



**Stantec**

## **Corrective Action Plan**

January 8, 2009

**ARCO Service Station No. 2128**  
**2230 Barrett Avenue**  
**Richmond, California**

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07-0019

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## **1.0 Introduction**

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This report, prepared by Stantec Consulting Corporation (Stantec), on behalf of Atlantic Richfield Company (ARC), a BP Affiliated Company, presents this Corrective Action Plan (CAP) for ARCO Service Station 2128, located at 2230 Barrett Avenue, Richmond, California (Figures 1 and 2). This CAP was prepared in response to a California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) directive dated September 29, 2008 (Attachment A). This CAP presents the site background, a summary of previous investigation and remedial actions, an evaluation of proposed corrective action alternatives, and a proposed remedial alternative of soil vapor extraction and air sparging (SVE/AS).

## **2.0 Site Location and Facility Description**

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The site is an active ARCO gasoline retail outlet located on the southwestern corner of Barrett Avenue and 23<sup>rd</sup> Street in Richmond, California (Contra Costa County Assessor's Parcel Numbers 514-100-022 and 514-100-023). The site is located at approximately 50 feet above mean sea level. The current site layout consists of four gasoline underground storage tanks (USTs), two dispenser islands, and a station building. Five onsite groundwater monitoring wells (BC-1, and MW-2 through MW-5), two offsite monitoring wells (MW-6 and MW-7), three onsite soil vapor extraction (SVE) wells (V-1, V-2, and V-5), two air sparge (AS) wells (S-2 and S-4), and two dual completion SVE/AS wells (V-3/S-1 and V-6/S-3) are located at the site.

The site is located in a mixed commercial/residential area. The property is bounded by an auto repair facility to the south and residential housing to the southwest, and an apartment building to the west.

### **3.0 Site Background and Previous Investigations**

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On September 17, 1987, a waste oil tank was removed from the site. The waste oil tank was located on the western side of the existing station building. No holes were observed in the tank or associated piping. Discolored soil and hydrocarbon odors were encountered along the tank pit walls to a depth of 9 feet below ground surface (bgs). Total petroleum hydrocarbons (TPH) and oil and grease (O&G) were reported in a soil sample, WO-1, collected from the excavation bottom at concentrations of 270 and 330 milligrams per kilogram (mg/kg), respectively. Based upon the sample results, the Contra Costa County Department of Health Services (CCCDHS) required additional excavation.

For reference purposes, the soil boring and well completion details are provided in Table 1, groundwater monitoring and sampling data are included in Table 2, and soil sample analytical results are summarized in Table 3 and on Figure 3. Soil vapor analytical results are presented in Table 4, and grab groundwater sample analytical results are presented in Table 5.

On October 1, 1987, the excavation was deepened to 14 feet bgs, and an additional soil sample, WO-3, was collected. Total fuel hydrocarbons (TFH) and O&G were reported in sample WO-3 at concentrations of 6,800 and 350 mg/kg, respectively. Soil from the excavation was stockpiled onsite, profiled for disposal, and transported to a licensed disposal facility.

On January 27, 1988, Brown and Caldwell (B&C) installed monitoring well BC-1 and drilled soil boring B-1. Due to a subsequent boring being labeled B-1, this boring location is shown as B-1(BC) on tables and figures throughout this report. Benzene was reported at a concentration of 1.0 mg/kg in the sample collected from B-1(BC) at 8.5 feet bgs; petroleum hydrocarbons were not detected in any other soil samples collected.

In April 1991, EA Engineering, Science, and Technology (EA) drilled and sampled borings V-1, V-2, SB-1, and SB-2 at the site. Total petroleum hydrocarbons as gasoline (TPHg) were reported at concentrations of 120, 1,400, and 930 mg/kg in soil samples collected immediately above the groundwater table in borings SB-1, SB-2, and V-2, respectively. TPHg was not reported above laboratory detection limits in samples from boring V-1. Borings V-1 and V-2 were completed as SVE wells.

In May 1991, EA conducted a soil vapor survey at the site. The soil vapor survey was conducted by collecting samples from 31 temporary soil vapor probe locations at depths ranging from 3 to 7 feet bgs. Total volatile hydrocarbons (TVH) were reported at a maximum concentration of 11,000 parts per million by volume (ppmv) immediately north of the UST pit. The soil vapor survey indicated that soil containing hydrocarbons are confined in a narrow zone between depths of 6 and 11 feet bgs. Soil gas survey results are presented in Attachment B.

In July and August 1992, EA installed wells MW-2, MW-3, and MW-4 at the site. TPHg and benzene, toluene, ethylbenzene, and xylenes (collectively BTEX) were reported in the soil

samples collected from MW-3 and MW-4; petroleum hydrocarbons were not detected in the samples collected from MW-2. The maximum TPHg and benzene concentrations were observed in the sample collected MW-4 at 9 feet bgs, at 300 and 1.3 mg/kg, respectively. Following development of the wells, separate phase hydrocarbons (SPH) were encountered in well MW-4.

In December 1992, five single-walled USTs consisting of one 10,000-gallon fiberglass UST, two 6,000-gallon steel USTs, and two 4,000-gallon steel USTs, and associated product lines were removed from the site. The tanks were replaced with four double-walled fiberglass 10,000-gallon tanks in the same tank cavity. During removal, the 10,000-gallon fiberglass tank broke apart. The other tanks were visually inspected and appeared to be in good condition. Three soil samples (SW1, SW2, and SW3) were collected from the south, east, and west sidewalls of the tank cavity at depths of 9 to 11 feet bgs. Five soil samples (L1 through L5) were collected from beneath the product lines at depths of 2 feet bgs. TPHg concentrations from the former tank cavity samples ranged from 1,100 mg/kg in SW2 to 4,500 mg/kg in SW1. Benzene concentrations ranged from 4.8 mg/kg in SW3 to 30 mg/kg in SW1. TPHg concentrations in the product line samples ranged from 4.8 mg/kg in L5 to 1,300 mg/kg in L2. Benzene concentrations ranged from 0.030 mg/kg in L5 to 11 mg/kg in L2. TPHg and benzene were reported in one water sample collected from the tank cavity excavation at concentrations of 25,000 and 2,600 micrograms per liter ( $\mu\text{g/L}$ ), respectively. A total of approximately 1,150 cubic yards of soil was removed from the site and transported to Laidlaw Class II landfill in Buttonwillow, California. A total of approximately 10,000 gallons of water were removed from the excavation and transported offsite for disposal.

To reduce future site disruption, vault boxes and horizontal piping for a future soil vapor extraction (SVE), groundwater extraction, and AS system were installed at the site during the UST facility upgrades. Four-inch plastic pipe was installed from the proposed remediation compound location to the existing sanitary sewer.

In August 1993, EA installed onsite monitoring well MW-5, offsite monitoring wells MW-6 and MW-7, four SVE wells (V-1, V-3, V-5, and V-6) and four AS wells (S-1 through S-4). V-3 and V-6 were installed as cluster wells, each with an associated AS well (S-1 and S-3, respectively). TPHg was reported at a maximum concentration of 190 mg/kg in the soil sample collected from MW-5 at 9 feet bgs. Soil samples from the SVE and AS wells were not retained for laboratory analysis.

In March 2002, Cambria Environmental Technology, Inc. (Cambria) advanced six soil borings (B-1 through B-6) at the site, collected soil, water, and soil vapor samples, and submitted the results with a Risk-Based Corrective Action (RBCA) report. Borings B-1 through B-6 were advanced to a maximum depth of 20 feet bgs. Soil samples collected at depths ranging from 3.5 to 9 feet bgs did not contain TPHg, benzene, or MtBE at concentrations above the laboratory reporting limit (Table 3). Grab groundwater samples collected from borings B-1 through B-5 contained concentrations of TPHg (990 to 370,000  $\mu\text{g/L}$ ), benzene (7.3 to 6,000  $\mu\text{g/L}$ ), and MtBE (less than 20 to 16,000  $\mu\text{g/L}$ ). Soil vapor samples collected from the 5 borings at depths ranging from 5 to 9 feet bgs contained maximum concentrations of TPHg, benzene, and MtBE of 2.55, 0.015, and 0.011  $\mu\text{g/L}$ , respectively. The results of the RBCA indicated that the concentrations of BTEX and MtBE in soil and groundwater should not pose a health risk to offsite commercial workers or residents.



In November 2002, the dispensers and product lines were upgraded. URS Corporation (URS) collected eight soil samples from underneath the former dispensers (S-1 through S-8) and six soil samples from beneath the product lines (L-1, L-2 and LF-1 through LF-4). TPHg was reported in samples S-2, S-3, S-5, S-6, L-1, and LF-1 through LF-4, with a maximum of 1,600 mg/kg in LF-3. All soil samples reported for BTEX constituents except for samples S-4, S-7, S-8 and L-2. MtBE was reported in all soil samples except for samples L-1, L-2, LF-3 and S-4 through S-8. The MtBE concentrations reported ranged between 0.29 mg/kg and 7.4 mg/kg. All soil samples analyzed for total lead resulted in varied concentrations ranging from 6.6 to 53 mg/kg. Approximately 65 cubic yards of soil was removed from the site and transported to Vasco Road Landfill in Livermore, California, for disposal.

## **4.0 Previous Remedial Actions**

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A summary of historical remedial actions conducted at the site is presented below.

### **1987 WASTE OIL UST REMOVAL – REMOVAL OF IMPACTED SOIL**

On September 17, 1987, a waste oil tank was removed from the site. The waste oil tank was located on the western side of the existing station building. No holes were observed in the tank or associated piping. Based upon analytical results of soil samples collected from the excavation, the excavation was deepened to 14 feet bgs. Soil from the excavation was stockpiled onsite, profiled for disposal, and transported to a licensed disposal facility. The volume of soil removed from the UST pit is unknown.

### **1991 – SOIL VAPOR EXTRACTION PILOT TEST**

In May 1991, EA conducted an SVE pilot test at the site and conducted a soil vapor survey. The SVE test was conducted by applying vacuum to wells BC-1, V-1, and V-2 for durations of 96, 197, and 88 minutes, respectively. TVH concentrations measured in soil vapor samples collected during the pilot SVE test ranged from less than 1 ppmv in BC-1 to 2,200 ppmv in V-2. The average vapor concentrations of TVH during the test were 580, 1,300, and 1,600 ppmv, respectively. Mass removal rates of wells BC-1, V-1, and V-2 were estimated to be 8.9, 38, and 2.8 pounds per day (lb/day), respectively. The radius of influence in the area of the tank field was estimated to be from 6 to 19 feet.

### **1992 UST REMOVAL – REMOVAL OF IMPACTED SOIL AND GROUNDWATER**

In December 1992, five single-walled USTs consisting of one 10,000-gallon fiberglass UST, two 6,000-gallon steel USTs, and two 4,000-gallon steel USTs, and associated product lines were removed from the site. A total of approximately 1,150 cubic yards of soil was removed from the site and transported to Laidlaw Class II landfill in Buttonwillow, California. A total of approximately 10,000 gallons of water were removed from the excavation and transported offsite for disposal at H & H Environmental Services in San Francisco, California. During facility upgrades, vault boxes and horizontal piping for a future SVE, groundwater extraction, and AS system were installed at the site. Four-inch plastic pipe was installed from the proposed remediation compound location to the existing sanitary sewer.

### **2002 PRODUCT LINE UPGRADE – REMOVAL OF IMPACTED SOIL AND GROUNDWATER**

In November 2002, the dispensers and product lines were upgraded. Approximately 65 cubic yards of soil was removed from the site and transported to Vasco Road Landfill in Livermore, California, for disposal.

## 5.0 Geology and Hydrogeology

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The site is located approximately 2 miles north of San Francisco Bay and approximately 2 miles west of the Hayward Fault. The geology of the Richmond area generally consists of a complex sequence of sedimentary, igneous, and metamorphic rocks ranging in age from Late Jurassic to Quaternary. A complex assemblage of Franciscan rocks forms the basement for the area. Above the basement rock lies a section of Tertiary marine and nonmarine sedimentary and volcanic rocks. The site is underlain by Quaternary alluvium, consisting of unconsolidated clay, silt, sand, gravel, and bay mud, composed primarily of a clay and silt mixture with occasional sand layers.

Based on the descriptions of soil samples collected from soil borings at the site, soil underlying the site consists of sandy and silty clay, silt, sand, and gravel from grade to approximately 21 feet below ground surface (ft bgs), the maximum depth explored. On the southern portion of the site, gravelly and clayey sand is observed at approximately 13 feet bgs. In the vicinity of the UST pit, a higher permeability sand and gravel layer is observed from approximately 9 feet bgs to 15 feet bgs. Figure 4 presents a site plan showing the cross section locations and the geologic cross sections are presented as Figures 5 through 7.

Since 1993, the minimum and maximum depths to water monitored in well BC-1 were 4.55 and 12.50 feet bgs (Table 6). The average depth to water monitored in well BC-1 during the same period is 10.02 feet bgs. The minimum depth to water of 4.55 feet bgs occurred in 2001 and is significantly shallower than the second shallowest depth to water of 7.38 feet bgs measured in 2005. Referring to Table 6 and Figure 8, groundwater generally flows toward the west-southwest with an average gradient of 0.012 feet per foot.

## **6.0 Petroleum Hydrocarbon Distribution and Concentration Trends**

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### **6.1 DISTRIBUTION OF PETROLEUM HYDROCARBONS IN SOIL**

#### **6.1.1 Lateral Distribution of Hydrocarbons in Soil**

Isoconcentration maps depicting gasoline range organics (GRO) and benzene concentrations in shallow soil (2 to 6 feet bgs) are presented as Figures 9 and 10, respectively. Isoconcentration maps depicting GRO and benzene concentrations in deep soil (7 to 14 feet bgs) are presented as Figures 11 and 12, respectively.

The distribution of GRO in shallow soils at concentrations greater than 500 mg/kg is centered in the immediate vicinity of the western dispenser islands, with concentrations declining toward the west. Referring to Figure 10, benzene with concentrations above 0.50 mg/kg in shallow soil is limited to the area surrounding the tank pit (MW-3 and SB-2) and adjacent to the current southeastern dispenser island (LF-4). Maximum adsorbed concentrations were reported in sample LF-3 (1,600 mg/kg TPHg) at 3.5 feet bgs and LF-4 (2.1 mg/kg benzene) at 6.5 feet bgs.

Maximum adsorbed concentrations of petroleum hydrocarbons in deep soil (7 to 14 feet bgs) are located in the area of the former waste oil UST and former and current gasoline USTs. Maximum adsorbed concentrations were reported in sample WO-3 (6,800 mg/kg TPHg) at 13.5 feet bgs and SW1 (30 mg/kg benzene) at 9 feet bgs.

The downgradient extent of TPHg/GRO and benzene adsorbed to soil is defined by low concentrations of GRO and benzene in soil samples collected during installation of wells MW-6 and MW-7 1993 (Figure 5). Furthermore, TPHg was not detected in deep soil samples (8.5 to 9 feet bgs) collected from downgradient borings B-1, B-2, and B-4 in 2002.

#### **6.1.2 Vertical Delineation of Hydrocarbons in Soil**

The vertical extent of petroleum hydrocarbons in soil is not defined in the former and current gasoline and waste oil UST area based on analytical results from soil samples collected from borings WO-3 and SW1 through SW3. (Table 3). However, since approximately 1,150 cubic yards of soil was removed from the source area, it is likely that hydrocarbons in soil are limited to the capillary fringe near groundwater.

### **6.2 DISTRIBUTION OF PETROLEUM HYDROCARBONS IN GROUNDWATER**

Dissolved isoconcentration maps of GRO, benzene, and MtBE in groundwater during the third quarter 2008 are presented as Figures 13 through 15.

### 6.2.1 Lateral Distribution of GRO Dissolved in Groundwater

Based on the dissolved GRO isoconcentration map included as Figure 13, and Table 2, the extent of GRO dissolved in groundwater is not delineated by the existing monitoring well network. During the third quarter 2008, the highest dissolved GRO concentration (48,000 µg/L) was reported in well MW-5.

The average concentration of GRO in all site wells during the last four quarters (fourth quarter 2007 through the third quarter 2008) is summarized below:

Well ID	Average Detected GRO Concentration in µg/L, Previous 4 Quarters
BC-1	12,000
MW-2	2,400
MW-3	2,500
MW-4	31,000
MW-5	51,000
MW-6	520
MW-7	1,100

### 6.2.2 Lateral Distribution of Benzene Dissolved in Groundwater

Based on the dissolved benzene isoconcentration map included as Figure 14, and Table 2, the downgradient extent of benzene with concentrations less than 5 µg/L is delineated by the existing monitoring well network.

During the third quarter of 2008, the maximum dissolved benzene concentration was observed in well BC-1 at 1,200 µg/L. The average concentration of benzene in all site wells during the last four quarters is summarized below.

Well ID	Average Detected Benzene Concentration in µg/L, Previous 4 Quarters
BC-1	1,500
MW-2	25
MW-3	<0.50
MW-4	350
MW-5	1,000
MW-6	2.1
MW-7	<0.50

### 6.2.3 Lateral Distribution of MtBE Dissolved in Groundwater

Based on the dissolved MtBE isoconcentration map included as Figure 15, and Table 2, the lateral extent of MtBE in groundwater is not delineated in the downgradient direction (to the west) by the existing monitoring well network. MtBE was detected above the State of California Secondary Maximum Contaminant Level (MCL) of 5.0 µg/L in offsite wells MW-6 and MW-7 during the second and third quarters of 2008. The dissolved MtBE plume is delineated to below laboratory reporting limits to the north by well MW-2 and to the northeast by well MW-3.

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The maximum dissolved MtBE concentration during the third quarter 2008 was observed in well BC-1 at 1,900 µg/L. The average concentration of MtBE in wells MW-1 through MW-7 during the last four quarters is summarized below.

<b>Well ID</b>	<b>Average Detected MtBE Concentration in µg/L, Previous 4 Quarters</b>
BC-1	2,500
MW-2	11
MW-3	<0.50
MW-4	<50
MW-5	1,600
MW-6	9.8
MW-7	13

**6.2.4 Vertical Delineation of Hydrocarbons in Groundwater**

To date, the deepest well or boring advanced at the site were wells S-1 through S-4. Deep borings have not been advanced at the site to collect hydropunch samples to investigate vertical delineation of hydrocarbons in groundwater. Data interpreted from hydrocarbon concentrations in soil indicate attenuation of GRO and benzene with increasing depth.

**6.2.5 Dissolved Hydrocarbon Concentration Trends**

Dissolved hydrocarbon concentration versus groundwater elevation and time graphs for all site wells are presented in Appendix D. As indicated in the graphs, elevated concentrations of GRO, benzene, and MtBE dissolved in groundwater are generally stable or declining over time.

## **7.0 Sensitive Receptors**

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### **7.1 LOCAL GROUNDWATER USES**

The California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Water Quality Control Plan indicates the site is located in the Santa Clara Valley Groundwater Basin, East Bay Plain Subbasin. This basin has existing uses as a municipal, domestic, agricultural, and industrial process or service water supply. Potable water is supplied to the site by the East Bay Municipal Utilities District (EBMUD), which obtains surface water from the Mokelumne River in the Sierra Nevada mountains.

### **7.2 SURFACE WATER BODIES**

The nearest surface water body to the site is the San Francisco Bay, located approximately 2 miles south of the site. No other surface water bodies are located within 1 mile of the site.

## **8.0 Water Quality Goals**

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Comprehensive water quality goals are meant to protect the relevant beneficial uses of groundwater identified above. To develop water quality goals, it is recognized that protecting the beneficial use with the most stringent numeric water quality goals will protect all other uses. In general, water quality goals focus on protecting the existing water quality, and whenever that water quality is better than that required, to protect all present and potential beneficial uses (State Water Resources Control Board Resolution 68-16). Numeric water quality goals based on Resolution 68-16 are background levels, which in turn are subject to the limits of detection for residual constituents of concern.

### **8.1 GROUNDWATER REMEDIATION GOALS**

The proposed site water quality goals apply to the site during remediation and beyond; however, they may be modified at any time if it can be shown that changes:

- Are consistent with the maximum benefit to the people of the State, and
- Will not unreasonably affect present or probable future beneficial uses of groundwater.

Groundwater quality goals may be modified to protect the beneficial water use with the most stringent numeric water quality goals: municipal and domestic supply. The RWQCB San Francisco Bay Region Basin Plan classifies groundwater within the Santa Clara Valley Basin, East Bay Plain Subbasin, where the subject site is located, as existing municipal and domestic water supply.

The RWQCB, San Francisco Bay Region has presented Environmental Screening Levels (ESLs) for sites where groundwater is a current or potential drinking water resource. These screening levels are published in the “*Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater*” as revised in May 2008 Table F-1a.

As specified in the Tier 1 Lookup Table F-1b, ESLs for the COCs in groundwater beneath the site based on groundwater being a potential drinking water resource are as follows:

<b>Constituent</b>	<b>ESL</b>
• MtBE:	5 µg/L
• Benzene:	1 µg/L
• Toluene:	40 µg/L
• Ethylbenzene:	30 µg/L
• Xylenes:	20 µg/L
• GRO:	100 µg/L

Stantec proposes these updated ESLs as groundwater remediation goals for the site.



## 8.2 SOIL REMEDIATION GOALS

The RWQCB, San Francisco Bay Region, has presented ESLs for soil at commercial/industrial land-use sites, where groundwater is a current or potential drinking water resource. These screening levels are published in the “*Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater*” as revised in May 2008 Table A.

As specified in the Tier 1 Lookup Table A, ESLs for the COCs in shallow soils (<3m bgs) at the site based upon commercial/industrial land use where groundwater is a potential drinking water resource are as follows:

Constituent	ESL
• MtBE:	0.023 mg/kg
• Benzene:	0.044 mg/kg
• Toluene:	2.9 mg/kg
• Ethylbenzene:	3.3 mg/kg
• Xylenes:	2.3 mg/kg
• TPHg/GRO:	83 mg/kg

Stantec proposes these updated ESLs as soil remediation goals for the site.

## 8.3 REMEDIAL OBJECTIVES

The proposed corrective action objectives are to maintain beneficial uses of groundwater resources and to protect human health. Title 22 distinguishes between groundwater-based and soil-based corrective action objectives as follows:

- **Groundwater-based:** Within physical and economic constraints, eliminate hazardous and nuisance conditions associated with the presence of dissolved hydrocarbons and MtBE in the subsurface environment at the site. Specifically, groundwater-based objectives include (a) reducing the dissolved-phase mass and (b) controlling plume migration.
- **Soil-based:** To the extent economically feasible using established technology, prevent migration and hazardous or nuisance conditions associated with the presence of hydrocarbons and MtBE in site soils.

To facilitate the remedial action design, remedial objectives were determined. These objectives were formulated with attention to site characteristics, public health and safety, and protection of beneficial water uses. These objectives are indicated below:

- **Groundwater:** Within technical and economic constraints, reduce petroleum hydrocarbon and MtBE concentrations in excess of the proposed water cleanup levels and protect the potential use of the water-bearing zones underlying the site.

- **Soil:** Within technical and economic constraints, reduce residual hydrocarbon and MtBE concentrations that may serve as a significant secondary source and prevent exposure of the public to soils containing residual petroleum hydrocarbons or MtBE.

## **9.0 Remedial Approach Review**

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In order to evaluate various remedial approaches, Stantec reviewed the historical data and previous remedial actions conducted at the site. Soil types, groundwater flow direction data, sensitive receptors, and hydrocarbon ratios, concentrations, and distribution are considered for each remedial strategy.

As part of this revised CAP, Stantec evaluated natural attenuation, excavation, soil vapor extraction, air sparging, and oxygen injection.

### **9.1 REMEDIAL ALTERNATIVES EVALUATION**

#### **9.1.1 Natural Attenuation**

Natural attenuation involves the breakdown of hydrocarbon concentrations in-situ via natural processes. Over time chemical degradation and biological processes would break down the hydrocarbons. Elevated concentrations of hydrocarbons in soil vapor near the USTs will require a more aggressive remedial strategy other than natural attenuation. Furthermore, given the presence of dissolved phase hydrocarbons in downgradient wells, monitored natural attenuation does not appear to be a viable offsite remedial strategy.

#### **9.1.2 Excavation**

Excavation is technically feasible, generally effective, and may be the most rapid form of remediation for this site. Due to the presence of contaminants below the equilibrated groundwater surface, dewatering of the excavation and shoring would be required. In addition, the USTs and dispenser islands would need to be removed to obtain adequate access to the source area, and the site could not be used for the duration of the process. Safety concerns are significant and include the dangers of sidewall slumping, weakening of nearby structure subsurface support, restricting public access to an open excavation in a high-visibility setting, vapor mitigation, and dust control. Due to safety concerns, the cost of removing the facility and the actual costs of a large scale excavation, soil excavation is not a viable remedial approach at the site at this time.

#### **9.1.3 Soil Vapor Extraction**

SVE involves inducing a vacuum on vadose zone soils to induce the volatilization of hydrocarbon concentrations adhered to soil which are then removed and treated with granular activated carbon (GAC) or a thermal/catalytic oxidizer to remove/treat hydrocarbons before discharging to the atmosphere. This is a proven and effective method of soil treatment where hydrocarbon concentrations occur above the saturated zone. This method may prove to be the most effective method to reduce near surface soil vapor concentrations at the site. As indicated

in Section 3.0, several SVE wells and associated conveyance piping are located on the site, and an SVE pilot test conducted in 1991 indicated SVE may be a viable remedial alternative.

#### **9.1.4 Air Sparging**

AS involves the injection of air into the subsurface soils to volatilize hydrocarbons adhered to submerged soils and groundwater, and to increase the dissolved oxygen (DO) concentration in the groundwater. Increased DO concentrations will, in turn, stimulate the biodegradation of gasoline-range petroleum hydrocarbons and oxygenates dissolved in groundwater and adsorbed to soil. As indicated in Section 3.0, several AS wells and associated conveyance piping are located on the site.

#### **9.1.5 Oxygen Injection**

Oxygen injection involves the injection of oxygen into the subsurface soils to volatilize hydrocarbons adhered to submerged soils and groundwater, and to increase the dissolved oxygen (DO) concentration in the groundwater. Introduction of oxygen will, in turn, stimulate the biodegradation of gasoline-range petroleum hydrocarbons and oxygenates dissolved in groundwater and adsorbed to soil. Given the relatively high concentrations of hydrocarbons in groundwater, a more aggressive remedial approach may be needed at the site.

#### **9.1.6 Proposed Remedial Approach**

Based on the site characteristics and the high concentrations of hydrocarbons dissolved in groundwater, Stantec proposes SVE/AS as the preferred remedial approach for the site. The remedial approach is detailed in the following section.

## **10.0 Remediation System Installation and Operation**

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Stantec's remedial approach is based on the data derived from previous investigations, a review of site lithology and hydrology, and the results of a prior SVE pilot test. Details of the remedial system implementation are summarized below.

### **10.1 REMEDIATION SYSTEM DESCRIPTION**

Stantec proposes to implement SVE and AS to remediate petroleum hydrocarbons beneath the site. SVE will directly remove petroleum hydrocarbons from the vadose zone beneath the site. AS will enhance natural volatilization of hydrocarbons in groundwater and also introduce oxygen into the saturated zone that will stimulate insitu biodegradation of petroleum hydrocarbons adsorbed to soil and dissolved in groundwater.

#### **10.1.1 Conceptual Design and Process Flow**

Based on the SVE pilot test conducted at the site, a thermal or catalytic oxidizer will be required to abate extracted vapors. The soil vapor will be extracted and treated with a 200 to 300 standard cubic feet per minute (scfm) vapor extraction blower. The extracted soil vapor will be treated using an oxidizer or granulated activated carbon (GAC). Influent and effluent petroleum hydrocarbon vapor samples, process temperatures, applied vacuums, and flow rates will be measured as required for permit compliance and to ensure reliable operation of the system. A permit to operate and discharge to the atmosphere will be obtained through the Bay Area Air Quality Management District (BAAQMD).

The air sparging system will consist of a blower or compressor capable of delivering a peak injection pressure of 30 pounds per square inch (psi) with a stabilized flow of 20 scfm at 15 psi. The air sparge system will be designed with solenoids and a controller to allow for the injection of air into the individual sparge wells or a group of sparge wells. The ability to inject into all the wells at one time will be dependent upon the final system design and number of sparge wells.

The SVE and AS system will utilize the existing SVE and AS wells. A manifold in the remedial compound will allow for measurement and adjustment of the individual extraction or injection wells. Soil vapor will be extracted from the SVE wells and directed through the manifold setup and into a moisture separator, where moisture will be knocked out allowing the soil vapor to pass through the catalytic oxidizer for abatement. The AS piping will also be brought up into the compound in a manifold that will allow for measurement and adjustment of flow rates to the AS wells.

#### **10.1.2 Final Remedial Design**

Upon RWQCB approval of this CAP, a package of construction design drawings will be prepared for the recommended remedial method. The package will contain drawings detailing the location of the current conveyance trenches and compound as wells the proposed utility

connections and remediation equipment layout. Specification of the extraction and treatment equipment will be prepared to aid in procurement of the equipment.

### **10.1.3 Permitting**

The proposed treatment system will reduce influent vapor concentrations to effluent levels acceptable to BAAQMD. An application for an authority to construct (ATC) permit for the oxidizer treatment system will be prepared and submitted to BAAQMD. After an ATC permit is obtained and the system is installed, a source test will be conducted to verify system performance. A permit to operate (PTO) will be obtained at the successful completion of the source test and compliance demonstration.

### **10.1.4 Pre-Construction Activities**

The construction bid package will be distributed to a minimum of three qualified contractors with experience performing similar projects. A bid walk will be performed to allow potential contractors to view the site and direct questions to the design engineer regarding construction specifications. Competitive bids will be procured from the qualified contractors and the client will select a contractor based on the contractors' capabilities to perform the work and their submitted bid cost.

Process equipment will be procured prior to construction based on the specifications prepared during the design phase. Equipment delivery will be coordinated to meet the construction scheduling needs of the selected contractor.

Prior to installation of the remediation system, the existing piping and wellhead connections will be inspected and the piping pressure-tested to ensure the integrity of the existing layout.

### **10.1.5 Remediation System Installation**

The remediation system construction will commence upon procurement of all system construction and operation permits and completion of pre-field activities. An ARC-selected subcontractor will provide construction management during construction activities. This includes onsite management of contractor and subcontractor personnel. An experienced representative will be present to document site activities using daily logs and photographic documentation. The representative will verify compliance with design drawings, construction specifications, building permits, the Site Health and Safety Plan, and construction schedules.

### **10.1.6 System Start-up and Shake Down**

An ARC-selected subcontractor will conduct a system start-up and shake down to insure that the SVE/AS system are working properly. In addition, all fail safe mechanisms and interlocks will be tested to insure the system is capable of automatic shut down during alarm conditions. Once the system is fully operable, official startup will be performed. The system will be monitored and sampled according to the conditions of each of the system operating permits. Data from the startup will be tabulated as necessary to prepare a report, or reports, to fulfill start-up reporting requirements of each permit.

### **10.1.7 Monthly Catalytic Oxidizer Operation and Maintenance**

An operation and maintenance (O&M) manual will be prepared as a stand-alone document to assist personnel maintaining the operation and performing compliance monitoring of the remediation system. The system manual will include as-built drawings, monitoring and maintenance checklists and schedules, troubleshooting guides, and equipment operating manuals. The remediation system will be operated until cleanup goals are achieved or until such a time as the remediation effort is shown to no longer be technically or economically feasible such as when groundwater concentrations reach asymptotic levels. Site clean-up goals may eventually be determined by risk based corrective action assessment. Throughout the life of the system, its operation will be monitored, at a minimum, to verify permit compliance and to meet permit reporting requirements.

As part of the system operation and maintenance, the site will be visited two times per month to monitor and adjust the SVE extraction rates and air sparge injection rates. Monthly air samples will be collected from the influent and effluent vapor lines and analyzed for GRO using EPA Method 8015M, and BTEX and MtBE using EPA method 8260. The air sample data will be compiled and tracked to comply with BAAQMD Permit to Operate.

### **10.1.8 Monitoring and Sampling**

Site groundwater monitoring and sampling will continue to be performed on a quarterly basis using the existing well array.

### **10.1.9 Quarterly Monitoring Reports**

Site groundwater monitoring and system efficiency reports will be prepared and submitted on a quarterly basis or in compliance with the air and water discharge permit requirements. System efficiency reporting will include summaries of mass extracted, mass extraction rates, and any modifications to system operation, which may have increased mass extraction rates. Extracted mass will be compared to the estimated mass of hydrocarbons in soil and groundwater prior to remediation and groundwater concentrations will be compared to groundwater cleanup goals to evaluate the progress toward remediation of the site. The monitoring and sampling results will be summarized into the quarterly report that will include the field notes, copies of the analytical lab results, tables summarizing the field and analytical data, and maps showing the groundwater gradient and chemical concentration results.

