Atlantic Richfield Company

Chuck Carmel
Project Manager

PO Box 1257
San Ramon, CA 94583
Phone: (925) 275-3803
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January 27, 2014

Re: Fourth 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,

Chuck Carmel
Project Manager

Attachment

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

Prepared for:

Mr. Chuck Carmel
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

January 27, 2014

No. 08-82-603

BROADBENT
1370 Ridgewood Drive, Suite 5, Chico, CA 95973
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broadbentinc.com

January 27, 2014

Project No. 08-82-603

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

Attn.: Mr. Chuck Carmel

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

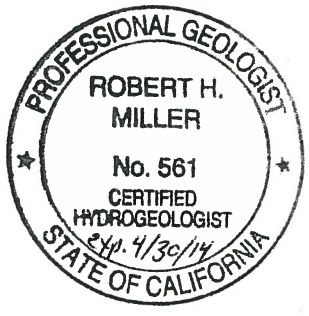
Dear Mr. Carmel:

Attached is the Fourth 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

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

Broadbent & Associates, Inc. (Broadbent) is pleased to present this *Fourth 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:	Mr. Chuck Carmel / 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 (Fourth Quarter 2013):

1. Prepared and submitted *Third Quarter 2013 Status Report* (Broadbent, 10/25/2013).
2. Conducted semi-annual groundwater monitoring/sampling for Fourth Quarter 2013 on October 9, 2013.

WORK SCHEDULED FOR NEXT QUARTER (First Quarter 2014):

1. Prepare and submit *Fourth Quarter 2013 Semi-Annual Groundwater Monitoring Report* (contained herein).
2. Conducted additional soil and groundwater investigation activities between January 2 and January 20, 2014 in accordance with Broadbent's August 20, 2013 *Additional Soil and Groundwater Investigation Work Plan and Sensitive Receptor Survey*.
3. Prepare and submit Additional Soil and Groundwater Investigation Report.
4. Conduct groundwater monitoring/sampling for newly installed wells MW-5A, MW-5B, MW-6A, and MW-6B.

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:	31.26 (MW-1) to 35.23 (MW-2)	(ft below TOC)
Gradient direction:	West-Northwest	(compass direction)
Gradient magnitude:	0.02	(ft/ft)
Average change in elevation:	-2.05	(ft since last measurement)

Laboratory Analytical Data

Summary: GRO were detected in one of the four wells sampled at a concentration of 810 µg/L in well MW-1. Benzene was detected in two of the four wells sampled at a maximum concentration of 390 µg/L in MW-3. MTBE was detected in three of the four wells sampled at a maximum concentration of 94 µg/L in well MW-3.

ACTIVITIES CONDUCTED & RESULTS:

Fourth Quarter 2013 groundwater monitoring was conducted on October 9, 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 31.26 ft at MW-1 to 35.23 ft at MW-2. Resulting groundwater surface elevations ranged from 460.12 ft at MW-2 to 465.46 ft at MW-1. Well MW-1 was not used for contouring purposes due to its anomalous groundwater elevation presumed to be the result of the screen interval of the well and corresponding variations in the piezometric surface observed with depth in the clay and silty clay layers. 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 October 9, 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. Naphthalene was also analyzed by EPA Method 8260 as a one time event. 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 one of the four wells sampled at a concentration of 810 µg/L in well MW-1. Benzene was detected above the laboratory reporting limit in two of the four wells sampled at a maximum concentration of 390 µg/L in well MW-3. Toluene was detected above the laboratory reporting limit in one of the four wells sampled at a concentration of 0.90 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 33 µg/L in well MW-3. Total Xylenes were detected above the laboratory reporting limits in one of the four wells sampled at a concentration of 2.6 µg/L in well MW-1. MTBE was detected above the laboratory reporting limit in three of the four wells sampled at a maximum concentration of 94 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 100 µg/L in well MW-3. TAME was detected above the laboratory reporting limit in one of the four wells sampled at a concentration of 0.52 µg/L in well MW-1. Naphthalene was detected above the laboratory reporting limit in two of the four wells sampled at a maximum concentration of 11 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 with the exception of Naphthalene. 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: TBA reached a historic maximum concentration in well MW-1; GRO and Total Xylenes reached historic minimum concentrations, while MTBE reached a historic maximum concentration in well MW-3; MTBE reached a historic minimum concentration in well MW-4. 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 Second Quarter 2014.

RECOMMENDATIONS:

Broadbent submitted the *Additional Soil and Groundwater Investigation Work Plan and Sensitive Receptor Survey* dated August 20, 2013. A letter from the ACEH dated September 9, 2013 approved this work plan. The additional soil and groundwater investigation activities were completed between January 2 and January 20, 2014. A report detailing the investigation activities, data analysis, interpretation, and recommendations will be submitted under separate cover to the ACEH during First Quarter 2014. In addition, the newly installed wells will be sampled during First Quarter 2014. Routine groundwater monitoring and sampling will take place during the Second Quarter 2014, 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, Fourth Quarter 2013

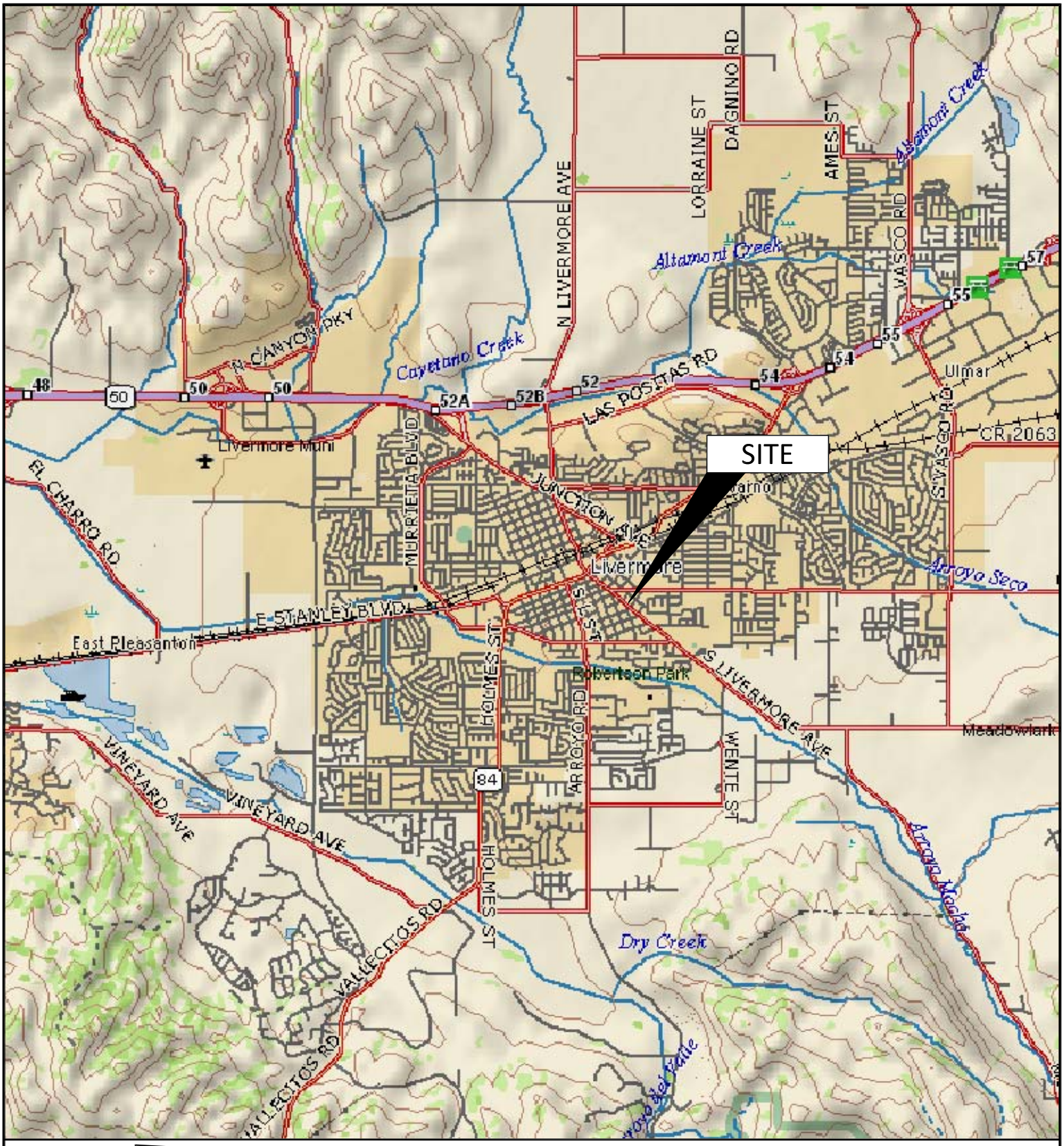
Table 1: Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
Table 2: Summary of Fuel Additives Analytical Data
Table 3: Historic Groundwater Gradient – Direction and Magnitude

