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April 23, 2014

Re: Additional Soil and Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report
Atlantic Richfield Company Service 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

ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION, FIRST QUARTER 2014 GROUNDWATER MONITORING, AND CONCEPTUAL SITE MODEL 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:

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April 23, 2014

No. 08-82-603

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April 23, 2014

Project No. 08-82-603

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

Attn.: Mr. Chuck Carmel

Re: Additional Soil and Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report, Atlantic Richfield Company (a BP affiliated company) Station #498, 286 South Livermore Avenue, Livermore, California; ACEH Case #RO0002873

Dear Mr. Carmel:

Broadbent & Associates, Inc. (Broadbent) is pleased to submit this *Additional Soil and Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report* for Atlantic Richfield Company Station #498 (herein referred to as Station #498) located at 286 South Livermore Avenue, Livermore, California (Property). This report summarizes the activities and results of additional assessment conducted both on- and off-Site, which included CPT drilling, well installations, and groundwater sampling. A Conceptual Site Model was also prepared in an effort to further understand current Site conditions and assess potential data gaps associated with the Site. A discussion of the Site background, work conducted, analytical results, conceptual site model, conclusions and recommendations is provided within this report.

Should you have any questions concerning this report, please due not hesitate to contact us at (530) 566-1400.

Sincerely,
BROADBENT & ASSOCIATES, INC.

Jason R. Duda
Senior Scientist

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

cc: Mr. Jerry Wickham, ACEH (Submitted via ACEH ftp Site)
GeoTracker

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Atlantic Richfield Company Station #498
286 South Livermore Avenue
Livermore, California
Fuel Leak Case No. RO0002873

1.0 INTRODUCTION

On behalf of the Atlantic Richfield Company, RM – a BP affiliated company; Broadbent & Associates, Inc. (Broadbent) has prepared this *Additional Soil and Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report* for the Atlantic Richfield Company (ARC) Station No. 498, located at 286 South Livermore Avenue, Livermore, California (Site). This work was conducted in general accordance with Broadbent's *Additional Soil and Groundwater Investigation Work Plan and Sensitive Receptor Survey* dated August 20, 2013, which was approved by the Alameda County Environmental Health Agency (ACEH) in a letter dated September 9, 2013 (Appendix A). The purpose of this work was to further evaluate the vertical extent of impacts to the lower water-bearing zone both on- and off-Site, accurately assess subsurface hydro-geologic conditions, and further delineate the contaminate plume to the southeast and northwest of the Site. Proposed boring locations were revised following submittal of the initial work plan in order to avoid potential property access issues to the northwest. This modification was approved by ACEH via email correspondence received on October 30, 2013. This report includes discussions on the Site background and previous investigations, details and results of the soil and groundwater investigation, details of well installation activities, a conceptual site model, conclusions, and recommendations.

1.1 Site Setting

The Site is an active ARC-branded service station located at the northern corner of South Livermore Avenue and Third Street in Livermore, California. The land use in the immediate vicinity of the Site is mixed commercial and residential. Current structures at the Site include three 12,000-gallon underground storage tanks (USTs), two fuel dispenser islands with a total of four dispensers, and a station building. The majority of the Site is paved with asphalt and concrete. The location of the Site is presented in Drawing 1. A Site Plan that shows current well locations and previous and current sampling locations is provided as Drawing 2. A Groundwater Elevation Contour Map presenting the most current groundwater data (February 2014) is provided as Drawing 3.

The Site is bounded by the two-lane Third Street to the southeast, the two-lane South Livermore Avenue to the southwest, an optometry office to the northwest, and a residential property to the northeast. A Shell Station formerly resided on the property immediately southeast of the Site across Third Street. This station is identified as a closed leaking UST case, ACEH Fuel Leak Case No. RO0002525 / GeoTracker Global ID No. T0600156427, on the State Water Resources Control Board's Geotracker website. The case was closed in 2007.

1.2 Background

A detailed history of previous Site activities is presented in Appendix B. Historic soil and groundwater data are presented in Tables 1 through 3 and Appendix C. Copies of soil boring and monitoring well construction logs are provided in Appendix D.

2.0 ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION

2.1 Preliminary Field Activities

Additional attempts to gain property access to off-Site properties to the north of the site, at Tri Valley Optometry located at 254 South Livermore Avenue and at the U.S. Post office located at 220 South Livermore Avenue, were made and denied. Due to the denial of previous attempts at these locations, previously proposed offsite borings SB-19 and SB-20 were modified to include just one boring (SB-19) located within Second Street to the northwest of the Site. Prior to initiating field activities, Broadbent obtained the necessary well drilling permits from the Zone 7 Water Agency (Appendix E), prepared a Site health and safety plan specific to the scope of work, and cleared the on- and off-Site locations for subsurface utilities. The utility clearance included notifying Underground Service Alert of the work a minimum of 48 hours prior to initiating the field investigation, and additionally securing the services of a private underground utility locating company to confirm the absence of underground utilities at each boring location. Borehole locations were also cleared to a depth of 6.5 feet bgs using an air knife rig by Gregg Drilling between January 2 and 3, 2014 prior to borehole advancement. Additionally, an encroachment permit was obtained from the City of Livermore prior to borehole clearance and drilling activities conducted within Second and Third Streets.

The Site-specific HASP was prepared for use by personnel implementing the work plan. A copy of the HASP was available on-site during work. A safety tailgate meeting was conducted daily to review potential hazards and scope of work.

2.2 CPT Boring Advancement

Between January 7 and 8, 2014, Broadbent field personnel observed Gregg Drilling advance two soil borings on-site (SB-17 and SB-18) and two soil borings offsite (SB-19 and SB-20). Gregg Drilling utilized a truck-mounted hollow stem auger to drill from approximately 6.5 feet bgs to 15 feet bgs due to the presence of large gravels and a Cone Penetration Testing (CPT) drill rig to advance the soil borings from approximately 15 feet bgs to a maximum depth of approximately 75 feet bgs at each location.

A log based on CPT measurements was created for each boring. Metal rods equipped with a cone penetrometer (cone) were advanced into the subsurface at each proposed location. This cone measured parameters in the subsurface. These parameters included tip friction, sleeve friction, and pore pressure. The CPT measured these parameters in real time with depth, allowing for a vertical soil profile to be created based on these measurements. Pore pressure dissipation tests (PPDTs) were not conducted at the on-Site exploratory boring locations SB-17 and SB-18 as previously proposed within the work plan. The two targeted intervals, the upper clay/silty clay layer observed from approximately 35 to 48 feet bgs and the lower sand interval observed between approximately 55 and 65 feet bgs, were easily identified during CPT boring advancement. As such, additional conduct of PPDTs did not prove necessary in order to determine the two water-bearing zones targeted for groundwater sampling activities. Soil borings were completed under the supervision of

a Broadbent field representative. The CPT data package including lithologic logs generated during CPT advancement and field notes are provided in Appendix F.

2.3 Groundwater Sampling Activities

Following completion of the on- and off-Site CPT borings, a second borehole immediately adjacent to the first was installed in order to collect groundwater samples. Collection of two groundwater samples, one from the clay/silty clay layer observed between approximately 35 and 48 feet bgs and one from the lower sand zone between approximately 55 and 65 feet bgs, was attempted at each boring location. However, due to slow groundwater infiltration rates within the clay/silty clay interval, groundwater samples from this layer could not be collected at borings SB-17 and SB-19, despite leaving the temporary filter screens in place for up to one hour to allow for groundwater infiltration. The deeper groundwater samples within the sand layer were successfully collected from each boring.

Groundwater samples were collected using a Hydropunch-type sampler equipped with a retrievable stainless steel screen with an expendable tip. The groundwater sampler operated by advancing 1 ¾ - inch hollow-push rods with the filter tip in a closed configuration to the base of the desired sampling interval. Once at the desired depth, the push rods were retracted, exposing the encased filter screen and allowing groundwater to infiltrate hydrostatically from the formation to the inlet screen. A small diameter bailer was then lowered through the push rod into the screened interval for sample collection. Upon completion of borehole advancement, each boring was abandoned using neat cement grout and completed at the surface to match the surrounding area. Soil samples were not collected during investigative activities due to the numerous soil samples collected during the previous CPT investigation and the minimal hydrocarbon concentrations observed in those samples.

2.4 Well Installation Activities

Between January 13 and 15, 2014, Broadbent observed Gregg Drilling install onsite wells MW-5A, MW-5B, MW-6A, and MW-6B using a hollow stem auger drill rig. Well locations are depicted on Drawing 2. A shallow and deep well cluster was proposed for locations MW-5A/B near the southern property boundary and MW-6A/B near the northern property boundary. The shallow and deep wells were drilled in close proximity to one another yet at a distance great enough to maintain structural integrity of the adjacent well during drilling activities. The locations of the screened intervals in these two areas varied dependent upon the results of the CPT profile. The screen interval for shallow well MW-5A in the southern portion of the Site was set from approximately 40 to 50 feet bgs in the clay layer, as observed in CPT logs from previous borings SB-15 and SB-16 and recent boring SB-17. The screen interval for the deeper well in this cluster, MW-5B, was set at approximately 56 to 66 feet bgs, where the water-bearing sand zone was encountered within CPT boring SB-17. In the northern portion of the Site, the screen interval for the shallow well, MW-6A, was set at approximately 40 to 50 feet bgs based on the CPT logs from previous borings SB-11 and SB-12 and recent boring SB-18. The screen interval for the deeper well, MW-6B, was set from

approximately 60 to 70 feet bgs, within the water-bearing sand zone encountered within CPT boring SB-18.

Due to the primarily non-detect petroleum hydrocarbon concentrations observed during the recent soil investigation, soil samples were not collected during well installation activities. Lithologic and well construction logs for wells MW-5A/B and MW-6A/B are provided in Appendix D. Field notes and the lithologic logs generated during CPT activities are presented in Appendix F. A Site map and the lithologic and well construction logs were uploaded to the GeoTracker AB2886 database. Copies of the GeoTracker upload confirmation reports (GEO_MAP and GEO_BORE files) are provided within Appendix G.

Each well was constructed using two-inch diameter, Schedule 40 PVC well casing and factory slotted well screen (0.010-inch slots). The screen interval for each well was 10 feet in length surrounded by #2/12 silica sand in the annular space from total depth to approximately one foot above the top of screen. A sanitary seal, consisting of approximately four feet of bentonite well-seal overlain by neat cement grout, was installed from the top of the silica sand to approximately 0.5 feet bgs. The well head was completed with an air-tight plug and a traffic rated monitor well vault set in concrete at each location.

2.5 Well Development and Surveying

Wells MW-5A, MW-5B, MW-6A, and MW-6B were developed by Gregg Drilling on January 20, 2014. In general, well development activities consisted of surging the well with a surge block, bailing the well with a stainless steel bailer, and pumping the well with a submersible groundwater pump until relatively silt-free water was removed. Pumping was not conducted during development of well MW-5A due to slow groundwater recharge and the well was bailed dry after removal of approximately 15 gallons of water. However, relatively silt-free water was observed prior to dry conditions and well development was considered complete. Approximately 55 gallons of water were removed from well MW-5B during development activities. Relatively silt-free water was observed prior to completion of well development. Approximately 20 gallons of water were removed from well MW-6A during development activities before running dry. Relatively silt-free water was observed prior to dry conditions and development was considered complete. Approximately 57 gallons of water were removed from well MW-6B during development activities. Relatively silt-free water was observed prior to completion of development activities.
Wells MW-5A, MW-5B, MW-6A, and MW-6B were surveyed by Morrow Surveying of Sacramento, California on January 29, 2014. The well survey information was uploaded to the GeoTracker AB2886 database. Copies of the GeoTracker upload confirmation reports (GEO_MAP, GEO_XY, and GEO_Z files) are provided within Appendix G.

2.6 Investigation-Derived Residual Management

Residual solids and liquids generated during the Site investigation activities were stored temporarily onsite in Department of Transportation-approved 55-gallon drums pending analytical results and profiling. Following characterization and profiling, Belshire Environmental Services transported the

investigation-derived residuals to an Atlantic Richfield Company-approved facility for treatment or disposal.

3.0 RESULTS OF INVESTIGATION

Six groundwater samples were submitted to TestAmerica of Irvine, California, a California State-certified laboratory, under chain-of-custody protocol. Each sample was analyzed for Gasoline range organics (GRO, C6-C12) via EPA Method 8015B and benzene, toluene, ethylbenzene, and total xylenes (BTEX), methyl tertiary butyl ether (MTBE), tert-butyl alcohol (TBA), ethyl tert-butyl ether (ETBE), tert-amyl methyl ether (TAME), di-isopropyl ether (DIPE), 1,2-dichloroethane (1,2-DCA), 1,2-dibromoethane (EDB), and ethanol via EPA Method 8260B. No significant irregularities were reported during laboratory analysis of the samples. A copy of the laboratory analytical report with chain-of-custody documentation is provided in Appendix H. Laboratory analytical results (EDF) were uploaded to the GeoTracker AB2886 database. Upload confirmation pages are provided in Appendix G.

3.1 Groundwater Sample Analytical Results

Laboratory analytical results for GRO, BTEX, and MTBE are summarized in Table 4. Tabulated groundwater sample laboratory analytical results were compared against the revised residential Environmental Screening Levels (ESLs) established by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB, 2013) under a potential drinking water resource scenario. Additional discussion regarding groundwater analytical results of this investigation is summarized below:

- GRO were detected at concentrations of 1,400 µg/L and 54 µg/L in samples collected from boring SB-20 between depths of approximately 43 and 48 feet and 60 and 65 feet bgs, respectively.

- GRO was detected at a concentration of 880 µg/L in the sample collected from boring SB-17 between depths of approximately 60 and 65 feet bgs.

- BTEX were detected at concentrations of 0.71 µg/L, 8.7 µg/L, 13 µg/L, and 60 µg/L, respectively, in the sample collected from boring SB-17 at depths between approximately 60 and 65 feet bgs.

- MTBE and TBA were detected at concentrations of 3,000 µg/L and 660 µg/L, respectively, in the sample collected from boring SB-18 at depths between 40 and 45 feet bgs.

The remaining constituents were not detected above laboratory reporting limits.

3.2 Subsurface Lithology

Vertical profiles for soil behavior type (SBT) from each CPT boring were used to update the geologic cross-sections, which are shown in Drawings 4 through 6. As depicted on the cross-sections, the soil underlying the site primarily consists of a layer of sand and/or silty sand that extends from approximately 10 to 34 feet bgs resting on top of a layer of silty clay and/or clay which extends from a

depth of approximately 34 to 57 feet bgs. The sand layer also consists of occasional finer grained clay and silty clay layers. The deeper clay and silty clay layer consists of intermittent beds of silty sand and sandy silt. A small layer of sand and/or silty sand was observed beneath the silt and/or clay layer between approximately 57 and 66 feet bgs. CPT borings from this investigation continued past this lower sand layer until more than two feet of continuous clay and/or silt was encountered. This clay and/or silty clay layer extended from a depth of approximately 66 to at least 75 feet bgs, the maximum depth explored. CPT lithologic logs are provided in Appendix F.

3.3 Vertical Gradient Evaluation

During the previous onsite CPT investigation conducted in 2013, a downward vertical groundwater gradient was thought to exist at the Site based on measurements generated during conduct of numerous PPDTs. However, upon further evaluation following the installation of the two deep wells onsite (MW-5B and MW-6B), the contrary actually appears to exist. Hydrocarbon results above laboratory reporting limits were not observed in either groundwater sample collected from wells MW-5B and MW-6B, suggesting little to no downward vertical migration of contaminants as were present in adjacent, shallower wells. Furthermore, the groundwater potentiometric elevations recorded for deeper wells MW-5B and MW-6B were higher than those recorded in their shallow well pairings, MW-5A and MW-6A, suggesting that an upward vertical groundwater gradient may exist within the deeper water-bearing zone. Additional groundwater monitoring and sampling events will allow for further evaluation regarding possible vertical gradient trends.

4.0 FIRST QUARTER 2014 GROUNDWATER MONITORING

Following installation of the new onsite wells, First Quarter 2014 groundwater monitoring and sampling was conducted to obtain data for all wells currently associated with the Site. Information relative to groundwater monitoring and 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 First Quarter 2014 groundwater monitoring and sampling activities 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

4.1 Work Performed This Quarter (First Quarter 2014)

The following work activities associated with Station #498 were conducted during the First Quarter 2014:

1. Conducted additional soil and groundwater investigation activities including onsite well installations 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*.
2. Conducted First Quarter 2014 groundwater monitoring/sampling on February 21, 2014 including newly installed wells MW-5A, MW-5B, MW-6A, and MW-6B.
3. Prepared and submitted *Fourth Quarter 2013 Semi-Annual Groundwater Monitoring Report* (Broadbent, 1/27/2014).

4.2 Work Scheduled For Next Quarter (Second Quarter 2014)

The following work activities are anticipated to be conducted during the Second Quarter 2014:

1. Prepare and submit Additional Soil and Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report (contained herein).
2. Conduct semi-annual groundwater monitoring/sampling for Second Quarter 2014.

4.3 Groundwater Monitoring Plan Summary

The current groundwater monitoring plan is summarized below.

Groundwater level gauging:	MW-1 through MW-4, MW-5A/5B, MA-6A/6B	(2Q, 3Q14 (one-time) and 4Q)
Groundwater sample collection:	MW-1 through MW-4, MW-5A/5B, MW-6A/6B	(2Q, 3Q14 (one-time) and 4Q)
Biodegradation indicator parameter monitoring:	NA	

4.4 Quarterly Results Summary

A summary of the results obtained from monitoring and sampling activities is provided below.

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:	30.67 (MW-1) to 37.40 (MW-6A)	(ft below TOC)
Gradient direction:	West-Northwest	(compass direction)
Gradient magnitude:	0.02	(ft/ft)
Average change in elevation:	-0.81 (MW-1 through MW-4 only)	(ft since last measurement)

Laboratory Analytical Data

Summary:	GRO were detected in three of the eight wells sampled at a maximum concentration of 2,000 µg/L in well MW-3. Benzene was detected in three of the eight wells sampled at a maximum concentration of 210 µg/L in MW-3. MTBE was detected in five of the eight wells sampled at a maximum concentration of 780 µg/L in well MW-6A.

4.5 Activities Conducted and Results

First Quarter 2014 groundwater monitoring was conducted on February 21, 2014 by Broadbent personnel for the purpose of sampling the four newly installed wells at the Site. 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 30.67 feet at MW-1 to 37.40 feet at MW-6A. Resulting groundwater surface elevations ranged from 458.86 feet at MW-2 to 466.05 feet 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. Newly installed wells MW-5B and MW-6B were also not used for contouring purposes due to being screened within the deeper sand layer. 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 I. Field data sheets are included in Appendix J. A Site Location Map is presented as Drawing 1. Potentiometric groundwater elevation contours are presented in Drawing 3.

Groundwater samples were collected on February 21, 2014 from wells MW-1 through MW-4, MW-5A, MW-5B, MW-6A, and MW-6B. 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 K.

Hydrocarbons in the GRO range were detected above the laboratory reporting limit in three of the eight wells sampled at a maximum concentration of 2,000 µg/L in well MW-3. Benzene was detected above the laboratory reporting limit in three of the eight wells sampled at a maximum concentration of 210 µg/L in well MW-3. Toluene was detected above the laboratory reporting limit in one of the eight wells sampled at a concentration of 3.0 µg/L in well MW-1. Ethylbenzene was detected above the laboratory reporting limit in three of the eight wells sampled at a maximum concentration of 30 µg/L in well MW-1. Total Xylenes were detected above the laboratory reporting limits in two of the eight wells sampled at a maximum concentration of 15 µg/L in well MW-5A. MTBE was detected above the laboratory reporting limit in five of the eight wells sampled at a maximum concentration of 780 µg/L in well MW-6A. TBA was detected above the laboratory reporting limit in four of the eight wells sampled at a maximum concentration of 58 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 3. Groundwater monitoring data (GEO_WELL) and laboratory analytical results (EDF) were uploaded to the GeoTracker AB2886 database. Upload confirmation receipts are provided in Appendix G.

5.0 CONCEPTUAL SITE MODEL

In order to better understand the current Site conditions and properly evaluate those conditions, a Conceptual Site Model (CSM) was prepared for the Site following additional assessment and First Quarter 2014 groundwater monitoring and sampling activities. Isoconcentration maps (Drawings 7 through 12) and concentration and groundwater elevation trend graphs (Appendix M) were generated for inclusion within the CSM, which is presented in Table 5.

6.0 CONCLUSIONS

On behalf of Atlantic Richfield Company, Broadbent has prepared this *Additional Soil & Groundwater Investigation, First Quarter 2014 Groundwater Monitoring, and Conceptual Site Model Report* for Station 498 located at 286 South Livermore Avenue, Livermore, CA. Based on the findings of this investigation, Broadbent concludes the following:

- Analytical results from the groundwater samples collected during CPT assessment activities showed moderate concentrations of GRO within the deeper water-bearing zone at onsite boring SB-17 located in the southern portion of the Site and within the shallower water-bearing zone at offsite boring SB-20 located immediately southeast of the Site across Third Street.

- The elevated GRO concentration observed at SB-20 appears to suggest a potential offsite source related to the former Shell Station previously operated on the northeast corner of Third Street and South Livermore Avenue.

- Elevated concentrations of MTBE and TBA were noted on the northern portion of the property at SB-18 within the shallower zone. Concentrations in the groundwater sample collected from offsite, downgradient boring SB-19 were below the laboratory reporting limits for each constituent analyzed.

- The absence of contaminants detected above laboratory reporting limits in the groundwater sample collected from offsite and downgradient boring SB-19 suggests that downgradient contaminant migration has not occurred within this area.

- The GRO concentration observed within the deeper water-bearing zone at SB-17 is markedly less than results obtained from the shallow zone during the previous onsite CPT assessment (borings SB-15 and SB-16), suggesting that the deeper water-bearing zone has been impacted to a lesser extent. Additionally, the analytical results from the initial groundwater samples collected from deeper wells MW-5B and MW-6B during the First Quarter 2014 were below laboratory reporting limits for each constituent analyzed for, suggesting a downward vertical gradient may not exist at the Site as previously suggested based on PPDT results. Furthermore, the groundwater potentiometric elevations observed at deeper wells MW-5B and MW-6B are greater than those observed in shallower well pairings MW-5A and MW-6A, indicating that an upward vertical gradient may actually exist at the Site. Vertical characterization of groundwater has been successfully achieved at the Site and additional groundwater monitoring and sampling of wells MW-5A/B and MW-6A/B will allow more detailed and representative concentration trend and vertical gradient analysis.

- Installation of four depth-discrete groundwater monitoring wells (MW-5A, MW-5B, MW-6A, and MW-6B) was conducted onsite near the two onsite wells exhibiting the highest concentrations of GRO and MTBE, wells MW-3 and MW-1, respectively. These two well pairings will allow for additional evaluation of contaminant impact within the clay/silt zone and the lower sand zone.

- Groundwater levels were between historic minimum and maximum elevations for each well gauged during the First Quarter 2014, not including newly installed wells MW-5A, MW-5B, MW-6A, and MW-6B. 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, excluding the newly installed wells, with the following exception: Ethylbenzene reached a historic minimum concentration in well MW-3. Recent and historic laboratory analytical results are summarized in Table 3 and Table 4.

- The updated cross-sections generated generally show a sand and silt layer extending from approximately 10 feet bgs to 34 feet bgs overlaying a less permeable finer grained clay and silty clay layer from approximately 34 to 57 feet bgs that includes intermittent beds of courser material. A layer of sand and/or silty sand was observed beneath the clay/silty clay layer beginning at approximately 57 feet bgs and ending at approximately 66 feet bgs. A clay and silty clay layer was again observed from approximately 66 feet bgs to at least 75 feet bgs, the total depth explored.

7.0 SUMMARY AND RECOMMENDATIONS

Onsite geology has been adequately characterized following advancement of deeper CPT borings. The previously observed sand layer near the termination point (approximately 58 feet bgs) of CPT borings installed in 2013 was verified and found to extend an approximate length of 10 feet below the deeper clay/silt layer. Another clay/silt layer was observed beneath the lower sand layer extending to the total depth explored (approximately 75 feet bgs).

Deeper groundwater at the Site has been adequately characterized. The data suggests that the majority of the groundwater contamination lies within the upper clay/silt layer overlying the deeper sand layer, in which minimal impact was observed during both the CPT assessment and First Quarter 2014 groundwater sampling event. Based on a comparison between the contaminant concentrations and groundwater elevations within the newly installed shallower wells (MW-5A and MW-6A) and the deeper wells (MW-5B and MW-6B), a downward vertical gradient does not appear to exist at the Site. In contrast, the difference in groundwater elevations suggests that an upward vertical gradient may exist onsite. It is recommended that three additional groundwater monitoring and sampling events to include the newly installed wells be completed in order to evaluate appropriate concentration and vertical gradient trends.

Delineation of impact to groundwater in the downgradient, west-northwest direction was accomplished through the installation of offsite boring SB-19. The hydrocarbon concentrations in the groundwater sample collected from SB-19 did not exceed laboratory reporting limits for the constituents analyzed. This appears to demonstrate that contaminant migration within groundwater does not extend to the location of offsite boring SB-19. Impacts to groundwater upgradient of the Site were verified through installation of offsite boring SB-20, located southeast of the Site immediately across Third Street. An elevated concentration of GRO was observed in the shallow groundwater sample collected from SB-20, indicating potential impact from the former Shell Station previously located on the northeast corner of Third Street and South Livermore Avenue. These impacts could potentially be impacting concentrations observed in the southeastern portion of the Site within the vicinity of MW-3 and MW-5A/B.

Although the concentrations of GRO and MTBE observed in the northern portion of the Site from both CPT boring samples and newly installed monitoring well MW-6A do not appear defined, concentrations within the offsite, downgradient CPT boring SB-19 did not indicate further downgradient contaminant migration. Additional characterization further north is not feasibility due to the lack of property owner cooperation to allow access for an additional investigation. Based on current concentrations, the predominant gradient direction, a lack of sensitive receptors in the vicinity, no anticipated human health risks, and accessibility issues, additional assessment

immediately north of the Site is not warranted or feasible. The contaminant plume appears to be stable and/or decreasing and is predominantly isolated onsite.

Based on the results of the on- and offsite investigation and initial results of groundwater monitoring and sampling conducted at the newly installed wells, the Site appears that it may meet the requirement of the Low-Threat Closure Policy. As previously discussed, it is recommended to conduct three more consecutive groundwater monitoring and sampling events including all wells associated with the Site in order to establish concentration and groundwater elevation trends. Following completion of these events, additional evaluation of Site conditions pertaining to potential closure under the Low-Threat Closure Policy will be completed.

8.0 LIMITATIONS

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

9.0 REFERENCES

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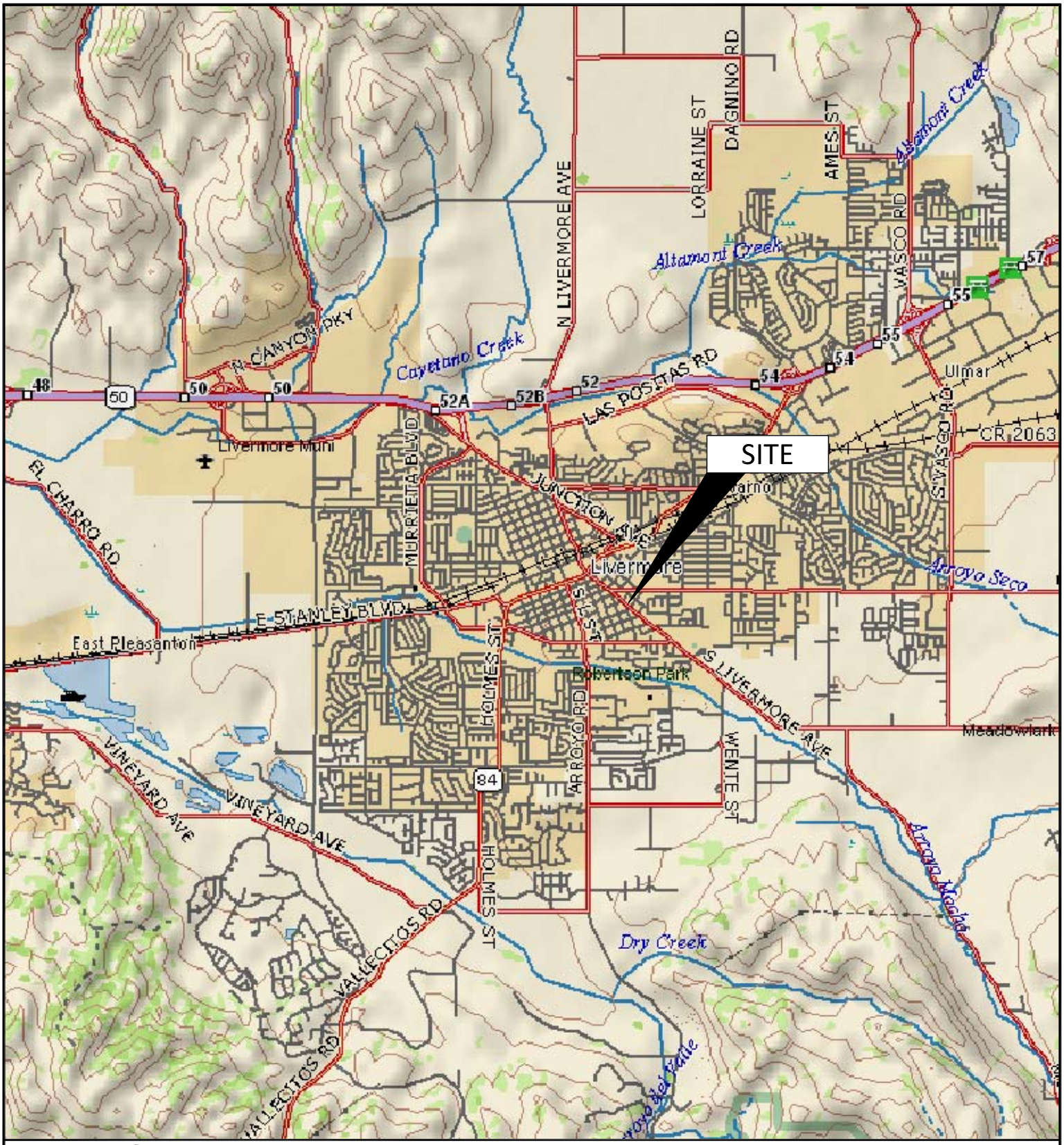
DRAWINGS



N

0 1 2

APPROXIMATE SCALE (mi)

IMAGE SOURCE: DELORME

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

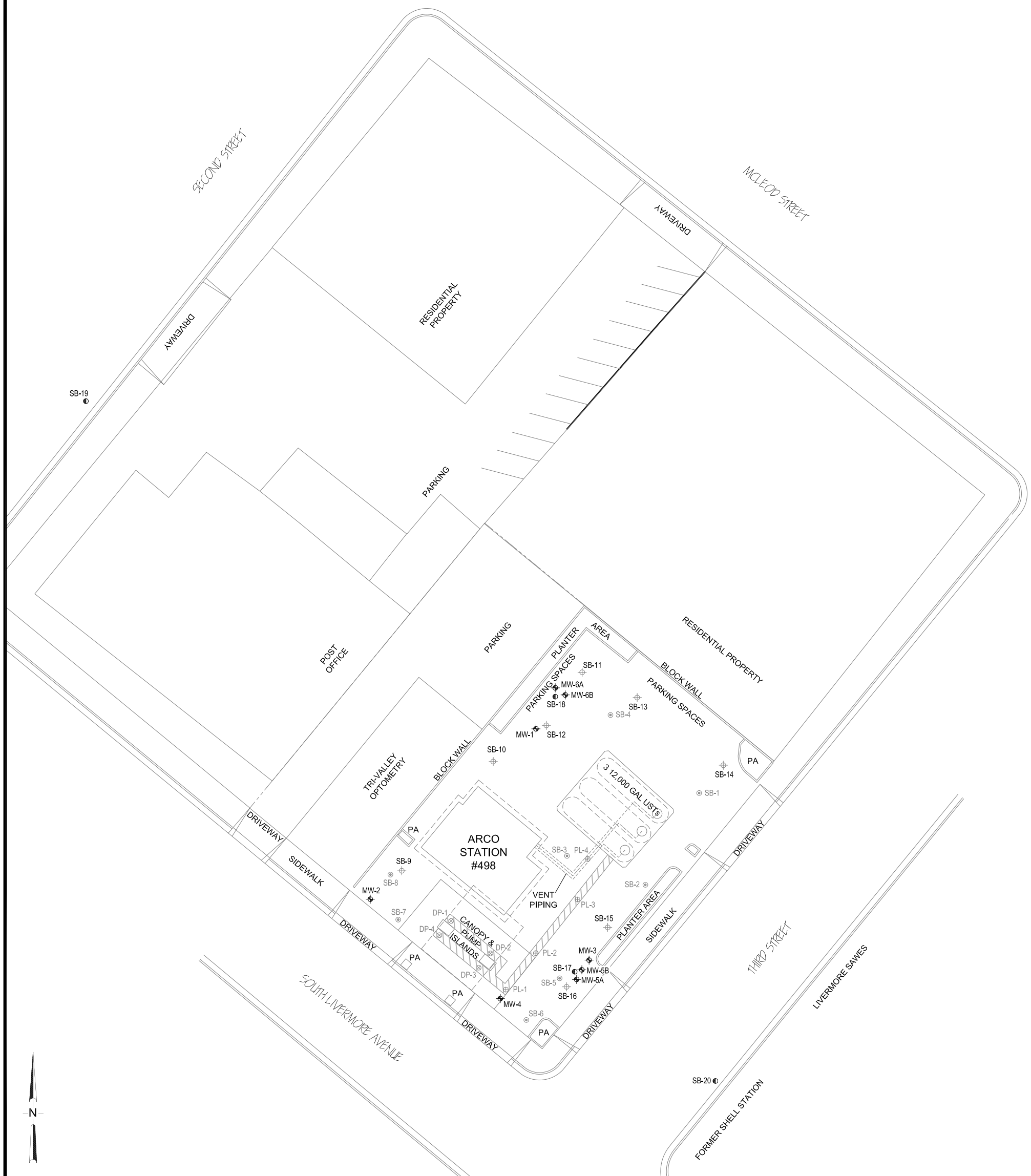
Site Location Map

Drawing
1

LEGEND

- Monitor Well
- CPT Borings (Broadbent 2013)
- Soil Boring (URS 2005)
- Product Line Soil Sample (Delta 2001)
- Dispenser Pump Soil Sample (Delta 2001)
- CPT Borings (Broadbent 2014)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contour interval
- Product Line Excavation Trench

NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.



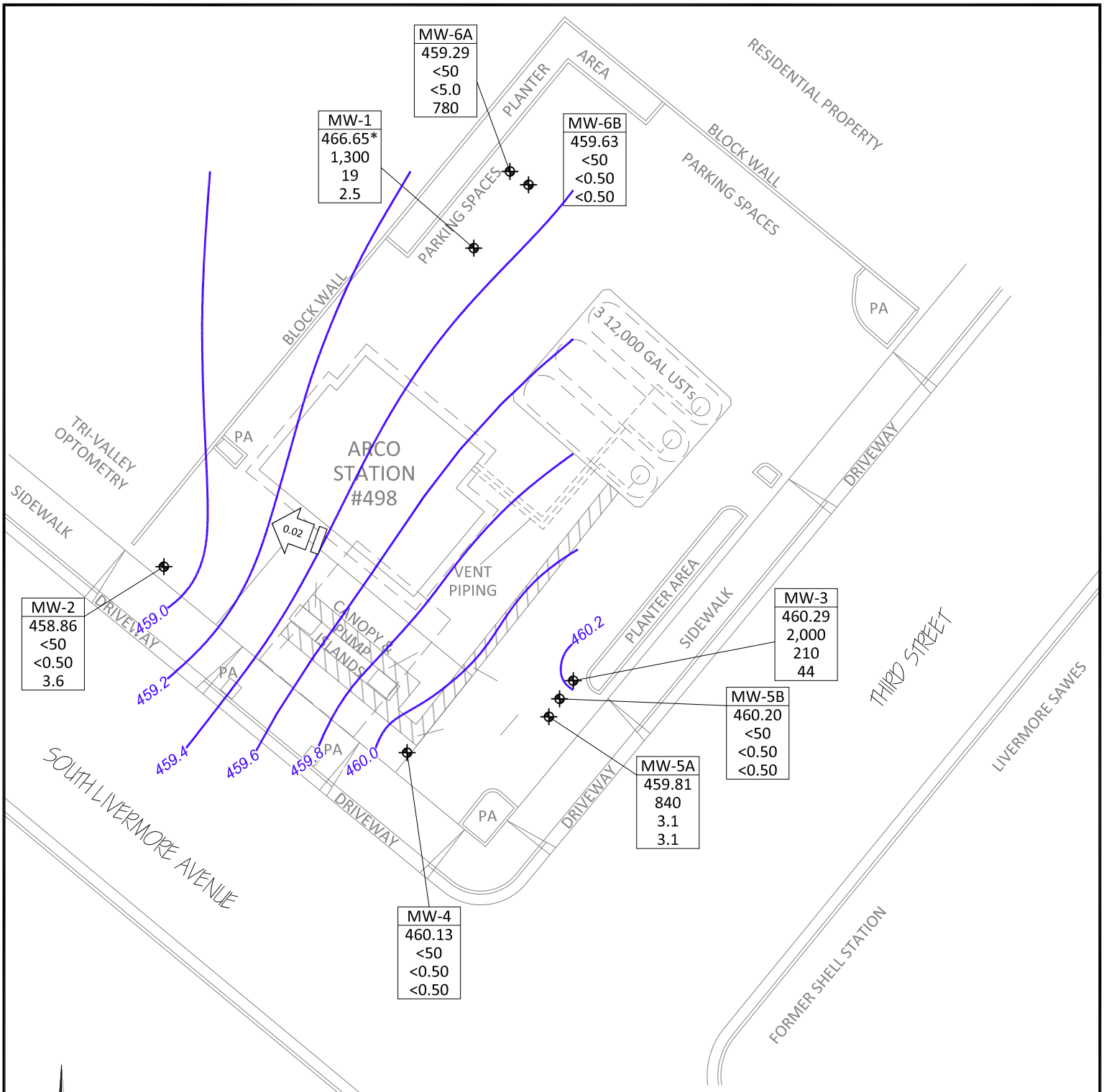
0 40 80
SCALE (ft)

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-103 Date: 7/24/2013

Station #498
286 South Livermore Avenue
Livermore, California

Site Map with Boring and Well Locations

Drawing
2



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: 4/8/2014

Station #498
286 South Livermore Avenue
Livermore, California

Groundwater Elevation Contour and Analytical Summary Map
First Quarter 2014

Drawing
3

A

A'

MW-2

SB-9 (5' SE)

STATION BUILDING

SB-10 (3' SE)

MW-1 (5' SE)

SB-12 (7' SE)

SB-18 (3' SE)

MW-6A

MW-6B (4' NW)

SB-11

0'

10'

20'

30'

40'

50'

60'

70'

SB-9-20'

SB-9-37'

SB-10-15'

SB-12-15'

SB-12-30'

SB-11-15'

TD 40'

TD 57'

TD 58'

TD 58'

TD 58'

TD 58'

TD 75'

Unknown - Air Knife from 0' to 6.5', Auger from 6.5' to 10'

SW - Sand

SM - Silty Sand and Sandy Silt

CL - Clay and Silty Clay

Boring ID with Projected Distance and Direction (feet)

Extent of Boring

Extent of Well Screen (Where Applicable)

TD = Total Depth (feet)

Piezometric Surface Calculated from Pore Pressure Dissipation Tests (March 18-22, 2013)

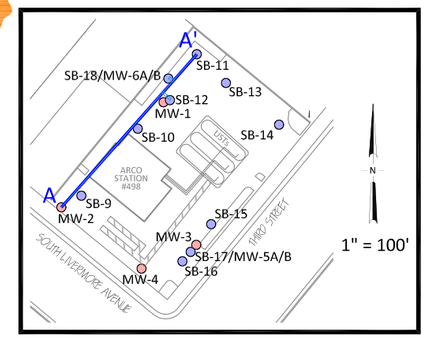
Static Groundwater Elevation (April 24, 2013)

Soil Sample Location

0 10 20

SCALE (ft)

NO VERTICAL EXAGGERATION



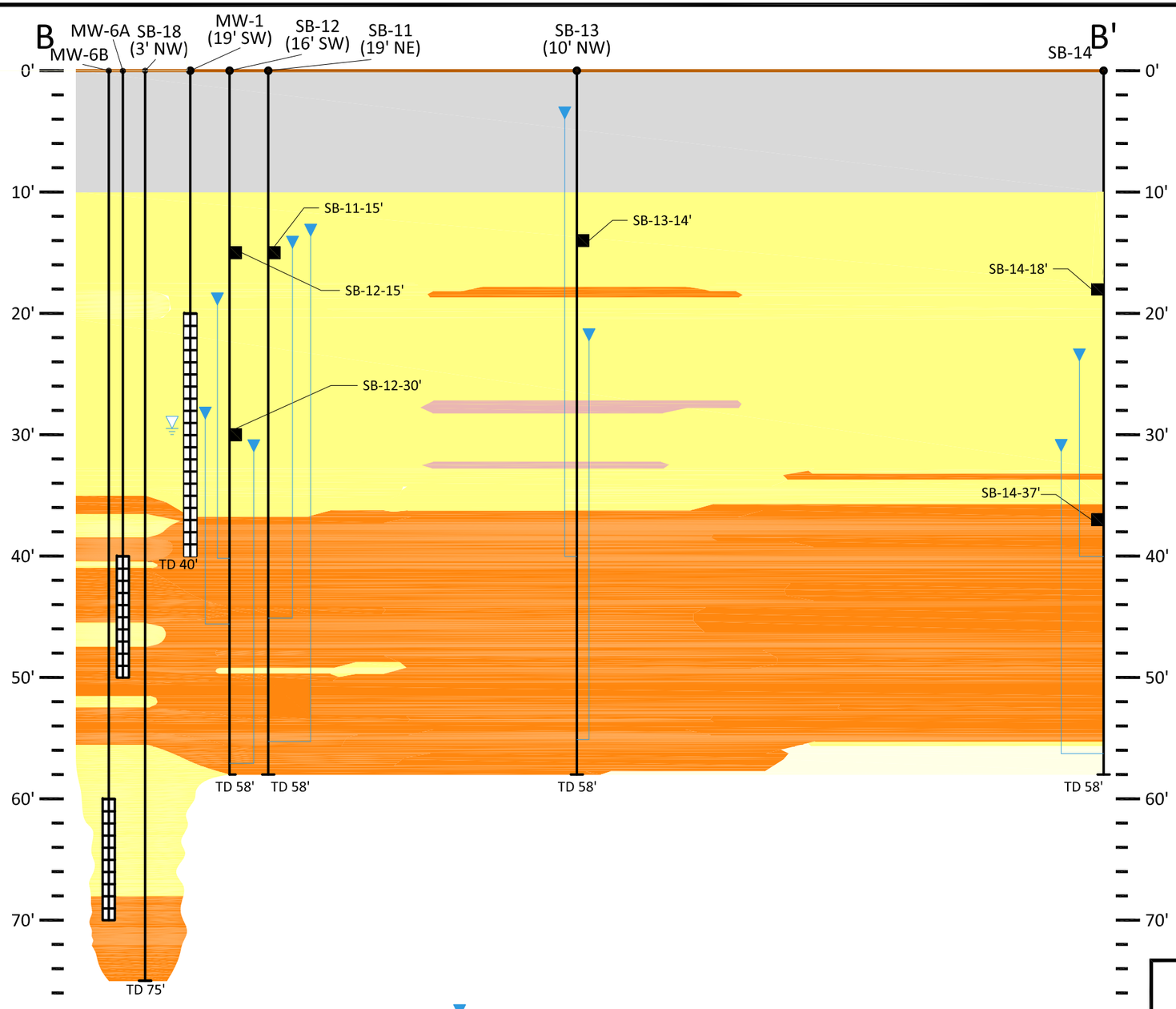
Note: MW-1, MW-2, MW-3, MW-4, MW-6A and MW-6B lithology not used.
Vertical scale is feet below ground surface.