### **10.1.10 Project Schedule**

The anticipated schedule to complete the tasks contained in this RAP is as follows:

- Task 1 – Design SVE/AS system.
- Task 2 – Permit SVE/AS system.
- Task 3 – Install SVE/AS system.
- Task 4 – Startup SVE/AS system.

- Task 5 – Data Compilation and Reporting- One month after final sampling analytical results have been received.



## 11.0 Limitations

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This report was prepared in accordance with the scope of work outlined in Stantec's contract and with generally accepted professional engineering and environmental consulting practices existing at the time this report was prepared and applicable to the location of the site. It was prepared for the exclusive use of Atlantic Richfield Company, a BP affiliated company, for the express purpose stated above. Any re-use of this report for a different purpose or by others not identified above shall be at the user's sole risk without liability to Stantec. To the extent that this report is based on information provided to Stantec by third parties, Stantec may have made efforts to verify this third party information, but Stantec cannot guarantee the completeness or accuracy of this information. The opinions expressed and data collected are based on the conditions of the site existing at the time of the field investigation. No other warranties, expressed or implied are made by Stantec.

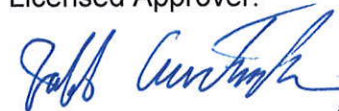
Prepared by:



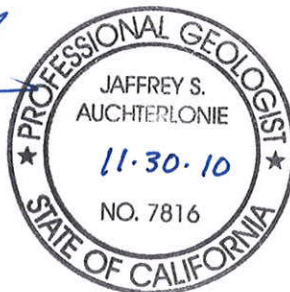
Erik Brown  
*Associate Scientist*

Information, conclusions, and recommendations provided by Stantec in this document regarding the site have been prepared under the supervision of and reviewed by the licensed professional whose signature appears below.

Licensed Approver:



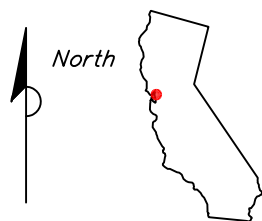
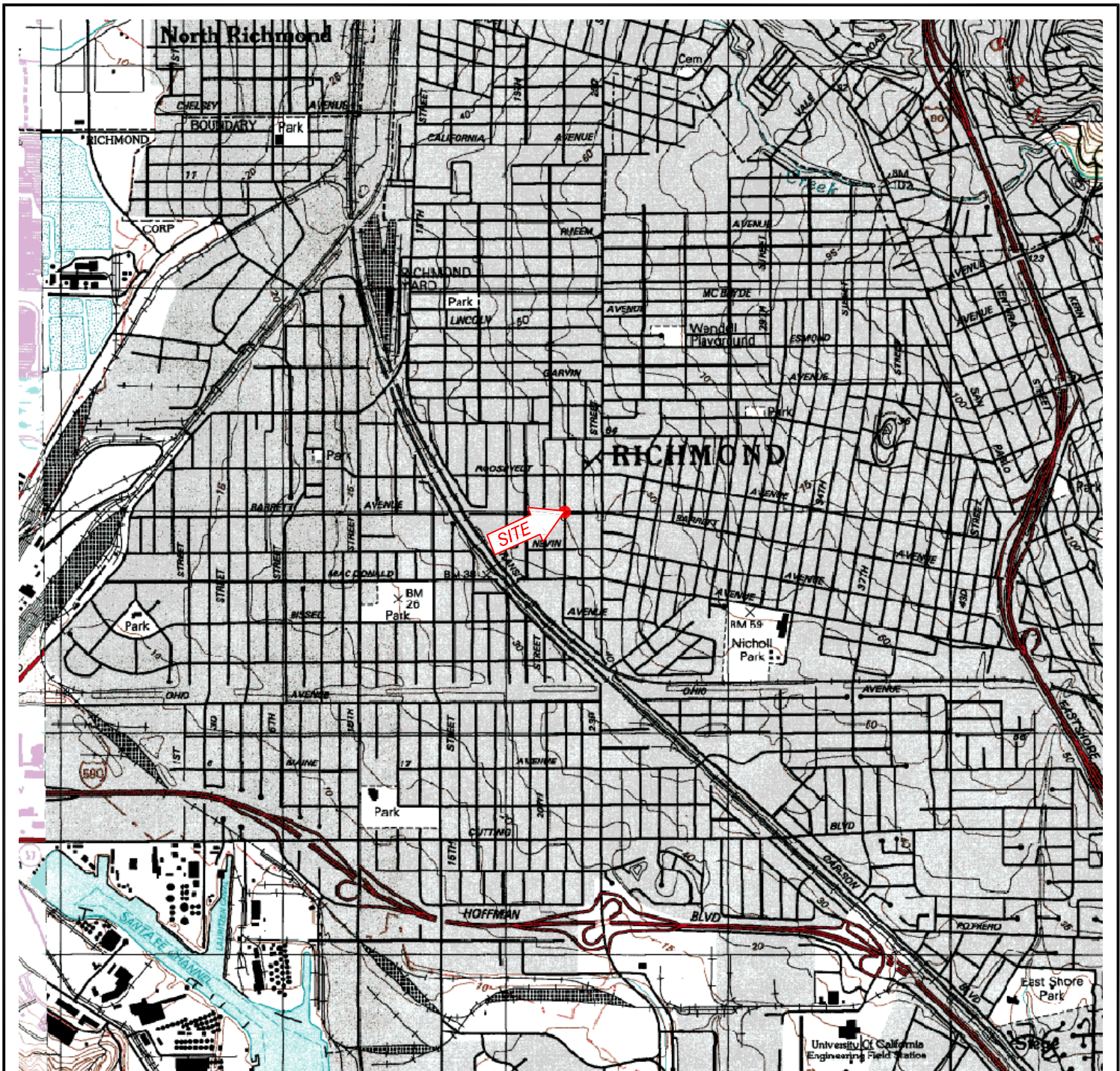
Jaff Auchterlonie, P.G.  
*Principal Geologist*



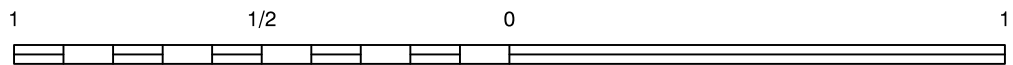
cc: Mr. Paul Andrews, Contra Costa Hazardous Materials Program  
Mr. Charles Carmel, Atlantic Richfield Company (RM) (ENFOS Upload)  
Mr. Jay Johnson, Stratus Environmental, Inc. (ENFOS Upload)

# Figures

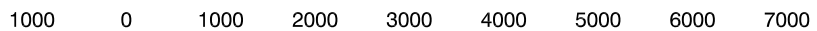




CALIFORNIA



SCALE (MILES)



SCALE (FEET)

REFERENCE: USGS 7.5 MINUTE QUADRANGLE, RICHMOND, CALIFORNIA



**Stantec**

FOR:  
ARCO SERVICE  
STATION NO. 2128  
2230 BARRETT AVENUE  
RICHMOND, CALIFORNIA

**SITE LOCATION MAP**

FIGURE:

**1**

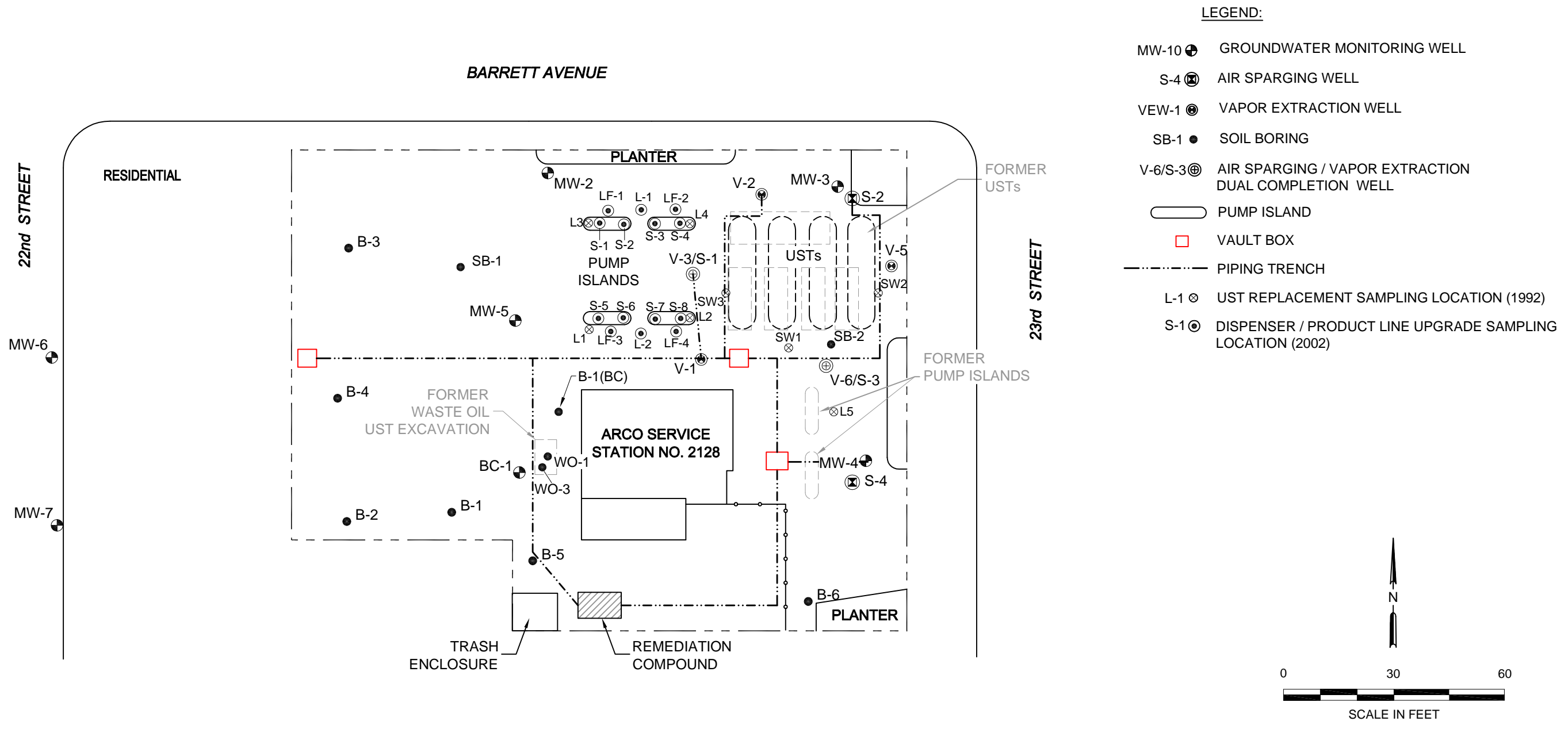
JOB NUMBER:  
77BP.02128.07

DRAWN BY:  
CDH/CM

CHECKED BY:  
SP

APPROVED BY:  
RB

DATE:  
11/13/08



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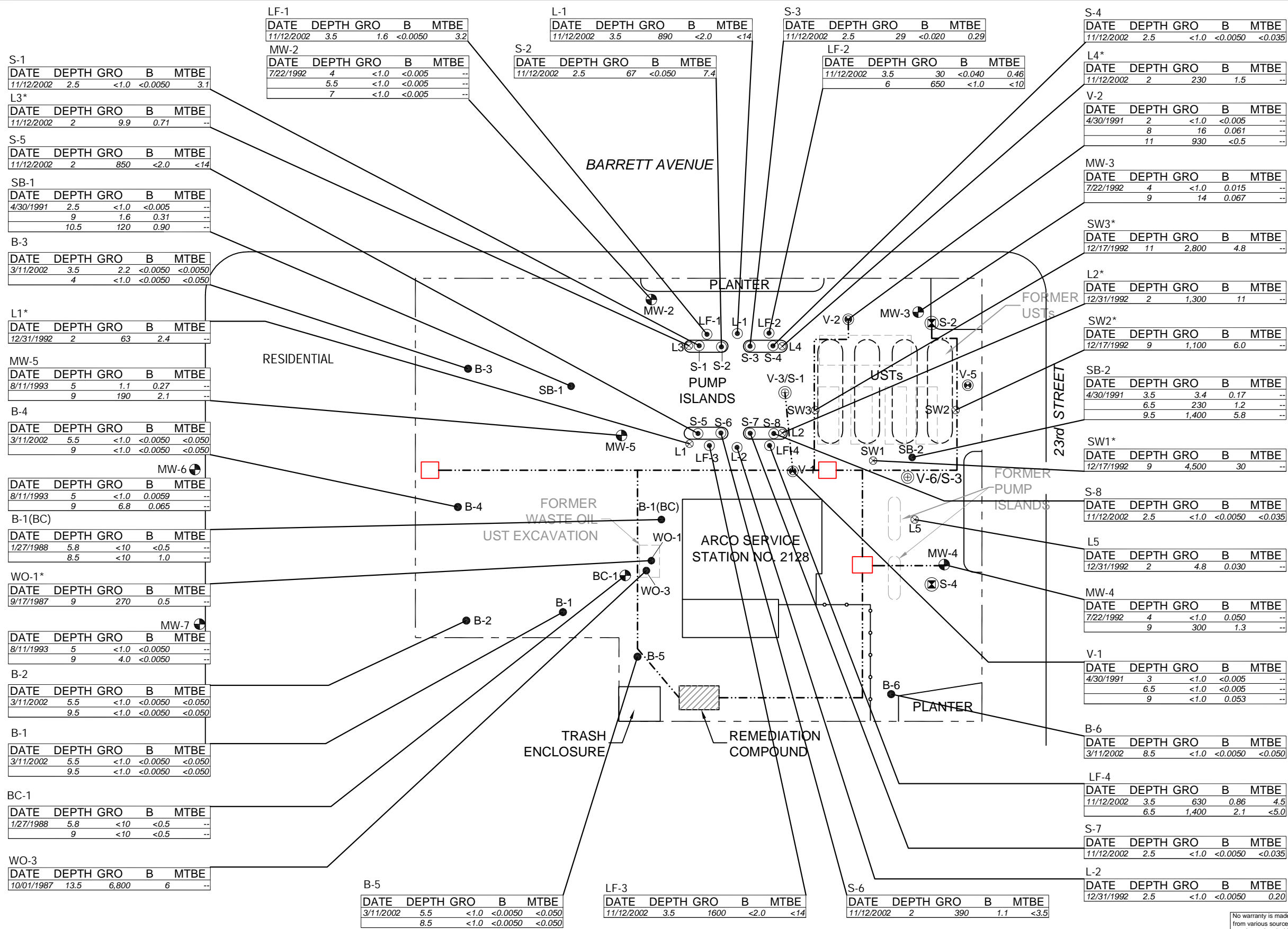
FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		SITE PLAN		FIGURE: <b>2</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: STA/JBL	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09



22nd STREET

BARRETT AVENUE

23rd STREET



**LEGEND:**

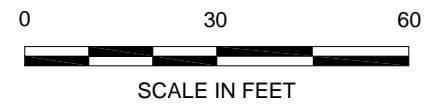
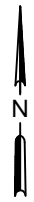
- MW-10 GROUNDWATER MONITORING WELL
- S-4 AIR SPARGING WELL
- VEW-1 VAPOR EXTRACTION WELL
- SB-1 SOIL BORING
- V-6/S-3 AIR SPARGING / VAPOR EXTRACTION DUAL COMPLETION WELL
- PUMP ISLAND
- VAULT BOX
- PIPING TRENCH
- L-1 UST REPLACEMENT SAMPLING LOCATION (1992)
- S-1 DISPENSER / PRODUCT LINE UPGRADE SAMPLING LOCATION (2002)
- SAMPLE LOCATION REMOVED BY OVEREXCAVATION

**CHEMICAL ANALYTICAL RESULTS:**

DATE	DEPTH	GRO	B	MTBE	CONCENTRATION
11/12/2002	3.5	30	<0.040	<10	
6	650	<1.0	0.46		

**ANALYTES:**

- GRO GASOLINE RANGE ORGANICS
- B BENZENE
- MTBE METHYL TERT-BUTYL ETHER

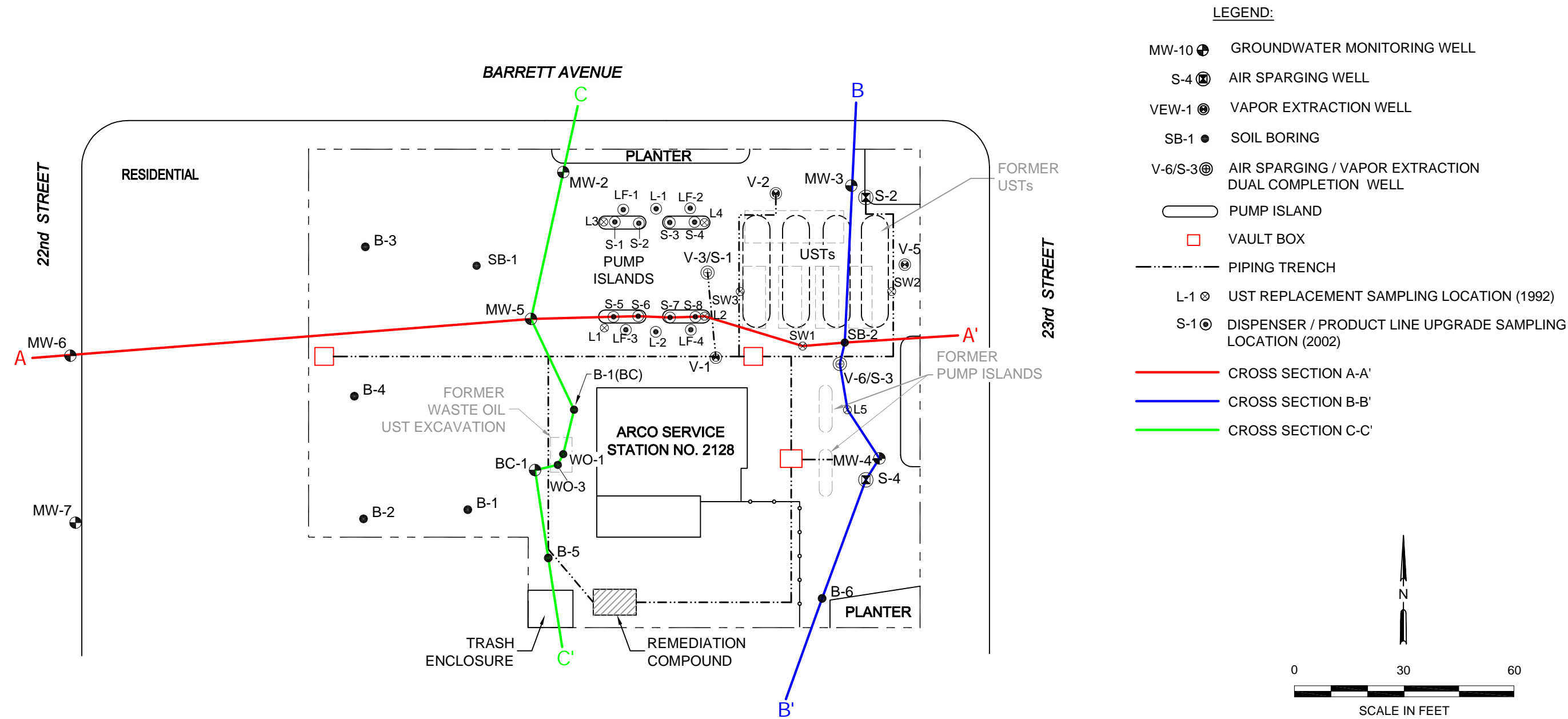


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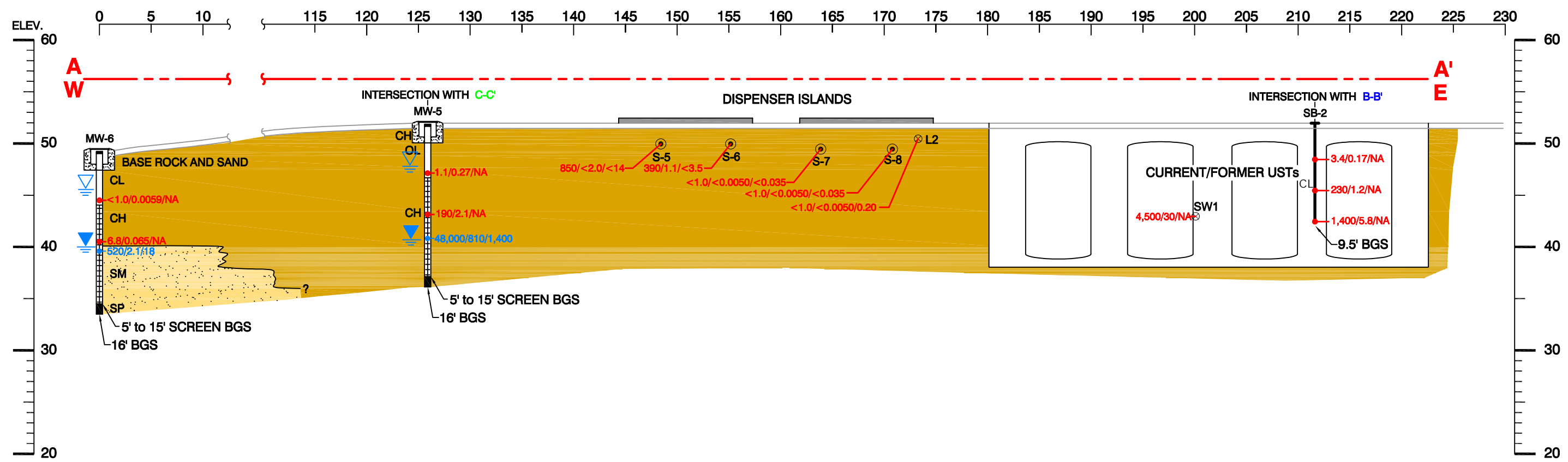
FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		SOIL SAMPLE HYDROCARBON CONCENTRATION MAP		FIGURE: <b>3</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: STA/JBL	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09



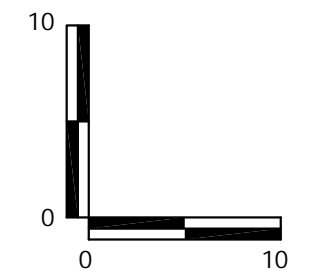
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	FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		GENERALIZED GEOLOGIC CROSS SECTION LOCATION MAP		FIGURE: <b>4</b>
	JOB NUMBER: 77BP.02128.08	DRAWN BY: STA/JBL	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09



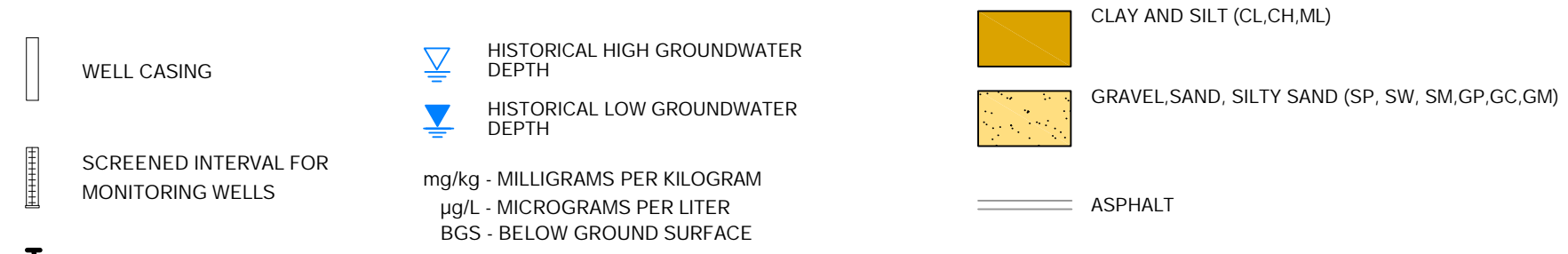
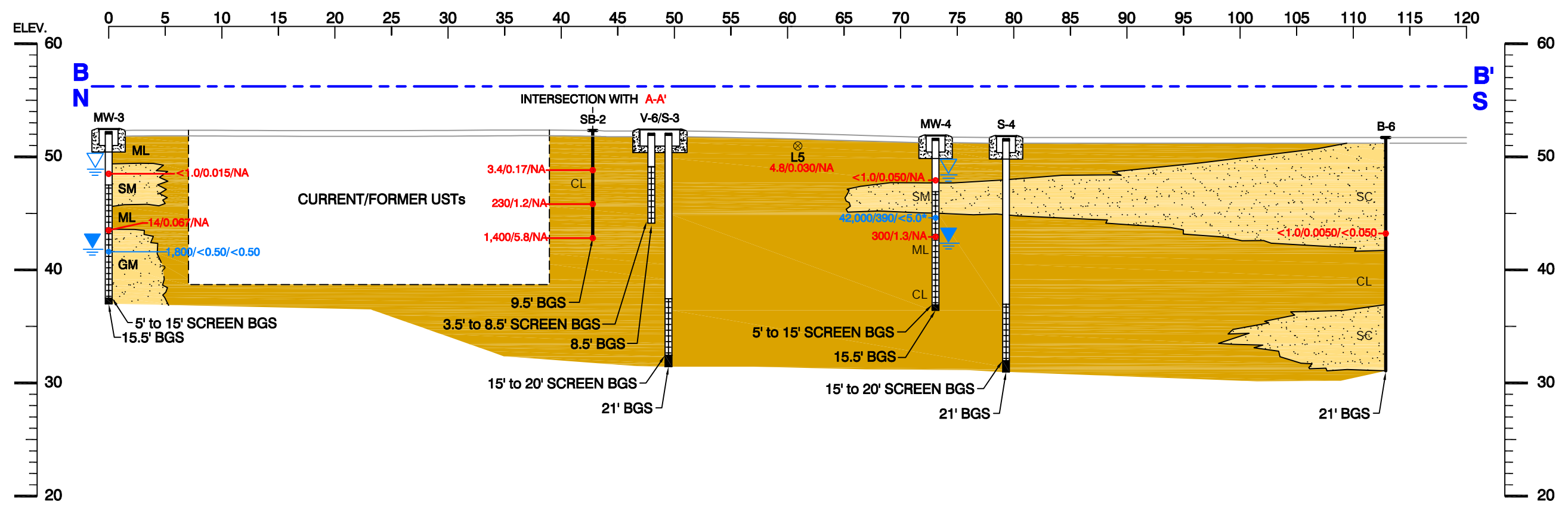
- WELL CASING
- SCREENED INTERVAL FOR MONITORING WELLS
- SOIL BORING
- HISTORICAL HIGH GROUNDWATER DEPTH
- HISTORICAL LOW GROUNDWATER DEPTH
- mg/kg - MILLIGRAMS PER KILOGRAM
- µg/L - MICROGRAMS PER LITER
- BGS - BELOW GROUND SURFACE
- HISTORICAL- SOIL ANALYTICAL DATA (GRO/BENZENE/MTBE) mg/kg
- 3Q08- GROUNDWATER ANALYTICAL DATA (GRO/BENZENE/MTBE) µg/L
- CLAY AND SILT (CL,ML,CH)
- GRAVEL, SAND, SILTY SAND (SP, SW, SM,GP,GC,GM)
- ASPHALT



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REFERENCE: THIS FIGURE IS BASED ON A MAP PROVIDED BY URS CORPORATION

	FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		<b>GENERALIZED GEOLOGIC          CROSS SECTION          A-A'</b>		FIGURE: <b>5</b>
	JOB NUMBER: 77BP.02128.08	DRAWN BY: JBL	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09



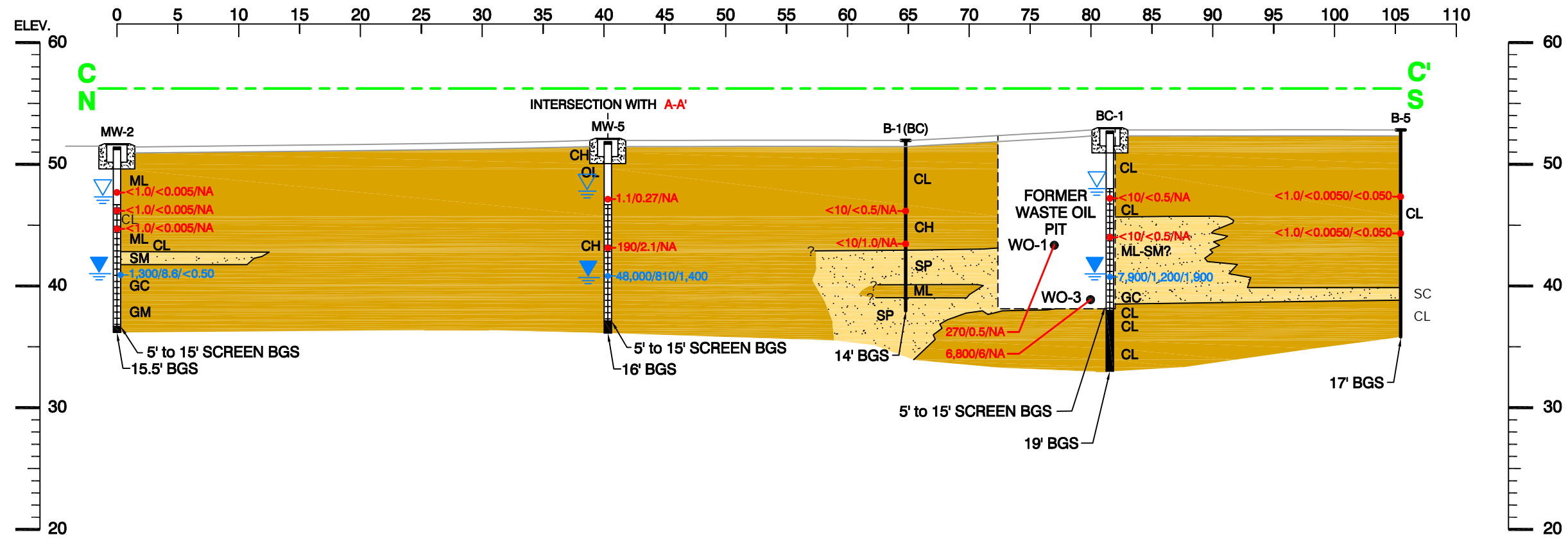
**HISTORICAL- SOIL ANALYTICAL DATA (GRO/BENZENE/MTBE) mg/kg**  
**3Q08- GROUNDWATER ANALYTICAL DATA (GRO/BENZENE/MTBE) µg/L**  
 \* GROUNDWATER DATA FROM 2Q08

REFERENCE: THIS FIGURE IS BASED ON A MAP PROVIDED BY URS CORPORATION

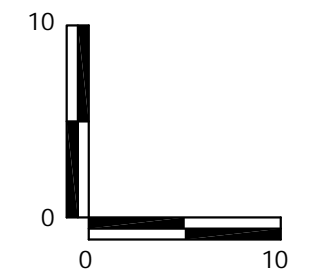
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	FOR:	ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		GENERALIZED GEOLOGIC CROSS SECTION B-B'	FIGURE: <b>6</b>
	JOB NUMBER:	DRAWN BY:	CHECKED BY:		
	77BP.02128.08	JBL	EB	JSA	01/09/09





- WELL CASING
- SCREENED INTERVAL FOR MONITORING WELLS
- SOIL BORING
- HISTORICAL HIGH GROUNDWATER DEPTH
- HISTORICAL LOW GROUNDWATER DEPTH
- CLAY AND SILT (CL, CH, ML)
- GRAVEL, SAND, SILTY SAND (SP, SW, SM, GP, GC, GM)
- ASPHALT
- mg/kg - MILLIGRAMS PER KILOGRAM
- µg/L - MICROGRAMS PER LITER
- BGS - BELOW GROUND SURFACE
- HISTORICAL- SOIL ANALYTICAL DATA (GRO/BENZENE/MTBE) mg/kg
- 3Q08- GROUNDWATER ANALYTICAL DATA (GRO/BENZENE/MTBE) µg/L

