM D6771-02. It is a method of groundwater removal from within a well’s screened interval that is intended to minimize drawdown and mixing of the water column in the well

¹ As stated in ASTM D6771-02, turbidity is not a chemical parameter and not indicative of when formation-quality water is being purged; however, turbidity may be helpful in evaluating stress on the formation during purging. Turbidity measurements are taken at the same time that stabilization parameter measurements are made, or, at a minimum, once when purging is initiated and again just prior to sample collection, after stabilization parameters have stabilized. To avoid artifacts in sample analysis, turbidity should be as low as possible when samples are collected. If turbidity values are persistently high, the withdrawal rate is lowered until turbidity decreases. If high turbidity persists even after lowering the withdrawal rate, the purging is stopped for a period of time until turbidity settles, and the purging process is then restarted. If this fails to solve the problem, the purging/sampling process for the well is ceased, and well maintenance or redevelopment is considered.

casing. This is accomplished by pumping the well using a decontaminated pump with new disposable plastic discharge or suction tubing or dedicated well tubing at a low flow rate while evaluating the groundwater elevation during pumping.

The low flow pumping rate is well specific and is generally established at a volume that is less than or equal to the natural recovery rate of the well. A pump with adjustable flow rate control is positioned with the intake at or near the mid-point of the submerged well screen. The pumping rate used during low-flow purging is low enough to minimize mobilization of particulate matter and drawdown (stress) of the water column. Low-flow purging rates will vary based on the individual well characteristics; however, the purge rate should not exceed 1.0 Liter per minute (L/min) or 0.25 gallon per minute (gal/min). Low-flow purging should begin at a rate of approximately 0.1 L/min (0.03 gal/min)², or the lowest rate possible, and be adjusted based on an evaluation of drawdown. Water level measurements should be recorded at approximate one (1) to two (2) minute intervals until the low-flow rate has been established, and drawdown is minimized. As a general rule, drawdown should not exceed 25% of the distance between the top of the water column and the pump in-take.

To evaluate when purging is complete, one or more groundwater stabilization parameters are monitored and recorded during purging activities until stabilization is achieved. Most commonly, stabilization parameters include temperature, conductivity, and pH, but field procedures detailed in the scope of work may also include monitoring of dissolved oxygen concentrations, oxidation reduction potential, and/or turbidity¹. The frequency between measurements will be at an interval of one (1) to three (3) minutes; however, if a flow cell is used, the frequency will be determined based on the time required to evacuate one cell volume. Stabilization is defined as three (3) consecutive readings recorded several minutes apart falling within ranges provided in Table 1. Samples will be collected by filling appropriate containers from the pump discharge tubing at a rate not to exceed the established pumping rate.

3.3 Minimal Purge, Discrete Depth, and Passive Sampling

In accordance with ASTM D4448-01, sampling techniques that do not rely on purging, or require only minimal purging, may be used if a particular zone within a screened interval is to be sampled or if a well is not capable of yielding sufficient groundwater for purging. To properly use these sampling techniques, a water sample is collected within the screened interval with little or no mixing of the water column within the casing. These techniques include minimal purge sampling which uses a dedicated sampling pump capable of pumping rates of less than 0.1 L/min (0.03 gal/min)², discrete depth sampling using a bailer that allows groundwater entry at a controlled depth (e.g. differential pressure bailer), or passive (diffusion) sampling. These techniques are based on certain studies referenced in ASTM D4448-01 that indicate that under certain conditions, natural groundwater flow is laminar and horizontal with little or no mixing within the well screen.

² According to ASTM D4448-01, studies have indicated that at flow rates of 0.1 L/min, low-density polyethylene (LDPE) and plasticized polypropylene tubing materials are prone to sorption. Therefore, TFE-fluorocarbon or other appropriate tubing material is used, particularly when tubing lengths of 50 feet or longer are used.

4.0 DECONTAMINATION

Reusable groundwater sampling equipment were cleaned using a solution of Alconox or other acceptable detergent, rinsed with tap water, and finally rinsed with distilled water prior to use in each well. Decontamination water was stored on-site in labeled steel drum(s) or other appropriate container(s) prior to disposal.

5.0 SAMPLE CONTAINERS, LABELING, AND STORAGE

Samples were collected in laboratory prepared containers with appropriate preservative (if preservative was required). Samples were labeled (site name, sample I.D., sampler initials, date, and time of collection) and stored chilled (refrigerator or ice chest with ice) until delivery to a certified laboratory, under chain of custody procedures.

6.0 CHAIN OF CUSTODY RECORD AND PROCEDURE

The field sampler was personally responsible for care and custody of the samples collected until they were properly transferred to another party. To document custody and transfer of samples, a Chain of Custody Record was prepared. The Chain of Custody Record provided identification of the samples corresponding to sample labels and specified analyses to be performed by the laboratory. The original Chain of Custody Record accompanied the shipment, and a copy of the record was stored in the project file. When the samples were transferred, the individuals relinquishing and receiving them signed, dated, and noted the time of transfer on the record.

7.0 FIELD RECORDS

Daily Report and data forms were completed by staff personnel to provide daily record of significant events, observations, and measurements. Field records were signed, dated, and stored in the project file.