Drawing 4

Geologic Cross Section A - A'

Station #498
286 South Livermore Avenue
Livermore, California

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/26/2013



Unknown - Air Knife from 0' to 6.5', Auger from 6.5' to 10'

SW - Sand

SM - Silty Sand and Sandy Silt

CL - Clay and Silty Clay

Boring ID with Projected Distance and Direction (feet)

Extent of Boring

Extent of Well Screen (Where Applicable)

TD = Total Depth (feet)

Piezometric Surface Calculated from Pore Pressure Dissipation Tests (March 18-22, 2013)

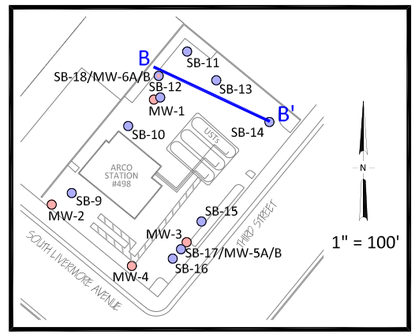
Static Groundwater Elevation (April 24, 2013)

Soil Sample Location

0 10 20

SCALE (ft)

NO VERTICAL EXAGGERATION



Note:Locations approximate for MW-6A and MW-6B. MW-1, MW-2, MW-3, MW-4, MW-6A and MW-6B lithology not used. Vertical scale is feet below ground surface.

Drawing 5

Geologic Cross Section B - B'

Station #498
286 South Livermore Avenue
Livermore, California

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 2/12/2014

C

C'

MW-4 | SB-16 (16' SE) | MW-5B MW-5A | SB-17 (16' NW) | MW-3 (15' SE) | SB-15 (13' SE) | SB-14

0' 10' 20' 30' 40' 50' 60' 70'

SB-16-13'

SB-16-26'

SB-15-24'

SB-15-38'

SB-14-18'

SB-14-37'

TD 40'

TD 58'

TD 57'

TD 58'

TD 58'

TD 75'

Unknown - Air Knife from 0' to 6.5', Auger from 6.5' to 10'

SM - Silty Sand and Sandy Silt

CL - Clay and Silty Clay

Boring ID with Projected Distance and Direction (feet)

Extent of Boring

Extent of Well Screen (Where Applicable)

TD = Total Depth (feet)

Piezometric Surface Calculated from Pore Pressure Dissipation Tests (March 18-22, 2013)

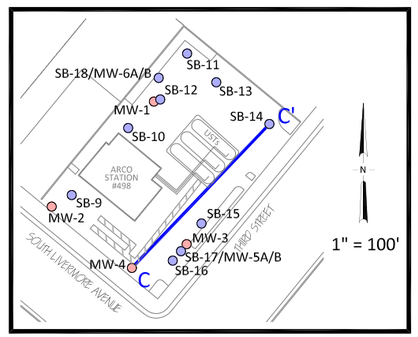
Static Groundwater Elevation (April 24, 2013)

Soil Sample Location

0 10 20

SCALE (ft)

NO VERTICAL EXAGGERATION



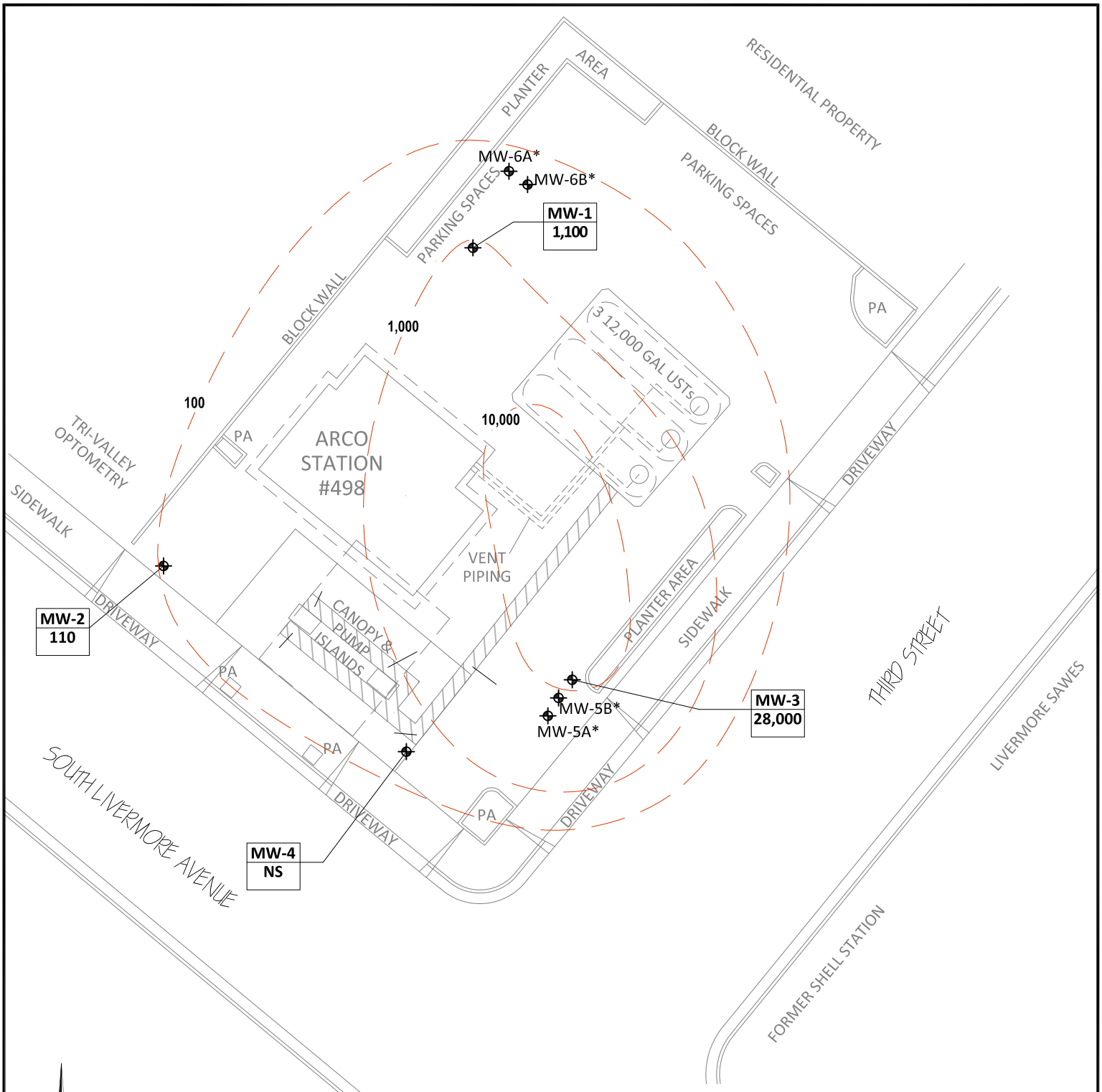
Note: Locations approximate for MW-6A and MW-6B. MW-1, MW-2, MW-3, MW-4, MW-6A and MW-6B lithology not used. Vertical scale is feet below ground surface.

Drawing 6

Geologic Cross Section C - C'

Station #498
286 South Livermore Avenue
Livermore, California

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 2/12/2014



LEGEND

- Monitor Well Location
- Well / GRO — Well designation; Concentration of GRO (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring, well installed in 2014
- Product Line Excavation Trench

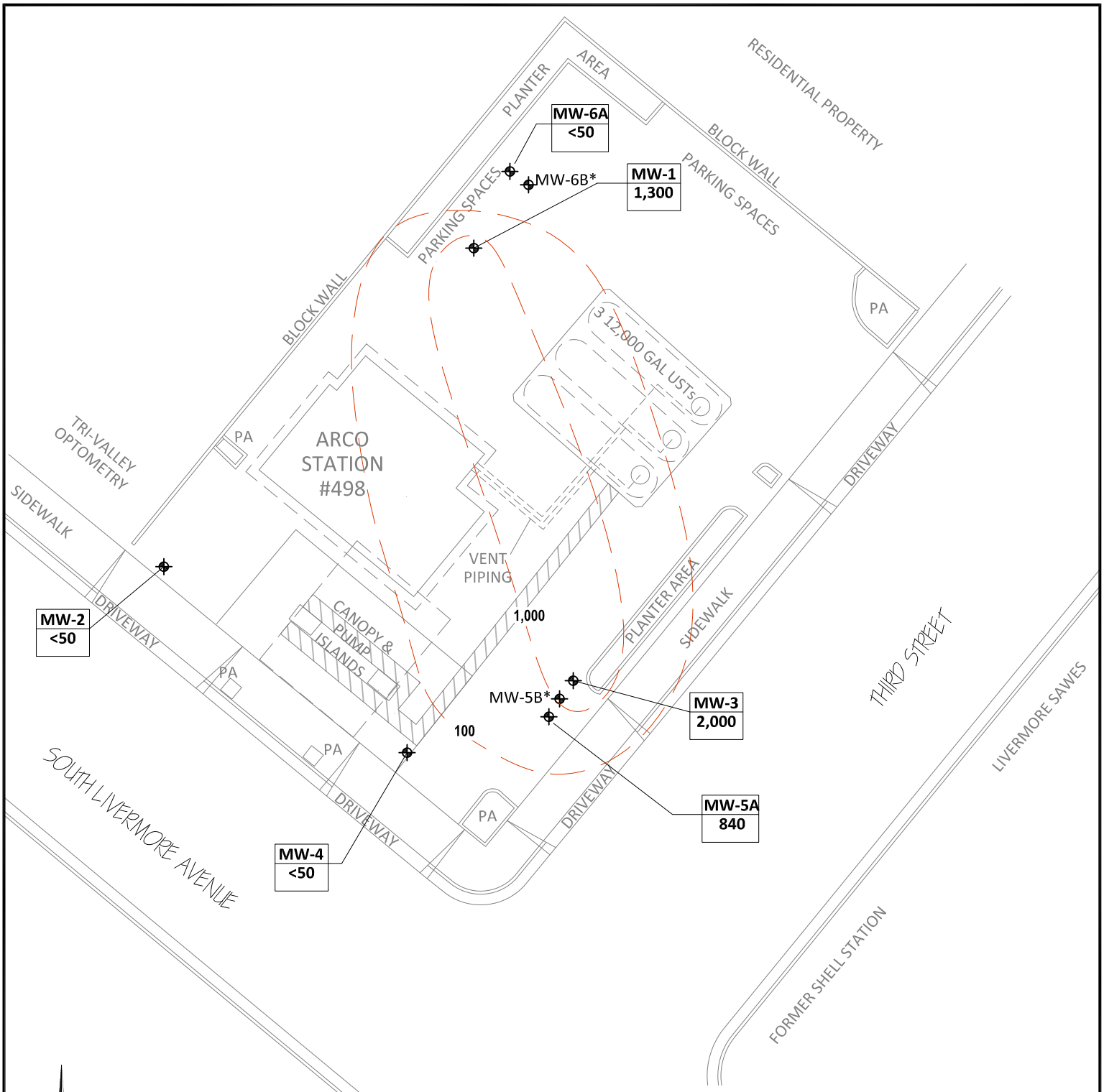
NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

GRO Isoconcentration Map
December 29, 2008

Drawing
7



LEGEND

- Monitor Well Location
- Well / GRO — Well designation / Concentration of GRO (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring due to deeper screen interval
- Product Line Excavation Trench

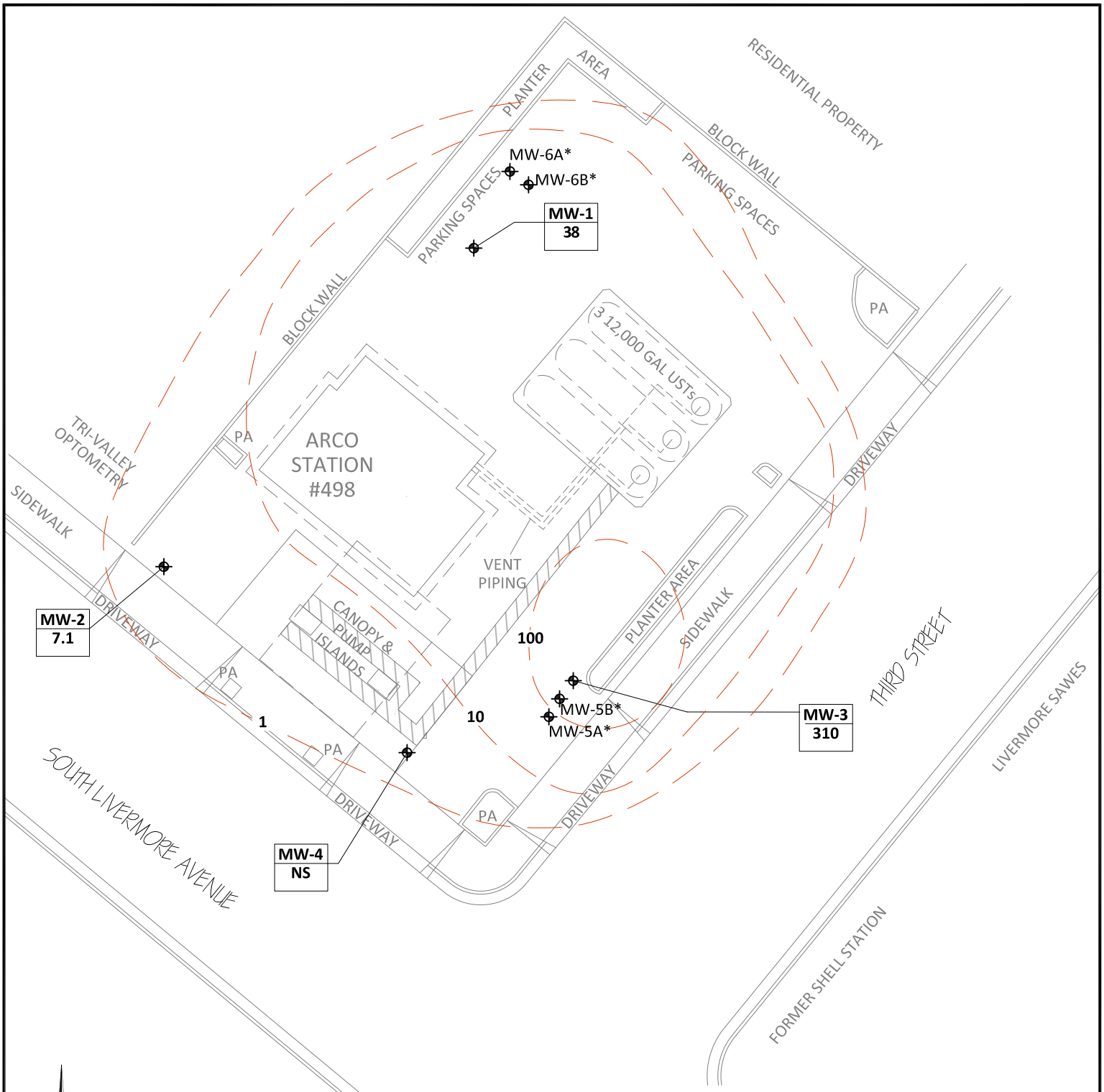
NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

GRO Isoconcentration Map
February 21, 2014

Drawing
8



LEGEND

- Monitor Well Location
- Well / Benzene — Well designation; Concentration of benzene (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring, well installed in 2014
- Product Line Excavation Trench

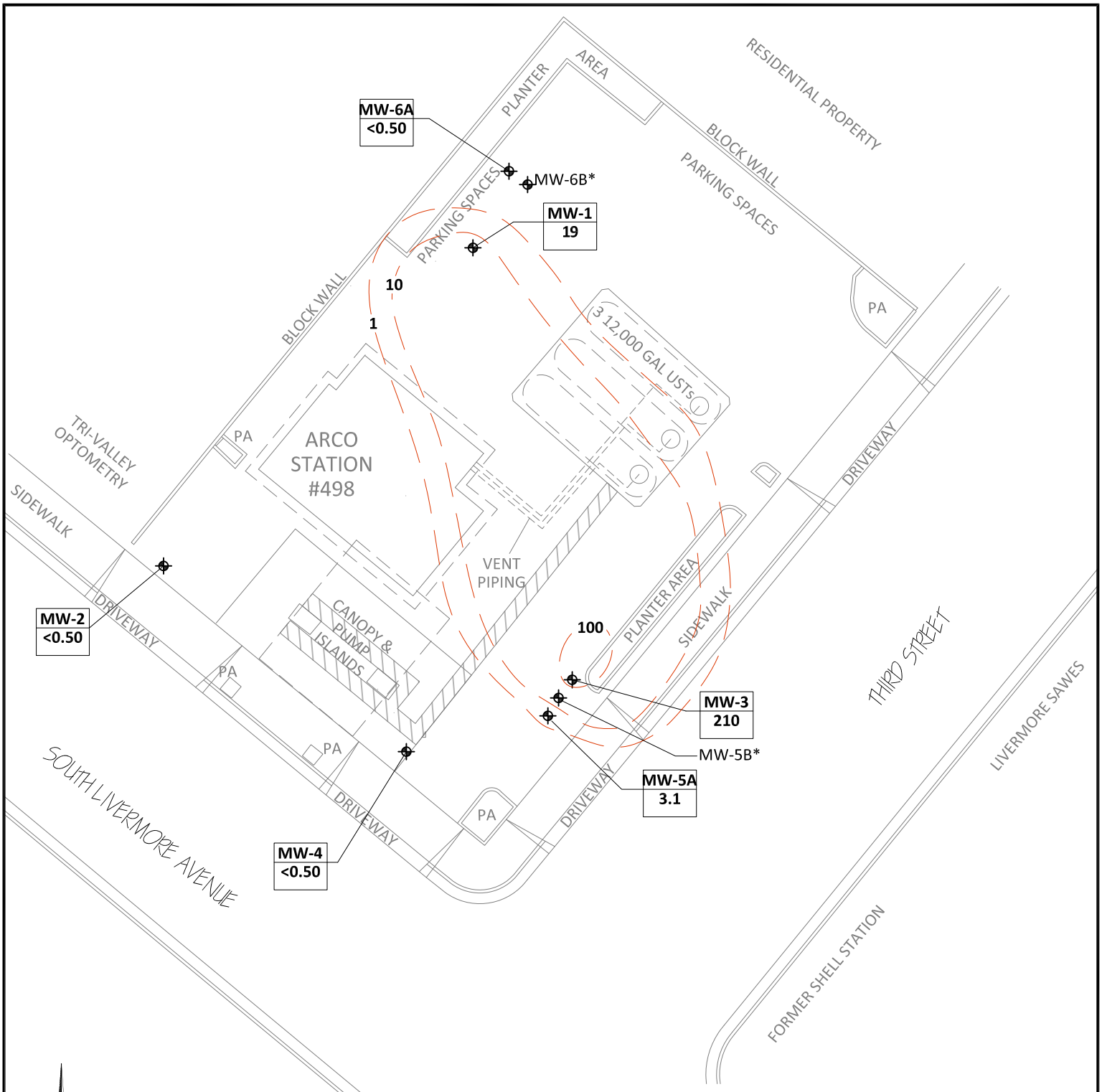
NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

Benzene Isoconcentration Map
December 29, 2008

Drawing
9



LEGEND

- Monitor Well Location
- Well / Benzene — Well designation; Concentration of benzene (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring due to deeper screen interval
- Product Line Excavation Trench

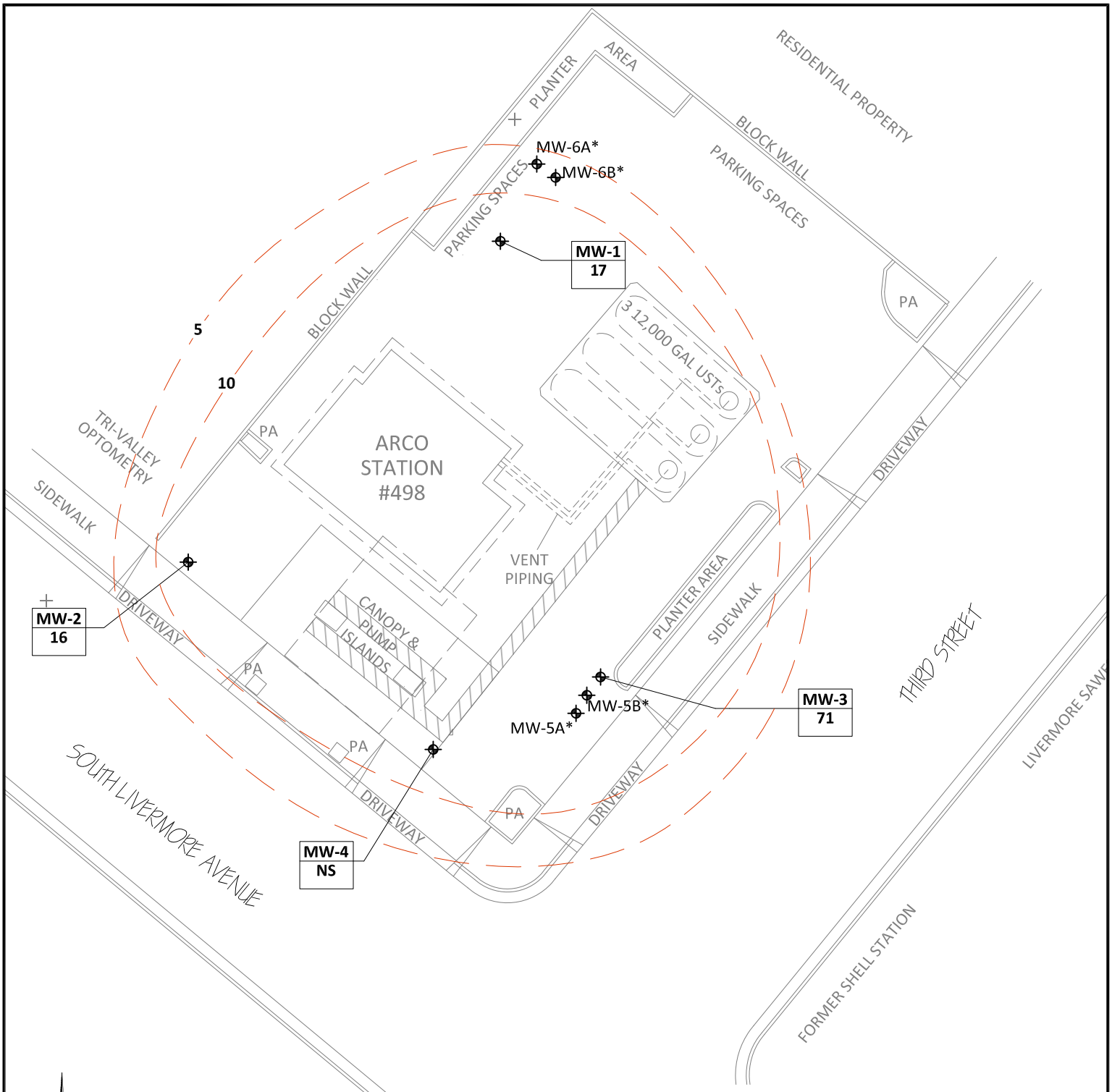
NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

Benzene Isoconcentration Map
February 21, 2014

Drawing
10



LEGEND

- Monitor Well Location
- Well / MTBE — Well designation; Concentration of MTBE (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring, well installed in 2014
- Product Line Excavation Trench

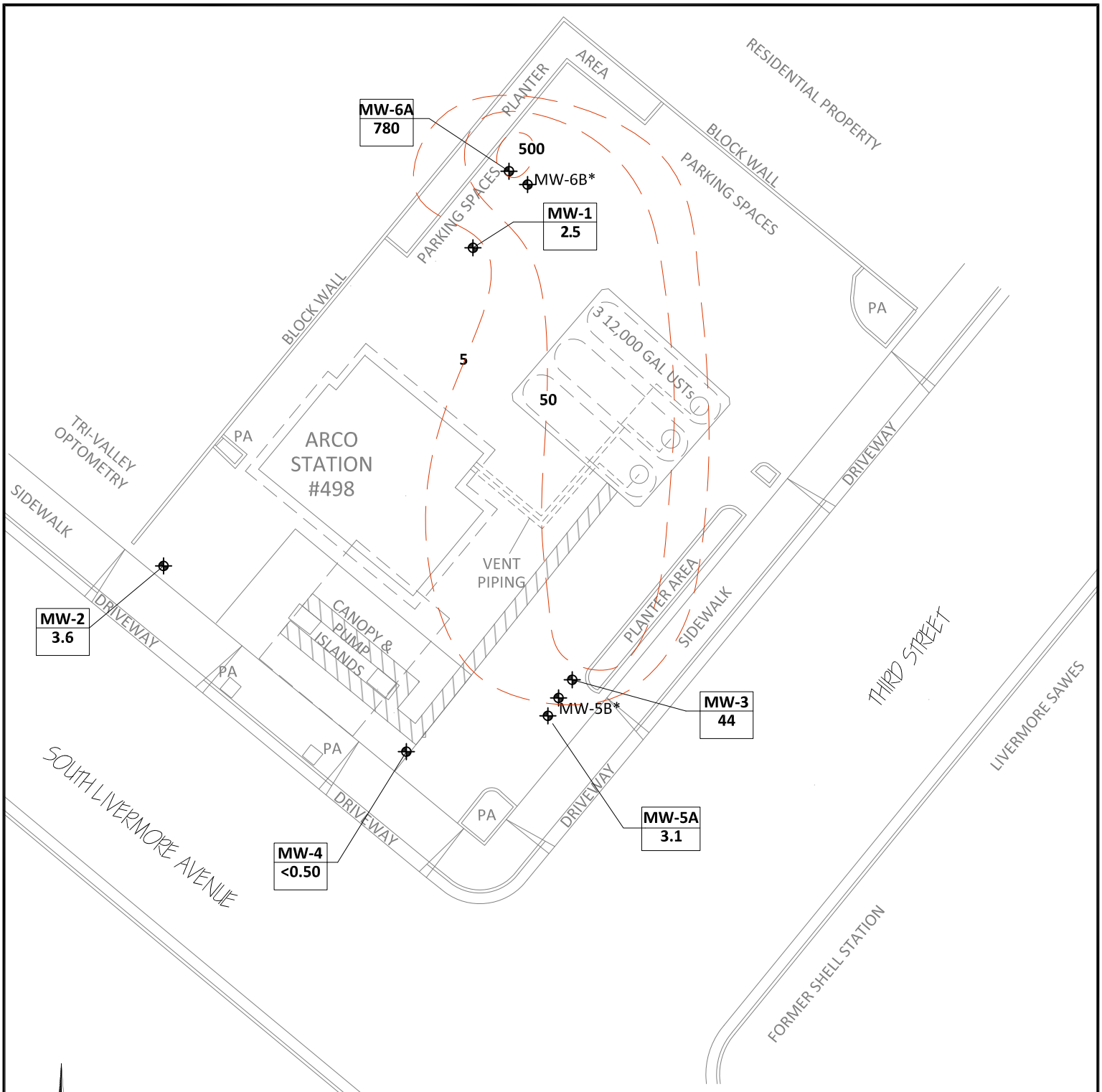
NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

MTBE Isoconcentration Map
December 29, 2008

Drawing
11



LEGEND

- Monitor Well Location
- Well / MTBE — Well designation; Concentration of MTBE (µg/L)
- < Not detected at or above laboratory reporting limits
- NS Not sampled
- * Not used in contouring due to deeper screen interval
- Product Line Excavation Trench

NOTES: SITE MAP ADAPTED FROM WATSON WEST, DELTA ENVIRONMENTAL AND WOOD RODGERS FIGURES.
WOOD RODGERS SURVEY COMPLETED DECEMBER 2, 2008.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973
Project No.: 08-82-603 Date: 4/7/2014

Station #498
286 South Livermore Avenue
Livermore, California

MTBE Isoconcentration Map
February 21, 2014

Drawing
12

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	
2/21/2014	**P**		**20.00**	**40.00**	**30.67**	**0.00**	**466.05**	**1,300**	**19**	**3.0**	**30**	**4.2**	**2.5**	**1.23**	**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	
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	
2/21/2014	**P**		**37.00**	**57.00**	**36.49**	**0.00**	**458.86**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**3.6**	**8.05**	**7.17**	

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																
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
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	
2/21/2014	**P**		**37.00**	**57.00**	**36.03**	**0.00**	**460.29**	**2,000**	**210**	**<2.0**	**27**	**<4.0**	**44**	**2.03**	**7.41**	
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	
2/21/2014	**P**		**20.00**	**40.00**	**35.88**	**0.00**	**460.13**	**<50**	**<0.50**	**<0.50**	**<0.50**	**<1.0**	**<0.50**	**2.33**	**6.76**	

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-5A																
2/21/2014	P	495.98	--	--	36.17	0.00	459.81	840	3.1	<0.50	19	15	3.1	2.39	7.19	
MW-5B																
2/21/2014	P	496.04	--	--	35.84	0.00	460.20	<50	<0.50	<0.50	<0.50	<1.0	<0.50	8.42	7.65	
MW-6A																
2/21/2014	P	496.69	--	--	37.40	0.00	459.29	<50	<5.0	<5.0	<5.0	<10	780	9.15	7.36	
MW-6B																
2/21/2014	P	496.89	--	--	37.26	0.00	459.63	<50	<0.50	<0.50	<0.50	<1.0	<0.50	5.81	7.36	

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	
2/21/2014	**<150**	**12**	**2.5**	**<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	
10/9/2013	<150	<10	5.9	<0.50	<0.50	<0.50	<0.50	<0.50	
2/21/2014	**<150**	**<10**	**3.6**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	

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									
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	
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	
2/21/2014	**<600**	**58**	**44**	**<2.0**	**<2.0**	**<2.0**	**<2.0**	**<2.0**	
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	
2/21/2014	**<150**	**37**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	
MW-5A									
2/21/2014	**<150**	**19**	**3.1**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	
MW-5B									
2/21/2014	**<150**	**<10**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.50**	

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-6A									
2/21/2014	<1,500	<100	780	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-6B									
2/21/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

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
2/21/2014	**West-Northwest**	**0.02**

Symbols & Abbreviations:
NA = Not Available

Table 4. Summary of Groundwater Sample Analytical Data
Station #498, 286 South Livermore Avenue, Livermore, California

Sample ID*	Sample Depth (ft. bgs)	Date Collected	GRO µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	MTBE µg/L	TBA µg/L	TAME µg/L	Comments
SB-17-65	60-65	1/8/2014	**880**	0.71	8.7	13	**60**	<0.50	<10	<0.50	
SB-18-40	40-45	1/8/2014	<500	<25	<25	<25	<50	**3,000**	**660**	<25	
SB-18-65	60-65	1/8/2014	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	<0.50	
SB-19-63	58-63	1/7/2014	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	<0.50	
SB-20-48	43-48	1/7/2014	**1,400**	<0.50	<0.50	<0.50	<1.0	<0.50	<10	<0.50	
SB-20-65	60-65	1/7/2014	54	<0.50	<0.50	<0.50	<1.0	<0.50	<10	<0.50	
ESLs	--	--	100	1.0	40	30	20	5.0	12	--	

Abbreviations & Symbols:

Bolded concentrations exceed their respective ESL.

* = See Drawing 2 for soil boring locations.

-- = Not applicable or available

GRO: Gasoline range organics.

TestAmerica.: GRO (C6-C12)

GRO analyzed using EPA method 8015B

TBA = Tert-butyl alcohol

TAME = Tert-amyl methyl ether

Benzene, Toluene, Ethylbenzene, Total Xylenes, MTBE, TBA and TAME analyzed using EPA method 8260B.

µg/L = Micrograms per liter.

ESLs = Environmental Screening Levels where groundwater is a current or potential source of drinking water (San Francisco Bay Regional Water Quality Control Board, 2013).

bgs = Below ground surface

Notes:

1,2-dibromoethane (EDB), 1,2-dichloroethane (1,2 DCA), Di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), and ethanol were not detected at or above their respective laboratory reporting limit.

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	Regional	The Site is located within the Livermore Valley Groundwater Basin. According to the *California Groundwater, Bulletin 118*, the Livermore Valley basin, "extends from the Pleasanton Ridge east to the Altamont Hills (about 14 miles) and from the Livermore Upland north to the Orinda Upland (about 3 miles)." The valley's principal streams include Arroyo Valle, Arroyo Mocho, and Arroyo las Positas; all converging to form Arroyo de la Laguna. These natural drainages are located approximately 1.3 miles north (Arroyo las Positas), 0.6 miles south (Arroyo Mocho), and 2.5 miles southwest (Arroyo Valle) of the Site. The groundwater basin is bounded by several faults; these faults act as barriers to the lateral movement of groundwater and divide the groundwater basin into several subbasins. The water-bearing materials in the Livermore Valley basin include the Livermore Formation, the Tassahara Formation, and valley-fill. Natural recharge occurs primarily along the uplands and edges of the Livermore Valley groundwater basin, through the arroyos during periods of precipitation and winter flow, by underground flow, and by applied irrigation water seeping into the ground. The basin is also recharged by controlled releases from the South Bay Aqueduct along with local surface water stored at Del Valle reservoir into Arroyo Valle and Arroyo Mocho. Mine quarrying pits on the west side of the Livermore Valley are currently being used for storm water collection to assist in recharge of groundwater in the basin (Zone 7 Water Agency, 2005). The basins' groundwater is a multi-layered system with an unconfined upper aquifer overlying deeper semi-confined to confined aquifers separated by clay aquitards. These clay aquitards impede the vertical movement of groundwater between the upper and deeper aquifers. Most of the water for municipal and agricultural use is pumped from the deeper aquifers. The general groundwater gradient within the basin is to the west, then south towards Arroyo de la Laguna. Groundwater near the center of Livermore Valley flows toward a cone of depression located west of the city of Livermore near gravel mining areas. The groundwater depression is thought to have been created by extraction of groundwater for municipal and agricultural use and dewatering for gravel quarrying (Zone 7 Water Agency, 2005). The extraction of groundwater is ongoing but has lessened over the years due to usage of water from the State Water Project.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology (Cont.)	Site	The Site elevation is approximately 500 feet above mean sea level; regional topography slopes from east to west (USGS Topographic Map, Livermore Quadrangle – 7.5 Minute Series). As stated above, the regional surface and groundwater flow is generally to the west. The historical groundwater flow direction at the Site has been generally to the west-northwest (Table 3). Since 2008, the hydraulic gradient has remained consistent at 0.020 ft/ft (Table 3), only deviating to 0.010 ft/ft once during Second Quarter 2010. Historical depth to groundwater measurements have ranged from approximately 26.69 to 50.25 ft bgs (Table 1). In general, the soil underlying the site primarily consists of a layer of sand and silty sand that extends to approximately 34 ft bgs with two to four foot thick interbedded lenses of clay and silty clay. At approximately 34 feet bgs the geology transitions to clay and silty clay with interspersed lenses of sand and silt. A small layer of sand and/or silty sand appears to be present beneath the silt and/or clay layer between approximately 57 and 66 ft bgs. Beneath this sand/silty sand layer is another clay and/or silty clay layer extending from a depth of approximately 66 to at least 75 ft bgs, the maximum depth explored. Geologic cross-sections are provided as Drawings 4 through 6 and boring logs are presented in Appendix D.	None	NA
Surface Water Bodies		The principal surface water bodies in the site vicinity are Arroyo Mocho to the southwest and Arroyo Las Positas to the north, located approximately 4,100 feet and 7,100 feet from the Site, respectively.	None	NA
Nearby Wells		In 2013, a Sensitive Receptor Survey was carried out to identify the presence of water wells within a 2,000 foot radius of the Site. The survey indicated the presence of four domestic wells, three municipal wells, and three wells of unknown use. The nearest well to the Site is a domestic well located approximately 400 feet in the upgradient direction; wells in the downgradient direction from the Site were not identified in the Sensitive Receptor Survey. Additional sensitive receptor data is provided in Appendix L.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Constituents of Concern	Light-Non Aqueous Phase Liquid (LNAPL)	Measureable LNAPL has not been detected on-Site.	None	NA
	Gasoline Range Organics	Historically, concentrations of GRO have been detected in monitoring wells MW-1, MW-2, MW-3, and MW-4. GRO has not been detected in MW-2 and MW-4 since November 11, 2009 and October 25, 2011, respectively. The historical maximum detected concentration of GRO was recorded on December 29, 2008 in well MW-3 at 28,000 µg/L. The maximum detected concentration within the last four monitoring events was reported in well MW-3 at 3,500 µg/L, indicating a decreasing GRO trend over time. Based on recent and historical data, the GRO plume has been delineated and appears to be restricted to the central portion of the Site. GRO isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2008 and First Quarter 2014 are presented as Drawings 7 and 8, demonstrating the decrease in plume size over time. GRO concentration trend graphs for all monitoring wells are included in Appendix M. Decreasing trends indicate that the concentrations will continue to degrade over time.	None	NA
	Benzene	Historically, concentrations of benzene have been detected in monitoring wells MW-1, MW-2, and MW-3; benzene was detected during a single monitoring event in MW-4 on March 20, 2009. The historical maximum concentration of benzene was reported in well MW-3 at 960 µg/L on April 24, 2013. The maximum detected concentration within the last four monitoring events was reported in well MW-3, which is also the historical maximum detection referenced above. Based on recent and historical data, the benzene plume has been delineated and appears to be isolated within the central portion of the Site. Benzene isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2008 and First Quarter 2014 are presented as Drawings 9 and 10. Benzene concentration trend graphs for all monitoring wells are included in Appendix M; the graphs indicate a stable to decreasing trend in benzene concentrations over time.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Constituents of Concern (Cont.)	Methyl tert-butyl ether (MTBE)	Historically, concentrations of MTBE have been detected in monitoring wells MW-1, MW-2, MW-3, and MW-4. The historical maximum MTBE concentration was reported in well MW-1 at a concentration of 140 µg/L on November 9, 2009. The maximum detected concentration within the last four monitoring events was reported in well MW-3 at 94 µg/L on October 9, 2013. Based on recent and historical data, the MTBE plume has been delineated and appears to be generally isolated onsite, with the potential exception along the northwestern property boundary. MTBE isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2008 and First Quarter 2014 are presented as Drawings 11 and 12. MTBE concentration trend graphs for all monitoring wells are presented in Appendix M. The graphs indicate that MTBE concentrations have generally decreased over time and will continue to degrade in the future.	None	
Potential Sources	Onsite	The exact release source and volume released at the Site is unknown. The minimal concentrations observed in soil sample data collected from beneath the product lines and dispensers during upgrade activities conducted in 2001 are not indicative of a release from the fuel delivery system. It is noted that since the USTs were not removed during upgrade activities, it is difficult to assess potential contamination associated with a release from the USTs. Historically, the highest concentrations observed in groundwater have been from well MW-3, which is positioned in a general upgradient location onsite and cross-gradient of the USTs. This appears to suggest the possibility of an offsite source contributing to elevated hydrocarbon concentrations onsite in the southern portion of the property. Had the USTs been the source, higher concentrations would have been expected in well MW-1 due to its relatively direct downgradient location from the UST complex. Regardless of the release source, current concentration trends, as depicted in the graphs presented in Appendix M, indicate decreasing contaminant concentrations over time and Drawings 7 through 12 indicate shrinking GRO, benzene, and MTBE plumes. These trends are anticipated to continue in the future.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Sources (continued)	Offsite	A former Shell service station was located southeast of the Site, directly across Third Street. Three USTs, one waste oil tank, and associated dispensers and product piping were removed from the site in 2003. Subsequent investigations included numerous soil and groundwater sampling events. The case associated with this site was closed in June 2007. The Closure letter from the ACEH noted that concentrations of 540 µg/L TPHg and 3.5 µg/L MTBE remained in shallow groundwater. Due the relatively minimal petroleum compounds noted in soil and groundwater samples at this adjacent Shell site and the fact that the case is closed, it appears unlikely that this adjacent Shell station is an offsite source. However, based on the data collected from recently installed CPT boring SB-20 located immediately downgradient of the former Shell location, it appears that residual contamination within groundwater in the more shallow clay layer, presumably from the former Shell Station, is present in the form of GRO at a concentration of 1,400 µg/L. It is possible that his residual contamination has migrated within the shallow groundwater to Station 498. Additional research into operations and historic sampling data at this former Shell Station may be warranted. No other offsite sources have been identified.	Potential	Additional research into former Shell Station and sampling data
Nature and Extent of Environmental Impacts	Extent in Soil	Soil contamination appears defined and limited to the Site boundaries. Based on historical data, the highest recently observed concentrations of GRO and benzene were noted in CPT boring SB-15 at concentrations of 1,500 mg/kg and 4.8 mg/kg, respectively, in 2013 at a depth of approximately 38 feet bgs. Boring SB-15 was located in the southeastern portion of the Site. However, this soil sample was collected within the saturated zone and was likely impacted by the presence of contaminated groundwater. Prior to the 2013 investigation, the highest concentration of GRO or TPHg was recorded at approximately 25 feet bgs in the boring advancing for installation of well MW-3, also located within the southeastern portion of the Site, at a concentration of 530 mg/kg in 2008. Shallow soil samples collected during product line and dispenser upgrades in 2001 indicated minimal hydrocarbon impact to shallow soils within the vicinity of the product delivery components. The highest concentrations of TPHg and benzene detected during the 2001 upgrades were observed at approximately 3.5 feet bgs in the soil	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Nature and Extent of Environmental Impacts (Cont.)	Extent in Soil (Cont.)	sample collected from DP-3, located within the southwestern portion of the Site at concentrations of 87 mg/kg and 0.11 mg/kg, respectively. It is unclear whether over-excavation activities were conducted during product line and dispenser upgrades as the report documenting this work could not be located. Since the concentrations observed in soil samples collected in 2001 and 2008 were representative of overall concentrations at the time of sampling, it is likely that these concentrations have further attenuated over the last 6 to 13 years. Furthermore, aside from the deep soil sample collected from SB-15 during the 2013 onsite CPT investigation, as previously discussed, soil concentrations from the other 13 soil samples collected during this investigation were not detected above laboratory reporting limits for each constituent analyzed for. Based on current and historic data and observations, soil at the Site appears to be adequately defined.		
	Extent in Shallow Groundwater	The current groundwater monitoring network at the Site includes well MW-1 located downgradient from the USTs; upgradient well MW-3; crossgradient well MW-4; and downgradient well MW-2. Isoconcentration maps for the groundwater monitoring and sampling event conducted in Fourth Quarter 2008 for GRO, benzene, and MTBE are provided as Drawings 7, 9, and 11, respectively, and for the most recent event conducted in First Quarter 2014 as Drawings 8, 10, and 12, respectively. Based on these drawings, a decrease in plume length and area over time can be observed for each constituent and the extent of impact is predominantly isolated onsite. Stable to decreasing concentration trends at each well are also evident in the concentration and groundwater elevation trend graphs for GRO, benzene, and MTBE provided in Appendix M. Petroleum compounds appear defined in each direction. Accessibility issues were encountered at the properties immediately north of the Site. In this northern area, current relatively low concentrations exist, together with a lack of sensitive receptors to the north, and the general cross-gradient direction, additional assessment further north of the Site does not appear warranted at this time. Additionally, it is not anticipated that the influence of petroleum compounds potentially extending beyond the Site boundaries will affect human health and trends indicate that the concentrations of the compounds will continue to degrade over time.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Nature and Extent of Environmental Impacts (Cont.)	Extent in Deeper Groundwater	The extent of environmental impact in deeper groundwater was recently investigated at the Site during CPT activities and deeper well installations (MW-5B and MW-6B). Results from the CPT assessment indicated moderate GRO impact (880 µg/L) at SB-17 between approximately 60 and 65 feet bgs in the southern portion of the Site. Concentrations for the remaining groundwater samples collected from the deeper water-bearing zone during CPT activities were below laboratory reporting limits with the exception of a minor detection of GRO (54 µg/L) just above the laboratory reporting limit in upgradient, offsite boring SB-20. The recent groundwater samples collected from newly installed wells MW-5B and MW-6B, screened within the deeper water-bearing sand zone, resulted in detections below laboratory reporting limits for each constituent analyzed for. Additional sampling events are proposed in order to establish appropriate concentration trends within the deeper water-bearing zone utilizing wells MW-5B and MW-6B. A downward vertical gradient was previously thought to exist at the Site based on results from PPDTs conducted during CPT investigation activities in 2013. However, based on the relative absences of contaminants in groundwater samples collected from deeper wells MW-5B and MW-6B compared to the shallow wells within the same vicinity and higher groundwater elevations observed in deep wells compared to their shallow well pairings (MW-5A and MW-6A), this does not appear to be the case. In contrast, due to the higher elevations observed in the deeper wells, an upward vertical gradient may actually exist. Additional monitoring events are proposed to further evaluate vertical gradient trends.	Potential	Additional sampling of deeper wells to establish concentration and gradient trends
	Extent in Soil Vapor	The extent of environmental impact in soil vapor has not been investigated at the Site. Based on current concentrations of petroleum compounds in groundwater monitoring wells at the Site and their location (an active service station), soil vapor assessment is not warranted at the Site. Additionally, the LTCP states that the exposure from current fueling operations represents a greater risk than any associated with potential groundwater or soil vapor exposure (CSWRCB, 2012).	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Migration Pathways	Potential Conduits	A potential transmissive conduit study has not been performed on Site. However, underground utilities tend to be shallow, above 10 feet bgs. Historical depth-to-groundwater measurements at the Site have averaged approximately 36 feet bgs, which is well below the anticipated depth of utilities within the area. Therefore, potential migration of contaminants along underground conduits does not pose a concern at the Site.	None	NA
Potential Receptors	Onsite	No onsite water supply wells or surface water bodies exist. The only potential onsite receptor would be onsite workers exposed to gasoline vapors. However, the exposure from current fueling operations represents a greater risk than any associated with potential groundwater or soil vapor exposure (CSWRCB, 2012).	None	NA
	Offsite	The nearest potential surface water bodies appear to be two creeks, Arroyo Mocho and Arroyo Las Positas. However, both are located outside of the 2,000 foot search radius utilized during the Sensitive Receptor Survey. Arroyo Mocho is located approximately 4,100 feet to the southwest of the Site, in a general cross-gradient direction and Arroyo Las Positas is located approximately 7,100 feet to the north of the Site, in a general down-gradient direction. A Sensitive Receptor Survey was completed in 2013. Results from this survey identified four domestic wells, three municipal wells, and three wells of unknown use within a 2,000-foot search radius of the Site. The potential impact to municipal and domestic wells within the search radius is possible; however, the closest domestic well, located approximately 400 feet to the East of the Site, is cross-gradient from the predominantly West-Northwest flow direction. A well log with owner information could not be located for this well. All three of the Cal Water municipal water supply wells are located either cross-gradient or up-gradient at a minimum distance of approximately 1,390 feet from the Site. The remaining domestic wells and wells of unknown use were all located at a distance at or greater than 740 feet in either a cross-gradient or up-gradient direction of groundwater flow from the Site. Sensitive receptor data including a map depicting locations is provided in Appendix L.	None	NA

TABLE 5

CONCEPTUAL SITE MODEL
Atlantic Richfield Company Station No. 498
286 South Livermore Avenue
Livermore, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Receptors (Cont.)	Offsite (Cont.)	Since the plume is almost entirely limited to onsite and hydrocarbon concentrations in downgradient well MW-2 have below laboratory reporting limits since 2009, with the exception of MTBE, these offsite receptors are not anticipated to be affected. Additionally, overall concentration trends for Site wells are decreasing, indicating that the plume size is shrinking. Concentration trend graphs are included in Appendix M.		