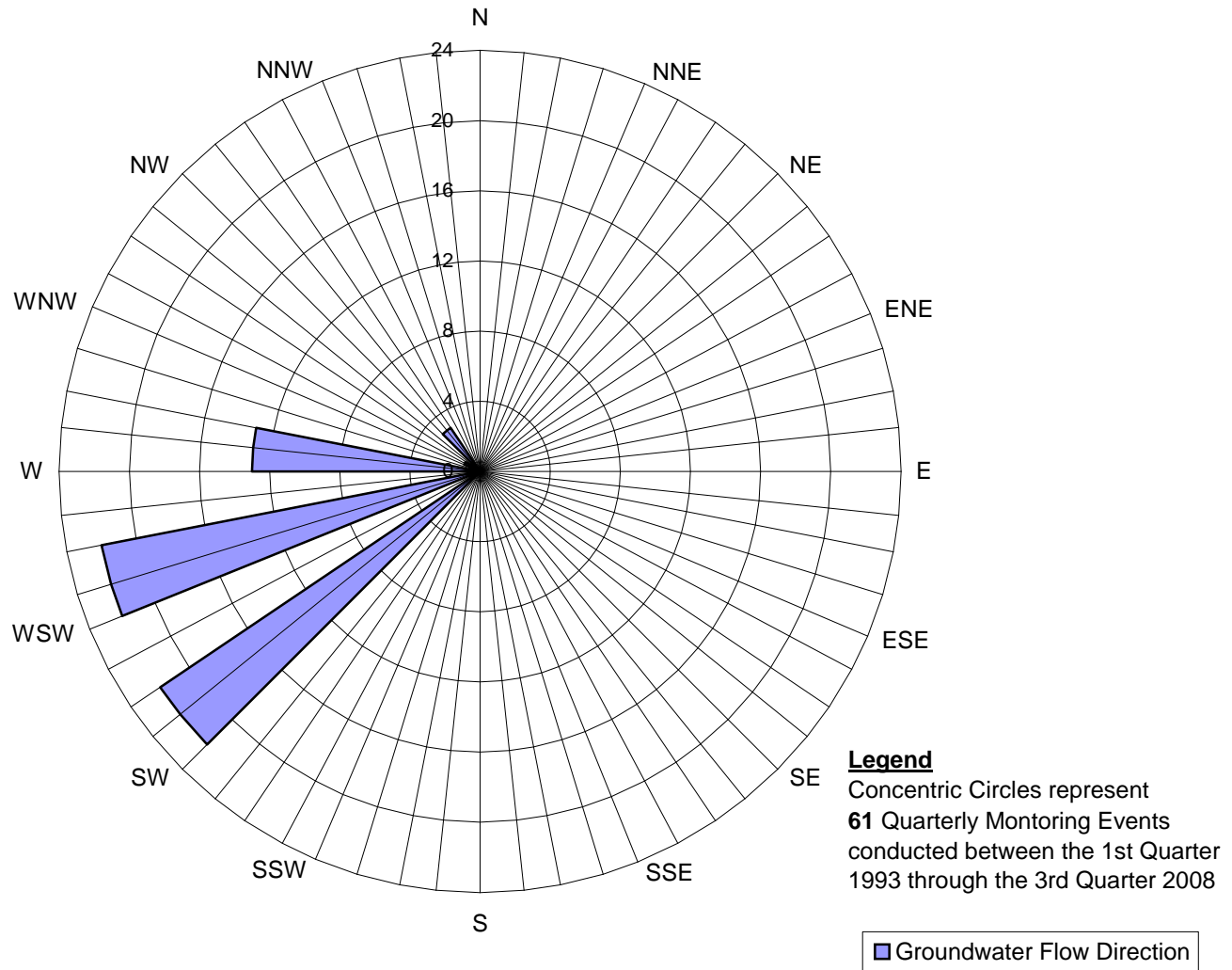


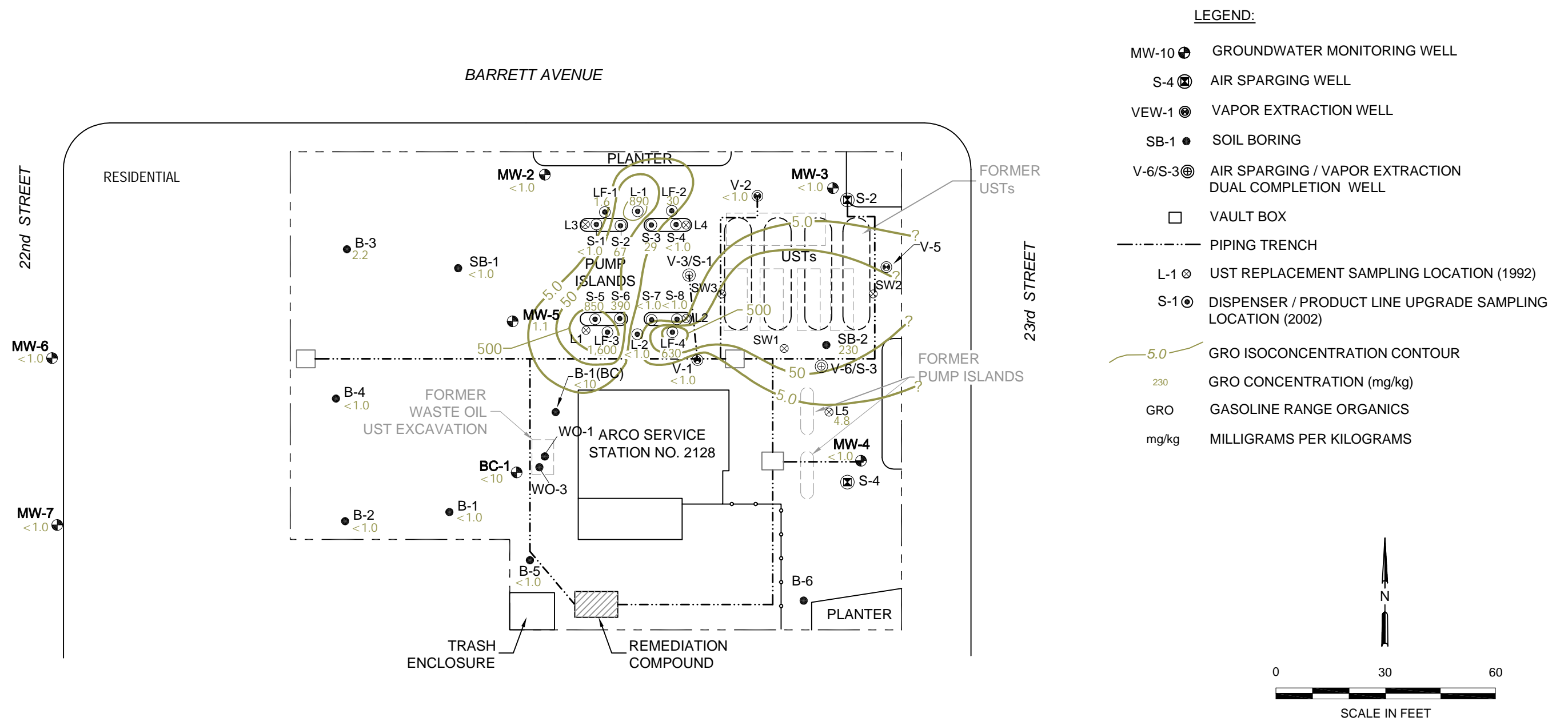
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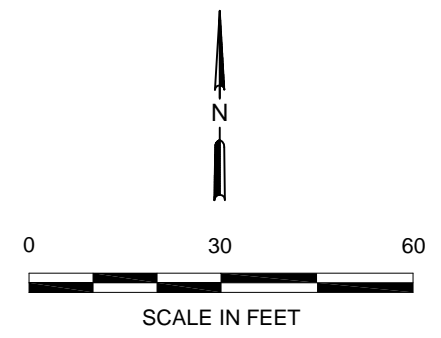
	FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		<b>GENERALIZED GEOLOGIC CROSS SECTION C-C'</b>		<b>FIGURE: 7</b>
	JOB NUMBER: 77BP.02128.08	DRAWN BY: JBL			

**Figure 8**  
**Groundwater Flow Direction Rose Diagram**  
**ARCO Service Station No. 2128**  
**2230 Barrett Avenue, Richmond, California**





- LEGEND:**
- MW-10 ⊕ GROUNDWATER MONITORING WELL
  - S-4 ⊗ AIR SPARGING WELL
  - VEW-1 ⊕ VAPOR EXTRACTION WELL
  - SB-1 ● SOIL BORING
  - V-6/S-3 ⊕ AIR SPARGING / VAPOR EXTRACTION DUAL COMPLETION WELL
  - VAULT BOX
  - PIPING TRENCH
  - L-1 ⊗ UST REPLACEMENT SAMPLING LOCATION (1992)
  - S-1 ⊕ DISPENSER / PRODUCT LINE UPGRADE SAMPLING LOCATION (2002)
  - 5.0 GRO ISOCONCENTRATION CONTOUR
  - 230 GRO CONCENTRATION (mg/kg)
  - GRO GASOLINE RANGE ORGANICS
  - mg/kg MILLIGRAMS PER KILOGRAMS

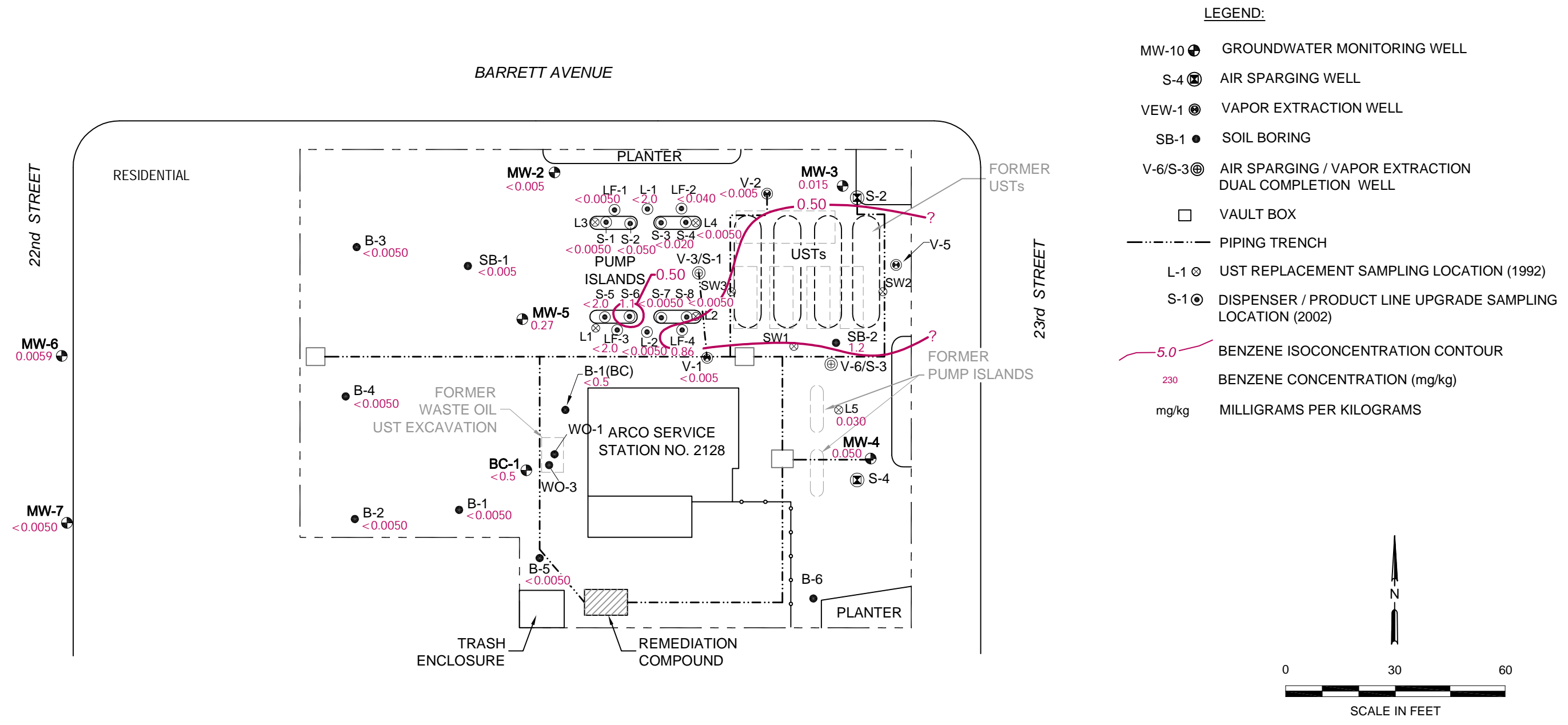


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FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		FIGURE: <b>9</b>	
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA
		DATE: 01/09/09	

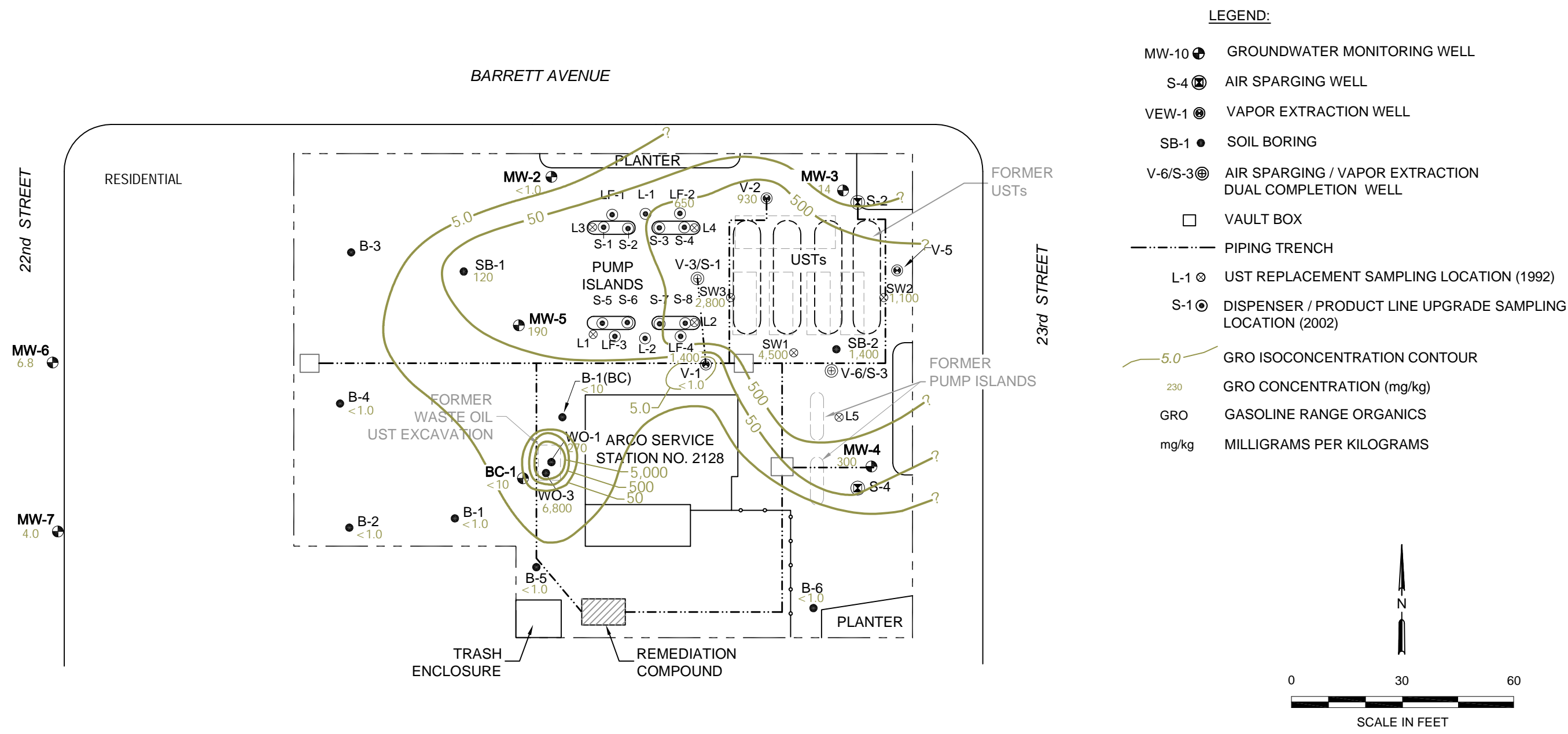


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FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		BENZENE IN SOIL ISOCONCENTRATION MAP (2' TO 6')		FIGURE: <b>10</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09

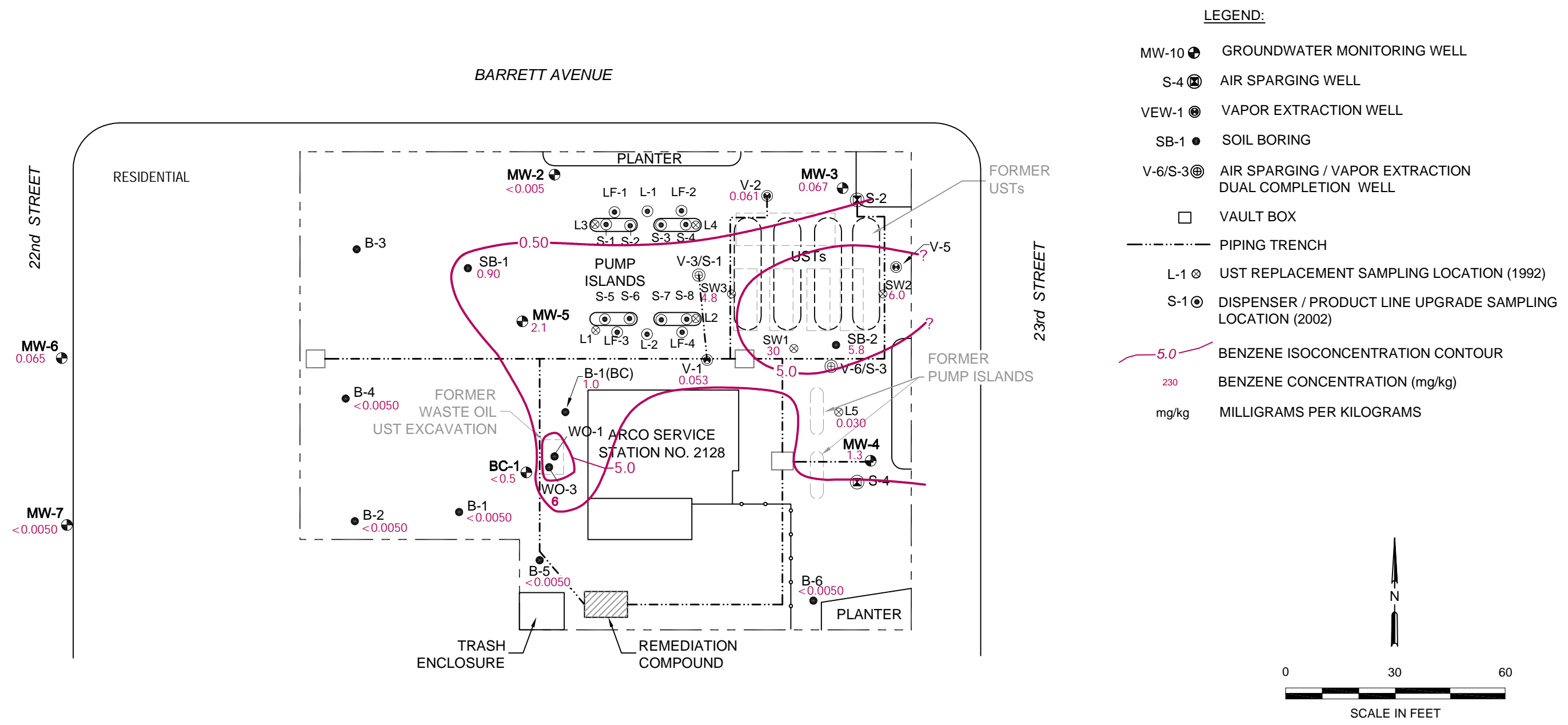


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FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		FIGURE: <b>11</b>	
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA
		DATE: 01/09/09	

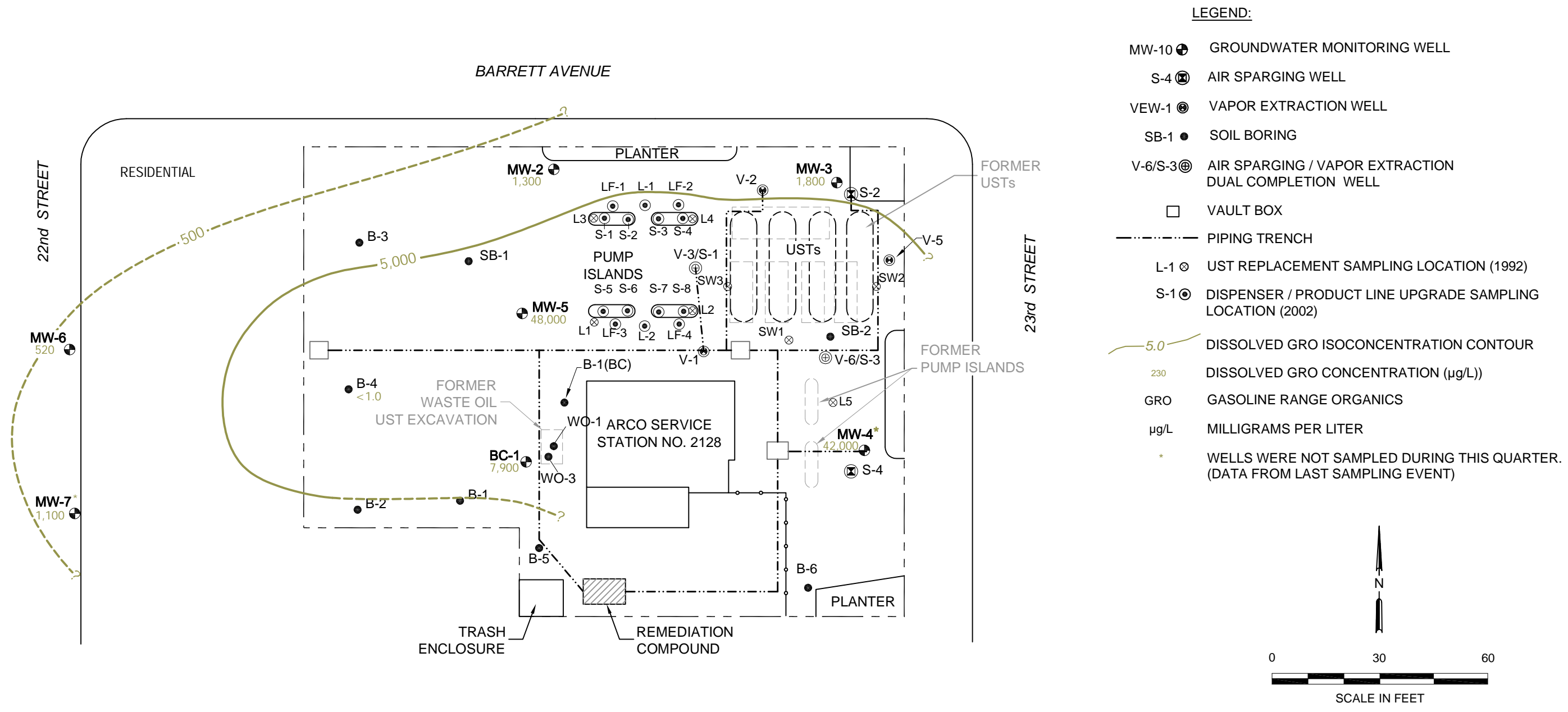


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FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		FIGURE: <b>12</b>	
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA
DATE: 01/09/09			



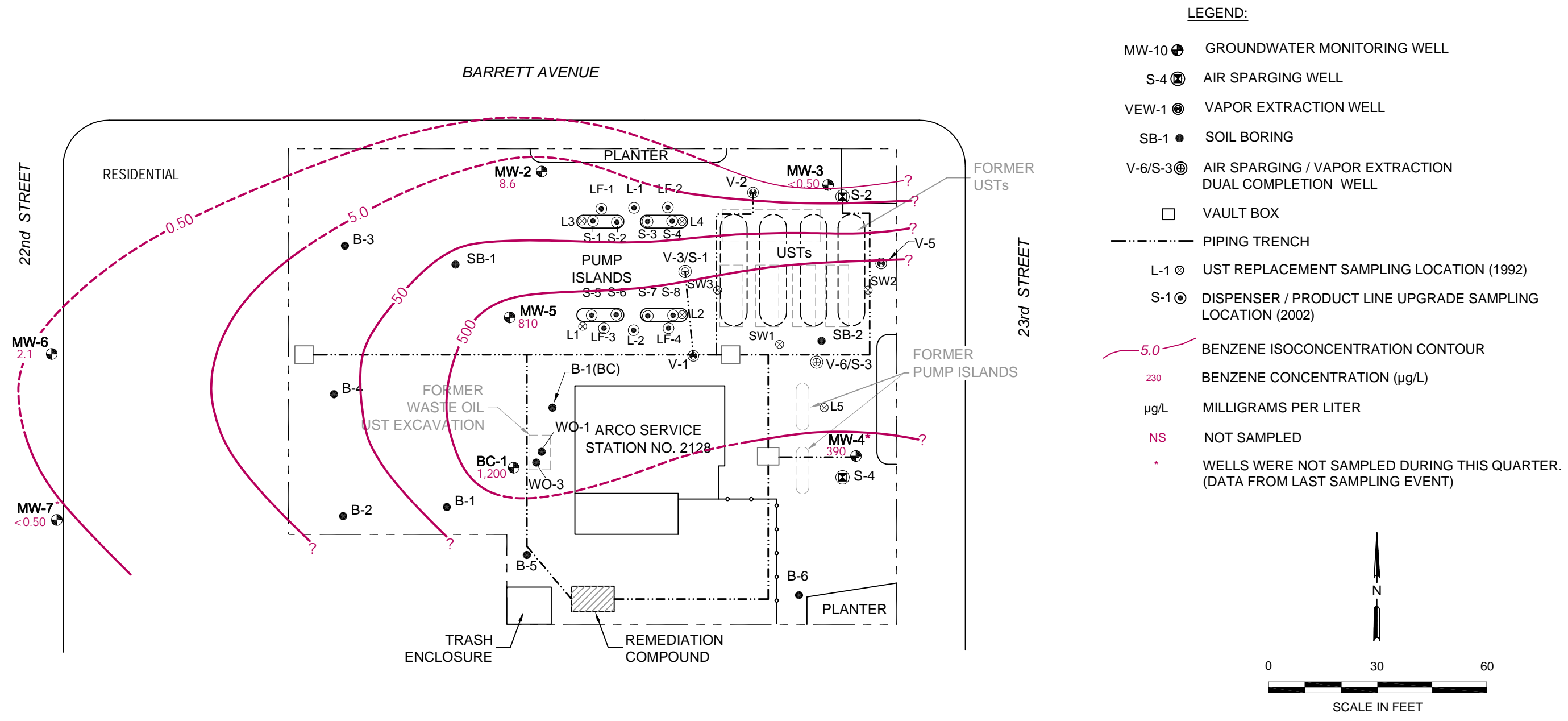
REFERENCE: THIS FIGURE IS BASED ON A MAP PROVIDED BY URS CORPORATION



FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		DISSOLVED GRO ISOCONCENTRATION MAP JULY 24, 2008		FIGURE: <b>13</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09

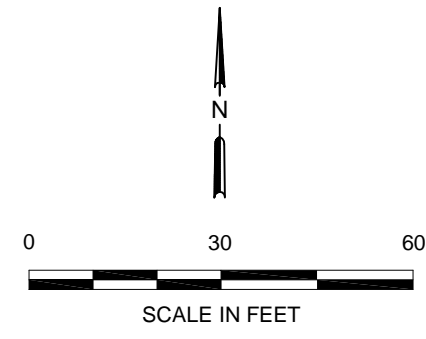
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**LEGEND:**

- MW-10 ⊕ GROUNDWATER MONITORING WELL
- S-4 ⊗ AIR SPARGING WELL
- VEW-1 ⊕ VAPOR EXTRACTION WELL
- SB-1 ● SOIL BORING
- V-6/S-3 ⊕ AIR SPARGING / VAPOR EXTRACTION DUAL COMPLETION WELL
- VAULT BOX
- PIPING TRENCH
- L-1 ⊗ UST REPLACEMENT SAMPLING LOCATION (1992)
- S-1 ⊕ DISPENSER / PRODUCT LINE UPGRADE SAMPLING LOCATION (2002)
- 5.0 BENZENE ISOCONCENTRATION CONTOUR
- 230 BENZENE CONCENTRATION (µg/L)
- µg/L MILLIGRAMS PER LITER
- NS NOT SAMPLED
- \* WELLS WERE NOT SAMPLED DURING THIS QUARTER. (DATA FROM LAST SAMPLING EVENT)



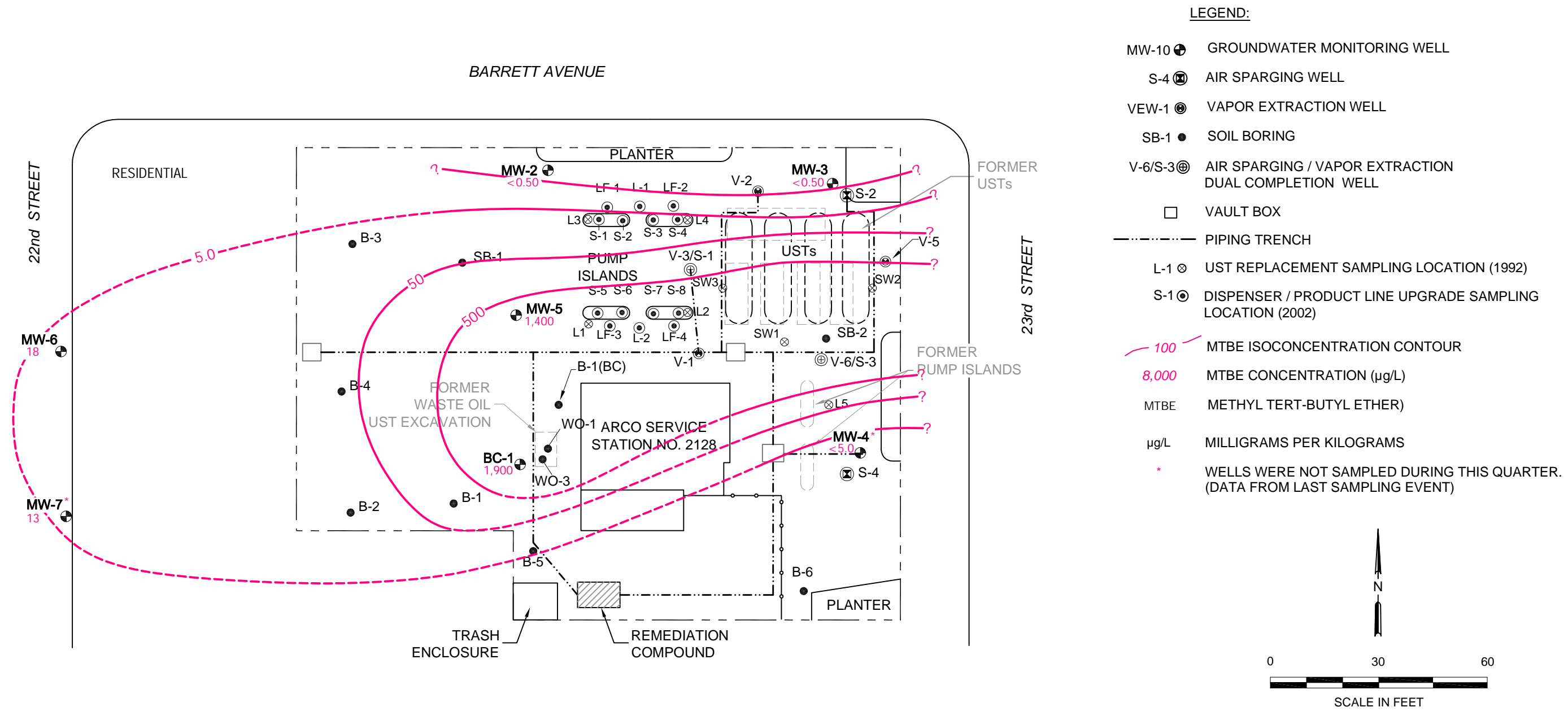
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REFERENCE: THIS FIGURE IS BASED ON A MAP PROVIDED BY URS CORPORATION



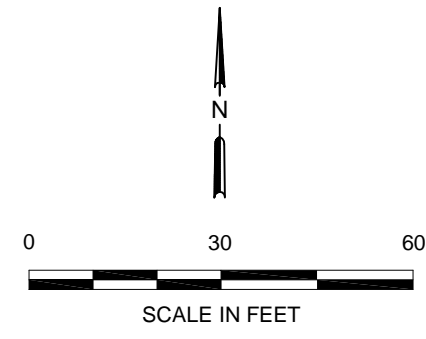
FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		DISSOLVED BENZENE ISOCONCENTRATION MAP JULY 24, 2008		FIGURE: <b>14</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09





