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## Atlantic Richfield Company

**Chuck Carmel**  
Project Manager

PO Box 1257  
San Ramon, CA 94583  
Phone: (925) 275-3803  
Fax: (925) 275-3815  
E-Mail: charles.carmel@bp.com

March 26, 2014

Re: Conceptual Site Model and Case Closure Request  
Atlantic Richfield Company Station #4977  
2770 Castro Valley Boulevard, Castro Valley, California  
ACEH Case #RO0002436

"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



**CONCEPTUAL SITE MODEL AND CASE CLOSURE REQUEST  
Atlantic Richfield Company Station #4977  
2770 Castro Valley Blvd.  
Castro Valley, Alameda County, California**

**Prepared for:**

Mr. Chuck Carmel  
Atlantic Richfield Company  
P.O. Box 1257  
San Ramon, CA 94583

**Prepared by:**

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

March 26, 2014

No. 06-82-625



**BROADBENT**

1370 Ridgewood Drive, Suite 5, Chico, CA 95973

[T] 530-566-1400 [F] 530-566-1401

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March 26, 2014

Project No. 06-82-625

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

Attn.: Mr. Chuck Carmel

Re: Conceptual Site Model and Case Closure Request, Atlantic Richfield Company Station No. 4977, 2770 Castro Valley Boulevard, Castro Valley, California; ACEH Case No. RO0002436; GeoTracker Global ID # T0600100089

Dear Mr. Carmel:

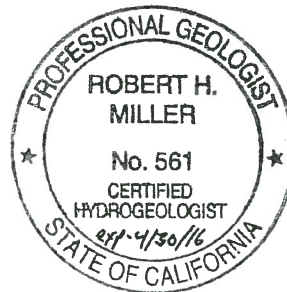
Broadbent & Associates, Inc. (Broadbent) is pleased to submit this *Conceptual Site Model and Case Closure Request* for Atlantic Richfield Company Station No. 4977 located at 2770 Castro Valley Boulevard in Castro Valley, California (Site). This document was prepared in order to evaluate this Site for case closure under the *Low Threat Underground Storage Tank Case Closure Policy* (LTCP; CSWRCB, 2012). After completion of the CSM and comparing the current Site conditions to the LTCP, case closure is recommended.

Should you have questions or require additional information, please do not hesitate to contact us at (530) 566-1400.

Sincerely,  
BROADBENT & ASSOCIATES, INC.

Jason Duda  
Senior Scientist

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



Enclosures

cc: Ms. Karel Detterman, Alameda County Environmental Health (Submitted via ACEH ftp site)  
Mr. Kevin Brown, California Regional Water Quality Control Board - San Francisco Region  
(Submitted via GeoTracker)  
Electronic copy uploaded to GeoTracker

# CONCEPTUAL SITE MODEL AND CASE CLOSURE REQUEST

Atlantic Richfield Company Station No. 4977  
2770 Castro Valley Boulevard, Castro Valley, California  
Fuel Leak Case No. R00002436

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## CONCEPTUAL SITE MODEL AND CASE CLOSURE REQUEST

Atlantic Richfield Company Station No. 4977  
2770 Castro Valley Boulevard, Castro Valley, California  
Fuel Leak Case No. RO0002436

### 1.0 INTRODUCTION

On behalf of the Atlantic Richfield Company– (ARC, a BP affiliated company) Broadbent & Associates, Inc. (Broadbent) has prepared this *Conceptual Site Model and Case Closure Request* (CSM and CCR) for the Atlantic Richfield Company (ARCO) Station No. 4977 (herein referred to as Station No. 4977), located at 2770 Castro Valley Boulevard in Castro Valley, California (Site). This CSM and CCR was prepared in order to evaluate the Site’s eligibility to be closed under the California State Water Resources Control Board’s (CSWRCB) *Low Threat Underground Storage Tank Case Closure Policy* (LTCP; CSWRCB, 2012). This CSM and CCR includes discussions on the Site background and previous environmental activities, regional and Site geology and hydrogeology, and justification for case closure.

#### 1.1 Site Setting

The Site is an active ARCO-branded service station located on the northwest corner of the intersection between Castro Valley Boulevard and Wisteria Street in Castro Valley, California (Drawing 1 and 2). The land use in the immediate vicinity of the Site is mixed commercial and residential. Development at the Site consists of a station building and two gasoline dispensing islands with associated underground storage tanks (USTs) and product piping. 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 historic boring/sampling locations is provided as Drawing 2. A Groundwater Elevation Contour Map presenting the most current groundwater data (October 2013) is provided as Drawing 3.

#### 1.2 Site Background

The Site has operated as a gasoline fueling station since before the environmental case was open in 2001. The Site is likely to remain a service station for the foreseeable future. A detailed history of previous Site activities is presented in Appendix A. Historic soil and groundwater data are presented in Tables 2 through 5. Copies of available soil boring and monitor well construction logs are provided in Appendix B. Petroleum compound concentration and groundwater elevation trend graphs are provided in Appendix C.

#### 1.3 Document Purpose and Organization

The purpose of this document is to summarize and present current Site conditions in the form of a CSM and evaluate these conditions and data gathered for Site closure based on the LTCP. The following section presents justification for closure based on the CSM. The CSM is presented as Table 1. Tables 2 and 3 present historical and current groundwater analytical data. Table 4 summarizes historical and current groundwater gradients. Table 5 presents historical soil analytical data.

In order to evaluate Site conditions against the LTCP, each category in the policy has been individually evaluated using the data presented in the CSM (Table 1). These evaluations are presented in the following sections.

## 2.0 JUSTIFICATION FOR SITE CLOSURE

As indicated in Section 1.3 above, the Site was evaluated for Closure based on comparing data presented in the CSM (Table 1) against the LTCP (CSWRCB, 2012). Closure criteria in the LTCP are organized into the following categories:

- General Criteria
- Media Specific Criteria – Groundwater
- Media Specific Criteria – Petroleum Vapor Intrusion to Indoor Air
- Media Specific Criteria – Direct Contact and Outdoor Air Exposure

The following sections present the details of the evaluation.

### 2.1 General Criteria

The general criteria relates to the Site use, presence of free product, petroleum sources, and completeness of the Site understanding. As evidenced in the data presented in the CSM, a sufficiently good understanding of Site conditions, on- and offsite receptors, and Site history has been established. General criteria and discussion on how the Site is consistent with these criteria's are presented below.

#### ***The unauthorized release is located within the service area of a public water system***

The Site is located within the East Bay Municipal Utility District (EBMUD) service area.

#### ***The unauthorized release consists only of petroleum***

The release at the Site appears to have occurred in the area of the UST basin and the eastern and southern dispensers. Additionally, analytical data collected to date has shown no indication of any other contaminant releases other than petroleum (Tables 2, 3, and 5). The Site has been a retail service station since before the environmental case was open in 2001 and there is no evidence that any other activities have occurred at the Site which may have caused non-petroleum releases.

#### ***The unauthorized release has been stopped***

The USTs, product piping, and product dispensers where the releases occurred have been removed and replaced; thereby, removing the leak sources (Table 1; Appendix A).

#### ***Free product has been removed to the maximum extent practicable***

Free product has never been observed at the Site throughout the duration of sampling.

#### ***A conceptual site model (CSM) that assesses the nature, extent, and mobility of the release has been developed***

The most recent CSM prepared for this Site is presented as Table 1.

#### ***Secondary source has been removed to the extent practical***

Soils around the former UST complex, dispensers and product piping have been over-excavated. Approximately 1,105 cubic tons of petroleum impacted soil were over-excavated and disposed of offsite in March 2001 (Table 1; Closure Solutions, 2012).

***Soil and groundwater have been tested for MTBE and results reported in accordance with Health and Safety Code 25296.15***

Soil and groundwater samples collected have been analyzed for methyl tert-butyl ether (MTBE). Historical MTBE analytical data are included in Tables 2, 3, and 5.

***Nuisance as defined by the Water Code section 13050 does not exist at this site***

A nuisance as defined by the water code does not exist at this Site.

**2.2 Media-Specific Criteria - Groundwater**

The LTCP lists four scenarios for groundwater plumes. According to the petroleum plume sizes indicated in Drawings 4 through 9, the plume is currently less than 100 feet in length, as measured from the source area. Free product has never been observed at the Site since sampling was first initiated in 2002. A sensitive receptor survey indicated that three domestic wells and one well of unknown use were located within a 2,000 foot radius of the Site at distances greater than 1,000 feet from the Site, as presented in the CSM (Table 1). The closest surface water is an unnamed concrete-lined drainage canal, located approximately 575 feet southwest of the Site. The canal empties into the San Lorenzo Creek about 2,200 feet south of the Site (Table 1). Based on these criteria, the Site is eligible for closure under the LTCP groundwater category 1.

**2.3 Media Specific Criteria – Petroleum Vapor Intrusion to Indoor Air**

The Site is an active service station, and therefore the LTCP considers that petroleum vapors from onsite fueling activities are a far greater risk than those associated with exposure to vapors from historic petroleum releases. Minor offsite migration of benzene and MTBE may have occurred (Drawings 6 and 8, respectively). However, concentrations above cleanup levels do not extend significantly past the edge of Castro Valley Boulevard and Wisteria Street. Accordingly, there are no vapor intrusion risks to offsite buildings. This Site data meets the criteria for closure according to the LTCP.

**2.4 Media Specific Criteria – Direct Contact and Outdoor Air Exposure**

Soil samples were collected adjacent to the former source areas (dispensers and USTs) in 2011 (Drawing 2; Table 5). Soil samples collected during this investigation contained GRO, benzene, ethylbenzene, and total xylenes. The highest concentrations of GRO, benzene, ethylbenzene, and total xylenes observed during the 2011 investigation were 630 mg/kg at 10 feet bgs (B-4), 0.37 mg/kg at 10 feet bgs (B-4), 9.9 mg/kg at 10 feet bgs (B-4), and 6.8 mg/kg at 6.5 feet bgs (B-3), respectively. The most recent soil samples collected from 0 to 5 feet bgs were collected from borings B-4 and B-5 at approximately four feet bgs during this investigation. Benzene and ethylbenzene were not detected above laboratory reporting limits in these two samples.

Historically, the highest benzene (8.05 mg/kg) and ethylbenzene (37.3 mg/kg) concentrations observed in soil at the Site were recorded from sample DP-2 collected at approximately 6 feet bgs beneath the southernmost dispenser island during upgrade activities in 2001. The benzene concentration observed from DP-2 was relatively close to the LTCP direct exposure maximum value of 8.2 mg/kg for a commercial/industrial setting. However, the area within the vicinity of this sample was over-excavated prior to installation of new dispensers and piping, reducing the concentration further. Additionally, future work within the vicinity of the dispensers requiring soil excavation will be conducted by personnel properly trained to work on a service station (American Petroleum Institute Service Station Contractor Safety Program) and with potentially contaminated materials (40 hour HAZWOPER). Table A below

summarizes the highest concentrations of benzene and ethylbenzene detected in representative soil samples between 0 to 5 feet bgs and 5 to 10 feet bgs. Locations of the soil samples collected and analytical data, as well as additional historical data are presented in Drawing 2 and Table 5.

**Table A: Representative Maximum Concentrations of Benzene and Ethylbenzene in Soil Samples - 0 to 5 feet bgs and 5 to 10 feet bgs**

Sample Identification and Depth	Sample Date	Benzene (mg/kg)	Ethylbenzene (mg/kg)	Removal by Excavation
B-4 @ 4'	9/23/2011	<0.0010	<0.0010	No
B-5 @ 4'	9/23/2011	<0.0010	<0.0010	No
B-4 @ 10'	9/23/2011	0.37	9.9	No
B-5 @ 10'	9/23/2011	<0.10	0.41	No
DP-2 @ 6'	3/15/2001	8.05	37.3	Yes
LTCP Maximum* - 0-5/5-10 feet bgs		8.2/12	89/134	--

\*Under a commercial/industrial exposure setting  
mg/kg = milligrams per kilogram

Soil samples collected from 2011 (mentioned above) were not analyzed for naphthalene or poly-aromatic hydrocarbons (PAHs). Naphthalene has not been included in the analysis of past soil samples collected at the site. This apparent data gap can be addressed using the published relative concentrations of naphthalene and benzene in gasoline. This approach has been used by State Water Board staff in recent Closure Orders pursuant to the Policy (e.g., SWB WQ Order 2013-0003): Gasoline mixtures contain an average of approximately 2 percent benzene and 0.25 percent naphthalene (Potter and Simmons 1998); therefore, benzene concentrations can be directly substituted for naphthalene concentrations with a safety factor of about 10. The maximum benzene concentrations from the Site are less than the naphthalene criteria in Table 1 of the Policy. Therefore, the estimated naphthalene concentrations at the Site meet the Policy criteria for direct contact by a factor of about 10. It is highly unlikely that naphthalene concentrations in the soil, if any, exceed the Policy criteria. Based on the data presented herein and in Appendix B, remaining petroleum concentrations in soil appear to be within acceptable levels for closure under the LTCP.

## 2.5 Recommendation for Case Closure

As presented above and in the attached CSM table (Table 1), this Site appears to meet all applicable criteria for case closure under the LTCP. Over 10 years of groundwater monitoring data has shown that petroleum hydrocarbons exhibit a stable-to-decreasing trend at the Site. Adequate Site characterization, evaluation of receptors, historical descriptions, and technical analysis have been performed at the Site and in this document to support a recommendation for case closure. We hereby recommend that a determination of No Further Action be made for this Site. Upon concurrence of this recommendation from the ACEH, closure activities including well decommissioning should be carried out.



### 3.0 REFERENCES

Broadbent & Associates, Inc., January 2, 2012. *On-Site Soil and Groundwater Investigation Report, ARCO Station #4977, 2770 Castro Valley Boulevard, Castro Valley, California.*

Broadbent & Associates, Inc., January 27, 2014. *Fourth Quarter 2013 Semi-Annual Groundwater Monitoring Report, ARCO Station #4977, 2770 Castro Valley Boulevard, Castro Valley, California.*

Closure Solutions, Inc., 9 November 2011. *Sensitive Receptor Survey, ARCO Station No. 4977, 2770 Castro Valley Boulevard, Castro Valley, California.*

Closure Solutions, Inc., 19 March 2012. *Conceptual Site Model, ARCO Station No. 4977, 2770 Castro Valley Boulevard, Castro Valley, California.*

Potter, T.L. and K.E. Simmons, 1998. *Composition of Petroleum Mixtures. TPHCWG Series, Vol. 2*  
Amherst Scientific Publishers, MA.

State Water Resources Control Board, August 17, 2012. *Low-Threat Underground Storage Tank Case Closure Policy.*

State Water Resources Control Board Low-Threat UST Closure Policy Task Force, July 11, 2011. *Technical Justification for Groundwater Plume Lengths, Indicator Constituents, Concentrations, and Buffer Distances (Separation Distances) to Receptors.*