APPENDIX B

FIELD DATA SHEETS AND NON-HAZARDOUS WASTE DATA FORM



DAILY REPORT

Page 1 of 1

Project: BP 498 Project No.: 08-82-603

Field Representative(s): A. Martinez / J. Ramos Day: Wednesday Date: 4/24/13

Time Onsite: From: 0845 To: 1200 ; From: To: ; From: To:

- Signed HASP Safety Glasses Hard Hat Steel Toe Boots Safety Vest
UST Emergency System Shut-off Switches Located Proper Gloves
Proper Level of Barricading Other PPE (describe)

Weather: Sunny

Equipment In Use: Bladder pump, water level meter, water quality meter

Visitors:

Table with 2 columns: TIME and WORK DESCRIPTION. Contains handwritten entries for arrival, setup at MW-4, MW-2, MW-1, MW-3, and cleanup.

Signature: [Handwritten Signature]



Project: BP 498 Project No.: 08-82-603 Date: 4/24/13
 Field Representative: JR/AM
 Well ID: MW-2 Start Time: _____ End Time: _____ Total Time (minutes): _____

PURGE EQUIPMENT _____ Disp. Bailer _____ 120V Pump _____ Flow Cell
 Disp. Tubing _____ 12V Pump _____ Peristaltic Pump _____ Other/ID# BLADDER PUMP

WELL HEAD INTEGRITY (cap, lock, vault, etc.) _____ Comments: _____
 Good Improvement Needed (circle one)

PURGING/SAMPLING METHOD _____ Predetermined Well Volume Low-Flow Other: _____ (circle one)

PREDETERMINED WELL VOLUME					LOW-FLOW				
Casing Diameter Unit Volume (gal/ft) (circle one)					Previous Low-Flow Purge Rate: _____ (lpm)				
1" (0.04)	1.25" (0.08)	2" (0.17)	3" (0.38)	Other: _____	Total Well Depth (a): <u>57.18</u> (ft)				
4" (0.66)	6" (1.50)	8" (2.60)	12" (5.81)	_____ (____)	Initial Depth to Water (b): <u>33.17</u> (ft)				
Total Well Depth (a): _____ (ft)					Pump In-take Depth = b + (a-b)/2: <u>45.18</u> (ft)				
Initial Depth to Water (b): _____ (ft)					Maximum Allowable Drawdown = (a-b)/8: <u>3.06</u> (ft)				
Water Column Height (WCH) = (a - b): _____ (ft)					Low-Flow Purge Rate: <u>0.25</u> (Lpm)*				
Water Column Volume (WCV) = WCH x Unit Volume: _____ (gal)					Comments: _____				
Three Casing Volumes = WCV x 3: _____ (gal)					<p>*Low-flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.</p>				
Five Casing Volumes = WCV x 5: _____ (gal)									
Pump Depth (if pump used): _____ (ft)									

Time (24:00)	Cumulative Vol. gal or L	Temperature °C	pH	Conductivity μS or mS	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1019	0	24.06	7.55	1.00	3.98	151	257	
1021	0.5	23.29	7.53	1.02	3.00	153	---	
1023	1.0	22.71	7.52	1.03	2.63	152	---	
1025	1.5	22.58	7.53	1.03	2.57	152	---	
1027	2.0	22.34	7.50	1.03	2.57	151	160	

Previous Stabilized Parameters _____
 PURGE COMPLETION RECORD Low Flow & Parameters Stable _____ 3 Casing Volumes & Parameters Stable _____ 5 Casing Volumes
 Other: _____

SAMPLE COLLECTION RECORD		GEOCHEMICAL PARAMETERS	
Parameter	Time	Measurement	
Depth to Water at Sampling: <u>33.19</u> (ft)			
Sample Collected Via: _____ Disp. Bailer _____ Dedicated Pump Tubing			
<input checked="" type="checkbox"/> Disp. Pump Tubing Other: _____			
Sample ID: <u>MW-2</u> Sample Collection Time: <u>1036</u> (24:00)			
Containers (#): <u>6</u> VOA (<input checked="" type="checkbox"/> preserved or _____ unpreserved) _____ Liter Amber			
Other: _____			
Other: _____			
Other: _____			
DO (mg/L)			
Ferrous Iron (mg/L)			
Redox Potential (mV)			
Alkalinity (mg/L)			
Other:			
Other:			

Signature:



GROUNDWATER SAMPLING DATA SHEET

Page 4 of 5

Project: BP 498 Project No.: 08-82-603 Date: 4/24/13
 Field Representative: JR/AM
 Well ID: MW-3 Start Time: _____ End Time: _____ Total Time (minutes): _____

PURGE EQUIPMENT _____ Disp. Bailer _____ 120V Pump _____ Flow Cell
 Disp. Tubing _____ 12V Pump _____ Peristaltic Pump _____ Other/ID#: BLADDER PUMP

WELL HEAD INTEGRITY (cap, lock, vault, etc.) _____ Comments: _____
 Good _____ Improvement Needed (circle one)

PURGING/SAMPLING METHOD _____ Predetermined Well Volume Low-Flow _____ Other: _____ (circle one)

PREDETERMINED WELL VOLUME				
Casing Diameter	Unit Volume (gal/ft)	(circle one)		
1" (0.04)	1.25" (0.08)	2" (0.17)	3" (0.38)	Other: _____
4" (0.66)	6" (1.50)	8" (2.60)	12" (5.81)	_____ (____)