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 Receipts

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

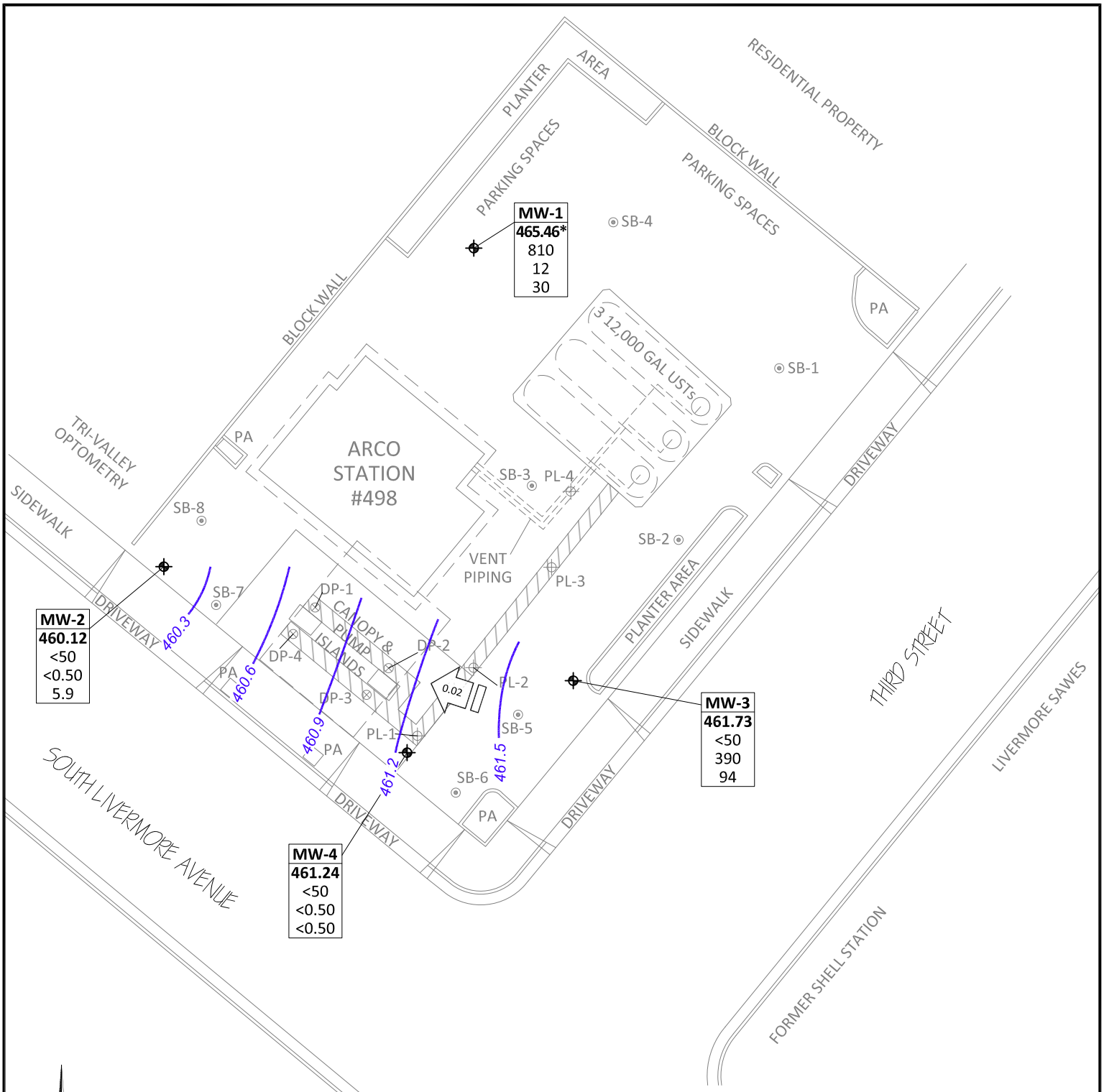


BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 12/3/2012

Station #498
286 South Livermore Avenue
Livermore, California

Site Location Map

Drawing
1



LEGEND

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

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: 1/17/2014

Station #498
286 South Livermore Avenue
Livermore, California

Groundwater Elevation Contour and Analytical Summary Map
Fourth 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	
10/9/2013	**P**		**20.00**	**40.00**	**31.26**	**0.00**	**465.46**	**810**	**12**	**0.90**	**4.3**	**2.6**	**30**	**4.24**	**7.17**	
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	
10/9/2013	**P**		**37.00**	**57.00**	**35.23**	**0.00**	**460.12**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**5.9**	**4.30**	**7.46**	
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	

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.																
3/20/2009	P	496.32	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
9/2/2009	P		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	
10/9/2013	**P**		**37.00**	**57.00**	**34.59**	**0.00**	**461.73**	**<50**	**390**	**<2.5**	**33**	**<5.0**	**94**	**4.12**	**7.27**	
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	
10/9/2013	**P**		**20.00**	**40.00**	**34.77**	**0.00**	**461.24**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**<0.50**	**4.14**	**6.98**	
SB-9																
3/22/2013	--	NS	--	--	--	--	--	--	<0.50	<0.50	<0.50	<1.0	1.9	--	--	
SB-10																

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-10 Cont.																
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	--	--	
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	
10/9/2013	**<150**	**79**	**30**	**<0.50**	**<0.50**	**0.52**	**<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	
10/9/2013	**<150**	**<10**	**5.9**	**<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	