Notes:
ACEH = Alameda County Environmental Health
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, xylenes
Cambria = Cambria Environmental Technology, Inc.
CRA = Conestoga-Rovers & Associates
CSM = Conceptual Site Model
CSWRCB = California State Water Resources Control Board
ft = foot
ft/ft = foot per foot
mg/kg = milligrams per kilogram
mg/m^3 = milligrams per cubic meter
MTBE = Methyl tert-butyl Ether
GRO = Gasoline Range Organics
NA = Not Applicable
No. = Number
UST = Underground Storage Tank
µg/L = micrograms per liter

All report references are included in Section 9 of the preceding report

APPENDICES

APPENDIX A

Recent Regulatory Correspondence

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
ALEX BRISCOE, Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

September 9, 2013

Chuck Carmel
Atlantic Richfield Company
PO Box 1257
San Ramon, CA 94583
(*Sent via E-mail to: charles.carmel@bp.com*)

Choonghun Chun
286 South Livermore Avenue
Livermore, CA 94550-4652

Subject: Case File Review for Fuel Leak Case No. RO0002873 and GeoTracker Global ID T0600124081, ARCO #0498, 286 South Livermore Avenue, Livermore, CA 94550

Dear Ms. Couch and Choonghun Chun:

Alameda County Environmental Health (ACEH) staff has reviewed the fuel leak case file for the above-referenced site including the proposed scope of work in the document entitled, "*Additional Soil and Ground-water Investigation Work Plan and Sensitive Receptor Survey*," dated August 20, 2013 (Work Plan). The Work Plan, which was prepared on behalf of Atlantic Richfield Company by Broadbent & Associates, Inc., proposes installation of four on-site groundwater monitoring wells and collection of additional on-site and off-site groundwater samples.

The proposed scope of work is acceptable and may be implemented as proposed. We request that you perform the proposed work and send us the reports described below

TECHNICAL REPORT REQUEST

Please upload technical reports to the ACEH ftp site (Attention: Jerry Wickham), and to the State Water Resources Control Board's GeoTracker website according to the following schedule and file-naming convention:

- **February 9, 2014** – Site Investigation Report
  File to be named: SWI_R_yyyy-mm-dd RO2873

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

If you have any questions, please call me at (510) 567-6791 or send me an electronic mail message at jerry.wickham@acgov.org. Case files can be reviewed online at the following website: http://www.acgov.org/aceh/index.htm. As your email address does not appear on the cover page of this notification ACEH is requesting you provide your email address so that we can correspond with you quickly and efficiently regarding your case.

Sincerely,

Jerry Wickham, California PG 3766, CEG 1177, and CHG 297
Senior Hazardous Materials Specialist

Attachments: Responsible Party(ies) Legal Requirements/Obligations

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Danielle Stefani, Livermore Pleasanton Fire Department, 3560 Nevada St, Pleasanton, CA 94566 (*Sent via E-mail to: dstefani@lpfire.org*)

Colleen Winey (QIC 8021), Zone 7 Water Agency, 100 North Canyons Pkwy, Livermore, CA 94551 (*Sent via E-mail to: cwiney@zone7water.com*)

Jason Duda, Broadbent & Associates, Inc., 1370 Ridgewood Drive, Suite 5, Chico, CA 95973 (*Sent via E-mail to: jduda@broadbentinc.com*)

Donna Drogos, ACEH (*Sent via E-mail to: donna.drogos@acgov.org*)
Jerry Wickham, ACEH (*Sent via E-mail to: jerry.wickham@acgov.org*)

GeoTracker, eFile

Attachment 1

Responsible Party(ies) Legal Requirements/Obligations

REPORT/DATA REQUESTS

These reports/data are being requested pursuant to Division 7 of the California Water Code (Water Quality), Chapter 6.7 of Division 20 of the California Health and Safety Code (Underground Storage of Hazardous Substances), and Chapter 16 of Division 3 of Title 23 of the California Code of Regulations (Underground Storage Tank Regulations).

ELECTRONIC SUBMITTAL OF REPORTS

ACEH's Environmental Cleanup Oversight Programs (Local Oversight Program [LOP] for unauthorized releases from petroleum Underground Storage Tanks [USTs], and Site Cleanup Program [SCP] for unauthorized releases of non-petroleum hazardous substances) require submission of reports in electronic format pursuant to Chapter 3 of Division 7, Sections 13195 and 13197.5 of the California Water Code, and Chapter 30, Articles 1 and 2, Sections 3890 to 3895 of Division 3 of Title 23 of the California Code of Regulations (23 CCR). Instructions for submission of electronic documents to the ACEH FTP site are provided on the attached "Electronic Report Upload Instructions."

Submission of reports to the ACEH FTP site is in addition to requirements for electronic submittal of information (ESI) to the State Water Resources Control Board's (SWRCB) Geotracker website. In April 2001, the SWRCB adopted 23 CCR, Division 3, Chapter 16, Article 12, Sections 2729 and 2729.1 (Electronic Submission of Laboratory Data for UST Reports). Article 12 required electronic submittal of analytical laboratory data submitted in a report to a regulatory agency (effective September 1, 2001), and surveyed locations (latitude, longitude and elevation) of groundwater monitoring wells (effective January 1, 2002) in Electronic Deliverable Format (EDF) to Geotracker. Article 12 was subsequently repealed in 2004 and replaced with Article 30 (Electronic Submittal of Information) which expanded the ESI requirements to include electronic submittal of any report or data required by a regulatory agency from a cleanup site. The expanded ESI submittal requirements for petroleum UST sites subject to the requirements of 23 CCR, Division, 3, Chapter 16, Article 11, became effective December 16, 2004. All other electronic submittals required pursuant to Chapter 30 became effective January 1, 2005. Please visit the SWRCB website for more information on these requirements. (http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/)

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 7835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, late reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

Alameda County Environmental Cleanup Oversight Programs (LOP and SCP)	**REVISION DATE:** July 25, 2012
	ISSUE DATE: July 5, 2005
	PREVIOUS REVISIONS: October 31, 2005; December 16, 2005; March 27, 2009; July 8, 2010
SECTION: Miscellaneous Administrative Topics & Procedures	**SUBJECT:** Electronic Report Upload (ftp) Instructions

The Alameda County Environmental Cleanup Oversight Programs (petroleum UST and SCP) require submission of all reports in electronic form to the county's FTP site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities.

REQUIREMENTS

- **Please do not submit reports as attachments to electronic mail.**
- Entire report including cover letter must be submitted to the ftp site as **a single Portable Document Format (PDF) with no password protection**.
- It is **preferable** that reports be converted to PDF format from their original format, (e.g., Microsoft Word) rather than scanned.
- **Signature pages and perjury statements must be included and have either original or electronic signature.**
- **Do not password protect the document**. Once indexed and inserted into the correct electronic case file, the document will be secured in compliance with the County's current security standards and a password. **Documents with password protection will not be accepted**.
- Each page in the PDF document should be rotated in the direction that will make it easiest to read on a computer monitor.
- Reports must be named and saved using the following naming convention:

  RO#_Report Name_Year-Month-Date (e.g., RO#5555_WorkPlan_2005-06-14)

Submission Instructions

1) Obtain User Name and Password
   a) Contact the Alameda County Environmental Health Department to obtain a User Name and Password to upload files to the ftp site.
      i) Send an e-mail to .loptoxic@acgov.org
   b) In the subject line of your request, be sure to include **"ftp PASSWORD REQUEST"** and in the body of your request, include the **Contact Information, Site Addresses**, and the **Case Numbers (RO# available in Geotracker) you will be posting for**.

2) Upload Files to the ftp Site
   a) Using Internet Explorer (IE4+), go to ://alcoftp1.acgov.org
      (i) Note: Netscape, Safari, and Firefox browsers will not open the FTP site as they are NOT being supported at this time.
   b) Click on Page located on the Command bar on upper right side of window, and then scroll down to Open FTP Site in Windows Explorer.
   c) Enter your User Name and Password. (Note: Both are Case Sensitive.)
   d) Open "My Computer" on your computer and navigate to the file(s) you wish to upload to the ftp site.
   e) With both "My Computer" and the ftp site open in separate windows, drag and drop the file(s) from "My Computer" to the ftp window.

3) Send E-mail Notifications to the Environmental Cleanup Oversight Programs
   a) Send email to .loptoxic@acgov.org notify us that you have placed a report on our ftp site.
   b) Copy your Caseworker on the e-mail. Your Caseworker's e-mail address is the entire first name then a period and entire last name @acgov.org. (e.g., firstname.lastname@acgov.org)
   c) The subject line of the e-mail must start with the RO# followed by **Report Upload**. (e.g., Subject: RO1234 Report Upload) If site is a new case without an RO#, use the street address instead.
   d) If your document meets the above requirements and you follow the submission instructions, you will receive a notification by email indicating that your document was successfully uploaded to the ftp site.

APPENDIX B

Site Background

During product line and dispenser upgrade activities completed in June 2001, Delta Environmental Consultants, Inc. (Delta) collected soil samples beneath the product lines and dispenser islands. Total purgeable hydrocarbons as gasoline (TPHg) were detected in two of the four dispenser island samples at 1.8 milligrams per kilogram (mg/kg) in sample DP-1 and 87 mg/kg in sample DP-3. Benzene, toluene, ethylbenzene, and total xylenes (BTEX), and methyl tertiary butyl ether (MTBE) were also detected in dispenser island sample DP-3. Toluene and total xylenes were detected in product line sample PL-2 at relatively low concentrations. Historic soil analytical data are provided in Appendix C. Historic soil sample locations are depicted in Drawing 2. Product line and dispenser island sampling activities are summarized in the Delta September 19, 2001 *Product Line and Dispenser Island Sampling Results* report.

In January 2005, URS completed a site assessment to fulfill a due diligence audit as part of the sale of the Property. Field activities were conducted to assess whether subsurface soils in the vicinity of the USTs and fuel dispensers had been impacted by petroleum hydrocarbons. The work was not required as part of a regulatory agency directive. Eight soil borings were advanced using a direct push Geoprobe® 6600 drill rig. URS stated in the February 15, 2005 Site Assessment Report that the proposed total depth of all borings was 30 feet below ground surface (bgs); however, due to difficult drilling conditions encountered, the borings were only advanced to depths ranging from 15 to 25 feet bgs. Groundwater was not encountered in the borings advanced. MTBE and tert-butyl alcohol (TBA) were detected in four of the collected soil samples (SB-1-22', SB-1-24', SB-3-25', and SB-8-25') at maximum concentrations of 0.022 mg/kg (SB-8-25') and 0.031 mg/kg (SB-1-22'), respectively. Historic soil analytical data are provided in Appendix B and sample locations are depicted on Drawing 2.

In November 2008, a soil and groundwater investigation was completed, which included the installation of monitor wells MW-1 through MW-4. Field activities were conducted to further define the vertical and lateral extent of impacted soil and complete an initial groundwater investigation. Soil sample analytical results showed the presence of petroleum hydrocarbon impacted soil at all four sample locations (MW-1 through MW-4) at depths ranging from 15 to 35 feet bgs. Historic soil analytical data are provided in Appendix B. Elevated groundwater concentrations were detected in well MW-3 and moderately elevated concentrations were detected in wells MW-1 and MW-2. Well MW-4 was found to be dry. The February 6, 2009 Soil and Ground-Water Investigation and Fourth Quarter, 2008 Quarterly Monitoring Report recommended that two additional quarters (First and Second Quarter, 2009) of groundwater monitoring/sampling be completed to better understand the hydrogeology before additional investigative work activities were proposed.

Broadbent prepared the *Soil and Groundwater Investigation Work Plan* on August 28, 2009, which proposed installation of three additional groundwater monitoring wells (MW-5, MW-6, and MW-7). The purpose of locating proposed well MW-5 adjacent to MW-1 was to determine if anomalous water levels observed in MW-1 were potentially due to a localized perched water-bearing zone. Proposed wells MW-6 and MW-7 were located off-Site and to the northwest of the station in order to further delineate the down-gradient extent of groundwater contamination. In a letter dated February 10, 2010, ACEH requested a Work Plan Addendum to address concerns regarding the proposed locations of wells MW-6 and MW-7, which may not have adequately characterized the

extent of impacted groundwater due to the calculated groundwater flow direction on November 9, 2009, which was south-southwest instead of northwest as was calculated on March 20, 2009. On April 12, 2010, Broadbent submitted the Soil and Groundwater Investigation Work Plan Addendum, which stated that the locations of MW-6 and MW-7 were based on the flow directions calculated at the Shell Station located across 3rd Street and data collected from the Site during the First Quarter 2009 groundwater monitoring event. In a letter dated August 12, 2010, ACEH approved the proposed scope of work.

Numerous attempts to obtain off-Site property access in order to complete the installation of off-Site wells have been made. However, off-Site property owners have been unresponsive and/or uncooperative in allowing access, which delayed commencement of the proposed scope of work. On August 29, 2012, ACEH, Atlantic Richfield Company, and Broadbent met to discuss the possibility of advancing borings along the northwestern property boundary in lieu of the off-Site borings. In a letter dated September 18, 2012, ACEH accepted advancing borings along the northwestern property boundary to define the site stratigraphy and vertical and lateral distribution of contamination and requested submittal of a Work Plan by November 30, 2012. ACEH also recommended use of Cone Penetration Testing (CPT) drilling procedures to adequately characterize subsurface hydro-geologic features. The *Soil and Groundwater Investigation Work Plan* dated December 7, 2012 detailed proposed CPT drilling activities and was approved by ACEH in their letter dated December 24, 2012. Details and results from the boring installations performed between March 18 and 22, 2013 were provided to ACEH in the *Soil and Groundwater Investigation Report* dated May 3, 2013. Boring locations are depicted on Drawing 2. Soil and groundwater analytical data from this investigation are provided in Appendix C.

Quarterly groundwater monitoring and sampling has been conducted on wells MW-1, MW-2, MW-3, and MW-4 at the Site since November 2008. The monitoring and sampling schedule was modified to be conducted semi-annually during the second and fourth quarters of each calendar year in June 2009. Groundwater flow direction on-Site has consistently been to the West-Northwest historically, with an average gradient of approximately 0.02. Historic groundwater monitoring and analytical data are provided in Tables 3 through 5.

APPENDIX C

Historic Groundwater and Soil Analytical Data

Table 2. Summary of Groundwater Sample Analytical Data
Station #498, 286 South Livermore Avenue, Livermore, California

Sample ID*	Sample Depth (ft. bgs)	Date Collected	GRO µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	MTBE µg/L	TBA µg/L	TAME µg/L	Comments
SB-9	55-60	3/22/2013	<50	<0.50	<0.50	<0.50	<1.0	1.9	<10	<0.50	
SB-10	45-50	3/18/2013	<50	<2.0	<2.0	<2.0	<4.0	**520**	**67**	<2.0	
SB-11	45-50	3/20/2013	73	<5.0	<5.0	<5.0	<10	**1,700**	**570**	7.5	
SB-12	45-50	3/20/2013	<50	<1.0	<1.0	<1.0	<2.0	**570**	**21**	4	
SB-13	51-56	3/21/2013	<50	<0.50	<0.50	<0.50	<1.0	**100**	<10	<0.50	
SB-14	55-60	3/22/2013	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	<0.50	
SB-15	50-55	3/21/2013	**6,300**	**4.7**	8.2	**110**	**52**	<1.0	<20	<1.0	
SB-16	55-60	3/21/2013	**26,000**	**180**	**360**	**1,500**	**9,300**	<25	<500	<25	
ESLs	--	--	100	1.0	40	30	20	5.0	12	--	

Abbreviations & Symbols:

Bolded concentrations exceed their respective ESL.

* = See Drawing 2 for soil boring locations.

-- = Not applicable or available

GRO: Gasoline range organics.

TestAmerica.: GRO (C6-C12)

GRO analyzed using EPA method 8015B

TBA = Tert-butyl alcohol

TAME = Tert-amyl methyl ether

Benzene, Toluene, Ethylbenzene, Total Xylenes, MTBE, TBA and TAME analyzed using EPA method 8260B.

µg/L = Micrograms per liter.

ESLs = Environmental Screening Levels where groundwater is a current or potential source of drinking water (San Francisco Bay Regional Water Quality Control Board, 2013).

bgs = Below ground surface

Notes:

1,2-dibromoethane (EDB), 1,2-dichloroethane (1,2 DCA), Di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), and ethanol were not detected at or above their respective laboratory reporting limit.

Table 3. Summary of Pore Pressure Dissipation Tests and Corresponding Piezometric Surface
Station #498, 286 South Livermore Avenue, Livermore, California

CPT Boring ID	Test Depth (ft bgs)	u_0 (psi)	u_0 (ft H_2O)	Piezometric Surface (ft bgs)
SB-9	32.80	Not Applicable - Readings did not reach equilibrium		
SB-9	45.11	Negative readings indicative of dry soil conditions		
SB-9	52.00	Negative readings indicative of dry soil conditions		
SB-9	57.07	Negative readings indicative of dry soil conditions		
SB-10	29.50	Negative readings indicative of dry soil conditions		
SB-10	39.50	Not Applicable - Test terminated early		
SB-10	42.98	3.46	7.99	34.99
SB-10	49.21	Not Applicable - Readings did not reach equilibrium		
SB-10	57.74	6.62	15.29	42.45
SB-11	25.09	Negative readings indicative of dry soil conditions		
SB-11	36.42	Negative readings indicative of dry soil conditions		
SB-11	45.11	13.19	30.47	14.64
SB-11	55.28	18.02	41.63	13.65
SB-12	15.09	Negative readings indicative of dry soil conditions		
SB-12	20.01	Negative readings indicative of dry soil conditions		
SB-12	25.26	Negative readings indicative of dry soil conditions		
SB-12	30.02	Negative readings indicative of dry soil conditions		
SB-12	35.10	Negative readings indicative of dry soil conditions		
SB-12	40.19	9.04	20.88	19.31
SB-12	45.60	7.31	16.89	28.71
SB-12	57.07	11.11	25.66	31.41
SB-13	40.03	15.60	36.04	3.99
SB-13	55.12	14.22	32.85	22.27
SB-14	40.02	6.97	16.10	23.92
SB-14	56.27	10.77	24.88	31.39
SB-15	40.35	8.00	18.48	21.87
SB-15	58.07	11.11	25.66	32.41
SB-16	35.10	2.82	6.51	28.59
SB-16	55.12	6.62	15.29	39.83
SB-16	57.91	6.62	15.29	42.62

Abbreviations and Notes:

ft = feet

bgs = below ground surface

psi = pounds per square inch

H_2O = Water

u_0 = Equilibrium pore pressure at end of dissipation test

Conversion: 1 psi = 2.31 ft H_2O

Piezometric Surface (ft bgs) = Test Depth (ft bgs) – u0 (feet H_2O)

TABLE 1

SOIL SAMPLE LABORATORY ANALYTICAL RESULTS

ARCO Service Station No. 498
286 South Livermore Avenue
Livermore, California

Sample ID	Date	Depth (ft)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	TPH as gasoline (mg/kg)	MTBE (mg/kg)	Total Lead (mg/kg)
Dispenser Island Samples									
DP-1	06/01/01	3.0	<0.0050	<0.0050	<0.0050	0.019	1.8	<0.050	23
DP-2	06/01/01	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	<0.050	3.7
DP-3	06/01/01	3.5	0.11	2.8	1.2	8.9	87	3.7	17
DP-4	06/01/01	3.5	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	<0.050	4.2
Product Line Samples									
PL-1	06/01/01	3.8	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	<0.050	2.3
PL-2	06/01/01	4.5	<0.0050	0.011	<0.0050	0.010	<1.0	<0.050	13
PL-3	06/01/01	5.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	<0.050	5.4
PL-4	06/01/01	2.5	<0.0050	<0.0050	<0.0050	<0.0050	<1.0	<0.050	190
Soil Stockpile Results									
SP-1,2,3,4	06/01/01	Composite	<0.0050	<0.0050	<0.0050	0.13	5.6	<0.050	32

TPH = Total purgeable hydrocarbons.
MTBE = Methyl tertiary butyl ether (analyzed by DHS LUFT Methods)
NA = Not Analyzed

Table 1 - Soil Analytical Data
ARCO Service Station #0498
286 South Livermore Avenue, Livermore California

Sample Name	Sample Depth (ft)	Date Sampled	TPH-GRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
SB-1-7'	7.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-12'	12.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-17'	17.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-22'	22.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-24'	24.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-10'	10.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-15'	15.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-18.5'	18.5	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-10'	10.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-15'	15.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-20'	20.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-25'	25.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-7'	7.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-12'	12.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-17'	17.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-22'	22.0	01/19/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-5-10'	10.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-5-15'	15.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-10'	10.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-15'	15.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-22'	22.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-10'	10.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-14.5'	14.5	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-20'	20.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-10'	10.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-15'	15.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-20'	20.0	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-25'	25	01/20/05	ND <1.0	ND <0.005	ND <0.005	ND <0.005	ND <0.005

Notes:
ND = Not Detected at or above the laboratory reporting limit
mg/kg = milligrams per kilogram
TPH-GRO = Total Petroleum Hydrocarbons gasoline range organics
BTEX = Benzene, toluene, ethylbenzene, and xylenes

Table 2 Soil Analytical Data-Oxygenates
ARCO Service Station #0498
286 South Livermore Avenue, Livermore California

Sample Name	Sample Depth (ft)	Date Sampled	Ethanol (mg/kg)	TBA (mg/kg)	MTBE (mg/kg)	DIPE (mg/kg)	ETBE (mg/kg)	TAME (mg/kg)	1,2-DCA (mg/kg)	EDB (mg/kg)
SB-1-7'	7.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-12'	12.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-17'	17.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-22'	22.0	01/20/05	ND <0.1	**0.031**	**0.015**	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-1-24'	24.0	01/20/05	ND <0.1	**0.025**	**0.006**	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-10'	10.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-15'	15.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-2-18.5'	18.5	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-10'	10.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-15'	15.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-20'	20.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-3-25'	25.0	01/19/05	ND <0.1	**0.021**	**0.011**	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-7'	7.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-12'	12.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-17'	17.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-4-22'	22.0	01/19/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-5-10'	10.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-5-15'	15.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-10'	10.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-15'	15.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-6-22'	22.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-10'	10.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-14.5'	14.5	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-7-20'	20.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-10'	10.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-15'	15.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-20'	20.0	01/20/05	ND <0.1	ND <0.01	ND <0.005	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005
SB-8-25'	25	01/20/05	ND <0.1	**0.012**	**0.022**	ND <0.01	ND <0.005	ND <0.005	ND <0.005	ND <0.005

Notes:

ND = Not Detected at or above the laboratory reporting limit
mg/kg = milligrams per kilogram
TBA = Tert-butyl alcohol
MTBE = Methyl tertiary butyl ether
DIPE = Di-isopropyl ether
ETBE = Ethyl tertiary butyl ether
TAME = Tert-amyl methyl ether
1,2-DCA = 1,2-Dichloroethane
EDB = 1,2-Dibromoethane

Table 1. Summary of Soil Sample Analytical Data

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

Boring and Sample Date	Sample ID	Concentrations in (mg/kg)								Comments
		GRO/ TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE	Ethanol	TBA	
MW-1										
11/24/2008	MW-1 25'	**45**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.010	
11/24/2008	MW-1 30'	**0.86**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.010	
11/24/2008	MW-1 40'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	**0.16**	**0.23**	**0.036**	
MW-2										
11/24/2008	MW-2 40'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	**0.010**	<0.10	**0.022**	
11/24/2008	MW-2 45'	**18**	<0.0010	<0.0010	<0.0010	<0.0010	**0.0019**	**0.44**	**0.022**	
11/24/2008	MW-2 50'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.010	
MW-3										
11/26/2008	MW-3 15'	**6.7**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	**0.14**	
11/26/2008	MW-3 20'	**210**	<0.0010	<0.0010	**0.88**	<0.0010	<0.0010	<0.10	<0.010	
11/26/2008	MW-3 25'	**530**	<0.10	<0.10	**1.5**	**0.17**	<0.10	<10	<1.0	
11/26/2008	MW-3 30'	**0.84**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	<0.010	
11/26/2008	MW-3 35'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	**0.028**	
11/26/2008	MW-3 40'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	**0.013**	<0.10	**0.014**	
MW-4										
11/25/2008	MW-4 30'	**2.0**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.35**	**0.054**	
11/25/2008	MW-4 35'	**75**	<0.0010	<0.0010	<0.0010	<0.0010	**0.0030**	<0.10	**0.65**	
11/25/2008	MW-4 40'	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.10	**0.14**	

SYMBOLS AND ABBREVIATIONS:

< = Not detected at or above specified laboratory reporting limit
GRO = Gasoline range organics
MTBE = Methyl tert-butyl ether
TBA = Tert-Butyl Alcohol
mg/kg = Milligrams per Kilogram

NOTES:

1,2-dibromoethane (EDB), 1,2-dichloroethane (1,2 DCA), Di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE) and ter-amyl methyl ether (TAME) were not detected at or above their respective laboratory reporting limits.

GRO (C6-C12) analyzed using EPA method 8015B.

Benzene, toluene, ethylbenzene, total xylenes, MTBE, ethanol and TBA analyzed using EPA method 8260B.

The number after space in Sample ID denotes the depth at which the sample was collected in feet bls.

Table 1. Summary of Soil Sample Analytical Data
Station #498, 286 South Livermore Avenue, Livermore, California

Soil Boring Identification*	Sample ID	Date Collected	GRO mg/kg	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg	MTBE mg/kg	Comments
SB-9	SB-9-20'	3/22/2013	<0.380	<0.0020	<0.0020	<0.0020	<0.0040	<0.0049	
	SB-9-37'	3/22/2013	<0.390	<0.0020	<0.0020	<0.0020	<0.0040	<0.0049	
SB-10	SB-10-15'	3/18/2013	<0.400	<0.0020	<0.0020	<0.0020	<0.0040	<0.0049	
SB-11	SB-11-15'	3/20/2013	<0.390	<0.0020	<0.0020	<0.0020	<0.0040	<0.0049	
SB-12	SB-12-15'	3/20/2013	<0.400	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
	SB-12-30'	3/20/2013	<0.350	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
SB-13	SB-13-14'	3/21/2013	<0.390	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
	SB-13-27'	3/21/2013	<0.370	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
SB-14	SB-14-18'	3/22/2013	<0.38	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
	SB-14-37'	3/22/2013	<0.38	<0.0020	<0.0020	<0.0020	<0.0039	<0.0049	
SB-15	SB-15-24'	3/21/2013	<0.38	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
	SB-15-38'	3/21/2013	**1,500**	**4.8**	**53**	**35**	**230**	<2.5	
SB-16	SB-16-13'	3/21/2013	<0.40	<0.0020	<0.0020	<0.0020	<0.0040	<0.0049	
	SB-16-26'	3/21/2013	<0.36	<0.0020	<0.0020	<0.0020	<0.0040	<0.0050	
ESLs	--	--	83	0.044	2.9	2.9	2.3	0.023	

Abbreviations & Symbols:

Bolded concentrations exceed their respective ESL.

* = See Drawing 2 for soil boring locations.

GRO: Gasoline range organics.

TestAmerica: GRO (C6-C12)

GRO analyzed using EPA method 8015B

Benzene, Toluene, Ethylbenzene, Total Xylenes, and MTBE analyzed using EPA method 8260B.

mg/kg = Milligrams per kilogram.

ESLs = Environmental Screening Levels for deep soil (>3 meters bgs) where groundwater is a current or potential source of drinking water (San Francisco Bay Regional Water Quality Control Board, 2013).

bgs = Below ground surface

Notes:

1,2-dibromoethane (EDB), 1,2-dichloroethane (1,2 DCA), tert-butyl alcohol (TBA), Di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), ter-amyl methyl ether (TAME), and ethanol were not detected at or above their respective laboratory reporting limit.

The last number in each Sample ID denotes the depth at which the sample was collected in feet bgs (i.e., SB-9-20' was collected at a depth of 20 feet bgs)

Appendix D

Soil Boring and Well Construction Logs

URS

1333 Broadway, Suite 800
Oakland, California 94612

LOG OF BORING

Borehole ID: SB-1

Total Depth: 24 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							
4							Air Knifed to a Depth of 5 ft.
6		SANDY GRAVEL: 2.5Y3/2, very dark grayish brown, loose, very fine to coarse sand, fine gravels, minor coarse gravels (subangular to angular), minimal fines, dry.	SP	0.0	SB1-7'		
8							
10		Same as above, no coarse gravels					
12				0.5	SB1-12'		
14							
16		Increase in fines (silt/clay) content, color change to 10Y4/1, dark greenish gray, odor.		0.5	SB1-17'		
18							
20		CLAYEY SAND: 10Y4/1, dark greenish gray, moderately dense, fine to medium sand with minor coarse sand, fine gravels, low plasticity, dry to damp, odor.	SC	9.7	SB1-22'		
22							
24				11.3	SB1-24'		Borings terminated at 24 ft bgs
26							

URS

1333 Broadway, Suite 800
Oakland, California 94612

LOG OF BORING

Borehole ID: SB-2

Total Depth: 22 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							
4							Air Knifed to a Depth of 5 ft.
6		GRAVELLY SAND: 2.5Y3/3, dark olive brown, loose, medium to coarse sand, coarse gravels (angular to subangular), no fines, damp.	SP				
8							
10		Same as above, minor fines, solid rock (quartz).		0.5	SB2-10'		
12							
14		SANDY GRAVEL: 2.5Y5/3, light olive brown, dense, coarse gravel (1.5" +), coarse sand. Gravel greater than 2" diameter, possible cobbles (subrounded to aubangular), minor fines, damp.	GW	10.7	SB2-15'		
16							
18				17.8	SB2-18.5		
20		Same as above, increased fines, some gravel clast greater than 2" diameter.		22.2			
22		Increased fines.		7901			Borings terminated at 22 ft bgs
24							
26							

URS

1333 Broadway, Suite 800
Oakland, California 94612

LOG OF BORING

Borehole ID: SB-3

Total Depth: 25 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							
4							Air Knifed to a Depth of 5 ft.
6		GRAVELLY SAND: 2.5Y4/4, olive brown, dense, coarse sand, minor medium sand, fine gravels with rare coarse gravels (subangular to subrounded), minor non-plastic fines, damp.	SP				
8							
10		Increased fines (clay) content, medium to coarse sand, fine gravels, dry to damp.		2.5	SB3-10'		
12							
14							
16		Color change to 2.5Y5/2, light olive brown, medium sand, fine gravels, damp, odor.		12.4	SB3-15'		
18							
20				26	SB3-20'		
22							
24		Increased fines.		114	SB3-25'		Borings terminated at 25 ft bgs
26							

URS

1333 Broadway, Suite 800
Oakland, California 94612

LOG OF BORING

Borehole ID: SB-4

Total Depth: 26 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							
4							Air Knifed to a Depth of 5 ft.
6		GRAVELLY SAND: 2.5Y5/4, light olive brown, loose, fine to coarse sand, coarse gravel (0.75 to 1"), angular to subangular, no fines, dry.	GW	0.0	SB4-7'		
8							
10		2.5Y4/4, light brown, moderately dense, fine to coarse sand, fine gravels, angular to subangular, low plasticity, dry to damp.	GC				
12				28.8	SB4-12'		
14							
16		SANDY SILT: 2.5Y4/4, olive brown, firm, low plasticity, very fine to fine sand, dry to damp.	ML	35.5	SB4-17'		
18							
20		GRAVELLY SAND: 2.5Y4/4, olive brown, moderately dense, fine to coarse sand, coarse gravel (0.75' +), angular to subangular, no to low plasticity, dry to damp.	GC				
22				22.2	SB4-22'		
24							Borings terminated at 26 ft bgs
26							Lost rods and sampler down hole.

URS

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LOG OF BORING

Borehole ID: SB-5

Total Depth: 15 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							Air Knifed to a Depth of 5 ft.
4							
6		CLAYEY SAND: 2.5Y3/3, dark olive brown, moderately dense, fine to medium sand, rare coarse sand, fine to coarse gravel (subangular to subrounded), low plasticity fines, dry.	SC				
8							
10				0.5	SB5-10'		
12		Increase in fine to coarse gravel content, rare cobbles.					
14		SANDY CLAY: 10YR4/4, dark yellowish brown, very hard, low plasticity, very fine to fine sand, dry.	CL	19.5	SB5-15'		Lost sampler down hole.
16							Borings terminated at 15 ft bgs
18							
20							
22							
24							
26							

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LOG OF BORING

Borehole ID: SB-6

Total Depth: 24 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							
4							Air Knifed to a Depth of 5 ft.
6		GRAVELLY SAND: 2.5Y5/3, light olive brown, loose, fine to coarse sand, fine gravels (subrounded to subangular), non-plastic fines (minor fines), dry.	SP				
8							
10				0.0	SB6-10'		
12							
14		CLAYEY SAND: 2.5Y4/3, olive brown, dense, low plasticity fines, very fine to fine sand, dry.	SC	1.0	SB6-15'		
16		No Recovery from 15 to 20 feet bgs. Shoe of sampling rod contained: Sandy Clay: 2.5Y5/4, light olive brown, very hard, very fine to fine sand, low plasticity, dry.					
18							
20		CLAYEY SAND: Same as above.		14			
22				18.9	SB6-22'		
24		SILTY CLAY: 5GY4/1, dark greenish gray, very hard, low plasticity, very fine to fine sands, dry, odor.	ML	11.8	SB6-24'		Borings terminated at 24 ft bgs
26							

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LOG OF BORING

Borehole ID: SB-7

Total Depth: 20 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05
BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							Air Knifed to a Depth of 5 ft.
4							
6		GRAVELLY SAND: 2.5Y6/2, light yellowish brown, loose, fine to coarse sand, fine gravels (subangular to subrounded), minimal fines, dry.	SP				
8							
10				11.3	SB7-10'		
12		Increase in fines (clay), minor coarse gravels (subangular).					
14		SANDY SILTY CLAY: 10YR4/4, dark yellowish brown, very hard, low plasticity, very fine to fine sand, minor coarse sand, minor coarse gravels, dry.	CL	16.7	SB7-14.5		
16		Color change to 10YR4/4, dark yellowish brown, very hard, increased silt content, decreased fine gravel (rounded), fine sand, rare coarse sand (rounded), dry.					
18							
20				27.1	SB7-20'		
22		Refusal at 20 ft. bgs.					Borings terminated at 20 ft bgs
24							
26							

URS

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LOG OF BORING

Borehole ID: SB-8

Total Depth: 25 ft bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: ARCO Site 0498-Livermore	**Drilling Company:** Cascade Drilling
Site Location: 286 S. Livermore Ave., Livermore, CA	**Driller:** Tom Evans
Project Manager: Scott Robinson	**Type of Drilling Rig:** Geoprobe 6600
RG: Bob Horwath	**Drilling Method:** Direct Push
Geologist: Jacob Henry	**Sampling Method:** Continuous
Job Number: 38487288	**Date(s) Drilled:** 1/20/05

BORING INFORMATION	
Groundwater Depth: NA	**Boring Location:** 286 S. Livermore Ave., Livermore, CA
Air Knife or Hand Auger Depth: 5 ft bgs	**Boring Diameter:** 2 in
Coordinates: X Y	**Boring Type:** Exploratory

Depth (ft bgs)	Symbol	Lithologic Description	USCS	PID (ppm)	Sample ID	Recovery	Comments
0							Surface conditions-Asphalt
2							Air Knifed to a Depth of 5 ft.
4							
6		GRAVELLY SAND: 2.5Y5/3, light olive brown, loose, fine to medium sand, minor coarse sand, fine to coarse gravels (subangular to subrounded), minor fines, dry.	SP				
8							
10				14	SB8-10'		
12							
14		SANDY CLAY: 10YR4/2, brown, very hard, low plasticity, very fine to fine sand (subrounded), dry to damp.	CL	16.7	SB8-15'		
16		CLAYEY SAND: 2.5Y4/3, olive brown, moderately dense, fine to medium sand, rare coarse sand, rare fine gravels (rounded to subrounded), low plasticity fines, dry to damp.	SC				
18		Color change to 10Y5/1, greenish gray, odor.					
20		SANDY CLAYEY GRAVEL: 10Y4/1, dark greenish gray, loose, medium to coarse sand, fine to coarse gravels (subangular to angular), non-plastic fines, damp to moist, odor.	GC	14	SB8-20'		
22							
24				21.1	SB8-25'		Borings terminated at 25 ft bgs
26							

SOIL BORING LOG **Boring No. MW-1** **Sheet: 1 of 3**

Client	Arco 498	Date	11/24/2008 - 11/25/2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 5' bgs with air knife	
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						10			
	MW-1 10'	50/3"	1550	0		11		No recovery	
						12			
						13			
						14			
						15	GC	Gravel with silty clay matrix	
S	MW-1 15'	14	1555	100		16			0
		14							
		16				17		Silty sand with clay, SM, dark yellowish brown, dense, moist 60% coarse sand, 40% clayey silt	
						18	SM		
						19			
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-1** **Sheet: 2 of 3**

Client	Arco 498	Date	11/24/2008 - 11/25/2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-1 20'	50/5.5"	1600	0		21	SM	Silty sand with clay, SM, dark yellowish brown, dense, moist 60% coarse sand, 40% clayey silt	0
						22			
						23			
						24			
						25			
S	MW-1 25'	41 50/5"	1605	100		26		Gravel with clayey silt, GM, dark grayish brown, very dense, moist 70% gravel, 30% clayey silt	0
						27			
						28	GM		
						29			
						30			
S	MW-1 30'	12 15	1610	67		31		Gravel with clayey silt, GM, dark grayish brown, very dense, moist 70% gravel, 30% clayey silt	0
		18				32	▽		
						33			
						34			
						35			
S	MW-1 35'	6 7	1615	67		36		Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity, moist 60% silt, 40% clay	0
		9				37	ML		
						38			
						39			
						40			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-1** **Sheet: 3 of 3**

Client	Arco 498	Date	11/24/2008 - 11/25/2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
	MW-1 40'	9 10	0755	100		41	ML	Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity moist, 60% silt, 40% clay	2
		12				42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-2** **Sheet: 1 of 3**

Client	Arco 498	Date	November 24, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 57 ft. to 34 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 34 ft. to 31 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 31 ft. to 0 ft.	Depth to GW:	▽ first encountered static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 5' bgs with air knife	
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						10			
S	MW-2 10'	50/5.5"	1000	100		11		Silty gravel, GM, dark yellowish brown, very dense, dry 75% medium to course grained gravel, 25% silt	0
						12			
						13	GM		
						14			
						15			
S	MW-2 15'	16 10	1005	67		16			
		11				17	CL	Silty clay, CL, dark yellowish brown, very stiff, medium plasticity, moist 70% clay, 30% silt	0
						18			
						19	GC		
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-2** **Sheet: 2 of 3**

Client	Arco 498	Date	November 24, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 57 ft. to 34 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 34 ft. to 31 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 31 ft. to 0 ft.	Depth to GW:	▽ first encountered static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-2 20'	16 21 30	1010	67		21 22 23 24 25	GC	Silty clayey gravel, GC, dark yellowish brown, very dense, moist to wet 75% medium gravel, 25% silty clay	0
S	MW-2 25'	19 19 25	1015	67		26 27 28 29 30	GP	Silty sandy gravel, GP, dark yellowish brown, dense, moist to wet 70% medium gravel, 30% silty coarse grained sand	0
S	MW-2 30'	12 12 16	1020	67		31 32 33 34 35 36 37	GC	Silty clayey gravel, GC, dark yellowish brown, very dense, moist to wet 75% medium gravel, 25% silty clay	0
S	MW-2 37'	10 12 12	1028	100		38 39 40	ML	Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity, moist 60% silt, 40% clay	1.4