Total Well Depth (a): _____ (ft)

Initial Depth to Water (b): _____ (ft)

Water Column Height (WCH) = (a - b): _____ (ft)

Water Column Volume (WCV) = WCH x Unit Volume: _____ (gal)

Three Casing Volumes = WCV x 3: _____ (gal)

Five Casing Volumes = WCV x 5: _____ (gal)

Pump Depth (if pump used): _____ (ft)

LOW-FLOW

Previous Low-Flow Purge Rate: _____ (lpm)

Total Well Depth (a): 55.43 (ft)

Initial Depth to Water (b): 32.52 (ft)

Pump In-take Depth = b + (a-b)/2: 43.96 (ft)

Maximum Allowable Drawdown = (a-b)/8: 2.86 (ft)

Low-Flow Purge Rate: 0.25 (lpm)*

Comments: _____

*Low-flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.

GROUNDWATER STABILIZATION PARAMETER RECORD								NOTES
Time (24:00)	Cumulative Vol. gal or l	Temperature °C	pH	Conductivity µS or mS	DO mg/L	ORP mV	Turbidity NTU	Odor, color, sheen or other
1130	0	26.52	7.72	0.612	3.99	27	159	
1132	0.5	24.20	7.34	0.801	2.37	-27		
1134	1.0	23.62	7.28	0.882	1.57	-57		Slight to moderate odor
1136	1.5	23.22	7.22	0.929	1.27	-63		
1138	2.0	22.13	7.22	0.944	1.17	-65		
1140	2.5	23.09	7.21	0.948	1.15	-67	74.9	

Previous Stabilized Parameters _____
 PURGE COMPLETION RECORD Low Flow & Parameters Stable _____ 3 Casing Volumes & Parameters Stable _____ 5 Casing Volumes
 Other: _____

SAMPLE COLLECTION RECORD		GEOCHEMICAL PARAMETERS	
Parameter	Time	Measurement	
Depth to Water at Sampling: <u>32.57</u> (ft)			
Sample Collected Via: _____ Disp. Bailer _____ Dedicated Pump Tubing		DO (mg/L)	
<input checked="" type="checkbox"/> Disp. Pump Tubing _____ Other: _____		Ferrous Iron (mg/L)	
Sample ID: <u>MW-3</u> Sample Collection Time: <u>1140</u> (24:00)		Redox Potential (mV)	
Containers (#): <u>6</u> VOA (<input checked="" type="checkbox"/> preserved or _____ unpreserved) _____ Liter Amber		Alkalinity (mg/L)	
Other: _____		Other: _____	
Other: _____		Other: _____	

Signature:

APPENDIX C

LABORATORY REPORT
AND CHAIN-OF-CUSTODY DOCUMENTATION

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-44775-1
Client Project/Site: ARCO 0498, Livermore

For:
Broadbent & Associates, Inc.
1324 Mangrove Ave
Suite 212
Chico, California 95926

Attn: Mr. Jason Duda



*Authorized for release by:
5/10/2013 10:35:39 AM*

Kathleen Robb, Project Manager II
kathleen.robbs@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-44775-1	MW-1	Water	04/24/13 11:10	04/26/13 09:05
440-44775-2	MW-2	Water	04/23/13 10:30	04/26/13 09:05
440-44775-3	MW-3	Water	04/23/13 11:40	04/26/13 09:05
440-44775-4	MW-4	Water	04/23/13 09:55	04/26/13 09:05

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Case Narrative

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Job ID: 440-44775-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-44775-1

Comments

No additional comments.

Receipt

The samples were received on 4/25/2013 9:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.5° C.

GC/MS VOA

No analytical or quality issues were noted.

GC VOA

Method(s) 8015B: Surrogate recovery for the following sample(s) was outside control limits: MW-1 (440-44775-1). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

No other analytical or quality issues were noted.

VOA Prep

No analytical or quality issues were noted.

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Client Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Client Sample ID: MW-1
Date Collected: 04/24/13 11:10
Date Received: 04/26/13 09:05

Lab Sample ID: 440-44775-1
Matrix: Water

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			05/02/13 20:46	1
1,2-Dichloroethane	ND		0.50	ug/L			05/02/13 20:46	1
Ethanol	ND		150	ug/L			05/02/13 20:46	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			05/02/13 20:46	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			05/02/13 20:46	1
m,p-Xylene	13		1.0	ug/L			05/02/13 20:46	1
Methyl-t-Butyl Ether (MTBE)	12		0.50	ug/L			05/02/13 20:46	1
o-Xylene	2.3		0.50	ug/L			05/02/13 20:46	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			05/02/13 20:46	1
tert-Butyl alcohol (TBA)	43		10	ug/L			05/02/13 20:46	1
Toluene	12		0.50	ug/L			05/02/13 20:46	1
Xylenes, Total	15		1.0	ug/L			05/02/13 20:46	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	118		80 - 120				05/02/13 20:46	1
Dibromofluoromethane (Surr)	107		80 - 120				05/02/13 20:46	1
Toluene-d8 (Surr)	112		80 - 120				05/02/13 20:46	1

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) - DL

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	87		1.3	ug/L			05/01/13 23:38	2.5
Ethylbenzene	87		1.3	ug/L			05/01/13 23:38	2.5
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	105		80 - 120				05/01/13 23:38	2.5
Dibromofluoromethane (Surr)	112		80 - 120				05/01/13 23:38	2.5
Toluene-d8 (Surr)	106		80 - 120				05/01/13 23:38	2.5

Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	1600		50	ug/L			05/02/13 20:48	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	769	LH	65 - 140				05/02/13 20:48	1

Client Sample Results

Client: Broadbent & Associates, Inc.
 Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Client Sample ID: MW-2

Lab Sample ID: 440-44775-2

Date Collected: 04/23/13 10:30

Matrix: Water

Date Received: 04/26/13 09:05

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			05/01/13 22:43	1
1,2-Dichloroethane	ND		0.50	ug/L			05/01/13 22:43	1
Benzene	ND		0.50	ug/L			05/01/13 22:43	1
Ethanol	ND		150	ug/L			05/01/13 22:43	1
Ethylbenzene	ND		0.50	ug/L			05/01/13 22:43	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			05/01/13 22:43	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			05/01/13 22:43	1
m,p-Xylene	ND		1.0	ug/L			05/01/13 22:43	1
Methyl-t-Butyl Ether (MTBE)	1.1		0.50	ug/L			05/01/13 22:43	1
o-Xylene	ND		0.50	ug/L			05/01/13 22:43	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			05/01/13 22:43	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			05/01/13 22:43	1
Toluene	ND		0.50	ug/L			05/01/13 22:43	1
Xylenes, Total	ND		1.0	ug/L			05/01/13 22:43	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	102		80 - 120		05/01/13 22:43	1
Dibromofluoromethane (Surr)	113		80 - 120		05/01/13 22:43	1
Toluene-d8 (Surr)	106		80 - 120		05/01/13 22:43	1

Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			05/02/13 21:16	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	107		65 - 140		05/02/13 21:16	1

Client Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Client Sample ID: MW-3

Lab Sample ID: 440-44775-3

Date Collected: 04/23/13 11:40

Matrix: Water

Date Received: 04/26/13 09:05

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		1.3	ug/L			05/02/13 21:15	2.5
1,2-Dichloroethane	ND		1.3	ug/L			05/02/13 21:15	2.5
Ethanol	ND		380	ug/L			05/02/13 21:15	2.5
Ethylbenzene	110		1.3	ug/L			05/02/13 21:15	2.5
Ethyl-t-butyl ether (ETBE)	ND		1.3	ug/L			05/02/13 21:15	2.5
Isopropyl Ether (DIPE)	ND		1.3	ug/L			05/02/13 21:15	2.5
m,p-Xylene	6.0		2.5	ug/L			05/02/13 21:15	2.5
Methyl-t-Butyl Ether (MTBE)	89		1.3	ug/L			05/02/13 21:15	2.5
o-Xylene	ND		1.3	ug/L			05/02/13 21:15	2.5
Tert-amyl-methyl ether (TAME)	ND		1.3	ug/L			05/02/13 21:15	2.5
tert-Butyl alcohol (TBA)	71		25	ug/L			05/02/13 21:15	2.5
Toluene	3.6		1.3	ug/L			05/02/13 21:15	2.5
Xylenes, Total	6.0		2.5	ug/L			05/02/13 21:15	2.5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	118		80 - 120		05/02/13 21:15	2.5
Dibromofluoromethane (Surr)	104		80 - 120		05/02/13 21:15	2.5
Toluene-d8 (Surr)	110		80 - 120		05/02/13 21:15	2.5

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) - DL

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	960		13	ug/L			05/02/13 00:06	25

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	102		80 - 120		05/02/13 00:06	25
Dibromofluoromethane (Surr)	106		80 - 120		05/02/13 00:06	25
Toluene-d8 (Surr)	105		80 - 120		05/02/13 00:06	25

Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	3500		1000	ug/L			05/04/13 02:47	20

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	92		65 - 140		05/04/13 02:47	20

Client Sample Results

Client: Broadbent & Associates, Inc.
 Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Client Sample ID: MW-4

Lab Sample ID: 440-44775-4

Date Collected: 04/23/13 09:55

Matrix: Water

Date Received: 04/26/13 09:05

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			05/01/13 23:10	1
1,2-Dichloroethane	ND		0.50	ug/L			05/01/13 23:10	1
Benzene	ND		0.50	ug/L			05/01/13 23:10	1
Ethanol	ND		150	ug/L			05/01/13 23:10	1
Ethylbenzene	ND		0.50	ug/L			05/01/13 23:10	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			05/01/13 23:10	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			05/01/13 23:10	1
m,p-Xylene	ND		1.0	ug/L			05/01/13 23:10	1
Methyl-t-Butyl Ether (MTBE)	1.2		0.50	ug/L			05/01/13 23:10	1
o-Xylene	ND		0.50	ug/L			05/01/13 23:10	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			05/01/13 23:10	1
tert-Butyl alcohol (TBA)	24		10	ug/L			05/01/13 23:10	1
Toluene	ND		0.50	ug/L			05/01/13 23:10	1
Xylenes, Total	ND		1.0	ug/L			05/01/13 23:10	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	102		80 - 120		05/01/13 23:10	1
Dibromofluoromethane (Surr)	114		80 - 120		05/01/13 23:10	1
Toluene-d8 (Surr)	106		80 - 120		05/01/13 23:10	1

Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			05/03/13 20:39	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	98		65 - 140		05/03/13 20:39	1