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.									
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	
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	
10/9/2013	**<750**	**100**	**94**	**<2.5**	**<2.5**	**<2.5**	**<2.5**	**<2.5**	
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	
10/9/2013	**<150**	**13**	**<0.50**	**<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	

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-13 3/21/2013	<150	<10	100	<0.50	<0.50	<0.50	<0.50	<0.50	
SB-14 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/avaliable
< = 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. Summary of 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
10/9/2013	**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 turbidity[1]. 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	± 0.2ºC (± 0.36ºF)
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 turbidity[1]. 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

BROADBENT

DAILY REPORT

Page _____ of _____

Project: BP 190 Project No.: 08-82-603

Field Representative(s): JR/AM Day: Wednesday Date: 10-9-13

Time Onsite: From: 1015 To: 1315; From: _____ To: _____; From: _____ To: _____

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

Weather: overcast / sunny

Equipment In Use: horiba, WLM, peristaltic pump

Visitors: _____

TIME:	WORK DESCRIPTION:
1015	Arrived onsite; proceeded w/ tailgate meeting & paper work
1050	Set up @ MW-4
1135	Set up @ MW-2
1205	Set up @ MW-1
1235	Set up @ MW-3
1315	Completed fieldwork & offsite

Signature: _____

Revision: 1/24/2012

BROADBENT

GROUNDWATER MONITORING SITE SHEET

Page _____ of _____

Project: BP 498 Project No.: 08-82-603 Date: 10-9-13

Field Representative: JR/AM Elevation: _____

Formation recharge rate is historically: High Low *(circle one)*

W. L. Indicator ID #: _____ Oil/Water Interface ID #: _____ *(List #s of all equip used.)*

WELL ID RECORD					WELL GAUGING RECORD					LAB ANALYSES					
Well ID	Well Sampling Order	As-Built Well Diameter (inches)	As-Built Well Screen Interval (ft)	Previous Depth to Water (ft)	Time (24:00)	Depth to LNAPL (ft)	Apparent LNAPL Thickness (ft)*	Depth to Water (ft)	Well Total Depth (ft)						
MW-1					1242			31.26	40.30						
MW-2					1141			35.23	55.43						
MW-3					1232			34.59	57.18						
MW-4					1108			34.77	40.02						

* Device used to measure LNAPL thickness: Bailer Oil/Water Interface Meter *(circle one)*

If bailer used, note bailer dimensions (inches): Entry Diameter _____ Chamber Diameter _____

Signature: _____

Revision: 1/24/2012

BROADBENT

GROUNDWATER SAMPLING DATA SHEET

Page _____ of _____

Project: BP 498 Project No.: 08-32-603 Date: 10-9-13

Field Representative: JR/AM

Well ID: MW-1 Start Time: _____ End Time: _____ Total Time (minutes): _____

PURGE EQUIPMENT ___ Disp. Bailer ___ 120V Pump X Flow Cell
X Disp. Tubing ___ 12V Pump ___ Peristaltic Pump Other/ID#: RLSHAPER

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

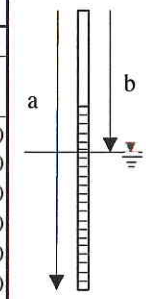
PURGING/SAMPLING METHOD Predetermined Well Volume (Low-Flow) Other: *(circle one)*

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): 40.30 (ft)
Initial Depth to Water (b): 31.26 (ft)
Pump In-take Depth = b + (a-b)/2: 33.78 (ft)
Maximum Allowable Drawdown = (a-b)/8: 1.13 (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

Time (24:00)	Cumulative Volume (L)	Temperature °C	pH	Conductivity µS or mS	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1215	0	23.09	7.76	0.452	4.51	90	>1000	
1217	0.5	23.35	7.40	0.498	4.25	19	—	
1219	1.0	23.25	7.28	0.497	4.18	-29	—	
1221	1.5	23.21	7.21	0.496	4.26	-55	—	
1223	2.0	23.21	7.17	0.497	4.24	-64	733	
Previous Stabilized Parameters								

PURGE COMPLETION RECORD X Low Flow & Parameters Stable ___ 3 Casing Volumes & Parameters Stable ___ 5 Casing Volumes
___ Other:

SAMPLE COLLECTION RECORD

Depth to Water at Sampling: 32.09 (ft)

Sample Collected Via: ___ Disp. Bailer ___ Dedicated Pump Tubing
X Disp. Pump Tubing Other:

Sample ID: MW-1 Sample Collection Time: 1225 (24:00)

Containers (#): 6 VOA (X preserved or ___ unpreserved) ___ Liter Amber
___ Other: _____ ___ Other: _____
___ Other: _____ ___ Other: _____

GEOCHEMICAL PARAMETERS

Parameter	Time	Measurement
DO (mg/L)		
Ferrous Iron (mg/L)		
Redox Potential (mV)		
Alkalinity (mg/L)		
Other:		
Other:		

Signature: _____

Revision: 7/3/12

BROADBENT

GROUNDWATER SAMPLING DATA SHEET

Page _____ of _____

Project: BP 498 Project No.: 08-82-603 Date: 10/4/13

Field Representative: JR/AM

Well ID: MW-2 Start Time: _____ End Time: _____ Total Time (minutes): _____

PURGE EQUIPMENT

X Disp. Tubing ___ Disp. Bailer ___ 120V Pump X Flow Cell

___ 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)

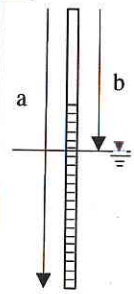
Water Column Height (WCH) = (a - b): _____ (ft)

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): 35.23 (ft)

Pump In-take Depth = b + (a-b)/2: 45.33 (ft)

Maximum Allowable Drawdown = (a-b)/8: 2.62 (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

Time (24:00)	Cumulative Volume (L)	Temperature °C	pH	Conductivity µS or mS	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1144	0	22.69	7.90	~~0.610~~	4.41	77	802	
1146	0.5	22.53	7.68	0.625	4.28	95	—	
1148	1.0	22.34	7.54	0.632	4.40	101	—	
1150	1.5	22.28	7.52	0.634	4.23	104	—	
1152	2.0	22.21	7.46	0.636	4.30	105	978	
Previous Stabilized Parameters								

PURGE COMPLETION RECORD X Low Flow & Parameters Stable ___ 3 Casing Volumes & Parameters Stable ___ 5 Casing Volumes

___ Other:

SAMPLE COLLECTION RECORD

Depth to Water at Sampling: 36.07 (ft)

Sample Collected Via: ___ Disp. Bailer ___ Dedicated Pump Tubing

X Disp. Pump Tubing Other:

Sample ID: MW-2 Sample Collection Time: 1155 (24:00)

Containers (#): 10 VOA (X preserved or ___ unpreserved) ___ Liter Amber

___ Other: _____ ___ Other: _____

___ Other: _____ ___ Other: _____

GEOCHEMICAL PARAMETERS

Parameter	Time	Measurement
DO (mg/L)		
Ferrous Iron (mg/L)		
Redox Potential (mV)		
Alkalinity (mg/L)		
Other:		
Other:		