## **DRAWINGS**

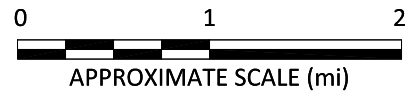


IMAGE SOURCE: DELORME



1370 Ridgewood Dr., Suite 5  
Chico, California 95973

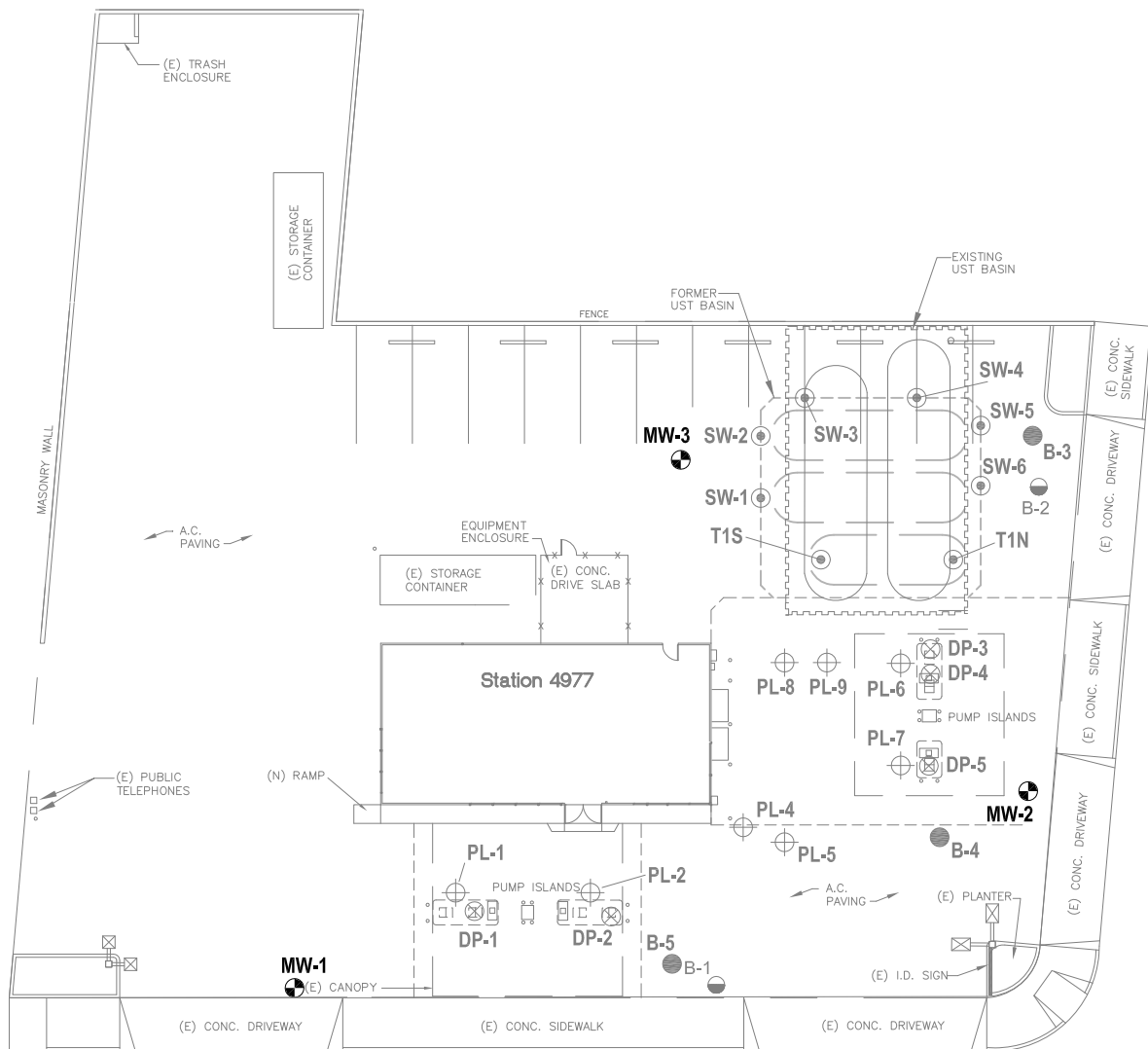
Project No.: 06-82-625 Date: 11/29/2012

Station #4977  
2770 Castro Valley Blvd.  
Castro Valley, California

Site Location Map

Drawing

1



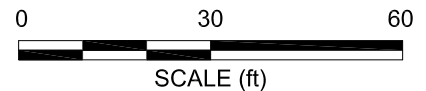
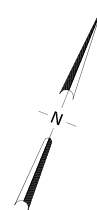
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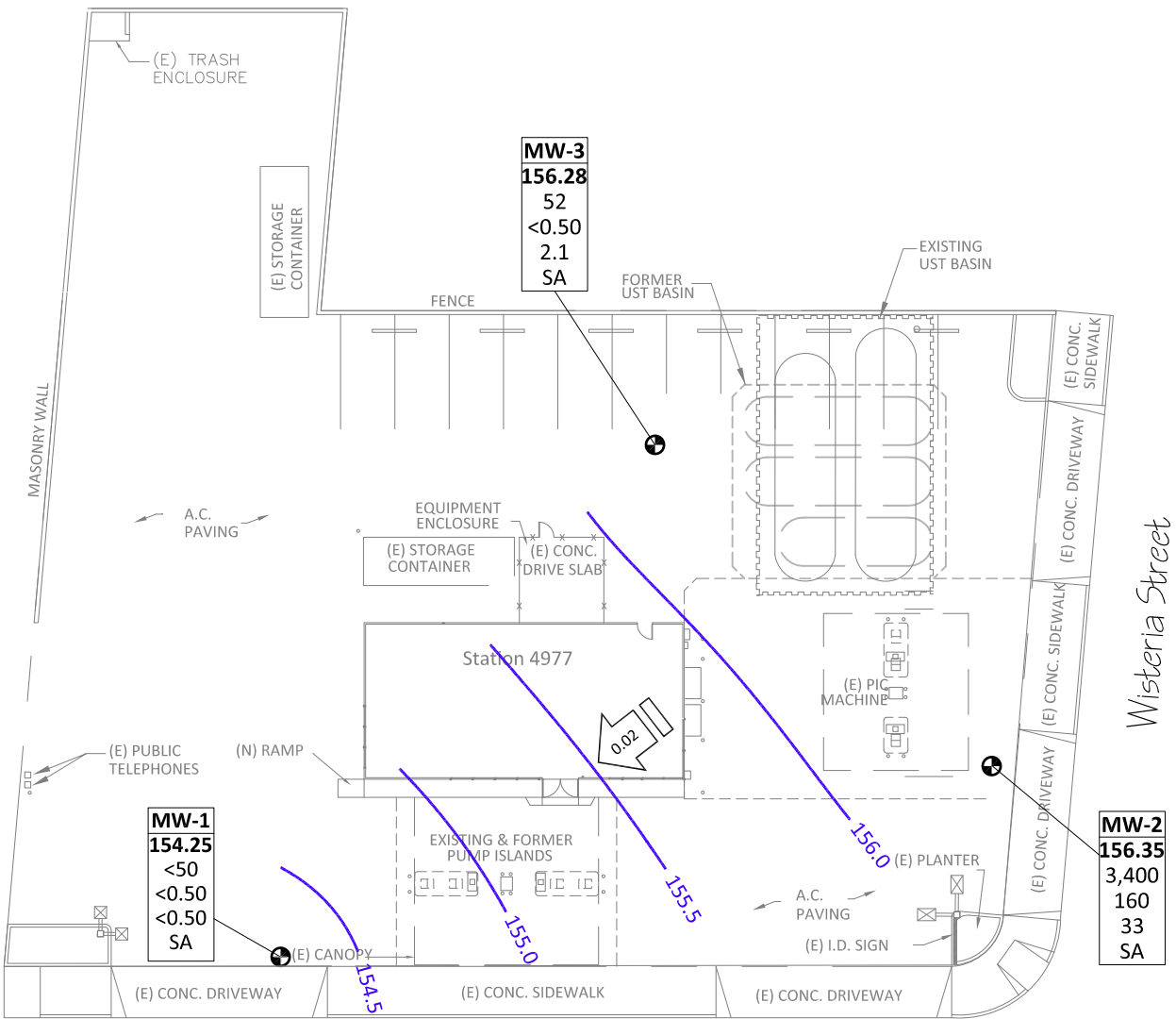
Wisteria Street

**LEGEND**

- SOIL BORING
- ⊕ MONITORING WELL
- HISTORIC SOIL BORING
- ⊗ DISPENSER COMPLIANCE SAMPLE
- ⊕ PRODUCT LINE SAMPLES
- ⊙ FORMER TANK BASIN SAMPLES

NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.





NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

Castro Valley Blvd.

**LEGEND**

⊕ Monitor Well Location

Well — Well Designation

ELEV — Groundwater Elevation (ft.)

GRO — Concentration of GRO, Benzene and MTBE in Groundwater (µg/L)

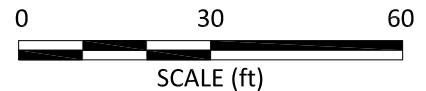
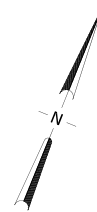
SA — Sampling Frequency

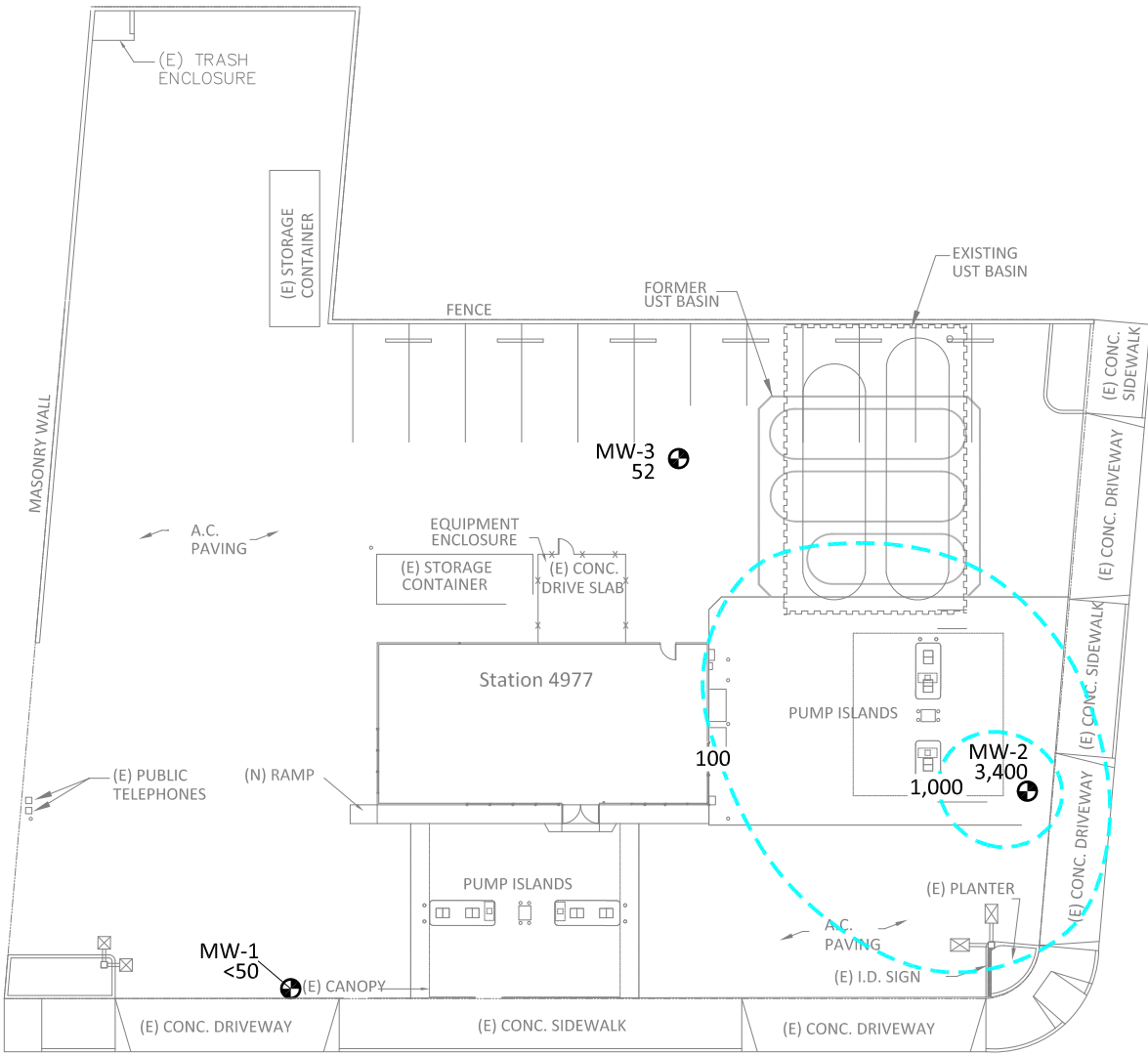
< — Not Detected at or Above Laboratory Reporting Limits

SA — Sampled Semi-Annually

155.0 — Groundwater Elevation Contour (ft)

0.02 — Approximate Groundwater Gradient (ft/ft)







NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

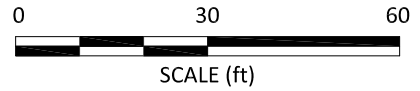
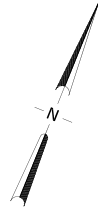
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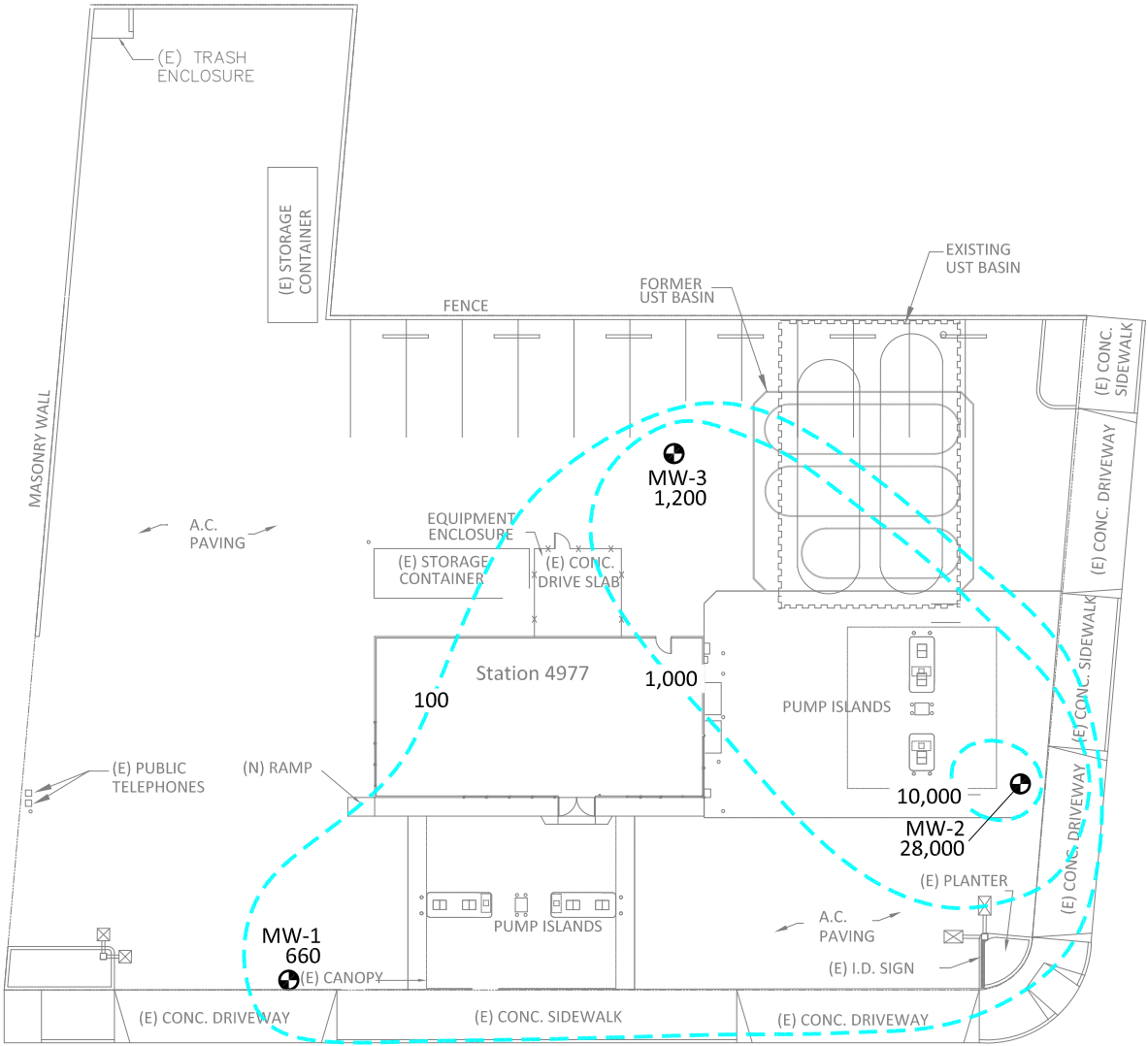
Wisteria Street

**LEGEND**

 Monitor Well Location with GRO Concentration ( $\mu\text{g/L}$ )

 GRO Contour ( $\mu\text{g/L}$ )





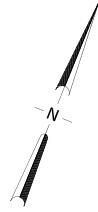
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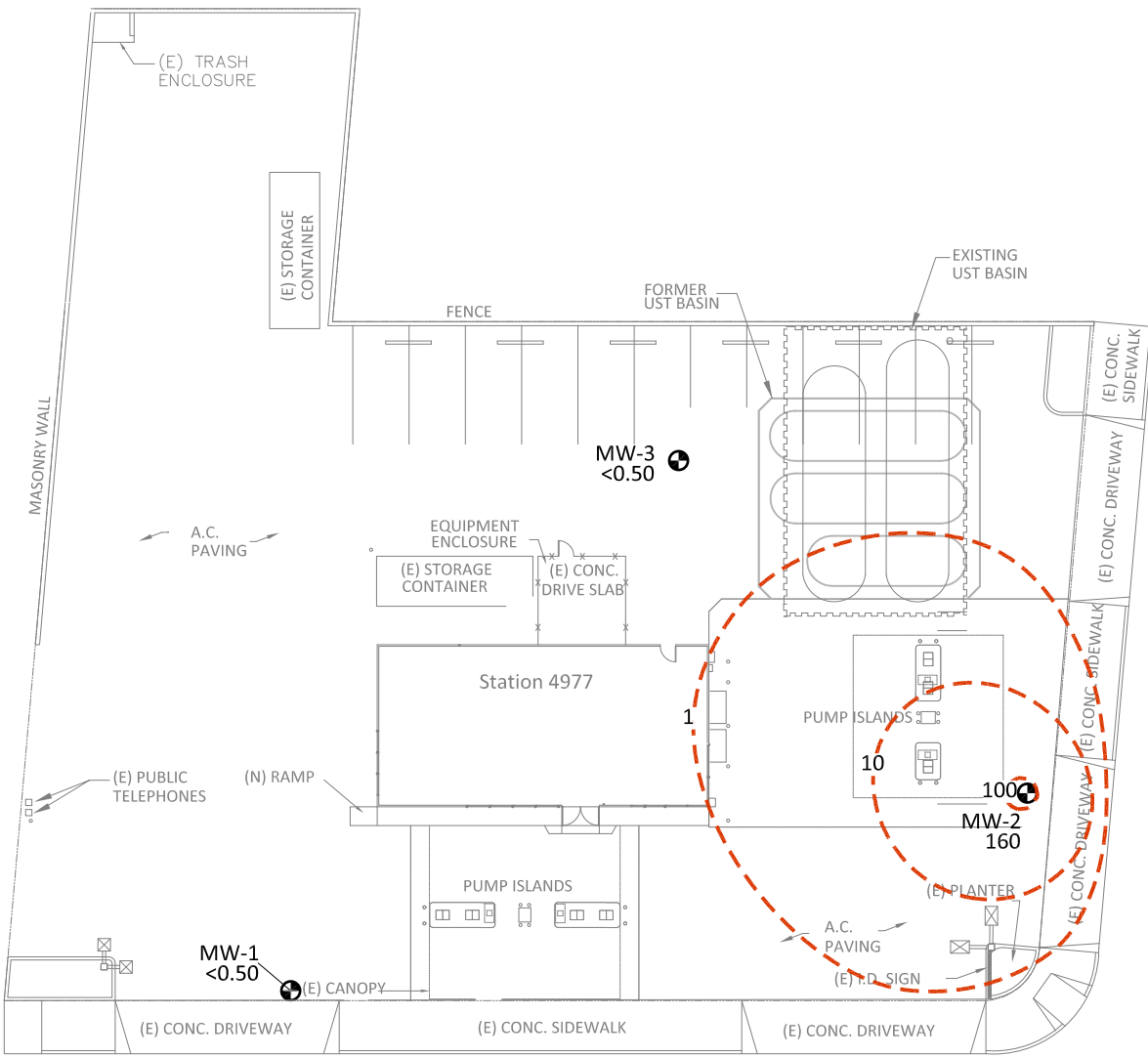
Castro Valley Blvd.