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-2** **Sheet: 3 of 3**

Client	Arco 498	Date	November 24, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 57 ft. to 34 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 34 ft. to 31 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 31 ft. to 0 ft.	Depth to GW:	▽ first encountered static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-2 40'	9 10	1035	100		41		Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity, moist 60% silt, 40% clay	2.3
		10				42			
						43	ML		
						44			
						45			
S	MW-2 45'	10 12	1040	100		46			38
		13				47	CL	Silty clay, CL, dark yellowish brown, very stiff, medium plasticity, moist 80% clay, 20% silt	
						48			
						49			
						50		Clayey sand with gravel,	
S	MW-2 50'	9 21	1050	100		51	SW-SC	dark grayish brown, dense, moist 40% clay, 35% medium grained sand, 25% medium gravel	46
		22				52			
						53			
						54			
						55			
S	MW-2 55'	32 50/5"	1100	100		56	GW-GC	Gravel with clayey sand, GC, dark grayish brown, very dense, wet 60% medium to coarse gravel, 40% clayey medium to coarse grained sand	0
						57			
						58			
						59			
						60			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-3** **Sheet: 1 of 3**

Client	ARCO 498	Date	11/25/2008 - 11/26/2008
Address	2186 S. Livermore Aveune	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	
Well Pack	sand: 34 ft. to 57 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 31 ft. to 34 ft.		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 0 ft. to 31 ft.	Depth to GW:	▽ first encountered 52 static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 5' bgs with air knife.	
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						10			
S	MW-3 10'	6 7 7	1335	67		11	GC	Gravel with silty clay, GC, dark yellowish brown, medium dense, moist 70% medium gravel, 30% silty clay	0
						12			
						13			
						14			
						15			
	MW-3 15'	10 10 11	1340	33		16	ML	Clayey silt, ML, dark grayish brown, very stiff, low plasticity, moist 60% silt, 40% clay	82
						17			
						18			
						19			
						20	GC		

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-3** **Sheet: 2 of 3**

Client	ARCO 498	Date	11/25/2008 - 11/26/2008
Address	2186 S. Livermore Aveune	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	
Well Pack	sand: 34 ft. to 57 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 31 ft. to 34 ft.		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 0 ft. to 31 ft.	Depth to GW:	▽ first encountered 52 static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-3 20'	9 12 15	1345	67		21		Gravel with silty clay, GC, dark yellowish brown, medium dense, moist 70% medium gravel, 30% silty clay	216
						22			
						23			
						24			
						25			
S	MW-3 25'	12 15 17	1350	67		26	GC	Gravel with silty clay, GC, dark yellowish brown, dense, moist 70% medium gravel, 30% silty clay	106
						27			
						28			
						29			
						30			
S	MW-3 30'	12 12 15	1355	67		31	GC	Gravel with silty clay, GC, dark yellowish brown, medium dense, moist 70% medium gravel, 30% silty clay	76
						32			
						33			
						34			
						35			
S	MW-3 35'	12 12 15	1400	100		36	ML	Clayey silt, ML, dark grayish brown, very stiff, low plasticity, moist 60% silt, 40% silt	14.8
						37			
						38			
						39			
						40			

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-3** **Sheet: 3 of 3**

Client	ARCO 498	Date	11/25/2008 - 11/26/2008
Address	2186 S. Livermore Aveune	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	
Well Pack	sand: 34 ft. to 57 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 37 ft. to 57 ft.
	bent.: 31 ft. to 34 ft.		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 0 ft. to 31 ft.	Depth to GW:	▽ first encountered 52 static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-3 40'	6 10	1405	100		41		Clayey silt, ML, dark grayish brown, very stiff, low plasticity, moist 70% silt, 30% silt	20
		12				42	ML		
						43			
						44			
						45		Clayey silt, ML, dark grayish brown, very stiff, low plasticity, moist 70% silt, 30% silt	
S	MW-3 45'	13 13	0805	100		46			4.8
		15				47	CL	Silty clay, CL, dark yellowish brown, very stiff, medium plasticity, moist 80% clay, 20% silt	
						48			
						49			
						50			
S	MW-3 50'	15 15	0830	100		51		Clayey silt with coarse sand trace gravel, ML, dark yellowish brown, hard low plasticity, wet, 50% silt, 30% clay, 20% coarse grained sand	7
		17				52		10% fine gravel	
						53	ML		
						54			
						55			
S	MW-3 55'	30 32	0850	100		56		Clayey silt with coarse sand trace gravel, ML, dark yellowish brown, hard low plasticity, wet, 50% silt, 30% clay, 20% coarse grained sand	
		50/3"				57		10% fine gravel	
						58			
						59			
						60			

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-4** **Sheet: 1 of 3**

Client	Arco 498	Date	November 25, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 5' bgs with air knife	
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						10			
S	MW-4 10'	9 16 17	0925	67		11	GC	Gravel with silty clay, GC, dark yellowish brown, hard 70% medium to coarse gravel, 30% silty clay	0
						12			
						13			
						14			
						15			
S	MW-4 15'	9 10 10	0930	67		16	CL	Silty clay, CL, dark yellowish brown, very stiff, medium plasticity, moist 60% clay, 40% silt	0
						17			
						18			
						19	GM		
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-4** **Sheet: 2 of 3**

Client	Arco 498	Date	November 25, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
S	MW-4 20'	12 14	0935	67		21	GM	Gravel with clayey silt, dark grayish brown, medium dense, moist 70% medium gravel, 30% clayey silt	0
		14				22			
						23			
						24			
						25			
S	MW-4 25'	16 18	0940	67		26	GP	Gravel with silty sand, GP, dark grayish brown, dense, moist to wet 70% medium gravel, 30% fine to medium grained silty sand	0
		20				27			
						28			
						29			
						30			
S	MW-4 30'	16 17	0945	67		31	GM	Gravel with clayey silt, dark grayish brown, medium dense, moist 70% medium gravel, 30% clayey silt	0
		19				32	▽		
						33			
						34			
						35			
S	MW-4 35'	6 10	0950	67		36	ML	Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity, moist 60% silt, 40% clay	212
		16				37			
						38			
						39			
						40			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. MW-4** **Sheet: 3 of 3**

Client	Arco 498	Date	November 25, 2008
Address	286 South Livermore Avenue	Drilling Co.	Woodward Drilling rig type:BK-81
	Livermore, CA	Driller	Dave
Project No.	E-498	Method	Hollow Stem Auger Hole Diameter: 8 inches
Logged By:	Collin Fischer	Sampler:	18" x 2" Split Spoon
Well Pack	sand: 40 ft. to 17 ft	Well Construction	Casing Material: Schedule 40 PVC Screen Interval: 20 ft. to 40 ft.
	bent.: 17 ft. to 14 ft		Casing Diameter: 2 in. Screen Slot Size: 0.020-in.
	grout: 14 ft. to 0 ft.	Depth to GW:	▽ first encountered 32' static ▼

Sample Type	Sample No.	Blow Count	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
	MW-4 40'	10 10	0955	100		41	ML	Clayey silt, ML, dark yellowish brown, very stiff, medium plasticity, moist 60% silt, 40% clay	13.4
		12				42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-498

DATE: 3/22/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

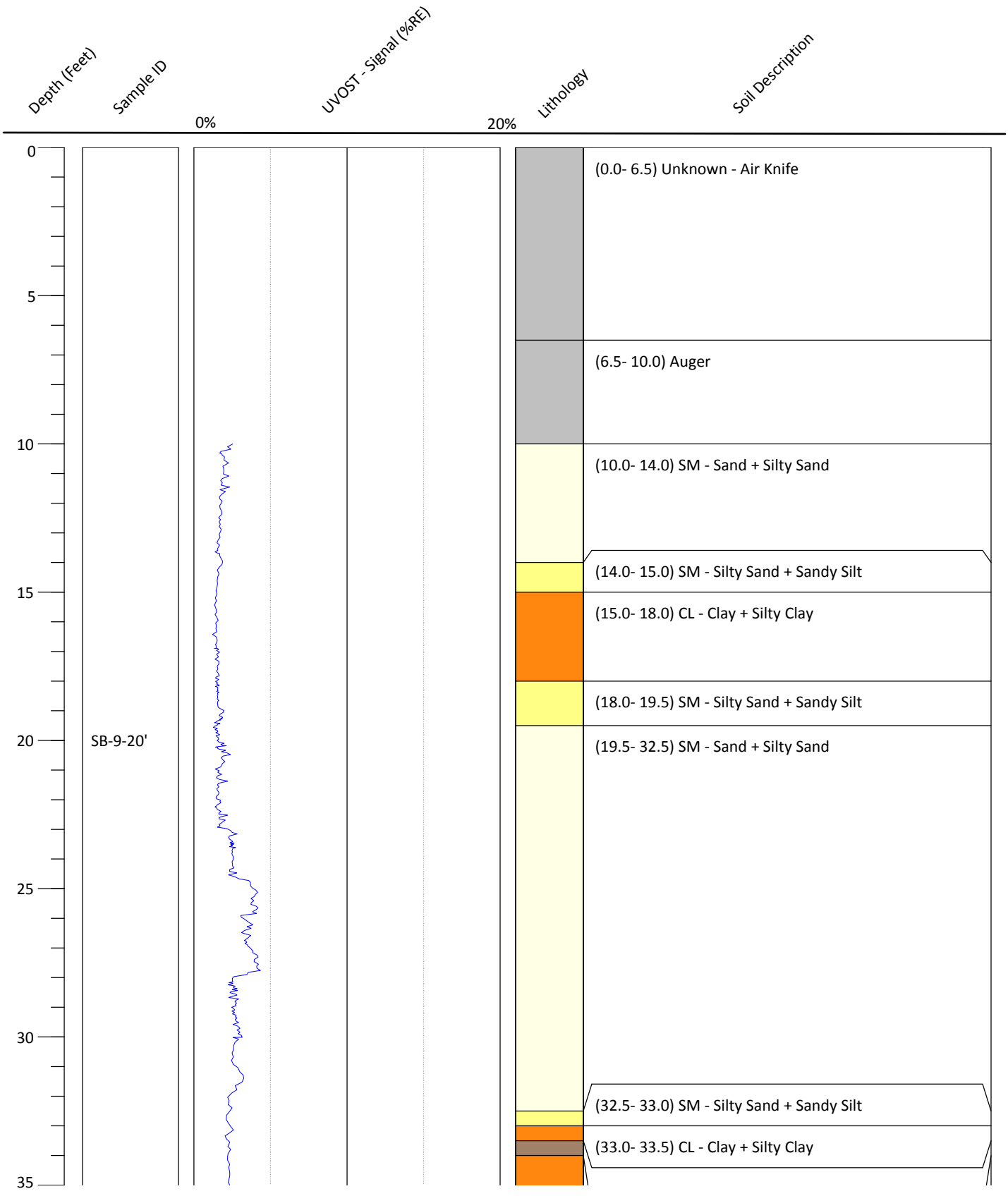
BORING ID: SB-9

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-498

DATE: 3/22/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

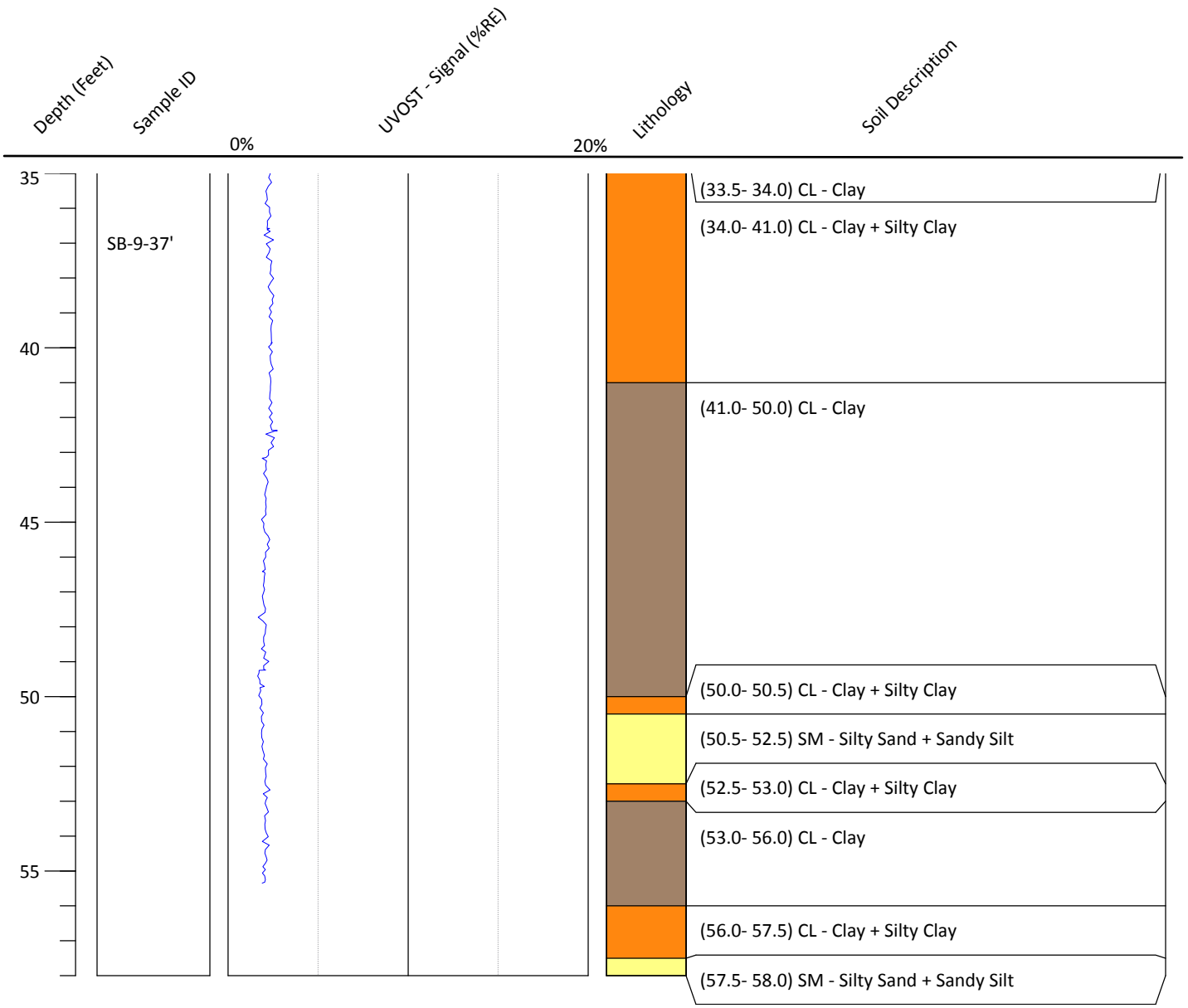
BORING ID: SB-9

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/18/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

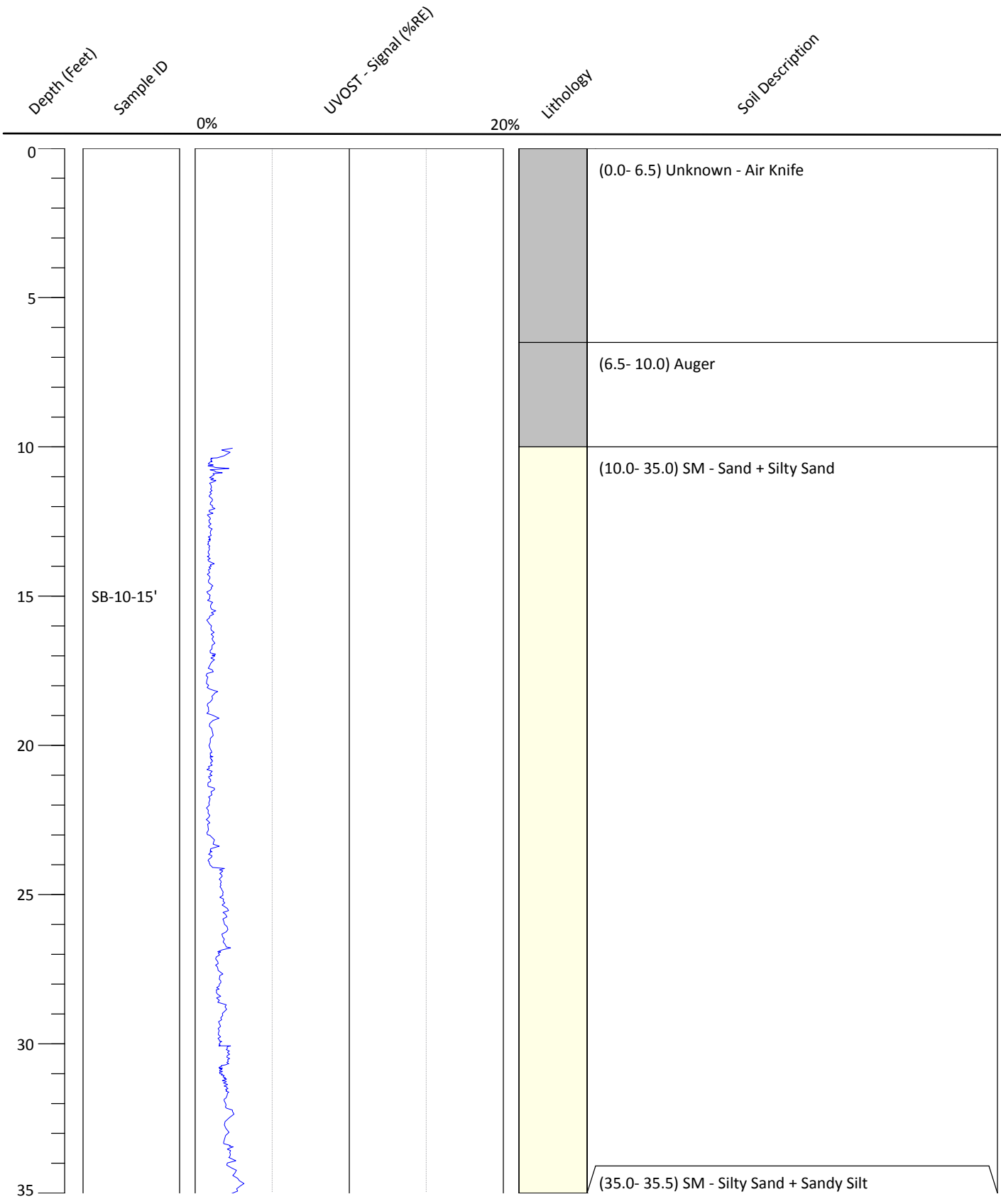
BORING ID: SB-10

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/18/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

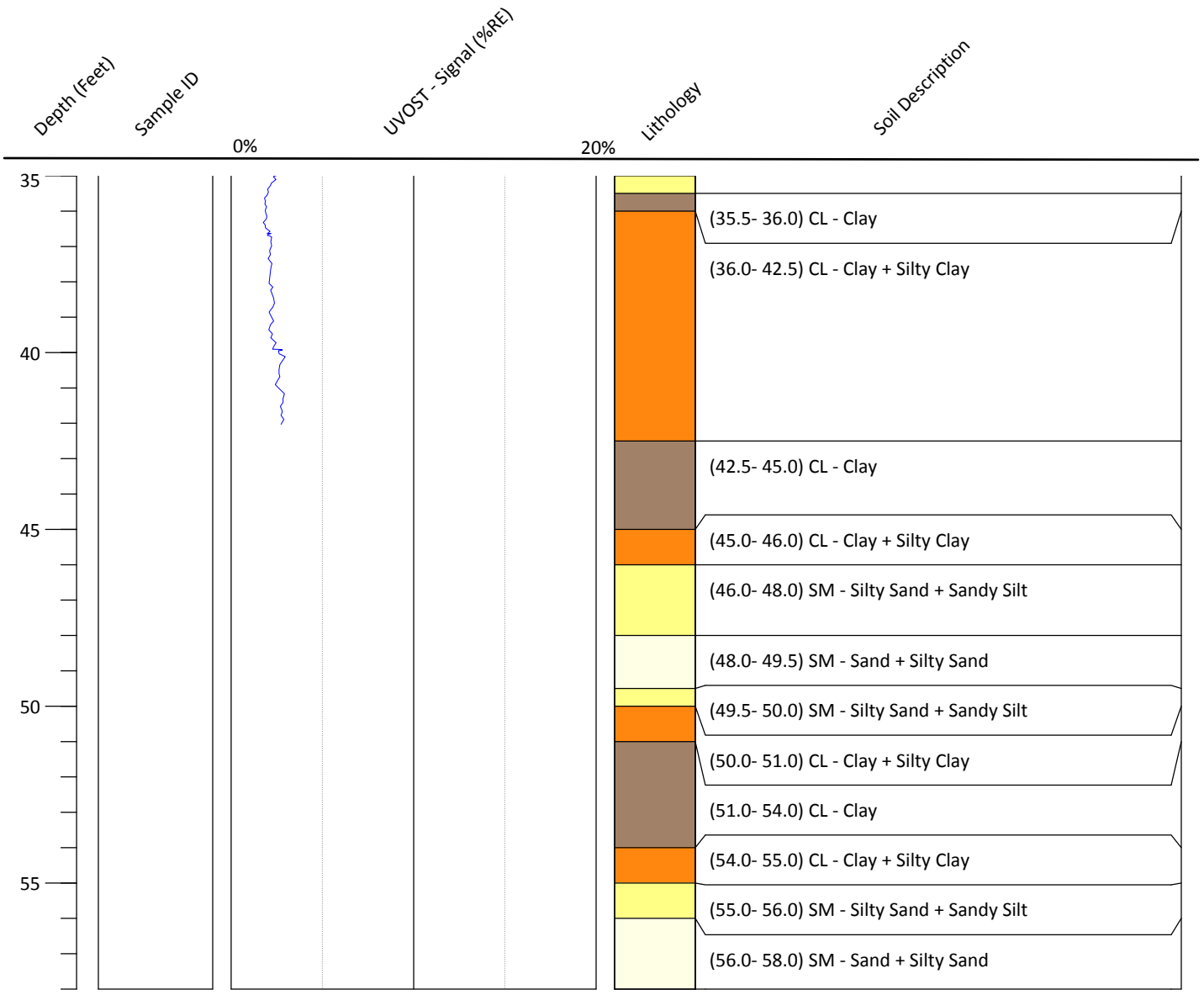
BORING ID: SB-10

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/20/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

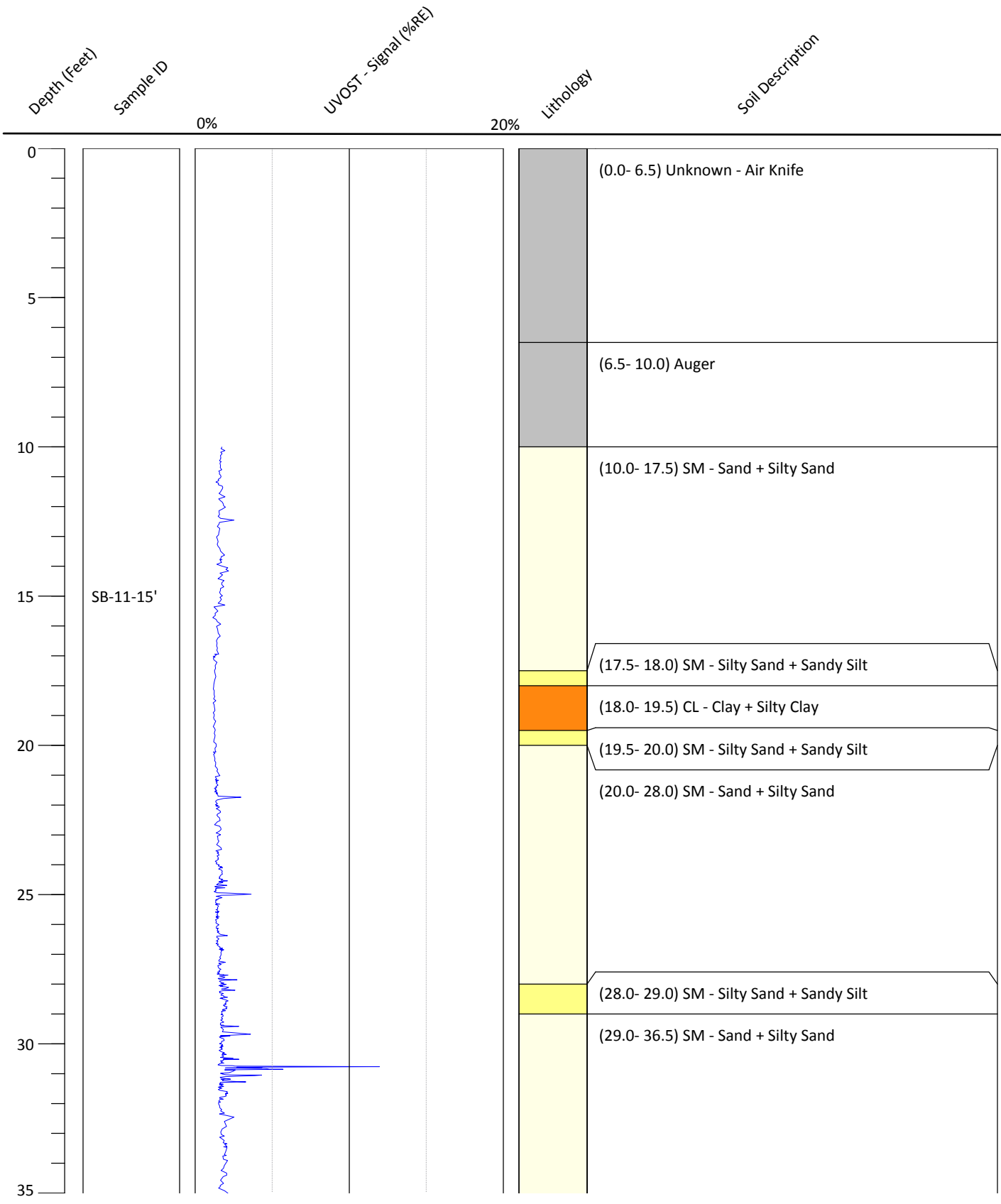
BORING ID: SB-11

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/20/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

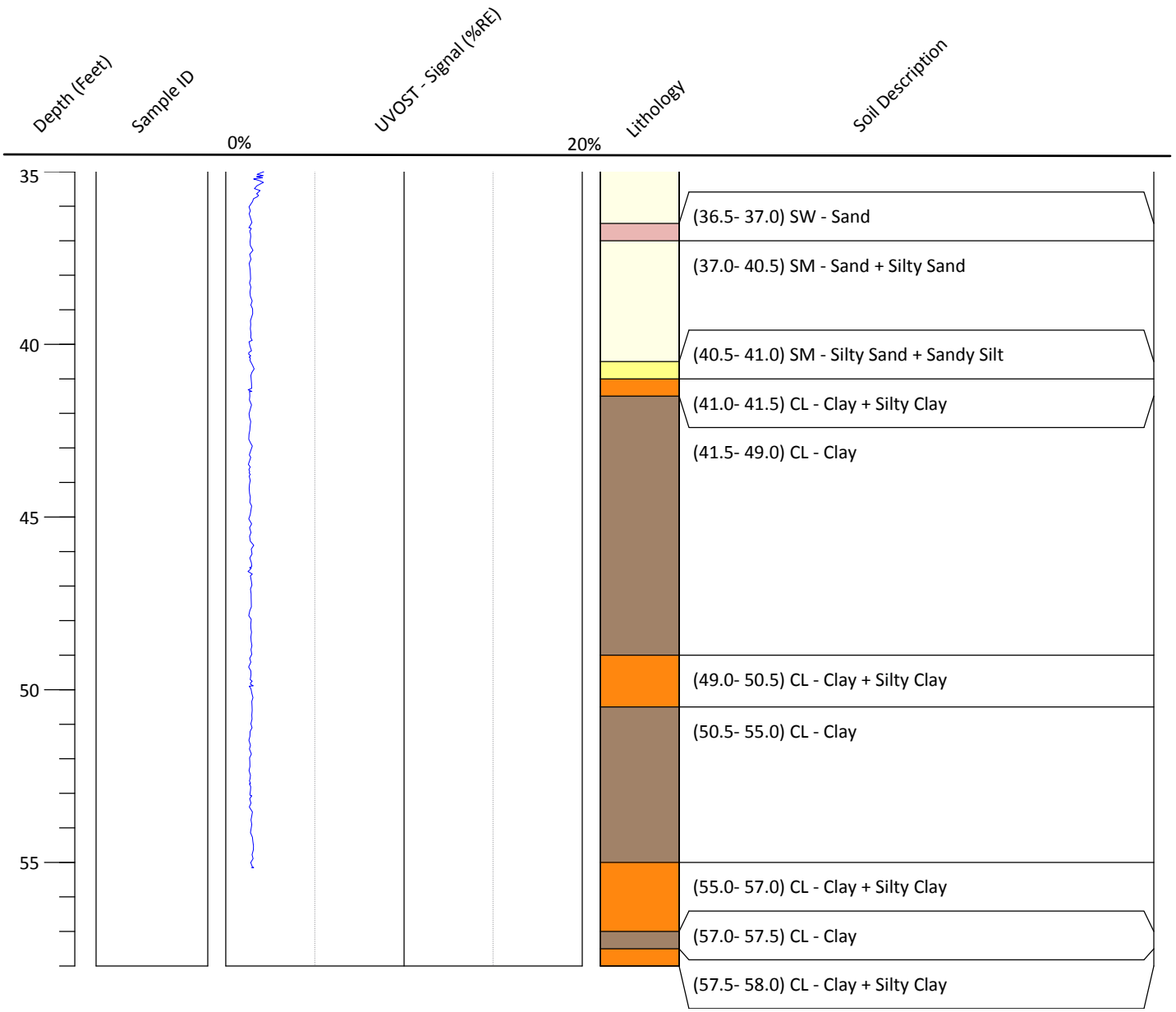
BORING ID: SB-11

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/20/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

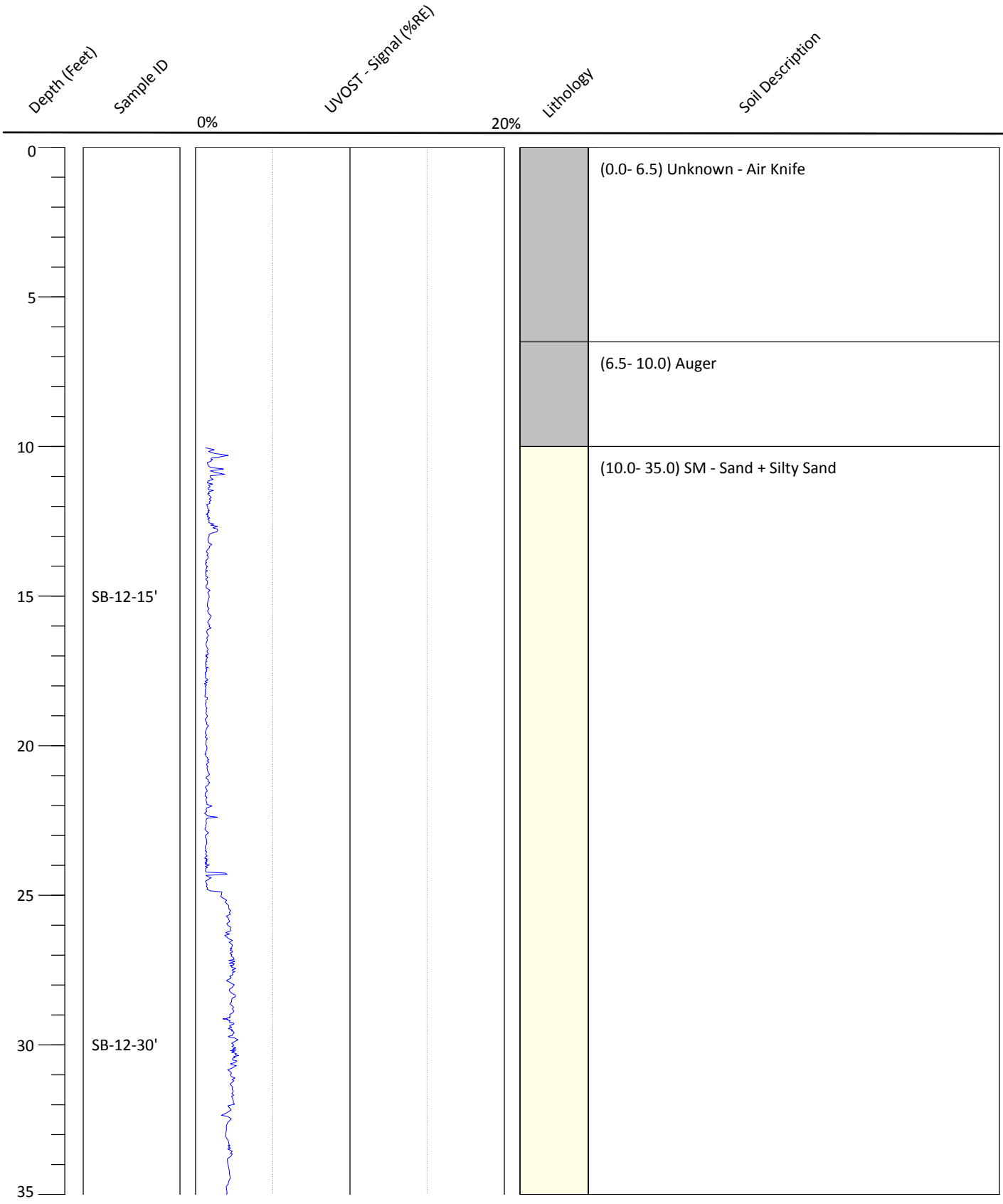
BORING ID: SB-12

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/20/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

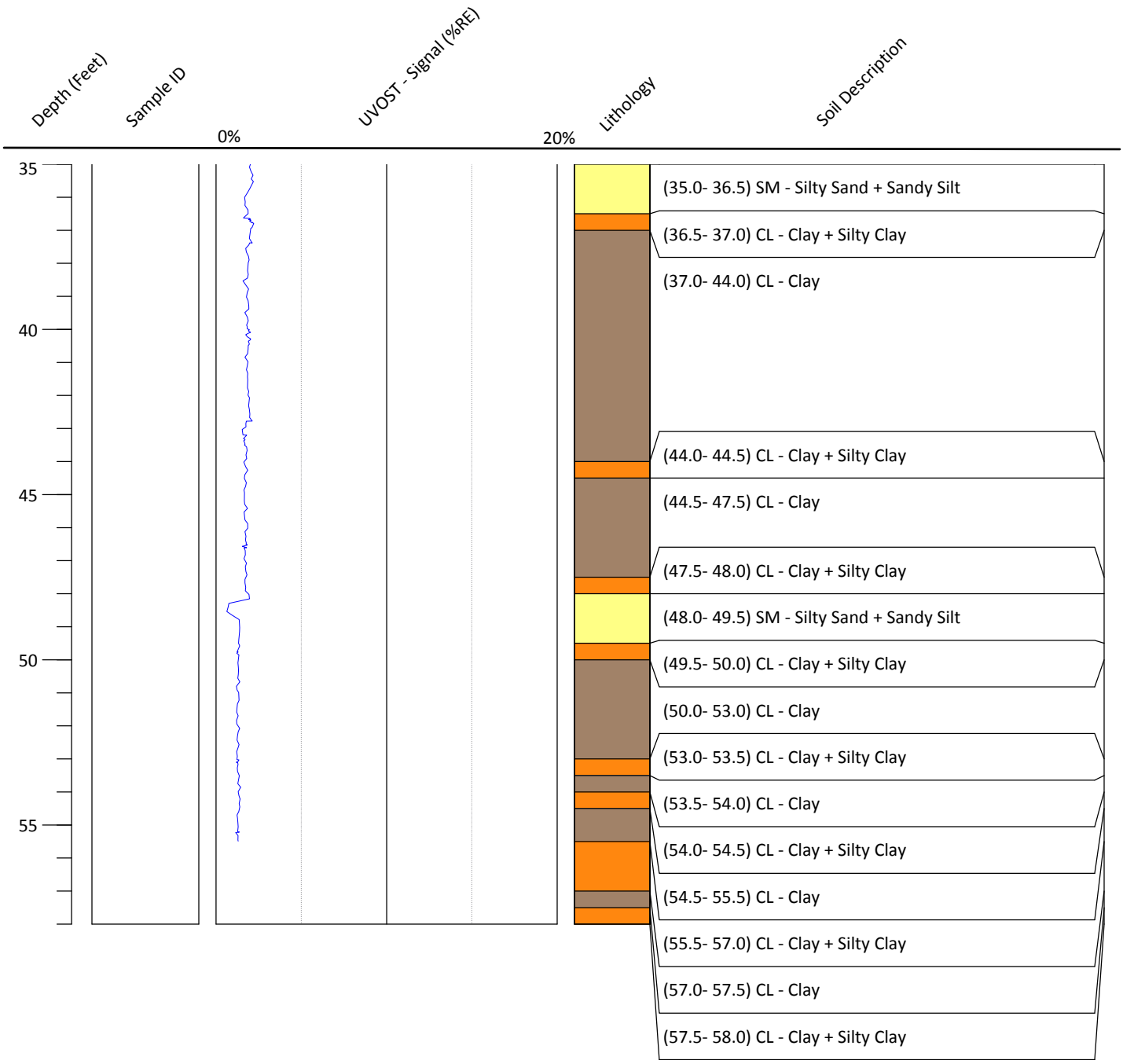
BORING ID: SB-12

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP-498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave, Livermore, CA

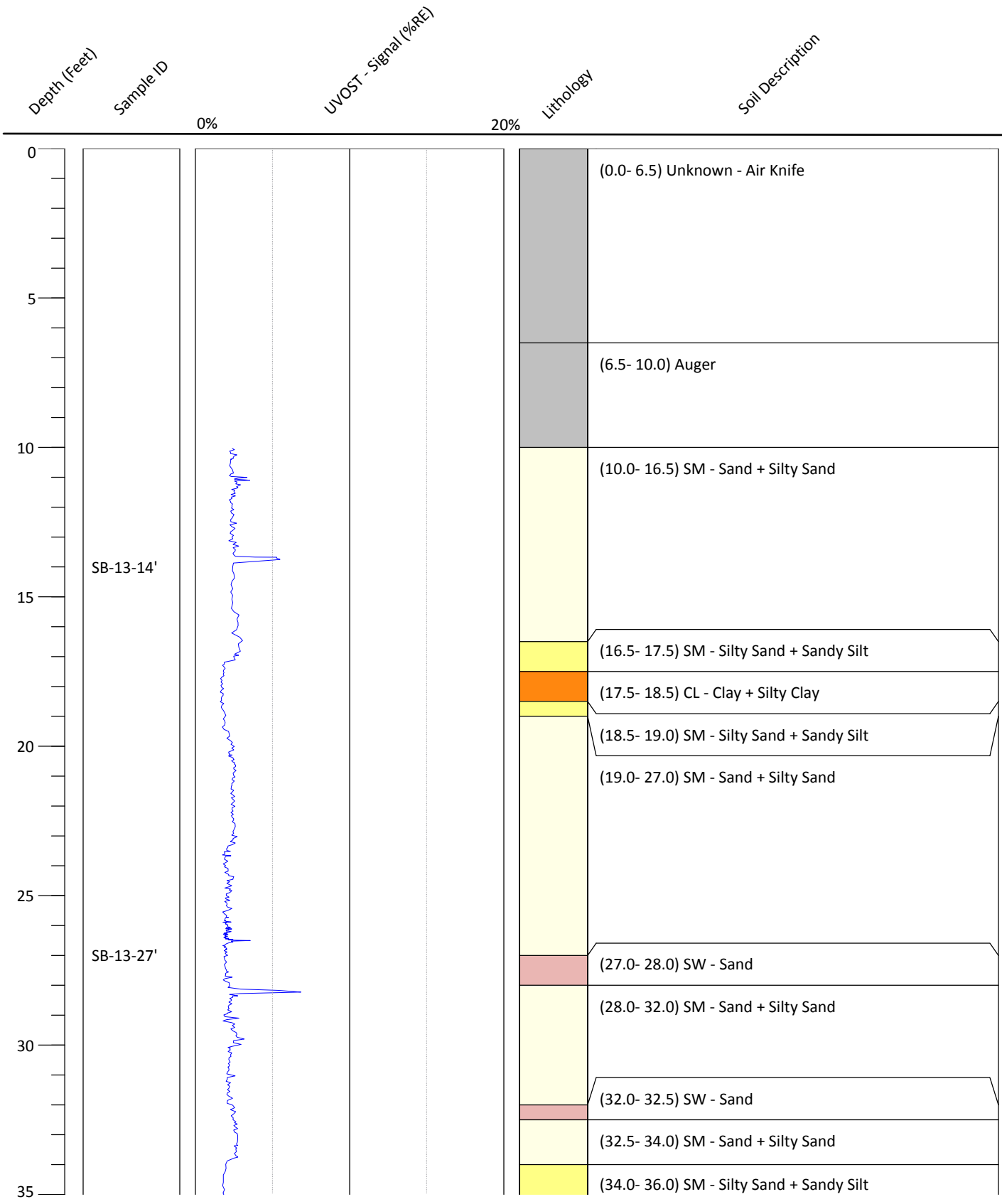
BORING ID: SB-13

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP-498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave, Livermore, CA