Signature: _____

Revision: 7/3/12

BROADBENT

GROUNDWATER SAMPLING DATA SHEET

Page ____ of ____

Project: BP 498 Project No.: 08-82-603 Date: 10-9-13

Field Representative: JR/AM

Well ID: MW-3 Start Time: ____ End Time: ____ Total Time (minutes): ____

PURGE EQUIPMENT

X Disp. Tubing ___ Disp. Bailer ___ 12V Pump ___ 120V Pump ___ Peristaltic Pump X Flow Cell Other/ID#: BLADDER

WELL HEAD INTEGRITY (cap, lock, vault, etc.) Comments: missing one bolt

(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)

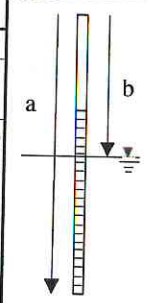
Water Column Height (WCH) = (a - b): ____ (ft)

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): 57.10 (ft)

Initial Depth to Water (b): 34.59 (ft)

Pump In-take Depth = b + (a-b)/2: 45.89 (ft)

Maximum Allowable Drawdown = (a-b)/8: 2.82 (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

Time (24:00)	Cumulative Volume (L)	Temperature °C	pH	Conductivity µS or mS	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1244	0	24.77	7.60	0.454	4.12	37	625	
1246	0.5	23.42	7.47	0.504	4.16	-39	—	
1248	1.0	23.17	7.39	0.542	4.27	-61	—	
1250	1.5	23.08	7.32	0.566	4.19	-73	—	
1252	2.0	22.90	7.27	0.581	4.12	-77	730	
Previous Stabilized Parameters								

PURGE COMPLETION RECORD X Low Flow & Parameters Stable ___ 3 Casing Volumes & Parameters Stable ___ 5 Casing Volumes

___ Other:

SAMPLE COLLECTION RECORD

Depth to Water at Sampling: 35.75 (ft)

Sample Collected Via: ___ Disp. Bailer ___ Dedicated Pump Tubing

X Disp. Pump Tubing Other:

Sample ID: MW-3 Sample Collection Time: 1255 (24:00)

Containers (#): 6 VOA (X preserved or ___ unpreserved) ___ Liter Amber

___ Other: ___ ___ Other: ___

___ Other: ___ ___ Other: ___

GEOCHEMICAL PARAMETERS

Parameter	Time	Measurement
DO (mg/L)		
Ferrous Iron (mg/L)		
Redox Potential (mV)		
Alkalinity (mg/L)		
Other:		
Other:		

Signature: James Ramsey

Revision: 7/3/12

BROADBENT

GROUNDWATER SAMPLING DATA SHEET

Page ____ of ____

Project: BP 498 Project No.: 08-82-603 Date: 10-9-13

Field Representative: JR/AM

Well ID: MW-4 Start Time: ____ End Time: ____ Total Time (minutes): ____

PURGE EQUIPMENT ___ Disp. Bailer ___ 120V Pump X Flow Cell X Disp. Tubing ___ 12V Pump ___ Peristaltic Pump ~~Other/ID#:~~ BLADDER

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)

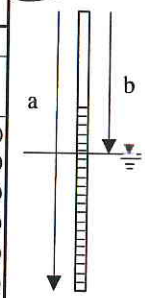
Water Column Height (WCH) = (a - b): ____ (ft)

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): 40.02 (ft)

Initial Depth to Water (b): 34.77 (ft)

Pump In-take Depth = b + (a-b)/2: 37.40 (ft)

Maximum Allowable Drawdown = (a-b)/8: 0.66 (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

Time (24:00)	Cumulative Volume (L)	Temperature °C	pH	Conductivity µS or mS	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1112	0	21.17	7.36	0.800	4.87	117	645	
1114	0.5	22.42	7.17	0.786	4.39	119	—	
1116	1.0	22.54	7.03	0.780	4.27	122	—	
1118	1.5	22.62	6.98	0.775	4.24	120	—	
1120	2.0	22.72	6.98	0.776	4.14	113	417	
Previous Stabilized Parameters								

PURGE COMPLETION RECORD X Low Flow & Parameters Stable ___ 3 Casing Volumes & Parameters Stable ___ 5 Casing Volumes ___ Other:

SAMPLE COLLECTION RECORD

Depth to Water at Sampling: 35.17 (ft)

Sample Collected Via: ___ Disp. Bailer ___ Dedicated Pump Tubing

X Disp. Pump Tubing Other:

Sample ID: MW-4 Sample Collection Time: 1120 (24:00)

Containers (#): 6 VOA (X preserved or ___ unpreserved) ___ Liter Amber

___ Other: ____ ___ Other: ____

___ Other: ____ ___ Other: ____

GEOCHEMICAL PARAMETERS

Parameter	Time	Measurement
DO (mg/L)		
Ferrous Iron (mg/L)		
Redox Potential (mV)		
Alkalinity (mg/L)		
Other:		
Other:		

Signature: ____

Revision: 7/3/12

NO. 702274

NON-HAZARDOUS WASTE DATA FORM

BESI #

GENERATOR

Generator's Name and Mailing Address

BP WEST COAST PRODUCTS, LLC
P.O. BOX 80249
RANCHO SANTA MARGARITA, CA 92688

Generator's Site Address (if different than mailing address)

BP 498
286 S. Livermore Ave
Livermore, CA

Generator's Phone: 949-460-5200

Container type removed from site:

☐ Drums ☐ Vacuum Truck ☐ Roll-off Truck ☐ Dump Truck

☐ Other _____

Quantity 1 gal.

Container type transported to receiving facility:

☐ Drums ☐ Vacuum Truck ☐ Roll-off Truck ☐ Dump Truck

☐ Other _____

Quantity _____ Volume _____

WASTE DESCRIPTION NON-HAZARDOUS WATER

GENERATING PROCESS WELL PURGING / DECON WATER

COMPONENTS OF WASTE	PPM	%
1. WATER		99-100%
2. TPH		<1%

COMPONENTS OF WASTE	PPM	%
3.		
4.		

Waste Profile _____ PROPERTIES: pH 7-10 ☐ SOLID ☒ LIQUID ☐ SLUDGE ☐ SLURRY ☐ OTHER _____

HANDLING INSTRUCTIONS: WEAR ALL APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT.

Generator Printed/Typed Name: On behalf of BP West Coast Products, LLC | Signature | Month Day Year

The Generator certifies that the waste as described is 100% non-hazardous

TRANSPORTER

Transporter 1 Company Name: Broadbent & Associates | Phone#: 707-455-7290

Transporter 1 Printed/Typed Name: Alex Martinez | Signature | Month Day Year

Transporter Acknowledgment of Receipt of Materials

Transporter 2 Company Name | Phone#

Transporter 2 Printed/Typed Name | Signature | Month Day Year

Transporter Acknowledgment of Receipt of Materials

RECEIVING FACILITY

Designated Facility Name and Site Address

INSTRAT, INC.
1105 AIRPORT RD.
RIO VISTA, CA 94571

Phone#: 530-753-1829

Printed/Typed Name | Signature | Month Day Year

Designated Facility Owner or Operator: Certification of receipt of materials covered by this data form.