Method Summary

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method	Method Description	Protocol	Laboratory
8260B/5030B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8015B/5030B	Gasoline Range Organics (GC)	SW846	TAL IRV

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022



Lab Chronicle

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Client Sample ID: MW-1

Date Collected: 04/24/13 11:10

Date Received: 04/26/13 09:05

Lab Sample ID: 440-44775-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B	DL	2.5	10 mL	10 mL	101736	05/01/13 23:38	MP	TAL IRV
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	102004	05/02/13 20:46	NS	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	101955	05/02/13 20:48	IM	TAL IRV

Client Sample ID: MW-2

Date Collected: 04/23/13 10:30

Date Received: 04/26/13 09:05

Lab Sample ID: 440-44775-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	101736	05/01/13 22:43	MP	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	101955	05/02/13 21:16	IM	TAL IRV

Client Sample ID: MW-3

Date Collected: 04/23/13 11:40

Date Received: 04/26/13 09:05

Lab Sample ID: 440-44775-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B	DL	25	10 mL	10 mL	101736	05/02/13 00:06	MP	TAL IRV
Total/NA	Analysis	8260B/5030B		2.5	10 mL	10 mL	102004	05/02/13 21:15	NS	TAL IRV
Total/NA	Analysis	8015B/5030B		20	10 mL	10 mL	102264	05/04/13 02:47	IM	TAL IRV

Client Sample ID: MW-4

Date Collected: 04/23/13 09:55

Date Received: 04/26/13 09:05

Lab Sample ID: 440-44775-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	101736	05/01/13 23:10	MP	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	102264	05/03/13 20:39	IM	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-101736/4

Matrix: Water

Analysis Batch: 101736

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			05/01/13 19:00	1
1,2-Dichloroethane	ND		0.50	ug/L			05/01/13 19:00	1
Benzene	ND		0.50	ug/L			05/01/13 19:00	1
Ethanol	ND		150	ug/L			05/01/13 19:00	1
Ethylbenzene	ND		0.50	ug/L			05/01/13 19:00	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			05/01/13 19:00	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			05/01/13 19:00	1
m,p-Xylene	ND		1.0	ug/L			05/01/13 19:00	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50	ug/L			05/01/13 19:00	1
o-Xylene	ND		0.50	ug/L			05/01/13 19:00	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			05/01/13 19:00	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			05/01/13 19:00	1
Toluene	ND		0.50	ug/L			05/01/13 19:00	1
Xylenes, Total	ND		1.0	ug/L			05/01/13 19:00	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	102		80 - 120		05/01/13 19:00	1
Dibromofluoromethane (Surr)	103		80 - 120		05/01/13 19:00	1
Toluene-d8 (Surr)	105		80 - 120		05/01/13 19:00	1

Lab Sample ID: LCS 440-101736/5

Matrix: Water

Analysis Batch: 101736

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dibromoethane (EDB)	25.0	24.1		ug/L		96	75 - 125
1,2-Dichloroethane	25.0	24.9		ug/L		99	60 - 140
Benzene	25.0	22.9		ug/L		92	70 - 120
Ethanol	250	209		ug/L		84	40 - 155
Ethylbenzene	25.0	23.7		ug/L		95	75 - 125
Ethyl-t-butyl ether (ETBE)	25.0	20.4		ug/L		82	65 - 135
Isopropyl Ether (DIPE)	25.0	21.2		ug/L		85	60 - 135
m,p-Xylene	50.0	45.1		ug/L		90	75 - 125
Methyl-t-Butyl Ether (MTBE)	25.0	21.9		ug/L		87	60 - 135
o-Xylene	25.0	22.7		ug/L		91	75 - 125
Tert-amyl-methyl ether (TAME)	25.0	20.7		ug/L		83	60 - 135
tert-Butyl alcohol (TBA)	125	134		ug/L		108	70 - 135
Toluene	25.0	23.2		ug/L		93	70 - 120

Surrogate	LCS %Recovery	LCS Qualifier	Limits
4-Bromofluorobenzene (Surr)	99		80 - 120
Dibromofluoromethane (Surr)	100		80 - 120
Toluene-d8 (Surr)	104		80 - 120

TestAmerica Irvine

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-44889-D-1 MS

Matrix: Water

Analysis Batch: 101736

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	%Rec.	Limits
	Result	Qualifier	Added	Result	Qualifier					
1,2-Dibromoethane (EDB)	ND		25.0	24.2		ug/L		97	70 - 130	
1,2-Dichloroethane	ND		25.0	26.3		ug/L		105	60 - 140	
Benzene	ND		25.0	22.6		ug/L		90	65 - 125	
Ethanol	ND		250	205		ug/L		82	40 - 155	
Ethylbenzene	ND		25.0	22.4		ug/L		90	65 - 130	
Ethyl-t-butyl ether (ETBE)	ND		25.0	23.2		ug/L		93	60 - 135	
Isopropyl Ether (DIPE)	ND		25.0	23.2		ug/L		93	60 - 140	
m,p-Xylene	ND		50.0	41.6		ug/L		83	65 - 130	
Methyl-t-Butyl Ether (MTBE)	ND		25.0	24.7		ug/L		99	55 - 145	
o-Xylene	ND		25.0	22.1		ug/L		89	65 - 125	
Tert-amyl-methyl ether (TAME)	ND		25.0	22.9		ug/L		92	60 - 140	
tert-Butyl alcohol (TBA)	ND		125	122		ug/L		98	65 - 140	
Toluene	ND		25.0	22.9		ug/L		92	70 - 125	