Wisteria Street

**LEGEND**

- Monitor Well Location with GRO Concentration ( $\mu\text{g/L}$ )
- GRO Contour ( $\mu\text{g/L}$ )





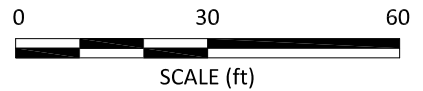
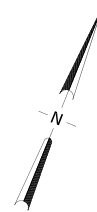
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Castro Valley Blvd.

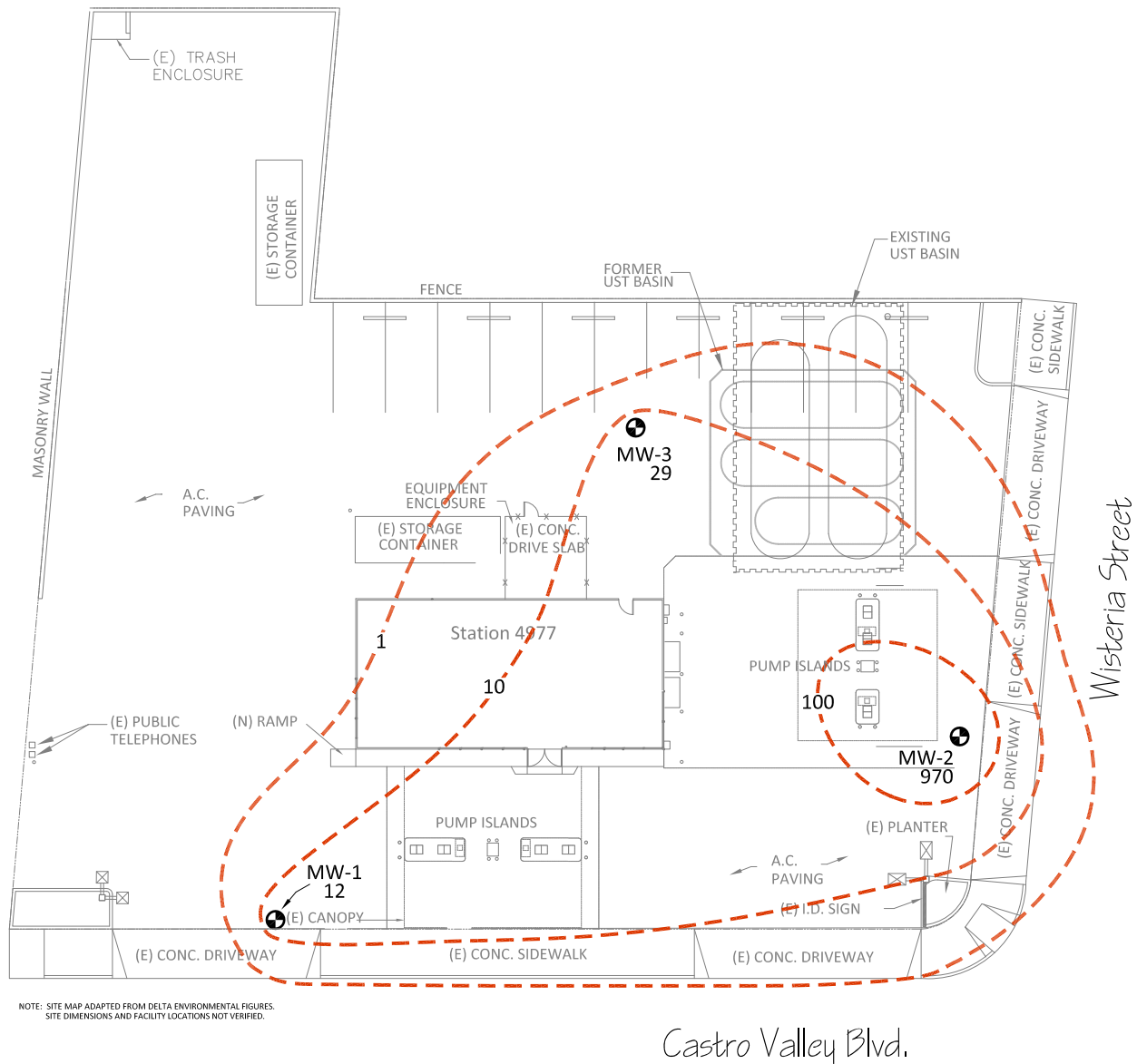
Wisteria Street

**LEGEND**

- ⊕ Monitor Well Location with Benzene Concentration ( $\mu\text{g/L}$ )
- Benzene Contour ( $\mu\text{g/L}$ )







NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

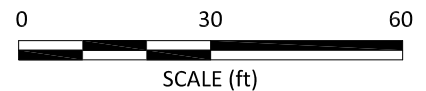
Castro Valley Blvd.

Wisteria Street

**LEGEND**

⊕ Monitor Well Location with Benzene Concentration (µg/L)

--- Benzene Contour (µg/L)







NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

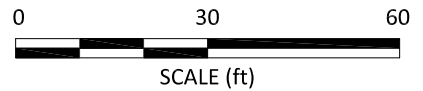
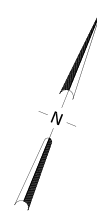
Castro Valley Blvd.

Wisteria Street

**LEGEND**

 Monitor Well Location with MTBE Concentration (µg/L)

 MTBE Contour (µg/L)





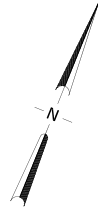
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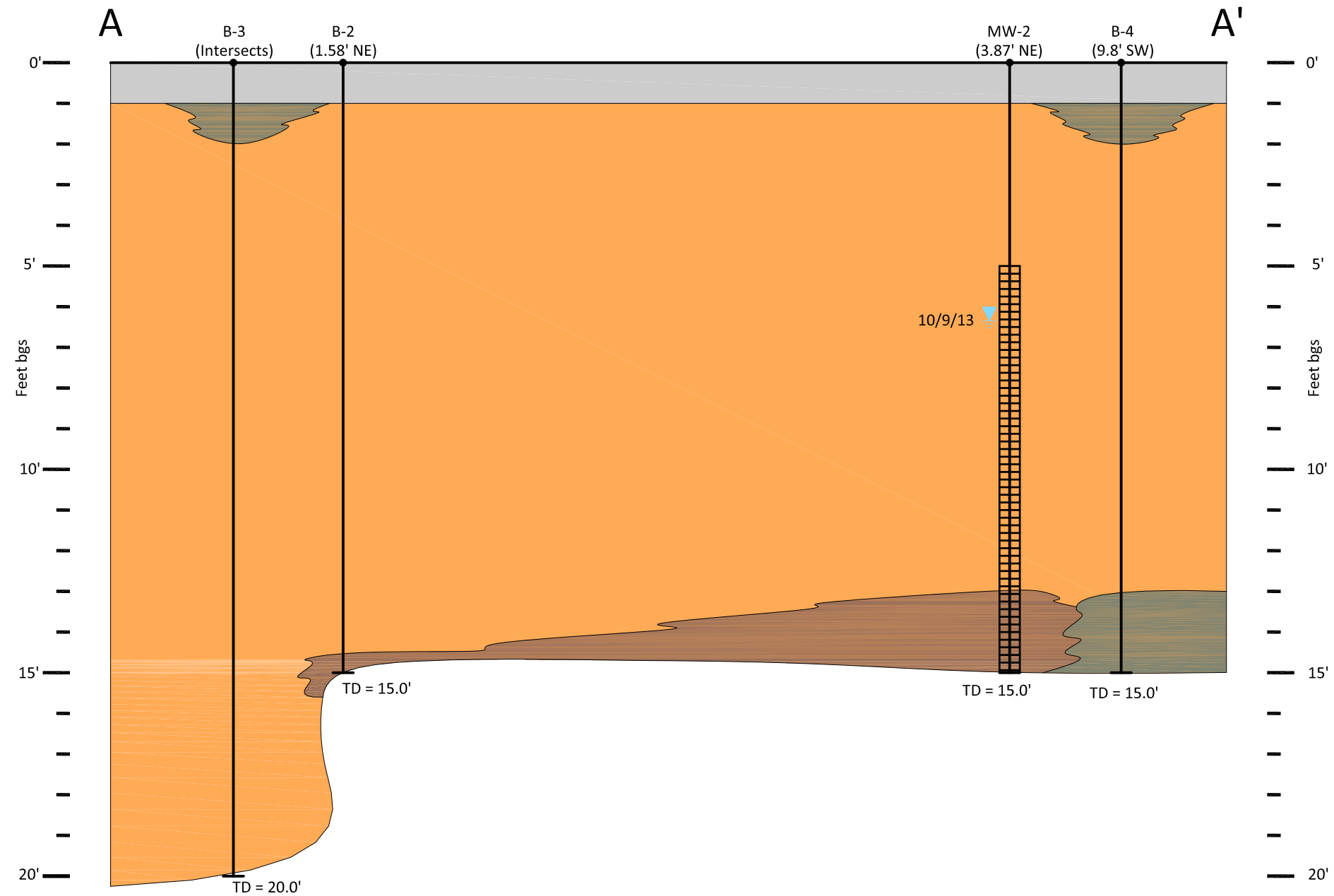
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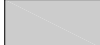




Wisteria Street

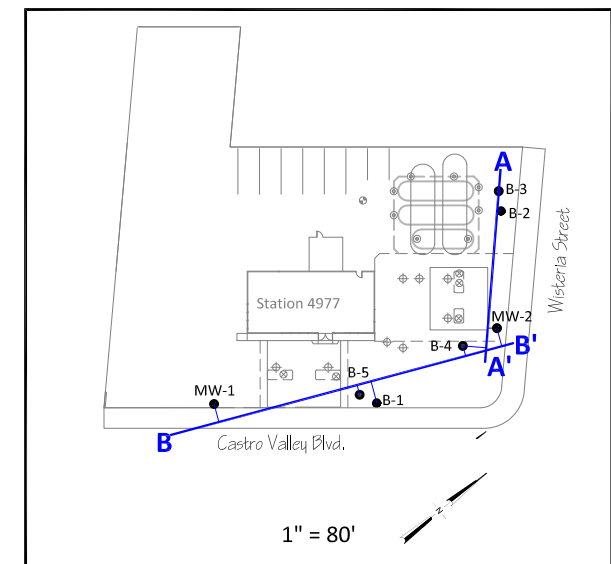
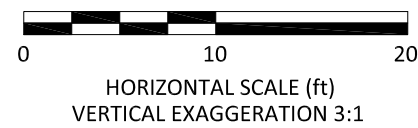
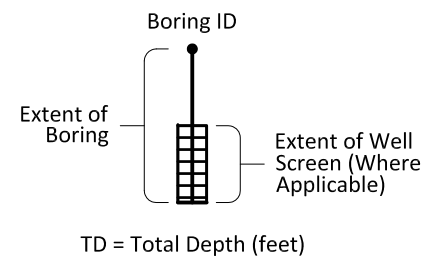
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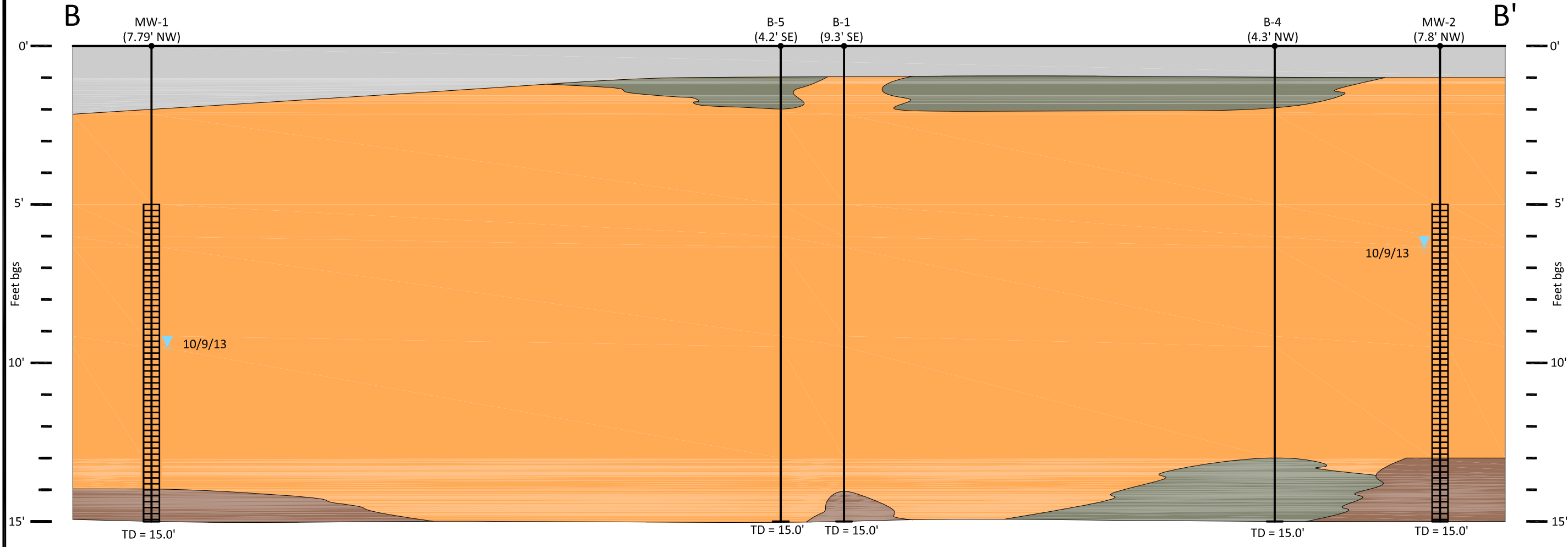
- Monitor Well Location with MTBE Concentration (µg/L)
- MTBE Contour (µg/L)








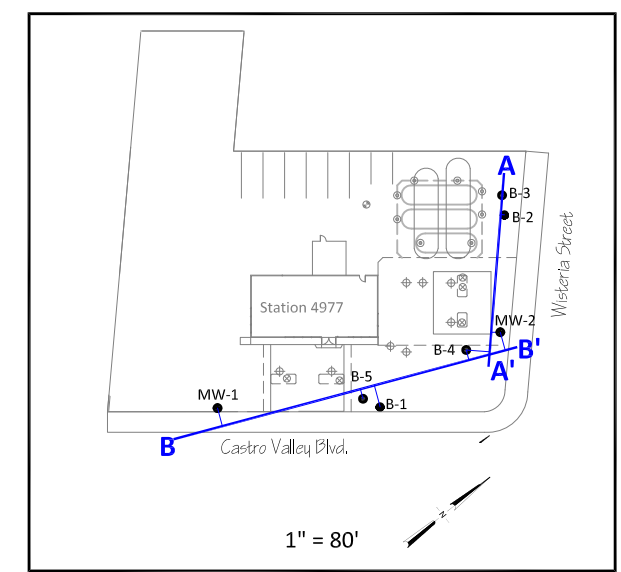
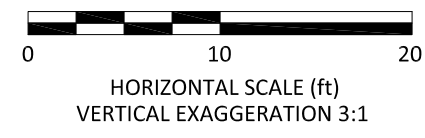
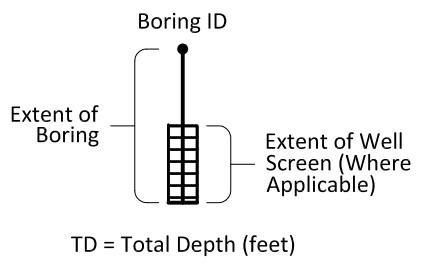


-  Asphalt/Backfill
-  Gravels (GM)
-  Clays (CL)
-  Bedrock
-  10/9/13  
Date of Groundwater Elevation Measurement





-  Asphalt/Backfill
-  Gravels (GM)
-  Clays (CL)
-  Bedrock
-  Groundwater Elevation  
Date of Groundwater Elevation Measurement  
10/9/13



## TABLES

**TABLE 1****CONCEPTUAL SITE MODEL**

Atlantic Richfield Company Station No. 4977  
 2770 Castro Valley Boulevard  
 Castro Valley, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	Regional	<p>The Site is located within the Coast Range Geomorphic Province, on the eastern side of San Francisco Bay, approximately one mile west of the Hayward Fault. The Site was mapped by the United States Geological Survey (USGS) as containing weakly consolidated, poorly sorted, slightly weathered, irregular interbedded clay, silt, sand, and gravel.</p> <p>The Site is located within the Castro Valley Basin, which is an isolated structural basin surrounded on the north, west, and east by folded and faulted uplands comprised of Cretaceous sandstone, shale, and conglomerates of marine origin. Active traces of the Hayward fault are present to the west of the valley. Sediments in the valley are mostly of fluvial origin and relatively thin (&lt;100 foot thickness). The unconfined water-bearing zone lies within unconsolidated alluvial sediments and groundwater generally flows to the southwest towards San Francisco Bay.</p>	None	NA
	Site	<p>The Site elevation is approximately 165 feet above mean sea level. The water table fluctuates seasonally with recorded static depths to water in monitor wells at the Site ranging between a historic minimum depth of 4.44 feet (MW-3 on 5/17/2011) and maximum depth of 14.91 feet (MW-1 on 6/2/2009). Historically, depth-to-water measurements have averaged 7.63 feet below the top-of-casing measuring point elevations in the monitoring wells. The potentiometric groundwater gradient was to the south-southwest at a magnitude of 0.02 foot/foot during the Fourth Quarter 2013 monitoring event on October 9, 2013 (most recent available). It should be noted that the north arrow on the base maps inherited from previous consultants for this Site was incorrectly skewed to the east on previous drawings. This has been corrected on each drawing presented in this report. Previous gradient directions were calculated and depicted correctly; however, due to the slight skew of the north arrow, previous gradient directions may not have been accurately identified within the text or tables of historic reports. The historical groundwater flow direction at the Site has been generally to the south with slight variations towards the southeast and southwest (Table 4). The hydraulic gradient has ranged from 0.011 to 0.042 foot/foot since 2002 (Table 4). Depth to groundwater within the last five years has ranged from 4.44 to 14.91 feet bgs onsite.</p> <p>Geologic data derived from onsite borings indicate that the lithology onsite consists mainly of clay and silty clay with interbedded layers of silty gravel and gravelly, silty clay from ground surface to a depth of approximately 20 feet bgs. Bedrock was said to be observed in several historic borings between</p>	None	NA