APPENDIX C

LABORATORY REPORT
AND CHAIN-OF-CUSTODY DOCUMENTATION

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

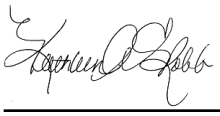
ANALYTICAL REPORT

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

TestAmerica Job ID: 440-59449-1
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:
10/29/2013 8:58:33 PM

Kathleen Robb, Project Manager II
(949)261-1022
kathleen.robb@testamericainc.com

Table of Contents

Sample Summary

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

TestAmerica Job ID: 440-59449-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-59449-1	MW-1	Water	10/09/13 12:25	10/10/13 10:45
440-59449-2	MW-2	Water	10/09/13 11:55	10/10/13 10:45
440-59449-3	MW-3	Water	10/09/13 12:55	10/10/13 10:45
440-59449-4	MW-4	Water	10/09/13 11:20	10/10/13 10:45

Job ID: 440-59449-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-59449-1

Comments
No additional comments.

Receipt
The samples were received on 10/10/2013 10:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.5º C.

GC/MS VOA
No analytical or quality issues were noted.

GC VOA
Method(s) 8015B: Surrogate recovery was outside control limits for the following sample: (440-59506-1 MS), (440-59506-1 MSD), (CCVRT 440-138053/1), (LCS 440-138053/40). The GRO standard coeluted with the 4-bromofluorobenzene surrogate. Data not impacted.

Method(s) 8015B: Surrogate recovery for the following sample(s) was outside control limits: MW-1 (440-59449-1). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

Method(s) 8015B: Surrogate recovery was outside control limits for the following sample: (CCV 440-138053/63), (CCV 440-138053/69). The GRO standard coeluted with the 4-bromofluorobenzene surrogate. Data not impacted.

Method(s) 8015B: Surrogate recovery was outside control limits for the following sample: (CCVRT 440-138779/1). The GRO standard coeluted with the 4-bromofluorobenzene surrogate. Data not impacted.

Method(s) 8015B: Surrogate recovery was outside control limits for the following sample: (CCV 440-138779/66). The GRO standard coeluted with the 4-bromofluorobenzene surrogate. Data not impacted.

No other analytical or quality issues were noted.

VOA Prep
No analytical or quality issues were noted.

Client Sample ID: MW-1
Date Collected: 10/09/13 12:25
Date Received: 10/10/13 10:45

Lab Sample ID: 440-59449-1
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			10/22/13 16:24	1
1,2-Dichloroethane	ND		0.50		ug/L			10/22/13 16:24	1
Benzene	**12**		0.50		ug/L			10/22/13 16:24	1
Ethanol	ND		150		ug/L			10/22/13 16:24	1
Ethylbenzene	**4.3**		0.50		ug/L			10/22/13 16:24	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			10/22/13 16:24	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			10/22/13 16:24	1
m,p-Xylene	ND		1.0		ug/L			10/22/13 16:24	1
Methyl-t-Butyl Ether (MTBE)	**30**		0.50		ug/L			10/22/13 16:24	1
o-Xylene	**2.6**		0.50		ug/L			10/22/13 16:24	1
Tert-amyl-methyl ether (TAME)	**0.52**		0.50		ug/L			10/22/13 16:24	1
tert-Butyl alcohol (TBA)	**79**		10		ug/L			10/22/13 16:24	1
Toluene	**0.90**		0.50		ug/L			10/22/13 16:24	1
Xylenes, Total	**2.6**		1.0		ug/L			10/22/13 16:24	1
Naphthalene	**2.4**		0.50		ug/L			10/22/13 16:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*105*		*80 - 120*		*10/22/13 16:24*	*1*
Dibromofluoromethane (Surr)	*101*		*76 - 132*		*10/22/13 16:24*	*1*
Toluene-d8 (Surr)	*97*		*80 - 128*		*10/22/13 16:24*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**810**		50		ug/L			10/17/13 15:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*340*	*LH*	*65 - 140*		*10/17/13 15:51*	*1*

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

TestAmerica Job ID: 440-59449-1

Client Sample ID: MW-2
Date Collected: 10/09/13 11:55
Date Received: 10/10/13 10:45

Lab Sample ID: 440-59449-2
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			10/23/13 05:15	1
1,2-Dichloroethane	ND		0.50		ug/L			10/23/13 05:15	1
Benzene	ND		0.50		ug/L			10/23/13 05:15	1
Ethanol	ND		150		ug/L			10/23/13 05:15	1
Ethylbenzene	ND		0.50		ug/L			10/23/13 05:15	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			10/23/13 05:15	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			10/23/13 05:15	1
m,p-Xylene	ND		1.0		ug/L			10/23/13 05:15	1
Methyl-t-Butyl Ether (MTBE)	**5.9**		0.50		ug/L			10/23/13 05:15	1
o-Xylene	ND		0.50		ug/L			10/23/13 05:15	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			10/23/13 05:15	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			10/23/13 05:15	1
Toluene	ND		0.50		ug/L			10/23/13 05:15	1
Xylenes, Total	ND		1.0		ug/L			10/23/13 05:15	1
Naphthalene	ND		0.50		ug/L			10/23/13 05:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*10/23/13 05:15*	*1*
Dibromofluoromethane (Surr)	*94*		*76 - 132*		*10/23/13 05:15*	*1*
Toluene-d8 (Surr)	*101*		*80 - 128*		*10/23/13 05:15*	*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			10/17/13 16:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*89*		*65 - 140*		*10/17/13 16:20*	*1*

Client Sample ID: MW-3
Date Collected: 10/09/13 12:55
Date Received: 10/10/13 10:45

Lab Sample ID: 440-59449-3
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		2.5		ug/L			10/22/13 17:18	5
1,2-Dichloroethane	ND		2.5		ug/L			10/22/13 17:18	5
Benzene	**390**		2.5		ug/L			10/22/13 17:18	5
Ethanol	ND		750		ug/L			10/22/13 17:18	5
Ethylbenzene	**33**		2.5		ug/L			10/22/13 17:18	5
Ethyl-t-butyl ether (ETBE)	ND		2.5		ug/L			10/22/13 17:18	5
Isopropyl Ether (DIPE)	ND		2.5		ug/L			10/22/13 17:18	5
m,p-Xylene	ND		5.0		ug/L			10/22/13 17:18	5
Methyl-t-Butyl Ether (MTBE)	**94**		2.5		ug/L			10/22/13 17:18	5
o-Xylene	ND		2.5		ug/L			10/22/13 17:18	5
Tert-amyl-methyl ether (TAME)	ND		2.5		ug/L			10/22/13 17:18	5
tert-Butyl alcohol (TBA)	**100**		50		ug/L			10/22/13 17:18	5
Toluene	ND		2.5		ug/L			10/22/13 17:18	5
Xylenes, Total	ND		5.0		ug/L			10/22/13 17:18	5
Naphthalene	**11**		2.5		ug/L			10/22/13 17:18	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*		*10/22/13 17:18*	*5*
Dibromofluoromethane (Surr)	*99*		*76 - 132*		*10/22/13 17:18*	*5*
Toluene-d8 (Surr)	*97*		*80 - 128*		*10/22/13 17:18*	*5*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50		ug/L			10/17/13 16:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*65 - 140*		*10/17/13 16:49*	*1*