**LEGEND:**

- MW-10 ⊕ GROUNDWATER MONITORING WELL
- S-4 ⊗ AIR SPARGING WELL
- VEW-1 ⊕ VAPOR EXTRACTION WELL
- SB-1 ● SOIL BORING
- V-6/S-3 ⊕ AIR SPARGING / VAPOR EXTRACTION DUAL COMPLETION WELL
- VAULT BOX
- PIPING TRENCH
- L-1 ⊗ UST REPLACEMENT SAMPLING LOCATION (1992)
- S-1 ⊕ DISPENSER / PRODUCT LINE UPGRADE SAMPLING LOCATION (2002)
- 100 (pink line) MTBE ISOCONCENTRATION CONTOUR
- 8,000 (pink line) MTBE CONCENTRATION (µg/L)
- MTBE METHYL TERT-BUTYL ETHER
- µg/L MILLIGRAMS PER KILOGRAMS
- \* WELLS WERE NOT SAMPLED DURING THIS QUARTER. (DATA FROM LAST SAMPLING EVENT)



REFERENCE: THIS FIGURE IS BASED ON A MAP PROVIDED BY URS CORPORATION



FOR: ARCO SERVICE STATION NO. 2128 2230 BARRETT AVENUE RICHMOND, CALIFORNIA		DISSOLVED MTBE ISOCONCENTRATION MAP JULY 24, 2008		FIGURE: <b>15</b>
JOB NUMBER: 77BP.02128.08	DRAWN BY: MDR/CM	CHECKED BY: EB	APPROVED BY: JSA	DATE: 01/09/09

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# Tables

**Table 1**  
**Soil Boring and Well Construction Details**  
 ARCO Service Station No. 2128  
 2230 Barrett Avenue  
 Richmond, CA

Well I.D.	Drill Date	Well		Screen		Screen Length (feet)	Comments
		Depth (feet bgs)	Diameter (inches)	Top (feet bgs)	Bottom (feet bgs)		
<b>Soil Borings</b>							
B-1 (BC)	1/27/88	14	--	--	--	--	Brown and Caldwell boring
SB-1	4/30/91	11	--	--	--	--	
SB-2	4/30/91	9.5	--	--	--	--	
B-1	3/11/02	20	--	--	--	--	
B-2	3/11/02	20	--	--	--	--	
B-3	3/11/02	13	--	--	--	--	
B-4	3/11/02	13	--	--	--	--	
B-5	3/11/02	17	--	--	--	--	
B-6	3/11/02	21	--	--	--	--	
SV1 - SV31	5/1/91	3 - 7	--	--	--	--	Soil Vapor Probes
<b>Monitoring Wells</b>							
BC-1	1/27/88	19	4	5	15	10	Vapor Well V-4
MW-2	7/22/92	15.5	4	5	15	10	
MW-3	7/22/92	15.5	4	5	15	10	
MW-4	7/22/92	15.5	4	5	15	10	
MW-5	8/11/93	16	4	5	15	10	
MW-6	8/11/93	16	4	5	15	10	
MW-7	8/11/93	15.5	4	5	15	10	
<b>Vapor Extraction Wells</b>							
V-1	4/30/91	11	4	4.5	9.5	5	
V-2	4/30/91	11	4	3	8	5	
V-5	8/12/93	9.5	4	3.5	8.5	5	
<b>Air Sparge Wells</b>							
S-2	8/11/93	21	2	14.5	19.5	5	
S-4	8/11/93	21	2	15	20	5	
<b>Dual Completion Wells</b>							
V-3	8/11/93	8.5	4	3.5	8.5	5	Nested VE/AS Well
S-1		21	2	15	20	5	
V-6	8/11/93	8.5	4	3.5	8.5	5	Nested VE/AS Well
S-3		21	2	15	20	5	
<b>Explanation</b>							
Wells are of poly-vinyl-chloride (PVC) construction							
bgs = Below ground surface							
-- Denotes unknown data or non-applicable information							

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
BC-1	03/01/93	SPH	50.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	05/01/93			9.95	0.00	40.85	20,000	5,600	1,400	1,400	1,700	-	-	-	-	-	-	-	-	-	-	
	08/01/93			10.91	0.00	39.89	17,000	4,100	1,100	890	1,100	-	-	-	-	-	-	-	-	-	-	
	09/01/93	NSP		11.43	0.00	39.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10/01/93			12.46	0.00	38.34	10,000	7,200	800	840	930	-	-	-	-	-	-	-	-	-	-	
	02/01/94			8.92	0.00	41.88	24,000	4,200	3,100	1,300	3,600	-	-	-	-	-	-	-	-	-	-	
	05/01/94			10.04	0.00	40.76	36,000	4,900	5,400	2,300	7,400	-	-	-	-	-	-	-	-	-	-	
	08/01/94			12.28	0.00	38.52	27,000	3,700	2,500	340	5,200	-	-	-	-	-	-	-	-	-	-	
	11/23/94			9.61	0.00	41.19	30,000	3,800	3,300	1,500	5,000	-	-	-	-	-	-	-	-	-	-	
	03/23/95			7.69	0.00	43.11	36,000	3,800	3,000	1,500	5,500	-	-	-	-	-	-	-	-	-	-	
	05/03/95			9.49	0.00	41.31	38,000	4,000	2,400	1,400	5,000	-	-	-	-	-	-	-	-	-	-	
	09/28/95			11.31	0.00	39.49	31,000	3,200	1,200	1,700	6,100	-	-	-	-	-	-	-	-	-	-	
	12/23/95			10.16	0.00	40.64	27,000	3,000	1,100	1,300	4,600	-	-	-	-	-	-	-	-	-	-	
	03/06/96			8.41	0.00	42.39	33,000	3,000	1,200	1,600	6,000	-	-	-	-	-	-	-	-	-	-	
	06/05/96			9.71	0.00	41.09	28,000	2,800	410	1,200	4,200	3,500	-	-	-	-	-	-	-	-	-	
	09/04/96			10.13	0.00	40.67	17,000	3,600	<100	810	1,900	44,000	-	-	-	-	-	-	-	-	-	
	12/03/96			10.65	0.00	40.15	24,000	4,000	<200	1,300	3,400	73,000	-	-	-	-	-	-	-	-	-	
	03/26/97			9.82	0.00	40.98	25,000	4,100	310	1,200	3,700	110,000	-	-	-	-	-	-	-	-	0.0	
	05/19/97	NP		9.72	0.00	41.08	32,000	6,100	880	1,600	5,300	85,000	-	-	-	-	-	-	-	-	0.7	
	07/28/97	NP		11.00	0.00	39.80	19,000	3,300	200	1,300	3,800	85,000	-	-	-	-	-	-	-	-	0.0	
	11/14/97	NP		10.54	0.00	40.26	41,000	3,500	<200	1,400	2,800	45,000	-	-	-	-	-	-	-	-	0.1	
	04/03/98	NP		8.69	0.00	42.11	13,000	2,700	<100	470	700	33,000	-	-	-	-	-	-	-	-	0.5	
	06/15/98	NP		9.54	0.00	41.26	14,100	2,610	<50	650	969	33,800	-	-	-	-	-	-	-	-	0.6	
	09/22/98	NP		10.59	0.00	40.21	12,700	2,710	77	621	1,290	16,300	-	-	-	-	-	-	-	-	1.4	
	12/02/98	NP		8.97	0.00	41.83	17,200	3,730	<100	925	1,080	23,800	-	-	-	-	-	-	-	-	0.9	
	03/02/99	NP		8.72	0.00	42.08	8,850	2,130	52	327	278	25,000	-	-	-	-	-	-	-	-	0.8	
	06/08/99	NP		9.57	0.00	41.23	12,800	2,880	72	1,000	979	10,200	-	-	-	-	-	-	-	-	0.8	
	09/02/99	NP		10.92	0.00	39.88	10,400	2,760	63	801	696	9,320	-	-	-	-	-	-	-	-	0.8	
	12/01/99	GAU		11.42	Sheen	39.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/15/00			8.21	0.00	42.59	14,500	3,010	59	771	424	11,600	-	-	-	-	-	-	-	-	0.6	
	06/22/00	NP		10.02	0.00	40.78	13,600	1,830	140	860	538	7,700	-	-	-	-	-	-	-	-	1.1	
	08/16/00	NP		10.55	0.00	40.25	12,000	2,850	71	196	88	13,800	-	-	-	-	-	-	-	-	0.9	
	11/08/00	NP		11.03	0.00	39.77	12,600	3,670	56	444	66	21,200	-	-	-	-	-	-	-	-	1.3	
	02/05/01	NP		10.00	0.00	40.80	14,200	2,860	45	591	72	15,100	-	-	-	-	-	-	-	-	0.4	
	04/13/01	NP		4.55	0.00	46.25	8,050	2,820	48	397	44	15,400	-	-	-	-	-	-	-	-	0.6	
	08/08/01	NP		11.75	0.00	39.05	<10,000	3,000	<100	230	110	22,000	-	-	-	-	-	-	-	-	0.6	
	10/04/01	NP		11.83	0.00	38.97	8,700	2,100	60	120	53	13,000	-	-	-	-	-	-	-	-	0.7	
	01/15/02	NP		10.04	0.00	40.76	7,100	2,200	32	190	27	12,000	-	-	-	-	-	-	-	-	0.4	
	04/18/02	NP		10.07	0.00	40.73	12,000	440	72	420	69	9,800	-	-	-	-	-	-	-	-	-	
	07/18/02	NP		10.55	0.00	40.25	13,000	2,400	180	570	110	16,000	-	-	-	-	-	-	-	-	1.3	

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments		
BC-1	10/30/02	NP	50.80	12.50	0.00	38.30	11,000 N	1,600	62	200	59	11,000	-	-	-	-	-	-	-	-	1.0		
	01/22/03	NP		8.47	0.00	42.33	31,000	2,300	<100	200	<100	10,000	<4,000	<100	<100	1,400	<8,000	-	-	-	1.4		
	04/17/03			8.92	0.00	41.88	47,000	3,000	<250	680	<250	16,000	<10,000	<250	<250	1,900	<50,000	-	-	-	0.8		
	07/23/03			10.43	0.00	40.37	27,000	2,400	300	560	480	15,000	<10,000	<250	<250	1,900	<50,000	<250	<250	-	1.1		
	10/29/03	NP	53.00	11.66	0.00	41.34	22,000	2,500	<100	180	180	13,000	<4,000	<100	<100	1,900	<20,000	-	-	-	0.9		
	01/14/04	NP		8.55	0.00	44.45	<25,000	2,000	<250	<250	<250	9,500	<10,000	<250	<250	1,300	<50,000	<250	<250	-	1.5		
	04/21/04	NP		9.28	0.00	43.72	32,000	3,100	180	250	160	13,000	<5,000	<120	<120	1,800	<25,000	<120	<120	-	1.1		
	07/27/04	NP		10.67	0.00	42.33	<25,000	3,200	<250	<250	380	13,000	<10,000	<250	<250	2,000	<50,000	<250	<250	-	0.7		
	10/27/04	NP		11.21	0.00	41.79	12,000	2,300	<50	<50	130	9,000	<2,000	<50	<50	1,500	<10,000	<50	<50	-	1.1		
	01/12/05	NP		7.38	0.00	45.62	15,000	1,800	<100	<100	<100	7,100	<4,000	<100	<100	1,300	<20,000	<100	<100	-	0.6		
	04/13/05	NP		8.67	0.00	44.33	19,000	2,200	<120	<120	<120	9,900	<5,000	<120	<120	1,400	<25,000	<120	<120	-	2.6		
	07/13/05	NP		9.61	0.00	43.39	<25,000	2,500	<250	280	380	6,700	<10,000	<250	<250	1,300	<50,000	<250	<250	-	1.3		
	10/26/05	NP		10.48	0.00	42.52	7,300	1,400	<50	170	260	3,400	<2,000	<50	<50	640	<10,000	<50	<50	-	0.4		
	01/25/06	NP		8.46	0.00	44.54	<12,000	1,800	190	<120	290	4,300	<5,000	<120	<120	1,000	<75,000	<120	<120	-	1.4		
	04/12/06	NP		7.62	0.00	45.38	<12,000	1,400	<120	<120	<120	4,900	<5,000	<120	<120	890	<75,000	<120	<120	-	1.5		
	07/26/06	NP		10.22	0.00	42.78	12,000	2,400	130	120	210	5,700	<2,000	<50	<50	1,000	<30,000	<50	<50	-	1.1		
	11/22/06			10.98	0.00	42.02	12,000	2,000	<50	<50	110	3,600	<2,000	<50	<50	690	<30,000	<50	<50	-	9.2		
	01/24/07			10.33	0.00	42.67	9,500	2,100	88	74	120	4,300	<2,000	<50	<50	780	<30,000	<50	<50	-	1.8		
	04/25/07			9.63	0.00	43.37	11,000	1,800	57	70	130	3,800	<2,000	<50	<50	710	<30,000	<50	<50	-	0.7		
	07/18/07	NP		11.75	0.00	41.25	8,900	1,900	<50	64	180	4,000	<2,000	<50	<50	750	<30,000	<50	<50	-	0.6		
	10/18/07	NP		12.38	0.00	40.62	11,000	1,300	<50	55	95	3,100	<2,000	<50	<50	600	<30,000	<50	<50	-	0.5		
	01/23/08	NP		9.54	0.00	43.46	10,000	1,700	57	73	86	2,800	<2,000	<50	<50	530	<30,000	<50	<50	-	0.8		
	04/21/08	NP		10.42	0.00	42.58	18,000	1,600	310	210	240	2,300	310	<10	<10	420	<6,000	<10	<10	-	1.6		
	<b>07/24/08</b>	<b>NP</b>		<b>12.25</b>	<b>0.00</b>	<b>40.75</b>	<b>7,900</b>	<b>1,200</b>	<b>120</b>	<b>120</b>	<b>110</b>	<b>1,900</b>	<b>&lt;1,000</b>	<b>&lt;50</b>	<b>&lt;50</b>	<b>380</b>	<b>&lt;30,000</b>	<b>&lt;50</b>	<b>&lt;50</b>	-	<b>1.6</b>		
MW-2	03/01/93		49.50	7.33	0.00	42.17	30,000	13,000	2,000	1,700	6,300	-	-	-	-	-	-	-	-	-	-		
	05/01/93			8.17	0.00	41.33	16,000	280	200	620	2,000	-	-	-	-	-	-	-	-	-	-		
	08/01/93			9.16	0.00	40.34	10,000	85	64	360	1,000	-	-	-	-	-	-	-	-	-	-		
	09/01/93	NSP		9.77	0.00	39.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10/01/93			10.85	0.00	38.65	14,000	280	140	650	1,800	-	-	-	-	-	-	-	-	-	-		
	02/01/94			7.29	0.00	42.21	14,000	51	89	260	620	-	-	-	-	-	-	-	-	-	-		
	05/01/94			8.13	0.00	41.37	13,000	110	37	200	440	-	-	-	-	-	-	-	-	-	-		
	08/01/94			10.64	0.00	38.86	9,000	150	26	240	460	-	-	-	-	-	-	-	-	-	-		
	11/23/94			8.17	0.00	41.33	8,400	120	44	240	500	-	-	-	-	-	-	-	-	-	-		
	03/23/95			6.50	0.00	43.00	4,000	35	<5.0	98	150	-	-	-	-	-	-	-	-	-	-		
	05/03/95			7.69	0.00	41.81	4,600	54	14	100	180	-	-	-	-	-	-	-	-	-	-		
	09/28/95			9.84	0.00	39.66	4,500	<12	15	71	88	-	-	-	-	-	-	-	-	-	-		
	12/23/95			8.40	0.00	41.10	1,300	4.0	2.2	21	24	-	-	-	-	-	-	-	-	-	-		
	03/06/96			6.97	0.00	42.53	2,600	<10	<10	51	70	-	-	-	-	-	-	-	-	-	-		
	06/05/96			7.79	0.00	41.71	530	9.6	2.3	2.4	11	47	-	-	-	-	-	-	-	-	-		
	09/04/96			9.11	0.00	40.39	4,300	42	<5.0	52	63	160	-	-	-	-	-	-	-	-	-		

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
MW-2	12/03/96		49.50	8.98	0.00	40.52	2,100	22	<2.5	5.3	9.6	100	-	-	-	-	-	-	-	-		
	03/26/97			7.84	0.00	41.66	170	3.4	1.9	1.4	2.1	15	-	-	-	-	-	-	-	-	0.1	
	05/19/97	NP		7.94	0.00	41.56	290	4.8	3.9	4.4	4.9	15	-	-	-	-	-	-	-	-	-	1.2
	07/28/97	NP		9.23	0.00	40.27	360	4.9	2.8	10	14	10	-	-	-	-	-	-	-	-	-	0.1
	11/14/97	NP		9.56	0.00	39.94	1,300	28	14	16	25	160	-	-	-	-	-	-	-	-	-	0.1
	04/03/98	NP		6.81	0.00	42.69	850	5.0	29	13	90	97	-	-	-	-	-	-	-	-	-	1.9
	06/15/98	NP		7.40	0.00	42.10	449	7.2	3.8	0.96	2.4	36	-	-	-	-	-	-	-	-	-	0.4
	09/22/98	NP		8.40	0.00	41.10	383	2.5	7.0	6.6	5.4	20	-	-	-	-	-	-	-	-	-	2.2
	12/02/98	NP		7.29	0.00	42.21	231	1.3	1.2	1.9	8.9	37	-	-	-	-	-	-	-	-	-	1.4
	03/02/99	NP		6.96	0.00	42.54	29,100	<10	58	54	430	<100	-	-	-	-	-	-	-	-	-	2.4
	06/08/99	NP		8.42	0.00	41.08	22,800	<5.0	112	33	171	<50	-	-	-	-	-	-	-	-	-	0.8
	09/02/99	NP		8.72	0.00	40.78	8,260	<10	30	27	80	<100	-	-	-	-	-	-	-	-	-	0.8
	12/01/99	GAU		9.70	Sheen	39.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	03/15/00	GAU		7.49	Sheen	42.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
	06/22/00	GAU		7.90	Sheen	41.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1
	08/16/00	NP		8.70	0.00	40.80	919	<1.00	<1.00	1.7	3.6	15	-	-	-	-	-	-	-	-	-	1.5
	11/08/00	NP		9.25	0.00	40.25	2,070	27	2.4	2.2	6.5	159	-	-	-	-	-	-	-	-	-	0.6
	02/05/01	NP		8.11	0.00	41.39	1,950	3.2	1.7	1.8	8.4	33	-	-	-	-	-	-	-	-	-	0.4
	04/13/01	NP, DUP		-	-	-	259	0.54	4.0	<0.50	1.2	34	-	-	-	-	-	-	-	-	-	0.6
	04/13/01	NP		4.90	0.00	44.60	254	0.54	2.4	<0.50	1.2	32	-	-	-	-	-	-	-	-	-	-
	08/08/01	NP		10.05	0.00	39.45	810	11	<5.0	<5.0	<5.0	66	-	-	-	-	-	-	-	-	-	0.8
	10/04/01	NP		10.19	0.00	39.31	3,000	<1.0	<1.0	4.7	6.4	93	-	-	-	-	-	-	-	-	-	-
	01/15/02	NP		9.11	0.00	40.39	3,600	47	11	<5.0	15	95	-	-	-	-	-	-	-	-	-	0.5
	04/18/02	NP		9.25	0.00	40.25	1,100	26	3.3	4.5	-	17	-	-	-	-	-	-	-	-	-	-
	07/18/02	NP		8.64	0.00	40.86	5,200 N	<5.0	110	6.3	18	430	-	-	-	-	-	-	-	-	-	1.5
	10/30/02	NP		10.82	0.00	38.68	190 N	6.8	1.2	0.52	2.2	19	-	-	-	-	-	-	-	-	-	0.9
	01/22/03	NP		7.04	0.00	42.46	1,500	<5.0	<5.0	<5.0	<5.0	8.9	-	-	-	-	-	-	-	-	-	1.2
	04/17/03	NSP		7.00	0.00	42.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	07/23/03	NP		8.54	0.00	40.96	1,400	0.88	0.82	0.90	1.6	6.9	-	-	-	-	-	-	-	-	-	1.1
	10/29/03	NSP	51.68	10.05	0.00	41.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	01/14/04	NP		7.84	0.00	43.84	2,300	<5.0	8.9	<5.0	<5.0	47	<200	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	-	-	1.2
	04/21/04	NSP		7.11	0.00	44.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	07/27/04	NP		7.73	0.00	43.95	960	<2.5	4.0	<2.5	4.8	7.0	<100	<2.5	<2.5	<2.5	<500	<2.5	<2.5	-	-	0.9
	10/27/04	NSP		9.65	0.00	42.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	01/12/05	NP		6.49	0.00	45.19	1,200	1.0	1.6	<1.0	3.8	5.6	<40	<1.0	<1.0	<1.0	<200	<1.0	<1.0	-	-	0.8
	04/13/05	NSP		6.85	0.00	44.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	07/13/05	NP		7.57	0.00	44.11	1,500	0.64	1.9	0.78	2.9	4.2	23	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	-	1.2
	10/26/05	NSP		8.07	0.00	43.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	01/25/06	NP		6.72	0.00	44.96	660	<1.0	1.5	<1.0	1.5	<1.0	<40	<1.0	<1.0	<1.0	<600	<1.0	<1.0	-	-	1.1
	04/12/06	NSP		5.92	0.00	45.76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
MW-2	07/26/06	NP	51.68	7.73	0.00	43.95	940	<1.0	3.5	<1.0	1.2	1.6	<40	<1.0	<1.0	<1.0	<600	<1.0	<1.0	-		
	11/22/06	NSP		8.84	0.00	42.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/24/07			7.88	0.00	43.80	1,100	1.3	4.9	1.7	4.4	0.68	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	1.1		
	04/25/07	NSP		7.73	0.00	43.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/18/07	NP		10.19	0.00	41.49	1,400	36	13	2.9	10	1.2	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	0.7		
	10/18/07	NSP		11.17	0.00	40.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/23/08	NP		7.70	0.00	43.98	3,500	42	6.7	4.6	17	11	<40	<1.0	<1.0	<1.0	<600	<1.0	<1.0	2.5		
	04/21/08	NSP		8.12	0.00	43.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	<b>07/24/08</b>	<b>NP</b>		<b>10.77</b>	<b>0.00</b>	<b>40.91</b>	<b>1,300</b>	<b>8.6</b>	<b>2.9</b>	<b>4.8</b>	<b>15</b>	<b>&lt;0.50</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;300</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>2.3</b>		
MW-3	03/01/93		50.12	7.55	0.00	42.57	9,700	2,100	98	460	450	-	-	-	-	-	-	-	-	-		
	05/01/93			8.06	0.00	42.06	8,800	1,200	45	170	220	-	-	-	-	-	-	-	-	-	-	
	08/01/93			9.18	0.00	40.94	6,900	430	28	110	140	-	-	-	-	-	-	-	-	-	-	
	10/01/93			10.92	0.00	39.20	6,300	390	30	95	120	-	-	-	-	-	-	-	-	-	-	
	02/01/94			7.55	0.00	42.57	8,200	270	44	65	68	-	-	-	-	-	-	-	-	-	-	
	05/01/94			8.07	0.00	42.05	7,300	200	18	60	63	-	-	-	-	-	-	-	-	-	-	
	08/01/94			10.65	0.00	39.47	6,100	83	8.3	3.3	42	-	-	-	-	-	-	-	-	-	-	
	11/23/94			8.02	0.00	42.10	9,400	350	110	140	170	-	-	-	-	-	-	-	-	-	-	
	03/23/95			7.01	0.00	43.11	4,700	170	8.2	47	32	-	-	-	-	-	-	-	-	-	-	
	05/03/95			7.78	0.00	42.34	4,800	78	5.8	17	17	-	-	-	-	-	-	-	-	-	-	
	09/28/95			9.94	0.00	40.18	3,000	40	12	<10	10	-	-	-	-	-	-	-	-	-	-	
	12/23/95			8.28	0.00	41.84	2,900	81	<5.0	11	6.9	-	-	-	-	-	-	-	-	-	-	
	03/06/96			7.31	0.00	42.81	4,300	29	<10	18	12	-	-	-	-	-	-	-	-	-	-	
	06/05/96			7.85	0.00	42.27	4,700	95	11	44	43	88	-	-	-	-	-	-	-	-	-	
	09/04/96			9.28	0.00	40.84	5,900	110	<10	25	22	80	-	-	-	-	-	-	-	-	-	
	12/03/96			9.00	0.00	41.12	6,400	41	7.3	30	31	<25	-	-	-	-	-	-	-	-	-	
	03/26/97			7.79	0.00	42.33	4,300	52	22	11	13	58	-	-	-	-	-	-	-	-	-	0.1
	05/19/97	NP		7.90	0.00	42.22	2,700	16	19	<10	34	<50	-	-	-	-	-	-	-	-	-	1.8
	07/28/97	NP		9.40	0.00	40.72	2,900	28	10	<10	14	<50	-	-	-	-	-	-	-	-	-	0.0
	11/14/97	NP		9.78	0.00	40.34	4,300	59	<20	34	33	<100	-	-	-	-	-	-	-	-	-	0.4
	04/03/98	NP		7.39	0.00	42.73	6,400	<5.0	7.0	50	44	130	-	-	-	-	-	-	-	-	-	0.4
	06/15/98	NP		7.69	0.00	42.43	435	65	<5.0	26	24	<50	-	-	-	-	-	-	-	-	-	0.3
	09/22/98	NP		8.62	0.00	41.50	4,090	56	<5.0	15	18	97	-	-	-	-	-	-	-	-	-	2.2
	12/02/98	NP		7.52	0.00	42.60	6,170	79	20	24	23	1,410	-	-	-	-	-	-	-	-	-	1.2
	03/02/99	NP		7.39	0.00	42.73	4,880	81	19	19	23	<25	-	-	-	-	-	-	-	-	-	0.7
	06/08/99	NP		7.79	0.00	42.33	4,010	57	4.6	15	22	64	-	-	-	-	-	-	-	-	-	0.9
	09/02/99	NP		9.31	0.00	40.81	2,100	21	8.3	6.2	7.2	40	-	-	-	-	-	-	-	-	-	0.8
	12/01/99			9.88	0.00	40.24	2,630	39	3.5	12	9.1	43	-	-	-	-	-	-	-	-	-	1.0
03/15/00		7.38	0.00	42.74	6,870	98	14	31	52	<50	-	-	-	-	-	-	-	-	-	0.9		
06/22/00	NP	5.18	0.00	44.94	2,600	<2.50	<2.50	3.9	5.3	<2.50	-	-	-	-	-	-	-	-	-	1.7		
08/16/00	NP	8.91	0.00	41.21	1,460	1.6	<0.50	2.7	3.1	11	-	-	-	-	-	-	-	-	-	1.5		

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**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments		
MW-3	11/08/00	NP	50.12	9.35	0.00	40.77	2,560	27	13	<10.0	<10.0	131	-	-	-	-	-	-	-	-	1.3		
	02/05/01	NP		8.13	0.00	41.99	2,610	1.2	2.5	1.9	<0.50	12	-	-	-	-	-	-	-	-	-	0.8	
	04/13/01	NP		4.17	0.00	45.95	1,620	<5.00	12	5.5	7.7	61	-	-	-	-	-	-	-	-	-	0.5	
	08/08/01	NP		10.10	0.00	40.02	1,900	11	<5.0	<5.0	8.2	34	-	-	-	-	-	-	-	-	-	0.6	
	10/04/01	NP		10.17	0.00	39.95	2,400	1.9	<0.50	7.0	5.7	8.8	-	-	-	-	-	-	-	-	-	0.6	
	01/15/02	NP		9.05	0.00	41.07	2,600	<5.0	9.4	6.7	<5.0	<50	-	-	-	-	-	-	-	-	-	0.4	
	04/18/02	NP		9.22	0.00	40.90	770	<1.0	7.6	<1.0	2.1	13	-	-	-	-	-	-	-	-	-	-	
	07/18/02	NP		8.73	0.00	41.39	3,600 N	10	45	9.2	9.3	230	-	-	-	-	-	-	-	-	-	1.4	
	10/30/02	NP		10.97	0.00	39.15	2,000	89	24	17	6.8	71	-	-	-	-	-	-	-	-	-	1.3	
	01/22/03	NP		7.27	0.00	42.85	2,900	<5.0	<5.0	<5.0	<5.0	<5.0	<200	<5.0	<5.0	<5.0	<5.0	<400	-	-	-	1.2	
	04/17/03	NSP		7.24	0.00	42.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/23/03	NP		8.45	0.00	41.67	1,700	<5.0	<5.0	<5.0	<5.0	<5.0	<200	<5.0	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	-	1.2	
	10/29/03	NSP	52.50	10.09	0.00	42.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/14/04	NP		7.05	0.00	45.45	1,900	<2.5	<2.5	<2.5	<2.5	<2.5	<100	<2.5	<2.5	<2.5	<2.5	<500	<2.5	<2.5	-	2.4	
	04/21/04	NSP		7.34	0.00	45.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/27/04	NP		8.88	0.00	43.62	160	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	1.1	
	10/27/04	NSP		9.72	0.00	42.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/12/05	NP		6.98	0.00	45.52	2,800	<1.0	<1.0	2.9	2.7	<1.0	<40	<1.0	<1.0	<1.0	<1.0	<200	<1.0	<1.0	-	1.0	
	04/13/05	NSP		7.17	0.00	45.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/13/05	NP		7.53	0.00	44.97	160	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	1.5	
	10/26/05	NSP		8.55	0.00	43.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/25/06	NP		7.34	0.00	45.16	1,500	<2.5	<2.5	<2.5	5.0	<2.5	<100	<2.5	<2.5	<2.5	<2.5	<1,500	<2.5	<2.5	-	1.4	
	04/12/06	NSP		6.47	0.00	46.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/26/06	NP		8.38	0.00	44.12	430	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	1.3	
	11/22/06	NSP		9.11	0.00	43.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/24/07	NP		8.46	0.00	44.04	240	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	0.3	
	04/25/07	NSP		7.71	0.00	44.79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/18/07	NP		10.30	0.00	42.20	210	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	0.6	
10/18/07	NSP		11.18	0.00	41.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
01/23/08	NP		7.88	0.00	44.62	3,100	<1.0	<1.0	2.4	1.3	<1.0	<40	<1.0	<1.0	<1.0	<1.0	<600	<1.0	<1.0	-	2.0		
04/21/08	NSP		8.48	0.00	44.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	<b>07/24/08</b>	<b>NP</b>		<b>10.89</b>	<b>0.00</b>	<b>41.61</b>	<b>1,800</b>	<b>&lt;0.50</b>	<b>0.55</b>	<b>1.3</b>	<b>1.4</b>	<b>&lt;0.50</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;300</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>1.8</b>			
MW-4	03/01/93	GAU	49.43	6.38	Sheen	43.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	05/01/93	SPH		6.98	0.01	42.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	08/01/93	SPH		8.04	0.01	41.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	09/01/93	SPH		8.60	0.01	40.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10/01/93	SPH		9.80	0.04	39.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	02/01/94	GAU		6.36	Sheen	43.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	05/01/94	GAU		8.35	Sheen	41.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
08/01/94	NS		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			