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Atlantic Richfield Company Station No. 4977  
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 Castro Valley, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology (Cont.)	Site (Cont.)	<p>approximately 13 and 15 feet bgs but this layer was not observed during the 2011 investigation. Since refusal was not encountered to a maximum depth of 20 feet bgs using a direct push drill rig in 2011, the presence of bedrock between 13 and 15 feet bgs is suspect. Soil boring logs are provided in Appendix B.</p> <p>Geologic cross-sections (Drawings 10 and 11) indicate large areas of clay from ground surface to depths of approximately 20 feet bgs. Gravel lenses are present at depths of approximately one to two feet bgs and 13 to 15 feet bgs. Bedrock was encountered at approximately 13 to 15 feet bgs in some areas. First encountered groundwater in soil was at approximately 11 feet bgs on April 11, 2002. Boring logs are presented in Appendix B and current geologic cross-sections are provided as Drawings 10 and 11.</p>		
Surface Water Bodies		The nearest surface water body is an unnamed concrete-lined drainage canal approximately 575 feet southwest of the Site. The canal's general flow direction is from east to west; however, specific flow directions of the canal vary to the southeast near the Site, eventually turning to the west-northwest prior to entering the San Francisco Bay via the San Lorenzo Creek about 2,200 feet to the south of the Site.	None	NA
Nearby Wells		In November 2011, a <i>Sensitive Receptor Survey</i> was conducted out by Closure Solutions, Inc., to identify the presence of wells within the vicinity of the Site. The survey identified three domestic wells (one downgradient and two upgradient) and one well of unknown use (upgradient) within a half mile radius of the Site. Each well was located over 1,000 feet from the Site.	None	NA
Constituents of Concern	Light-Non Aqueous Phase Liquid (LNAPL)	LNAPL has not been observed in any groundwater monitoring wells at the Site throughout the duration of sampling events.	None	NA
	Gasoline Range Organics (GRO)	Historically, concentrations of GRO have been detected in all monitoring wells MW-1 through MW-3. GRO impacts have not historically been significantly reported in monitor well MW-1. The historical maximum detected concentration of GRO was reported in well MW-2 at 33,000 µg/L on December 27, 2005. The maximum detected concentration of GRO within the last four monitoring events was	None	NA



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Atlantic Richfield Company Station No. 4977  
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Constituents of Concern (Cont.)	GRO (Cont.)	<p>reported in well MW-2 at 5,400 µg/L, indicating a strong decreasing GRO trend over time. Based on recent and historical data, the GRO plume has been delineated and appears small and isolated within the southeastern portion of the Site. GRO isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2013 and Second Quarter 2002 are presented in Drawings 4 and 5, demonstrating the reduction in plume extent over time. A GRO concentration trend graph for monitoring wells is included in Appendix C. Decreasing trends indicate that the concentrations will continue to degrade over time.</p>		
	Benzene	<p>Historically, concentrations of benzene have been detected in monitoring wells MW-2 and MW-3. Benzene concentrations have been sporadically detected in well MW-1 on the southern portion of the Site but has remained below laboratory detection limits since 2006. The historical maximum concentration of benzene was reported in monitor well MW-2 at 1,600 µg/L on March 11, 2003. The maximum detected concentration of benzene within the last four monitoring events was reported in well MW-2 at 210 µg/L, indicating a decreasing trend of benzene over time.</p> <p>Based on recent and historical data, the benzene plume has been delineated and appears small, with impacts that appear to be confined to the southeastern portion of the Site. Benzene isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2013 and Second Quarter 2002 are presented in Drawings 6 and 7, demonstrating the decrease in plume size over time. A benzene concentration trend graph for all monitoring wells is included in Appendix C. Decreasing trends indicate that the concentrations will continue to degrade over time.</p> <p>Review of the Technical Justification for Groundwater Plume Lengths (SWRCB, July 2011) document provided insight into average and maximum plume lengths of TPHg (GRO), benzene, and MTBE for numerous Sites throughout the State of California. This document indicated that average benzene plumes with a plume limit concentration of 5 µg/L were 198 feet in length with a maximum observed plume length of 554 feet. Based on current Site conditions and concentrations, the benzene plume, with a plume limit of 1 µg/L, associated with Station #4977 is confined to well below 100 feet in length (Drawing 6), as measured from the source area. This is supported by the fact that well MW-1, located approximately 120 feet directly downgradient of well MW-2 with a current benzene concentration of 160 µg/L, has recorded benzene concentrations below laboratory detection limits</p>	None	NA

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Atlantic Richfield Company Station No. 4977  
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Constituents of Concern (Cont.)	Benzene (Cont.)	<p>since 2006.</p> <p>The magnitude of any impacts in a direction other than downgradient are very unlikely to extend laterally further from the Site than impacts observed in the prevailing southern/south-southwestern direction. Additionally, the predominant presence of low permeable clay beneath the Site further supports limited migration within the subsurface. Supposing the benzene plume did extend into Castro Valley Boulevard, it would not be expected to reach offsite properties due to the fact that the street is approximately 80 feet wide itself. Thus, offsite vapor intrusion issues due to the presence of benzene within groundwater are not a concern.</p>		
	Methyl tert-butyl ether (MTBE)	<p>Historically, concentrations of MTBE have been detected in all monitoring wells MW-1 through MW-3. The historical maximum MTBE concentration was reported in well MW-3 at 1,700 µg/L on April 19, 2002. The maximum detected concentration within the last four monitoring events was reported in well MW-2 at 40 µg/L, indicating a strong decreasing MTBE trend over time.</p> <p>Based on recent and historical data, the MTBE plume has been delineated and appears small and does not extend offsite. MTBE isoconcentration contour maps for groundwater monitoring and sampling events for Fourth Quarter 2013 and Second Quarter 2002 are presented in Drawings 8 and 9, demonstrating the decline in plume size over time. The concentration of MTBE in well MW-2 has decreased significantly in magnitude since 2002. Based on the observed decreasing trends, the extent of MTBE is limited to onsite and will continue to degrade over time.</p>	None	NA
Potential Sources	Onsite	<p>The exact release source and volume released at the Site is unknown; however, it is assumed that the source was from former USTs, and dispensers, located in the northern, southern, and eastern portions of the Site. These assumptions are supported by data from historic soil sample and dissolved-phase petroleum hydrocarbon concentrations. An unknown amount of residual petroleum hydrocarbon contamination is presently bound within the soil matrix in these areas, and dissolved in groundwater beneath the Site. A fluctuating groundwater table has likely caused a contaminant smear zone where the residual hydrocarbon mass remains. However, the trends for the residual petroleum compounds in groundwater indicate that the remaining concentrations in this smear zone have degraded over time and are minimally impacting the groundwater beneath the Site and will continue to degrade over time (Appendix C).</p>	None	NA

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Atlantic Richfield Company Station No. 4977  
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Sources (Cont.)	Onsite (Cont.)	<p>In March 2001, Delta Environmental Consultants (Delta) conducted assessment activities associated with dispenser, product line and UST upgrades at the Site. Soil samples were collected from beneath the product piping, dispenser islands and USTs (Table 5). Hydrocarbon impacted soil was observed in several of the soil samples collected with the highest concentrations present at the southernmost dispenser island (DP-2) at approximately 6 feet bgs. Approximately 1,105 tons of soil was removed and disposed of during excavation activities conducted along the product line trenches, dispenser islands and UST basin. Based on the observations during these station upgrades and the proximity of historical and current petroleum concentrations in groundwater, it appears that the onsite hydrocarbon sources were the former USTs and dispensers. The removal and replacement of the storage and dispensing system was conducted to stop the potential release.</p>		
	Offsite	<p>A former automotive service station (Quality Tune Up) was located just east of the Site at 2780 Castro Valley Boulevard in Castro Valley, California. Quality Tune Up once maintained three gasoline USTs and one of the gasoline USTs was converted into a waste oil UST in February 1987. In May 1992, three groundwater monitoring wells were installed and groundwater monitoring was initiated.</p> <p>The open case associated with Quality Tune Up was closed in April 2012. The Closure letter from the ACEH noted that concentrations of TPHg (430 mg/kg) and benzene (0.810 mg/kg) remain in the soil. The location of this property is directly upgradient from Station #4977, which makes the case a suspect contributor to the Site. However, due to minimal petroleum compounds noted in soil and groundwater samples at this adjacent automotive service station and the fact that the Quality Tune Up site is a closed environmental case, it is unlikely that contaminants from this automotive service station have significantly impacted Station #4977. No other offsite sources have been identified.</p>	None	NA

**TABLE 1****CONCEPTUAL SITE MODEL**

Atlantic Richfield Company Station No. 4977  
 2770 Castro Valley Boulevard  
 Castro Valley, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Nature and Extent of Environmental Impacts	Extent in Soil	<p>Soil contamination appears defined and limited to onsite. Based on historical data, the highest concentrations of GRO were detected in the northern portion of the Site, immediately north of the UST complex. The highest concentration of benzene was observed at approximately 6 feet bgs beneath the southernmost dispenser island (DP-2 at 8.05 mg/kg). However, over-excavation occurred within the area of DP-2, resulting in additional concentration reduction. The highest concentrations were consistently reported at approximately 6 to 10 feet bgs, which is consistent with the capillary fringe zone at the Site. The highest GRO concentration (B-2 at 1,600 mg/kg) was detected immediately upgradient of the UST complex in 2002. In 2001, the former USTs, dispenser islands, and associated piping were removed and replaced. Soil was defined laterally and vertically by upgradient and cross-gradient borings and limited to a depth range of approximately 6 to 15 feet bgs.</p> <p>Since the sources have been removed and these concentrations were representative of overall concentrations at the time of sampling, it is likely that these concentrations have further attenuated over the last 10 years. The highest concentration of GRO (1,600 mg/kg) in soil was observed in boring B-2, at a depth of approximately 6 feet bgs, during an investigation conducted in 2002. The highest concentration of benzene (8.05 mg/kg) was observed in dispenser sample DP-2, at a depth of approximately 6 feet bgs, during onsite upgrade activities in 2001. The highest concentrations of GRO and benzene observed from approximately 4 to 7 feet bgs during the most recent investigation conducted in 2011 were 490 mg/kg and &lt;0.0010 mg/kg, respectively (Drawing 2 and Table 5). The decrease in concentrations suggests a reduction in hydrocarbon impact within the soil matrix beneath the Site. Based on data and observations from current groundwater conditions, soil at the Site appears to be adequately defined.</p>	None	NA
	Extent in Shallow Groundwater	<p>The current groundwater monitoring network at the Site includes cross-gradient wells (MW-2 and MW-3); and downgradient well (MW-1). Isoconcentration maps for the most recent groundwater monitoring and sampling event (4Q13) for GRO, benzene, and MTBE are included as Drawings 4, 6, and 8, respectively. Based on the observed decreasing trends and low concentrations, the extent of petroleum hydrocarbon compounds is predominately limited to onsite. Decreasing trends indicate that the concentrations will continue to degrade over time.</p>	None	NA

**TABLE 1****CONCEPTUAL SITE MODEL**

Atlantic Richfield Company Station No. 4977  
 2770 Castro Valley Boulevard  
 Castro Valley, 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 has not been investigated at the Site. Due to the nature of petroleum being less dense than water, as it is prevalent with the groundwater surface and the current low concentrations detected in Site wells, it is unlikely deeper petroleum impacts are present at the Site. Additionally, current concentrations are so low that deeper zone petroleum impacts are unlikely. Based on petroleum characteristics and the fact that a lower water bearing zone has not been identified, vertical characterization is not considered a data gap, even though no deeper groundwater samples have been collected.	None	NA
	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
Migration Pathways	Potential Conduits	A potential transmissive conduit study has not been performed for the Site. However, conversations with local utility providers including Pacific Gas and Electric, Castro Valley Sanitary District, and East Bay Municipal Utility District provided information regarding the expected depth of underground utilities in the area, which was stated to range from approximately one to four feet bgs. As depth to water measurements at the Site have averaged 7.63 feet bgs since 2002, it is unlikely that utilities within the vicinity of the Site have influenced offsite migration of contaminants within the groundwater and no evidence exists to suggest such an occurrence. Additionally, groundwater monitoring well MW-1, located in the downgradient direction from the presumed source areas, has not contained hydrocarbon concentrations above water quality objectives since 2008. The hydrocarbon plumes have significantly decreased over time and will continue to decrease onsite, thus alleviating significant concerns regarding migration of higher levels of contaminants offsite.	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. The exposure from current fueling operations represents a greater risk than any associated with potential groundwater or soil vapor exposure (CSWRCB, 2012).	None	NA

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**CONCEPTUAL SITE MODEL**

Atlantic Richfield Company Station No. 4977  
2770 Castro Valley Boulevard  
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Receptors (Cont.)	Offsite	<p>As discussed above, the nearest surface water body is the unnamed canal that flows into the San Lorenzo Creek about 2,200 feet to the south of the Site. The unnamed canal is located approximately 575 feet to the southwest of the Site. This canal is lined with concrete making it difficult for groundwater to percolate through and as such, due to its distance and lining, is not considered to be a receptor. In addition, monitoring well MW-1 located between the canal and the source area at the Site has a documented history of minor petroleum hydrocarbon impacts.</p> <p>Results of a receptor survey noted above indicate the presence of three domestic wells and one well of unknown use within a half-mile radius of the Site. Each well is located greater than 1,000 feet from the Site and three of the wells are located upgradient of the Site.</p> <p>Since the plume is almost entirely limited to onsite and concentrations in downgradient well MW-1 being below laboratory reporting limits since 2006, 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 C.</p>	None	NA

**Notes:**

ACEH = Alameda County Environmental Health

bgs = below ground surface

BTEX = benzene, toluene, ethylbenzene, xylenes

CSM = Conceptual Site Model

CSWRCB = California State Water Resources Control Board

mg/kg = milligrams per kilogram

mg/m<sup>3</sup> = 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 3 of the preceding report

Table 2. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
<b>MW-1</b>															
4/19/2002	--	161.11	5.00	15.00	11.21	149.90	660	12	1.3	4.3	0.8	38	--	--	
9/27/2002	--		5.00	15.00	9.29	151.82	130	7.7	0.87	5.4	0.79	39	1.7	6.9	
12/16/2002	--		5.00	15.00	8.55	152.56	77	1.8	<0.50	0.69	<1.0	42	1.6	6.9	a
3/11/2003	--		5.00	15.00	8.07	153.04	140	9.8	<0.50	5.6	<0.50	20	1.4	7.4	
6/17/2003	--		5.00	15.00	8.31	152.80	510	60	1.4	81	<1.0	23	2.2	7	
9/18/2003	--		5.00	15.00	9.45	151.66	72	2.4	1.4	1.6	1.5	39	2.7	7	b
12/11/2003	P		5.00	15.00	8.80	152.31	79	1.5	<0.50	1.5	4.4	48	2.1	7.0	
03/11/2004	P	163.44	5.00	15.00	7.61	155.83	<50	1.3	<0.50	0.77	1.3	17	1.4	6.8	
06/02/2004	P		5.00	15.00	8.95	154.49	53	1.4	<0.50	0.93	<0.50	39	2.3	7.1	
09/22/2004	P		5.00	15.00	9.42	154.02	70	<0.50	<0.50	<0.50	<0.50	48	1.7	6.8	
12/15/2004	P		5.00	15.00	7.88	155.56	63	<0.50	<0.50	<0.50	<0.50	45	1.8	6.9	
03/07/2005	P		5.00	15.00	7.02	156.42	<50	<0.50	<0.50	<0.50	<0.50	4.0	2.4	6.8	
06/27/2005	P		5.00	15.00	7.53	155.91	52	2.0	<0.50	1.9	0.78	8.1	2.8	7.1	
09/16/2005	P		5.00	15.00	9.20	154.24	<50	<0.50	<0.50	<0.50	0.76	14	1.82	6.9	
12/27/2005	P		5.00	15.00	7.60	155.84	<50	1.3	<0.50	1.5	<0.50	9.4	2.02	7.87	
03/16/2006	P		5.00	15.00	6.97	156.47	71	3.0	<0.50	3.5	<0.50	3.4	1.6	7.1	
6/26/2006	P		5.00	15.00	8.58	154.86	71	0.69	<0.50	1.1	3.5	3.2	2.2	6.9	
9/29/2006	P		5.00	15.00	8.85	154.59	<50	<0.50	<0.50	<0.50	<0.50	5.2	2.35	6.7	
12/19/2006	P		5.00	15.00	8.00	155.44	<50	<0.50	<0.50	<0.50	<0.50	4.3	4.80	7.21	
3/29/2007	P		5.00	15.00	7.70	155.74	<50	<0.50	<0.50	<0.50	<0.50	2.3	3.44	7.18	
6/5/2007	P		5.00	15.00	8.77	154.67	<50	<0.50	<0.50	<0.50	<0.50	3.2	3.45	7.29	
9/25/2007	P		5.00	15.00	9.18	154.26	<50	<0.50	<0.50	<0.50	<0.50	5.3	2.61	7.41	
12/26/2007	P		5.00	15.00	8.45	154.99	<50	<0.50	<0.50	<0.50	<0.50	2.9	5.57	7.43	
3/25/2008	P		5.00	15.00	8.29	155.15	<50	<0.50	<0.50	<0.50	<0.50	0.94	3.52	7.80	
6/10/2008	P		5.00	15.00	9.17	154.27	<50	<0.50	<0.50	<0.50	<0.50	1.3	3.38	7.01	
9/2/2008	P		5.00	15.00	9.15	154.29	<50	<0.50	<0.50	<0.50	<0.50	5.6	2.30	6.81	
12/2/2008	P		5.00	15.00	8.90	154.54	<50	<0.50	<0.50	<0.50	<0.50	2.7	2.41	6.96	
3/5/2009	P		5.00	15.00	8.05	155.39	<50	<0.50	<0.50	<0.50	<0.50	1.3	2.48	7.47	
6/2/2009	P		5.00	15.00	14.91	148.53	<50	<0.50	<0.50	<0.50	<0.50	0.60	0.83	7.01	
11/6/2009	P		5.00	15.00	8.46	154.98	<50	<0.50	<0.50	<0.50	<0.50	1.9	1.15	6.8	