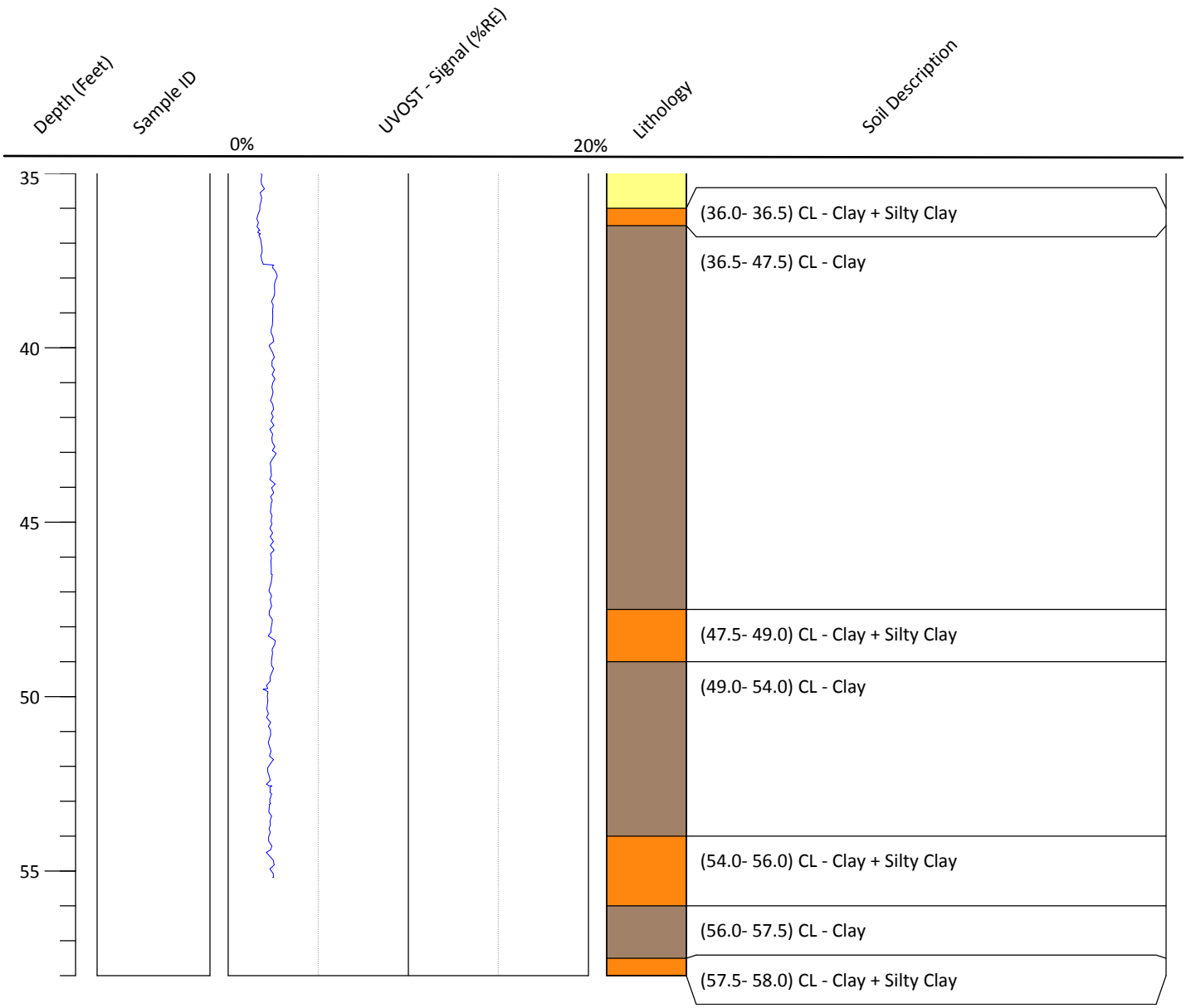
BORING ID: SB-13

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/22/2013

SITE ADDRESS: 286 Livermore Ave., Livermore, CA

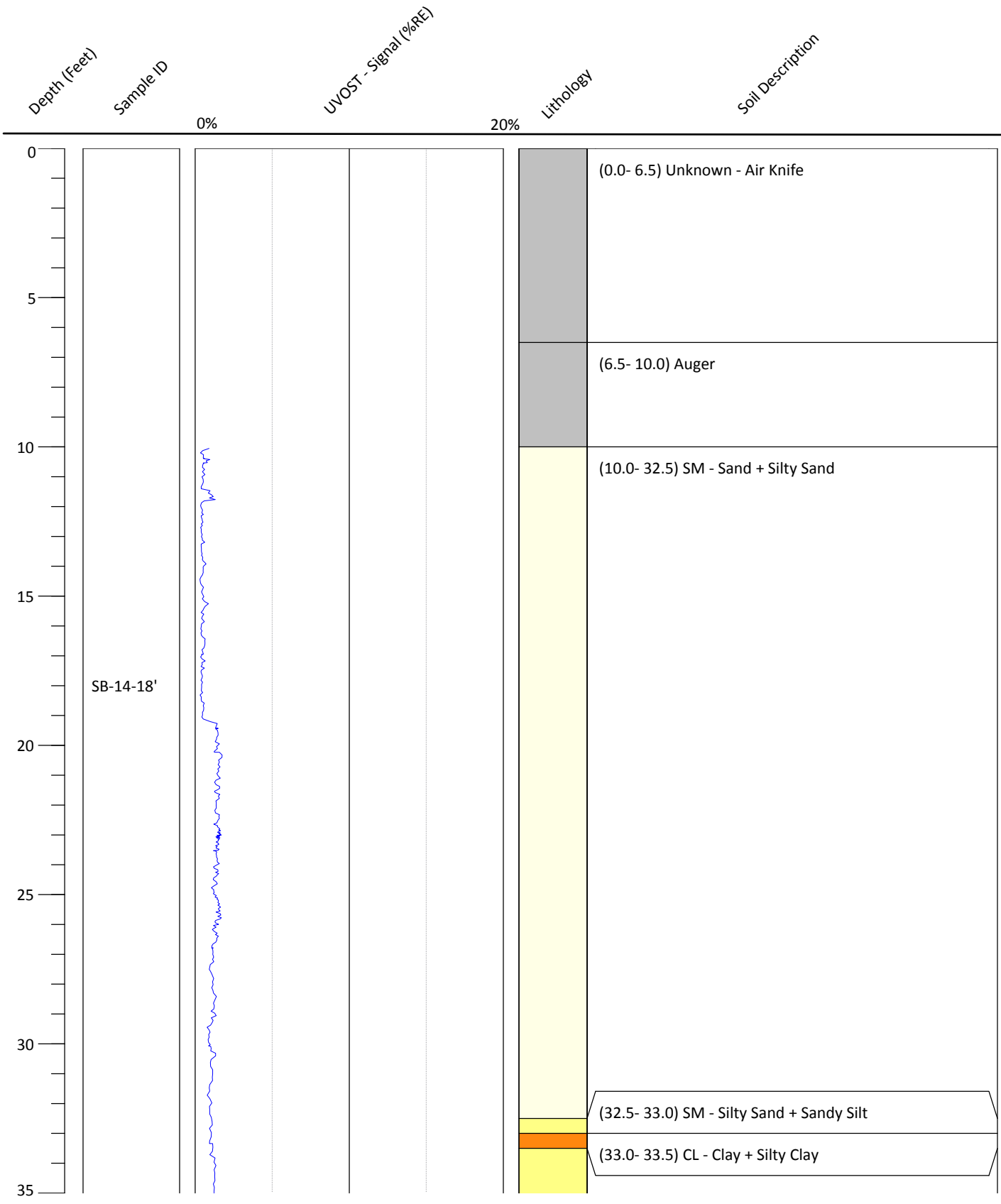
BORING ID: SB-14

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/22/2013

SITE ADDRESS: 286 Livermore Ave., Livermore, CA

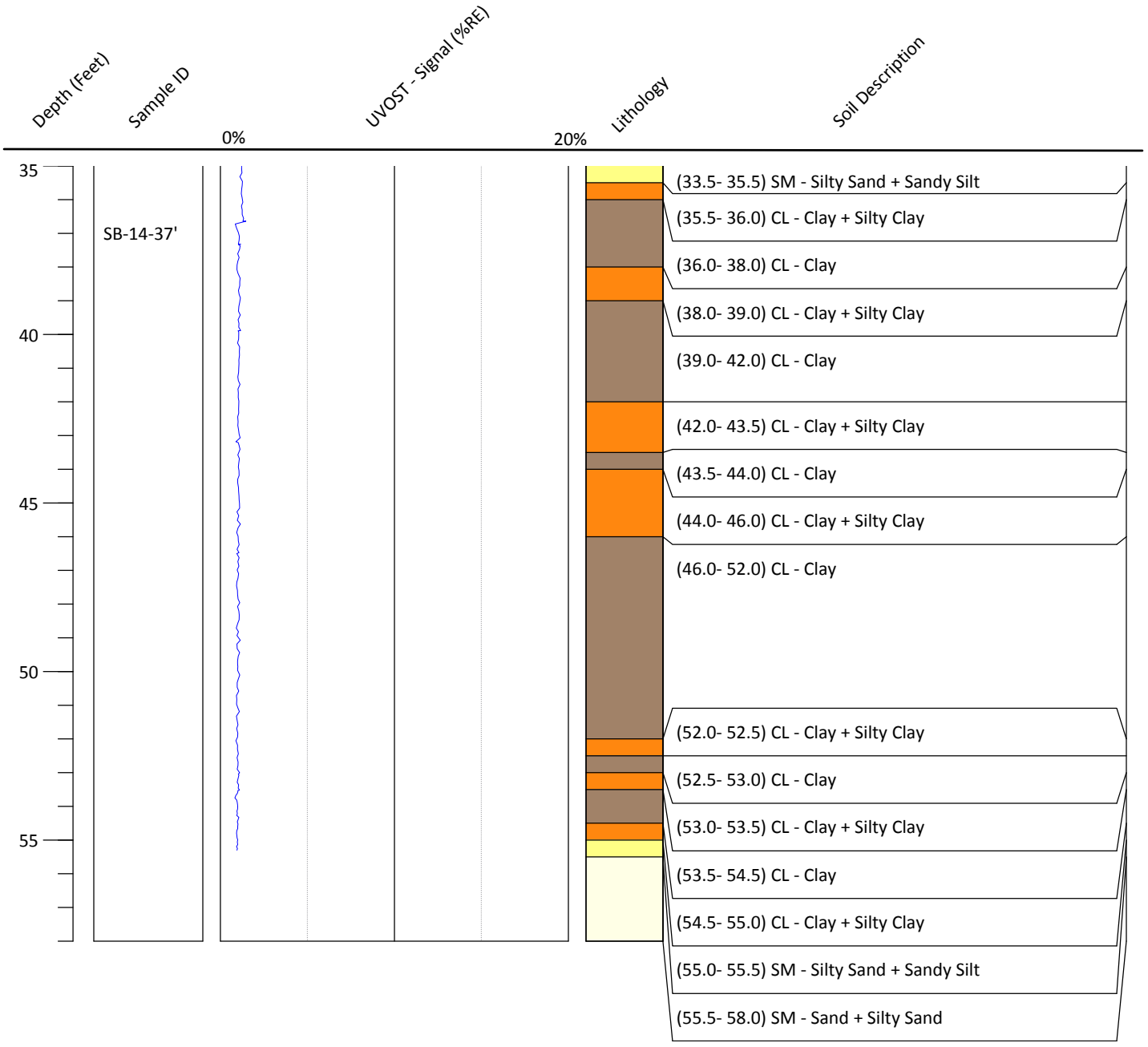
BORING ID: SB-14

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

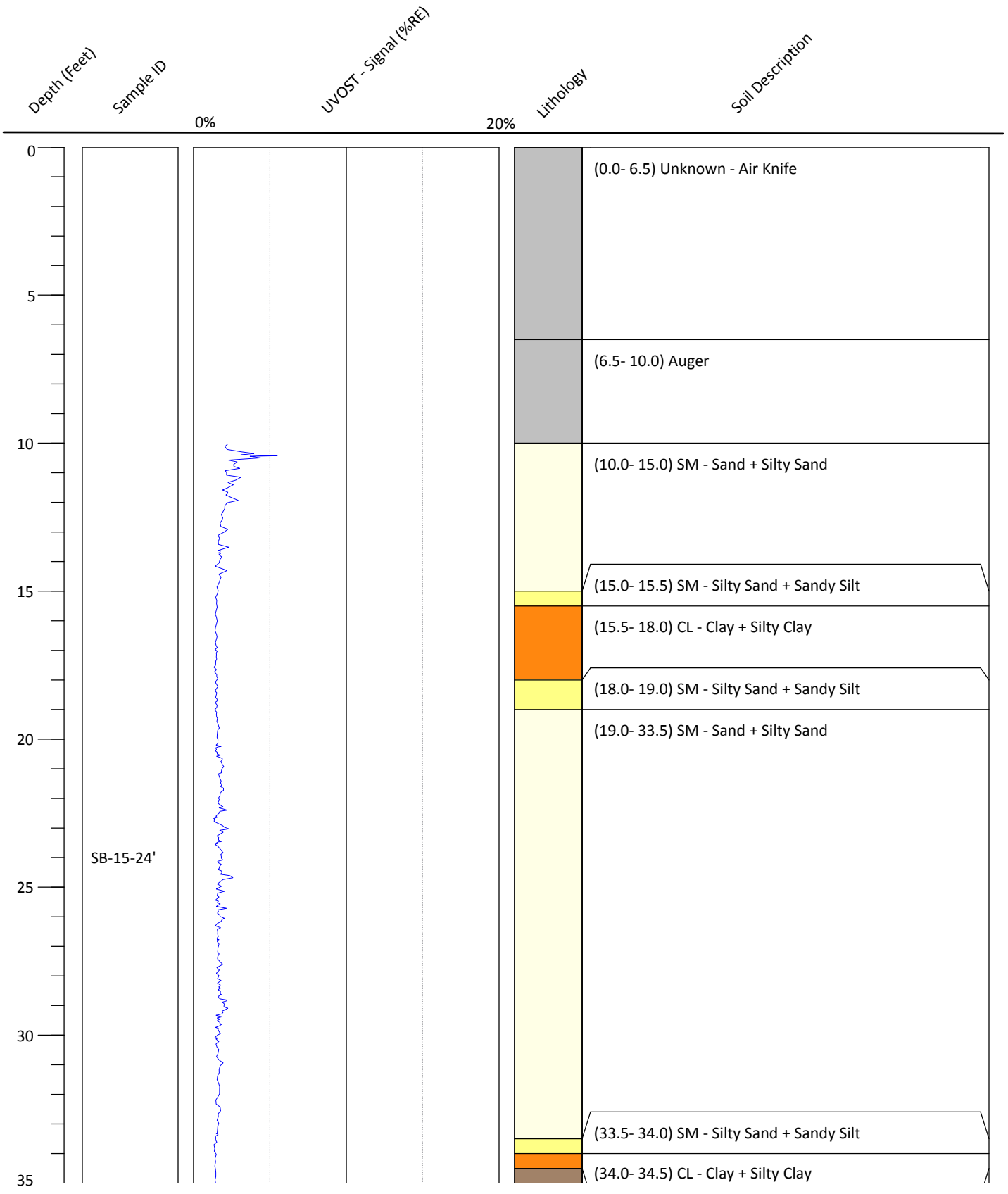
BORING ID: SB-15

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

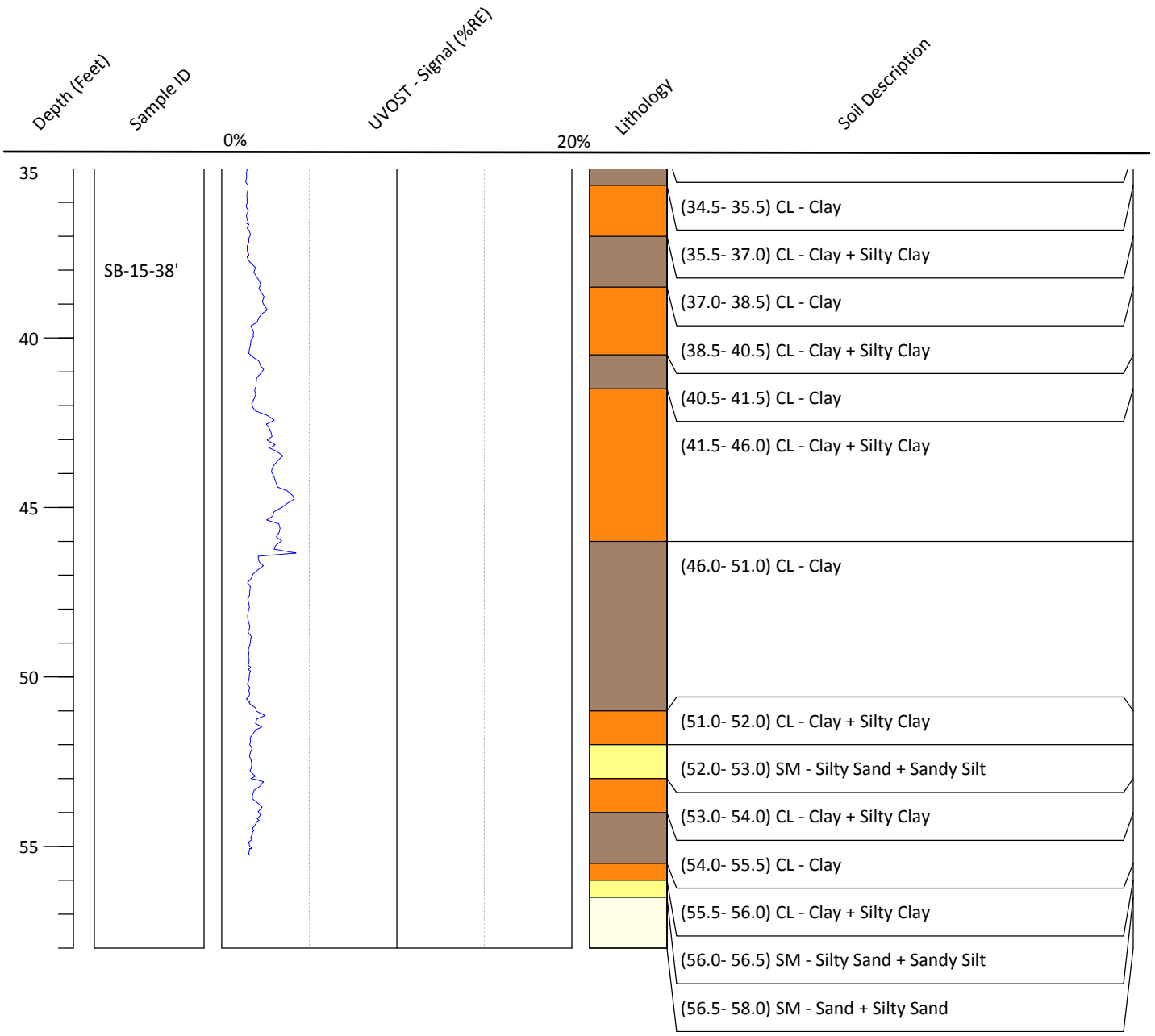
BORING ID: SB-15

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

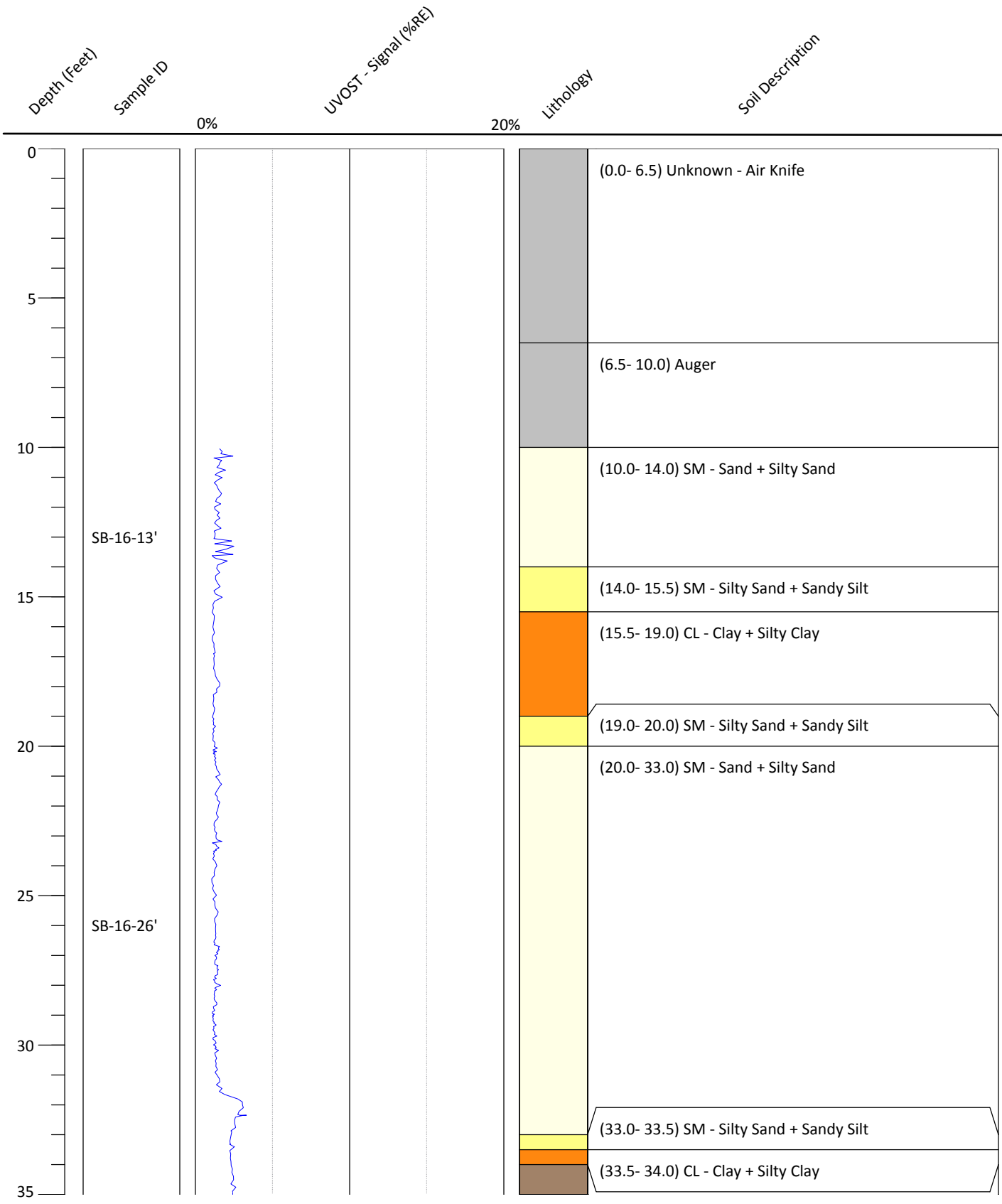
BORING ID: SB-16

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT



TOTAL BORING DEPTH: 58'

LITHOLOGIC LOG

PROJECT NAME: BP 498

PROJECT NUMBER: 08-82-603

DATE: 3/21/2013

SITE ADDRESS: 286 South Livermore Ave., Livermore, CA

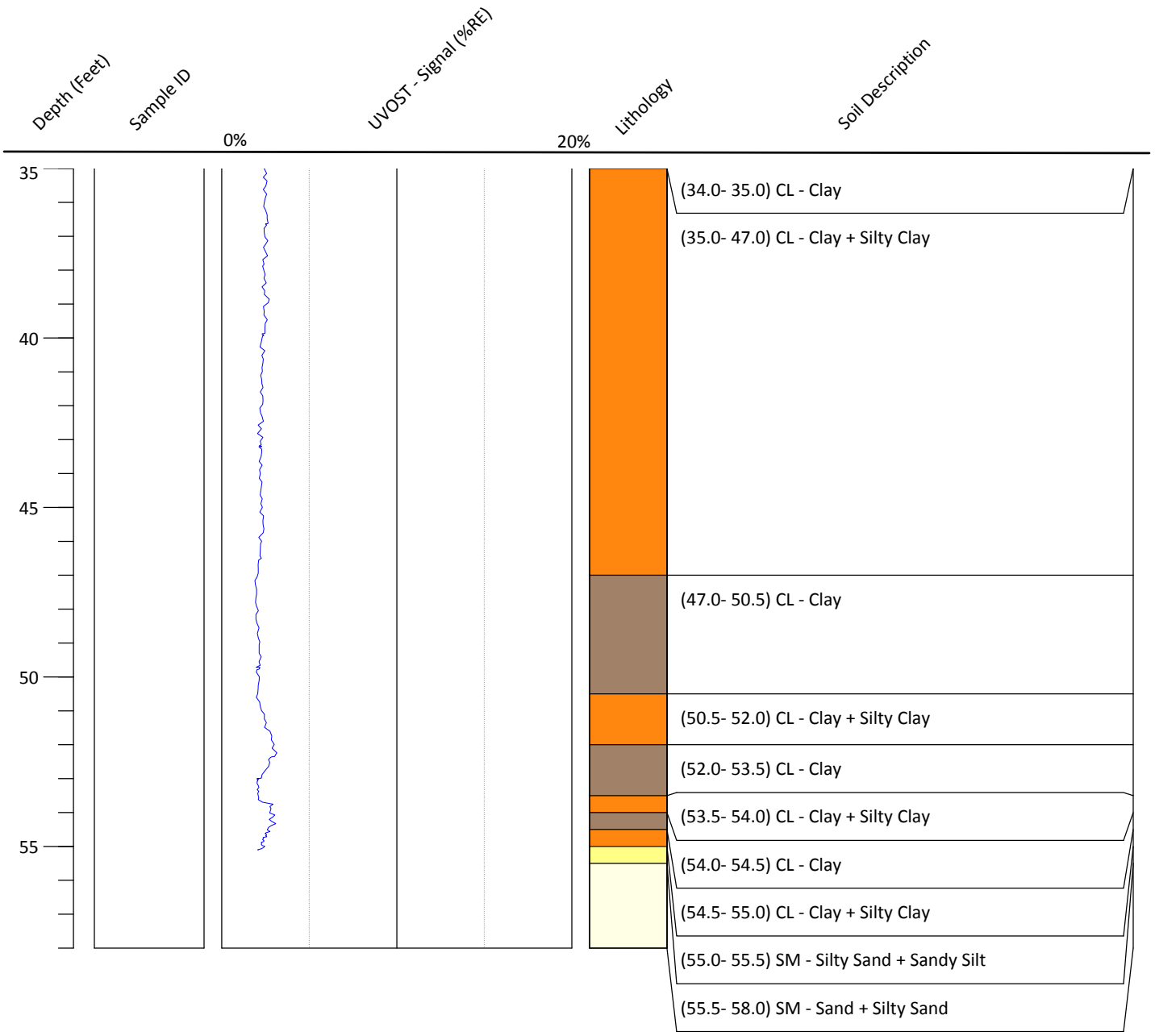
BORING ID: SB-16

DRILLING COMPANY: Gregg Drilling

SAMPLE METHOD: Direct Push

BORE HOLE DIAMETER: 1.78"

DRILLING METHOD: CPT

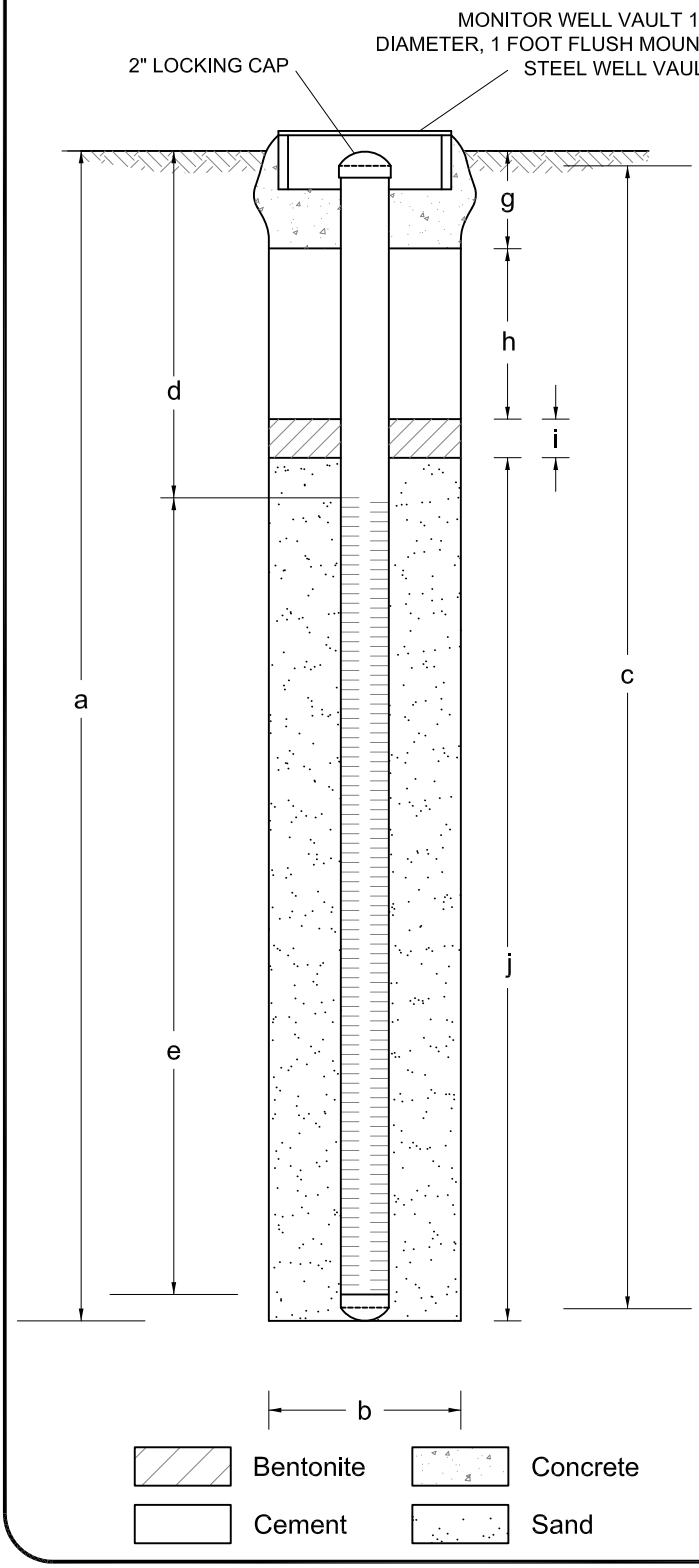


TOTAL BORING DEPTH: 58'

MONITOR WELL DIAGRAM

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973

Project Number: 08-82-103
Project Name: BP 498
Location: 286 S Livermore Ave, Livermore, CA
Date: 01/15/2014
Boring / Well No.: MW-5A



EXPLORATORY BORING

a. Total Depth: 50 ft.
b. Diameter: 8 in.
Drilling Method: Hollow Stem Auger

WELL CONSTRUCTION

Drilling Contractor: Gregg Drilling
c. Total Casing Length: 50 ft.
Material: Schedule 40 PVC
Diameter: 2 inches
d. Depth to Top Perforations: 40 ft.
e. Perforated Length: 10 ft.
Perforated Interval From: 40 ft. to 50 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.010"
g. Surface Seal: 0 to 0.5 ft.
Surface Seal Material: Concrete
h. Backfill Length: 34.5 ft
Backfill Material: Neat Cement
i. Seal Length: 4 ft.
Seal Material: Bentonite
j. Filter Pack Length: 11 ft.
Filter Pack Material: #2/12 Sand

NOTES

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 15 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-5A STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
1–14							Auger 15'		
15							Clay	CL	
16–18							Clay & Silty Clay	CL	
18–19							Silty Sand & Sandy Silt	SM ML	
19–21							Sand & Silty Sand	SW SM	
21–25							Very Dense/Stiff Soil		

TOTAL BORING DEPTH: 50 ft PAGE NO: 1 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 15 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-5A STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
26–31							Sand & Silty Sand	SW SM	
32							Silty Sand & Sandy Silt	SM ML	
33							Clay & Silty Clay	CL	
34–35							Silty Sand & Sandy Silt	SM ML	
36–47							Clay & Silty Clay	CL	
48							Clay	CL	
49–50							Clay & Silty Clay	CL	

0.010 Slotted Screen

TOTAL BORING DEPTH: 50 ft PAGE NO: 2 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT

LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498

SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603

LEGAL DESC:

APN:

LOGGED BY: James Ramos

FACILITY ID OR WAIVER:

NOI NUMBER:

DATE: 1 / 15 /2014

START:

DRILLING COMPANY: Gregg Drilling

DRILLER: Sean Rakow

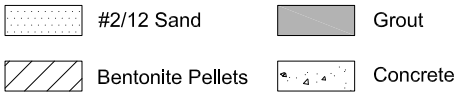
WELLID: MW-5A

STOP:

DRILLING METHOD: 8 In. Hollow Stem Auger

SAMPLE METHOD: -

LEGEND



TOTAL BORING DEPTH: 50 ft

PAGE NO: 3 OF 3

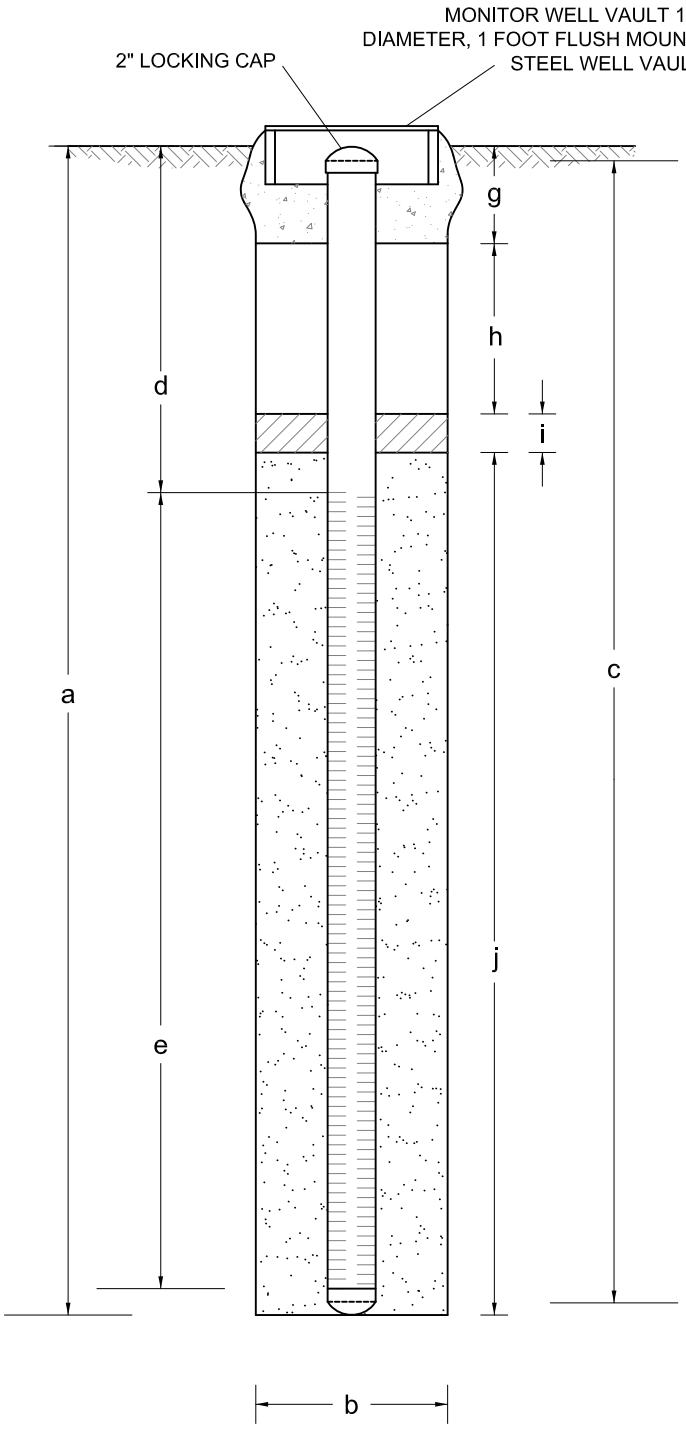
ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

MONITOR WELL DIAGRAM

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973

Project Number: 08-82-103
Project Name: BP 498
Location: 286 S Livermore Ave, Livermore, CA
Date: 01/14/2014
Boring / Well No.: MW-5B



EXPLORATORY BORING

a. Total Depth: 66 ft.
b. Diameter: 8 in.
Drilling Method: Hollow Stem Auger

WELL CONSTRUCTION

Drilling Contractor: Gregg Drilling
c. Total Casing Length: 66 ft.
Material: Schedule 40 PVC
Diameter: 2 inches
d. Depth to Top Perforations: 56 ft.
e. Perforated Length: 10 ft.
Perforated Interval From: 56 ft. to 66 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.010"
g. Surface Seal: 0 to 0.5 ft.
Surface Seal Material: Concrete
h. Backfill Length: 50.5 ft
Backfill Material: Neat Cement
i. Seal Length: 4 ft.
Seal Material: Bentonite
j. Filter Pack Length: 11 ft.
Filter Pack Material: #2/12 Sand

NOTES

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 14 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-5B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
1–15							Auger 15'		
15							Clay	CL	
15–18							Clay & Silty Clay	CL	
18–19							Silty Sand & Sandy Silt	SM ML	
19–21							Sand & Silty Sand	SW SM	
21–25							Very Dense/Stiff Soil		

TOTAL BORING DEPTH: 66 ft PAGE NO: 1 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: - -

STATIC GROUNDWATER DEPTH: - -

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 14 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-5B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
26–31							Sand & Silty Sand	SW SM	
32							Silty Sand & Sandy Silt	SM ML	
33							Clay & Silty Clay	CL	
34–35							Silty Sand & Sandy Silt	SM ML	
36–47							Clay & Silty Clay	CL	
48							Clay	CL	
49–50							Clay & Silty Clay	CL	

TOTAL BORING DEPTH: 66 ft PAGE NO: 2 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 14 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-5B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
51							Clay & Silty Clay	CL	
52							Clay	CL	
53							Clay & Silty Clay	CL	
54							Clay	CL	
55							Sand & Silty Sand	SW SM	
56									
57									
58									
59									
60									
61									
62									
63									
64		0.010 Slotted Screen							
65									
66							Silty Sand & Sandy Silt	SM ML	

LEGEND

- #2/12 Sand
- Grout
- Bentonite Pellets
- Concrete

TOTAL BORING DEPTH: 66 ft PAGE NO: 3 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

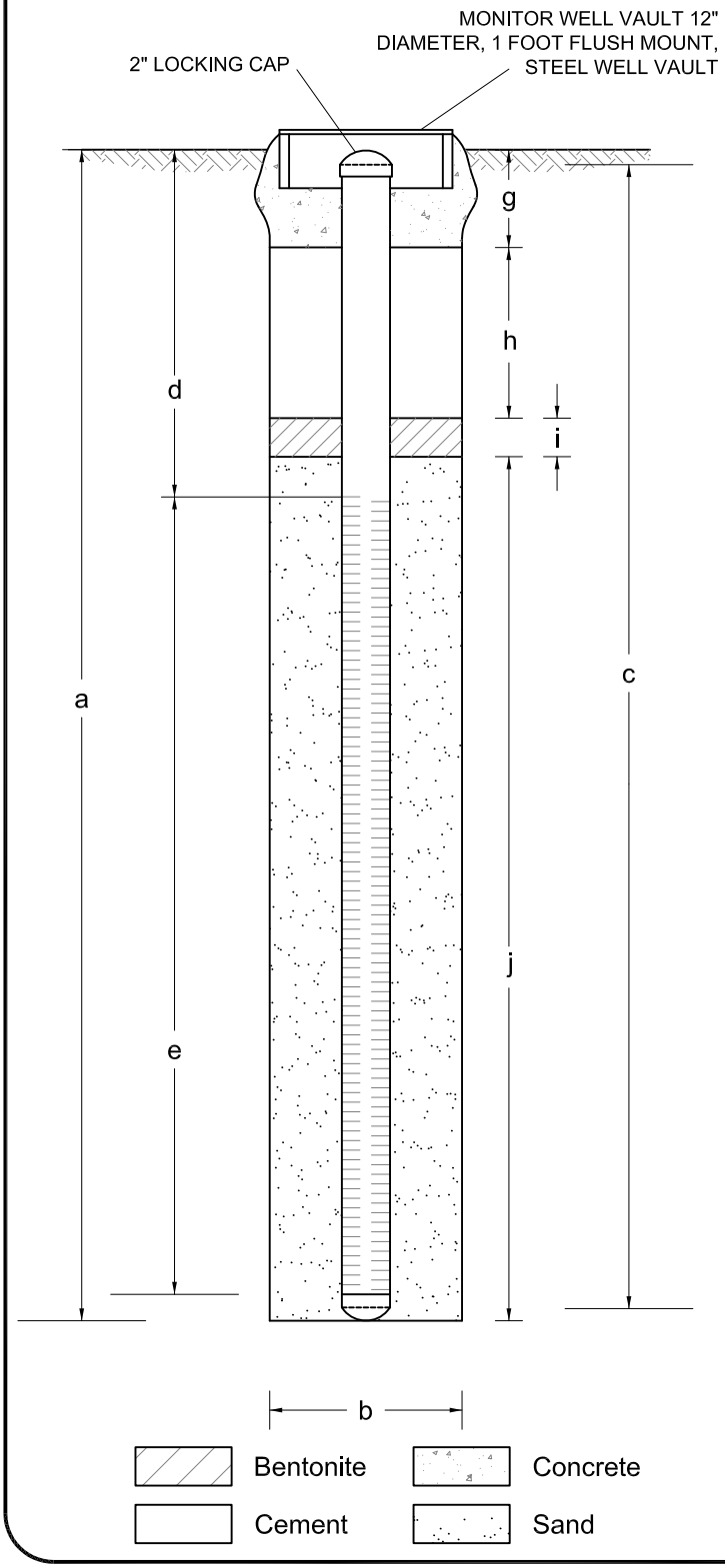
STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

MONITOR WELL DIAGRAM

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973

Project Number: 08-82-103
Project Name: BP 498
Location: 286 S Livermore Ave, Livermore, CA
Date: 01/15/2014
Boring / Well No.: MW-6A



EXPLORATORY BORING

a. Total Depth: 50 ft.
b. Diameter: 8 in.
Drilling Method: Hollow Stem Auger

WELL CONSTRUCTION

Drilling Contractor: Gregg Drilling
c. Total Casing Length: 50 ft.
Material: Schedule 40 PVC
Diameter: 2 inches
d. Depth to Top Perforations: 40 ft.
e. Perforated Length: 10 ft.
Perforated Interval From: 40 ft. to 50 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.010"
g. Surface Seal: 0 to 0.5 ft.
Surface Seal Material: Concrete
h. Backfill Length: 34.5 ft
Backfill Material: Neat Cement
i. Seal Length: 4 ft.
Seal Material: Bentonite
j. Filter Pack Length: 11 ft.
Filter Pack Material: #2/12 Sand

NOTES

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 15 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6A STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
1–14							Auger 15'		
15–17							Sand & Silty Sand	SW SM	
18							Silty Sand & Sandy Silt	SM ML	
19							Very Dense/Stiff Soil		
20							Silty Sand & Sandy Silt	SM ML	
21–25							Sand & Silty Sand	SW SM	

TOTAL BORING DEPTH: 50 ft PAGE NO: 1 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 15 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6A STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
26–30							Sand & Silty Sand	SW SM	
31							Very Dense/Stiff Soil		
32–33							Sand & Silty Sand	SW SM	
34							Silty Sand & Sandy Silt	SM ML	
35							Clay & Silty Clay	CL	
36–37							Silty Sand & Sandy Silt	SM ML	
38–44							Clay & Silty Clay	CL	
45–46							Silty Sand & Sandy Silt	SM ML	
47–48							Clay	CL	
49–50									

0.010 Slotted Screen

TOTAL BORING DEPTH: 50 ft PAGE NO: 2 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

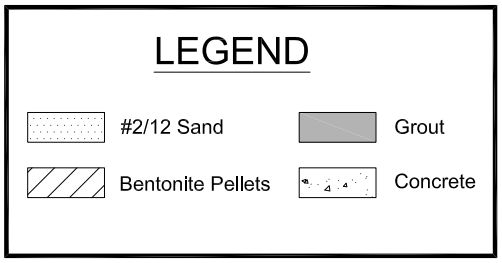
PROJECT NUMBER: 08-82-603 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 15 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6A STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