**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
MW-4	11/23/94	GAU	49.43	6.71	Sheen	42.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/23/95	GAU		7.46	Sheen	41.97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	05/03/95	GAU		7.51	Sheen	41.92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	09/28/95	GAU		9.76	Sheen	39.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	12/23/95	GAU		7.76	Sheen	41.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/06/96	GAU		6.99	Sheen	42.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	06/05/96	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	09/04/96			7.76	0.00	41.67	32,000	2,000	170	1,100	5,600	<500	-	-	-	-	-	-	-	-	-	
	12/03/96	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/26/97			6.64	0.00	42.79	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	-	0.1
	05/19/97	NP		6.64	0.00	42.79	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	-	1.7
	07/28/97	NP		8.12	0.00	41.31	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	-	0.1
	11/14/97	NP		8.62	0.00	40.81	<50	<0.50	0.75	<0.50	1.1	2.6	-	-	-	-	-	-	-	-	-	0.0
	04/03/98	NP		4.07	0.00	45.36	3,500	550	810	120	470	1,000	-	-	-	-	-	-	-	-	-	7.6
	06/15/98	NP		6.78	0.00	42.65	2,740	433	198	137	439	1,980	-	-	-	-	-	-	-	-	-	0.3
	09/22/98	NP		7.15	0.00	42.28	1,400	246	7.6	69	203	1,490	-	-	-	-	-	-	-	-	-	1.7
	12/02/98	NP		6.53	0.00	42.90	<500	24	<5.0	14	33	1,440	-	-	-	-	-	-	-	-	-	1.0
	03/02/99	NP		6.25	0.00	43.18	318	41	32	12	44	1,350	-	-	-	-	-	-	-	-	-	0.8
	06/08/99	NP		6.44	0.00	42.99	186	12	1.5	2.7	21	1,010	-	-	-	-	-	-	-	-	-	0.9
	09/02/99	NP		7.45	0.00	41.98	98	2.1	0.94	<5.0	4.9	943	-	-	-	-	-	-	-	-	-	0.8
	12/01/99			8.19	0.00	41.24	79	0.73	<0.50	<0.50	2.2	606	-	-	-	-	-	-	-	-	-	1.6
	03/15/00			6.24	0.00	43.19	15,400	1,730	2,740	947	3,540	3,210	-	-	-	-	-	-	-	-	-	0.8
	06/22/00	NP		7.02	0.00	42.41	2,920	220	17	171	405	1,050	-	-	-	-	-	-	-	-	-	1.6
	08/16/00	NP		7.79	0.00	41.64	57,900	2,740	2,510	3,650	18,100	507	-	-	-	-	-	-	-	-	-	1.3
	11/08/00	NP		8.73	0.00	40.70	41,100	1,640	448	3,480	13,700	316	-	-	-	-	-	-	-	-	-	1.2
	02/05/01	NP		7.02	0.00	42.41	44,400	2,030	2,180	3,130	12,200	613	-	-	-	-	-	-	-	-	-	0.7
	04/13/01	NP		4.50	0.00	44.93	51,500	2,730	4,670	3,610	16,300	961	-	-	-	-	-	-	-	-	-	0.3
	08/08/01	NP		9.60	0.00	39.83	48,000	2,300	310	4,000	16,000	1,300	-	-	-	-	-	-	-	-	-	0.5
	10/04/01	NP		9.73	0.00	39.70	43,000	1,300	140	3,400	12,000	230	-	-	-	-	-	-	-	-	-	-
	10/04/01	NP		9.73	0.00	39.70	45,000	1,500	110	3,600	13,000	200	-	-	-	-	-	-	-	-	-	0.5
	01/15/02	NP, DUP		-	-	-	78,000	2,400	7,300	2,900	13,000	<1,000	-	-	-	-	-	-	-	-	-	0.5
	01/15/02	NP		9.09	0.00	40.34	72,000	2,200	6,700	2,700	12,000	<1,000	-	-	-	-	-	-	-	-	-	-
	04/18/02	NP, DUP		-	-	-	57,000	2,700	5,800	4,300	20,000	<500	-	-	-	-	-	-	-	-	-	-
	04/18/02	NP		9.20	0.00	40.23	57,000	2,200	5,100	3,600	17,000	710	-	-	-	-	-	-	-	-	-	-
	07/18/02	NP		7.67	0.00	41.76	52,000	2,000	660	3,800	17,000	620	-	-	-	-	-	-	-	-	-	1.8
	10/30/02	NP		10.03	0.00	39.40	37,000	2,600	150	5,500	13,000	<500	-	-	-	-	-	-	-	-	-	1.5
	01/22/03	NP		7.13	0.00	42.30	91,000	2,200	11,000	4,800	21,000	1,500	<4,000	<100	<100	<100	<8,000	-	-	-	-	1.2
	04/17/03	NP		6.22	0.00	43.21	69,000	1,700	3,900	4,800	21,000	600	<10,000	<250	<250	<250	<50,000	-	-	-	-	1.1
	07/23/03	NP		7.58	0.00	41.85	95,000	2,300	1,700	3,900	14,000	1,800	<20,000	<500	<500	<500	<100,000	<500	<500	-	-	0.5
	10/29/03	NP	51.92	9.04	0.00	42.88	46,000	1,300	880	4,200	12,000	340	<2,000	<50	<50	<50	<10,000	-	-	-	-	1.1

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments
MW-4	01/14/04	NP	51.92	6.28	0.00	45.64	57,000	1,200	3,500	4,700	16,000	250	<2,000	<50	<50	<50	<10,000	<50	<50	7.7	
	04/21/04	NP		6.51	0.00	45.41	51,000	1,200	2,700	4,500	18,000	140	<2,000	<50	<50	<50	<10,000	<50	<50	1.2	
	07/27/04	NP		7.95	0.00	43.97	49,000	1,100	1,800	4,600	16,000	100	<4,000	<100	<100	<100	<20,000	<100	<100	0.6	
	10/27/04	NP		8.61	0.00	43.31	47,000	1,100	1,600	4,700	18,000	<100	<4,000	<100	<100	<100	<20,000	<100	<100	2.1	
	01/12/05	NP		5.99	0.00	45.93	54,000	930	2,600	4,500	15,000	160	<4,000	<100	<100	<100	<20,000	<100	<100	0.9	
	04/13/05	NP		6.36	0.00	45.56	59,000	900	1,600	5,000	16,000	<120	<5,000	<120	<120	<120	<25,000	<120	<120	2.2	
	07/13/05	NP		6.72	0.00	45.20	37,000	770	180	4,100	11,000	59	<2,000	<50	<50	<50	<10,000	<50	<50	1.2	
	10/26/05	NP		7.57	0.00	44.35	38,000	840	140	3,700	11,000	53	<2,000	<50	<50	<50	<10,000	<50	<50	0.7	
	01/25/06	NP		6.45	0.00	45.47	35,000	520	560	3,300	9,200	<50	<2,000	<50	<50	<50	<30,000	<50	<50	1.4	
	04/12/06	NP		5.55	0.00	46.37	46,000	470	460	4,000	9,700	<50	<2,000	<50	<50	<50	<30,000	<50	<50	1.2	
	07/26/06	NP		9.27	0.00	42.65	30,000	650	50	3,400	8,700	<50	<2,000	<50	<50	<50	<30,000	<50	<50	1.2	
	11/22/06			8.99	0.00	42.93	120	<0.50	<0.50	<0.50	<0.50	130	<20	<0.50	<0.50	2.2	<300	<0.50	<0.50	3.7	
	01/24/07			8.20	0.00	43.72	<50	<0.50	<0.50	<0.50	<0.50	3.8	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	1.4	
	04/25/07			6.73	0.00	45.19	26,000	380	53	4,100	6,700	<25	<1,000	<25	<25	<25	<15,000	<25	<25	1.8	
	07/18/07	NP		8.99	0.00	42.93	30,000	420	<50	3,900	5,500	<50	<2,000	<50	<50	<50	<30,000	<50	<50	0.8	
	10/18/07	NP		9.70	0.00	42.22	24,000	330	<50	2,900	3,700	<50	<2,000	<50	<50	<50	<30,000	<50	<50	0.6	
	01/23/08	NP		6.49	0.00	45.43	27,000	340	<50	2,900	5,100	<50	<2,000	<50	<50	<50	<30,000	<50	<50	1.4	
04/21/08	NP		7.31	0.00	44.61	42,000	390	41	5,400	8,100	<5.0	<100	<5.0	<5.0	<5.0	<3,000	<5.0	<5.0	1.6		
07/24/08			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wrong well sampled
MW-5	09/01/93		49.74	10.07	0.00	39.67	140,000	8,800	23,000	3,700	20,000	-	-	-	-	-	-	-	-	-	
	10/01/93			11.17	0.00	38.57	85,000	7,400	20,000	3,400	17,000	-	-	-	-	-	-	-	-	-	
	02/01/94			8.27	0.00	41.47	93,000	4,000	7,200	3,300	17,000	-	-	-	-	-	-	-	-	-	
	05/01/94			8.52	0.00	41.22	96,000	11,000	23,000	3,900	20,000	-	-	-	-	-	-	-	-	-	
	08/01/94			11.96	0.00	37.78	93,000	5,000	21,000	3,000	16,000	-	-	-	-	-	-	-	-	-	
	11/23/94			8.50	0.00	41.24	72,000	12,000	24,000	3,000	19,000	-	-	-	-	-	-	-	-	-	
	03/23/95			6.85	0.00	42.89	120,000	8,300	19,000	3,000	17,000	-	-	-	-	-	-	-	-	-	
	05/03/95			7.91	0.00	41.83	160,000	8,200	23,000	3,700	21,000	-	-	-	-	-	-	-	-	-	
	09/28/95			10.20	0.00	39.54	92,000	3,400	14,000	3,800	19,000	-	-	-	-	-	-	-	-	-	
	12/23/95			8.81	0.00	40.93	98,000	3,400	15,000	3,400	18,000	-	-	-	-	-	-	-	-	-	
	03/06/96			7.17	0.00	42.57	110,000	4,200	15,000	3,300	18,000	-	-	-	-	-	-	-	-	-	
	06/05/96			8.24	0.00	41.50	65,000	2,600	12,000	4,100	23,000	<1,000	-	-	-	-	-	-	-	-	
	09/04/96			9.52	0.00	40.22	77,000	2,600	9,700	4,100	22,000	2,100	-	-	-	-	-	-	-	-	
	12/03/96			9.41	0.00	40.33	69,000	2,500	4,600	3,600	17,000	<500	-	-	-	-	-	-	-	-	
	03/26/97			8.30	0.00	41.44	74,000	1,200	5,400	3,100	18,000	1,000	-	-	-	-	-	-	-	-	0.1
	05/19/97	NP		8.42	0.00	41.32	51,000	1,100	4,500	3,500	18,000	<1,000	-	-	-	-	-	-	-	-	0.9
	07/28/97	NP		9.68	0.00	40.06	57,000	1,400	3,500	3,700	19,000	<1,000	-	-	-	-	-	-	-	-	0.1
11/14/97	NP		10.08	0.00	39.66	52,000	1,300	2,400	3,200	15,000	<250	-	-	-	-	-	-	-	-	0.1	
04/03/98	NP		7.43	0.00	42.31	47,000	1,300	2,500	2,800	14,000	<1,000	-	-	-	-	-	-	-	-	0.3	
06/15/98	NP		7.91	0.00	41.83	52,800	1,020	1,930	3,200	14,500	<500	-	-	-	-	-	-	-	-	0.3	
09/22/98	NP		8.99	0.00	40.75	49,700	995	1,090	3,600	14,400	<1,250	-	-	-	-	-	-	-	-	1.7	

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments		
MW-5	12/02/98	NP	49.74	7.63	0.00	42.11	38,600	818	890	2,710	12,000	592	-	-	-	-	-	-	-	-	1.0		
	03/02/99	NP		7.47	0.00	42.27	37,600	1,100	650	3,380	11,900	<500	-	-	-	-	-	-	-	-	0.7		
	06/08/99	NP		8.12	0.00	41.62	42,700	1,020	1,080	3,900	14,700	<500	-	-	-	-	-	-	-	-	0.8		
	09/02/99	NP		9.57	0.00	40.17	36,900	739	550	3,230	10,900	890	-	-	-	-	10,900	-	-	-	0.7		
	12/01/99	GAU		10.18	Sheen	39.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/15/00			7.54	0.00	42.20	52,400	1,750	3,600	4,560	17,100	4,270	-	-	-	-	-	-	-	-	0.6		
	06/22/00	DUP		-	-	-	56,900	1,130	1,690	2,900	9,890	1,470	-	-	-	-	-	-	-	-	-	-	
	06/22/00	NP		8.55	0.00	41.19	54,500	1,150	1,690	2,910	9,860	1,540	-	-	-	-	-	-	-	-	1.0		
	08/16/00	DUP		-	-	-	38,400	1,170	604	3,590	9,800	1,310	-	-	-	-	-	-	-	-	-	-	
	08/16/00	NP		6.21	0.00	43.53	42,400	1,220	655	3,880	11,900	1,400	-	-	-	-	-	-	-	-	1.2		
	11/08/00	NP		9.65	0.00	40.09	42,400	983	450	4,280	12,000	494	-	-	-	-	-	-	-	-	0.4		
	02/05/01	NP		8.50	0.00	41.24	48,700	1,210	845	3,710	10,400	1,340	-	-	-	-	-	-	-	-	0.4		
	04/13/01	NP		4.93	0.00	44.81	37,700	1,800	868	4,500	10,700	1,440	-	-	-	-	-	-	-	-	0.3		
	08/08/01	NP		10.60	0.00	39.14	31,000	1,000	270	4,100	7,800	1,200	-	-	-	-	-	-	-	-	0.5		
	10/04/01	NP		10.68	0.00	39.06	40,000	1,300	550	4,600	7,500	1,200	-	-	-	-	-	-	-	-	0.6		
	01/15/02	NP		9.54	0.00	40.20	46,000	2,100	1,500	2,900	7,100	2,700	-	-	-	-	-	-	-	-	0.5		
	04/18/02	NP		9.60	0.00	40.14	14,000	130	430	1,400	3,100	1,400	-	-	-	-	-	-	-	-	-	-	
	07/18/02	NP		9.10	0.00	40.64	26,000	840	210	2,500	4,600	2,200	-	-	-	-	-	-	-	-	1.0		
	10/30/02	NP		11.32	0.00	38.42	31,000	1,400	320	5,700	9,500	1,100	-	-	-	-	-	-	-	-	0.8		
	01/22/03	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/17/03	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/23/03	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10/29/03	NP	52.13	10.58	0.00	41.55	41,000	1,100	360	4,600	8,600	1,500	<4,000	<100	<100	330	<20,000	-	-	-	0.8		
	01/14/04	NP		7.60	0.00	44.53	37,000	1,500	900	4,000	5,900	2,200	<2,000	<50	<50	510	<10,000	<50	<50	-	2.1		
	04/21/04	NP		7.85	0.00	44.28	39,000	1,500	990	4,600	8,000	1,700	<2,000	<50	<50	350	<10,000	<50	<50	-	1.4		
	07/27/04	NP		9.32	0.00	42.81	<50,000	1,200	<500	4,700	7,000	1,000	<20,000	<500	<500	<500	<100,000	<500	<500	-	0.9		
	10/27/04	NP		10.07	0.00	42.06	26,000	880	250	4,500	5,300	790	<1,000	<25	<25	210	<5,000	<25	<25	-	1.4		
	01/12/05	NP		7.10	0.00	45.03	27,000	1,100	580	3,500	3,900	1,200	<2,000	<50	<50	280	<10,000	<50	<50	-	0.9		
	04/13/05	NP		7.80	0.00	44.33	30,000	1,100	270	4,200	3,600	1,100	<2,000	<50	<50	260	<10,000	<50	<50	-	2.2		
	07/13/05	NP		8.21	0.00	43.92	30,000	1,100	640	4,400	6,200	660	<2,000	<50	<50	200	<10,000	<50	<50	-	1.1		
	10/26/05	NP		9.05	0.00	43.08	23,000	650	180	3,200	3,800	380	<1,000	<25	<25	120	<5,000	<25	<25	-	0.8		
	01/25/06	NP		7.73	0.00	44.40	19,000	760	140	2,900	2,200	400	<2,000	<50	<50	140	<30,000	<50	<50	-	1.3		
	04/12/06	NP		7.15	0.00	44.98	19,000	820	92	3,100	1,300	500	<2,000	<50	<50	170	<30,000	<50	<50	-	1.7		
	07/26/06	NP		8.84	0.00	43.29	29,000	790	290	4,500	5,200	500	<2,000	<50	<50	190	<30,000	<50	<50	-	1.0		
	11/22/06			9.58	0.00	42.55	21,000	520	100	3,200	2,600	400	<2,000	<50	<50	85	<30,000	<50	<50	-	1.7		
	01/24/07			8.92	0.00	43.21	19,000	600	180	4,300	3,800	570	<2,000	<50	<50	120	<30,000	<50	<50	-	2.0		
	04/25/07			8.17	0.00	43.96	30,000	610	250	3,600	3,900	440	<2,000	<50	<50	120	<30,000	<50	<50	-	1.0		
	07/18/07	NP		10.83	0.00	41.30	19,000	610	120	3,300	2,500	600	<2,000	<50	<50	110	<30,000	<50	<50	-	0.7		
	10/18/07	SPH		11.58	0.09	40.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/23/08	NP		8.13	0.00	44.00	51,000	1,200	730	4,600	13,000	1,800	<2,000	<50	<50	280	<30,000	<50	<50	-	1.4		

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments
MW-5	04/21/08	NP	52.13	9.10	0.00	43.03	53,000	970	530	4,300	11,000	1,600	340	<5.0	<5.0	230	<3,000	<5.0	<5.0	1.5	
	07/24/08	NP		11.31	0.00	40.82	48,000	810	210	3,200	5,200	1,400	<2,000	<100	<100	220	<60,000	<100	<100	1.3	
MW-6	09/01/93		47.12	9.14	0.00	37.98	18,000	1,900	180	1,100	1,100	-	-	-	-	-	-	-	-	-	
	10/01/93			10.07	0.00	37.05	15,000	1,400	110	940	660	-	-	-	-	-	-	-	-	-	
	02/01/94	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	05/01/94	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	08/01/94			9.07	0.00	38.05	8,900	520	23	450	230	-	-	-	-	-	-	-	-	-	
	11/23/94			7.35	0.00	39.77	7,100	85	24	95	14	-	-	-	-	-	-	-	-	-	
	03/23/95			4.53	0.00	42.59	210	18	<0.50	9.4	7.1	-	-	-	-	-	-	-	-	-	
	05/03/95			7.11	0.00	40.01	6,300	280	<5.0	260	160	-	-	-	-	-	-	-	-	-	
	09/28/95	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	12/23/95			7.74	0.00	39.38	420	100	<1.2	<1.2	2.0	-	-	-	-	-	-	-	-	-	
	03/06/96			5.73	0.00	41.39	1,100	50	<1.0	69	30	-	-	-	-	-	-	-	-	-	
	06/05/96			7.56	0.00	39.56	3,200	90	<5.0	190	75	32	-	-	-	-	-	-	-	-	
	09/04/96			7.82	0.00	39.30	1,700	140	<5.0	160	93	30	-	-	-	-	-	-	-	-	
	12/03/96			8.14	0.00	38.98	7,200	240	<10	200	44	230	-	-	-	-	-	-	-	-	
	03/26/97			7.74	0.00	39.38	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	0.4
	05/19/97	NP		7.75	0.00	39.37	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	2.4
	07/28/97	NP		8.56	0.00	38.56	1,200	37	<5.0	31	17	44	-	-	-	-	-	-	-	-	0.3
	11/14/97	NP		9.95	0.00	37.17	3,900	110	5.2	<5.0	94	130	-	-	-	-	-	-	-	-	0.4
	04/03/98	NP		5.28	0.00	41.84	<50	<0.50	<0.50	<0.50	0.64	<5.0	-	-	-	-	-	-	-	-	3.8
	06/15/98	NP		6.73	0.00	40.39	99	1.7	4.4	<0.50	1.4	<5.0	-	-	-	-	-	-	-	-	0.4
	09/22/98	NP		8.22	0.00	38.90	2,000	12	<5.0	41	13	119	-	-	-	-	-	-	-	-	1.5
	12/02/98	NP		6.08	0.00	41.04	2,260	40	5.9	9.2	7.2	66	-	-	-	-	-	-	-	-	0.8
	03/02/99	NP		6.04	0.00	41.08	<50	<0.50	<0.50	<0.50	0.66	<5.0	-	-	-	-	-	-	-	-	4.2
	06/08/99	NP		7.10	0.00	40.02	<50	<0.50	<0.50	<0.50	<0.50	<5.0	-	-	-	-	-	-	-	-	0.9
	09/02/99	NP		8.36	0.00	38.76	4,010	59	<10	86	15	<100	-	-	-	-	-	-	-	-	1.3
	12/01/99			8.76	0.00	38.36	1,990	14	4.1	8.7	9.7	<2.5	-	-	-	-	-	-	-	-	1.5
	03/15/00	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	06/22/00	NP		7.65	0.00	39.47	<50.0	<0.50	<0.50	<0.50	<0.50	<2.50	-	-	-	-	-	-	-	-	1.3
	08/16/00	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11/08/00	DUP		-	-	-	1,460	20	1.2	17	2.1	35	-	-	-	-	-	-	-	-	
	11/08/00	NP		8.45	0.00	38.67	1,750	31	6.6	17	<5.00	34	-	-	-	-	-	-	-	-	0.9
	02/05/01	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/13/01	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	08/08/01	NP		9.30	0.00	37.82	2,100	33	<5.0	12	19	59	-	-	-	-	-	-	-	-	0.7
	10/04/01	NP		9.49	0.00	37.63	2,000	1.0	3.2	1.7	1.7	10	-	-	-	-	-	-	-	-	0.7
	01/15/02	NP		9.00	0.00	38.12	<50	<0.50	<0.50	<0.50	<0.50	<5.0	-	-	-	-	-	-	-	-	0.5
	04/18/02	NP		9.24	0.00	37.88	<50	<0.50	<0.50	<0.50	<0.50	<2.5	-	-	-	-	-	-	-	-	
	07/18/02	NP		7.98	0.00	39.14	600 N	8.1	2.0	<0.50	<0.50	6.7	-	-	-	-	-	-	-	-	1.7

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
MW-6	10/30/02	NP	47.12	9.58	0.00	37.54	900 N	13	3.0	3.8	7.8	14	-	-	-	-	-	-	-	-	-	
	01/22/03	NS		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/17/03	NP		5.86	0.00	41.26	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	-	-	-	4.5	
	07/23/03	NP		7.57	0.00	39.55	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	3.6	
	10/29/03	NP	49.49	8.70	0.00	40.79	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	-	-	-	3.8	
	01/14/04	NP		5.65	0.00	43.84	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	7.8	
	04/21/04	NP		5.63	0.00	43.86	51	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	4.4	
	07/27/04	NP		7.47	0.00	42.02	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	5.6	
	10/27/04	NP		7.70	0.00	41.79	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	4.1	
	10/27/04	NP		7.70	0.00	41.79	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	4.1	
	01/12/05			4.66	0.00	44.83	88	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	3.3	
	04/13/05	NP		5.42	0.00	44.07	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	1.4	
	07/13/05	NP		6.52	0.00	42.97	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<100	<0.50	<0.50	-	1.4	
	10/26/05	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/25/06	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/12/06	NSP		5.18	0.00	44.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/26/06	NP		7.86	0.00	41.63	960	<0.50	<0.50	<0.50	0.67	11	<20	<0.50	<0.50	1.8	<300	<0.50	<0.50	-	1.1	
	11/22/06	NSP		7.83	0.00	41.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/24/07	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/25/07	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/18/07	NP		9.08	0.00	40.41	520	<0.50	<0.50	<0.50	<0.50	1.5	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	1.3	
	10/18/07	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Parked over
	01/23/08	NP		6.91	0.00	42.58	<50	<0.50	<0.50	<0.50	<0.50	1.5	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	5.6	
	04/21/08	NSP		8.15	0.00	41.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	<b>07/24/08</b>	<b>NP</b>		<b>9.90</b>	<b>0.00</b>	<b>39.59</b>	<b>520</b>	<b>2.1</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>0.57</b>	<b>18</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;300</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>4.2</b>		
MW-7	09/01/93		47.08	9.29	0.00	37.79	34,000	4,700	390	1,400	3,300	-	-	-	-	-	-	-	-	-	-	
	10/01/93			10.14	0.00	36.94	25,000	4,400	190	1,200	2,200	-	-	-	-	-	-	-	-	-	-	
	02/01/94			6.10	0.00	40.98	14,000	2,400	90	390	630	-	-	-	-	-	-	-	-	-	-	
	05/01/94			7.90	0.00	39.18	11,000	2,000	40	390	500	-	-	-	-	-	-	-	-	-	-	
	08/01/94			10.01	0.00	37.07	18,000	3,200	30	680	710	-	-	-	-	-	-	-	-	-	-	
	11/23/94			7.59	0.00	39.49	8,100	110	36	110	150	-	-	-	-	-	-	-	-	-	-	
	03/23/95			4.74	0.00	42.34	4,400	880	5.2	61	110	-	-	-	-	-	-	-	-	-	-	
	05/03/95			7.48	0.00	39.60	9,100	1,200	<10	190	220	-	-	-	-	-	-	-	-	-	-	
	09/28/95			8.94	0.00	38.14	5,100	1,200	<10	270	160	-	-	-	-	-	-	-	-	-	-	
	12/23/95			7.89	0.00	39.19	530	140	<1.2	<1.2	22	-	-	-	-	-	-	-	-	-	-	
	03/06/96	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	06/05/96			7.95	0.00	39.13	5,400	1,200	14	220	210	560	-	-	-	-	-	-	-	-	-	
	09/04/96			7.81	0.00	39.27	5,600	730	7.7	100	160	230	-	-	-	-	-	-	-	-	-	
	12/03/96			8.33	0.00	38.75	10,000	1,600	<20	280	340	590	-	-	-	-	-	-	-	-	-	
	03/26/97	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments		
MW-7	05/19/97	NP	47.08	7.93	0.00	39.15	3,500	540	<25	87	81	200	-	-	-	-	-	-	-	-	2.3		
	07/28/97	NP		8.87	0.00	38.21	260	11	<1.0	<1.0	1.7	15	-	-	-	-	-	-	-	-	-	0.1	
	11/14/97	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/03/98			5.48	0.00	41.60	2,500	170	<0.50	10	97	180	-	-	-	-	-	-	-	-	-	0.4	
	06/15/98	NP		7.16	0.00	39.92	3,820	162	<5.0	44	56	244	-	-	-	-	-	-	-	-	-	0.3	
	09/22/98	NP		8.56	0.00	38.52	3,820	242	<5.0	57	67	<50	-	-	-	-	-	-	-	-	-	1.4	
	12/02/98	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/02/99	NP		6.99	0.00	40.09	1,250	36	2.9	1.9	12	69	-	-	-	-	-	-	-	-	-	0.6	
	06/08/99	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	09/02/99	NP		8.55	0.00	38.53	1,880	102	6.3	45	28	93	-	-	-	-	-	-	-	-	-	1.1	
	12/01/99	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	03/15/00			6.31	0.00	40.77	3,180	127	5.8	45	61	219	-	-	-	-	-	-	-	-	-	1.1	
	06/22/00	NP		8.04	0.00	39.04	1,580	26	1.3	1.8	4.4	41	-	-	-	-	-	-	-	-	-	1.2	
	08/16/00	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11/08/00	NP		8.90	0.00	38.18	2,300	59	6.5	6.5	5.4	94	-	-	-	-	-	-	-	-	-	1.0	
	02/05/01	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/13/01	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	08/08/01	NP		9.40	0.00	37.68	2,000	28	<5.0	<5.0	7.8	110	-	-	-	-	-	-	-	-	-	0.7	
	10/04/01	NP		9.55	0.00	37.53	3,200	11	4.5	3.7	5.2	67	-	-	-	-	-	-	-	-	-	0.6	
	01/15/02	NP		8.97	0.00	38.11	480	13	1.8	<1.0	<1.0	26	-	-	-	-	-	-	-	-	-	0.6	
	04/19/02	NP		9.15	0.00	37.93	1,500	43	5.5	7.3	11	48	-	-	-	-	-	-	-	-	-	-	
	07/18/02	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10/30/02	NP		9.96	0.00	37.12	1,800	58	5.4	<5.0	8.7	88	-	-	-	-	-	-	-	-	-	1.2	
	01/22/03	NP		6.64	0.00	40.44	1,800	2.6	5.7	3.6	17	25	<100	<2.5	<2.5	4.6	<200	-	-	-	-	1.3	
	04/17/03	NP		6.52	0.00	40.56	1,200	<2.5	<2.5	5.0	7.2	40	<100	<2.5	<2.5	5.6	<500	-	-	-	-	0.8	
	07/23/03			8.33	0.00	38.75	1,400	<1.0	<1.0	<1.0	2.8	56	<40	<1.0	<1.0	5.8	<200	<1.0	<1.0	-	-	0.7	
	10/29/03	NP	49.46	9.22	0.00	40.24	1,400	1.6	<0.50	1.2	3.0	35	<20	<0.50	<0.50	4.4	<100	-	-	-	-	1.1	
	01/14/04	NP		6.44	0.00	43.02	350	<1.0	<1.0	<1.0	<1.0	18	<40	<1.0	<1.0	1.9	<200	<1.0	<1.0	-	-	2.1	
	04/21/04	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/27/04	NP		8.30	0.00	41.16	860	<1.0	<1.0	<1.0	<1.0	16	<40	<1.0	<1.0	1.8	<200	<1.0	<1.0	-	-	1.2	
	01/12/05	NP		5.05	0.00	44.41	410	<0.50	<0.50	<0.50	<0.50	7.3	<20	<0.50	<0.50	0.84	<100	<0.50	<0.50	-	-	0.7	
	04/13/05	NP		6.22	0.00	43.24	570	<1.0	<1.0	<1.0	<1.0	5.1	<40	<1.0	<1.0	<1.0	<200	<1.0	<1.0	-	-	2.2	
	07/13/05	NP		7.24	0.00	42.22	920	<0.50	<0.50	<0.50	<0.50	6.6	<20	<0.50	<0.50	0.77	<100	<0.50	<0.50	-	-	1.3	
	10/26/05	NSP		7.42	0.00	42.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/25/06	NP		6.32	0.00	43.14	460	<0.50	<0.50	<0.50	<0.50	6.4	<20	<0.50	<0.50	0.93	<300	<0.50	<0.50	-	-	1.3	
	04/12/06	NSP		5.47	0.00	43.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/26/06	NP		7.29	0.00	42.17	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	-	-	4.4	
	11/22/06	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/24/07	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	04/25/07	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Well No.	Date	Notes	TOC Elevation (ft-MSL)	Depth to Water (feet)	Measured SPH Thickness (feet)	Calc. GW Elev. (ft-MSL)	GRO (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	MTBE (µg/L)	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	Ethanol (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	D.O. (mg/L)	Comments	
MW-7	07/18/07	NP	49.46	9.29	0.00	40.17	1,100	2.6	0.60	5.3	1.3	9.1	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	1.2		
	10/18/07	NSP		9.68	0.00	39.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	01/23/08	NP		7.28	0.00	42.18	1,100	<0.50	<0.50	<0.50	1.2	13	<20	<0.50	<0.50	<0.50	<300	<0.50	<0.50	1.4		
	04/21/08	NSP		8.43	0.00	41.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	07/24/08	INA		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Car parked on well
S-4	07/24/08		-	11.24	0.00	-	<50	<2.5	<2.5	<2.5	<2.5	87	<50	<2.5	<2.5	<2.5	<1,500	<2.5	<2.5	1.7	Inadvertently sampled	

**TABLE 2**  
**Historical Groundwater Monitoring and Analytical Data**  
**ARCO Service Station No. 2128**  
**2230 Barrett Ave., Richmond, CA**

Notes:

GRO = Gasoline range organics

B = Benzene

T = Toluene

E = Ethylbenzene

X = Total xylenes

MTBE = Methyl tert-butyl ether

TBA = Tert-butyl alcohol

DIPE = Di-isopropyl ether

ETBE = Ethyl tert-butyl ether

TAME = Tert-amyl methyl ether

1,2-DCA = 1,2 Dichloroethane

EDB = 1,2-Dibromoethane

D.O. = Dissolved Oxygen

SPH = Separate phase hydrocarbons

TOC = Top of casing (surveyed)

Calc. GW Elev. = Calculated groundwater elevation = TOC - Depth to Water + 0.75\*(Measured SPH Thickness); assuming a specific gravity of 0.75 for SPH

ft-MSL = feet above mean sea level

mg/L = Milligrams per liter

µg/L = Micrograms per liter

< = Analyte was not detected above the specified method detection limit (MDL)

- = Not measured or analyzed

Refer to the reports in which data was first presented for more information on historical data.

DUP = Duplicate sample

INA = Well inaccessible; not sampled

N = Identity of contaminant uncertain (hydrocarbon pattern atypical of indicated analyte); see lab report

NP = Not Purged

NSP = Well not sampled this event, in accordance with groundwater sampling schedule

SPH = Well not sampled due to the presence of separate phase hydrocarbons (SPH)

Beginning in the second quarter 2008, the carbon range for GRO was changed from C4-C12 to C6-C12.