Client Sample ID: MW-4
Date Collected: 10/09/13 11:20
Date Received: 10/10/13 10:45

Lab Sample ID: 440-59449-4
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			10/22/13 17:45	1
1,2-Dichloroethane	ND		0.50		ug/L			10/22/13 17:45	1
Benzene	ND		0.50		ug/L			10/22/13 17:45	1
Ethanol	ND		150		ug/L			10/22/13 17:45	1
Ethylbenzene	ND		0.50		ug/L			10/22/13 17:45	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			10/22/13 17:45	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			10/22/13 17:45	1
m,p-Xylene	ND		1.0		ug/L			10/22/13 17:45	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			10/22/13 17:45	1
o-Xylene	ND		0.50		ug/L			10/22/13 17:45	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			10/22/13 17:45	1
tert-Butyl alcohol (TBA)	**13**		10		ug/L			10/22/13 17:45	1
Toluene	ND		0.50		ug/L			10/22/13 17:45	1
Xylenes, Total	ND		1.0		ug/L			10/22/13 17:45	1
Naphthalene	ND		0.50		ug/L			10/22/13 17:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*10/22/13 17:45*	*1*
Dibromofluoromethane (Surr)	*103*		*76 - 132*		*10/22/13 17:45*	*1*
Toluene-d8 (Surr)	*96*		*80 - 128*		*10/22/13 17:45*	*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			10/19/13 16:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*107*		*65 - 140*		*10/19/13 16:45*	*1*

Method Summary

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

TestAmerica Job ID: 440-59449-1

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: 440-59449-1

Client Sample ID: MW-1

Lab Sample ID: 440-59449-1

Date Collected: 10/09/13 12:25

Matrix: Water

Date Received: 10/10/13 10:45

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	139252	10/22/13 16:24	MR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	138053	10/17/13 15:51	IM	TAL IRV

Client Sample ID: MW-2

Lab Sample ID: 440-59449-2

Date Collected: 10/09/13 11:55

Matrix: Water

Date Received: 10/10/13 10:45

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	139439	10/23/13 05:15	WK	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	138053	10/17/13 16:20	IM	TAL IRV

Client Sample ID: MW-3

Lab Sample ID: 440-59449-3

Date Collected: 10/09/13 12:55

Matrix: Water

Date Received: 10/10/13 10:45

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		5	10 mL	10 mL	139252	10/22/13 17:18	MR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	138053	10/17/13 16:49	IM	TAL IRV

Client Sample ID: MW-4

Lab Sample ID: 440-59449-4

Date Collected: 10/09/13 11:20

Matrix: Water

Date Received: 10/10/13 10:45

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	139252	10/22/13 17:45	MR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	138779	10/19/13 16:45	IM	TAL IRV

Laboratory References:

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

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

Lab Sample ID: MB 440-139252/4
Matrix: Water
Analysis Batch: 139252

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			10/22/13 09:12	1
1,2-Dichloroethane	ND		0.50		ug/L			10/22/13 09:12	1
Benzene	ND		0.50		ug/L			10/22/13 09:12	1
Ethanol	ND		150		ug/L			10/22/13 09:12	1
Ethylbenzene	ND		0.50		ug/L			10/22/13 09:12	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			10/22/13 09:12	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			10/22/13 09:12	1
m,p-Xylene	ND		1.0		ug/L			10/22/13 09:12	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			10/22/13 09:12	1
o-Xylene	ND		0.50		ug/L			10/22/13 09:12	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			10/22/13 09:12	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			10/22/13 09:12	1
Toluene	ND		0.50		ug/L			10/22/13 09:12	1
Xylenes, Total	ND		1.0		ug/L			10/22/13 09:12	1
Naphthalene	ND		0.50		ug/L			10/22/13 09:12	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*105*		*80 - 120*		*10/22/13 09:12*	*1*
Dibromofluoromethane (Surr)	*95*		*76 - 132*		*10/22/13 09:12*	*1*
Toluene-d8 (Surr)	*97*		*80 - 128*		*10/22/13 09:12*	*1*

Lab Sample ID: LCS 440-139252/5
Matrix: Water
Analysis Batch: 139252

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	28.5		ug/L		114	70 - 130		
1,2-Dichloroethane			25.0	26.1		ug/L		104	57 - 138		
Benzene			25.0	25.8		ug/L		103	68 - 130		
Ethanol			250	225		ug/L		90	50 - 149		
Ethylbenzene			25.0	27.9		ug/L		112	70 - 130		
Ethyl-t-butyl ether (ETBE)			25.0	25.5		ug/L		102	60 - 136		
Isopropyl Ether (DIPE)			25.0	24.0		ug/L		96	58 - 139		
m,p-Xylene			50.0	54.7		ug/L		109	70 - 130		
Methyl-t-Butyl Ether (MTBE)			25.0	26.9		ug/L		108	63 - 131		
o-Xylene			25.0	26.5		ug/L		106	70 - 130		
Tert-amyl-methyl ether (TAME)			25.0	26.2		ug/L		105	57 - 139		
tert-Butyl alcohol (TBA)			125	123		ug/L		98	70 - 130		
Toluene			25.0	25.6		ug/L		102	70 - 130		
Naphthalene			25.0	28.5		ug/L		114	60 - 140		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*104*		*80 - 120*
Dibromofluoromethane (Surr)	*94*		*76 - 132*
Toluene-d8 (Surr)	*98*		*80 - 128*

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

Lab Sample ID: 440-60264-B-1 MS
Matrix: Water
Analysis Batch: 139252

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
1,2-Dibromoethane (EDB)	ND		25.0	30.0		ug/L		120	70 - 131
1,2-Dichloroethane	ND		25.0	27.9		ug/L		112	56 - 146
Benzene	ND		25.0	27.8		ug/L		111	66 - 130
Ethanol	ND		250	243		ug/L		97	54 - 150
Ethylbenzene	ND		25.0	29.6		ug/L		118	70 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	27.7		ug/L		111	70 - 130
Isopropyl Ether (DIPE)	ND		25.0	26.7		ug/L		107	64 - 138
m,p-Xylene	ND		50.0	57.4		ug/L		115	70 - 133
Methyl-t-Butyl Ether (MTBE)	0.95		25.0	30.5		ug/L		118	70 - 130
o-Xylene	ND		25.0	27.8		ug/L		111	70 - 133
Tert-amyl-methyl ether (TAME)	ND		25.0	28.7		ug/L		115	68 - 133
tert-Butyl alcohol (TBA)	ND		125	132		ug/L		106	70 - 130
Toluene	ND		25.0	27.3		ug/L		109	70 - 130
Naphthalene	ND		25.0	27.8		ug/L		111	60 - 140

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*
Dibromofluoromethane (Surr)	*98*		*76 - 132*
Toluene-d8 (Surr)	*98*		*80 - 128*