Surrogate	MS	MS	Limits
	%Recovery	Qualifier	
4-Bromofluorobenzene (Surr)	101		80 - 120
Dibromofluoromethane (Surr)	108		80 - 120
Toluene-d8 (Surr)	105		80 - 120

Lab Sample ID: 440-44889-D-1 MSD

Matrix: Water

Analysis Batch: 101736

Client Sample ID: Matrix Spike Duplicate

Prep Type: Total/NA

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	%Rec.	Limits	RPD	Limit
	Result	Qualifier	Added	Result	Qualifier							
1,2-Dibromoethane (EDB)	ND		25.0	24.0		ug/L		96	70 - 130	1	25	
1,2-Dichloroethane	ND		25.0	26.2		ug/L		105	60 - 140	0	20	
Benzene	ND		25.0	23.3		ug/L		93	65 - 125	3	20	
Ethanol	ND		250	230		ug/L		92	40 - 155	12	30	
Ethylbenzene	ND		25.0	23.0		ug/L		92	65 - 130	3	20	
Ethyl-t-butyl ether (ETBE)	ND		25.0	23.7		ug/L		95	60 - 135	2	25	
Isopropyl Ether (DIPE)	ND		25.0	23.6		ug/L		94	60 - 140	2	25	
m,p-Xylene	ND		50.0	42.6		ug/L		85	65 - 130	2	25	
Methyl-t-Butyl Ether (MTBE)	ND		25.0	25.0		ug/L		100	55 - 145	1	25	
o-Xylene	ND		25.0	22.9		ug/L		92	65 - 125	3	20	
Tert-amyl-methyl ether (TAME)	ND		25.0	23.8		ug/L		95	60 - 140	4	30	
tert-Butyl alcohol (TBA)	ND		125	129		ug/L		103	65 - 140	6	25	
Toluene	ND		25.0	23.5		ug/L		94	70 - 125	3	20	

Surrogate	MSD	MSD	Limits
	%Recovery	Qualifier	
4-Bromofluorobenzene (Surr)	102		80 - 120
Dibromofluoromethane (Surr)	109		80 - 120
Toluene-d8 (Surr)	105		80 - 120

TestAmerica Irvine

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 440-102004/3

Matrix: Water

Analysis Batch: 102004

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			05/02/13 18:23	1
1,2-Dichloroethane	ND		0.50	ug/L			05/02/13 18:23	1
Benzene	ND		0.50	ug/L			05/02/13 18:23	1
Ethanol	ND		150	ug/L			05/02/13 18:23	1
Ethylbenzene	ND		0.50	ug/L			05/02/13 18:23	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			05/02/13 18:23	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			05/02/13 18:23	1
m,p-Xylene	ND		1.0	ug/L			05/02/13 18:23	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50	ug/L			05/02/13 18:23	1
o-Xylene	ND		0.50	ug/L			05/02/13 18:23	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			05/02/13 18:23	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			05/02/13 18:23	1
Toluene	ND		0.50	ug/L			05/02/13 18:23	1
Xylenes, Total	ND		1.0	ug/L			05/02/13 18:23	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	114		80 - 120		05/02/13 18:23	1
Dibromofluoromethane (Surr)	107		80 - 120		05/02/13 18:23	1
Toluene-d8 (Surr)	112		80 - 120		05/02/13 18:23	1

Lab Sample ID: LCS 440-102004/4

Matrix: Water

Analysis Batch: 102004

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dibromoethane (EDB)	25.0	26.9		ug/L		107	75 - 125
1,2-Dichloroethane	25.0	28.7		ug/L		115	60 - 140
Benzene	25.0	24.6		ug/L		99	70 - 120
Ethanol	250	251		ug/L		101	40 - 155
Ethylbenzene	25.0	26.1		ug/L		104	75 - 125
Ethyl-t-butyl ether (ETBE)	25.0	27.3		ug/L		109	65 - 135
Isopropyl Ether (DIPE)	25.0	26.3		ug/L		105	60 - 135
m,p-Xylene	50.0	51.4		ug/L		103	75 - 125
Methyl-t-Butyl Ether (MTBE)	25.0	28.5		ug/L		114	60 - 135
o-Xylene	25.0	26.0		ug/L		104	75 - 125
Tert-amyl-methyl ether (TAME)	25.0	28.6		ug/L		114	60 - 135
tert-Butyl alcohol (TBA)	125	142		ug/L		114	70 - 135
Toluene	25.0	25.8		ug/L		103	70 - 120

Surrogate	LCS %Recovery	LCS Qualifier	Limits
4-Bromofluorobenzene (Surr)	111		80 - 120
Dibromofluoromethane (Surr)	114		80 - 120
Toluene-d8 (Surr)	113		80 - 120