Table 2. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
<b>MW-1 Cont.</b>															
5/20/2010	--	163.44	5.00	15.00	8.02	155.42	--	--	--	--	--	--	--	--	
11/3/2010	P		5.00	15.00	8.85	154.59	<50	<0.50	<0.50	<0.50	<0.50	1.4	0.80	6.3	
5/17/2011	P		5.00	15.00	7.71	155.73	<50	<0.50	<0.50	<0.50	<0.50	0.59	0.97	7.3	
12/16/2011	P		5.00	15.00	8.67	154.77	<50	<0.50	<0.50	<0.50	<0.50	2.4	3.02	7.3	
4/10/2012	P		5.00	15.00	7.67	155.77	<50	<0.50	<0.50	<0.50	<0.50	0.78	2.45	6.72	
10/9/2012	P		5.00	15.00	9.36	154.08	<50	<0.50	<0.50	<0.50	<1.0	<0.50	2.17	7.00	
4/23/2013	P		5.00	15.00	8.73	154.71	<50	<0.50	<0.50	<0.50	<1.0	<0.50	3.34	6.72	
<b>10/9/2013</b>	<b>P</b>		<b>5.00</b>	<b>15.00</b>	<b>9.19</b>	<b>154.25</b>	<b>&lt;50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>&lt;0.50</b>	<b>1.88</b>	<b>6.60</b>	
<b>MW-2</b>															
4/19/2002	--	161.87	5.00	15.00	6.59	155.28	28,000	970	120	860	6,900	760	--	--	
9/27/2002	--		5.00	15.00	7.18	154.69	17,000	1,400	<50	1,200	3,700	1,400	1.5	6.8	
12/16/2002	--		5.00	15.00	7.31	154.56	17,000	1,000	<50	980	3,300	980	1.9	6.8	a
3/11/2003	--		5.00	15.00	6.02	155.85	24,000	1,600	70	1,300	4,300	920	1.7	7.4	
6/17/2003	--		5.00	15.00	6.31	155.56	28,000	1,300	55	1,300	4,500	610	1.4	6.9	
9/18/2003	--		5.00	15.00	7.61	154.26	19,000	960	63	1,100	3,100	580	2.7	6.8	
12/11/2003	P		5.00	15.00	6.50	155.37	29,000	710	53	1,300	3,800	490	2.0	7.0	
03/11/2004	P	164.29	5.00	15.00	6.02	158.27	19,000	830	49	1,500	4,000	410	0.8	6.5	
06/02/2004	P		5.00	15.00	7.14	157.15	25,000	680	<50	1,300	3,900	240	4.3	7.1	
09/22/2004	--		5.00	15.00	7.63	156.66	15,000	980	<25	980	940	390	--	6.7	
12/15/2004	P		5.00	15.00	6.48	157.81	22,000	610	26	1,300	3,200	290	0.3	6.9	c
03/07/2005	P		5.00	15.00	6.08	158.21	25,000	570	33	1,400	3,900	120	2.3	6.8	
06/27/2005	P		5.00	15.00	6.90	157.39	24,000	630	32	1,200	2,900	86	2.5	7.2	
09/16/2005	P		5.00	15.00	7.66	156.63	25,000	550	<25	1,400	3,000	82	1.41	7.0	
12/27/2005	P		5.00	15.00	5.60	158.69	33,000	540	<25	1,300	2,700	100	2.26	7.19	
03/16/2006	P		5.00	15.00	7.25	157.04	29,000	710	<50	1,400	2,600	78	1.4	7.1	c
6/26/2006	P		5.00	15.00	6.60	157.69	20,000	630	<25	1,200	1,100	110	0.64	6.8	c
9/29/2006	P		5.00	15.00	6.85	157.44	24,000	530	<25	1,300	1,800	86	1.36	6.7	
12/19/2006	P		5.00	15.00	6.02	158.27	21,000	500	<25	1,400	1,700	70	1.11	7.42	
3/29/2007	P		5.00	15.00	6.03	158.26	16,000	530	<25	1,100	1,100	80	2.98	7.18	
6/5/2007	P		5.00	15.00	6.85	157.44	21,000	420	<25	1,100	1,100	50	2.09	7.20	



Table 2. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
<b>MW-2 Cont.</b>															
9/25/2007	P	164.29	5.00	15.00	7.15	157.14	25,000	620	<25	1,400	1,200	70	3.25	7.59	
12/26/2007	P		5.00	15.00	6.25	158.04	16,000	440	<5.0	760	570	80	1.84	7.66	
3/25/2008	P		5.00	15.00	6.63	157.66	16,000	530	7.8	790	470	96	1.78	7.72	
6/10/2008	P		5.00	15.00	7.04	157.25	14,000	480	<25	730	240	100	1.83	6.96	
9/2/2008	P		5.00	15.00	7.25	157.04	13,000	440	<25	690	240	91	3.09	6.61	
12/2/2008	P		5.00	15.00	6.42	157.87	31,000	490	<10	670	120	97	3.05	7.00	
3/5/2009	P		5.00	15.00	5.83	158.46	16,000	470	<10	490	130	82	2.99	7.35	
6/2/2009	P		5.00	15.00	14.51	149.78	11,000	340	<10	490	210	34	1.07	6.89	
11/6/2009	P		5.00	15.00	6.52	157.77	14,000	470	<10	400	110	76	0.32	6.8	
5/20/2010	P		5.00	15.00	6.80	157.49	12,000	430	<10	270	55	64	0.74	6.5	
11/3/2010	P		5.00	15.00	7.52	156.77	9,000	300	<10	79	<10	52	0.37	6.3	d
5/17/2011	P		5.00	15.00	5.86	158.43	14,000	230	<5.0	43	7.2	29	1.28	7.3	
12/16/2011	P		5.00	15.00	7.16	157.13	6,000	180	<5.0	87	<5.0	25	0.81	7.3	c, d
4/10/2012	P		5.00	15.00	6.08	158.21	5,400	210	<5.0	100	16	40	0.21	6.75	d
10/9/2012	P		5.00	15.00	7.54	156.75	4,700	160	1.9	23	5.9	32	1.69	7.14	
4/23/2013	P		5.00	15.00	7.21	157.08	3,100	110	3.5	21	5.4	21	1.20	6.87	
<b>10/9/2013</b>	<b>p</b>		<b>5.00</b>	<b>15.00</b>	<b>7.94</b>	<b>156.35</b>	<b>3,400</b>	<b>160</b>	<b>2.1</b>	<b>15</b>	<b>2.8</b>	<b>33</b>	<b>1.59</b>	<b>6.87</b>	
<b>MW-3</b>															
4/19/2002	--	162.14	5.00	15.00	6.94	155.20	1,200	29	1.1	43	62	1,700	--	--	
9/27/2002	--		5.00	15.00	8.26	153.88	740	7.8	<2.5	6.8	4.4	1,100	1	6.7	
12/16/2002	--		5.00	15.00	6.76	155.38	1,200	13	<10	170	88	910	2.3	6.8	a
3/11/2003	--		5.00	15.00	6.92	155.22	<2,500	<25	<25	<25	<25	470	1.7	7.5	
6/17/2003	--		5.00	15.00	7.44	154.70	<1,000	<10	<10	14	<10	530	1.9	7	
9/18/2003	--		5.00	15.00	8.43	153.71	470	4.8	<2.5	10	9.2	300	2.9	6.8	
12/11/2003	P		5.00	15.00	6.72	155.42	<500	<5.0	<5.0	7.0	13	180	1.9	6.9	
03/11/2004	P	164.53	5.00	15.00	6.09	158.44	360	1.9	<1.0	5.6	5.0	110	2.6	6.8	
06/02/2004	P		5.00	15.00	7.50	157.03	380	2.8	<0.50	8.0	2.1	43	3.6	7.3	
09/22/2004	P		5.00	15.00	8.00	156.53	270	<0.50	<0.50	0.54	<0.50	50	1.8	6.9	
12/15/2004	P		5.00	15.00	6.43	158.10	390	3.5	<0.50	20	3.7	49	1.1	6.9	
03/07/2005	P		5.00	15.00	6.12	158.41	1,900	13	<1.0	93	29	70	2.3	6.8	

Table 2. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses

ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
<b>MW-3 Cont.</b>															
06/27/2005	P	164.53	5.00	15.00	7.08	157.45	830	4.0	<0.50	13	2.8	33	3.3	7.3	
09/16/2005	P		5.00	15.00	7.28	157.25	320	2.1	<0.50	5.4	0.60	21	2.11	7.0	
12/27/2005	P		5.00	15.00	6.47	158.06	770	6.0	<0.50	33	2.7	36	2.96	7.42	
03/16/2006	P		5.00	15.00	6.10	158.43	1,600	11	<0.50	59	6.4	45	1.4	7.1	
6/26/2006	P		5.00	15.00	6.92	157.61	400	<0.50	<0.50	1.6	2.1	26	2.41	7.0	
9/29/2006	P		5.00	15.00	7.38	157.15	220	0.86	<0.50	2.2	0.58	14	1.95	7.0	
12/19/2006	P		5.00	15.00	6.65	157.88	450	4.3	<0.50	19	1.4	19	3.68	7.30	
3/29/2007	P		5.00	15.00	6.92	157.61	390	3.0	<0.50	9.1	0.60	27	1.98	7.16	
6/5/2007	P		5.00	15.00	7.01	157.52	390	1.9	<0.50	6.9	<0.50	20	1.99	7.34	
9/25/2007	P		5.00	15.00	7.52	157.01	260	1.3	<0.50	2.7	<0.50	12	3.44	7.41	
12/26/2007	P		5.00	15.00	6.65	157.88	460	3.1	<0.50	15	0.89	17	4.05	7.46	
3/25/2008	P		5.00	15.00	6.71	157.82	260	0.91	0.71	2.5	0.54	29	2.40	7.63	
6/10/2008	P		5.00	15.00	7.33	157.20	120	<0.50	<0.50	2.0	<0.50	12	2.29	7.59	
9/2/2008	P		5.00	15.00	7.53	157.00	97	<0.50	<0.50	<0.50	<0.50	9.3	3.28	6.81	
12/2/2008	P		5.00	15.00	7.38	157.15	140	<0.50	<0.50	<0.50	<0.50	8.4	3.18	7.06	
3/5/2009	P		5.00	15.00	5.21	159.32	530	3.3	<0.50	22	0.71	18	3.11	7.46	
6/2/2009	P		5.00	15.00	14.81	149.72	490	2.1	<0.50	6.2	<0.50	13	0.83	7.03	
11/6/2009	P		5.00	15.00	7.38	157.15	99	<0.50	<0.50	<0.50	<0.50	5.8	0.32	6.97	
5/20/2010	P		5.00	15.00	6.78	157.75	300	0.89	<0.50	<0.50	<0.50	14	--	6.48	
11/3/2010	P		5.00	15.00	7.73	156.80	66	<0.50	<0.50	<0.50	<0.50	4.4	1.11	6.0	d
5/17/2011	P		5.00	15.00	4.44	160.09	170	<0.50	<0.50	<0.50	<0.50	4.7	0.41	7.4	d
12/16/2011	P		5.00	15.00	7.84	156.69	<50	<0.50	<0.50	0.98	<0.50	4.0	0.39	7.2	
4/10/2012	P		5.00	15.00	6.69	157.84	95	<0.50	<0.50	<0.50	<0.50	3.5	0.16	6.83	d
10/9/2012	P		5.00	15.00	8.41	156.12	<50	<0.50	<0.50	<0.50	<1.0	1.5	1.33	7.36	
4/23/2013	P		5.00	15.00	7.37	157.16	<50	<0.50	<0.50	<0.50	<1.0	1.2	1.03	7.04	
<b>10/9/2013</b>	<b>P</b>		<b>5.00</b>	<b>15.00</b>	<b>8.25</b>	<b>156.28</b>	<b>52</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>2.1</b>	<b>1.94</b>	<b>6.80</b>	

Symbols & Abbreviations:

< = Not detected at or above specified laboratory reporting limits

-- = Not measured, sampled, analyzed, applicable

ft bgs = Feet below ground surface

DO = Dissolved oxygen

DTW = Depth to water in ft

GRO = Gasoline range organics

GWE = Groundwater elevation in ft

mg/L = Milligrams per liter

MTBE = Methyl tert-butyl ether analyzed by EPA Method 8021B unless otherwise noted (before 12/16/02)

P/NP = Well was purged/not purged prior to sampling

TPH-g = Total petroleum hydrocarbons as gasoline (C5-C9)

TOC = Top of casing measured in ft MSL

µg/L = Micrograms per liter

Footnotes:

a = TPH, benzene, toluene, ethylbenzene, total xylenes, and MTBE analyzed by EPA Method 8260B beginning on 4th quarter sampling event (12/16/02)

b = This sample was originally analyzed within the EPA recommended hold time. Re-analysis for confirmation or dilution was performed past the recommended hold time. The results may still be used for their intended purpose.

c = Sheen in well

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

Notes:

Beginning in the fourth quarter 2003, the laboratory modified the reported analyte list. TPH-g was changed to GRO. The resulting data may be impacted by the potential inclusion of non-TPH-g analytes within the requested fuel range resulting in a higher concentration being reported

Wells were re-surveyed on 3/23/2004

Values for DO and pH were field measurements

Beginning in the second quarter 2004, the carbon range for GRO was changed from C6-C10 to C4-C12

GRO analysis was completed by EPA method 8260B (C4-C12) for samples collected from the time period April 2006 through February 4, 2008. The analysis for GRO was changed to EPA method 8015B (C6-C12) for samples collected from the time period February 5, 2008 through the present

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information

**Table 3. Summary of Fuel Additives Analytical Data**  
**ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA**

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
<b>MW-1</b>									
4/19/2002	--	--	38	--	--	--	--	--	
9/27/2002	--	--	39	--	--	--	--	--	
12/16/2002	<50	<5.0	42	<0.50	<0.50	<0.50	<0.50	<0.50	
3/11/2003	<100	<20	20	<0.50	<0.50	<0.50	<0.50	<0.50	
6/17/2003	<200	<40	23	<1.0	<1.0	<1.0	<1.0	<1.0	
9/18/2003	<100	<20	39	<0.50	<0.50	<0.50	<0.50	<0.50	a
12/11/2003	<100	<20	48	<0.50	<0.50	<0.50	<0.50	<0.50	
03/11/2004	<100	<20	17	<0.50	<0.50	<0.50	<0.50	<0.50	
06/02/2004	<100	<20	39	<0.50	<0.50	<0.50	<0.50	<0.50	
09/22/2004	<100	<20	48	<0.50	<0.50	<0.50	<0.50	<0.50	
12/15/2004	<100	<20	45	<0.50	<0.50	<0.50	<0.50	<0.50	a
03/07/2005	<100	<20	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	
06/27/2005	<100	<20	8.1	<0.50	<0.50	<0.50	<0.50	<0.50	
09/16/2005	<100	<20	14	<0.50	<0.50	<0.50	<0.50	<0.50	
12/27/2005	<100	<20	9.4	<0.50	<0.50	<0.50	<0.50	<0.50	b
03/16/2006	<300	<20	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	c
6/26/2006	<300	<20	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	
9/29/2006	<300	<20	5.2	<0.50	<0.50	<0.50	<0.50	<0.50	
12/19/2006	<300	<20	4.3	<0.50	<0.50	<0.50	<0.50	--	b
3/29/2007	<300	<20	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	
6/5/2007	<300	<20	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	
9/25/2007	<300	<20	5.3	<0.50	<0.50	<0.50	<0.50	<0.50	
12/26/2007	<300	<20	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	
3/25/2008	<300	<10	0.94	<0.50	<0.50	<0.50	<0.50	<0.50	
6/10/2008	<300	<10	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	
9/2/2008	<300	<10	5.6	<0.50	<0.50	<0.50	<0.50	<0.50	
12/2/2008	<300	<10	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	
3/5/2009	<300	<10	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	
6/2/2009	<300	<10	0.60	<0.50	<0.50	<0.50	<0.50	<0.50	
11/6/2009	<300	<10	1.9	<0.50	<0.50	<0.50	<0.50	<0.50	
11/3/2010	<300	<10	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	
5/17/2011	<300	<10	0.59	<0.50	<0.50	<0.50	<0.50	<0.50	

**Table 3. Summary of Fuel Additives Analytical Data**  
**ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA**

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
<b>MW-1 Cont.</b>									
12/16/2011	<300	<10	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/2012	<300	<10	0.78	<0.50	<0.50	<0.50	<0.50	<0.50	
10/9/2012	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
4/23/2013	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>10/9/2013</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	
<b>MW-2</b>									
4/19/2002	--	--	760	--	--	--	--	--	
9/27/2002	--	--	1,400	--	--	--	--	--	
12/16/2002	<5,000	<500	980	<50	<50	<50	<50	<50	
3/11/2003	<10,000	<2,000	920	<50	<50	<50	<50	<50	
6/17/2003	<10,000	<2,000	610	<50	<50	<50	<50	<50	
9/18/2003	<5,000	<1,000	580	<25	<25	<25	<25	<25	
12/11/2003	<5,000	<1,000	490	<25	<25	<25	<25	<25	
03/11/2004	<2,000	<400	410	<10	<10	<10	<10	<10	
06/02/2004	<10,000	<2,000	240	<50	<50	<50	<50	<50	
09/22/2004	<5,000	<1,000	390	<25	<25	<25	<25	<25	
12/15/2004	<2,000	<400	290	<10	<10	<10	<10	<10	a
03/07/2005	<5,000	<1,000	120	<25	<25	<25	<25	<25	
06/27/2005	<5,000	<1,000	86	<25	<25	<25	<25	<25	
09/16/2005	<5,000	<1,000	82	<25	<25	<25	<25	<25	
12/27/2005	<5,000	<1,000	100	<25	<25	<25	<25	<25	b
03/16/2006	<30,000	<2,000	78	<50	<50	<50	<50	<50	c
6/26/2006	<15,000	<1,000	110	<25	<25	<25	<25	<25	
9/29/2006	<15,000	<1,000	86	<25	<25	<25	<25	<25	
12/19/2006	<15,000	<1,000	70	<25	<25	<25	<25	--	b
3/29/2007	<15,000	<1,000	80	<25	<25	<25	<25	<25	
6/5/2007	<15,000	<1,000	50	<25	<25	<25	<25	<25	
9/25/2007	<15,000	<1,000	70	<25	<25	<25	<25	<25	
12/26/2007	<3,000	<200	80	<5.0	<5.0	<5.0	<5.0	<5.0	
3/25/2008	<1,500	<50	96	<2.5	<2.5	<2.5	<2.5	<2.5	
6/10/2008	<15,000	<500	100	<25	<25	<25	<25	<25	