Lab Sample ID: 440-60264-B-1 MSD
Matrix: Water
Analysis Batch: 139252

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
1,2-Dibromoethane (EDB)	ND		25.0	28.8		ug/L		115	70 - 131	4	25
1,2-Dichloroethane	ND		25.0	26.9		ug/L		108	56 - 146	4	20
Benzene	ND		25.0	26.7		ug/L		107	66 - 130	4	20
Ethanol	ND		250	240		ug/L		96	54 - 150	1	30
Ethylbenzene	ND		25.0	28.8		ug/L		115	70 - 130	3	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	27.6		ug/L		110	70 - 130	0	25
Isopropyl Ether (DIPE)	ND		25.0	26.6		ug/L		106	64 - 138	1	25
m,p-Xylene	ND		50.0	55.7		ug/L		111	70 - 133	3	25
Methyl-t-Butyl Ether (MTBE)	0.95		25.0	29.7		ug/L		115	70 - 130	3	25
o-Xylene	ND		25.0	27.2		ug/L		109	70 - 133	2	20
Tert-amyl-methyl ether (TAME)	ND		25.0	27.9		ug/L		112	68 - 133	3	30
tert-Butyl alcohol (TBA)	ND		125	130		ug/L		104	70 - 130	1	25
Toluene	ND		25.0	26.1		ug/L		105	70 - 130	4	20
Naphthalene	ND		25.0	25.2		ug/L		101	60 - 140	10	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*105*		*80 - 120*
Dibromofluoromethane (Surr)	*98*		*76 - 132*
Toluene-d8 (Surr)	*98*		*80 - 128*

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

Lab Sample ID: MB 440-139439/4
Matrix: Water
Analysis Batch: 139439

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			10/22/13 20:31	1
1,2-Dichloroethane	ND		0.50		ug/L			10/22/13 20:31	1
Benzene	ND		0.50		ug/L			10/22/13 20:31	1
Ethanol	ND		150		ug/L			10/22/13 20:31	1
Ethylbenzene	ND		0.50		ug/L			10/22/13 20:31	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			10/22/13 20:31	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			10/22/13 20:31	1
m,p-Xylene	ND		1.0		ug/L			10/22/13 20:31	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			10/22/13 20:31	1
o-Xylene	ND		0.50		ug/L			10/22/13 20:31	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			10/22/13 20:31	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			10/22/13 20:31	1
Toluene	ND		0.50		ug/L			10/22/13 20:31	1
Xylenes, Total	ND		1.0		ug/L			10/22/13 20:31	1
Naphthalene	ND		0.50		ug/L			10/22/13 20:31	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*10/22/13 20:31*	*1*
Dibromofluoromethane (Surr)	*89*		*76 - 132*		*10/22/13 20:31*	*1*
Toluene-d8 (Surr)	*102*		*80 - 128*		*10/22/13 20:31*	*1*

Lab Sample ID: LCS 440-139439/5
Matrix: Water
Analysis Batch: 139439

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	23.8		ug/L		95	70 - 130		
1,2-Dichloroethane			25.0	22.1		ug/L		89	57 - 138		
Benzene			25.0	26.3		ug/L		105	68 - 130		
Ethanol			250	236		ug/L		94	50 - 149		
Ethylbenzene			25.0	27.2		ug/L		109	70 - 130		
Ethyl-t-butyl ether (ETBE)			25.0	23.5		ug/L		94	60 - 136		
Isopropyl Ether (DIPE)			25.0	23.2		ug/L		93	58 - 139		
m,p-Xylene			50.0	53.0		ug/L		106	70 - 130		
Methyl-t-Butyl Ether (MTBE)			25.0	23.7		ug/L		95	63 - 131		
o-Xylene			25.0	26.6		ug/L		106	70 - 130		
Tert-amyl-methyl ether (TAME)			25.0	23.1		ug/L		92	57 - 139		
tert-Butyl alcohol (TBA)			125	121		ug/L		97	70 - 130		
Toluene			25.0	26.5		ug/L		106	70 - 130		
Naphthalene			25.0	27.6		ug/L		110	60 - 140		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*96*		*80 - 120*
Dibromofluoromethane (Surr)	*91*		*76 - 132*
Toluene-d8 (Surr)	*102*		*80 - 128*

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

Lab Sample ID: 440-59610-A-1 MS
Matrix: Water
Analysis Batch: 139439

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
1,2-Dibromoethane (EDB)	ND		25.0	23.5		ug/L		94	70 - 131
1,2-Dichloroethane	12		25.0	33.9		ug/L		87	56 - 146
Benzene	3.3		25.0	29.3		ug/L		104	66 - 130
Ethanol	ND		250	239		ug/L		96	54 - 150
Ethylbenzene	1.0		25.0	27.0		ug/L		104	70 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	24.2		ug/L		97	70 - 130
Isopropyl Ether (DIPE)	ND		25.0	23.5		ug/L		94	64 - 138
m,p-Xylene	2.5		50.0	54.3		ug/L		104	70 - 133
Methyl-t-Butyl Ether (MTBE)	ND		25.0	25.1		ug/L		100	70 - 130
o-Xylene	1.3		25.0	26.7		ug/L		102	70 - 133
Tert-amyl-methyl ether (TAME)	ND		25.0	25.6		ug/L		102	68 - 133
tert-Butyl alcohol (TBA)	ND		125	124		ug/L		100	70 - 130
Toluene	0.74		25.0	28.0		ug/L		109	70 - 130
Naphthalene	ND		25.0	31.5		ug/L		124	60 - 140

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*92*		*80 - 120*
Dibromofluoromethane (Surr)	*89*		*76 - 132*
Toluene-d8 (Surr)	*102*		*80 - 128*

Lab Sample ID: 440-59610-A-1 MSD
Matrix: Water
Analysis Batch: 139439

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
1,2-Dibromoethane (EDB)	ND		25.0	24.2		ug/L		97	70 - 131	3	25
1,2-Dichloroethane	12		25.0	33.3		ug/L		84	56 - 146	2	20
Benzene	3.3		25.0	29.3		ug/L		104	66 - 130	0	20
Ethanol	ND		250	254		ug/L		102	54 - 150	6	30
Ethylbenzene	1.0		25.0	29.0		ug/L		112	70 - 130	7	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	23.7		ug/L		95	70 - 130	2	25
Isopropyl Ether (DIPE)	ND		25.0	23.0		ug/L		92	64 - 138	2	25
m,p-Xylene	2.5		50.0	57.3		ug/L		110	70 - 133	6	25
Methyl-t-Butyl Ether (MTBE)	ND		25.0	24.1		ug/L		96	70 - 130	4	25
o-Xylene	1.3		25.0	28.0		ug/L		107	70 - 133	5	20
Tert-amyl-methyl ether (TAME)	ND		25.0	24.8		ug/L		99	68 - 133	3	30
tert-Butyl alcohol (TBA)	ND		125	127		ug/L		102	70 - 130	2	25
Toluene	0.74		25.0	27.6		ug/L		107	70 - 130	1	20
Naphthalene	ND		25.0	31.1		ug/L		123	60 - 140	1	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*
Dibromofluoromethane (Surr)	*88*		*76 - 132*
Toluene-d8 (Surr)	*102*		*80 - 128*

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

Lab Sample ID: MB 440-138053/41
Matrix: Water
Analysis Batch: 138053

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			10/16/13 23:06	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*85*		*65 - 140*		*10/16/13 23:06*	*1*