LEGEND



TOTAL BORING DEPTH: 50 ft PAGE NO: 3 OF 3

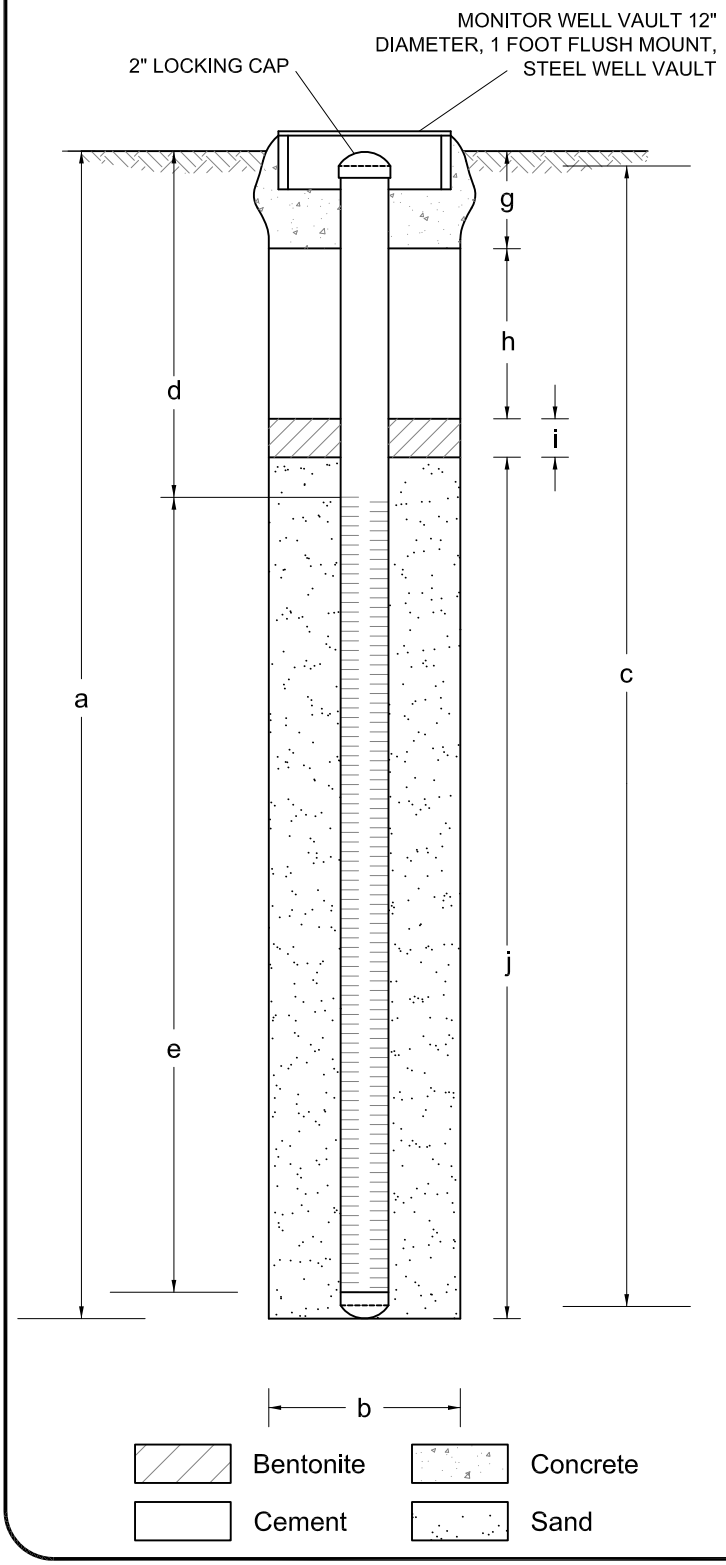
ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: --

STATIC GROUNDWATER DEPTH: --

MONITOR WELL DIAGRAM

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973

Project Number: 08-82-103
Project Name: BP 498
Location: 286 S Livermore Ave, Livermore, CA
Date(s): 01/13/2014 - 01/14/2014
Boring / Well No.: MW-6B



EXPLORATORY BORING

a. Total Depth: 70 ft.
b. Diameter: 8 in.
Drilling Method: Hollow Stem Auger

WELL CONSTRUCTION

Drilling Contractor: Gregg Drilling
c. Total Casing Length: 70 ft.
Material: Schedule 40 PVC
Diameter: 2 inches
d. Depth to Top Perforations: 60 ft.
e. Perforated Length: 10 ft.
Perforated Interval From: 60 ft. to 70 ft.
Perforation Type: Factory Slotted
Perforation Size: 0.010"
g. Surface Seal: 0 to 0.5 ft.
Surface Seal Material: Concrete
h. Backfill Length: 54.5 ft
Backfill Material: Neat Cement
i. Seal Length: 4 ft.
Seal Material: Bentonite
j. Filter Pack Length: 11 ft.
Filter Pack Material: #2/12 Sand

NOTES

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-60 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 13 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
1–6							Air knife to 6.5'		
7–14							No recovery; silty gravel		
15–16			0.4	Dry	Light Brown	Medium Dense	Gravel with silt and sand (70, 20, 10); coarse gravel; medium dense; non plastic;	GM	
17			1.5	Moist	Light Brown	Medium Dense	Clayey gravel with sand (60,25,15); coarse gravel; low plasticity; medium dense;	GC	
18–19			7.3	Moist	Light Brown	Medium Dense	Clayey gravel with sand (60,20,20); coarse gravel; low plasticity; medium dense;	GC	
20–21			9.0	Moist	Light Brown	Medium Dense	Gravel with silt and sand (70, 20, 10); fine to coarse gravel; non plastic; medium dense;	GM	
22–23			35.0	Moist	Light Brown	Loose to Medium Dense	Silty gravel with sand (60,25,15); coarse gravel; low plasticity; loose to medium dense;	GC	
24–25			16.5	Moist	Light Brown	Medium Dense	Gravel with silt and sand (70,20,10); coarse gravel; non plastic; medium dense; olive brown mottling;	GM	

TOTAL BORING DEPTH: 70 ft PAGE NO: 1 OF 3

▽ ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: 46.5 ft

▼ STATIC GROUNDWATER DEPTH: - -

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

PROJECT NUMBER: 08-82-60 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 13 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
26			35.6	Moist	Olive Brown	Medium Dense	Poorly graded gravel with sand (75,20,5); fine gravel; non plastic; poorly graded;	GP	None
27			58.6	Moist	Olive Brown	Dense	Poorly graded gravel (90,5,5); fine gravel; non plastic; trace sand	GP	
28									
29			74.4	Moist	Olive Brown	Medium Dense	Poorly graded gravel with sand (75,20,5); fine gravel; non plastic; poorly graded; discoloration;	GP	
30			19.6	Moist	Olive Brown	Medium Dense to Loose	Poorly graded gravel (85,10,5); fine to coarse gravel; non plastic; poorly graded; discoloration;	GP	
31									
32									
33			2.7 2.0	Moist	Brown	Stiff	Lean clay with sand (5,10,85); fine grained; low to medium plasticity;trace gravel	CL	
34									
35									
36			4.2	Moist	Brown	Loose	Poorly graded gravel with sand (80,15,5); fine to coarse gravel; non plastic; poorly graded;	GP	
37			3.0	Moist	Brown	Firm	Lean clay (0, 5,95); fine grained; medium plasticity;trace sand	CL	
38									
39									
40									
41									
42			1.9	Moist	Brown	Firm	Lean clay with sand (5,10,85); fine grained; low to medium plasticity;trace gravel; dark brown mottling;	CL	
43									
44									
45				Moist	Brown	Very Stiff	Clay (5,5,90); fine grained; high plasticity; trace sand and gravel	CH	
46	▽			Wet	Brown	Loose	Well graded sand with silt (5,85,10); medium to coarse sand; non plastic;	SW	
47				Wet to Moist	Brown	Firm	Clay (5,5,90); fine grained; high plasticity; trace sand and gravel	CH	
48				Moist	Brown	Firm	Lean clay with sand (5,10,85); fine grained;medium to high plasticity;trace gravel	CL	
49									
50									

TOTAL BORING DEPTH: 70 ft PAGE NO: 2 OF 3

▽ ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: 46.5 ft

▼ STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

BROADBENT LITHOLOGIC AND MONITOR WELL CONSTRUCTION LOG

PROJECT NAME: BP 498 SITE ADDRESS: 286 S. Livermore Avenue, Livermore, California

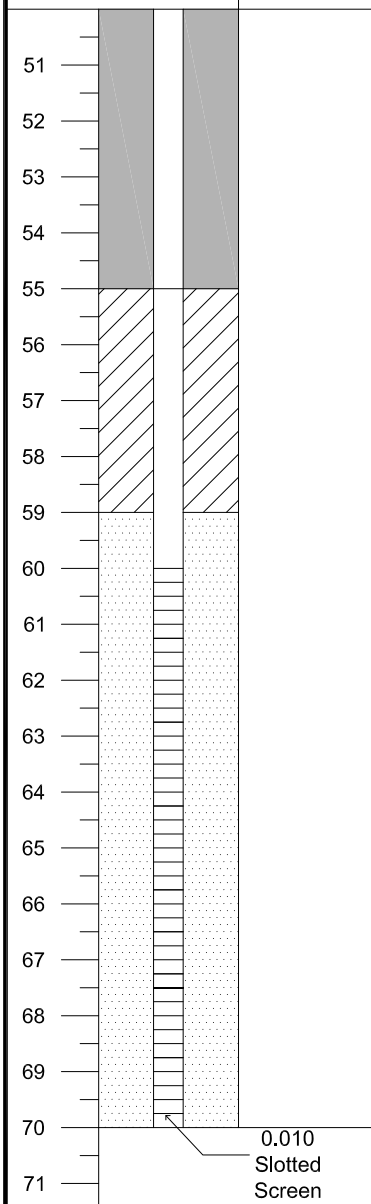
PROJECT NUMBER: 08-82-60 LEGAL DESC: APN:

LOGGED BY: James Ramos FACILITY ID OR WAIVER: NOI NUMBER:

DATE: 1 / 13 /2014 START: DRILLING COMPANY: Gregg Drilling DRILLER: Sean Rakow

WELLID: MW-6B STOP: DRILLING METHOD: 8 In. Hollow Stem Auger SAMPLE METHOD: -

DEPTH (FEET)	SOIL BORING	SAMPLE ID	PID (ppm)	MOISTURE	COLOR	CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
51				Moist	Dark Brown	Firm	Silt with gravel (15,10,75); fine grained; non plastic to low plasticity	ML	
52				Moist	Dark Brown	Firm	Silt with sand (10,15,75); fine grained; low plasticity	ML	
53				Wet	Dark Brown	Stiff	Lean clay with sand (5,10,85); fine grained; medium to high plasticity	CL	
54				Wet	Dark Brown	Firm	Silt with sand (5,10,85); fine grained; non plastic to low plasticity	ML	
55									
56									
57				Wet	Brown	Loose	Poorly graded sand with silt (5,85,10); fine to medium sand; poorly graded; non plastic	SP	
58									
59				Wet	Brown	Medium Dense	Poorly graded sand with gravel (20,75,5); coarse sand; poorly graded	SP	
60									
61									
62				Wet	Brown	Dense	Gravel with sand (25,70,5); fine gravel; trace fines	GP	
63									
64				Wet	Brown	Medium Dense	Poorly graded sand with silt (5,70,25); fine sand; poorly graded; non plastic	SP	
65				Moist	Brown	Firm	Gravelly clay (35,10,55); fine grained; low plasticity	CL	
66									
67				Wet	Brown	Firm	Clay (5,10,85); fine grained; high plasticity; olive brown mottling	CL	
68									
69				Moist	Brown	Stiff	Silt with gravel (65,15,20); fine grained; non plastic to low plasticity	ML	
70									
71									
72									
73									
74									
75									



#2/12 Sand
Grout
Bentonite Pellets
Concrete

TOTAL BORING DEPTH: 70 ft PAGE NO: 3 OF 3

ESTIMATED FIRST ENCOUNTERED GROUNDWATER DEPTH: 46.5 ft

STATIC GROUNDWATER DEPTH: --

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

Appendix E

Zone 7 Water Agency Permit

ZONE 7 WATER AGENCY

100 NORTH CANYONS PARKWAY, LIVERMORE, CALIFORNIA 94551 VOICE (925) 454-5000 FAX (925) 245-9306
E-MAIL whong@zone7water.com

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT BP Station #498
286 S. Livermore Ave., Livermore, CA

Coordinates Source _____ ft. Accuracy∀ _____ ft.
LAT: _____ ft. LONG: _____ ft.
APN 97-109-6

CLIENT
Name Atlantic Richfield Company
Address P.O. Box 1257 Phone (925)275-3803
City San Ramon Zip 94583

APPLICANT
Name Jason Duda
Email jduda@broadbentinc.com Fax (530) 566-1401
Address 1370 Ridgewood Dr., Ste. 5 Phone (530) 566-1400
City Chico Zip 95973

TYPE OF PROJECT:
Well Construction X Geotechnical Investigation
Well Destruction — Contamination Investigation X
Cathodic Protection — Other —

PROPOSED WELL USE:
Domestic — Irrigation —
Municipal — Remediation —
Industrial — Groundwater Monitoring X
Dewatering — Other —

DRILLING METHOD:
Mud Rotary — Air Rotary — Hollow Stem Auger X
Cable Tool — Direct Push — Other CPT - BORINGS

DRILLING COMPANY Gregg Drilling

DRILLER'S LICENSE NO. _____

WELL SPECIFICATIONS: MW-5A/5B + MW-6A/6B
Drill Hole Diameter 8 in. Maximum Depth 70 ft.
Casing Diameter 2 in.
Surface Seal Depth 36-60 ft. Number 4

SOIL BORINGS: SB-17 THRU SB-20
Number of Borings 4 Maximum Depth 70 ft.
Hole Diameter 2 in.

ESTIMATED STARTING DATE 1-13-14
ESTIMATED COMPLETION DATE 1-15-14

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ Date 12-3-13

ATTACH SITE PLAN OR SKETCH

FOR OFFICE USE

PERMIT NUMBER 2014003
WELL NUMBER 3S/2E-9N36 to 9N40 (MW5A,5B,6A & 6B)
APN 97-0109-006-00

PERMIT CONDITIONS
(Circled Permit Requirements Apply)

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to your proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original **Department of Water Resources Water Well Drillers Report (DWR Form 188), signed by the driller.**
3. Permit is void if project not begun within 90 days of approval date.
4. **Notify Zone 7 at least 24 hours before the start of work.**

B. WATER SUPPLY WELLS
1. Minimum surface seal diameter is four inches greater than the well casing diameter.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.
3. Grout placed by tremie.
4. An access port at least 0.5 inches in diameter is required on the wellhead for water level measurements.
5. A sample port is required on the discharge pipe near the wellhead.

(C.) GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal diameter is four inches greater than the well or piezometer casing diameter.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.
3. Grout placed by tremie.

D. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

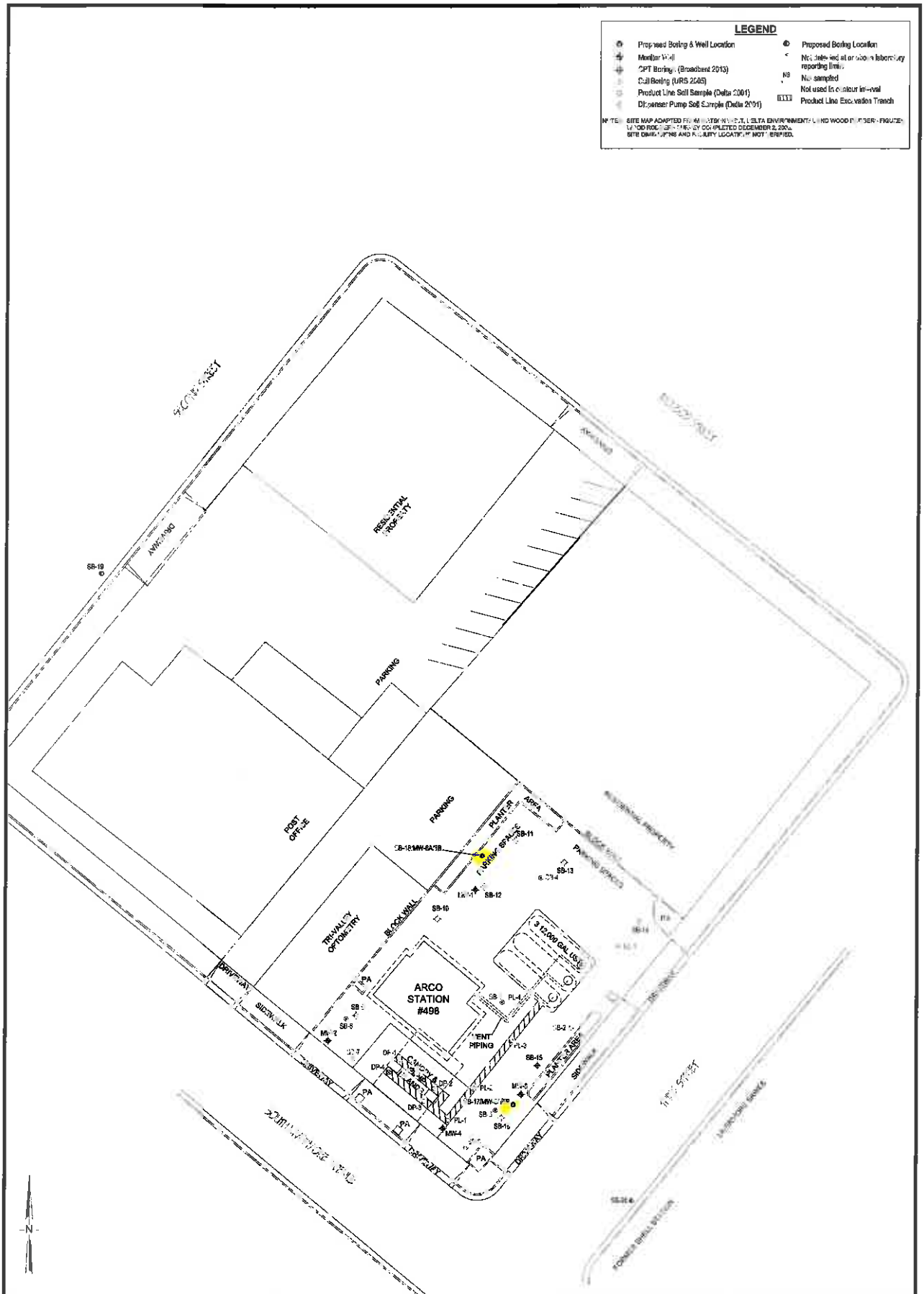
E. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

F. WELL DESTRUCTION. See attached.

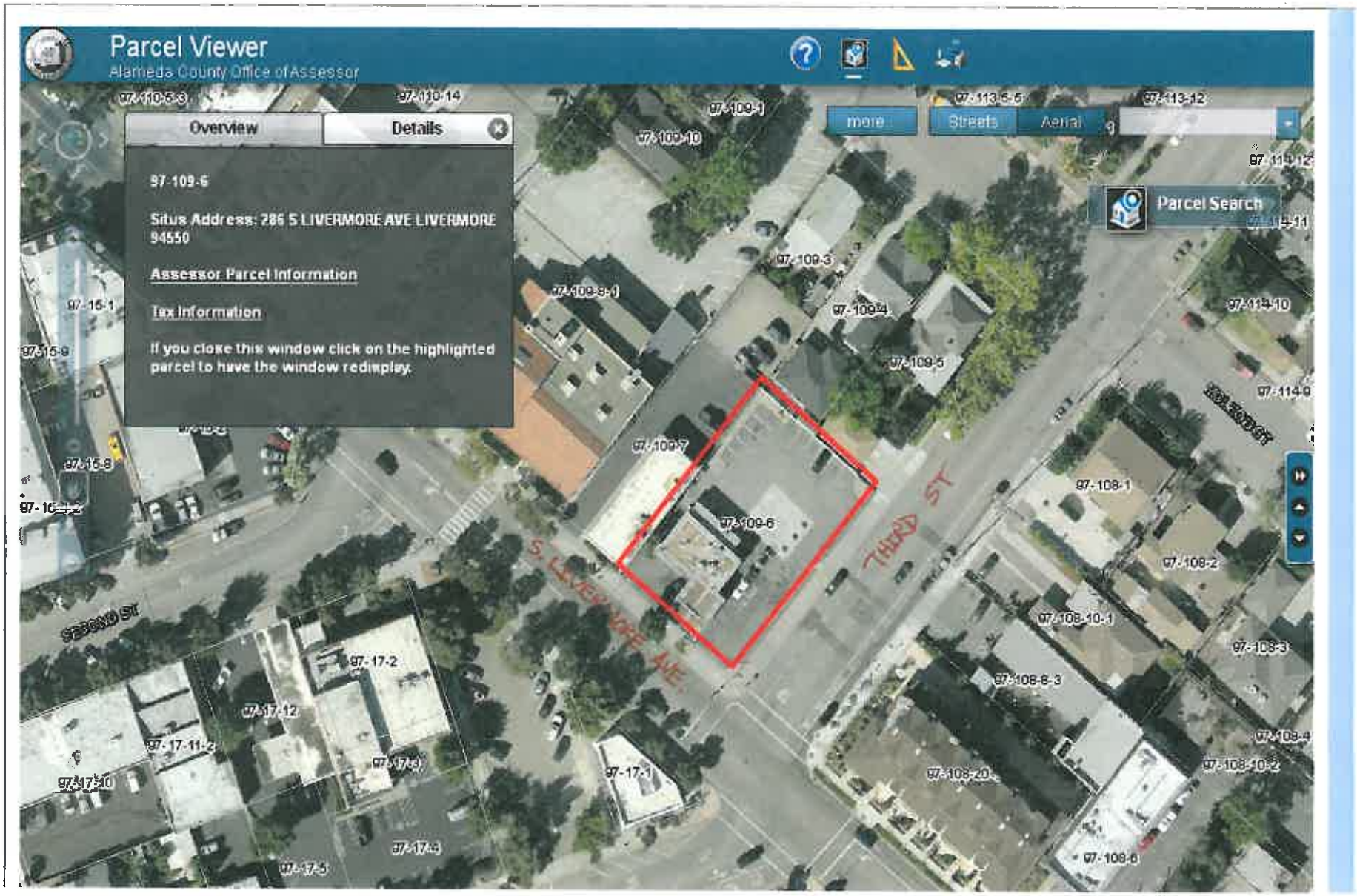
(G.) SPECIAL CONDITIONS. Submit to Zone 7 within 60 days after completion of permitted work the well installation report **including all soil and water laboratory analysis results.**

Approved Wyman Hong Date 1/3/14
Wyman Hong

Revised: January 4, 2010



0 40 80 SCALE (ft)	BROADBENT 1370 Ridgewood Dr., Suite 5 Chico, California 95973 Project No.: 08-82-103 Date: 7/24/2013	Station #498 286 South Livermore Avenue Livermore, California	Site Map with Proposed Boring and Well Locations	Drawing 2


Parcel Viewer
Alameda County Office of Assessor
Overview
Details
97-109-6
Situs Address: 286 S LIVERMORE AVE LIVERMORE 94550
Assessor Parcel Information
Tax Information
If you close this window click on the highlighted parcel to have the window redisplay.
more
Streets
Aerial
Parcel Search
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97-109-7
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97-16-3
97-15-1
97-15-9
97-114-9
97-114-10
97-114-11
97-113-12
97-110-14
S. LIVERMORE AVE
THIRD ST
SECOND ST

Appendix F

CPT Data Package and Field Notes

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

January 9, 2014

Broadbent
Attn: Kevin

Subject: CPT Site Investigation
BP-498
Livermore, California
GREGG Project Number: 14-005MA

Dear Sir:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☐
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☒
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Pressuremeter Testing	(PMT)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden
Operations Manager

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
SB-17	1/08/14	45	45, 65	-	-
SB-18	1/08/14	45	45, 65	-	-
SB-19	1/07/14	75	50, 63	-	-
SB-20	1/07/14	75	48, 65	-	-

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

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Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986 pp. 791-803.

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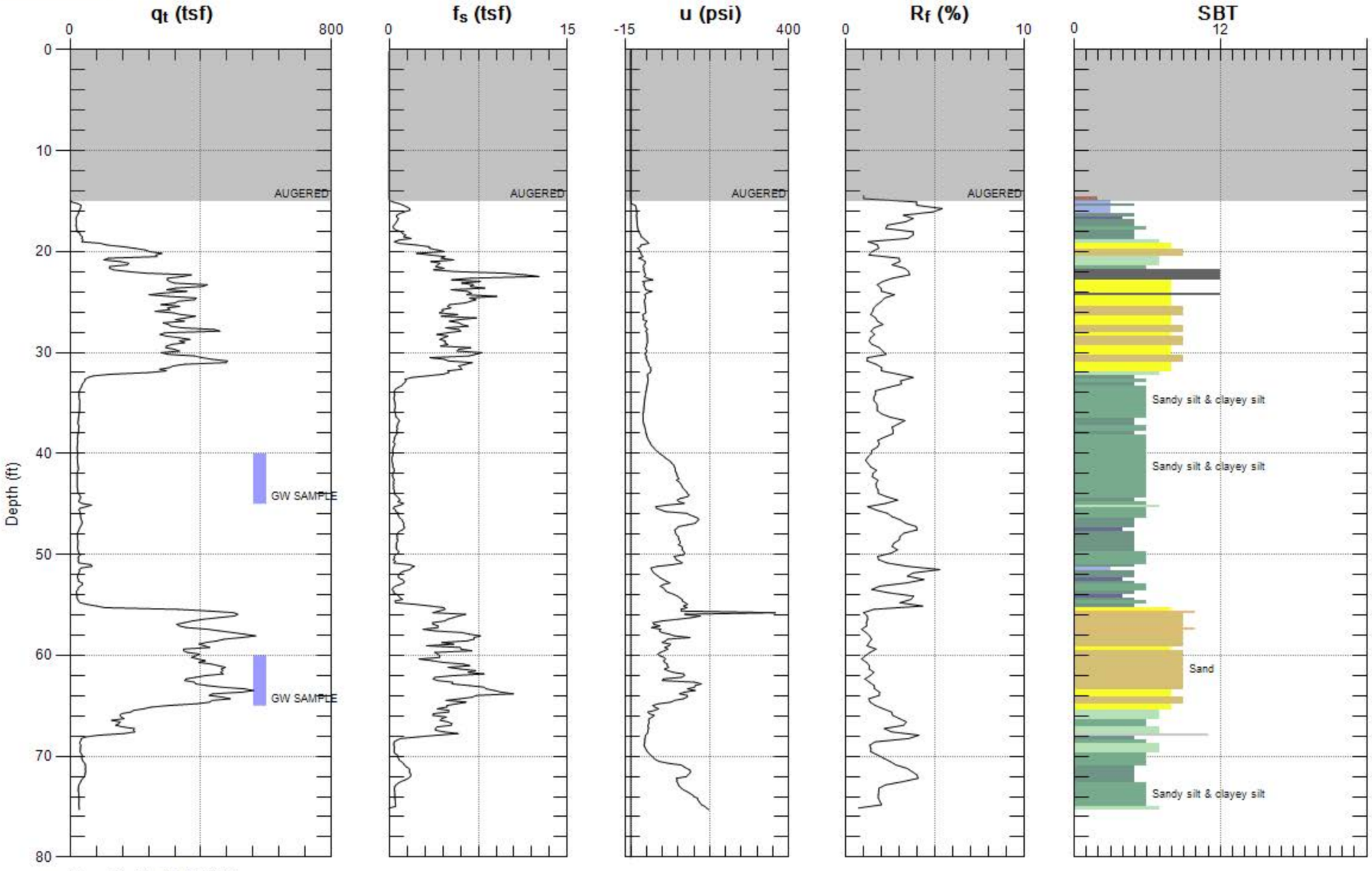
Copies of ASTM Standards are available through www.astm.org

BROADBENT

Site: BP-498
Sounding: SB-17

Engineer: KEVIN
Date: 1/8/2014 02:47

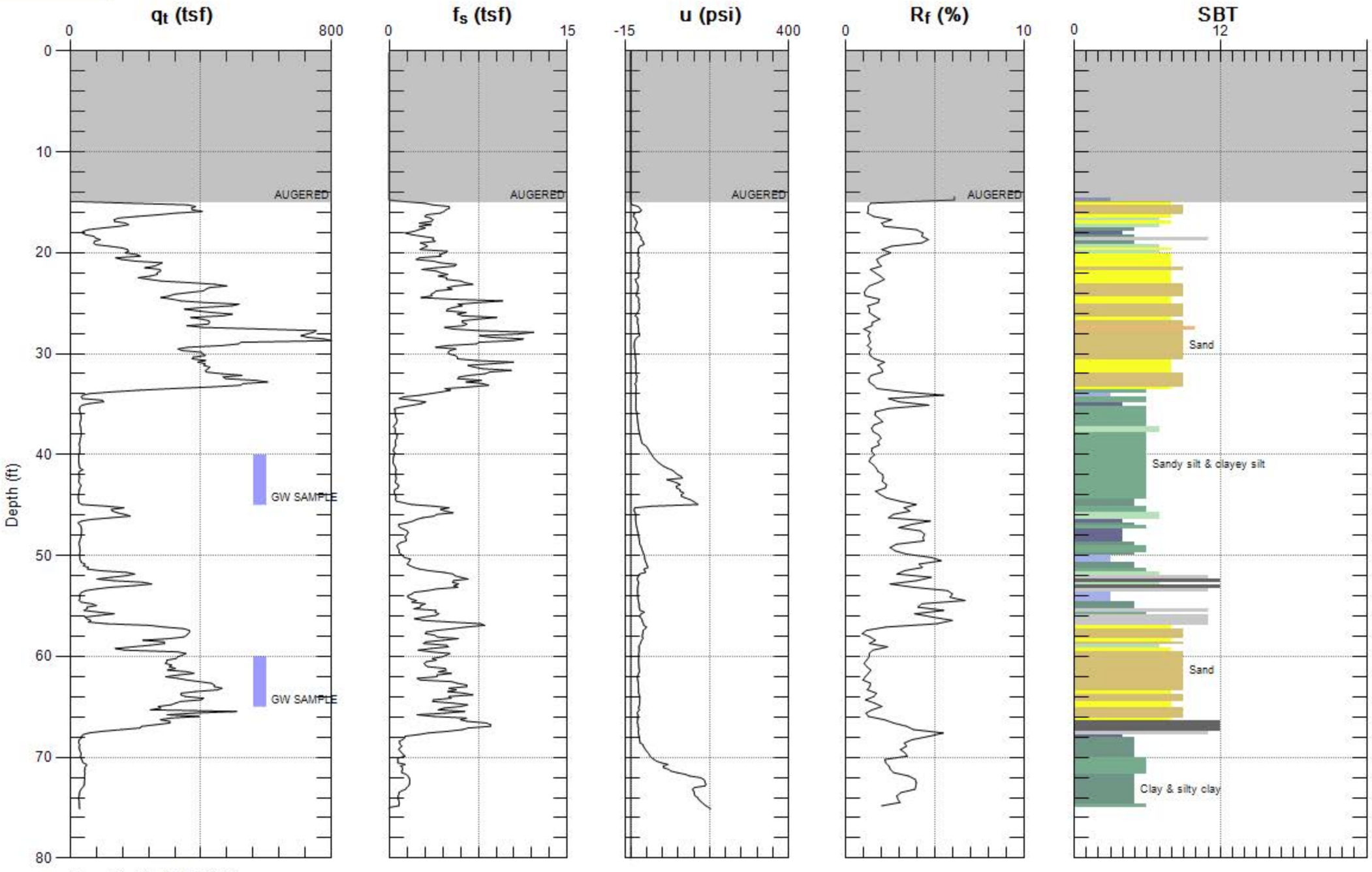


Max. Depth: 75.295 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

BROADBENT

Site: BP-498
Sounding: SB-18
Engineer: KEVIN
Date: 1/8/2014 08:06



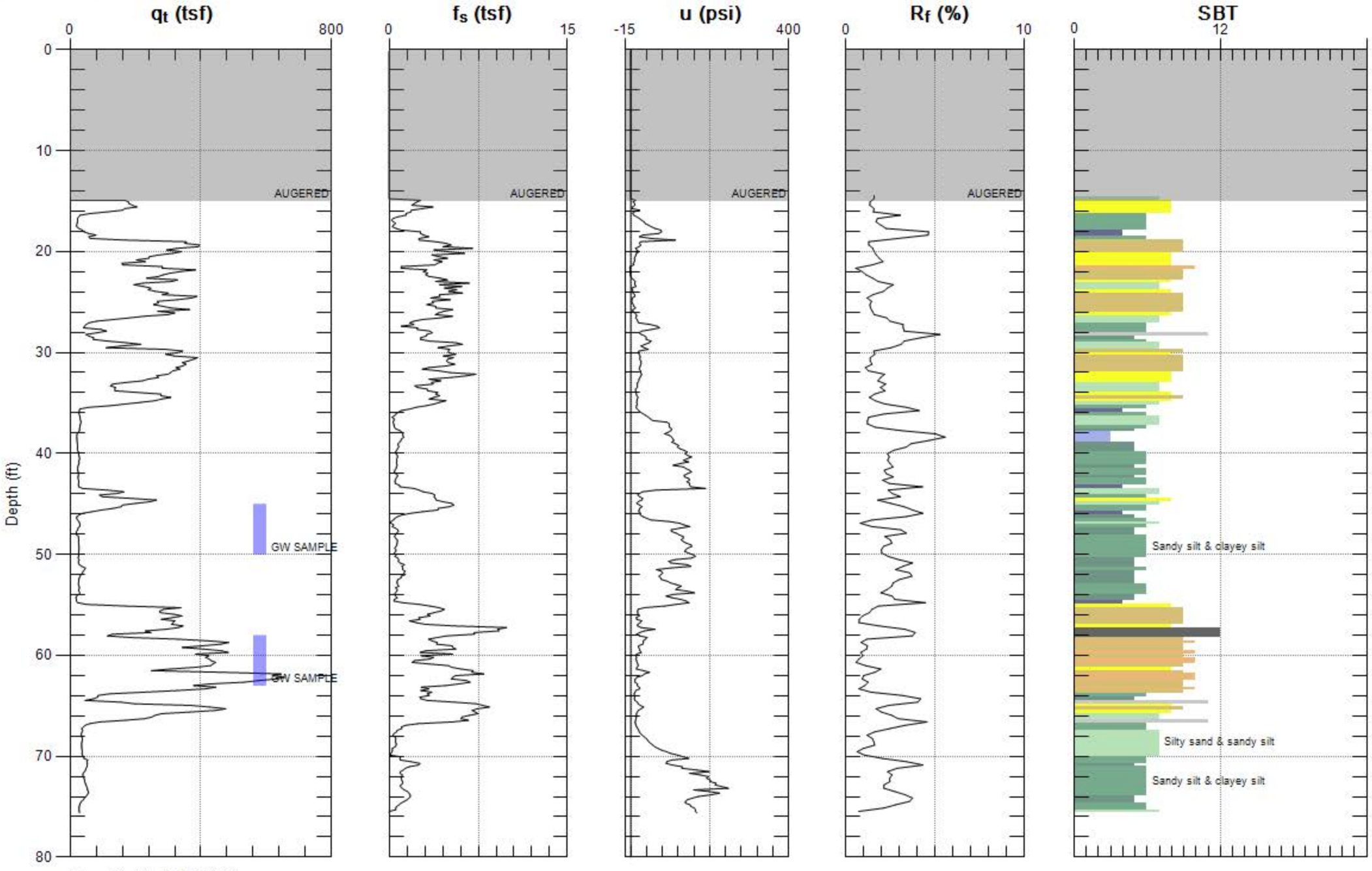
Max. Depth: 75.131 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

BROADBENT

Site: BP-498
Sounding: SB-19

Engineer: KEVIN
Date: 1/7/2014 03:55



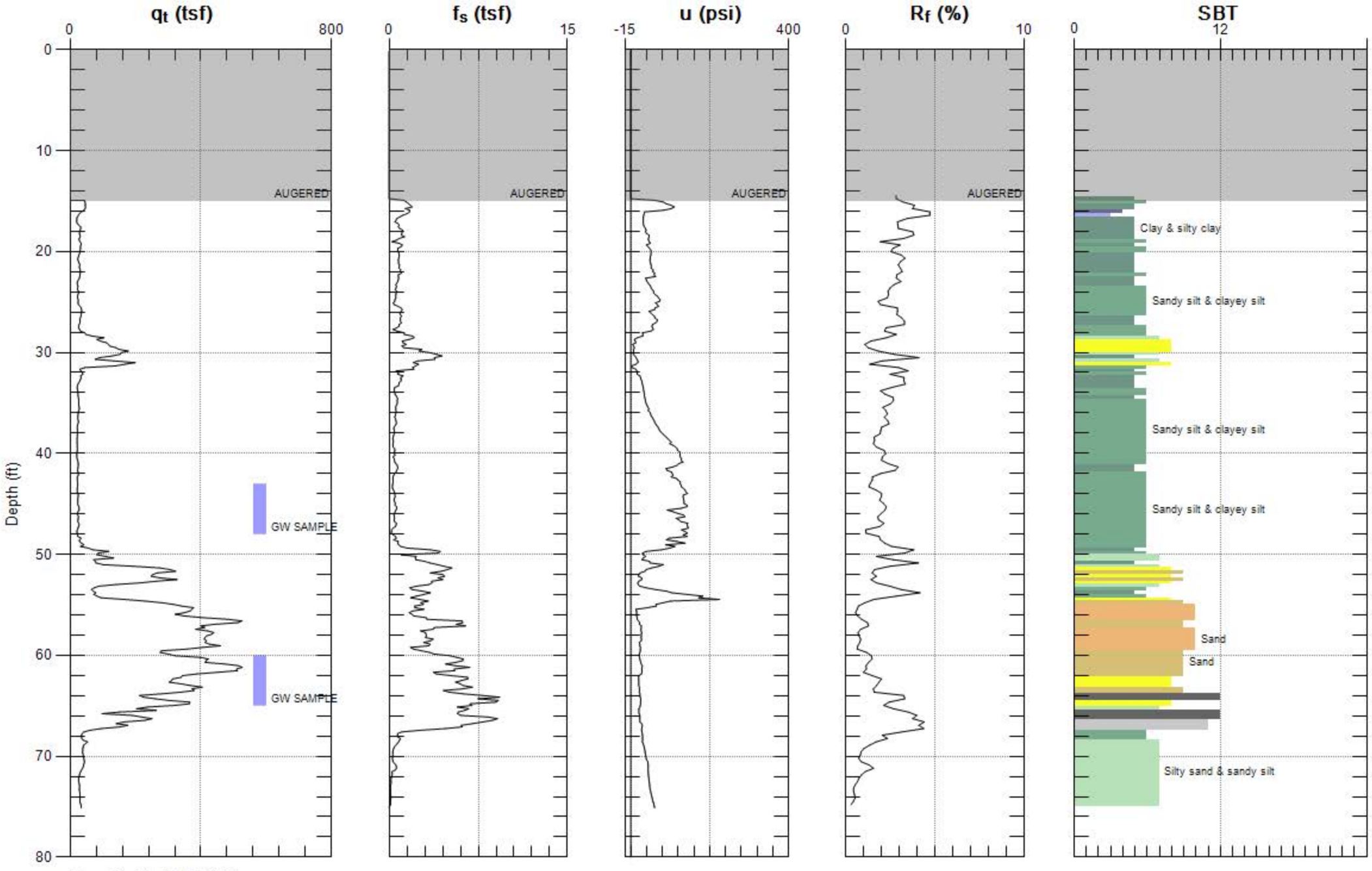
Max. Depth: 75.623 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

BROADBENT

Site: BP-498
Sounding: SB-20

Engineer: KEVIN
Date: 1/7/2014 08:47



Max. Depth: 75.131 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL

DAILY REPORT
Page 1 of ____

Project: BP 498 Project No.: 08-82-603
Field Representative(s): JRD Day: Tues. Date: 12-17-13
Time Onsite: From: ____ To: ____; 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 ___ Other PPE (describe) ____

Weather: Sunny, Clear
Equipment In Use: Geophysical Locating equipment
Visitors: ____

TIME:	WORK DESCRIPTION:
9:10	Arrive @ Site. Meet Statewide + Norcal
	Conduct safety meeting.
9:40	Begin traffic control setup @ SB-19. Had to wait
	for cars to move from parking spots.
	Many utilities but able to find appropriate location.
12:00	Begin traffic control setup @ SB-20
	Found suitable location
13:25	Cleanup traffic control. Take break.
13:35	Statewide offsite
9:40	Begin setup @ SB-17/MW-5A/5B
	Location clear of utilities
14:50	Cleared location @ SB-18/MW-6A/6B
15:00	Offsite.

Signature: Jenn Burk

BROADBENT

DAILY REPORT

Page _____ of _____

Project: BP 498 Project No.: 08-88-103

Field Representative(s): KCG, RG, MH, LM, MR Day: Thursday Date: 01-02-14

Time Onsite: From: 0800 To: 1630 ; 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 ___ Other PPE (describe) _____

Weather: Clear, Cool

Equipment In Use: Air knife/Vac Truck

Visitors: _____

TIME:	WORK DESCRIPTION:
0800	Arrive on site, Conduct Daily Toolbox meeting
0900	Set up traffic control
0920	Set up on SB-20, clear 2 CPT holes to 6.5'
1230	Set up on SB-19. clear 2 CPT holes to 6.5'
1430	Set up on SB-18 (North Side of Station), clear 2 CPT holes to 6.5'
1500	Steve Hammer depart from site
1615	Clean up site
1630	Depart from site

Signature: Kevin Crook

Revision: 1/24/2012

BROADBENT

DAILY REPORT

Page ____ of ____

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

Field Representative(s): KG PG Day: Friday Date: 1-3-14

Time Onsite: From: 0800 To: ____; 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 ___ Other PPE (describe) ____

Weather: cool, partly cloudy

Equipment In Use: Vacuum truck / Air knife

Visitors: ____

TIME:	WORK DESCRIPTION:
0800	Arrive on Site, Conduct daily toolbox meeting
0830	Set up on SB-17, clear 2 CPT holes to 6.5', clear
	2 MW holes to 6.5'
1400	Set up on SB-13, clear 2 MW holes to 6.5'
1540	clean up site, 2 Drums full of soil

Signature: Kevin Cook

BROADBENT

DAILY REPORT

Page ____ of ____

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

Field Representative(s): KCG AM Day: Tuesday Date: 1-7-14

Time Onsite: From: 0645 To: 1945 ; 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 ___ Other PPE (describe) ____

Weather: Cloudy, Cool

Equipment In Use: CPT Rig, Auger

Visitors: Statewide, Gregg, Livermore City, Zone 7 water District

TIME:	WORK DESCRIPTION:
0645	Arrive on site
0700	Alex Martinez (BAI) and Statewide arrive on site
0800	Gregg Drilling arrives on site, Conduct Daily toolbox meeting
0850	Set up on SB-20. Auger to 15' to avoid refusal of CPT
	6" Asphault, ~~Sandy silt with large gravel~~, Sandy, Silty gravel
	80% gravel, 15% silt, <5% sand
1030	begin CPT advancement
1200	begin CPT for water sample @ 48' and 65'
1230	43-48', no water, wait for recharge/infiltration
1300	Collected SB-20-48 @ 1300
1330	collected SB-20-65
1445	Set up on SB-19, Auger to 15' (70% gravel, 25% silt, <5% sand)
1530	~~AM~~ begin CPT advancement
1715	begin CPT for water sample @ 50' and 63'
1809	50', no water, wait for infiltration, none after 50 min
1830	collected SB-19-63
1945	clean up and depart from site

Signature: Kevin Cook

Revision: 1.24.2012

BROADBENT

DAILY REPORT

Page _____ of _____

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

Field Representative(s): KCG, AM, SS Day: Wednesday Date: 1-8-14

Time Onsite: From: 0700 To: 1830; 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 ___ Other PPE (describe) _____

Weather: Cloudy, Cold

Equipment In Use: CPT, Auger

Visitors: Gregg Drilling

TIME:	WORK DESCRIPTION:
0700	Arrive on Site, Conduct daily toolbox meeting
0800	Setup on SB18, begin Augering to 15' to prevent CPT refusal (95% gravel, <5% silt)
0930	Begin CPT advancement
1040	Begin CPT advancement for water samples @ 40-45' & 60-65'
1055	Begin Augering SB-17
1315	Collected SB-18-40 (2 VOAs only)
1400	Collected SB-18-65
1430	Set up on SB-17
1620	Unable to collect sample at 45'
1700	Collected SB-17-65
1716	Strong HC oder when pulling up rods 10'-20'
1830	Clean up and Depart from Site

Signature: Kevin Cook

Revision: 1/24/2012

BROADBENT

DAILY REPORT

Page ____ of ____

Project: BP 498 Project No.: 08-82-6003

Field Representative(s): KCL JR Day: Monday Date: 1-13-14

Time Onsite: From: 0650 To: 1700 ; 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 ___ Other PPE (describe) ____

Weather: Clear, Cool

Equipment In Use: ____

Visitors: Chuck Carmel

TIME:	WORK DESCRIPTION:
0650	Arrive on site, conduct daily toolbox
0800	Set up on MW-6B
0845	Begin drilling MW-6B
1700	Depart from Site

Signature: Kevin Cook

Revision: 1/24/2012

BROADBENT

DAILY REPORT

Page ____ of ____

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

Field Representative(s): KCE JR SJ Day: Tuesday Date: 1-14-14

Time Onsite: From: 0700 To: 1630 ; 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 ___ Other PPE (describe) ____

Weather: ____

Equipment In Use: ____

Visitors: Jeff Jones

TIME:	WORK DESCRIPTION:
0700	Arrive on site, Conduct daily toolbox
0745	Begin setting SB 6B
1045	Set up on SB 5B
1630	Clean up and Depart from Site

Signature: Kevin Cook

Revision: 1/24/2012

BROADBENT

DAILY REPORT

Page ____ of ____

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

Field Representative(s): KCG JR Day: Wednesday Date: 1-15-14

Time Onsite: From: 0700 To: 1500 ; 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: partly cloudy, cool

Equipment In Use: ____

Visitors: ____

TIME:	WORK DESCRIPTION:
0700	Arrive on site, Conduct Daily Toolbox meeting
0730	Set up on MW-5A
0800	Begin Drilling MW-5A
1045	Set up on MW-6A
1100	Begin Drilling MW-6A
1300	Begin setting casing
1415	20 Drums full, 19 soil, 1 decon/purge water
1500	Clean up site, Team members depart from site
↓	KCG departing to Grainger to purchase drum labels
1630	Return to site to label drums, found 1 additional soil drum
	21 total 20 soil, 1 water
1700	Depart from site

Signature: Kevin Cook

Appendix G

Geotracker Upload Receipts

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_Z FILE

SUCCESS

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

Submittal Type:	**GEO_Z**
Report Title:	**Geo Z (MW-5A/B & MW-6A/B)**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**Geo_Z.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/21/2014 3:16:08 PM**
Confirmation Number:	**6579825699**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_XY FILE

SUCCESS

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

Submittal Type:	**GEO_XY**
Report Title:	**Geo XY (MW-5A/B & MW-6A/B)**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**Geo_XY.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/21/2014 3:15:13 PM**
Confirmation Number:	**4099662125**

VIEW GEO_XY SUBMITTAL DATA ON MAP

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:	**1Q14 Geowell**
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:	**4/21/2014 2:58:26 PM**
Confirmation Number:	**2728090405**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_MAP FILE

SUCCESS

Your GEO_MAP file has been successfully submitted!