**Table 3  
Historical Soil Sample Analytical Results**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

Sample I.D.	Date Sampled	Sample Depth (ft bgs)	TPHg/ GRO (mg/kg)	Oil and Grease (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Xylenes (mg/kg)	MtBE (mg/kg)	Total Lead (mg/kg)	Notes
<b>Soil Borings</b>											
B-1 (BC)	1/27/1988	5.8 - 6.3	<10	--	<0.5	<0.5	<0.5	<0.5	--	--	--
		8.5 - 9	<10	--	<b>1.0</b>	<0.5	<0.5	<0.5	--	--	--
SB-1	4/30/1991	2.5	<1.0	--	<0.005	<b>0.0061</b>	<0.005	<0.005	--	--	--
		9	<b>1.6</b>	--	<b>0.31</b>	<0.005	<b>0.038</b>	<b>0.032</b>	--	--	--
		10.5	<b>120</b>	--	<b>0.90</b>	<b>0.45</b>	<b>1.8</b>	<b>6.1</b>	--	--	--
SB-2	4/30/1991	3.5	<b>3.4</b>	--	<b>0.17</b>	<b>0.064</b>	<b>0.032</b>	<b>0.096</b>	--	--	--
		6.5	<b>230</b>	--	<b>1.2</b>	<b>1.0</b>	<b>2.8</b>	<b>15</b>	--	--	--
		9.5	<b>1,400</b>	--	<b>5.8</b>	<b>22</b>	<b>28</b>	<b>160</b>	--	--	--
B-1	3/11/2002	5.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
		9.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
B-2	3/11/2002	5.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
		9.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
B-3	3/11/2002	3.5	<b>2.2</b>	--	<0.0050	<0.0050	<0.0050	<b>0.018</b>	<0.0050	--	--
		4	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
B-4	3/11/2002	5.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
		9	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
B-5	3/11/2002	5.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
		8.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	--	--
B-6	3/11/2002	8.5	<1.0	--	<0.0050	<0.0050	<0.0050	<b>0.0095</b>	<0.050	--	--
<b>Monitoring Wells</b>											
BC-1	1/27/1988	5.8 - 6.3	<10	--	<0.5	<0.5	<0.5	<0.5	--	--	--
		9 - 9.5	<10	--	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-2	7/22/1992	4	<1.0	--	<0.005	<0.005	<0.005	<0.005	--	--	--
		5.5	<1.0	--	<0.005	<0.005	<0.005	<0.005	--	--	--
		7	<1.0	--	<0.005	<0.005	<0.005	<0.005	--	--	--
MW-3	7/22/1992	4	<1.0	--	<b>0.015</b>	<0.005	<0.005	<b>0.0074</b>	--	--	--
		9	<b>14</b>	--	<b>0.067</b>	<0.005	<b>0.055</b>	<b>0.18</b>	--	--	--
MW-4	7/22/1992	4	<1.0	--	<b>0.050</b>	<0.005	<0.005	<0.005	--	--	--
		9	<b>300</b>	--	<b>1.3</b>	<b>5.2</b>	<b>5.7</b>	<b>33</b>	--	--	--
MW-5	8/11/1993	5 - 5.5	<b>1.1</b>	--	<b>0.27</b>	<b>0.015</b>	<b>0.060</b>	<b>0.088</b>	--	--	--
		9 - 9.5	<b>190</b>	--	<b>2.1</b>	<b>9.5</b>	<b>4.6</b>	<b>26</b>	--	--	--
MW-6	8/11/1993	5 - 5.5	<1.0	--	<b>0.0059</b>	<b>0.0087</b>	<0.0050	<b>0.0086</b>	--	--	--
		9 - 9.5	<b>6.8</b>	--	<b>0.065</b>	<b>0.0080</b>	<b>0.022</b>	<b>0.084</b>	--	--	--
MW-7	8/11/1993	5 - 5.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--
		9 - 9.5	<b>4.0</b>	--	<0.0050	<b>0.0076</b>	<0.0050	<b>0.017</b>	--	--	--
<b>Vapor Extraction Wells</b>											
V-1	4/30/1991	3	<1.0	--	<0.005	<0.005	<0.005	<0.005	--	--	--
		6.5	<1.0	--	<0.005	<0.005	<0.005	<0.005	--	--	--
		9	<1.0	--	<b>0.053</b>	<b>0.032</b>	<b>0.032</b>	<b>0.023</b>	--	--	--
V-2	4/30/1991	2	<1.0	--	<0.005	<b>0.022</b>	<0.005	<b>0.023</b>	--	--	--
		8	<b>16</b>	--	<b>0.061</b>	<b>0.038</b>	<b>0.047</b>	<b>0.19</b>	--	--	--
		11	<b>930</b>	--	<0.5	<b>4.6</b>	<b>11</b>	<b>53</b>	--	--	--

**Table 3**  
**Historical Soil Sample Analytical Results**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

Sample I.D.	Date Sampled	Sample Depth (ft bgs)	TPHg/GRO (mg/kg)	Oil and Grease (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Xylenes (mg/kg)	MtBE (mg/kg)	Total Lead (mg/kg)	Notes
<b>Product Line Trench Samples</b>											
L1	12/31/1992	2	63	--	2.4	7.1	1.7	13	--	--	Removed
L2	12/31/1992	2	1,300	--	11	79	27	210	--	--	Removed
L3	12/31/1992	2	9.9	--	0.71	1.3	0.37	2.3	--	--	Removed
L4	12/31/1992	2	230	--	1.5	8.2	5.0	33	--	--	Removed
L5	12/31/1992	2	4.8	--	0.030	0.0062	0.17	0.10	--	--	--
<b>Product Line/Dispenser Upgrade Samples</b>											
S-1	11/12/2002	2.5	<1.0	--	<0.0050	<0.0050	0.0058	0.018	3.1	8.1	--
S-2	11/12/2002	2.5	67	--	<0.050	1.5	0.67	5.7	7.4	20	--
S-3	11/12/2002	2.5	29	--	<0.020	<0.020	0.15	0.85	0.29	7.1	--
S-4	11/12/2002	2.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.015	<0.035	7.5	--
S-5	11/12/2002	2	850	--	<2.0	18	18	110	<14	45	--
S-6	11/12/2002	2	390	--	1.1	1.4	4.9	32	<3.5	53	--
S-7	11/12/2002	2.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.015	<0.035	39	--
S-8	11/12/2002	2.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.015	<0.035	8.5	--
L-1	11/12/2002	3.5	890	--	<2.0	<2.0	9.2	38	<14	38	--
L-2	11/12/2002	2.5	<1.0	--	<0.0050	<0.0050	<0.0050	<0.015	0.20	9.8	--
LF-1	11/12/2002	3.5	1.6	--	<0.0050	0.0097	<0.0050	0.18	3.2	<10	--
LF-2	11/12/2002	3.5	30	--	<0.040	<0.040	0.26	0.85	0.46	7.8	--
LF-2-6	11/12/2002	6	650	--	<1.0	4.7	14	83	<10	6.6	--
LF-3	11/12/2002	3.5	1,600	--	<2.0	3.6	35	41	<14	37	--
LF-4	11/12/2002	3.5	630	--	0.86	0.77	11	34	4.5	7.5	--
LF-4-6.5	11/12/2002	6.5	1,400	--	2.1	35	30	180	<5.0	8.9	--
<b>UST Removal Samples</b>											
SW1	12/17/1992	9	4,500	--	30	10	98	130	--	--	--
SW2	12/17/1992	9	1,100	--	6.0	50	21	120	--	--	--
SW3	12/17/1992	11	2,800	--	4.8	24	57	300	--	--	--
<b>Waste Oil Tank Removal Samples</b>											
WO-1	9/17/1987	9	270	330	0.5	<0.2	<0.2	--	--	--	--
WO-3	10/1/1987	13.5 - 14	6,800	350	6	6	20	--	--	--	--
<b>Soil Stockpile Samples</b>											
SP-1	9/17/1987	--	1,300	--	--	--	--	--	--	--	--

Explanation:

TPHg/GRO = Total petroleum hydrocarbons as gasoline/ gasoline range organics  
ft/bgs = feet below ground surface  
mg/kg = milligrams per kilogram  
MtBE = Methyl tert-butyl ether

**Table 4**  
**Historical Soil Vapor Sample Analytical Results**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

Sample I.D.	Date Sampled	Sample Depth (ft bgs)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L)	Oxygen (%)	Carbon Dioxide (%)	Notes
B-1	3/11/2002	6	1.88	0.0067 M	0.100	0.022	0.028 M	0.0073	20	0.38	--
		7.5	2.55	0.015 M	0.130	0.030	0.032 M	0.011	20	0.10	--
B-2	3/11/2002	6	2.3	0.0087	0.110	0.021	0.036 M	0.011	20	<0.10	--
		7	1.58	0.013 M	0.098	0.014	0.033 M	0.0073	20	<0.10	--
B-4	3/11/2002	7	1.88	0.0054	0.087	0.022	0.033 M	<0.0037	20	<0.10	--
		9	2.3	0.012 M	0.078	0.015	0.028 M	0.011	20	0.18	--
B-5	3/11/2002	5	1.25	<0.0032	0.062	0.017	0.029 M	<0.0037	15	8.8	--
		5 (Duplicate)	1.35	<0.0032	0.059	0.015	0.028 M	<0.0037	--	--	--
		7	1.01	<0.0032	0.062	0.014	0.024 M	<0.0037	18	5.2	--
B-6	3/11/2002	5.5	1.57	0.0041 M	0.066	0.015	0.026 M	<0.0037	20	<0.10	--
		7.5	1.09	0.0038 M	0.064	0.011	0.02 M	<0.0037	20	<0.10	--

Explanation:

TPHg = Total petroleum hydrocarbons as gasoline

ft/bgs = feet below ground surface

µg/L = micrograms per liter

% = percent

MtBE = Methyl tert-butyl ether

M = reported value may be biased due to apparent matrix interferences

**Table 5**  
**Grab Groundwater Sample Analytical Results**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

<b>Sample I.D.</b>	<b>Date Sampled</b>	<b>Sample Depth (ft bgs)</b>	<b>TPHg (µg/L)</b>	<b>Benzene (µg/L)</b>	<b>Toluene (µg/L)</b>	<b>Ethyl Benzene (µg/L)</b>	<b>Total Xylenes (µg/L)</b>	<b>MtBE (µg/L)</b>	<b>Notes</b>
B-1	3/11/2002	13	<b>370,000</b>	<b>6,000</b>	<b>1,200</b>	<b>6,800</b>	<b>2,300</b>	<b>16,000</b>	--
B-2	3/11/2002	13	<b>12,000</b>	<b>1,100</b>	<50	<b>910</b>	<b>130</b>	<b>1,400</b>	--
B-3	3/11/2002	5.5	<b>990</b>	<b>7.3</b>	<b>2.0</b>	<b>19</b>	<b>4.0</b>	<20	--
B-4	3/11/2002	9.0	<b>5,300</b>	<b>570</b>	<b>19</b>	<b>89</b>	<b>13</b>	<b>500</b>	--
B-5	3/11/2002	11	<b>12,000</b>	<b>840</b>	<50	<b>1,200</b>	<b>550</b>	<b>6,500</b>	--

Explanation:

TPHg = Total petroleum hydrocarbons as gasoline

ft/bgs = feet below ground surface

µg/L = micrograms per liter

MtBE = Methyl tert-butyl ether

**Table 6**  
**Groundwater Flow Direction and Gradient**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

Well No.	Monitoring Date	DTW (ft bgs)	SPH Thickness (feet)	Groundwater Gradient (feet per foot)	Groundwater Flow Direction																
					N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
BC-1	03/01/93	--	--	0.007																1	
	05/01/93	9.95	0.00	0.015																	1
	08/01/93	10.91	0.00	--																	
	10/01/93	12.46	0.00	0.011																	1
	02/01/94	8.92	0.00	0.007																	1
	05/01/94	10.04	0.00	0.012																	1
	08/01/94	12.28	0.00	0.017																	1
	11/23/94	9.61	0.00	0.012																1	
	03/23/95	7.69	0.00	0.003																	1
	05/03/95	9.49	0.00	0.013																	1
	09/28/95	11.31	0.00	0.008																	1
	12/23/95	10.16	0.00	0.016																	1
	03/06/96	8.41	0.00	0.009																	1
	06/05/96	9.71	0.00	0.013																	1
	09/04/96	10.13	0.00	0.011																	1
	12/03/96	10.65	0.00	0.010											1						
	03/26/97	9.82	0.00	0.015											1						
	05/19/97	9.72	0.00	0.017											1						
	07/28/97	11.00	0.00	0.013																	
	11/14/97	10.54	0.00	0.015																	
	04/03/98	8.69	0.00	0.010																	
	06/15/98	9.54	0.00	0.018																	
	09/22/98	10.59	0.00	0.020											1						
	12/02/98	8.97	0.00	0.009											1						
	03/02/99	8.72	0.00	0.010											1						
	06/08/99	9.57	0.00	0.010																	
	09/02/99	10.92	0.00	0.010											1						
	12/01/99	11.42	0.00	0.010																	
	03/15/00	8.21	0.00	0.012																	
	06/22/00	10.02	0.00	0.036																	
	08/16/00	10.55	0.00	0.015											1						
	11/08/00	11.03	0.00	0.009											1						
	02/05/01	10.00	0.00	0.007											1						
	04/13/01	4.55	0.00	0.013											1						
	08/08/01	11.75	0.00	0.010											1						
	10/04/01	11.83	0.00	0.011											1						
	01/15/02	10.04	0.00	0.016																	
	04/18/02	10.07	0.00	0.016																	
	07/18/02	10.55	0.00	0.010																	
	10/30/02	12.50	0.00	0.008																	
	01/22/03	8.47	0.00	0.011																	
	04/17/03	8.92	0.00	0.010																	
	07/23/03	10.43	0.00	0.013																	

**Table 6**  
**Groundwater Flow Direction and Gradient**

ARCO Service Station No. 2128  
2230 Barrett Avenue  
Richmond, California

Well No.	Monitoring Date	DTW (ft bgs)	SPH Thickness (feet)	Groundwater Gradient (feet per foot)	Groundwater Flow Direction																	
					N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
BC-1	10/29/03	11.66	0.00	0.012														1				
	01/14/04	8.55	0.00	0.012														1				
	04/21/04	9.28	0.00	0.013														1				
	07/27/04	10.67	0.00	0.020										1								
	10/27/04	11.21	0.00	0.010											1							
	01/12/05	7.38	0.00	0.006											1							
	04/13/05	8.67	0.00	0.009											1							
	07/13/05	9.61	0.00	0.010											1							
	10/26/05	10.48	0.00	0.010											1							
	01/25/06	8.46	0.00	0.009											1							
	04/12/06	7.62	0.00	0.009										1								
	07/26/06	10.22	0.00	0.008										1								
	11/22/06	10.98	0.00	0.011										1								
	01/24/07	10.33	0.00	0.012										1								
	04/25/07	9.63	0.00	0.014														1				
	07/18/07	11.75	0.00	0.010														1				
	10/18/07	12.38	0.00	0.014																1		
	01/23/08	9.54	0.00	0.013												1						
04/21/08	10.42	0.00	0.015												1							
07/24/08	12.25	0.00	0.015														1					
<b>Average Values</b>		<b>10.02</b>	<b>0.00</b>	<b>0.012</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>22</b>	<b>22</b>	<b>13</b>	<b>1</b>	<b>3</b>	<b>0</b>
<b>Minumum Values</b>		<b>4.55</b>	<b>0.00</b>	<b>0.003</b>																		
<b>Maximum Values</b>		<b>12.50</b>	<b>0.00</b>	<b>0.036</b>																		
<b>Explanation</b>																						
TOC = Top of Casing (elevation in feet above mean sea level)																						
DTW = Depth to water below grade surface as measured from TOC																						
SPH = Separate-phase hydrocarbons																						
<b>Number of Events                      61 Events</b>																						
Source: Historical Groundwater Gradient Maps (Pre 2006) from URS.																						

**Attachment A**  
**Regulatory Correspondence**



# California Regional Water Quality Control Board

## San Francisco Bay Region



Linda S. Adams  
Secretary for  
Environmental Protection

1515 Clay Street, Suite 1400, Oakland, California 94612  
(510) 622-2300 • Fax (510) 622-2460  
<http://www.waterboards.ca.gov/sanfranciscobay>

Arnold Schwarzenegger  
Governor

September 29, 2008  
File No. 07-0019 (BGS)

ARCO Products Company  
Attn.: Mr. Charles Carmel; [carmecp@bp.com](mailto:carmecp@bp.com)  
P.O. Box 1257  
San Ramon, CA 94582

**SUBJECT: Requirement for Corrective Action Plan (CAP) and Public Notification**  
ARCO Service Station No. 2128, 2230 Barrett Avenue  
Richmond, Contra Costa County

Dear Mr. Carmel:

Water Board staff has reviewed the case file, including the June 9, 2008, *Quarterly Groundwater Monitoring Report, Second Quarter 2008*, prepared by SECOR International Incorporated (now Stantec). Petroleum hydrocarbon concentrations in groundwater beneath the site are high (up to 53,000 µg/L of TPHg, 1,600 µg/L of benzene, and 2,300 µg/L of MtBE), and no significant contaminant concentration decrease has occurred over the past six years. The natural attenuation process has not been an effective method for site remediation. ARCO Products Company is hereby required to submit the following:

1. A CAP to cleanup the site pollution.
2. A mailing list for surrounding property owners and resident/occupants within a 200-foot radius of the subject site ("radius list"). The mailing list should also include any other interested parties or groups, including relevant public agencies and environmental/community groups.

**The CAP and the radius list are due in our office by December 24, 2008.**

This requirement for reports is made pursuant to Water Code Section 13267, which allows the Water Board to require technical or monitoring program reports from any person who has discharged, discharges, proposes to discharge, or is suspected of discharging waste that could affect water quality. The attachment provides additional information about Section 13267 requirements. Any extension in the above deadline must be confirmed in writing by Water Board staff.

You are also requested to provide us with a draft notification for the subject site by the same date cited above. The draft notification should contain the following information:

*Preserving, enhancing, and restoring the San Francisco Bay Area's waters for over 50 years*



- adequate information about the release and any site investigation, risk assessment, and cleanup actions taken;
- description of pending technical reports and next steps, and;
- contact information for responsible party/parties and the Water Board file number and where documents can be found.

We will use your draft notification in preparing a final notification, and will seek your assistance in circulating the final notification to the mailing list, including the “radius list” noted above. We will use the mailing list in the future to notify these parties of the availability of any significant reports with respect to the subject site, such as the CAP. Such notifications may be in a “fact sheet” format. We will provide a public comment period for such reports prior to Water Board action. Where appropriate, we will use e-mail and Website postings to notify and inform the public about site cleanup activities. Both a hard copy and an electronic copy of the draft notification should be submitted; the electronic copy should be in an editable form (e.g. MS Word). You may contact Water Board staff to obtain sample notifications.

You are required to submit all documents in electronic format to the State Water Resources Control Board’s GeoTracker database. Guidance for electronic information submittal is available at [http://www.waterboards.ca.gov/cwphome/ust/cleanup/electronic\\_reporting/index.html](http://www.waterboards.ca.gov/cwphome/ust/cleanup/electronic_reporting/index.html). All reports submitted should have the Regional Board file number 07-0019 on the first page of the report. A copy of any submittal should also be sent to the CCCHSD in Martinez.

Please direct all questions and correspondence regarding this matter to Barbara Sieminski at 510-622-2423 or via e-mail at [bsieminski@waterboards.ca.gov](mailto:bsieminski@waterboards.ca.gov).

Sincerely,

Bruce H. Wolfe  
Executive Officer

Enclosure: Fact Sheet – Requirements For Submitting Technical Reports Under Section 13267 of the California Water Code

cc:

Mr. Paul Andrews  
[pandrews@hds.co.contra-costa.ca.us](mailto:pandrews@hds.co.contra-costa.ca.us)  
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Martinez, CA 94553

Mr. Erik Brown  
[ebrown@secor.com](mailto:ebrown@secor.com)  
Stantec  
3017 Kilgore Road, Ste 100  
Rancho Cordova, CA 95670

Mr. Jaff Auchterlonie  
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Linda S. Adams  
Secretary for  
Environmental Protection

# California Regional Water Quality Control Board

## San Francisco Bay Region



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### Fact Sheet – Requirements for Submitting Technical Reports Under Section 13267 of the California Water Code

#### **What does it mean when the Regional Water Board requires a technical report?**

Section 13267<sup>1</sup> of the California Water Code provides that "...the regional board may require that any person who has discharged, discharges, or who is suspected of having discharged or discharging, or who proposes to discharge waste...that could affect the quality of waters...shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires."

#### **This requirement for a technical report seems to mean that I am guilty of something, or at least responsible for cleaning something up.**

##### **What if that is not so?**

The requirement for a technical report is a tool the Regional Water Board uses to investigate water quality issues or problems. The information provided can be used by the Regional Water Board to clarify whether a given party has responsibility.

#### **Are there limits to what the Regional Water Board can ask for?**

Yes. The information required must relate to an actual or suspected or proposed discharge of waste (including discharges of waste where the initial discharge occurred many years ago), and the burden of compliance must bear a reasonable relationship to the need for the report and the benefits obtained. The Regional Water Board is required to explain the reasons for its request.

#### **What if I can provide the information, but not by the date specified?**

A time extension may be given for good cause. Your request should be promptly submitted in writing, giving reasons.

#### **Are there penalties if I don't comply?**

Depending on the situation, the Regional Water Board can impose a fine of up to \$5,000 per day, and a court can impose fines of up to \$25,000 per day as well as criminal penalties. A person who submits false information or fails to comply with a requirement to submit a technical report may be found guilty of a misdemeanor. For some reports, submission of false information may be a felony.

#### **Do I have to use a consultant or attorney to comply?**

There is no legal requirement for this, but as a practical matter, in most cases the specialized nature of the information required makes use of a consultant and/or attorney advisable.

#### **What if I disagree with the 13267 requirements and the Regional Water Board staff will not change the requirement and/or date to comply?**

You may ask that the Regional Water Board reconsider the requirement, and/or submit a petition to the State Water Resources Control Board. See California Water Code sections 13320 and 13321 for details. A request for reconsideration to the Regional Water Board does not affect the 30-day deadline within which to file a petition to the State Water Resources Control Board.

#### **If I have more questions, whom do I ask?**

Requirements for technical reports include the name, telephone number, and email address of the Regional Water Board staff contact.

*Revised January 2008*

<sup>1</sup> All code sections referenced herein can be found by going to [www.leginfo.ca.gov](http://www.leginfo.ca.gov).



# California Regional Water Quality Control Board

## San Francisco Bay Region



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Arnold Schwarzenegger  
Governor

Date: December 23, 2008  
File No. 07-0019 (BGS)

ARCO Products Company  
Attn: Mr. Charles Carmel  
[carmecp@bp.com](mailto:carmecp@bp.com)  
P.O. Box 1257  
San Ramon, CA 94582

SUBJECT: **Approval of Time Extension** - ARCO Service Station No. 2128  
2230 Barrett Avenue, Richmond, Contra Costa County

Dear Mr. Carmel:

This letter approves your December 19, 2008, request for a time extension to comply with our requirement for a technical report. You requested a time extension to January 9, 2009, to submit a corrective action plan (CAP) for the site, citing an additional time needed to complete the CAP because of the holiday closure of your consultant's office.

**The CAP required in our September 29, 2008, letter is due in this office by January 9, 2009.**

This requirement for a report is made pursuant to Water Code Section 13267, which allows the Water Board to require technical or monitoring program reports from any person who has discharged, discharges, proposes to discharge, or is suspected of discharging waste that could affect water quality. The attachment provides additional information about Section 13267 requirements. Any extension in the above deadline must be confirmed in writing by Water Board staff.

You are required to submit all documents in electronic format to the State Water Resources Control Board's GeoTracker database. Guidance for electronic information submittal is available at [http://www.waterboards.ca.gov/cwphome/ust/cleanup/electronic\\_reporting/index.html](http://www.waterboards.ca.gov/cwphome/ust/cleanup/electronic_reporting/index.html). All reports submitted should have the Water Board file number 07-0019 on the first page of the report. A copy of any submittal should also be sent to the CCCHSD in Martinez.

Please direct all questions and correspondence regarding this matter to Barbara Sieminski at 510-622-2423 or via e-mail at [bsieminski@waterboards.ca.gov](mailto:bsieminski@waterboards.ca.gov).

Sincerely,

Bruce H. Wolfe  
Executive Officer

Enclosure: Fact Sheet – Requirements For Submitting Technical Reports Under Section 13267 of the California Water Code

cc:

Mr. Paul Andrews  
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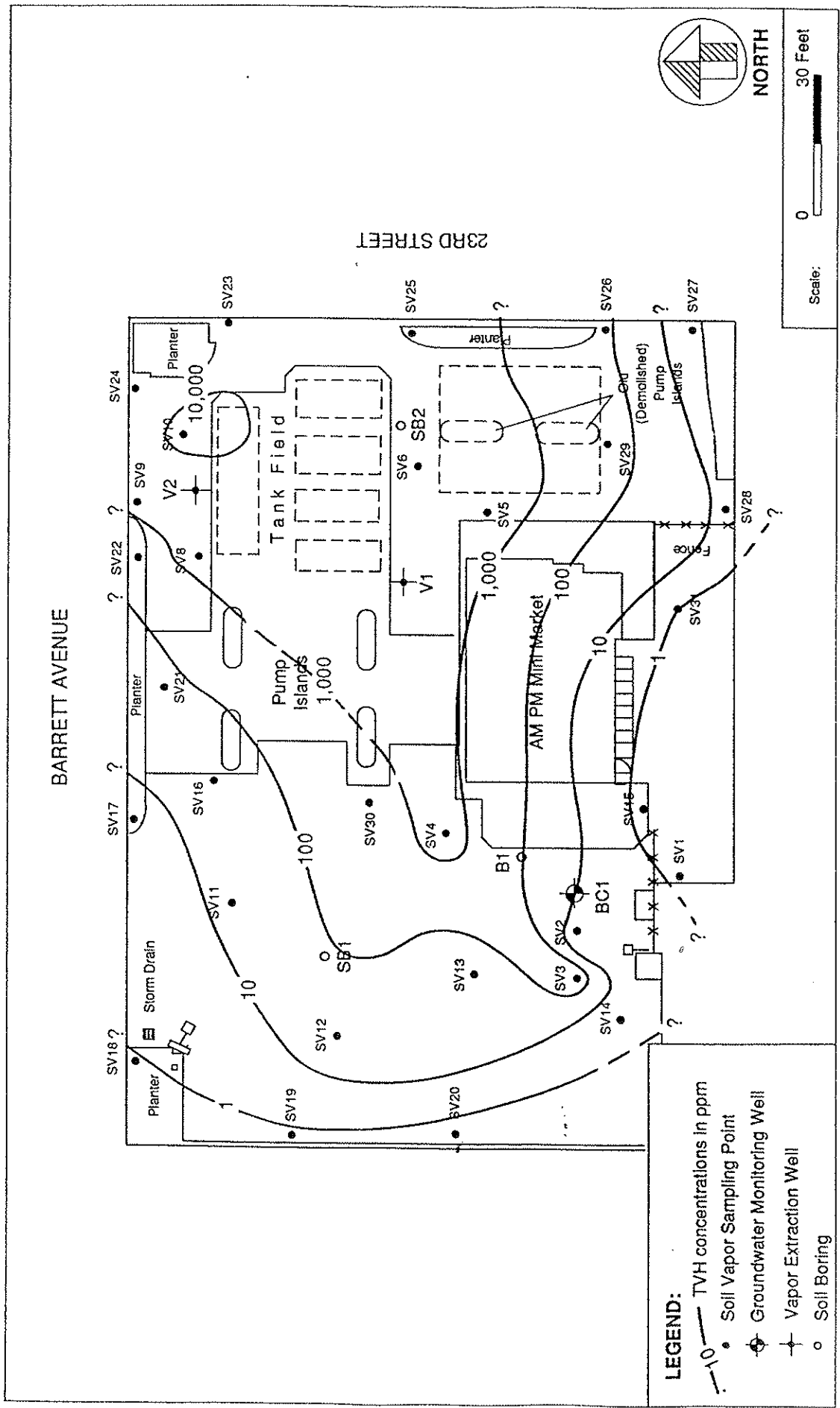
#### **If I have more questions, whom do I ask?**

Requirements for technical reports include the name, telephone number, and email address of the Regional Water Board staff contact.

*Revised January 2008*

<sup>1</sup> All code sections referenced herein can be found by going to [www.leginfo.ca.gov](http://www.leginfo.ca.gov).

**Attachment B**  
**Soil Gas Survey Results**



Drawn	RK	Date	2/11/92
Reviewed	DEO	Date	2/20/92
Rev. 1		Date	
Final	<i>AKW</i>	Date	2/26/92

Figure 7. Isoconcentration contours of total volatile hydrocarbons (TVH) at a depth of 3-7 feet, ARCO Facility No. 2128, Richmond, California, 29-30 May 1991.



ENVIRONMENTAL SERVICES  
Western Division

MDRW/ROUJAN92

TABLE 2 CONCENTRATIONS OF HYDROCARBON CONSTITUENTS IN VAPOR SAMPLES TAKEN FROM SOIL VAPOR SAMPLING POINTS, ARCO FACILITY NO. 2128, RICHMOND, CALIFORNIA, 29-30 MAY 1991

Sample Location	Depth (feet)	Vacuum (in. Hg)	Vacuum Release (min)	Peaks Prior to Benzene (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Total Xylenes (ppm)	Unidentified Peaks After Benzene (ppm)	Total Volatile Hydrocarbons (ppm)
SV1	7	20	0.2	<1	<1	<1	<1	<1	<1	<1
SV2	7	19	0.2	1	<1	2	<1	2	<1	5
SV3	7	16	0	130	--	3	<1	<1	24	160
SV4	7	18	0.1	2,000	--	2	<1	<1	21	2,000
SV5	7	16	0.1	3,900	--	210	<1	<1	900	5,000
SV6	7	20	>9	5,700	--	170	<1	1	1,400	7,300
SV8	3	20	>8	1,800	1	6	<1	<1	42	1,800
SV9	3	8	0	980	--	36	<1	<1	170	1,200
SV10	3	16	0.1	7,700	--	180	2	9	3,100	11,000
SV11	6.5	17	0.2	18	<1	<1	<1	<1	<1	18*
SV12	6.5	15	0.1	83	<1	<1	<1	<1	2	85
SV13	6.5	21	0.1	13	<1	<1	<1	<1	<1	13*
SV14	6.5	14	0	3	<1	<1	<1	<1	<1	3*
SV15	6.5	18	0	<1	<1	<1	<1	<1	<1	<1
SV16	6.5	15	0	16	<1	<1	<1	<1	6	22
SV17	6.5	13	0	370	<1	<1	<1	<1	<1	370**
SV18	6.5	21	0.1	<1	<1	<1	<1	<1	<1	<1
SV19	6.5	16	0.2	<1	<1	<1	<1	<1	<1	<1
SV20	6.5	18	0	<1	<1	<1	<1	<1	<1	<1

-- Indicates not quantifiable. Benzene is probably present but is masked by an unidentified hydrocarbon, calculated as an unidentified peak after benzene.

\* Chromatogram indicates the presence of highly volatile hydrocarbons, but an identifiable fuel pattern is not evident.

\*\* Chromatogram indicates a trace of an identifiable fuel pattern, but highly volatile hydrocarbon peak is disproportionately greater.