TestAmerica Irvine

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-44814-D-26 MS

Matrix: Water

Analysis Batch: 102004

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Analyte	Sample	Sample	Spike	MS	MS	Unit	D	%Rec	%Rec.
	Result	Qualifier	Added	Result	Qualifier				
1,2-Dibromoethane (EDB)	ND		25.0	26.5		ug/L		106	70 - 130
1,2-Dichloroethane	ND		25.0	28.5		ug/L		114	60 - 140
Benzene	ND		25.0	23.8		ug/L		95	65 - 125
Ethanol	ND		250	240		ug/L		96	40 - 155
Ethylbenzene	ND		25.0	25.7		ug/L		103	65 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	26.8		ug/L		107	60 - 135
Isopropyl Ether (DIPE)	ND		25.0	24.8		ug/L		99	60 - 140
m,p-Xylene	ND		50.0	48.8		ug/L		98	65 - 130
Methyl-t-Butyl Ether (MTBE)	ND		25.0	27.9		ug/L		112	55 - 145
o-Xylene	ND		25.0	25.2		ug/L		101	65 - 125
Tert-amyl-methyl ether (TAME)	ND		25.0	28.8		ug/L		115	60 - 140
tert-Butyl alcohol (TBA)	ND		125	139		ug/L		111	65 - 140
Toluene	ND		25.0	25.1		ug/L		100	70 - 125

Surrogate	MS	MS	Limits
	%Recovery	Qualifier	
4-Bromofluorobenzene (Surr)	110		80 - 120
Dibromofluoromethane (Surr)	113		80 - 120
Toluene-d8 (Surr)	110		80 - 120

Lab Sample ID: 440-44814-D-26 MSD

Matrix: Water

Analysis Batch: 102004

Client Sample ID: Matrix Spike Duplicate

Prep Type: Total/NA

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	%Rec.	RPD	RPD
	Result	Qualifier	Added	Result	Qualifier						
1,2-Dibromoethane (EDB)	ND		25.0	26.6		ug/L		106	70 - 130	0	25
1,2-Dichloroethane	ND		25.0	28.3		ug/L		113	60 - 140	1	20
Benzene	ND		25.0	23.4		ug/L		94	65 - 125	2	20
Ethanol	ND		250	243		ug/L		97	40 - 155	1	30
Ethylbenzene	ND		25.0	25.8		ug/L		103	65 - 130	0	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	26.1		ug/L		104	60 - 135	3	25
Isopropyl Ether (DIPE)	ND		25.0	24.7		ug/L		99	60 - 140	0	25
m,p-Xylene	ND		50.0	49.6		ug/L		99	65 - 130	2	25
Methyl-t-Butyl Ether (MTBE)	ND		25.0	27.4		ug/L		110	55 - 145	2	25
o-Xylene	ND		25.0	25.3		ug/L		101	65 - 125	0	20
Tert-amyl-methyl ether (TAME)	ND		25.0	27.8		ug/L		111	60 - 140	4	30
tert-Butyl alcohol (TBA)	ND		125	137		ug/L		110	65 - 140	1	25
Toluene	ND		25.0	25.7		ug/L		103	70 - 125	3	20

Surrogate	MSD	MSD	Limits
	%Recovery	Qualifier	
4-Bromofluorobenzene (Surr)	110		80 - 120
Dibromofluoromethane (Surr)	110		80 - 120
Toluene-d8 (Surr)	108		80 - 120

TestAmerica Irvine

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8015B/5030B - Gasoline Range Organics (GC)

Lab Sample ID: MB 440-101955/3

Matrix: Water

Analysis Batch: 101955

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			05/02/13 15:14	1
Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac		
4-Bromofluorobenzene (Surr)	78		65 - 140		05/02/13 15:14	1		

Lab Sample ID: LCS 440-101955/2

Matrix: Water

Analysis Batch: 101955

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	800	801		ug/L		100	80 - 120
Surrogate	LCS %Recovery	LCS Qualifier	Limits				
4-Bromofluorobenzene (Surr)	98		65 - 140				

Lab Sample ID: 440-44862-B-2 MS

Matrix: Water

Analysis Batch: 101955

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	ND		800	760		ug/L		95	65 - 140
Surrogate	MS %Recovery	MS Qualifier	Limits						
4-Bromofluorobenzene (Surr)	111		65 - 140						

Lab Sample ID: 440-44862-B-2 MSD

Matrix: Water

Analysis Batch: 101955

Client Sample ID: Matrix Spike Duplicate

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
GRO (C4-C12)	ND		800	754		ug/L		94	65 - 140	1	20
Surrogate	MSD %Recovery	MSD Qualifier	Limits								
4-Bromofluorobenzene (Surr)	102		65 - 140								

Lab Sample ID: MB 440-102264/3

Matrix: Water

Analysis Batch: 102264

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			05/03/13 19:15	1
Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac		
4-Bromofluorobenzene (Surr)	87		65 - 140		05/03/13 19:15	1		

TestAmerica Irvine

QC Sample Results

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Method: 8015B/5030B - Gasoline Range Organics (GC) (Continued)

Lab Sample ID: LCS 440-102264/2

Matrix: Water

Analysis Batch: 102264

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	800	880		ug/L		110	80 - 120
Surrogate		LCS %Recovery	LCS Qualifier				Limits
4-Bromofluorobenzene (Surr)		94					65 - 140

Lab Sample ID: 440-44775-4 MS

Matrix: Water

Analysis Batch: 102264

Client Sample ID: MW-4

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	ND		800	815		ug/L		102	65 - 140
Surrogate		MS %Recovery		MS Qualifier					Limits
4-Bromofluorobenzene (Surr)		87							65 - 140