**Table 3. Summary of Fuel Additives Analytical Data**  
**ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA**

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
<b>MW-2 Cont.</b>									
9/2/2008	<15,000	<500	91	<25	<25	<25	<25	<25	
12/2/2008	<6,000	<200	97	<10	<10	<10	<10	<10	
3/5/2009	<6,000	<200	82	<10	<10	<10	<10	<10	
6/2/2009	<6,000	<200	34	<10	<10	<10	<10	<10	
11/6/2009	<6,000	<200	76	<10	<10	<10	<10	<10	
5/20/2010	<6,000	<200	64	<10	<10	<10	<10	<10	
11/3/2010	<6,000	<200	52	<10	<10	<10	11	<10	
5/17/2011	<3,000	<100	29	<5.0	<5.0	<5.0	<5.0	<5.0	
12/16/2011	<3,000	<100	25	<5.0	<5.0	<5.0	<5.0	<5.0	
4/10/2012	<3,000	<100	40	<5.0	<5.0	<5.0	<5.0	<5.0	
10/9/2012	<380	<25	32	<1.3	<1.3	<1.3	<1.3	<1.3	
4/23/2013	<150	<10	21	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>10/9/2013</b>	<b>&lt;380</b>	<b>&lt;25</b>	<b>33</b>	<b>&lt;1.3</b>	<b>&lt;1.3</b>	<b>&lt;1.3</b>	<b>&lt;1.3</b>	<b>&lt;1.3</b>	
<b>MW-3</b>									
4/19/2002	--	--	1,700	--	--	--	--	--	
9/27/2002	--	--	1,100	--	--	--	--	--	
12/16/2002	<1,000	<100	910	<10	<10	12	<10	<10	
3/11/2003	<5,000	<1,000	470	<25	<25	<25	<25	<25	
6/17/2003	<2,000	<400	530	<10	<10	<10	<10	<10	
9/18/2003	<500	<100	300	<2.5	<2.5	3.2	<2.5	<2.5	
12/11/2003	<1,000	<200	180	<5.0	<5.0	<5.0	<5.0	<5.0	
03/11/2004	<200	570	110	<1.0	<1.0	<1.0	<1.0	<1.0	
06/02/2004	<100	130	43	<0.50	<0.50	0.56	<0.50	<0.50	
09/22/2004	<100	28	50	<0.50	<0.50	0.51	<0.50	<0.50	
12/15/2004	<100	110	49	<0.50	0.52	0.61	<0.50	<0.50	a
03/07/2005	<200	190	70	<1.0	<1.0	<1.0	<1.0	<1.0	
06/27/2005	<100	130	33	<0.50	<0.50	<0.50	<0.50	<0.50	
09/16/2005	<100	44	21	<0.50	<0.50	<0.50	<0.50	<0.50	
12/27/2005	<100	150	36	<0.50	<0.50	<0.50	<0.50	<0.50	b
03/16/2006	<300	160	45	<0.50	<0.50	0.84	<0.50	<0.50	c
6/26/2006	<300	53	26	<0.50	<0.50	<0.50	<0.50	<0.50	

**Table 3. Summary of Fuel Additives Analytical Data**  
**ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA**

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
<b>MW-3 Cont.</b>									
9/29/2006	<300	55	14	<0.50	<0.50	<0.50	<0.50	<0.50	
12/19/2006	<300	<20	19	<0.50	<0.50	<0.50	<0.50	--	b
3/29/2007	<300	130	27	<0.50	<0.50	<0.50	<0.50	<0.50	
6/5/2007	<300	77	20	<0.50	<0.50	<0.50	<0.50	<0.50	
9/25/2007	<300	30	12	<0.50	<0.50	<0.50	<0.50	<0.50	
12/26/2007	<300	76	17	<0.50	<0.50	<0.50	<0.50	<0.50	
3/25/2008	<300	100	29	<0.50	<0.50	<0.50	<0.50	<0.50	
6/10/2008	<300	25	12	<0.50	<0.50	<0.50	<0.50	<0.50	
9/2/2008	<300	<10	9.3	<0.50	<0.50	<0.50	<0.50	<0.50	
12/2/2008	<300	<10	8.4	<0.50	<0.50	<0.50	<0.50	<0.50	
3/5/2009	<300	98	18	<0.50	<0.50	<0.50	<0.50	<0.50	
6/2/2009	<300	89	13	<0.50	<0.50	<0.50	<0.50	<0.50	
11/6/2009	<300	11	5.8	<0.50	<0.50	<0.50	<0.50	<0.50	
5/20/2010	<300	100	14	<0.50	<0.50	<0.50	<0.50	<0.50	
11/3/2010	<300	<10	4.4	<0.50	<0.50	<0.50	<0.50	<0.50	
5/17/2011	<300	34	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	
12/16/2011	<300	17	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	
4/10/2012	<300	18	3.5	<0.50	<0.50	<0.50	<0.50	<0.50	
10/9/2012	<150	<10	1.5	<0.50	<0.50	<0.50	<0.50	<0.50	
4/23/2013	<150	<10	1.2	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>10/9/2013</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>2.1</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	

Symbols & Abbreviations:

< = 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

Footnotes:

a = This sample was originally analyzed within the EPA recommended hold time. Re-analysis for confirmation or dilution was performed past the recommended hold time. The results may still be used for their intended purpose

b = Calibration verification for ethanol was within method limits but outside contract limits

c = Possible high bias for DIPE, 1,2-DCA, and ethanol due to CCV falling outside acceptance criteria

Notes:

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information



**Table 4. Summary of Groundwater Gradient - Direction and Magnitude**  
**ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA**

<b>Date Measured</b>	<b>Approximate Gradient Direction</b>	<b>Approximate Gradient Magnitude (ft/ft)</b>
4/19/2002	Southwest	0.038
9/27/2002	Southwest	0.021
12/16/2002	Southeast	0.029
3/11/2003	South	0.024
6/17/2003	South-Southwest	0.022
9/18/2003	South-Southwest	0.022
3/11/2004	South-Southwest	0.024
6/2/2004	South	0.025
9/22/2004	South	0.025
12/15/2004	South	0.020
3/7/2005	South	0.02
6/27/2005	South	0.01
9/16/2005	Southeast	0.03
12/27/2005	South-Southeast	0.02
3/16/2006	Southeast	0.02
6/26/2006	South	0.03
9/29/2006	South	0.025
12/19/2006	South	0.024
3/29/2007	South	0.020
6/5/2007	South	0.027
9/25/2007	South	0.023
12/26/2007	South	0.027
3/25/2008	South	0.026
6/10/2008	South	0.026
9/2/2008	South	0.026
12/2/2008	South	0.028
3/5/2009	South	0.037
6/2/2009	South	0.011
11/6/2009	South-Southwest	0.025
5/20/2010	South	0.021
11/3/2010	South	0.021
5/17/2011	South-Southeast	0.042
12/16/2011	South	0.021
4/10/2012	South	0.016
10/9/2012	South	0.022
4/23/2013	South	0.02
<b>10/9/2013</b>	<b>South</b>	<b>0.02</b>

Notes:

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information

**Table 5. Historic Soil Analytical Data  
Station #4977, 2770 Castro Valley Boulevard, Castro Valley, 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
DP-1	6'	3/15/2001	235	0.946	<0.025	5.14	3.52	1.63
DP-2	6'	3/15/2001	1,450	8.05	2.17	37.3	127	<10
DP-3	3'	3/15/2001	<1.0	<0.005	<0.005	<0.005	0.00746	<0.05
DP-4	3.5'	3/15/2001	296	<0.25	<0.25	0.608	1.03	<2.5
DP-5	3.5'	3/15/2001	3.56	<0.005	<0.005	0.0174	0.0314	1.27
PL-1	6'	3/15/2001	398	1.79	<0.1	9.46	28.7	<1.0
PL-2	5'	3/15/2001	1,140	3.01	<0.25	25.8	65.7	4.79
PL-3	5.5'	3/15/2001	530	<0.25	0.947	11	9.76	<2.5
PL-4	4'	3/15/2001	8.77	0.077	<0.005	0.0335	0.0623	<0.05
PL-5	4'	3/15/2001	28.6	0.107	<0.025	0.143	0.195	<0.25
PL-6	3.5'	3/15/2001	243	0.911	<0.1	2.26	0.484	0.145
PL-7	3.5'	3/15/2001	128	0.847	0.438	2.5	9.13	8.6
PL-8	3.5'	3/15/2001	230	0.36	<0.1	0.919	0.877	<1.0
PL-9	5'	3/15/2001	295	0.82	<0.25	3.64	1.67	<2.5
T1-S	14'	3/15/2001	<1.0	<0.005	<0.005	0.00644	0.00558	<0.1
T1-N	16'	3/15/2001	<1.0	<0.005	0.0187	0.00595	0.0209	<0.05
SW-1	7.5'	3/15/2001	279	<0.05	<0.05	3.7	5.43	<0.5
SW-2	8'	3/15/2001	1,170	<1.0	<1.0	19.8	92.7	<10
SW-3	8'	3/15/2001	678	0.503	<0.5	10.4	57.9	<5.0
SW-4	8'	3/15/2001	581	<0.25	<0.25	5.38	32.9	<2.5
SW-5	7.5'	3/15/2001	556	<0.25	<0.25	3.49	16.6	<2.5
SW-6	7.5'	3/15/2001	631	0.326	<0.25	6.96	50.3	<2.5
MW-1	MW-1-5.5'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	MW-1-10.5'	4/11/2002	340	3.2	1.8	5.8	2.6	<0.0050
	MW-1-12.5'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	MW-1-14'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
MW-2	MW-2-6'	4/11/2002	12	<0.050	<0.050	<0.050	<0.050	<0.025
	MW-2-10'	4/11/2002	60	0.59	0.10	1.7	6.9	0.064
	MW-2-12'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	MW-2-13.5'	4/11/2002	<0.50	<0.0050	<0.0050	0.0061	0.019	0.016
MW-3	MW-3-6'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	0.025
	MW-3-11'	4/11/2002	35	0.36	<0.10	0.69	0.43	0.098
	MW-3-12.5'	4/11/2002	<0.50	0.0067	<0.0050	<0.0050	<0.0050	0.12
	MW-3-14'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	0.10
B-1	B-1-6'	4/12/2002	95	0.15	<0.050	0.8	0.87	<0.025
	B-1-10.5'	4/12/2002	240	1.1	1.2	6.2	2.1	<0.025
	B-1-12.5'	4/12/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	0.0098
B-2	B-2-6'	4/11/2002	1,600	<1.0	<1.0	25	150	0.037
	B-2-10.5'	4/11/2002	160	0.61	0.73	3	2.4	0.075
	B-2-12.5'	4/11/2002	<0.50	<0.0050	<0.0050	<0.0050	<0.0050	0.023

**Table 5. Historic Soil Analytical Data  
Station #4977, 2770 Castro Valley Boulevard, Castro Valley, 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
<b>B-3</b>	B-3-6.5'	9/23/2011	<b>610</b>	<0.40	<0.40	<b>4.1</b>	<b>6.8</b>	<0.40
	B-3-10'	9/23/2011	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	B-3-15'	9/23/2011	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	B-3-20'	9/23/2011	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
<b>B-4</b>	B-4-4'	9/22/2011	<b>1.2 (1)</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	B-4-6.5'	9/23/2011	<b>490</b>	<0.10 (2)	<0.10 (2)	<b>0.12</b>	<0.10 (2)	<0.10 (2)
	B-4-10'	9/23/2011	<b>630</b>	<b>0.37</b>	<0.10	<b>9.9</b>	<b>0.38</b>	<0.10
	B-4-15'	9/23/2011	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
<b>B-5</b>	B-5-4'	9/22/2011	<b>0.97 (1)</b>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	B-5-7'	9/23/2011	<b>17 (1)</b>	<0.0010	<0.0010	<b>0.0022</b>	<0.0010	<0.0010
	B-5-10'	9/23/2011	<b>610</b>	<0.10 (2)	<0.10 (2)	<b>0.41</b>	<0.10 (2)	<0.10 (2)
	B-5-15'	9/23/2011	<0.50	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
ESLs	--	--	83 (d & s)	0.044 (d & s)	2.9 (d & s)	2.3 (s)/3.3 (d)	2.3 (d & s)	0.023 (d & s)

**Abbreviations & Symbols:**

\* = See Drawing 2 for soil boring locations.

Indicates area where over-excavation occurred.

(1) = Quantitated against gasoline.

(2) = Reporting limits raised due to high levels of non-target analytes.

GRO: Gasoline range organics.

Calscience Environmental Laboratories, Inc.: 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) and shallow soil (<3 meters bgs) where groundwater is a current or potential source of drinking water in a residential setting (San Francisco Bay Regional Water Quality Control Board, 2008).

bgs = Below ground surface

d = Deep soil

s = Shallow soil

**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 either not detected at or above their respective laboratory reporting limit or not analyzed for.

The last number in each Sample ID denotes the depth at which the sample was collected in feet bgs (i.e., B-3-10' was collected at a depth of 10 feet bgs)

## **APPENDIX A**

### **Summary of Previous Site Activities**

## Previous Environmental Activities at Site

In March 2001, Delta Environmental Consultants (Delta) conducted assessment activities associated with dispenser and product line upgrades along with UST replacement at the Site. Analytical results from soil samples collected during upgrade activities consisted of concentrations of TPHg up to 1,450 mg/kg, benzene up to 8.05 mg/kg, and MTBE up to 9.97 mg/kg. Approximately 1,105 tons of soil was over-excavated and removed from the Site.

In April 2002, Delta observed the installation of groundwater monitoring wells MW-1, MW-2, and MW-3 and advancement of soil borings B-1 and B-2 to evaluate petroleum hydrocarbon impacts in soil and groundwater beneath the Site. TPHg, benzene, toluene, ethylbenzene, xylenes (BTEX constituents), and MTBE impacts were detected between 6 and 12.5 feet bgs and in groundwater concentrations above the state Water Quality Objectives (Table 2 and Table 5).

On September 23, 2011, Broadbent observed the advancement of borings B-3, B-4 and B-5 to further evaluate the lateral and vertical extent of petroleum hydrocarbon impacted soil and groundwater at the Site. The location of boring B-3 was chosen as it was adjacent to historic boring B-2, in which ground-water samples were not originally collected. The location of boring B-4 was southeast of the northernmost dispenser island adjacent to Wisteria Street and slightly southeast of historic product line soil sample PL-7, which contained elevated concentrations of MTBE. The location of boring B-5 was northeast of the southernmost dispenser island adjacent to historic dispenser island soil sample DP-2, which contained elevated concentrations of hydrocarbons. Analytical results from collected soil samples reported GRO and BTEX constituents above laboratory reporting limits. MTBE was not detected above laboratory reporting limits during this event. Due to the presence of clay within the subsurface onsite, groundwater was not encountered in the soil borings; therefore, no groundwater samples were collected during this event. Based on the data available, it was concluded that the vertical extent of impacted soil associated with the Site appeared to be adequately characterized.

On November 9, 2011, Closure Solutions, Inc., prepared a *Sensitive Receptor Survey* to identify the presence of water wells and surface water bodies within a 0.5 mile radius of the Site. Land use information was not included in this report.

On January 16, 2012, Broadbent prepared an *On-Site Soil & Groundwater Investigation Report* for work conducted in September 2011 at Station #4977. This report was completed to further evaluate the lateral and vertical extent of petroleum hydrocarbon impacted soil and groundwater.

On March 19, 2012, Closure Solutions, Inc., prepared a *Conceptual Site Model* for the purpose of documenting soil and groundwater conditions at the Site.

## **APPENDIX B**

### **Soil Boring and Well Construction Logs**

PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA  
 PROJECT NUMBER: 06-82-625 LEGAL DESC: \_\_\_\_\_ APN: \_\_\_\_\_  
 LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: \_\_\_\_\_ NOI NUMBER: \_\_\_\_\_  
 DATE: 9/23/11 START: 1013 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan  
 WELLID: B-3 STOP: 1040 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE COLOR CONSISTENCY			GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS	
				MOISTURE	COLOR	CONSISTENCY				
1	GROUT						ASPHALT			
2				DRY	LIGHT BROWN	LOOSE	SILTY GRAVEL	GM	NONE	
3				SLIGHTLY MOIST	DARK BROWN	FIRM	SILTY CLAY	CL	NONE	
4										
5										
6										
7			B-3-6.5	350	SLIGHTLY MOIST	BROWN GRAY GREEN	VERY STIFF	SILTY CLAY	CL	STRONG
8										
9										
10			B-3-10	31	MOIST	BROWN GRAY	STIFF	SILTY CLAY	CL	NONE
11					VERY MOIST	GREEN BROWN	SOFT	GRAVELLY, SILTY, CLAY	CL	NONE
12										
13										
14					MOIST	GRAY BROWN	FIRM	GRAVELLY, SILTY, CLAY, WITH LARGER COBBLES THAN PREVIOUS	CL	NONE
15			B-3-15	128						
16					SLIGHTLY MOIST	GRAY	STIFF	GRAVELLY, SILTY, CLAY	CL	NONE
17										
18					DRY	GRAY	LOOSE SOFT	GRAVELLY, SILTY, CLAY	CL	NONE
19										
20			B-3-20	0						

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.

PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA  
 PROJECT NUMBER: 06-82-625 LEGAL DESC: \_\_\_\_\_ APN: \_\_\_\_\_  
 LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: \_\_\_\_\_ NOI NUMBER: \_\_\_\_\_  
 DATE: 9/23/11 START: 1239 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan  
 WELLID: B-4 STOP: 1305 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE COLOR CONSISTENCY			GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS			
1	GROUT						ASPHALT					
2				DRY	LIGHT BROWN	LOOSE	SILTY GRAVEL	GM	NONE			
3				SLIGHTLY MOIST	BLACK	STIFF	SILTY CLAY	CL	STRONG			
4				SLIGHTLY MOIST	GRAY GREEN	FIRM	SILTY CLAY	CL	STRONG			
5												
6												
7				B-4-6.5	294	SLIGHTLY MOIST	GREEN BROWN	STIFF	SILTY CLAY	CL	STRONG	
8												
9												
10				B-4-10	205						TRACE	
11												
12						210	MOIST	BROWN GREEN	LOOSE SOFT	GRAVELLY, SILTY, CLAY	CL	SLIGHT
13							SLIGHTLY MOIST	BROWN GREEN	STIFF	SILTY CLAY	CL	NONE
14							DRY	BROWN	LOOSE	SILTY, CLAYEY, GRAVEL	GM	NONE
15				B-4-15								
16												
17												
18												
19												
20												

TOTAL BORING DEPTH: 15' PAGE NO: 1 OF 1 ESTIMATED GROUND WATER DEPTH: NA

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.



PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA  
 PROJECT NUMBER: 06-82-625 LEGAL DESC: \_\_\_\_\_ APN: \_\_\_\_\_  
 LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: \_\_\_\_\_ NOI NUMBER: \_\_\_\_\_  
 DATE: 9/23/11 START: 1330 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan  
 WELLID: B-5 STOP: 1350 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

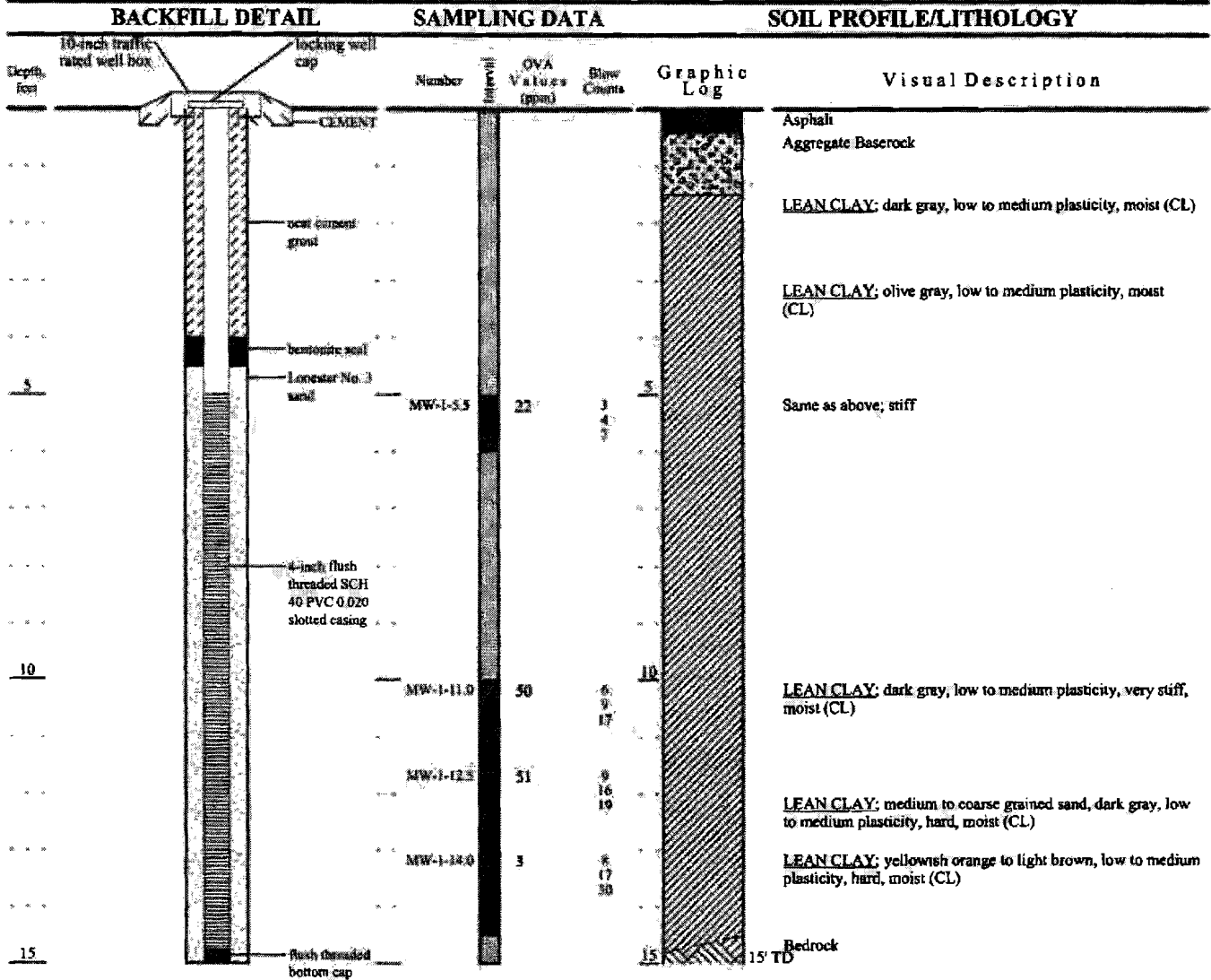
DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE COLOR CONSISTENCY			GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
				MOISTURE	COLOR	CONSISTENCY			
1	GROUT						ASPHALT		
2				DRY	LIGHT BROWN	LOOSE	SILTY, CLAYEY, GRAVEL	GM	NONE
3				SLIGHTLY MOIST	DARK BROWN	FIRM	SILTY CLAY	CL	NONE
4				SLIGHTLY MOIST	BLACK GREEN	STIFF	SILTY CLAY	CL	STRONG
5									
6				SLIGHTLY MOIST	BLACK	FIRM	SILTY CLAY	CL	STRONG
7				VERY MOIST	BLACK	SOFT	SILTY CLAY	CL	STRONG
8									
9				SLIGHTLY MOIST	BROWN GREEN	STIFF	SILTY CLAY	CL	STRONG
10				MOIST	GRAY BROWN GREEN	SOFT	SILTY CLAY	CL	STRONG
11				MOIST	GRAY BROWN GREEN	SOFT	GRAVELLY, SILTY CLAY	CL	SLIGHT
12									
13				SLIGHTLY MOIST	GRAY BROWN	FIRM	GRAVELLY, SILTY, CLAY	CL	SLIGHT
14				DRY	GRAY BROWN	STIFF	SILTY CLAY	CL	NONE
15									
16									
17									
18									
19									
20									

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.



**Delta**  
Environmental  
Consultants, Inc.

Street Address <b>2770 Castro Valley Road</b>		Project ID <b>ARCO Station No. 4977</b>	
City & State <b>Castro Valley, California</b>		Surface Elev. <b>161.63'</b>	Well / Boring ID <b>MW-1</b>
Delta Project # <b>D000-845</b>		Casing Elev. <b>161.11'</b>	Total Depth <b>15'</b>

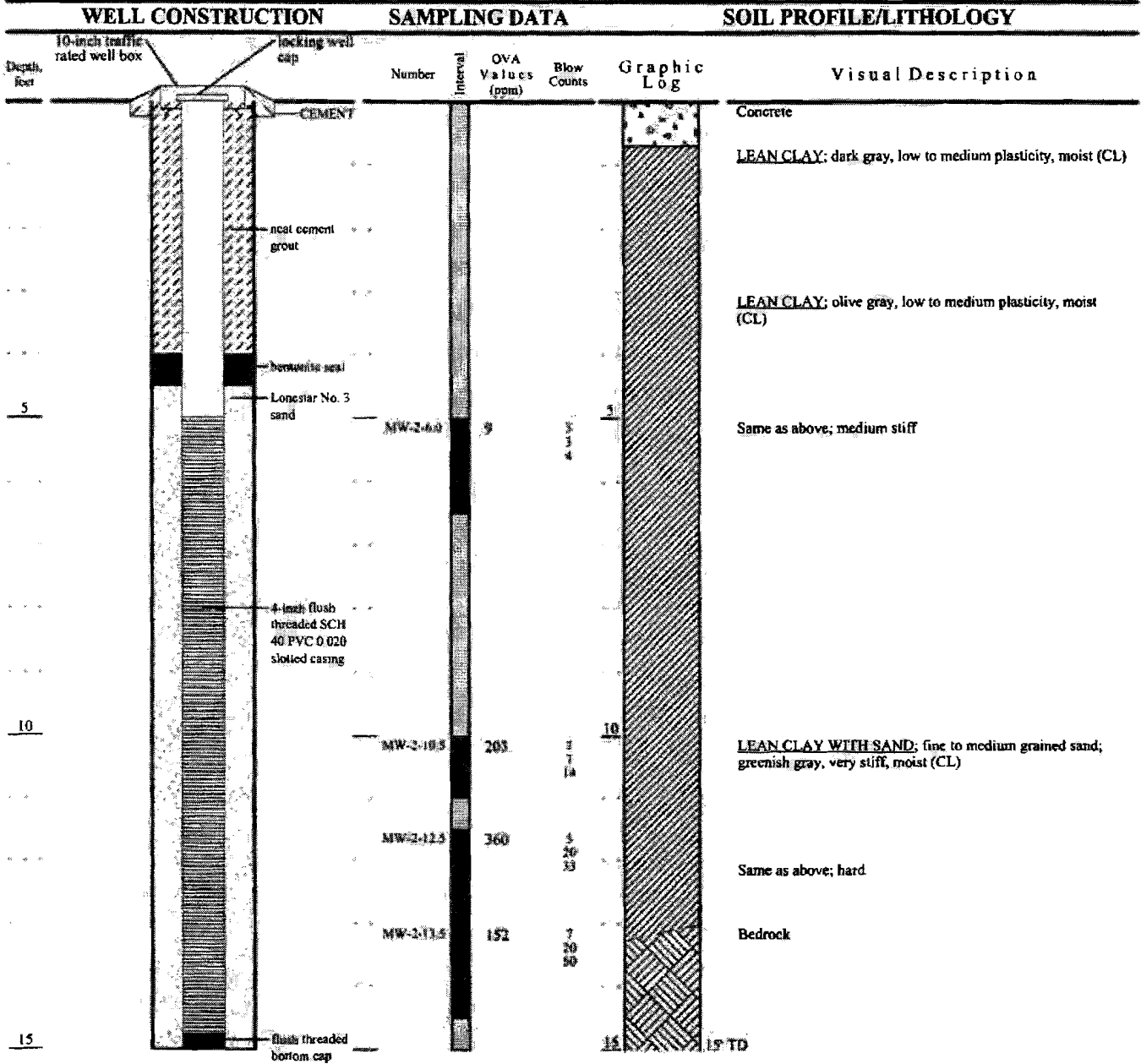


Dates and Times	Logger	Sampling Method & Diameter	Permitting Agency
Start 4/11/02 1145	Brett A. Hardsley Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	2-inch split spoon Bore Hole Diameter 10-inches	Alameda County Public Works Agency Permit # WB2-4314
Total Depth 4/11/02 1311	Drillers C-57# 672617	4-inch SCH 40 PVC 0.020 slot	
Completion or backfill 4/12/02 1115	Drilling Equipment and method CME-75, hollow stem auger		



**Delta**  
Environmental  
Consultants, Inc.

Street Address <b>2770 Castro Valley Road</b>	Project ID <b>ARCO Station No. 4977</b>	
City & State <b>Castro Valley, California</b>	Surface Elev. <b>162.15'</b>	Well / Boring ID <b>MW-2</b>
Delta Project # <b>D000-845</b>	Casing Elev. <b>161.87'</b>	Total Depth <b>15'</b>



<b>Dates and Times</b>	<b>Logger</b> Brett A. Bardley	<b>Sampling Method &amp; Diameter:</b> 2-inch split spoon	<b>Permitting Agency</b> Alameda County Public Works Agency
<b>Start</b> 4/11/02 1407	<b>Drilling Company &amp; Driller</b> Mitchell Drilling Environmental, Eddie Mitchell	<b>Bore Hole Diameter</b> 10-inches	<b>Permit #</b> WB2-0315
<b>Total Depth</b> 4/11/02 1458	<b>Drillers C-57#</b> 672617	<b>Diameter, Type &amp; Slot Size of Casing</b> 4-inch SCH 40 PVC 0.020 slot	
<b>Completion or backfill</b> 4/11/02 1800	<b>Drilling Equipment and method</b> CME-75 hollow stem auger		



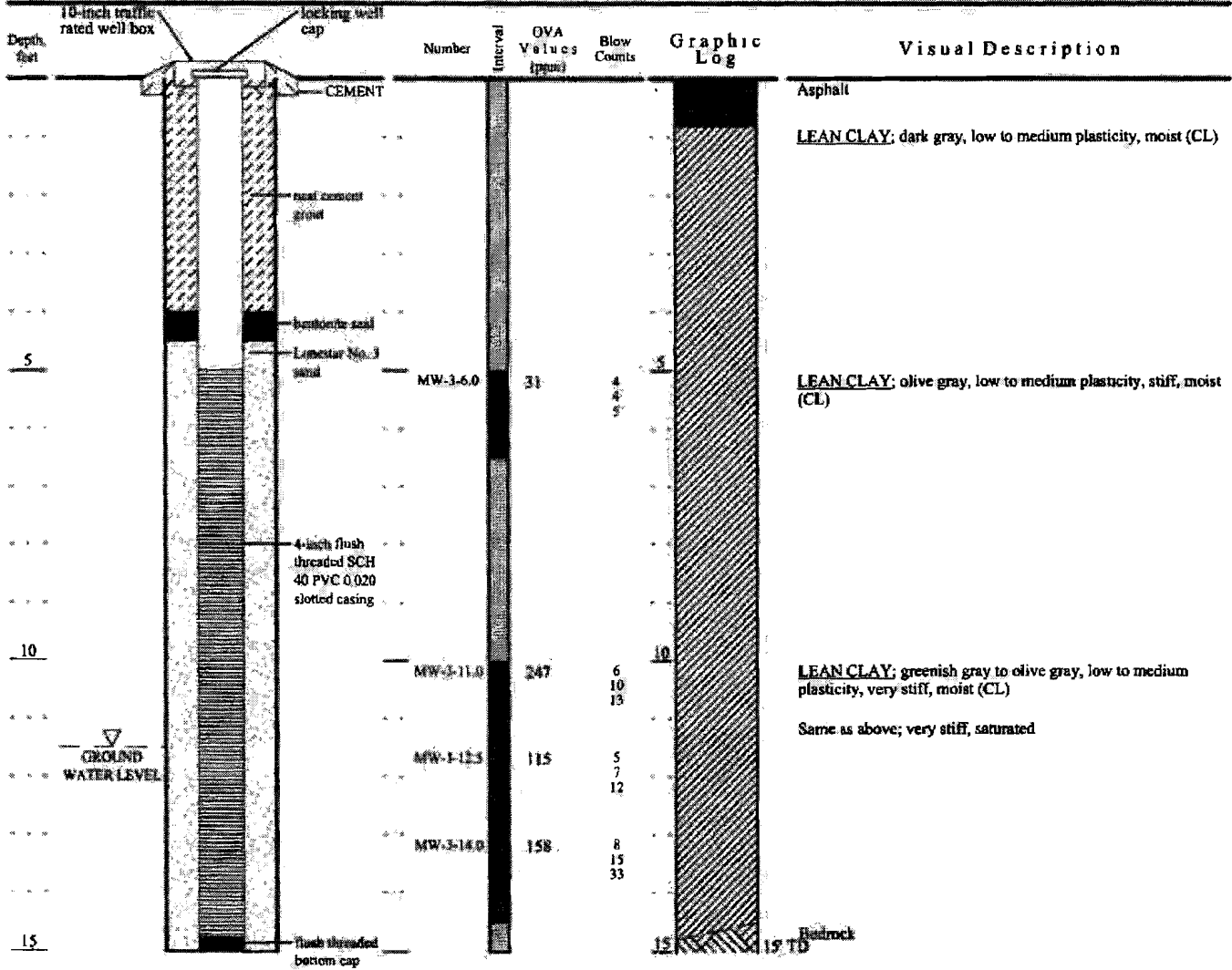
**Delta**  
Environmental  
Consultants, Inc.