Submittal Type:	**GEO_MAP**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**Drawing 2 - Site Map.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/21/2014 2:59:13 PM**
Confirmation Number:	**8672074794**

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:	**CPT Assessment 2014 - GW Sample Analytical Data**
Report Type:	**Site Investigation**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**440-67393-1_24 Jan 14 1047_EDF.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/21/2014 2:55:56 PM**
Confirmation Number:	**5297105908**

VIEW QC REPORT

VIEW DETECTIONS REPORT

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:	**1Q14 GWM Analytical Data**
Report Type:	**Monitoring Report - Semi-Annually**
Facility Global ID:	**T0600124081**
Facility Name:	**ARCO #0498**
File Name:	**440-71095-1_10 Mar 14 2056_EDF.zip**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/21/2014 2:57:29 PM**
Confirmation Number:	**4431520581**

VIEW QC REPORT

VIEW DETECTIONS REPORT

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**SB-20**
Facility Name:	**ARCO #0498**
File Name:	**SB-20.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:03:43 PM**
Confirmation Number:	**7733842372**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**SB-19**
Facility Name:	**ARCO #0498**
File Name:	**SB-19.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:03:06 PM**
Confirmation Number:	**1619264125**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**SB-18**
Facility Name:	**ARCO #0498**
File Name:	**SB-18.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:02:07 PM**
Confirmation Number:	**8370690524**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**SB-17**
Facility Name:	**ARCO #0498**
File Name:	**SB-17.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:01:24 PM**
Confirmation Number:	**2164513766**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**MW-6B**
Facility Name:	**ARCO #0498**
File Name:	**MW-6B.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:14:09 PM**
Confirmation Number:	**3582964062**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**MW-6A**
Facility Name:	**ARCO #0498**
File Name:	**MW-6A.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:13:08 PM**
Confirmation Number:	**3954230606**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**MW-5B**
Facility Name:	**ARCO #0498**
File Name:	**MW-5B.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:12:10 PM**
Confirmation Number:	**3742699801**

STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_BORE FILE

SUCCESS

Your GEO_BORE file has been successfully submitted!

Submittal Type:	**GEO_BORE**
Facility Global ID:	**T0600124081**
Field Point:	**MW-5A**
Facility Name:	**ARCO #0498**
File Name:	**MW-5A.pdf**
Organization Name:	**Broadbent & Associates, Inc.**
Username:	**BROADBENT-C**
IP Address:	**69.170.45.210**
Submittal Date/Time:	**4/23/2014 2:10:51 PM**
Confirmation Number:	**9707023382**

Appendix H

CPT Laboratory Analytical Report

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

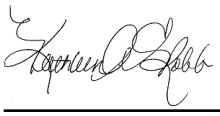
ANALYTICAL REPORT

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

TestAmerica Job ID: 440-67393-1
Client Project/Site: ARCO 0498, Livermore

For:
Broadbent & Associates, Inc.
1370 Ridgewood Drive
Suite 5
Chico, California 95973

Attn: Mr. Jason Duda



Authorized for release by:
1/24/2014 10:05:28 AM

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: 440-67393-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-67393-1	SB-20-48	Water	01/07/14 13:00	01/14/14 09:45
440-67393-2	SB-20-65	Water	01/07/14 13:30	01/14/14 09:45
440-67393-3	SB-19-63	Water	01/07/14 18:30	01/14/14 09:45
440-67393-4	SB-18-40	Water	01/08/14 13:15	01/14/14 09:45
440-67393-5	SB-18-65	Water	01/08/14 14:00	01/14/14 09:45
440-67393-6	SB-17-65	Water	01/08/14 17:00	01/14/14 09:45

Job ID: 440-67393-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-67393-1

Comments
No additional comments.

Receipt
The samples were received on 1/14/2014 9:45 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: The following sample(s) was diluted due to the abundance of non-target analytes: SB-18-40 (440-67393-4). Elevated reporting limits (RLs) are provided.

No other analytical or quality issues were noted.

VOA Prep
No analytical or quality issues were noted.

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

TestAmerica Job ID: 440-67393-1

Client Sample ID: SB-20-48
Date Collected: 01/07/14 13:00
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-1
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			01/18/14 04:36	1
1,2-Dichloroethane	ND		0.50		ug/L			01/18/14 04:36	1
Benzene	ND		0.50		ug/L			01/18/14 04:36	1
Ethanol	ND		150		ug/L			01/18/14 04:36	1
Ethylbenzene	ND		0.50		ug/L			01/18/14 04:36	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/18/14 04:36	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/18/14 04:36	1
m,p-Xylene	ND		1.0		ug/L			01/18/14 04:36	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/18/14 04:36	1
o-Xylene	ND		0.50		ug/L			01/18/14 04:36	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/18/14 04:36	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/18/14 04:36	1
Toluene	ND		0.50		ug/L			01/18/14 04:36	1
Xylenes, Total	ND		1.0		ug/L			01/18/14 04:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*110*		*80 - 120*		*01/18/14 04:36*	*1*
Dibromofluoromethane (Surr)	*109*		*76 - 132*		*01/18/14 04:36*	*1*
Toluene-d8 (Surr)	*113*		*80 - 128*		*01/18/14 04:36*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**1400**		50		ug/L			01/21/14 12:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*117*		*65 - 140*		*01/21/14 12:05*	*1*

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

TestAmerica Job ID: 440-67393-1

Client Sample ID: SB-20-65
Date Collected: 01/07/14 13:30
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-2
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			01/18/14 05:04	1
1,2-Dichloroethane	ND		0.50		ug/L			01/18/14 05:04	1
Benzene	ND		0.50		ug/L			01/18/14 05:04	1
Ethanol	ND		150		ug/L			01/18/14 05:04	1
Ethylbenzene	ND		0.50		ug/L			01/18/14 05:04	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/18/14 05:04	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/18/14 05:04	1
m,p-Xylene	ND		1.0		ug/L			01/18/14 05:04	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/18/14 05:04	1
o-Xylene	ND		0.50		ug/L			01/18/14 05:04	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/18/14 05:04	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/18/14 05:04	1
Toluene	ND		0.50		ug/L			01/18/14 05:04	1
Xylenes, Total	ND		1.0		ug/L			01/18/14 05:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*107*		*80 - 120*		*01/18/14 05:04*	*1*
Dibromofluoromethane (Surr)	*109*		*76 - 132*		*01/18/14 05:04*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*01/18/14 05:04*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**54**		50		ug/L			01/21/14 12:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*97*		*65 - 140*		*01/21/14 12:32*	*1*

Client Sample ID: SB-19-63
Date Collected: 01/07/14 18:30
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-3
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		0.50		ug/L			01/18/14 05:32	1
1,2-Dichloroethane	ND		0.50		ug/L			01/18/14 05:32	1
Benzene	ND		0.50		ug/L			01/18/14 05:32	1
Ethanol	ND		150		ug/L			01/18/14 05:32	1
Ethylbenzene	ND		0.50		ug/L			01/18/14 05:32	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/18/14 05:32	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/18/14 05:32	1
m,p-Xylene	ND		1.0		ug/L			01/18/14 05:32	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/18/14 05:32	1
o-Xylene	ND		0.50		ug/L			01/18/14 05:32	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/18/14 05:32	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/18/14 05:32	1
Toluene	ND		0.50		ug/L			01/18/14 05:32	1
Xylenes, Total	ND		1.0		ug/L			01/18/14 05:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*109*		*80 - 120*		*01/18/14 05:32*	*1*
Dibromofluoromethane (Surr)	*113*		*76 - 132*		*01/18/14 05:32*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*01/18/14 05:32*	*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			01/21/14 13:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*109*		*65 - 140*		*01/21/14 13:00*	*1*

Client Sample ID: SB-18-40
Lab Sample ID: 440-67393-4
Date Collected: 01/08/14 13:15
Matrix: Water
Date Received: 01/14/14 09:45

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		25		ug/L			01/18/14 06:00	50
1,2-Dichloroethane	ND		25		ug/L			01/18/14 06:00	50
Benzene	ND		25		ug/L			01/18/14 06:00	50
Ethanol	ND		7500		ug/L			01/18/14 06:00	50
Ethylbenzene	ND		25		ug/L			01/18/14 06:00	50
Ethyl-t-butyl ether (ETBE)	ND		25		ug/L			01/18/14 06:00	50
Isopropyl Ether (DIPE)	ND		25		ug/L			01/18/14 06:00	50
m,p-Xylene	ND		50		ug/L			01/18/14 06:00	50
Methyl-t-Butyl Ether (MTBE)	**3000**		25		ug/L			01/18/14 06:00	50
o-Xylene	ND		25		ug/L			01/18/14 06:00	50
Tert-amyl-methyl ether (TAME)	ND		25		ug/L			01/18/14 06:00	50
tert-Butyl alcohol (TBA)	**660**		500		ug/L			01/18/14 06:00	50
Toluene	ND		25		ug/L			01/18/14 06:00	50
Xylenes, Total	ND		50		ug/L			01/18/14 06:00	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*106*		*80 - 120*		*01/18/14 06:00*	*50*
Dibromofluoromethane (Surr)	*113*		*76 - 132*		*01/18/14 06:00*	*50*
Toluene-d8 (Surr)	*111*		*80 - 128*		*01/18/14 06:00*	*50*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		500		ug/L			01/21/14 16:00	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*104*		*65 - 140*		*01/21/14 16:00*	*10*

Client Sample ID: SB-18-65
Date Collected: 01/08/14 14:00
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-5
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			01/18/14 06:28	1
1,2-Dichloroethane	ND		0.50		ug/L			01/18/14 06:28	1
Benzene	ND		0.50		ug/L			01/18/14 06:28	1
Ethanol	ND		150		ug/L			01/18/14 06:28	1
Ethylbenzene	ND		0.50		ug/L			01/18/14 06:28	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/18/14 06:28	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/18/14 06:28	1
m,p-Xylene	ND		1.0		ug/L			01/18/14 06:28	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/18/14 06:28	1
o-Xylene	ND		0.50		ug/L			01/18/14 06:28	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/18/14 06:28	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/18/14 06:28	1
Toluene	ND		0.50		ug/L			01/18/14 06:28	1
Xylenes, Total	ND		1.0		ug/L			01/18/14 06:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*106*		*80 - 120*		*01/18/14 06:28*	*1*
Dibromofluoromethane (Surr)	*111*		*76 - 132*		*01/18/14 06:28*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*01/18/14 06:28*	*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			01/21/14 13:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*102*		*65 - 140*		*01/21/14 13:54*	*1*

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

TestAmerica Job ID: 440-67393-1

Client Sample ID: SB-17-65
Date Collected: 01/08/14 17:00
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-6
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			01/20/14 14:49	1
1,2-Dichloroethane	ND		0.50		ug/L			01/20/14 14:49	1
Benzene	**0.71**		0.50		ug/L			01/20/14 14:49	1
Ethanol	ND		150		ug/L			01/20/14 14:49	1
Ethylbenzene	**13**		0.50		ug/L			01/20/14 14:49	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/20/14 14:49	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/20/14 14:49	1
m,p-Xylene	**42**		1.0		ug/L			01/20/14 14:49	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/20/14 14:49	1
o-Xylene	**18**		0.50		ug/L			01/20/14 14:49	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/20/14 14:49	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/20/14 14:49	1
Toluene	**8.7**		0.50		ug/L			01/20/14 14:49	1
Xylenes, Total	**60**		1.0		ug/L			01/20/14 14:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*115*		*80 - 120*		*01/20/14 14:49*	*1*
Dibromofluoromethane (Surr)	*103*		*76 - 132*		*01/20/14 14:49*	*1*
Toluene-d8 (Surr)	*114*		*80 - 128*		*01/20/14 14:49*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**880**		50		ug/L			01/21/14 14:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*116*		*65 - 140*		*01/21/14 14:22*	*1*

Method Summary

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

TestAmerica Job ID: 440-67393-1

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

Client Sample ID: SB-20-48 — **Lab Sample ID: 440-67393-1**
Date Collected: 01/07/14 13:00 — **Matrix: Water**
Date Received: 01/14/14 09:45

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	156861	01/18/14 04:36	TR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	157253	01/21/14 12:05	IM	TAL IRV

Client Sample ID: SB-20-65 — **Lab Sample ID: 440-67393-2**
Date Collected: 01/07/14 13:30 — **Matrix: Water**
Date Received: 01/14/14 09:45

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	156861	01/18/14 05:04	TR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	157253	01/21/14 12:32	IM	TAL IRV

Client Sample ID: SB-19-63 — **Lab Sample ID: 440-67393-3**
Date Collected: 01/07/14 18:30 — **Matrix: Water**
Date Received: 01/14/14 09:45

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	156861	01/18/14 05:32	TR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	157253	01/21/14 13:00	IM	TAL IRV

Client Sample ID: SB-18-40 — **Lab Sample ID: 440-67393-4**
Date Collected: 01/08/14 13:15 — **Matrix: Water**
Date Received: 01/14/14 09:45

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		50	10 mL	10 mL	156861	01/18/14 06:00	TR	TAL IRV
Total/NA	Analysis	8015B/5030B		10	10 mL	10 mL	157253	01/21/14 16:00	IM	TAL IRV

Client Sample ID: SB-18-65 — **Lab Sample ID: 440-67393-5**
Date Collected: 01/08/14 14:00 — **Matrix: Water**
Date Received: 01/14/14 09:45

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	156861	01/18/14 06:28	TR	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	157253	01/21/14 13:54	IM	TAL IRV

Client Sample ID: SB-17-65 — **Lab Sample ID: 440-67393-6**
Date Collected: 01/08/14 17:00 — **Matrix: Water**
Date Received: 01/14/14 09:45

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	156980	01/20/14 14:49	YK	TAL IRV

Lab Chronicle

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

TestAmerica Job ID: 440-67393-1

Client Sample ID: SB-17-65
Date Collected: 01/08/14 17:00
Date Received: 01/14/14 09:45

Lab Sample ID: 440-67393-6
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	8015B/5030B		1	10 mL	10 mL	157253	01/21/14 14:22	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 440-156861/4
Matrix: Water
Analysis Batch: 156861

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			01/17/14 19:55	1
1,2-Dichloroethane	ND		0.50		ug/L			01/17/14 19:55	1
Benzene	ND		0.50		ug/L			01/17/14 19:55	1
Ethanol	ND		150		ug/L			01/17/14 19:55	1
Ethylbenzene	ND		0.50		ug/L			01/17/14 19:55	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			01/17/14 19:55	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			01/17/14 19:55	1
m,p-Xylene	ND		1.0		ug/L			01/17/14 19:55	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			01/17/14 19:55	1
o-Xylene	ND		0.50		ug/L			01/17/14 19:55	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			01/17/14 19:55	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			01/17/14 19:55	1
Toluene	ND		0.50		ug/L			01/17/14 19:55	1
Xylenes, Total	ND		0.50		ug/L			01/17/14 19:55	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*106*		*80 - 120*		*01/17/14 19:55*	*1*
Dibromofluoromethane (Surr)	*98*		*76 - 132*		*01/17/14 19:55*	*1*
Toluene-d8 (Surr)	*110*		*80 - 128*		*01/17/14 19:55*	*1*

Lab Sample ID: LCS 440-156861/5
Matrix: Water
Analysis Batch: 156861

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	27.4		ug/L		110	70 - 130		
1,2-Dichloroethane			25.0	24.0		ug/L		96	57 - 138		
Benzene			25.0	24.6		ug/L		98	68 - 130		
Ethanol			250	226		ug/L		90	50 - 149		
Ethylbenzene			25.0	27.2		ug/L		109	70 - 130		
Ethyl-t-butyl ether (ETBE)			25.0	26.8		ug/L		107	60 - 136		
Isopropyl Ether (DIPE)			25.0	26.0		ug/L		104	58 - 139		
m,p-Xylene			50.0	56.3		ug/L		113	70 - 130		
Methyl-t-Butyl Ether (MTBE)			25.0	27.0		ug/L		108	63 - 131		
o-Xylene			25.0	28.4		ug/L		114	70 - 130		
Tert-amyl-methyl ether (TAME)			25.0	27.7		ug/L		111	57 - 139		
tert-Butyl alcohol (TBA)			125	117		ug/L		94	70 - 130		
Toluene			25.0	26.9		ug/L		108	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*106*		*80 - 120*
Dibromofluoromethane (Surr)	*98*		*76 - 132*
Toluene-d8 (Surr)	*110*		*80 - 128*

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

Lab Sample ID: 440-67632-A-1 MS
Matrix: Water
Analysis Batch: 156861

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	29.2		ug/L		117	70 - 131
1,2-Dichloroethane	ND		25.0	25.1		ug/L		100	56 - 146
Benzene	ND		25.0	25.1		ug/L		100	66 - 130
Ethanol	ND		250	232		ug/L		93	54 - 150
Ethylbenzene	ND		25.0	28.3		ug/L		113	70 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	28.2		ug/L		113	70 - 130
Isopropyl Ether (DIPE)	ND		25.0	27.0		ug/L		108	64 - 138
m,p-Xylene	ND		50.0	57.9		ug/L		116	70 - 133
Methyl-t-Butyl Ether (MTBE)	ND		25.0	28.5		ug/L		114	70 - 130
o-Xylene	ND		25.0	29.6		ug/L		118	70 - 133
Tert-amyl-methyl ether (TAME)	ND		25.0	30.2		ug/L		121	68 - 133
tert-Butyl alcohol (TBA)	ND		125	119		ug/L		96	70 - 130
Toluene	ND		25.0	28.0		ug/L		112	70 - 130

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*105*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*76 - 132*
Toluene-d8 (Surr)	*109*		*80 - 128*

Lab Sample ID: 440-67632-A-1 MSD
Matrix: Water
Analysis Batch: 156861

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	26.8		ug/L		107	70 - 131	8	25
1,2-Dichloroethane	ND		25.0	24.0		ug/L		96	56 - 146	4	20
Benzene	ND		25.0	24.4		ug/L		97	66 - 130	3	20
Ethanol	ND		250	228		ug/L		91	54 - 150	2	30
Ethylbenzene	ND		25.0	26.8		ug/L		107	70 - 130	5	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	27.9		ug/L		112	70 - 130	1	25
Isopropyl Ether (DIPE)	ND		25.0	27.2		ug/L		109	64 - 138	0	25
m,p-Xylene	ND		50.0	55.6		ug/L		111	70 - 133	4	25
Methyl-t-Butyl Ether (MTBE)	ND		25.0	27.6		ug/L		111	70 - 130	3	25
o-Xylene	ND		25.0	28.3		ug/L		113	70 - 133	4	20
Tert-amyl-methyl ether (TAME)	ND		25.0	29.8		ug/L		119	68 - 133	1	30
tert-Butyl alcohol (TBA)	ND		125	116		ug/L		93	70 - 130	3	25
Toluene	ND		25.0	27.1		ug/L		109	70 - 130	3	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*107*		*80 - 120*
Dibromofluoromethane (Surr)	*102*		*76 - 132*
Toluene-d8 (Surr)	*110*		*80 - 128*

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

Lab Sample ID: 440-67501-E-4 MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 156980

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	31.6		ug/L		127	70 - 131	8	25
1,2-Dichloroethane	ND		25.0	28.1		ug/L		112	56 - 146	4	20
Benzene	ND		25.0	26.2		ug/L		105	66 - 130	2	20
Ethanol	ND		250	246		ug/L		99	54 - 150	1	30
Ethylbenzene	ND		25.0	29.1		ug/L		116	70 - 130	4	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	25.8		ug/L		103	70 - 130	4	25
Isopropyl Ether (DIPE)	ND		25.0	25.9		ug/L		104	64 - 138	3	25
m,p-Xylene	ND		50.0	56.6		ug/L		113	70 - 133	3	25
Methyl-t-Butyl Ether (MTBE)	130		25.0	152	BB	ug/L		80	70 - 130	2	25
o-Xylene	ND		25.0	27.9		ug/L		112	70 - 133	5	20
Tert-amyl-methyl ether (TAME)	ND		25.0	27.7		ug/L		111	68 - 133	5	30
tert-Butyl alcohol (TBA)	ND		125	135		ug/L		108	70 - 130	7	25
Toluene	ND		25.0	27.2		ug/L		109	70 - 130	2	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*110*		*80 - 120*
Dibromofluoromethane (Surr)	*100*		*76 - 132*
Toluene-d8 (Surr)	*110*		*80 - 128*

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

Lab Sample ID: MB 440-157253/4 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 157253

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50		ug/L			01/21/14 10:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*93*		*65 - 140*		*01/21/14 10:32*	*1*

Lab Sample ID: LCS 440-157253/3 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 157253

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)			800	769		ug/L		96	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*67*		*65 - 140*

Lab Sample ID: 440-67393-3 MS — **Client Sample ID: SB-19-63**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 157253

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
GRO (C4-C12)	ND		800	807		ug/L		97	65 - 140		

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

Lab Sample ID: 440-67393-3 MS
Matrix: Water
Analysis Batch: 157253

Client Sample ID: SB-19-63
Prep Type: Total/NA

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*111*		*65 - 140*

Lab Sample ID: 440-67393-3 MSD
Matrix: Water
Analysis Batch: 157253

Client Sample ID: SB-19-63
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	840		ug/L		101	65 - 140	4	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*116*		*65 - 140*

GC/MS VOA

Analysis Batch: 156861

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-67393-1	SB-20-48	Total/NA	Water	8260B/5030B	
440-67393-2	SB-20-65	Total/NA	Water	8260B/5030B	
440-67393-3	SB-19-63	Total/NA	Water	8260B/5030B	
440-67393-4	SB-18-40	Total/NA	Water	8260B/5030B	
440-67393-5	SB-18-65	Total/NA	Water	8260B/5030B	
440-67632-A-1 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-67632-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-156861/5	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-156861/4	Method Blank	Total/NA	Water	8260B/5030B	

Analysis Batch: 156980

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-67393-6	SB-17-65	Total/NA	Water	8260B/5030B	
440-67501-E-4 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	

GC VOA

Analysis Batch: 157253

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-67393-1	SB-20-48	Total/NA	Water	8015B/5030B	
440-67393-2	SB-20-65	Total/NA	Water	8015B/5030B	
440-67393-3	SB-19-63	Total/NA	Water	8015B/5030B	
440-67393-3 MS	SB-19-63	Total/NA	Water	8015B/5030B	
440-67393-3 MSD	SB-19-63	Total/NA	Water	8015B/5030B	
440-67393-4	SB-18-40	Total/NA	Water	8015B/5030B	
440-67393-5	SB-18-65	Total/NA	Water	8015B/5030B	
440-67393-6	SB-17-65	Total/NA	Water	8015B/5030B	
LCS 440-157253/3	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-157253/4	Method Blank	Total/NA	Water	8015B/5030B	

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
BB	Sample > 4X spike concentration

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: 440-67393-1

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	01-31-15
California	NELAP	9	1108CA	01-31-14
California	State Program	9	2706	06-30-14
Guam	State Program	9	Cert. No. 12.002r	01-23-14 *
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.

1-14-14 &

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:**

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: Kathleen Robb	Lead Regulatory Agency: ACEH	Address: 1370 Ridgewood Drive, Suite 5 Chico, California 95973
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#: 005X3 - 0010 / WR	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: Project Spend (80)	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	Water / Liquid	Air / Vapor	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
	SB-20-48	1-7-14	1300		X			6				X		X	X	X
	SB-20-65	1-7-14	1330		X			6				X		X	X	X
	SB-19-63	1-7-14	1830		X			6				X		X	X	X
	SB-18-40	1-8-14	1315		X			2				X		X	X	X
	SB-18-65	1-8-14	1400		X			6				X		X	X	X
	SB-17-65	1-8-14	1700		X			6				X		X	X	X
	TB-498-01082014	1-8-14	1700		X			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.

440-67393 Chain of Custody

On Hold

Sampler's Name: Kevin Cook-Gutierrez	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Company: Broadbent	Kevin Cook Gutierrez / Broadbent	1-9-14	16:30	JO ~~FedEx~~ Jason Duda / Broadbent	1-9-14	16:30
Shipment Method: FedEx Ship Date: 1-9-14	Jason Duda / Broadbent	1-13-14	16:30	FedEx 8041 0472 3690	1-13-14	16:30
Shipment Tracking No: 8041 0472 3690 1330				Iron Bank TAT 37/2.5 IR-63	1/14/14	9:45

Special Instructions:

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

1/24/2014

Login Sample Receipt Checklist

Client: Broadbent & Associates, Inc.

Job Number: 440-67393-1

Login Number: 67393

List Source: TestAmerica Irvine

List Number: 1

Creator: King, Ronald

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
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	
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 I

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 J

First Quarter 2014 Field Data Sheets and Non-Hazardous Waste Data Form

BROADBENT

DAILY REPORT

Page ____ of ____

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

Field Representative(s): JR / SJ Day: Friday Date: 2/21/14

Time Onsite: From: ~~0700~~ 0645 To: 1230 ; 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
- [ ] Other PPE (describe) ____

Weather: sunny, 67°F

Equipment In Use: bladder, horiba, water level meter

Visitors: ____

TIME:	WORK DESCRIPTION:
0645	Arrived onsite, proceeded w/ safety meeting & documents
~~0715~~	finished safety meeting, setup on MW-4
0815	Setup on MW-2
0850	Setup on MW-1
0916	Setup on MW-6B
0952	Setup on MW-6A
1033	Setup on MW-3
1100	Setup on MW-5B
~~1130~~ 1	Setup on MW-5A
1230	Cleaned up / packed & left site

Signature: ____

Revision: 1/24/2012

BROADBENT

GROUNDWATER MONITORING SITE SHEET

Page _____ of _____

Project: BP 498 Project No.: 08-88-603 Date: 2/21/14

Field Representative: SJ/JR 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					1053			30.07							
MW-2					~~0755~~			~~30.55~~	40.30						
MW-3					0820			36.41	57.18						
MW-4					1036		36.03	36.49	55.43						
MW-5A					0730		35.88	~~36.00~~	46.02						
MW-5B					1130			36.12	~~40.00~~ 49.65						
MW-6A					1102			35.84	56.00						
MW-6B					0955			37.40	~~49.67~~						
					0920			37.26	60.00						

* 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.: 08-88-603 Date: 2/2/14

Field Representative: SS/JK

Well ID: MW-1 Start Time: 0850 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.)

X Good ___ Improvement Needed (circle one) Comments: _____

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)

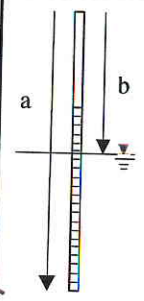
Water Column Height (WCH) = (a - b): _____ (ft)

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): ~~37.18~~ (ft)

Initial Depth to Water (b): ~~30.67~~ (ft)

Pump In-take Depth = b + (a-b)/2: ~~33.93~~ (ft)

Maximum Allowable Drawdown = (a-b)/8: ~~3.31~~ (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
0859	0.0	19.10	7.88	0.864	5.52	117	224	
0901	0.5	20.60	7.62	0.852	2.38	53	221	
0903	1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
0905	1.5	21.11	7.32	0.841	1.35	-30	162	
0907	2.0	21.33	7.22	0.839	1.23	-48	53.5	
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: 30.72 (ft)

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

Sample ID: MW-1 Sample Collection Time 0910 (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: BR 498 Project No.: 08-88-6003 Date: 2/21/14

Field Representative: SJ / JR

Well ID: MW-2 Start Time: 0820 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:

Good Improvement Needed *(circle one)*

PURGING/SAMPLING METHOD Predetermined Well Volume X 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)

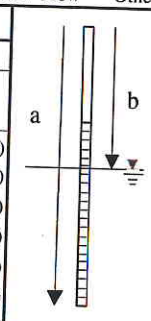
Water Column Height (WCH) = (a - b): _____ (ft)

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): 36.49 (ft)

Pump In-take Depth = b + (a-b)/2: 45.96 (ft)

Maximum Allowable Drawdown = (a-b)/8: 2.37 (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
0823	0.0	18.00	7.73	1.08	6.88	117	78.6	
0826	0.5	19.00	7.46	1.09	6.92	124	36.7	
0829	1.0	19.32	7.34	1.09	7.20	127	91.1	
0831	2.0	19.83	7.17	1.08	8.05	128	119	
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: 36.50 (ft)

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

X Disp. Pump Tubing Other:

Sample ID: MW-2 Sample Collection Time: 0835 (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.: 08-88-603 Date: 2/21/14

Field Representative: SS/JR

Well ID: MW-3 Start Time: 1036 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: _____
X Good ___ Improvement Needed *(circle one)*

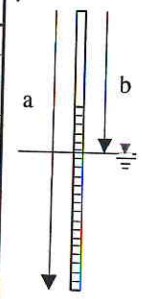
PURGING/SAMPLING METHOD Predetermined Well Volume Low-Flow X Other: *(circle one)*

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): 36.03 (ft)
Pump In-take Depth = b + (a-b)/2: 45.73 (ft)
Maximum Allowable Drawdown = (a-b)/8: 2.43 (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
1043	0.0	22.67	7.58	0.882	6.82	80	702	
1045	0.5	22.00	7.39	0.984	4.24	31	579	
1047	1.0	21.88	7.34	1.00	2.94	-4	380	
1049	1.5	21.85	7.34	1.01	2.25	-51	222	
1051	2.0	21.83	7.41	1.00	2.03	-67	175	
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: 36.19 (ft)
Sample Collected Via: ___ Disp. Bailer ___ Dedicated Pump Tubing
X Disp. Pump Tubing Other:
Sample ID: MW-3 Sample Collection Time: 1055 (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.: 08-88-602 Date: 2/21/14

Field Representative: SJ/JR

Well ID: MW-4 Start Time: 0730 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)

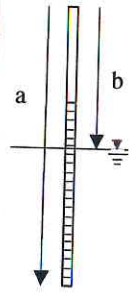
Water Column Height (WCH) = (a - b): _____ (ft)

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): 46.30 (ft)

Initial Depth to Water (b): 35.88 ~~36.88~~ (ft)

Pump In-take Depth = b + (a-b)/2: ~~41.09~~ (ft)

Maximum Allowable Drawdown = (a-b)/8: 1.30 (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
0746	0.0	19.37	7.52	1.30	4.65	80	791	
0748	0.5	~~20.19~~ 20.23	7.16	1.29	3.61	86	290	
0750	1.0	~~20.~~	~~6.~~	~~1.~~	~~3.~~	~~9~~	~~2~~	
0752	1.5	20.80	6.80	1.27	2.50	98	165	
0754	2.0	20.68	6.76	1.25	2.33	100	149	
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: 37.48 (ft)

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

X Disp. Pump Tubing Other:

Sample ID: MW-4 Sample Collection Time: 0755 (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.: 08-88-603 Date: 2/21/14

Field Representative: SJ / JR

Well ID: MW-5A Start Time: 1130 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:

Good / Improvement Needed *(circle one)*

PURGING/SAMPLING METHOD Predetermined Well Volume Low-Flow X 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)

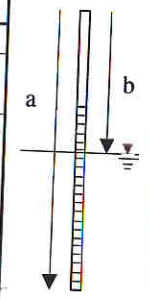
Water Column Height (WCH) = (a - b): _____ (ft)

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): 49.65 (ft)

Initial Depth to Water (b): 36.17 (ft)

Pump In-take Depth = b + (a-b)/2: 42.91 (ft)

Maximum Allowable Drawdown = (a-b)/8: 1.69 (ft)

Low-Flow Purge Rate: 0.75 (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
1138	0.0	23.20	7.46	1.36	3.78	99	691	
1140	0.5	22.13	7.37	1.36	3.10	96	[illegible]	
1142	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1144	1.5	21.93	7.23	1.34	2.59	98	893	
1146	2.8	21.96	7.19	1.33	2.49	82	672	
					2.39	77	512	
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: 39.27 (ft)

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

X Disp. Pump Tubing Other:

Sample ID: MW-5A Sample Collection Time: 1150 (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.: 08-88-603 | Date: 2/21/14

Field Representative: SJ/JR

Well ID: MW-5B | Start Time: 1102 | 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)

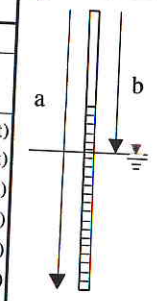
Water Column Height (WCH) = (a - b): _____ (ft)

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): 65.66 (ft)

Initial Depth to Water (b): 35.84 (ft)

Pump In-take Depth = b + (a-b)/2: 50.76 (ft)

Maximum Allowable Drawdown = (a-b)/8: 3.73 (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	0.0	22.33	7.66	1.02	8.54	64	71,000	
1114	0.5	22.89	7.35	0.846	6.66	60	71,000	
1116	1.0	21.99	7.30	0.966	7.15	69	952	
1118	1.5	21.99	7.30	1.02	7.27	76	635	
1120	2.0	21.63	7.76	1.05	8.13	78	361	
1122	2.5	21.43	7.65	1.05	8.42	84	174	
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: 35.86 (ft)

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

X Disp. Pump Tubing Other:

Sample ID: MW-5B Sample Collection Time: 1125 (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.: 08-88-603 | Date: 2/21/2014

Field Representative: SS/JR

Well ID: MW-6A | Start Time: 0955 | 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:

X Good | Improvement Needed (circle one)

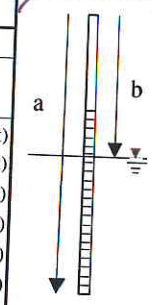
PURGING/SAMPLING METHOD Predetermined Well Volume | X Low-Flow | Other: (circle one)

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):	49.67 (ft)
Initial Depth to Water (b):	37.45 (ft)
Pump In-take Depth = b + (a-b)/2:	43.54 (ft)
Maximum Allowable Drawdown = (a-b)/8:	1.53 (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
1006	0.0	21.84	7.25	1.61	9.89	115	>1,000	
1008	0.5	21.75	7.28	1.61	8.88	115	>1,000	
1010	1.0	21.70	7.30	1.62	9.26	114	>1,000	
1012	1.5	21.70	7.33	1.62	8.48	113	>1,000	
1014	2.0	21.65	7.36	1.62	8.13	111	>1,000	
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: 39.30 (ft)

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

Sample ID: MW-6A | Sample Collection Time: 1015 (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.: 08-88-603 Date: 2/21/14

Field Representative: SJ/JR

Well ID: MW-6B Start Time: 0920 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:

X Good ___ Improvement Needed *(circle one)*

PURGING/SAMPLING METHOD Predetermined Well Volume Low-Flow X 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)

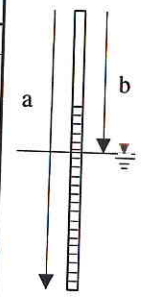
Water Column Height (WCH) = (a - b): _____ (ft)

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): 69.59 (ft)

Initial Depth to Water (b): 37.26 (ft)

Pump In-take Depth = b + (a-b)/2: 53.43 (ft)

Maximum Allowable Drawdown = (a-b)/8: 4.04 (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 (Greater than 1000)	NOTES Odor, color, sheen or other
0932	0.0	21.10	7.34	1.06	5.66	-91	0.0	
0934	0.5	21.12	7.31	1.06	6.06	83	0.0	
0936	1.0	21.14	7.31	1.06	6.10	86	0.0	
0938	1.5	21.16	7.33	1.06	6.14	89	0.0	
0940	2.0	21.18	7.36	1.06	5.81	92	0.0	
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: 37.30 (ft)

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

X Disp. Pump Tubing Other:

Sample ID: MW-6B Sample Collection Time: 0945 (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. 709893

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 4.5 gallons

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%
3.		
4.		

Waste Profile _____ PROPERTIES: pH 7-10 ☐ SOLID XX ☐ 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, INC> | Phone#: 530-566-1400

Transporter 1 Printed/Typed Name: Alex Martinez | Signature | Month: 2 | Day: 21 | Year: 14

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 K

First Quarter 2014 Laboratory Report and Chain-of-Custody Documentation

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

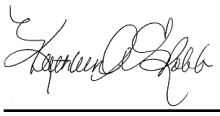
ANALYTICAL REPORT

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

TestAmerica Job ID: 440-71095-1
Client Project/Site: ARCO 0498, Livermore

For:
Broadbent & Associates, Inc.
1370 Ridgewood Drive
Suite 5
Chico, California 95973

Attn: Mr. Jason Duda



Authorized for release by:
3/10/2014 8:06:20 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: 440-71095-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-71095-1	MW-1	Water	02/21/14 09:10	02/25/14 09:30
440-71095-2	MW-2	Water	02/21/14 08:35	02/25/14 09:30
440-71095-3	MW-3	Water	02/21/14 10:55	02/25/14 09:30
440-71095-4	MW-4	Water	02/21/14 07:55	02/25/14 09:30
440-71095-5	MW-5A	Water	02/21/14 11:50	02/25/14 09:30
440-71095-6	MW-5B	Water	02/21/14 11:25	02/25/14 09:30
440-71095-7	MW-6A	Water	02/21/14 10:15	02/25/14 09:30
440-71095-8	MW-6B	Water	02/21/14 09:45	02/25/14 09:30

Job ID: 440-71095-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-71095-1

Comments
No additional comments.