Lab Sample ID: 440-44775-4 MSD

Matrix: Water

Analysis Batch: 102264

Client Sample ID: MW-4

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
GRO (C4-C12)	ND		800	825		ug/L		103	65 - 140	1	20
Surrogate		MSD %Recovery		MSD Qualifier					Limits		
4-Bromofluorobenzene (Surr)		89							65 - 140		

QC Association Summary

Client: Broadbent & Associates, Inc.
 Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

GC/MS VOA

Analysis Batch: 101736

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-44775-1 - DL	MW-1	Total/NA	Water	8260B/5030B	
440-44775-2	MW-2	Total/NA	Water	8260B/5030B	
440-44775-3 - DL	MW-3	Total/NA	Water	8260B/5030B	
440-44775-4	MW-4	Total/NA	Water	8260B/5030B	
440-44889-D-1 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-44889-D-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-101736/5	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-101736/4	Method Blank	Total/NA	Water	8260B/5030B	

Analysis Batch: 102004

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-44775-1	MW-1	Total/NA	Water	8260B/5030B	
440-44775-3	MW-3	Total/NA	Water	8260B/5030B	
440-44814-D-26 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-44814-D-26 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-102004/4	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-102004/3	Method Blank	Total/NA	Water	8260B/5030B	

GC VOA

Analysis Batch: 101955

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-44775-1	MW-1	Total/NA	Water	8015B/5030B	
440-44775-2	MW-2	Total/NA	Water	8015B/5030B	
440-44862-B-2 MS	Matrix Spike	Total/NA	Water	8015B/5030B	
440-44862-B-2 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B/5030B	
LCS 440-101955/2	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-101955/3	Method Blank	Total/NA	Water	8015B/5030B	

Analysis Batch: 102264

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-44775-3	MW-3	Total/NA	Water	8015B/5030B	
440-44775-4	MW-4	Total/NA	Water	8015B/5030B	
440-44775-4 MS	MW-4	Total/NA	Water	8015B/5030B	
440-44775-4 MSD	MW-4	Total/NA	Water	8015B/5030B	
LCS 440-102264/2	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-102264/3	Method Blank	Total/NA	Water	8015B/5030B	

Definitions/Glossary

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Qualifiers

GC VOA

Qualifier	Qualifier Description
LH	Surrogate Recoveries were higher than QC limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
□	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Certification Summary

Client: Broadbent & Associates, Inc.
Project/Site: ARCO 0498, Livermore

TestAmerica Job ID: 440-44775-1

Laboratory: TestAmerica Irvine

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska	State Program	10	CA01531	06-30-13
Arizona	State Program	9	AZ0671	10-13-13
California	LA Cty Sanitation Districts	9	10256	01-31-14
California	NELAP	9	1108CA	01-31-14
California	State Program	9	2706	06-30-14
Guam	State Program	9	Cert. No. 12.002r	03-28-13 *
Hawaii	State Program	9	N/A	01-31-14
Nevada	State Program	9	CA015312007A	07-31-13
Northern Mariana Islands	State Program	9	MP0002	01-31-14
Oregon	NELAP	10	4005	09-12-13
USDA	Federal		P330-09-00080	06-06-14
USEPA UCMR	Federal	1	CA01531	01-31-15

* Expired certification is currently pending renewal and is considered valid.

TestAmerica Irvine

Login Sample Receipt Checklist

Client: Broadbent & Associates, Inc.

Job Number: 440-44775-1

Login Number: 44775

List Number: 1

Creator: Chy, Jonathan

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is <=/ background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	Jason Duda
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

APPENDIX D

GEOTRACKER UPLOAD CONFIRMATION RECEIPTS

STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER ESI

UPLOADING A GEO_WELL FILE

SUCCESS

Processing is complete. No errors were found!
Your file has been successfully submitted!

<u>Submittal Type:</u>	GEO_WELL
<u>Report Title:</u>	2Q13 Geo Well 498
<u>Facility Global ID:</u>	T0600124081
<u>Facility Name:</u>	ARCO #0498
<u>File Name:</u>	GEO_WELL.zip
<u>Organization Name:</u>	Broadbent & Associates, Inc.
<u>Username:</u>	BROADBENT-C
<u>IP Address:</u>	69.170.45.210
<u>Submittal Date/Time:</u>	7/22/2013 11:50:56 AM
<u>Confirmation Number:</u>	4858636081

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STATE WATER RESOURCES CONTROL BOARD
GEOTRACKER ESI

UPLOADING A EDF FILE

SUCCESS

Processing is complete. No errors were found!
Your file has been successfully submitted!

<u>Submittal Type:</u>	EDF
<u>Report Title:</u>	2Q13 GW Monitoring
<u>Report Type:</u>	Monitoring Report - Semi-Annually
<u>Facility Global ID:</u>	T0600124081
<u>Facility Name:</u>	ARCO #0498
<u>File Name:</u>	440-44775-1_10 May 13 1132_EDF.zip
<u>Organization Name:</u>	Broadbent & Associates, Inc.
<u>Username:</u>	BROADBENT-C
<u>IP Address:</u>	69.170.45.210
<u>Submittal Date/Time:</u>	7/22/2013 11:49:05 AM
<u>Confirmation Number:</u>	9233254611

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