Street Address <b>2770 Castro Valley Road</b>		Project ID <b>ARCO Station No. 4977</b>	
City & State <b>Castro Valley, California</b>		Surface Elev. <b>162.60'</b>	Well / Boring ID <b>MW-3</b>
Delta Project # <b>D000-845</b>		Casing Elev. <b>162.14'</b>	Total Depth <b>15'</b>

**WELL CONSTRUCTION**

**SAMPLING DATA**

**SOIL PROFILE/LITHOLOGY**



Dates and Times	Logger <b>Brett A. Bardsley</b>	Sampling Method & Diameter <b>2-inch split spoon</b>	Permitting Agency <b>Alameda County Public Works Agency</b>
Start <b>4/11/02 0930</b>	Drilling Company & Driller <b>Mitchell Drilling Environmental, Eddie Mitchell</b>	Bore Hole Diameter <b>10-inches</b>	Permit # <b>WB2-0316</b>
Total Depth <b>4/11/02 1044</b>	Drillers C-57# <b>672617</b>	Diameter, Type & Slot Size of Casing <b>4-inch SCH 40 PVC 0.020 slot</b>	
Completion or backfill <b>4/11/02 1730</b>	Drilling Equipment and method <b>CME-75, hollow stem auger</b>		



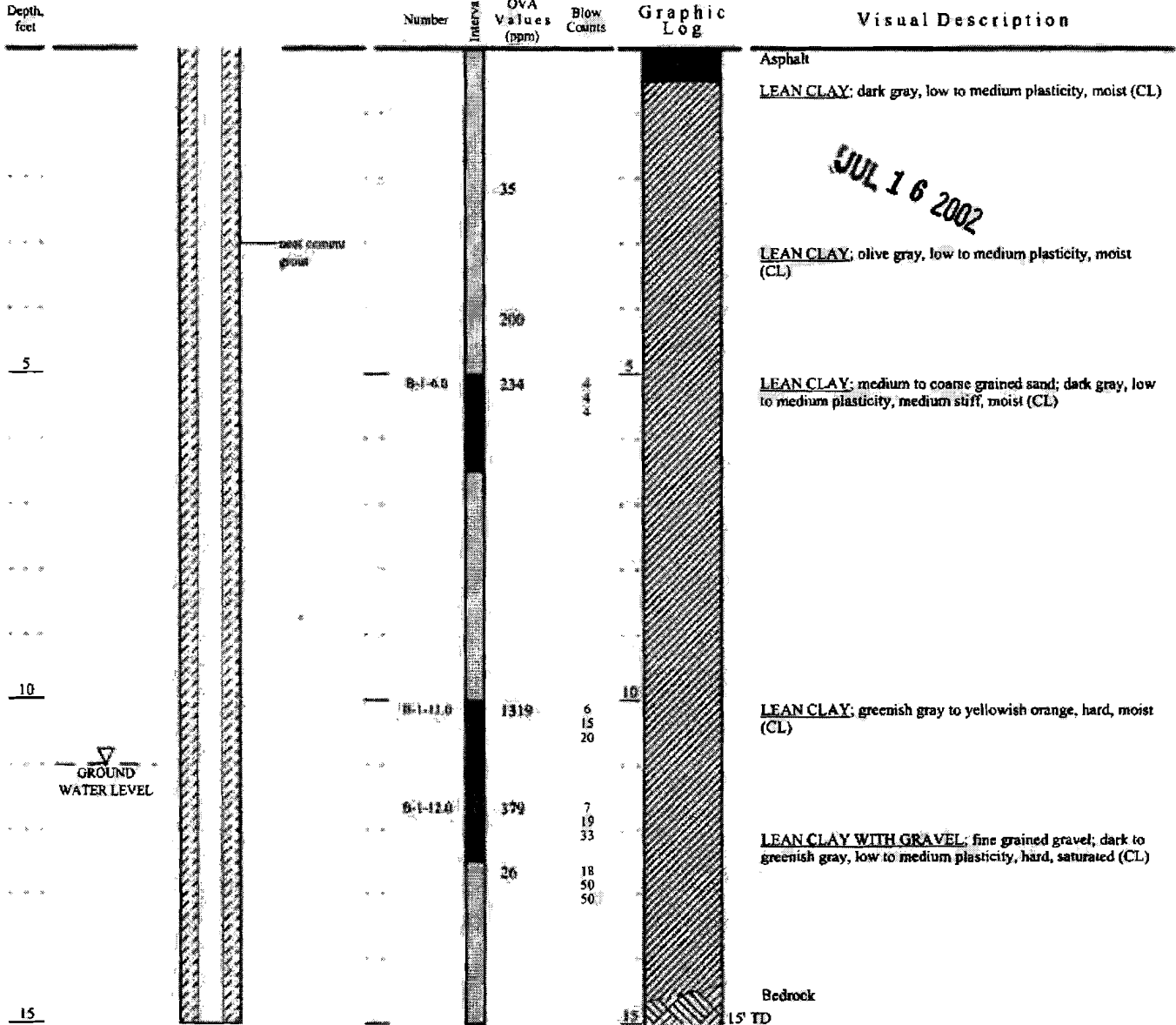
**Delta**  
Environmental  
Consultants, Inc.

Street Address <b>2770 Castro Valley Road</b>		Project ID <b>ARCO Station No. 4977</b>	
City & State <b>Castro Valley, California</b>		Surface Elev.	Well / Boring ID <b>B-1</b>
Delta Project # <b>D000-845</b>		Casing Elev.	Total Depth <b>15'</b>

**BACKFILL DETAIL**

**SAMPLING DATA**

**SOIL PROFILE/LITHOLOGY**



<b>Dates and Times:</b>	<b>Logger</b> Brett A. Bardley	<b>Sampling Method &amp; Diameter</b> 2-inch split spoon	<b>Permitting Agency</b> Alameda County Public Works Agency
<b>Start</b> 4/12/02 0900	<b>Drilling Company &amp; Driller</b> Mitchell Drilling Environmental, Eddie Mitchell	<b>Bore Hole Diameter</b> 8.25 inches	<b>Permit #</b> W02-0313
<b>Total Depth</b> 4/12/02 0934	<b>Drillers C-579</b> 673617		
<b>Completion or backfill</b> 4/12/02 1015	<b>Drilling Equipment and method</b> CME-75, hollow stem auger		



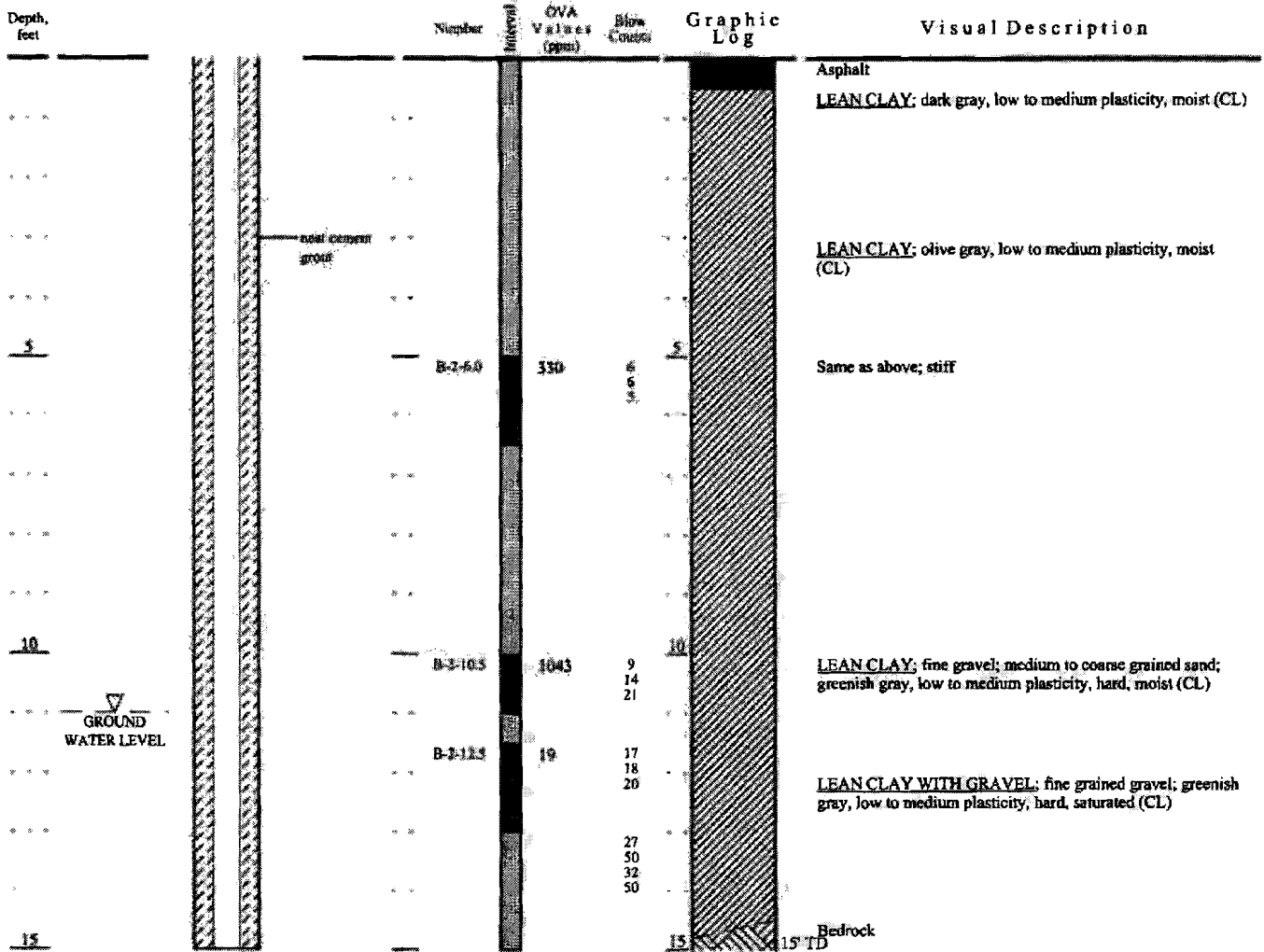
**Delta**  
Environmental  
Consultants, Inc.

Street Address <b>2770 Castro Valley Road</b>		Project ID <b>ARCO Station No. 4977</b>	
City & State <b>Castro Valley, California</b>		Surface Elev.	Well / Boring ID <b>B-2</b>
Delta Project # <b>D000-845</b>		Casing Elev.	Total Depth <b>15'</b>

**BACKFILL DETAIL**

**SAMPLING DATA**

**SOIL PROFILE/LITHOLOGY**



<b>Dates and Times</b>	<b>Logger</b> Brett A. Hardley	<b>Sampling Method &amp; Diameter</b> 3-inch split spoon	<b>Permitting Agency</b> Alameda County Public Works Agency
<b>Start</b> 4/11/02 1545	<b>Drilling Company &amp; Driller</b> Mitchell Drilling Environmental, Eddie Mitchell	<b>Bores Hole Diameter</b> 8.25-inches	<b>Permit #</b> W02-0313
<b>Total Depth</b> 4/11/02 1630	<b>Drillers C-57#</b> 672617		
<b>Completion or backfill</b> 4/11/02 1645	<b>Drilling Equipment and method</b> CME-75, hollow stem auger		

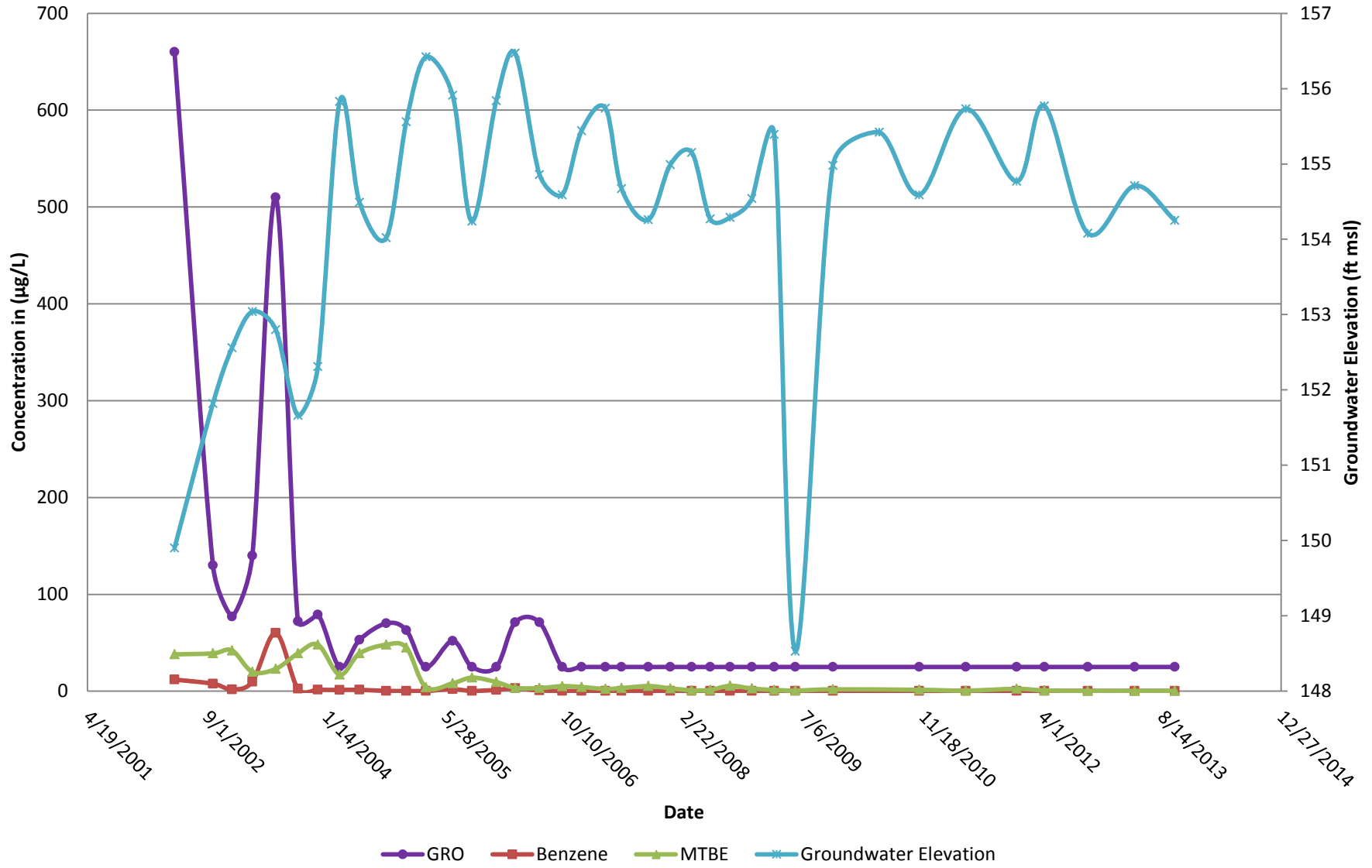
## **APPENDIX C**

### **Petroleum Compound Concentration and Groundwater Elevation Trend Graphs**

# MW-1 Concentrations and Groundwater Elevations vs Time

ARCO Station #4977

2770 Castro Valley Boulevard, Castro Valley, California

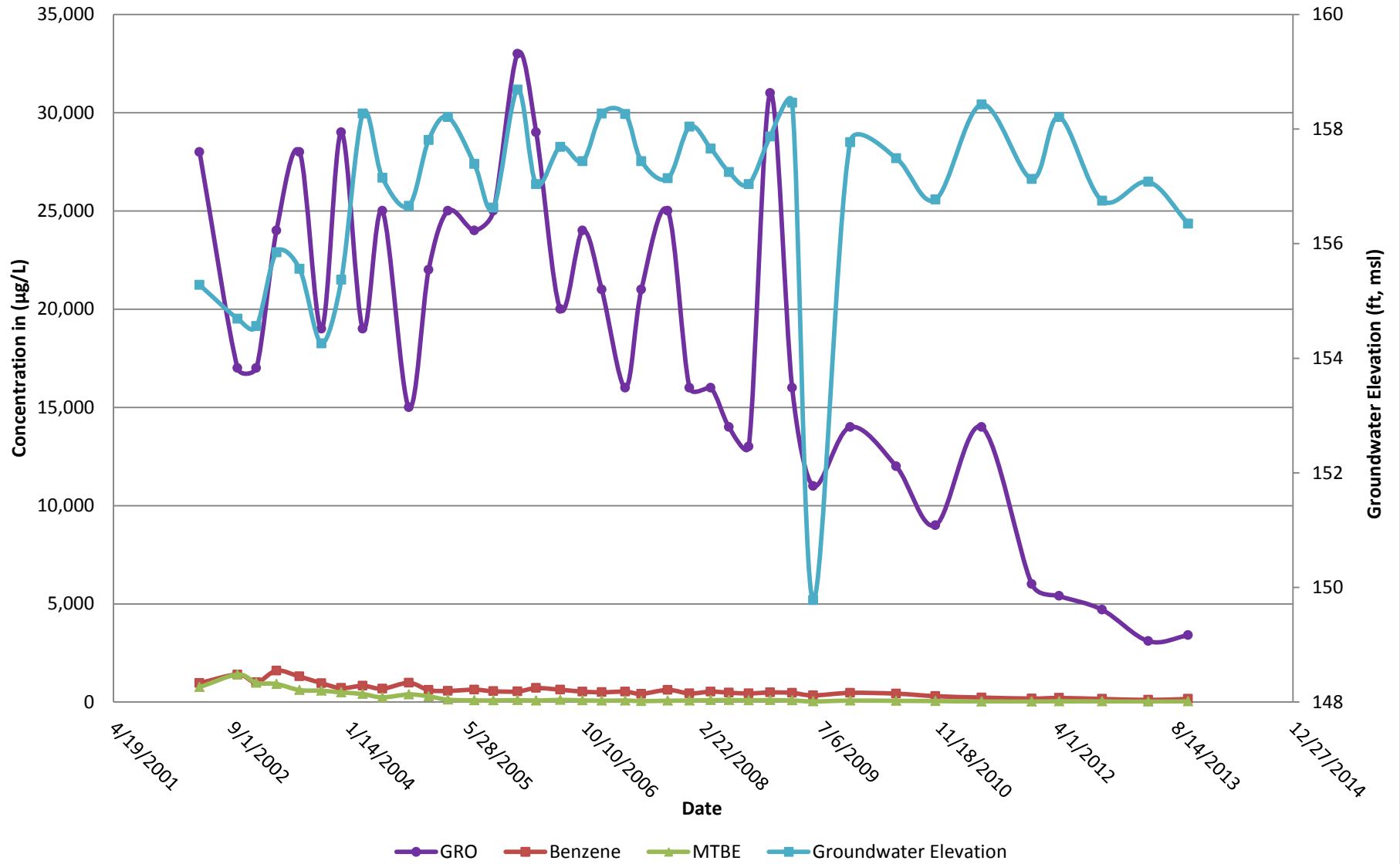




# MW-2 Concentrations and Groundwater Elevations vs Time

ARCO Station #4977

2770 Castro Valley Boulevard, Castro Valley, California



# MW-3 Concentrations and Groundwater Elevations vs Time

ARCO Station #4977

2770 Castro Valley Boulevard, Castro Valley, California