Receipt
The samples were received on 2/25/2014 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.0º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC VOA
Method(s) 8015B: The following sample(s) were collected in properly preserved vials for analysis of volatile organic compounds (VOCs). However, the pH was outside the required criteria when verified by the laboratory, and corrective action was not possible: MW-3 (440-71095-3).pH=4

No other analytical or quality issues were noted.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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

TestAmerica Job ID: 440-71095-1

Client Sample ID: MW-1
Date Collected: 02/21/14 09:10
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-1
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			03/03/14 13:43	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 13:43	1
Benzene	**19**		0.50		ug/L			03/03/14 13:43	1
Ethanol	ND		150		ug/L			03/03/14 13:43	1
Ethylbenzene	**30**		0.50		ug/L			03/03/14 13:43	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 13:43	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 13:43	1
m,p-Xylene	**3.3**		1.0		ug/L			03/03/14 13:43	1
Methyl-t-Butyl Ether (MTBE)	**2.5**		0.50		ug/L			03/03/14 13:43	1
Naphthalene	**22**		1.0		ug/L			03/03/14 13:43	1
o-Xylene	**0.93**		0.50		ug/L			03/03/14 13:43	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 13:43	1
tert-Butyl alcohol (TBA)	**12**	**ID**	10		ug/L			03/03/14 13:43	1
Toluene	**3.0**		0.50		ug/L			03/03/14 13:43	1
Xylenes, Total	**4.2**		1.0		ug/L			03/03/14 13:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*110*		*80 - 120*		*03/03/14 13:43*	*1*
Dibromofluoromethane (Surr)	*95*		*76 - 132*		*03/03/14 13:43*	*1*
Toluene-d8 (Surr)	*109*		*80 - 128*		*03/03/14 13:43*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**1300**		50		ug/L			02/28/14 09:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*83*		*65 - 140*		*02/28/14 09:24*	*1*

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

TestAmerica Job ID: 440-71095-1

Client Sample ID: MW-2
Date Collected: 02/21/14 08:35
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-2
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			03/03/14 14:13	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 14:13	1
Benzene	ND		0.50		ug/L			03/03/14 14:13	1
Ethanol	ND		150		ug/L			03/03/14 14:13	1
Ethylbenzene	ND		0.50		ug/L			03/03/14 14:13	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 14:13	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 14:13	1
m,p-Xylene	ND		1.0		ug/L			03/03/14 14:13	1
Methyl-t-Butyl Ether (MTBE)	**3.6**		0.50		ug/L			03/03/14 14:13	1
Naphthalene	ND		1.0		ug/L			03/03/14 14:13	1
o-Xylene	ND		0.50		ug/L			03/03/14 14:13	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 14:13	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			03/03/14 14:13	1
Toluene	ND		0.50		ug/L			03/03/14 14:13	1
Xylenes, Total	ND		1.0		ug/L			03/03/14 14:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*		*03/03/14 14:13*	*1*
Dibromofluoromethane (Surr)	*90*		*76 - 132*		*03/03/14 14:13*	*1*
Toluene-d8 (Surr)	*106*		*80 - 128*		*03/03/14 14:13*	*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			02/28/14 09:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*85*		*65 - 140*		*02/28/14 09:51*	*1*

Client Sample ID: MW-3
Date Collected: 02/21/14 10:55
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-3
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		2.0		ug/L			03/03/14 14:43	4
1,2-Dichloroethane	ND		2.0		ug/L			03/03/14 14:43	4
Benzene	**210**		2.0		ug/L			03/03/14 14:43	4
Ethanol	ND		600		ug/L			03/03/14 14:43	4
Ethylbenzene	**27**		2.0		ug/L			03/03/14 14:43	4
Ethyl-t-butyl ether (ETBE)	ND		2.0		ug/L			03/03/14 14:43	4
Isopropyl Ether (DIPE)	ND		2.0		ug/L			03/03/14 14:43	4
m,p-Xylene	ND		4.0		ug/L			03/03/14 14:43	4
Methyl-t-Butyl Ether (MTBE)	**44**		2.0		ug/L			03/03/14 14:43	4
Naphthalene	**5.5**		4.0		ug/L			03/03/14 14:43	4
o-Xylene	ND		2.0		ug/L			03/03/14 14:43	4
Tert-amyl-methyl ether (TAME)	ND		2.0		ug/L			03/03/14 14:43	4
tert-Butyl alcohol (TBA)	**58**		40		ug/L			03/03/14 14:43	4
Toluene	ND		2.0		ug/L			03/03/14 14:43	4
Xylenes, Total	ND		4.0		ug/L			03/03/14 14:43	4

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*103*		*80 - 120*		*03/03/14 14:43*	*4*
Dibromofluoromethane (Surr)	*91*		*76 - 132*		*03/03/14 14:43*	*4*
Toluene-d8 (Surr)	*107*		*80 - 128*		*03/03/14 14:43*	*4*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**2000**		500		ug/L			02/28/14 10:19	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*92*		*65 - 140*		*02/28/14 10:19*	*10*

Client Sample ID: MW-4
Date Collected: 02/21/14 07:55
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-4
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			03/03/14 15:13	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 15:13	1
Benzene	ND		0.50		ug/L			03/03/14 15:13	1
Ethanol	ND		150		ug/L			03/03/14 15:13	1
Ethylbenzene	ND		0.50		ug/L			03/03/14 15:13	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 15:13	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 15:13	1
m,p-Xylene	ND		1.0		ug/L			03/03/14 15:13	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			03/03/14 15:13	1
Naphthalene	ND		1.0		ug/L			03/03/14 15:13	1
o-Xylene	ND		0.50		ug/L			03/03/14 15:13	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 15:13	1
tert-Butyl alcohol (TBA)	**37**		10		ug/L			03/03/14 15:13	1
Toluene	ND		0.50		ug/L			03/03/14 15:13	1
Xylenes, Total	ND		1.0		ug/L			03/03/14 15:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*03/03/14 15:13*	*1*
Dibromofluoromethane (Surr)	*93*		*76 - 132*		*03/03/14 15:13*	*1*
Toluene-d8 (Surr)	*107*		*80 - 128*		*03/03/14 15:13*	*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			02/28/14 10:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*82*		*65 - 140*		*02/28/14 10:46*	*1*

Client Sample ID: MW-5A
Date Collected: 02/21/14 11:50
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-5
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			03/03/14 15:43	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 15:43	1
Benzene	**3.1**		0.50		ug/L			03/03/14 15:43	1
Ethanol	ND		150		ug/L			03/03/14 15:43	1
Ethylbenzene	**19**		0.50		ug/L			03/03/14 15:43	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 15:43	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 15:43	1
m,p-Xylene	**12**		1.0		ug/L			03/03/14 15:43	1
Methyl-t-Butyl Ether (MTBE)	**3.1**		0.50		ug/L			03/03/14 15:43	1
Naphthalene	**6.5**		1.0		ug/L			03/03/14 15:43	1
o-Xylene	**3.0**		0.50		ug/L			03/03/14 15:43	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 15:43	1
tert-Butyl alcohol (TBA)	**19**		10		ug/L			03/03/14 15:43	1
Toluene	ND		0.50		ug/L			03/03/14 15:43	1
Xylenes, Total	**15**		1.0		ug/L			03/03/14 15:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*105*		*80 - 120*		*03/03/14 15:43*	*1*
Dibromofluoromethane (Surr)	*92*		*76 - 132*		*03/03/14 15:43*	*1*
Toluene-d8 (Surr)	*109*		*80 - 128*		*03/03/14 15:43*	*1*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	**840**		50		ug/L			02/28/14 11:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*75*		*65 - 140*		*02/28/14 11:14*	*1*

Client Sample ID: MW-5B
Date Collected: 02/21/14 11:25
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-6
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			03/03/14 16:13	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 16:13	1
Benzene	ND		0.50		ug/L			03/03/14 16:13	1
Ethanol	ND		150		ug/L			03/03/14 16:13	1
Ethylbenzene	ND		0.50		ug/L			03/03/14 16:13	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 16:13	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 16:13	1
m,p-Xylene	ND		1.0		ug/L			03/03/14 16:13	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			03/03/14 16:13	1
Naphthalene	ND		1.0		ug/L			03/03/14 16:13	1
o-Xylene	ND		0.50		ug/L			03/03/14 16:13	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 16:13	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			03/03/14 16:13	1
Toluene	ND		0.50		ug/L			03/03/14 16:13	1
Xylenes, Total	ND		1.0		ug/L			03/03/14 16:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*03/03/14 16:13*	*1*
Dibromofluoromethane (Surr)	*89*		*76 - 132*		*03/03/14 16:13*	*1*
Toluene-d8 (Surr)	*105*		*80 - 128*		*03/03/14 16:13*	*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			02/28/14 11:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*81*		*65 - 140*		*02/28/14 11:42*	*1*

Client Sample ID: MW-6A
Date Collected: 02/21/14 10:15
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-7
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		5.0		ug/L			03/03/14 16:43	10
1,2-Dichloroethane	ND		5.0		ug/L			03/03/14 16:43	10
Benzene	ND		5.0		ug/L			03/03/14 16:43	10
Ethanol	ND		1500		ug/L			03/03/14 16:43	10
Ethylbenzene	ND		5.0		ug/L			03/03/14 16:43	10
Ethyl-t-butyl ether (ETBE)	ND		5.0		ug/L			03/03/14 16:43	10
Isopropyl Ether (DIPE)	ND		5.0		ug/L			03/03/14 16:43	10
m,p-Xylene	ND		10		ug/L			03/03/14 16:43	10
Methyl-t-Butyl Ether (MTBE)	**780**		5.0		ug/L			03/03/14 16:43	10
Naphthalene	ND		10		ug/L			03/03/14 16:43	10
o-Xylene	ND		5.0		ug/L			03/03/14 16:43	10
Tert-amyl-methyl ether (TAME)	ND		5.0		ug/L			03/03/14 16:43	10
tert-Butyl alcohol (TBA)	ND		100		ug/L			03/03/14 16:43	10
Toluene	ND		5.0		ug/L			03/03/14 16:43	10
Xylenes, Total	ND		10		ug/L			03/03/14 16:43	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*		*03/03/14 16:43*	*10*
Dibromofluoromethane (Surr)	*91*		*76 - 132*		*03/03/14 16:43*	*10*
Toluene-d8 (Surr)	*103*		*80 - 128*		*03/03/14 16:43*	*10*

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

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50		ug/L			02/28/14 12:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*78*		*65 - 140*		*02/28/14 12:09*	*1*

Client Sample ID: MW-6B
Date Collected: 02/21/14 09:45
Date Received: 02/25/14 09:30

Lab Sample ID: 440-71095-8
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			03/03/14 17:13	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 17:13	1
Benzene	ND		0.50		ug/L			03/03/14 17:13	1
Ethanol	ND		150		ug/L			03/03/14 17:13	1
Ethylbenzene	ND		0.50		ug/L			03/03/14 17:13	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 17:13	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 17:13	1
m,p-Xylene	ND		1.0		ug/L			03/03/14 17:13	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			03/03/14 17:13	1
Naphthalene	ND		1.0		ug/L			03/03/14 17:13	1
o-Xylene	ND		0.50		ug/L			03/03/14 17:13	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 17:13	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			03/03/14 17:13	1
Toluene	ND		0.50		ug/L			03/03/14 17:13	1
Xylenes, Total	ND		1.0		ug/L			03/03/14 17:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*		*03/03/14 17:13*	*1*
Dibromofluoromethane (Surr)	*95*		*76 - 132*		*03/03/14 17:13*	*1*
Toluene-d8 (Surr)	*106*		*80 - 128*		*03/03/14 17:13*	*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			02/28/14 12:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*84*		*65 - 140*		*02/28/14 12:37*	*1*

Method Summary

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

TestAmerica Job ID: 440-71095-1

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

Client Sample ID: MW-1 — **Lab Sample ID: 440-71095-1**
Date Collected: 02/21/14 09:10 — **Matrix: Water**
Date Received: 02/25/14 09:30

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	166053	03/03/14 13:43	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 09:24	PH	TAL IRV

Client Sample ID: MW-2 — **Lab Sample ID: 440-71095-2**
Date Collected: 02/21/14 08:35 — **Matrix: Water**
Date Received: 02/25/14 09:30

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	166053	03/03/14 14:13	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 09:51	PH	TAL IRV

Client Sample ID: MW-3 — **Lab Sample ID: 440-71095-3**
Date Collected: 02/21/14 10:55 — **Matrix: Water**
Date Received: 02/25/14 09:30

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		4	10 mL	10 mL	166053	03/03/14 14:43	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		10	10 mL	10 mL	165496	02/28/14 10:19	PH	TAL IRV

Client Sample ID: MW-4 — **Lab Sample ID: 440-71095-4**
Date Collected: 02/21/14 07:55 — **Matrix: Water**
Date Received: 02/25/14 09:30

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	166053	03/03/14 15:13	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 10:46	PH	TAL IRV

Client Sample ID: MW-5A — **Lab Sample ID: 440-71095-5**
Date Collected: 02/21/14 11:50 — **Matrix: Water**
Date Received: 02/25/14 09:30

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	166053	03/03/14 15:43	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 11:14	PH	TAL IRV

Client Sample ID: MW-5B — **Lab Sample ID: 440-71095-6**
Date Collected: 02/21/14 11:25 — **Matrix: Water**
Date Received: 02/25/14 09:30

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	166053	03/03/14 16:13	MM1	TAL IRV

Lab Chronicle

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

TestAmerica Job ID: 440-71095-1

Client Sample ID: MW-5B

Lab Sample ID: 440-71095-6

Date Collected: 02/21/14 11:25

Matrix: Water

Date Received: 02/25/14 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 11:42	PH	TAL IRV

Client Sample ID: MW-6A

Lab Sample ID: 440-71095-7

Date Collected: 02/21/14 10:15

Matrix: Water

Date Received: 02/25/14 09:30

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		10	10 mL	10 mL	166053	03/03/14 16:43	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 12:09	PH	TAL IRV

Client Sample ID: MW-6B

Lab Sample ID: 440-71095-8

Date Collected: 02/21/14 09:45

Matrix: Water

Date Received: 02/25/14 09:30

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	166053	03/03/14 17:13	MM1	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	165496	02/28/14 12:37	PH	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 440-166053/4
Matrix: Water
Analysis Batch: 166053

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			03/03/14 08:13	1
1,2-Dichloroethane	ND		0.50		ug/L			03/03/14 08:13	1
Benzene	ND		0.50		ug/L			03/03/14 08:13	1
Ethanol	ND		150		ug/L			03/03/14 08:13	1
Ethylbenzene	ND		0.50		ug/L			03/03/14 08:13	1
Ethyl-t-butyl ether (ETBE)	ND		0.50		ug/L			03/03/14 08:13	1
Isopropyl Ether (DIPE)	ND		0.50		ug/L			03/03/14 08:13	1
m,p-Xylene	ND		1.0		ug/L			03/03/14 08:13	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50		ug/L			03/03/14 08:13	1
Naphthalene	ND		1.0		ug/L			03/03/14 08:13	1
o-Xylene	ND		0.50		ug/L			03/03/14 08:13	1
Tert-amyl-methyl ether (TAME)	ND		0.50		ug/L			03/03/14 08:13	1
tert-Butyl alcohol (TBA)	ND		10		ug/L			03/03/14 08:13	1
Toluene	ND		0.50		ug/L			03/03/14 08:13	1
Xylenes, Total	ND		1.0		ug/L			03/03/14 08:13	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*		*03/03/14 08:13*	*1*
Dibromofluoromethane (Surr)	*85*		*76 - 132*		*03/03/14 08:13*	*1*
Toluene-d8 (Surr)	*103*		*80 - 128*		*03/03/14 08:13*	*1*

Lab Sample ID: LCS 440-166053/5
Matrix: Water
Analysis Batch: 166053

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	26.1		ug/L		104	70 - 130		
1,2-Dichloroethane			25.0	24.3		ug/L		97	57 - 138		
Benzene			25.0	24.9		ug/L		100	68 - 130		
Ethanol			250	240		ug/L		96	50 - 149		
Ethylbenzene			25.0	27.7		ug/L		111	70 - 130		
Ethyl-t-butyl ether (ETBE)			25.0	24.0		ug/L		96	60 - 136		
Isopropyl Ether (DIPE)			25.0	25.2		ug/L		101	58 - 139		
m,p-Xylene			50.0	54.9		ug/L		110	70 - 130		
Methyl-t-Butyl Ether (MTBE)			25.0	23.5		ug/L		94	63 - 131		
Naphthalene			25.0	25.3		ug/L		101	60 - 140		
o-Xylene			25.0	27.7		ug/L		111	70 - 130		
Tert-amyl-methyl ether (TAME)			25.0	24.8		ug/L		99	57 - 139		
tert-Butyl alcohol (TBA)			125	124		ug/L		99	70 - 130		
Toluene			25.0	26.5		ug/L		106	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*
Dibromofluoromethane (Surr)	*91*		*76 - 132*
Toluene-d8 (Surr)	*104*		*80 - 128*

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

Lab Sample ID: 440-71148-A-1 MS
Matrix: Water
Analysis Batch: 166053

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	26.5		ug/L		106	70 - 131
1,2-Dichloroethane	ND		25.0	24.9		ug/L		100	56 - 146
Benzene	ND		25.0	24.8		ug/L		99	66 - 130
Ethanol	ND		250	248		ug/L		99	54 - 150
Ethylbenzene	ND		25.0	28.0		ug/L		112	70 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	24.1		ug/L		97	70 - 130
Isopropyl Ether (DIPE)	ND		25.0	25.0		ug/L		100	64 - 138
m,p-Xylene	ND		50.0	55.2		ug/L		110	70 - 133
Methyl-t-Butyl Ether (MTBE)	ND		25.0	23.7		ug/L		95	70 - 130
Naphthalene	ND		25.0	25.1		ug/L		100	60 - 140
o-Xylene	ND		25.0	27.7		ug/L		111	70 - 133
Tert-amyl-methyl ether (TAME)	ND		25.0	24.6		ug/L		98	68 - 133
tert-Butyl alcohol (TBA)	ND		125	123		ug/L		98	70 - 130
Toluene	ND		25.0	26.5		ug/L		106	70 - 130

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*102*		*80 - 120*
Dibromofluoromethane (Surr)	*92*		*76 - 132*
Toluene-d8 (Surr)	*105*		*80 - 128*

Lab Sample ID: 440-71148-A-1 MSD
Matrix: Water
Analysis Batch: 166053

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	26.7		ug/L		107	70 - 131	1	25
1,2-Dichloroethane	ND		25.0	25.3		ug/L		101	56 - 146	2	20
Benzene	ND		25.0	25.8		ug/L		103	66 - 130	4	20
Ethanol	ND		250	251		ug/L		100	54 - 150	1	30
Ethylbenzene	ND		25.0	28.6		ug/L		114	70 - 130	2	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	24.6		ug/L		99	70 - 130	2	25
Isopropyl Ether (DIPE)	ND		25.0	25.8		ug/L		103	64 - 138	3	25
m,p-Xylene	ND		50.0	56.8		ug/L		114	70 - 133	3	25
Methyl-t-Butyl Ether (MTBE)	ND		25.0	24.3		ug/L		97	70 - 130	3	25
Naphthalene	ND		25.0	25.6		ug/L		102	60 - 140	2	30
o-Xylene	ND		25.0	28.3		ug/L		113	70 - 133	2	20
Tert-amyl-methyl ether (TAME)	ND		25.0	25.3		ug/L		101	68 - 133	3	30
tert-Butyl alcohol (TBA)	ND		125	132		ug/L		105	70 - 130	7	25
Toluene	ND		25.0	27.6		ug/L		111	70 - 130	4	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*101*		*80 - 120*
Dibromofluoromethane (Surr)	*91*		*76 - 132*
Toluene-d8 (Surr)	*105*		*80 - 128*

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

Lab Sample ID: MB 440-165496/35
Matrix: Water
Analysis Batch: 165496

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			02/28/14 02:58	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
4-Bromofluorobenzene (Surr)	*87*		*65 - 140*		*02/28/14 02:58*	*1*

Lab Sample ID: LCS 440-165496/34
Matrix: Water
Analysis Batch: 165496

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	743		ug/L		93	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*94*		*65 - 140*

Lab Sample ID: 440-70910-A-23 MS
Matrix: Water
Analysis Batch: 165496

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)	140		800	782		ug/L		81	65 - 140		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*85*		*65 - 140*

Lab Sample ID: 440-70910-A-23 MSD
Matrix: Water
Analysis Batch: 165496

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)	140		800	802		ug/L		83	65 - 140	3	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
4-Bromofluorobenzene (Surr)	*85*		*65 - 140*

GC/MS VOA

Analysis Batch: 166053

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-71095-1	MW-1	Total/NA	Water	8260B/5030B	
440-71095-2	MW-2	Total/NA	Water	8260B/5030B	
440-71095-3	MW-3	Total/NA	Water	8260B/5030B	
440-71095-4	MW-4	Total/NA	Water	8260B/5030B	
440-71095-5	MW-5A	Total/NA	Water	8260B/5030B	
440-71095-6	MW-5B	Total/NA	Water	8260B/5030B	
440-71095-7	MW-6A	Total/NA	Water	8260B/5030B	
440-71095-8	MW-6B	Total/NA	Water	8260B/5030B	
440-71148-A-1 MS	Matrix Spike	Total/NA	Water	8260B/5030B	
440-71148-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B/5030B	
LCS 440-166053/5	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-166053/4	Method Blank	Total/NA	Water	8260B/5030B	

GC VOA

Analysis Batch: 165496

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-70910-A-23 MS	Matrix Spike	Total/NA	Water	8015B/5030B	
440-70910-A-23 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B/5030B	
440-71095-1	MW-1	Total/NA	Water	8015B/5030B	
440-71095-2	MW-2	Total/NA	Water	8015B/5030B	
440-71095-3	MW-3	Total/NA	Water	8015B/5030B	
440-71095-4	MW-4	Total/NA	Water	8015B/5030B	
440-71095-5	MW-5A	Total/NA	Water	8015B/5030B	
440-71095-6	MW-5B	Total/NA	Water	8015B/5030B	
440-71095-7	MW-6A	Total/NA	Water	8015B/5030B	
440-71095-8	MW-6B	Total/NA	Water	8015B/5030B	
LCS 440-165496/34	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-165496/35	Method Blank	Total/NA	Water	8015B/5030B	

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
ID	Analyte identified by RT & presence of single mass ion

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: 440-71095-1

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	01-31-15
California	State Program	9	2706	06-30-14
Guam	State Program	9	Cert. No. 12.002r	01-23-14 *
Hawaii	State Program	9	N/A	01-29-15 *
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	01-29-15
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

Page 1 of 1

BP Site Node Path: BP 498 | Req Due Date (mm/dd/yy): | Rush TAT: Yes ___ No X

BP Facility No: 498 | Lab Work Order Number:

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: Pat Abe	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#: 1103-6633-7	Enfos Proposal No/ WR#: 0056X - 0005 / WR273478	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

Report Type & QC Level: Standard x; Full Data Package ___

Lab No.	Sample Description	Date	Time	Matrix: Soil / Solid	Water / Liquid	Air / Vapor	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	2-21-14	0910		x		y	6				x		x	x	x	x
	MW-2		0835		x		y	6				x		x	x	x	x
	MW-3		1055		x		y	6				x		x	x	x	x
	MW-4		0755		x		y	6				x		x	x	x	x
	MW-5A		1150		x		y	2				x		x	x	x	x
	MW-5B		1125		x		y	6				x		x	x	x	x
	MW-6A		1015		x		y	6				x		x	x	x	x
	MW-6B		0945		x		y	6				x		x	x	x	x
	TB-498-02212014	—	—		x		n	2				x					

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

440-71095 Chain of Custody

ON HOLD

	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
Sampler's Name: James K / Sarah J						
Sampler's Company: Broadbent	[signature] / Broadbent	2/21/14	1700			
Shipment Method: Fed Ex Ship Date: 2/24/14	[signature] / BA	2/21/14	1700	Leticia Lozano	2/25/14	9:30
Shipment Tracking No:						

Special Instructions:

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: 2.0 °F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

FedEx 8025 2344 1824

IR-63 3.2°C

Login Sample Receipt Checklist

Client: Broadbent & Associates, Inc.

Job Number: 440-71095-1

Login Number: 71095

List Source: TestAmerica Irvine

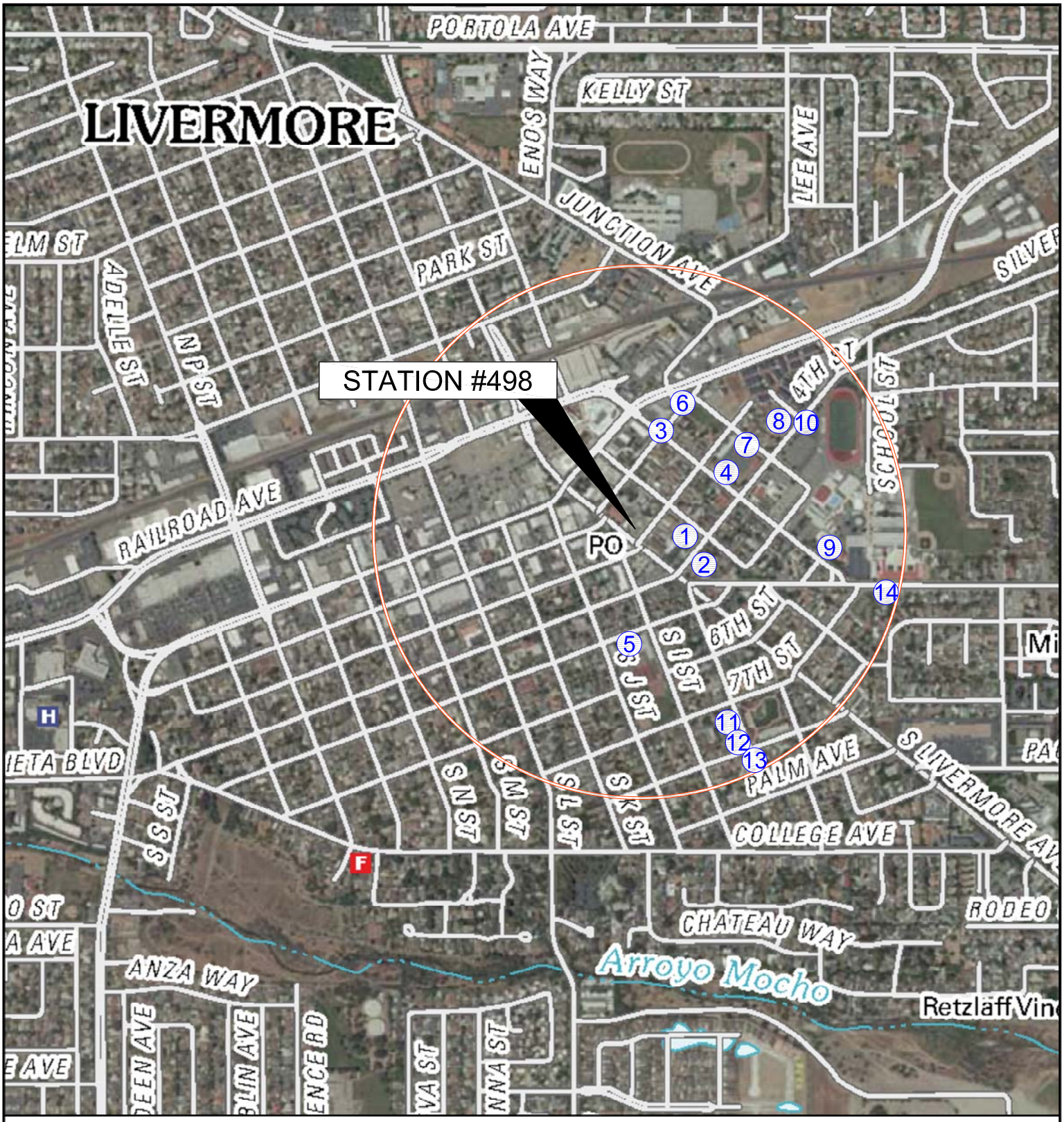
List Number: 1

Creator: Gonzales, Steve

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
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	
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 L

Sensitive Receptor Data



① Potential Sensitive Receptor Location
Reference Tables B1 and B2

2000 ft. Radius

0 1000 2000

APPROXIMATE SCALE (ft)

IMAGE SOURCE: USGS

BROADBENT
1370 Ridgewood Dr., Suite 5
Chico, California 95973

Project No.: 08-82-103 Date: 8/6/2013

Station #498
286 South Livermore Avenue
Livermore, California

Potential Sensitive Receptor
Site Location Map

Drawing
3

Table B-1. Summary of Well Driller's Reports
Department of Water Resources (DWR) and Zone 7 Water Agency Well Search - 2,000 foot radius
BP Station #498
286 South Livermore Avenue, Livermore, Alameda County, California

# On Drawing 3	DWR Record Number	State Well Number	Well Owner	Location	Well Use	Direction from Site	Distance from Site (feet)	Bore Hole Depth (feet)	Well Completion Depth (feet)	Screen Interval (feet)	Sanitary Seal (feet)
1	--	3S/2E 9P 3	--	367 MCLEOD ST	DOMESTIC	E	400	--	88.2	--	--
3	115713	3S/2E 9P	PACIFIC GAS & ELECTRIC	MAPLE AND 2ND ST	UNKNOWN	N-NE	740	120	120	--	95
4	62629	3S/2E 16A 5	ST. MICHAELS CEMETARY	372 MAPLE ST.	UNKNOWN	E-NE	820	316	312	252 - 276; 284 - 300	40
6	327589	3S/2E 17B 5	GERALD MCPEAK	1453 OLD 1ST	DOMESTIC	N-NE	930	48.5	48.5	28.5 - 48.5	25
8	24084A	3S/2E 9P 1	CAL WATER SERVICE	2778 FOURTH ST.	MUNICIPAL	NE	1,387	504	515	192 - 492	70
10	24084	--	CAL WATER SERVICE	4TH AND WOOD ST	MUNICIPAL	E-NE	1,490	515	504	192 - 492	70
11	--	3S/2E 16C 1	CAL WATER SERVICE	H ST. NEAR 7TH AVE.	MUNICIPAL	SE	1,500	568	584	150 - 523	60
12	24950	3S/2E 16C 1	BEN MINGOIA	787 SOUTH H ST	DOMESTIC	SE	1,830	584	578	288 - 298; 316-327; 347-353; 432-454;517-523	60
13	141735	3S/2E 16C 3	PACIFIC GAS & ELECTRIC	H ST. NEAR 8TH AVE.	UNKNOWN	SE	1,915	120	120	--	95
14	--	3S/2E 16B 3	LARRY PETERSON	3057 EAST AVE.	DOMESTIC	E-SE	1,930	--	86	--	--

-- = Information not available

Table B-2. Sensitive Receptor Summary
BP Station #498
286 South Livermore Avenue, Livermore, Alameda County, California

Number On Drawing 3	Name Of Business or Property Owner	Address	Presence Of Receptor
2	Storyland Preschool & Child Center	2475 4th Street	Confirmed
5	Del Valle/Pheonix High School	2253 5th Street	Confirmed
7	St. Michael School	345 Church Street	Confirmed
9	Livermore High School	600 Maple Street	Confirmed

Table B-3. California Natural Diversity Database Results
BP Station #498
286 South Livermore Avenue, Livermore, Alameda County, California

Record	QUADNAME	ELMCODE	SCINAME	COMNAME	FEDSTATUS	CALSTATUS	DFGSTATUS	CNPSLIST
1	Altamont	AAAAA01180	Ambystoma californiense	California tiger salamander	Threatened	Threatened	SSC	
2	Altamont	AAABH01022	Rana draytonii	California red-legged frog	Threatened	None	SSC	
3	Altamont	ABNKC06010	Elanus leucurus	white-tailed kite	None	None	FP	
4	Altamont	ABNKC12020	Accipiter striatus	sharp-shinned hawk	None	None	WL	
5	Altamont	ABNKC12040	Accipiter cooperii	Cooper's hawk	None	None	WL	
6	Altamont	ABNKC19120	Buteo regalis	ferruginous hawk	None	None	WL	
7	Altamont	ABNKC22010	Aquila chrysaetos	golden eagle	None	None	FP | WL	
8	Altamont	ABNKD06090	Falco mexicanus	prairie falcon	None	None	WL	
9	Altamont	ABNSB10010	Athene cunicularia	burrowing owl	None	None	SSC	
10	Altamont	ABPBR01030	Lanius ludovicianus	loggerhead shrike	None	None	SSC	
11	Altamont	ABPBX03018	Dendroica petechia brewsteri	yellow warbler	None	None	SSC	
12	Altamont	ABPBX94070	Spizella atrogularis	black-chinned sparrow	None	None		
13	Altamont	ABPBXA3010	Melospiza melodia	song sparrow (Modesto" population)"	None	None	SSC	
14	Altamont	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None	None	SSC	
15	Altamont	AMAJF04010	Taxidea taxus	American badger	None	None	SSC	
16	Altamont	ARAAD02030	Emys marmorata	western pond turtle	None	None	SSC	
17	Altamont	ICBRA03030	Branchinecta lynchi	vernal pool fairy shrimp	Threatened	None		
18	Altamont	ICBRA06010	Linderiella occidentalis	California linderiella	None	None		
19	Altamont	PDCHE040C3	Atriplex coronata var. coronata	crownscale	None	None		4.2
20	Altamont	PDCHE042M0	Atriplex minuscula	lesser saltscale	None	None		1B.1
21	Altamont	PDRAN0H031	Myosurus minimus ssp. apus	little mousetail	None	None		3.1

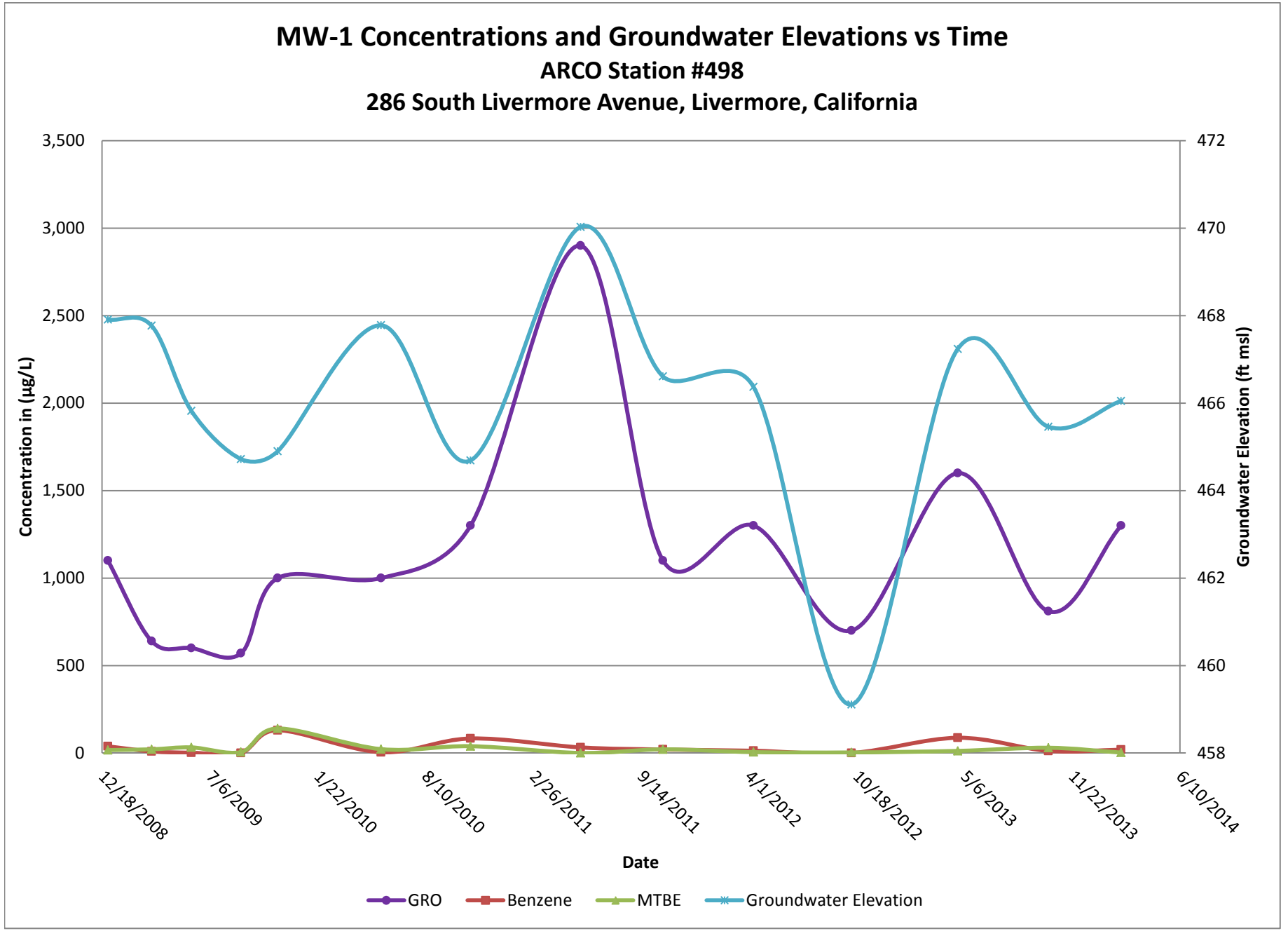
Table B-3. California Natural Diversity Database Results
BP Station #498
286 South Livermore Avenue, Livermore, Alameda County, California

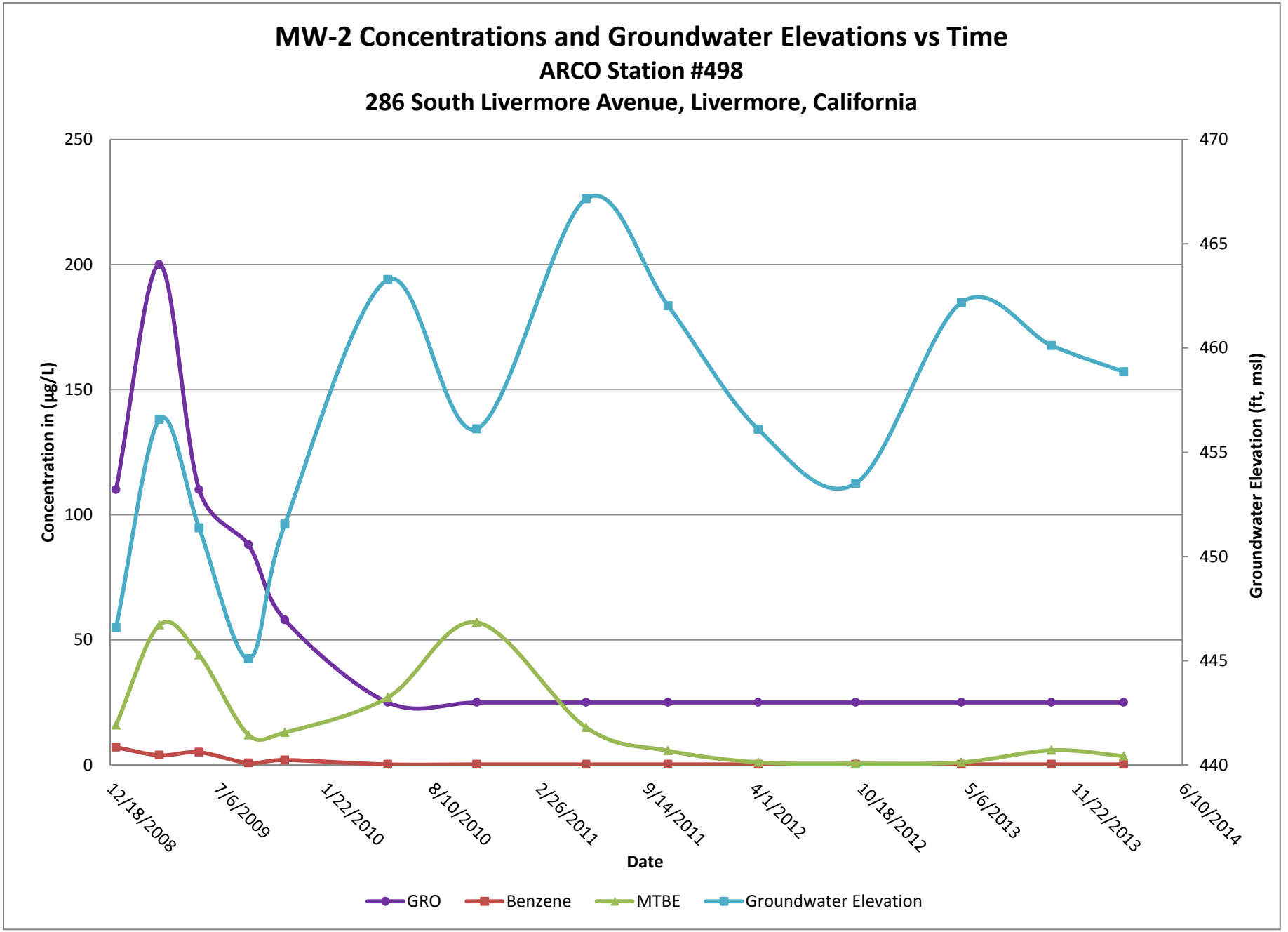
Record	QUADNAME	ELMCODE	SCINAME	COMNAME	FEDSTATUS	CALSTATUS	DFGSTATUS	CNPSLIST
94	Livermore	AAAAA01180	Ambystoma californiense	California tiger salamander	Threatened	Threatened	SSC	
95	Livermore	AAABH01022	Rana draytonii	California red-legged frog	Threatened	None	SSC	
96	Livermore	ABNGA04010	Ardea herodias	great blue heron	None	None		
97	Livermore	ABNKC06010	Elanus leucurus	white-tailed kite	None	None	FP	
98	Livermore	ABNKC10010	Haliaeetus leucocephalus	bald eagle	Delisted	Endangered	FP	
99	Livermore	ABNKC22010	Aquila chrysaetos	golden eagle	None	None	FP | WL	
100	Livermore	ABNSB10010	Athene cunicularia	burrowing owl	None	None	SSC	
101	Livermore	ABPBR01030	Lanius ludovicianus	loggerhead shrike	None	None	SSC	
102	Livermore	ABPBXB0020	Agelaius tricolor	tricolored blackbird	None	None	SSC	
103	Livermore	AMACC08010	Corynorhinus townsendii	Townsend's big-eared bat	None	None	SSC	
104	Livermore	AMAJF04010	Taxidea taxus	American badger	None	None	SSC	
105	Livermore	ARAAD02030	Emys marmorata	western pond turtle	None	None	SSC	
106	Livermore	ARACF12100	Phrynosoma blainvillii	coast horned lizard	None	None	SSC	
107	Livermore	PDCHE040C3	Atriplex coronata var. coronata	crownscale	None	None		4.2

Referenced from CNDDB Website:
http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp

Appendix M

Concentration and Groundwater Elevation Trend Graphs

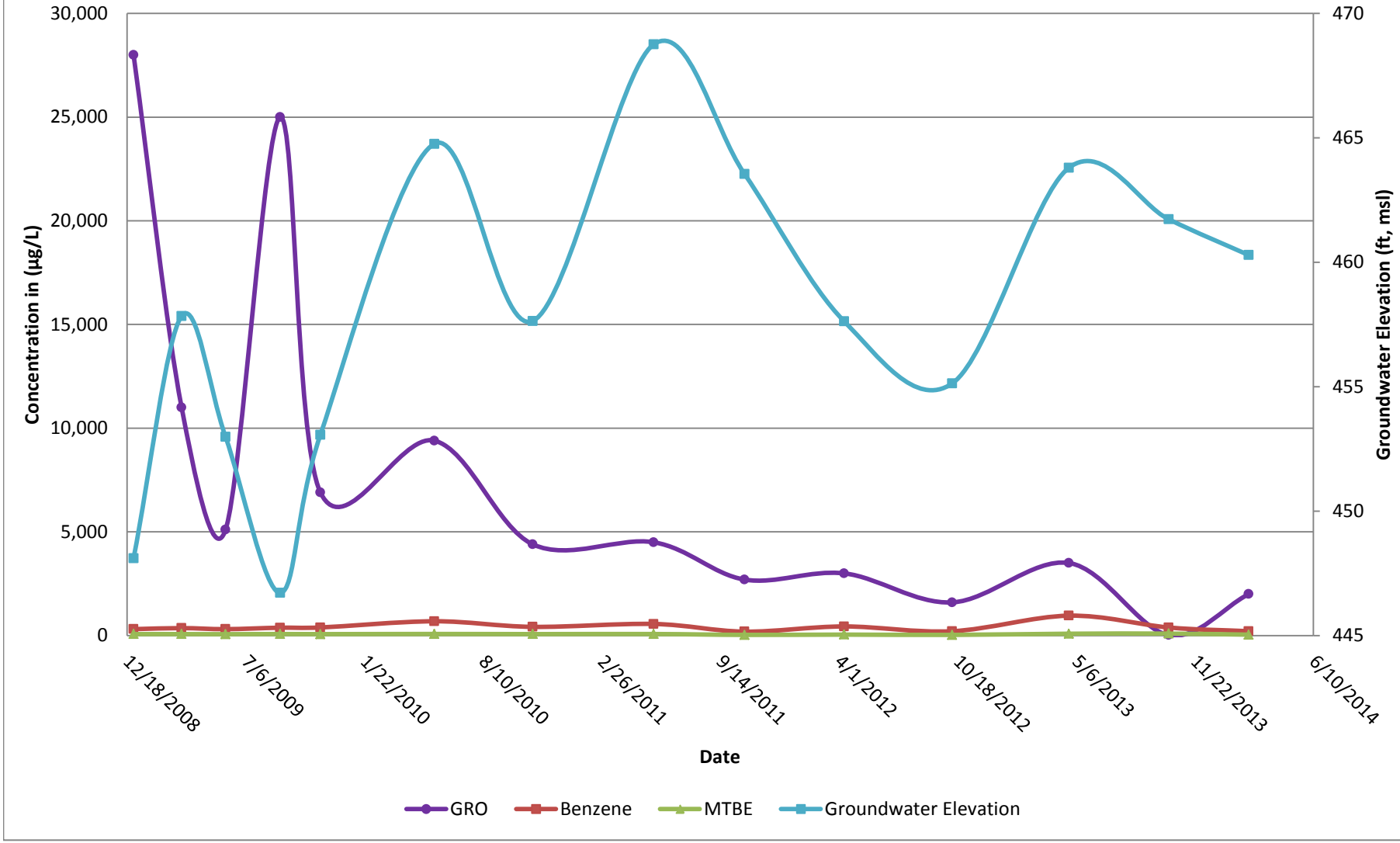

MW-1 Concentrations and Groundwater Elevations vs Time
ARCO Station #498
286 South Livermore Avenue, Livermore, California
Concentration in (µg/L)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Groundwater Elevation (ft msl)
472
470
468
466
464
462
460
458
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
Date
GRO
Benzene
MTBE
Groundwater Elevation


MW-2 Concentrations and Groundwater Elevations vs Time
ARCO Station #498
286 South Livermore Avenue, Livermore, California
Concentration in (µg/L)
Groundwater Elevation (ft, msl)
250
200
150
100
50
0
470
465
460
455
450
445
440
12/18/2008
7/6/2009
1/22/2010
8/10/2010
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
Date
GRO
Benzene
MTBE
Groundwater Elevation

MW-3 Concentrations and Groundwater Elevations vs Time

ARCO Station #498

286 South Livermore Avenue, Livermore, California



MW-4 Concentrations and Groundwater Elevations vs Time

ARCO Station #498

286 South Livermore Avenue, Livermore, California