Lab Sample ID: LCS 440-138053/40
Matrix: Water
Analysis Batch: 138053

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	692		ug/L		86	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*162*	*LH*	*65 - 140*

Lab Sample ID: 440-59506-B-1 MS
Matrix: Water
Analysis Batch: 138053

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	645		ug/L		81	65 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*161*	*LH*	*65 - 140*

Lab Sample ID: 440-59506-B-1 MSD
Matrix: Water
Analysis Batch: 138053

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	647		ug/L		81	65 - 140	0	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*161*	*LH*	*65 - 140*

Lab Sample ID: MB 440-138779/57
Matrix: Water
Analysis Batch: 138779

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			10/19/13 13:00	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*114*		*65 - 140*		*10/19/13 13:00*	*1*

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

Lab Sample ID: LCS 440-138779/56
Matrix: Water
Analysis Batch: 138779

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	746		ug/L		93	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*131*		*65 - 140*

Lab Sample ID: 440-59528-A-9 MS
Matrix: Water
Analysis Batch: 138779

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)	870		800	1560		ug/L		86	65 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*138*		*65 - 140*

Lab Sample ID: 440-59528-A-9 MSD
Matrix: Water
Analysis Batch: 138779

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)	870		800	1550		ug/L		85	65 - 140	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*131*		*65 - 140*

GC/MS VOA

Analysis Batch: 139252

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-59449-1	MW-1	Total/NA	Water	8260B/5030B	
440-59449-3	MW-3	Total/NA	Water	8260B/5030B	
440-59449-4	MW-4	Total/NA	Water	8260B/5030B	
440-60264-B-1 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-60264-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-139252/5	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-139252/4	Method Blank	Total/NA	Water	8260B/5030B	

Analysis Batch: 139439

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-59449-2	MW-2	Total/NA	Water	8260B/5030B	
440-59610-A-1 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-59610-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-139439/5	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-139439/4	Method Blank	Total/NA	Water	8260B/5030B	

GC VOA

Analysis Batch: 138053

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-59449-1	MW-1	Total/NA	Water	8015B/5030B	
440-59449-2	MW-2	Total/NA	Water	8015B/5030B	
440-59449-3	MW-3	Total/NA	Water	8015B/5030B	
440-59506-B-1 MS	Matrix Spike	Total/NA	Water	8015B/5030B	
440-59506-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B/5030B	
LCS 440-138053/40	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-138053/41	Method Blank	Total/NA	Water	8015B/5030B	

Analysis Batch: 138779

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-59449-4	MW-4	Total/NA	Water	8015B/5030B	
440-59528-A-9 MS	Matrix Spike	Total/NA	Water	8015B/5030B	
440-59528-A-9 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B/5030B	
LCS 440-138779/56	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-138779/57	Method Blank	Total/NA	Water	8015B/5030B	

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)
Dil Fac	Dilution Factor
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)
NC	Not Calculated
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: 440-59449-1

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	06-30-14
Arizona	State Program	9	AZ0671	10-13-14
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	01-28-14 *
Hawaii	State Program	9	N/A	01-31-14
Nevada	State Program	9	CA015312007A	07-31-14
New Mexico	State Program	6	N/A	01-31-14
Northern Mariana Islands	State Program	9	MP0002	01-31-14
Oregon	NELAP	10	4005	09-12-14
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.

bp rm — *Laboratory Management Program LaMP* Chain of Custody Record

BP Site Node Path: BP 498 **Req Due Date (mm/dd/yy):** _____ **Rush TAT:** Yes ____ No ____

BP Facility No: 498 **Lab Work Order Number:** 440- 59449

Lab Name: Test America	Facility Address: 286 South Livermore Avenue	Consultant/Contractor: Broadbent & Associates Inc.
Lab Address: 17461 Derian Avenue, Suite 100, Irvine, CA	City, State, ZIP Code: Livermore, California	Consultant/Contractor Project No: 08- 82-603
Lab PM: ~~[illegible]~~ Kathleen Robb	Lead Regulatory Agency: ACEH	Address: 1324 Mangrove Ave., Suite 212, Chico, California
Lab Phone: 949-261-1022	California Global ID No.: T0600124081	Consultant/Contractor PM: Jason Duda
Lab Shipping Accnt: Fed ex#: 11103-6633-7	Enfos Proposal No/ WR#: 0056X - 0002 / WR245438	Phone: 530-566-1400 / 530-566-1401 (f) Email: jduda@broadbentinc.com
Lab Bottle Order No:	Accounting Mode: Provision x OOC-BU ____ OOC-RM ____	Email EDD To: jduda@broadbentinc.com and to lab.enfosdoc@bp.com
Other Info:	Stage: Execute (4) Activity: GWM (401)	Invoice To: BP x Contractor ____
BP Project Manager (PM): Chuck Carmel		
BP PM Phone: 925-275-3803		
BP PM Email: charles.carmel@bp.com		

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Matrix: Water / Liquid	Matrix: Air / Vapor	Matrix: Is this location a well?	No. Containers / Preservative: Total Number of Container	Unpreserved	H2SO4	HNO3	HCl	Methanol	Requested Analyses: GRO by 8015M	BTEX/5 FO/EDB by 8260	1,2-DCA and Ethanol by 8260	Naphthalene by 8260
	MW-1	10-9-13	~~[illegible]~~ 1125		x		y	6				x		x	x	x	x
	MW-2		~~[illegible]~~ 1155		x		y	6				x		x	x	x	x
	MW-3		~~[illegible]~~ 1205		x		y	6				x		x	x	x	x
	MW-4		1120		x		y	6				x		x	x	x	x
	TB-498-10092013		—		x		n	2				x					

Report Type & QC Level: Standard x / Full Data Package ____

Comments

Note: If sample not collected, indicate "No Sample" in comments and single-strike out and initial any preprinted sample description.

440-59449 Chain of Custody

On Hold

Sampler's Name: James R / Alex M.	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: Broadbent & Associates	[signature] / BAI	10-9-13	1700			
Shipment Method: Fed ex Ship Date: 10-9-13	Alex Mac	10/9/13	1700			
Shipment Tracking No:				[signature]	10/10/13	1040

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: (Yes) / No | Cooler Temp on Receipt: 3.3 / 2.5 °F/C | Trip Blank: (Yes) / No | MS/MSD Sample Submitted: Yes / (No)

Login Sample Receipt Checklist

Client: Broadbent & Associates, Inc.

Job Number: 440-59449-1

Login Number: 59449

List Source: TestAmerica Irvine

List Number: 1

Creator: Perez, Angel

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.	True	
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	James R./Alex M.
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!

Submittal Type:	**GEO_WELL**
Report Title:	**4Q13 GEO_WELL**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**GEO_WELL.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**1/22/2014 3:51:39 PM**
Confirmation Number:	**1095228075**

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!

Submittal Type:	**EDF**
Report Title:	**4Q13 GW MONITORING**
Report Type:	**Monitoring Report - Semi-Annually**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**440-59449-1_29 Oct 13 2122_EDF.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**1/22/2014 3:50:32 PM**
Confirmation Number:	**2109719455**

VIEW QC REPORT

VIEW DETECTIONS REPORT