TABLE 2 (continued)

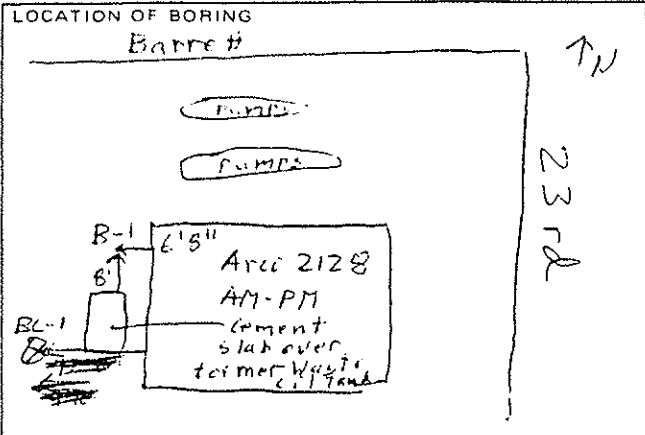
Sample Location	Depth (feet)	Vacuum (in. Hg)	Vacuum Release (min)	Peaks Prior to Benzene (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Total Xylenes (ppm)	Unidentified Peaks After Benzene (ppm)	Total Volatile Hydrocarbons (ppm)
SV21	6.5	16	0.1	<1	<1	<1	<1	<1	<1	<1
SV22	6.5	15	0	340	<1	<1	<1	<1	<1	340**
SV23	6.5	13	0	5,500	56	120	<1	13	1,100	6,800
SV24A	3	13	0	1	<1	<1	<1	<1	<1	1
SV24B	6.5	14	0	4,000	--	140	<1	4	1,100	5,200
SV25	6.5	13	0	5,600	--	77	2	5	1,600	7,300
SV26	6.5	15	0.2	120	9	2	<1	<1	28	160
SV27	6.5	13	0	1	<1	<1	<1	<1	<1	1
SV28	6.5	16	0	7	<1	<1	<1	<1	<1	7
SV29	6.5	16	3.5	300	2	2	<1	<1	27	330
SV30	6.5	16	0.1	130	<1	<1	<1	<1	<1	130**
SV31	6.5	16	0.1	<1	<1	<1	<1	<1	<1	<1

BLANK DATA

Date	Test Time	Peaks Prior to Benzene (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	o-Xylene (ppm)	m,p-Xylene (ppm)	Unidentified Peaks After Benzene (ppm)	Total Volatile Hydrocarbons (ppm)
05/29/91	0749	<1	<1	<1	<1	<1	<1	<1	<1
05/30/91	0831	<1	<1	<1	<1	<1	<1	<1	<1

**Attachment C**  
**Soil Boring Logs**

BROWN AND CALDWELL



CLIENT				BORING NO.	
LOCATION 2230 Barrett, Richmond 3556-04				JOB NO. B-1	
WATER LEVEL	10.5	9.7	9.6	9.6	SHEET 1 OF 1
TIME	11:45	1:30	3:30	4:30	DRILLING
DATE	1-27				START TIME 9:45
CASING DEPTH					FINISH TIME 12:15
DRILLING CONTRACTOR PC Exploration				DATE	DATE
DRILLING METHOD 12" hollow stem Auger				1-27	1-27-88
SAMPLING METHOD 2" CA Modified					

DRILLER Mike Wybear  
RIG Acker  
BY Ken Toney  
CHK'D BY

WELL CONST.		SAMPLER TYPE	INCHES DRIVEN RECOVERED	SAMPLE NO. SAMPLE DEPTH	BLOWS/6" SAMPLER	DEPTH IN FEET	SOIL CALLOUT	N/S	E/W	ELEV.
CASING	ANNULUS							SURFACE CONDITIONS		
						0				
						1	CP: (0-0.2) Asphalt SP: (0.2-1) Gravel; sandy, L-P, L-M, light brown, damp, 60-40% pebbles to 2", damp (Basic soil)			
		CA	15/10		6/8	2	(1-5.3) Clay: silty, [CL] dark brown, soft, pliable, damp - moist, no odor, 5% light brown and gray m.H. line, 5% coarse sand w/ 1/2" gravel, 24 ppm 2-2.5'			
					3	3				
						4				
		CA	16/16	B-1 5.3-5.8	2.5/5	5	Becomes darker, moister, and more plastic with depth			
					4	6	Block wet clay at 5-5.3 feet.			
						7	(5.3-9) Clay: [CH], light brown, mottled with 20% red-brown, 2% fine sand, moist, becomes stiff at 5.5 feet, becomes very stiff ~ 7.5 feet			
		CA	16/18	B-1 5.3-11	14/17	8	(5.8 ppm 5.3-5.8) (70 ppm 8-8.5 feet)			
						9				
						10	(9-12) Sand: [SP] blue-olive green, loose, 10% fines, 5% pebbles to 1/2", wet, strong gas to anaerobic hydrogen odor			
		CA	19/19		8/10	10	(300 ppm 10.5-11 feet)			
						11				
						12				
						13	(12-13.1) Silt: Sandy, [ML], gray green, soft, 30% fine to coarse sand, strong odor			
		CA	18/18		20/19	14	(13.1-14) Sand: Gravelly [SP], gray-blue green, loose, subangular to rounded pebbles to 2", strong odor (925 ppm 13-13.5 feet)			
						15				
						16				
						17				
						18				
						19				
						20				
						21				
						22				
						23				
						24				
						25				
						26				
						27				
						28				
						29				
						30				

back filled w/ cement-bentonite grout 1-27-88  
lowered jar, it had ~1/10" of light brown free product on surface

Western Division



**LOG OF SOIL BORING SB1**

Coordinates:

Elevation top of casing:

Casing below surface:

CLIENT <b>ARCO</b>	SITE NUMBER <b>2128</b>	LOCATION 2230 Barrett, at 23rd St. Richmond, CA
DRILLING AND SAMPLING METHODS 7.5" auger - continuous sampling.		
WATER LEVEL	10.5'	
TIME	9:50	
DATE	4:30	
REFERENCE	Surf.	
DRILLING		
START	FINISH	
TIME 09:30	TIME 10:00	
DATE 4/30/91	DATE 4/30/91	

Inches		Blows/ Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	
Driven	Recover						Asphalt.	
							DESCRIPTION by: L. Gardner <i>LG</i>	
		4		[Cross-hatched pattern]	0	CL	Silty clay: dark brown, ~30% organics.	
		4			1			
		5			2			Clay: gray-green, very plastic, orange mottling, <5% 0.1 cm gravel, subrounded, <10% organics.
		3	3.4		3			
		3			4			
		4			5			
		6			6			
		8			7	CH		Clay: gray-green, very plastic, orange mottling, <5% gravel (0.1-0.5cm), subrounded, <10% organics.
		8			8			
		8			9			
		12		10				
		8		11				
		11	3.4	12				
		16		13				
		4		14				
		5		15				
		9	3.4	16				
		7		17				
		9		18				
		10	68	19				
				20				
							Clay: gray-green, very plastic, orange mottling, ~50% gravel (0.1-1.0cm), subrounded, <10% organics, wet.	
							<u>Well specifications:</u> 4" PVC casing 0.20 slotted screen #3 Lonestar sand	

Western Division



LOG OF SOIL BORING


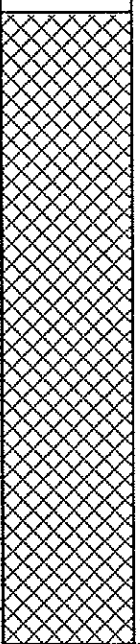
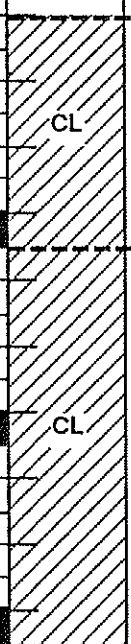
SB2

Coordinates:

Elevation top of casing:

Casing below surface:

CLIENT ARCO	SITE NUMBER 2128	LOCATION 2230 Barrett, at 23rd. St. Richmond, CA
DRILLING AND SAMPLING METHODS 7.5" auger - continuous sampling.		
WATER LEVEL 9.5'		DRILLING START FINISH
TIME 13:50		TIME 13:05 13:55
DATE 4/30/91		DATE 4/30/91 4/30/91
REFERENCE		

Inches		Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	
Driven	Recover						Asphalt.	
							DESCRIPTION by: L. Gardner 	
		7			0		Silty clay: dark brown, ~30% organics; subrounded gravel (0.2-2.5 cm) & localized sand.	
		11			1			
		11			2			
		4			3			
		7			4			
		8	2.7		5			
		4			6			Silty clay: dark green, ~30% organic; subrounded gravel (0.2-2.5cm) and localized sand.
		6			7			
		10	13.9		8			
		3			9			
		6			10			
		7	0		11			
		3			12			
		4			13			
		6	181		14			
		3			15			
		6			16			
		8	0		17			
				18				
				19				
				20				
							<u>Well specifications:</u> 4" PVC casing 0.20 slotted screen #3 Lonestar sand	



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# BORING/WELL LOG

CLIENT NAME	ARCO 2128 Richmond	BORING/WELL NAME	B-1
JOB/SITE NAME	Site Assessment/RBCA	DRILLING STARTED	11-Mar-02
LOCATION	2230 Barrett Avenue, Richmond	DRILLING COMPLETED	11-Mar-02
PROJECT NUMBER	439-1815-005	WELL DEVELOPMENT DATE (YIELD)	NA
DRILLER	Gregg Drilling	GROUND SURFACE ELEVATION	Not Surveyed
DRILLING METHOD	Hydraulic push	TOP OF CASING ELEVATION	NA
BORING DIAMETER	2 inch	SCREENED INTERVAL	15 to 20 ft bgs
LOGGED BY	M. Meyers	DEPTH TO WATER (First Encountered)	13.0 ft (11-Mar-02) ▽
REVIEWED BY	R. Scheele, RG# 6842	DEPTH TO WATER (Static)	NA ▽
REMARKS	Location - 5.5 ft W of the trash bin area, 7.4 ft N of the southern p/b, 43.5 ft E of the western p/b.		

Soil TPHg (mg/kg)	Soil Vapor TPHg (ug/L)	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
							<b>ASPHALT</b>	0.5	
					CL		<b>Sandy CLAY (CL):</b> mottled dark brown; medium stiff; moist; 80% clay, 20% fine to medium sand; low plasticity; low estimated permeability; some asphalt.		
					ML		<b>Sandy SILT (ML):</b> orange-brown; medium stiff; moist; 5% clay, 75% silt, 20% fine to medium sand; moderate estimated permeability.	4.0	
<1.0	1.88	B-1@5.5		5			<b>Sandy Clay (CL):</b> orange-brown; medium stiff; damp; 70% clay, 5% silt, 20% fine to coarse sand, 5% gravel to 10mm; low plasticity; moderate estimated permeability; some caliche.	5.0	
		B-1@6							
	2.55	B-1@7.5							← 3/4" diam., Schedule 40 PVC
<1.0		B-1@9.5			CL		@ 10': no caliche.		
		B-1@13.5						▽ 13.0	
					SC		<b>Gravelly, Clayey SAND (SC):</b> mottled orange brown; medium dense; saturated; 30% clay, 45% fine to very coarse sand, 25% gravel to 30mm; high estimated permeability. @ 15': 20% clay, 65% fine to medium sand, 15% gravel. @ 16': dense.		
									← 3/4"-diam., 0.020" Slotted Schedule 40 PVC
									Bottom of Boring @ 20 ft
							Soil vapor samples were taken at 6 and 7.5 feet below grade (fbg). A vapor probe was inserted a minimum of 6 inches in to native soil and a vapor sample was collected after purging a volume of approximately 2 to 3 lengths of tubing.		
							A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 15 to 20 ft below grade. A grab water sample was collected with a small diameter steel bailer. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.		

WELL LOG (TPHG PMP/PPB) H:\ARCO\2128\GINT\031102.GPJ DEFAULT.GDT 8/13/02



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# BORING/WELL LOG

<b>CLIENT NAME</b>	ARCO 2128 Richmond	<b>BORING/WELL NAME</b>	B-2
<b>JOB/SITE NAME</b>	Site Assessment/RBCA	<b>DRILLING STARTED</b>	11-Mar-02
<b>LOCATION</b>	2230 Barrett Avenue, Richmond	<b>DRILLING COMPLETED</b>	11-Mar-02
<b>PROJECT NUMBER</b>	439-1815-005	<b>WELL DEVELOPMENT DATE (YIELD)</b>	NA
<b>DRILLER</b>	Gregg Drilling	<b>GROUND SURFACE ELEVATION</b>	Not Surveyed
<b>DRILLING METHOD</b>	Hydraulic push	<b>TOP OF CASING ELEVATION</b>	NA
<b>BORING DIAMETER</b>	2 inch	<b>SCREENED INTERVAL</b>	15 to 20 ft bgs
<b>LOGGED BY</b>	M. Meyers	<b>DEPTH TO WATER (First Encountered)</b>	13.0 ft (11-Mar-02)
<b>REVIEWED BY</b>	R. Scheele, RG# 6842	<b>DEPTH TO WATER (Static)</b>	NA
<b>REMARKS</b>	Location - 35.2 ft W of the trash bin area, 5.0 ft N of the southern p/b, 15.0 ft E of the western p/b.		

Soil TPHg (mg/kg)	Soil Vapor TPHg (ug/L)	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
				0.5			<b>ASPHALT</b>	0.5	<p>3/4" diam., Schedule 40 PVC</p> <p>3/4"-diam., 0.020" Slotted Schedule 40 PVC</p> <p>Bottom of Boring @ 20 ft</p>
				5.0	SC		<b>Clayey SAND (SC):</b> mottled light brown-orange; medium dense; moist; 35% clay, 60% fine to coarse sand, 5% gravel to 15mm; moderate estimated permeability.		
<1.0	2.3	B-2@5.5		5			<b>Sandy CLAY (CL):</b> mottled medium brown; medium stiff; moist; 60% clay, 30% fine to very coarse sand, 10% gravel to 20mm; low plasticity; low estimated permeability.		
	1.58	B-2@6		6					
		B-2@7		7					
<1.0		B-2@9.5		10			@ 10': wet.		
		B-2@13		13	CL		@ 13': saturated.		
				15					
				20					
							Soil vapor samples were taken at 6 and 7 feet below grade (fbg). A vapor probe was inserted a minimum of 6 inches in to native soil and a vapor sample was collected after purging a volume of approximately 2 to 3 lengths of tubing.		
							A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 15 to 20 ft below grade. A grab water sample was collected with a small diameter steel bailer. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.		

WELL LOG (TPHG PPM/PPB) H:\ARCO\2128\GINT\031102.GPJ DEFAULT.GDT 8/13/02



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# BORING/WELL LOG

<b>CLIENT NAME</b>	ARCO 2128 Richmond	<b>BORING/WELL NAME</b>	B-3
<b>JOB/SITE NAME</b>	Site Assessment/RBCA	<b>DRILLING STARTED</b>	11-Mar-02
<b>LOCATION</b>	2230 Barrett Avenue, Richmond	<b>DRILLING COMPLETED</b>	11-Mar-02
<b>PROJECT NUMBER</b>	439-1815-005	<b>WELL DEVELOPMENT DATE (YIELD)</b>	NA
<b>DRILLER</b>	Gregg Drilling	<b>GROUND SURFACE ELEVATION</b>	Not Surveyed
<b>DRILLING METHOD</b>	Hydraulic push	<b>TOP OF CASING ELEVATION</b>	NA
<b>BORING DIAMETER</b>	2 inch	<b>SCREENED INTERVAL</b>	8 to 13 ft bgs
<b>LOGGED BY</b>	M. Meyers	<b>DEPTH TO WATER (First Encountered)</b>	5.5 ft (11-Mar-02)
<b>REVIEWED BY</b>	R. Scheele, RG# 6842	<b>DEPTH TO WATER (Static)</b>	NA
<b>REMARKS</b>	Location - 34.5 ft S of the curb, 80.0 ft N of the southern p/b, 15.5 ft E of the western p/b.		

Soil TPHg (mg/kg)	Soil Vapor TPHg (ug/L)	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
2.2 A1.0	-	B-3@3.5 B-3@4.0		0.5	CL		<b>ASPHALT</b> <b>Sandy CLAY (CL):</b> medium brown; stiff; moist; 60% clay, 40% fine to medium sand; low plasticity; low estimated permeability.	0.5	<p>3/4" diam., Schedule 40 PVC</p> <p>3/4"-diam., 0.020" Slotted Schedule 40 PVC</p> <p>Bottom of Boring @ 13 ft</p>
		B-3@5.5		3.5			<b>Gravelly SAND (SW):</b> dark brown; medium dense; moist; 70% medium to very coarse sand, 30% gravel to 15mm; high estimated permeability.	3.5	
				5.0			<b>Sandy CLAY (CL):</b> dark brown; stiff; saturated; 65% clay, 30% medium to coarse sand, 5% gravel to 5mm; low plasticity; low estimated permeability. @7': medium brown.	5.0	
				10	CL		@ 10': olive gray.	13.0	
							Soil vapor samples were not taken due to shallow groundwater conditions.		
							A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 8 to 13 ft below grade. A grab water sample was collected with a small diameter steel bailer. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.		

WELL LOG (TPHG PPM/PPB) H:\ARCO\2128\GINT\031102.GPJ DEFAULT.GDT 8/13/02





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# BORING/WELL LOG

CLIENT NAME	ARCO 2128 Richmond	BORING/WELL NAME	B-4
JOB/SITE NAME	Site Assessment/RBCA	DRILLING STARTED	11-Mar-02
LOCATION	2230 Barrett Avenue, Richmond	DRILLING COMPLETED	11-Mar-02
PROJECT NUMBER	439-1815-005	WELL DEVELOPMENT DATE (YIELD)	NA
DRILLER	Gregg Drilling	GROUND SURFACE ELEVATION	Not Surveyed
DRILLING METHOD	Hydraulic push	TOP OF CASING ELEVATION	NA
BORING DIAMETER	2 inch	SCREENED INTERVAL	8 to 13 ft bgs
LOGGED BY	M. Meyers	DEPTH TO WATER (First Encountered)	9.0 ft (11-Mar-02)
REVIEWED BY	R. Scheele, RG# 6842	DEPTH TO WATER (Static)	NA
REMARKS	Location - 75.3 ft S of the curb, 38.5 ft N of the southern p/b, 12.5 ft E of the western p/b.		

Soil TPHg (mg/kg)	Soil Vapor TPHg (ug/L)	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
<1.0		B-4@5.5		5			<b>ASPHALT</b> <b>Sandy CLAY (CL):</b> mottled dark brown; medium stiff; moist; 80% clay, 20% medium to coarse sand; medium plasticity; low estimated permeability.  @ 4': orange brown; medium stiff; damp; 55% clay, 40% medium to coarse sand, 5% gravel to 5mm; low plasticity; medium estimated permeability.	0.5	 3/4" diam., Schedule 40 PVC  3/4"-diam., 0.020" Slotted Schedule 40 PVC  Bottom of Boring @ 13 ft
<1.0	1.88	B-4@7			CL		@ 7': increased gravel content; stiff.  @ 9': saturated.  @ 11': olive gray.	9.0	
	2.3	B-4@9.0 B-4@9 B-4@9.5		10			Soil vapor samples were taken at 7 and 9 feet below grade (fbg). A vapor probe was inserted a minimum of 6 inches in to native soil and a vapor sample was collected after purging a volume of approximately 2 to 3 lengths of tubing.  A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 8 to 13 ft below grade. A grab water sample was collected with a small diameter steel bailer. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.	13.0	

WELL LOG (TPHG PPM/PPB) H:\ARCO\2128\GINT\031102.GPJ\_DEFAULT.GDT 8/13/02



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# BORING/WELL LOG

<b>CLIENT NAME</b>	ARCO 2128 Richmond	<b>BORING/WELL NAME</b>	B-5
<b>JOB/SITE NAME</b>	Site Assessment/RBCA	<b>DRILLING STARTED</b>	11-Mar-02
<b>LOCATION</b>	2230 Barrett Avenue, Richmond	<b>DRILLING COMPLETED</b>	11-Mar-02
<b>PROJECT NUMBER</b>	439-1815-005	<b>WELL DEVELOPMENT DATE (YIELD)</b>	NA
<b>DRILLER</b>	Gregg Drilling	<b>GROUND SURFACE ELEVATION</b>	Not Surveyed
<b>DRILLING METHOD</b>	Hydraulic push	<b>TOP OF CASING ELEVATION</b>	NA
<b>BORING DIAMETER</b>	2 inch	<b>SCREENED INTERVAL</b>	12 to 17 ft bgs
<b>LOGGED BY</b>	M. Meyers	<b>DEPTH TO WATER (First Encountered)</b>	11.0 ft (11-Mar-02)
<b>REVIEWED BY</b>	R. Scheele, RG# 6842	<b>DEPTH TO WATER (Static)</b>	NA
<b>REMARKS</b>	Location - 5.5 ft E of the trash bin area, 19.2 ft N of the southern property boundary, 14.5 ft W of the station building.		

Soil TPHg (mg/kg)	Soil Vapor TPHg (ug/L)	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM
							<b>ASPHALT</b>	0.5	
<1.0	1.25	B-5@5 B-5@5.5		5			<b>Sandy CLAY (CL):</b> mottled orange-brown; stiff; moist; 60% clay, 37% fine to medium sand, 3% gravel to 10mm; low plasticity; low estimated permeability.		
<1.0	1.01	B-5@7 B-5@8.5 B-5@9.0					@ 9': wet.  @ 11': saturated.		3/4" diam., Schedule 40 PVC
					SC		<b>Clayey SAND (SC):</b> mottled gray; dense; saturated; 20% clay, 80% medium to coarse sand; high estimated permeability; strong gasoline odor.	13.0	
					CL		<b>Sandy CLAY (CL):</b> light brown; stiff; saturated; 85% clay, 15% fine to medium grained sand; medium plasticity; low estimated permeability.	16.0 17.0	3/4"-diam., 0.020" Slotted Schedule 40 PVC Bottom of Boring @ 17 ft
<p>Soil vapor samples were taken at 5 and 7 feet below grade (fbg). A vapor probe was inserted a minimum of 6 inches in to native soil and a vapor sample was collected after purging a volume of approximately 2 to 3 lengths of tubing.</p> <p>A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 12 to 17 ft below grade. A grab water sample was collected with a small diameter steel baller. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.</p>									

WELL LOG (TPHG, PPM/PPB) H:\ARCO2128\GINT\031102.GPJ DEFAULT.GDT 8/13/02



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# BORING/WELL LOG

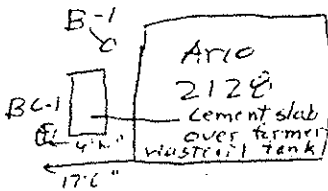
<b>CLIENT NAME</b>	ARCO 2128 Richmond	<b>BORING/WELL NAME</b>	B-6
<b>JOB/SITE NAME</b>	Site Assessment/RBCA	<b>DRILLING STARTED</b>	11-Mar-02
<b>LOCATION</b>	2230 Barrett Avenue, Richmond	<b>DRILLING COMPLETED</b>	11-Mar-02
<b>PROJECT NUMBER</b>	439-1815-005	<b>WELL DEVELOPMENT DATE (YIELD)</b>	NA
<b>DRILLER</b>	Gregg Drilling	<b>GROUND SURFACE ELEVATION</b>	Not Surveyed
<b>DRILLING METHOD</b>	Hydraulic push	<b>TOP OF CASING ELEVATION</b>	NA
<b>BORING DIAMETER</b>	2 inch	<b>SCREENED INTERVAL</b>	16 to 21 ft bgs
<b>LOGGED BY</b>	M. Meyers	<b>DEPTH TO WATER (First Encountered)</b>	10.0 ft (11-Mar-02)
<b>REVIEWED BY</b>	R. Scheele, RG# 6842	<b>DEPTH TO WATER (Static)</b>	NA
<b>REMARKS</b>	Location - 42 ft W of the curb, 7.7 ft N of the southern p/b, 9.8 ft E of the fenced in area.		

MTBE (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft bgs)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH (ft bgs)	WELL DIAGRAM	
				0.5			<b>ASPHALT</b>	0.5		
		B-6@5.5		5	SC		<b>Clayey SAND (SC):</b> mottled orange brown; medium dense; moist; 38% clay, 60% very fine to coarse sand, 2% gravel to 3mm; medium estimated permeability.  @ 6': dense.			
		B-6@7.5 B-6@8.5 B-6@9.0		10	CL		<b>Sandy CLAY (CL):</b> mottled orange-brown; stiff; wet; 60% clay, 35% fine to coarse sand, 5% gravel to 10mm; low plasticity; low estimated permeability.	10.0	3/4" diam., Schedule 40 PVC	
		B-6@12.5 B-6@13.0		15	SC		<b>Clayey SAND (SC):</b> orange-brown; dense; wet; 15% clay, 85% fine to medium sand; medium estimated permeability; strong gasoline odor.	15.0		
		B-6@16.5 B-6@17		20	CL		<b>Silty CLAY (CL):</b> orange-brown; very stiff; saturated; 60% clay, 40% silt; low plasticity; low estimated permeability.	20.0		
				21.0				21.0	3/4"-diam., 0.020" Slotted Schedule 40 PVC  Bottom of Boring @ 21 ft	
							Soil vapor samples were taken at 5.5 and 7.5 feet below grade (fbg). A vapor probe was inserted a minimum of 6 inches in to native soil and a vapor sample was collected after purging a volume of approximately 2 to 3 lengths of tubing.			
							A 3/4 inch diameter PVC casing was inserted to bottom of boring with a 5 ft section of screen from 16 to 21 ft below grade. A grab water sample was not collected due to insufficient water. Following sampling, the PVC casing was removed and the boring was sealed to the surface with bentonite-cement grout.			

WELL LOG (MTBE) H:\ARCO\2128\GINT\031102.GPJ DEFAULT.GDT 8/16/02

BROWN AND CALDWELL

LOCATION OF BORING Burgett		CLIENT		BORING NO. BC-1	
LOCATION 23rd Burgett		JOB NO. 3001-04		SHEET 1 OF 1	
WATER LEVEL	9.6 ft. h. 1200			DRILLING START FINISH 12:45 2:45	
TIME	5:30			DATE DATE 1-27 1-27-88	
DATE	1-27			DRILLING CONTRACTOR PC Exploration	
CASING DEPTH	15'			DRILLING METHOD 12-inch hollow-stem Auger	
				SAMPLING METHOD 2" California Modified Sampler	



DRILLER Mike Wyburn

CHD BY Ken Toney

WELL CONST.	CASING	ANNULUS	SAMPLER TYPE	INCHES DRIVEN	INCHES RECOVERED	SAMPLE NO. DEPTH	BLOWS/S' SAMPLER	DEPTH IN FEET	SOIL CALLOUT	N/S			E/W			ELEV.			
										SURFACE CONDITIONS									
Asphalt, somewhat overcast											Water level, Point of measurement 1/2' side of cross-trench, ~ 3" from ground surface								
MATERIALS ENCOUNTERED AND DRILLING CONDITIONS																			
								0	GM	(0-0.3) Asphalt									
								1		(0.3-0.8) Gravel: Silty [GM] 50% peb ≥ 1/2" [Fall]									
								2		(0.8-2.5) Clay: [CL], Light to dark brown, soft, some red-brown mottling, 5% pebbles to 1/2" moist, (60 ppm 2.5-2.8)									
			CA	15	15		4.5	3	CL	9" shown in lab sample									
								5		(5.1-7.5) Clay: [CL] sandy, brown, soft, crumbly 10% fine sand, rare pebbles to 1/2", low-med plasticity, earthy odor (5.3-5.5 90 ppm)									
			CA	16	15	BC-1 5.1-5.3	5	6	CL	at 6.3 feet, 20% fine to coarse sand, 5% pebbles to 1/2", some black angular pebbles									
								9	ML-SM?	(7.5-13) Silt: Sandy [ML-SM], blue green, crumbly, 50% fines, 40% fine to coarse sand, 10% pebbles to 3/4", anaerobic biodegradation odor, (9.5-10 90 ppm)									
			CA	18	12	BC-1 9.1-9.3	5	6											
								13-15	G	(13-15) Gravel indicated by drill rig operation									
								15-15.7	CL	(15-15.7) Clay: [CL], light brown, some blue and red brown mottling, stiff, strong odor									
			CA	18	15		10	14	CL	(15.7-16.5) Clay: Sandy [CL], dark blue-gray, stiff, 15% fine sand, some live green, some									
								16.4-16.5	CL	at 16.4-16.5 sandy silt interenz, dark blue-gray stiff clay to 19' indicated by drill rig operation									
								17-20.5		(17-20.5) Clay: [CL], brown, very stiff, some Mn-oxide? mottling, 5% fine sand									
			CA	18	16		10	10		at 19.0-19.5 blue green 2" open stringer, slightly odorous									

made by End CAP

clay cuttings + 1 bag sand

Rate



EA ENGINEERING,  
SCIENCE, AND  
TECHNOLOGY

CLIENT ARCO	SITE NUMBER 2128	LOCATION 2230 Barrett, at 23rd. St. Richmond, CA
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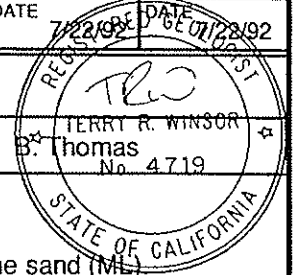
**LOG OF SOIL BORING MW2**

Coordinates:

Elevation top of casing:

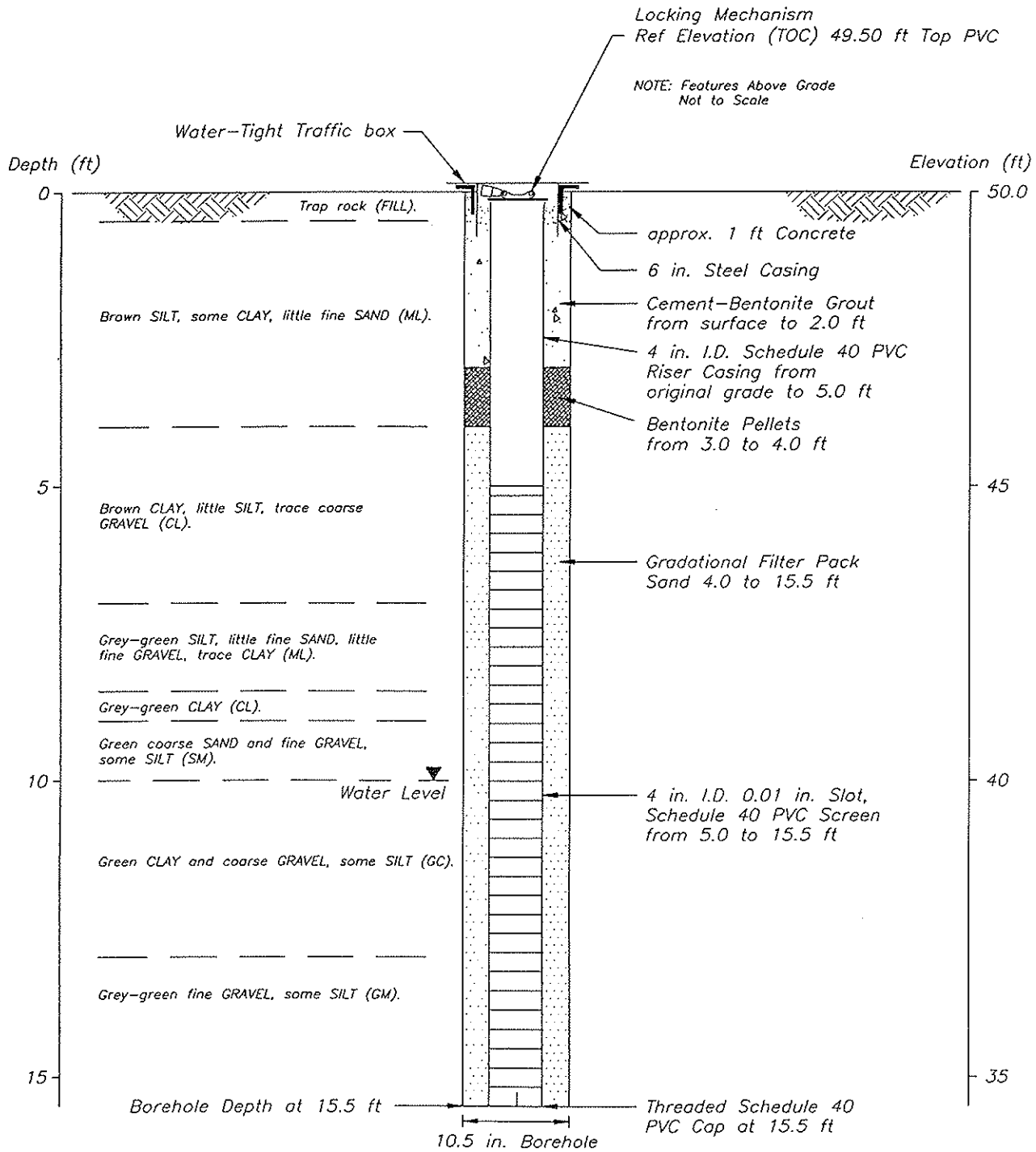
Casing below surface:

DRILLING AND SAMPLING METHODS Hollow Stem Auger with Split Spoon Sampler			
WATER LEVEL			
TIME		DRILLING START	FINISH
DATE		TIME	TIME
REFERENCE		DATE	DATE



Inches				WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS Paved asphalt	DESCRIPTION by: TERRY R. WINSOR B. Thomas No. 4719
Driven	Recover	Blows/ft Sampler	OVA Reading					
					0		Asphalt and traprock.	
					1		Brown silt, some clay, little fine sand (ML)	
					2			
					3			
	1.1	3	4.8		4		Brown clay, little sand, some roots, mottled grey, tight (CL).	
		4			5			
	1.5	5	18.0		6		Grey-brown clay, little silt, trace coarse gravel (CL).	
		5			7			
		7			8		Grey-green silt, little fine sand, little fine gravel, trace clay, HC odor (ML).	
	1.2	3	310		9			
		4			10		Green coarse sand and fine gravel, some silt, poorly sorted, wet (SM).	
		5	>1,000		11		Green clay and coarse gravel, some silt, little fine sand, poorly sorted, gravel is angular (GC).	
	1.5	7			12		Brown clay and coarse gravel, little silt, tight, moist, angular gravel (GC).	
		7			13			
		13			14		Grey-green fine gravel, some silt, poorly sorted (GM).	
		6			15			
	1.1	3			16			
		5			17			
	1.0	9			18			
		3			19			
		6			20			
		9						
	0.5	3						
		4						
		4						

WELL NO: MW2  
WELL COMPLETION DIAGRAM





CLIENT ARCO	SITE NUMBER 2128	LOCATION 2230 Barrett, at 23rd. St. Richmond, CA
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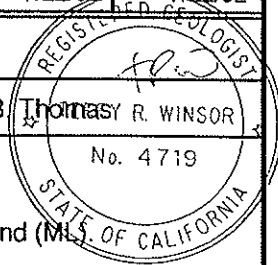
**LOG OF SOIL BORING MW3**

Coordinates:

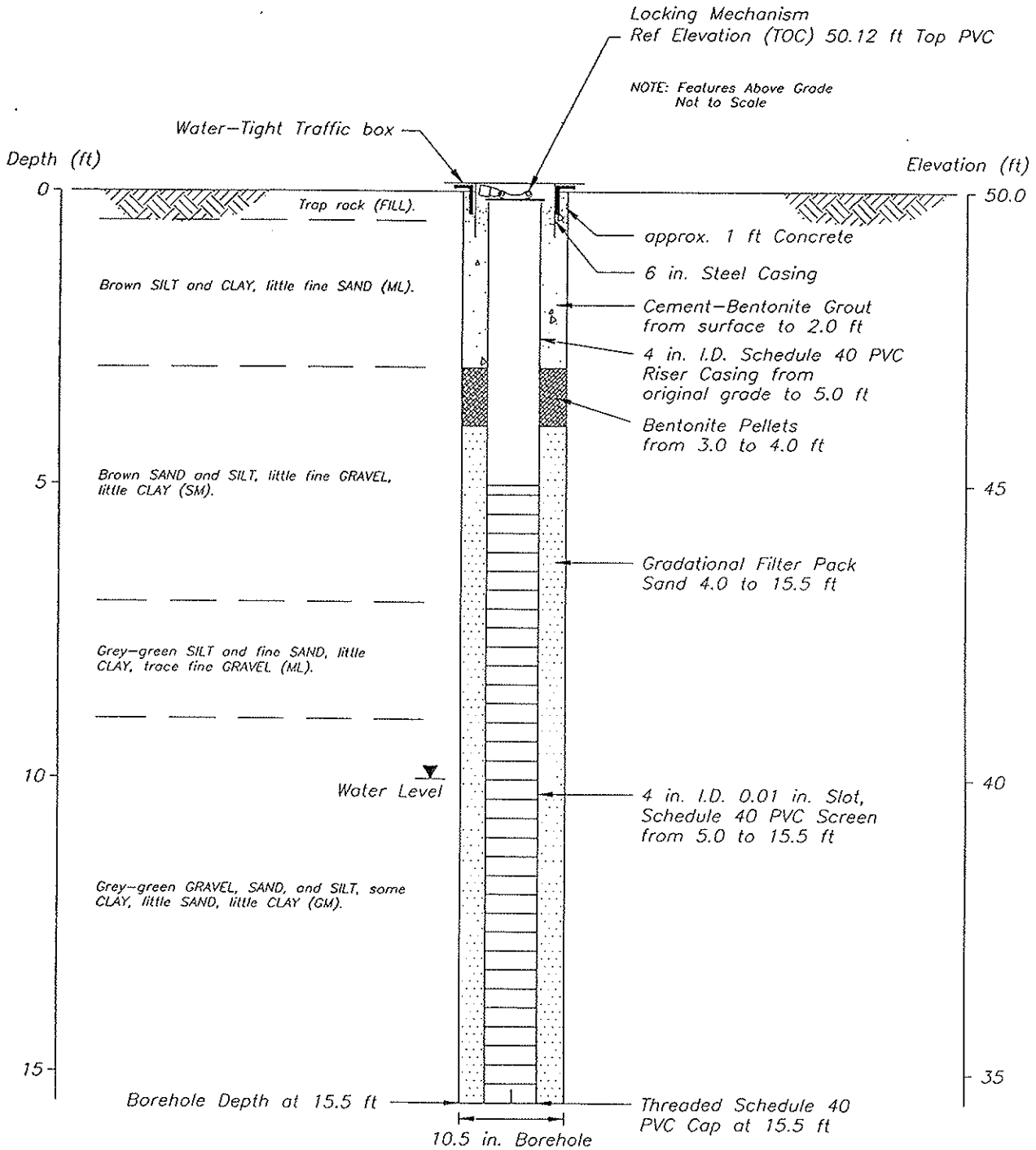
Elevation top of casing:  
Casing below surface:

DRILLING AND SAMPLING METHODS Hollow Stem Auger with Split Spoon Sampler	
WATER LEVEL	DRILLING
TIME	START FINISH
DATE	TIME DATE
REFERENCE	DATE 7/22/92 DATE 7/22/92

Inches		Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS
Driven	Recover						Paved asphalt
					0		DESCRIPTION by: B. Thomas R. WINSOR No. 4719
					1	ML	Brown silt and clay, little fine sand (ML).
					2		
					3		
	1.0	4 5 7	66		4	SM	Brown fine sand and silt. Green coarse sand, some silt, little fine gravel, little clay, tight, poorly sorted (SM).
					5		
					6		
					7		
					8	ML	Cuttings: grey-green silt and fine sand, little clay, trace fine gravel, poorly sorted (ML).
					9		
	1.3	4 7 4	410		10		Green medium sand and coarse gravel, some silt, little clay, poorly-sorted, wet @ 10 ft. (GM).
					11		
					12	GM	
					13		
	1.2	4 7 10			14		Grey-green coarse gravel and silt, some clay, little fine sand, poorly sorted, angular gravel (GM).
					15		
					16		
					17		
					18		
					19		
					20		



WELL NO: MW3  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO  
Site: Facility No. 2128  
Location: RICHMOND, CA





EA ENGINEERING,  
SCIENCE, AND  
TECHNOLOGY

CLIENT ARCO	SITE NUMBER 2128	LOCATION 2230 Barrett, at 23rd. St. Richmond, CA
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**LOG OF SOIL BORING MW4**

Coordinates:

Elevation top of casing:

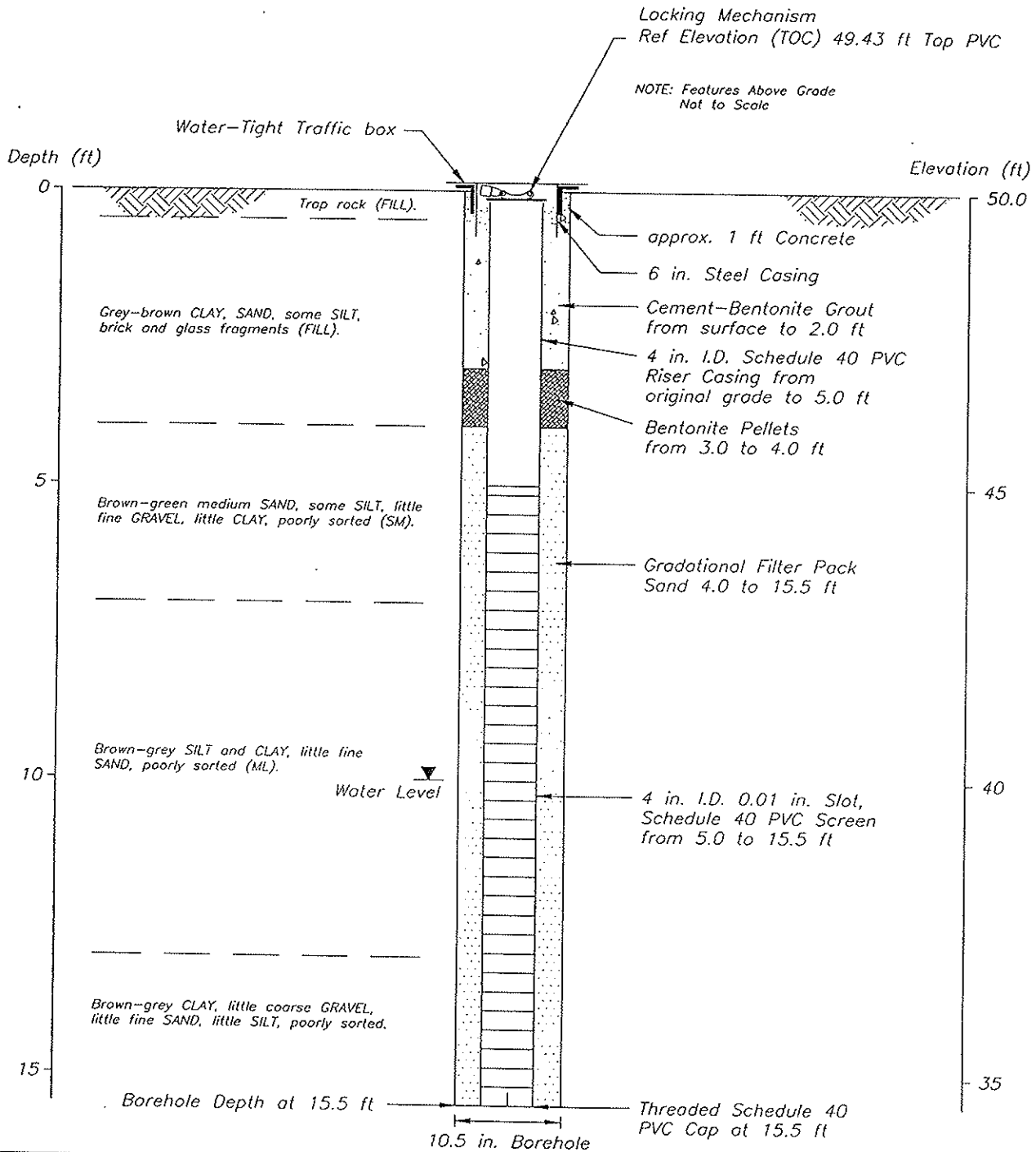
Casing below surface:

DRILLING AND SAMPLING METHODS  
Hollow Stem Auger with Split Spoon Sampler

WATER LEVEL				DRILLING	
TIME				START	FINISH
DATE				TIME	TIME
REFERENCE				DATE	DATE
				7/22/92	7/22/92

Inches		Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	DESCRIPTION by:
Driven	Recover						Paved asphalt	
					0		Traprock.	
					1	Fill	Grey-brown clay, some fine sand, some brick fragments, glass (fill).	
					2		Brown sand, some silt, little clay (fill).	
					3			
	1.2	8	8		4		Brown-green medium sand, some silt, little fine gravel, little clay, poorly-sorted (SM).	
		9			5	SM		
		10			6		Cuttings: grey-green silt and clay, little fine sand, little coarse gravel (ML).	
					7			
	1.2	7	>1,000		9	ML	Brown-grey silt and clay, little fine sand, tight, poorly-sorted (ML).	
		9			10			
		10			11			
					12			
					13			
		5			14	CL	Brown-grey clay, little coarse gravel, little silt, poorly-sorted (CL).	
	1.5	6			15			
		13			16			
					17			
					18			
					19			
					20			

WELL NO: MW4  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO  
Site: Facility No. 2128  
Location: RICHMOND, CA



CLIENT ARCO	FACILITY NO. 2128	LOCATION 2230 Barrett Avenue, Richmond, CA
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# LOG OF SOIL BORING MW5

Coordinates:

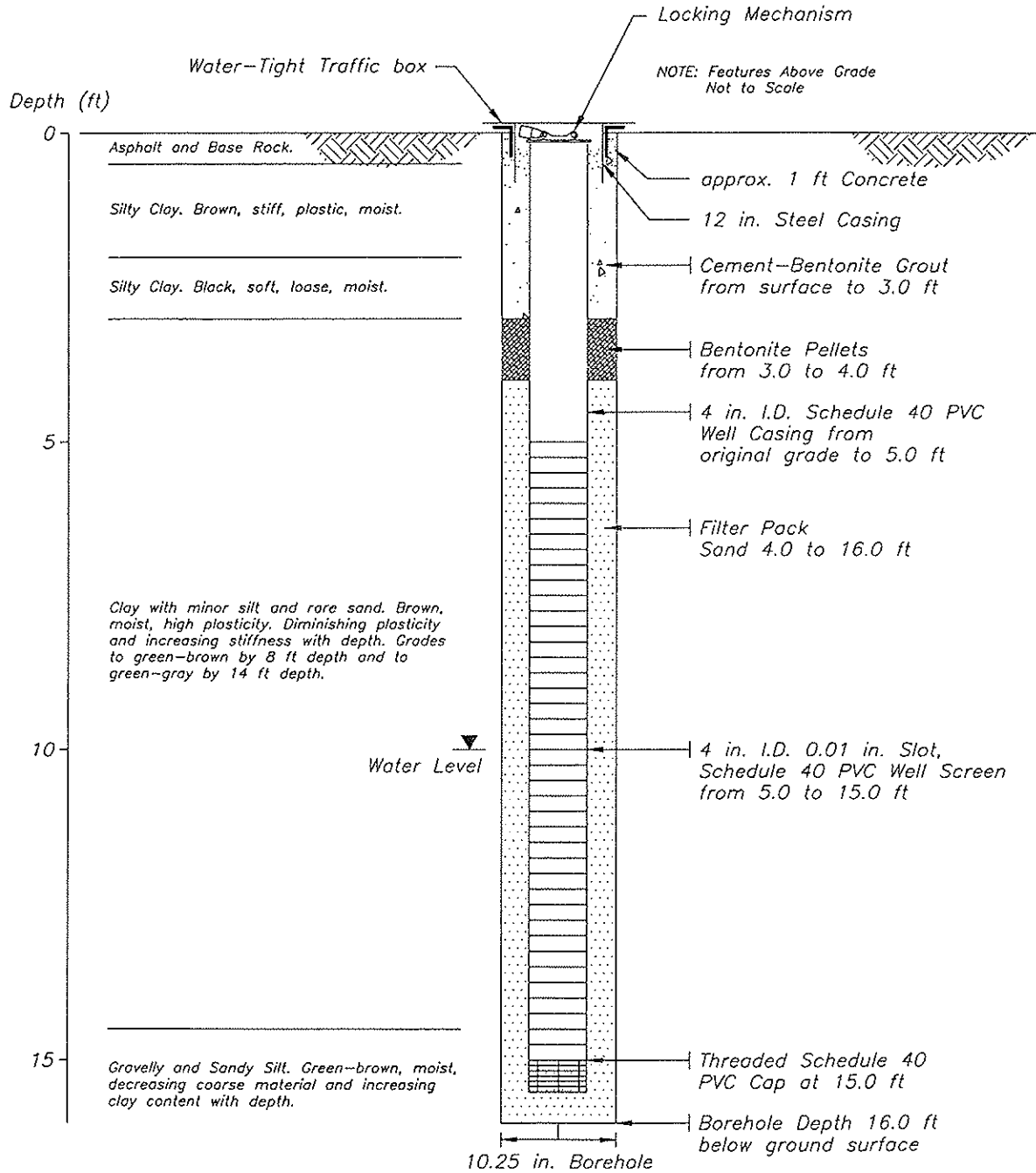
Elevation top of casing:

Casing below surface:

DRILLING and SAMPLING METHODS		8" Hollow Stem Auger, 10.25" Hollow Stem Auger Overdrill, 2" Split Spoon Sampler.		
WATER LEVEL	10.6	9.59	10.05	DRILLING
TIME	1620	1715	1715	START FINISH
DATE	8/11/93	8/11/93	8/11/93	TIME 1525 TIME 1700
REFERENCE	Surface	TOC	Surface	DATE 8/11/93 DATE 8/11/93

Inches				WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	
Driven	Recover	Blows/6" Sampler	OVA Reading				Asphalt; dry.	
							DESCRIPTION by: J. Dowdakin	
					0		Asphalt.	
					1	CH	Silty clay. Brown, stiff, plastic, moist, no odor.	
					2	OL	Grades to dark gray/black, soft, loose. HC odor at 1.5-2 ft. depth.	
					3			
18	18	14 16	280		4	CH	Grades to clay with minor silt and rare sand. Brown, moist, high plasticity, slight HC odor.	
		21			5			
					6			
					7			
18	18	17 21	>1000		8	CH	Silty clay. Green-brown, stiff, semi-plastic, moist, HC odor. Increasing moisture with depth.	
		26			9			
					10			
					11			
					12			
					13			
18	18	12 17	560 >1000		14	CH	Silty clay. Greenish-gray, very moist, moderate plasticity, semi-stiff, slight odor.	
		23			15	ML	Gravelly and sandy silt. Green-brown, moist, HC odor.	
					16		Gravel and sand decrease and clay increases with depth.	
					17			
					18			
					19			
					20			

WELL NO: MW5  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company  
Site: Facility No. 2128  
Location: RICHMOND, CA



CLIENT ARCO	FACILITY NO. 2128	LOCATION 2230 Barrett Avenue, Richmond, CA
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# LOG OF SOIL BORING MW6

Coordinates:

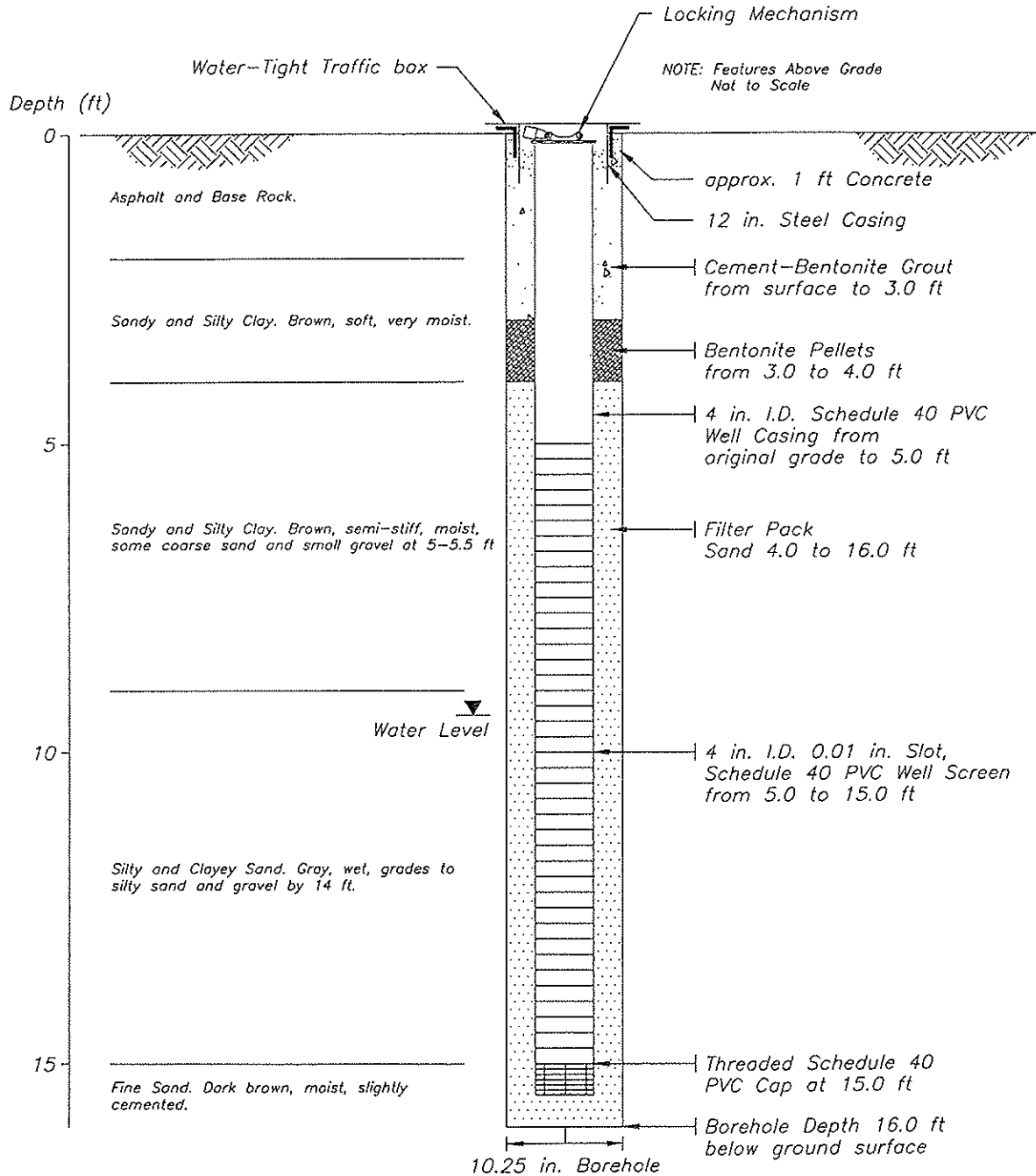
Elevation top of casing:

Casing below surface:

DRILLING and SAMPLING METHODS		8" Hollow Stem Auger, 10.25" Hollow Stem Auger Overdrill, 2" Split Spoon Sampler.	
WATER LEVEL	9.4	8.81	
TIME	1418	1418	
DATE	8/11/93	8/11/93	
REFERENCE	Surface	TOC	
		DRILLING	
		START	FINISH
		TIME 1300	TIME 1410
		DATE 8/11/93	DATE 8/11/93

Inches Driven	Inches Recover	Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	DESCRIPTION by:
							Asphalt; dry.	J. Dowdakin
					0		Asphalt.	
					1		Base rock and sand. Dry.	
					2		Sandy and silty clay, brown, soft, very moist, no odor.	
					3	CL		
18	16	15 18 23	<1		4	CH	Sandy and silty clay. Brown, semi-stiff, moist, no odor. Increasing coarse material with depth. Some coarse sand and small gravel to 1cm. at 5-5.5'.	
					5			
					6			
					7			
18	15	12 17 21	1 120		8	CH	Sandy and silty clay. Brown, very moist, slight odor. Occasional gravel to 0.5cm.	
					9			
					10		Silty and clayey sand. Gray, wet to saturated, HC odor.	
					11			
					12			
					13			
18	18	23 27 21	1		14	SM	Silty sand and gravel (gravel 10% to 1cm). Brown-gray, saturated, no odor.	
					15	SP	Fine sand. Dark brown/black, moist, slightly cemented, no odor.	
					16			
					17			
					18			
					19			
					20			

WELL NO: MW6  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company

Site: Facility No. 2128

Location: RICHMOND, CA



CLIENT ARCO	FACILITY NO. 2128	LOCATION 2230 Barrett Avenue, Richmond, CA
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**LOG OF SOIL BORING MW7**

Coordinates:

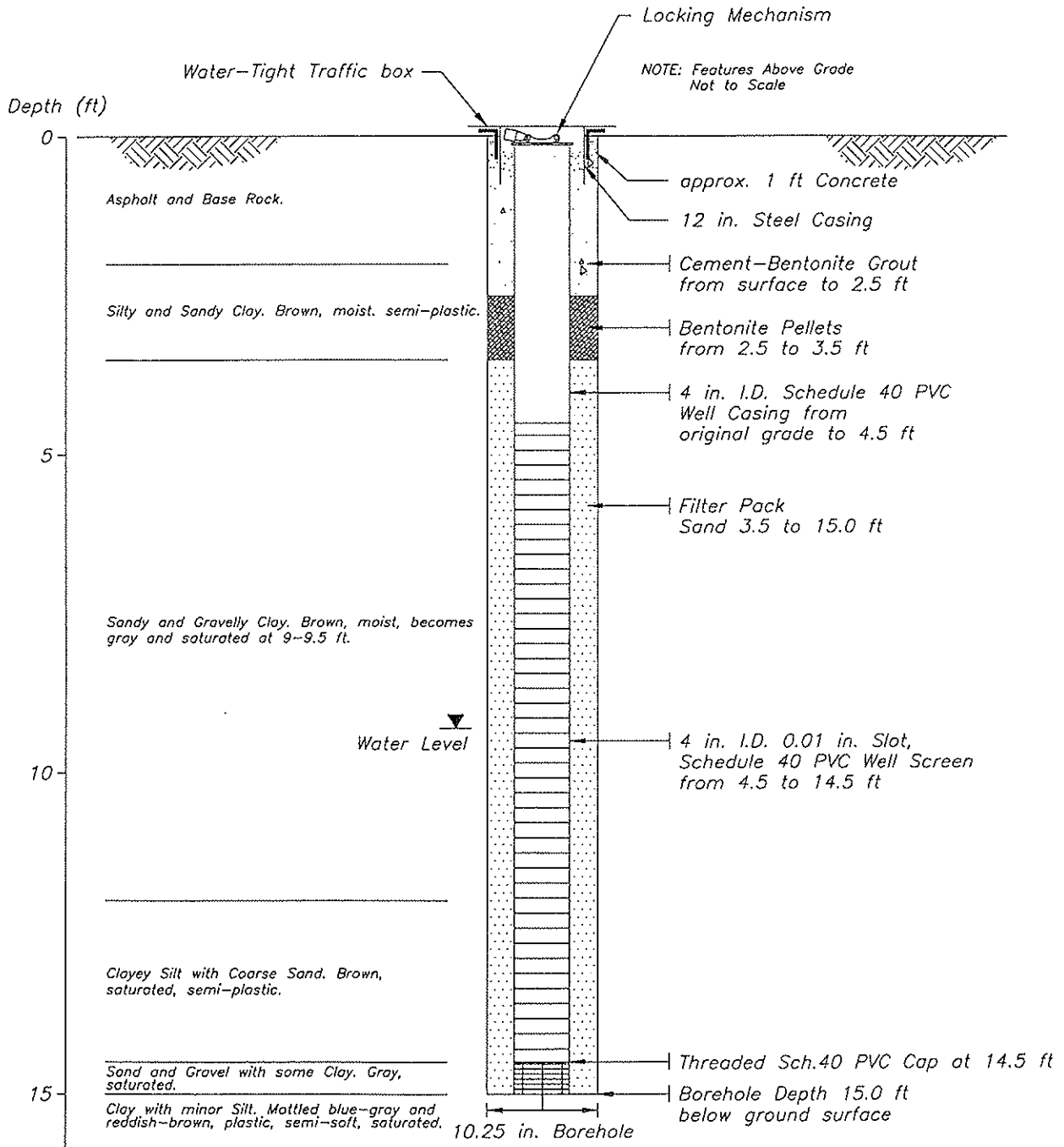
Elevation top of casing:

Casing below surface:

DRILLING and SAMPLING METHODS 8" Hollow Stem Auger, 10.25" Hollow Stem Auger Overdrill, 2" Split Spoon Sampler.			
WATER LEVEL	8.93	9.30	
TIME	1214	1214	
DATE	8/11/93	8/11/93	
REFERENCE	TOC	Surface	
			DRILLING
			START FINISH
			TIME TIME
			0955 1155
			DATE DATE
			8/11/93 8/11/93

Inches				WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS Asphalt; dry.	
Driven	Recover	Blows/6" Sampler	OVA Reading				DESCRIPTION by: J. Dowdakin	
					0		Asphalt.	
					1		Base rock and sand, dry.	
					2			
					3	CH	Silty and sandy clay. Brown, moist, semi-plastic, no odor.	
18	16	7 14 19	<1		4	CL	Sandy and gravelly clay. Brown, moist, crumbly, no odor.	
					5			
					6			
					7			
18	16	22 22 35	<1 10		8	CL	Sandy and gravelly clay. Brown, moist, crumbly, no odor. Becomes gray at 9-9.5'. Very moist to saturated, HC odor.	
					9			
					10			
					11			
					12			
					13	ML	Clayey silt with coarse sand. Brown, semi-plastic, HC odor.	
18	18	27 29 34	20 5		14			
					15	SC CH	Sand and gravel with some clay. Gray, saturated, HC odor.	
					16		Clay with minor silt. Mottled blue-gray and reddish-brown, plastic, semi-soft, saturated, HC odor.	
					17			
					18			
					19			
					20			

WELL NO: MW7  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company

Site: Facility No. 2128

Location: RICHMOND, CA



Western Division



LOG OF SOIL BORING

V1

Coordinates:

Elevation top of casing:

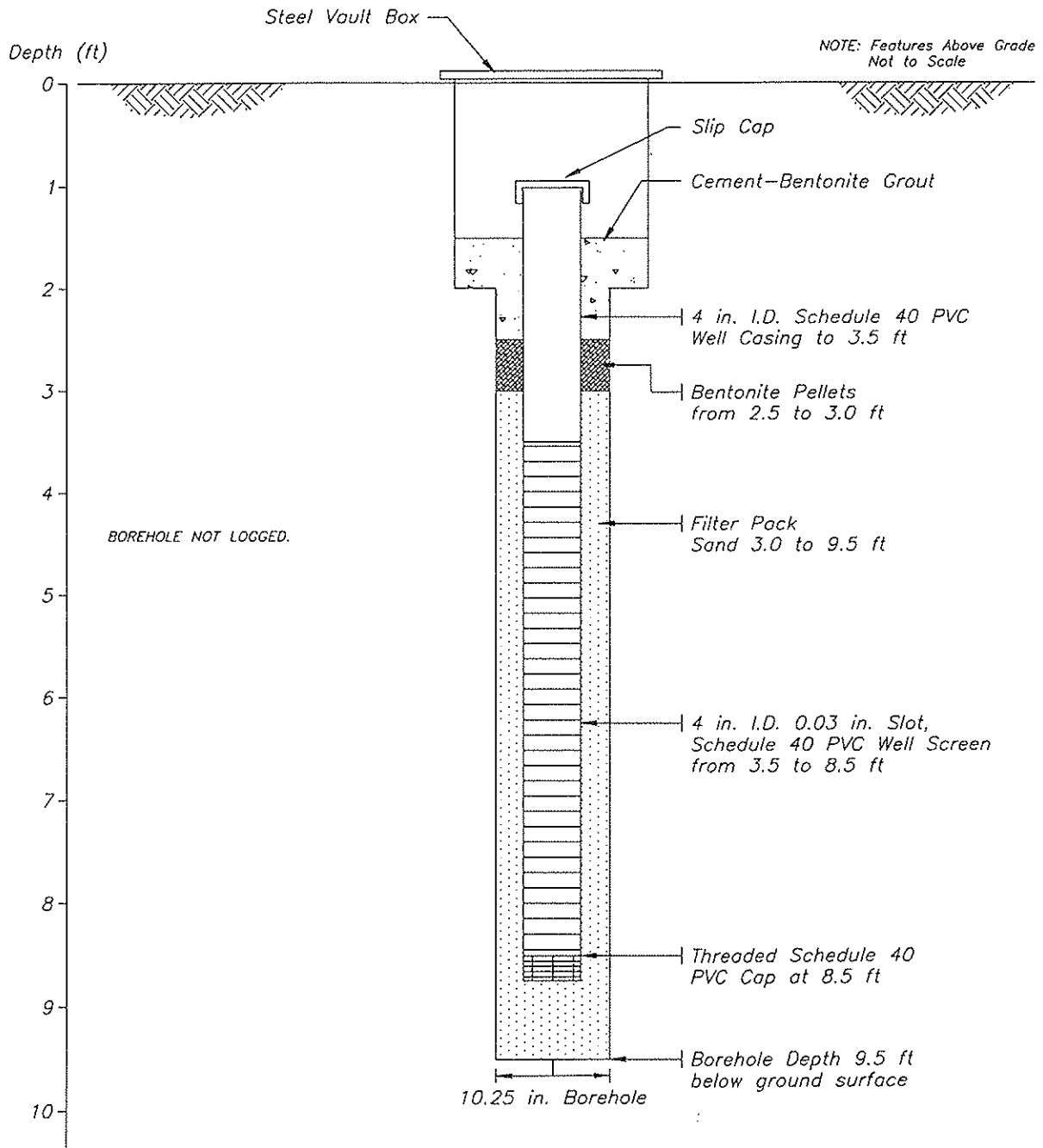
Casing below surface:

CLIENT ARCO		SITE NUMBER 2128		LOCATION 2230 Barrett, at 23rd. St. Richmond, CA	
DRILLING AND SAMPLING METHODS		7.5" auger - continuous sampling, completed as vadose well.			
WATER LEVEL	10'			DRILLING	
TIME	14:45			START	FINISH
DATE	4/30/91			TIME 14:07	TIME 14:50
REFERENCE	Surf.			DATE 4/30/91	DATE 4/30/91

Inches Driven	Inches Recover	Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	
							Asphalt.	
							DESCRIPTION by: L. Gardner <i>[Signature]</i>	
		4			0			
		7			1			Silty clay: dark brown, <5% subrounded gravel.
		11	0		2	CL		
		2			3			
		3			4			Silty clay: gray-green, 30% gravel (0.5-1.0 cm) with localized sand.
		4	8.0		5			
		5			6			
		7			7	CL		
		11	145		8			Clay: gray-green mottling.
		4			9			Clay: gray-green mottling, subrounded gravel (0.5-1.0 cm).
		7	2.7		10	CL		
		15			11			<u>Well specifications:</u>
		3			12			4" PVC casing
		5			13			0.20 slotted screen
		8	2.7		14			#3 Lonestar sand
		3			15			
		7			16			
		9	0*		17			
		5			18			
		7			19			
		11	0*		20			

\* smells - OVM recalibrated twice; failed QC standard reading. 70 ppm standard as 0.0.

WELL NO: V1  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company

Site: Facility No. 2128

Location: RICHMOND, CA

Western Division



LOG OF SOIL BORING

V2

Coordinates:

Elevation top of casing:

Casing below surface:

CLIENT ARCO	SITE NUMBER 2128	LOCATION 2230 Barrett, at 23rd. St. Richmond, CA
DRILLING AND SAMPLING METHODS 7.5" auger - continuous sampling, completed as vadose well.		
WATER LEVEL	11'	8'
TIME	11:30	11:45
DATE	4/30/91	4/30/91
REFERENCE	Surf.	Surf.
DRILLING START		DRILLING FINISH
TIME	10:50	TIME 11:40
DATE	4/30/91	DATE 4/30/91

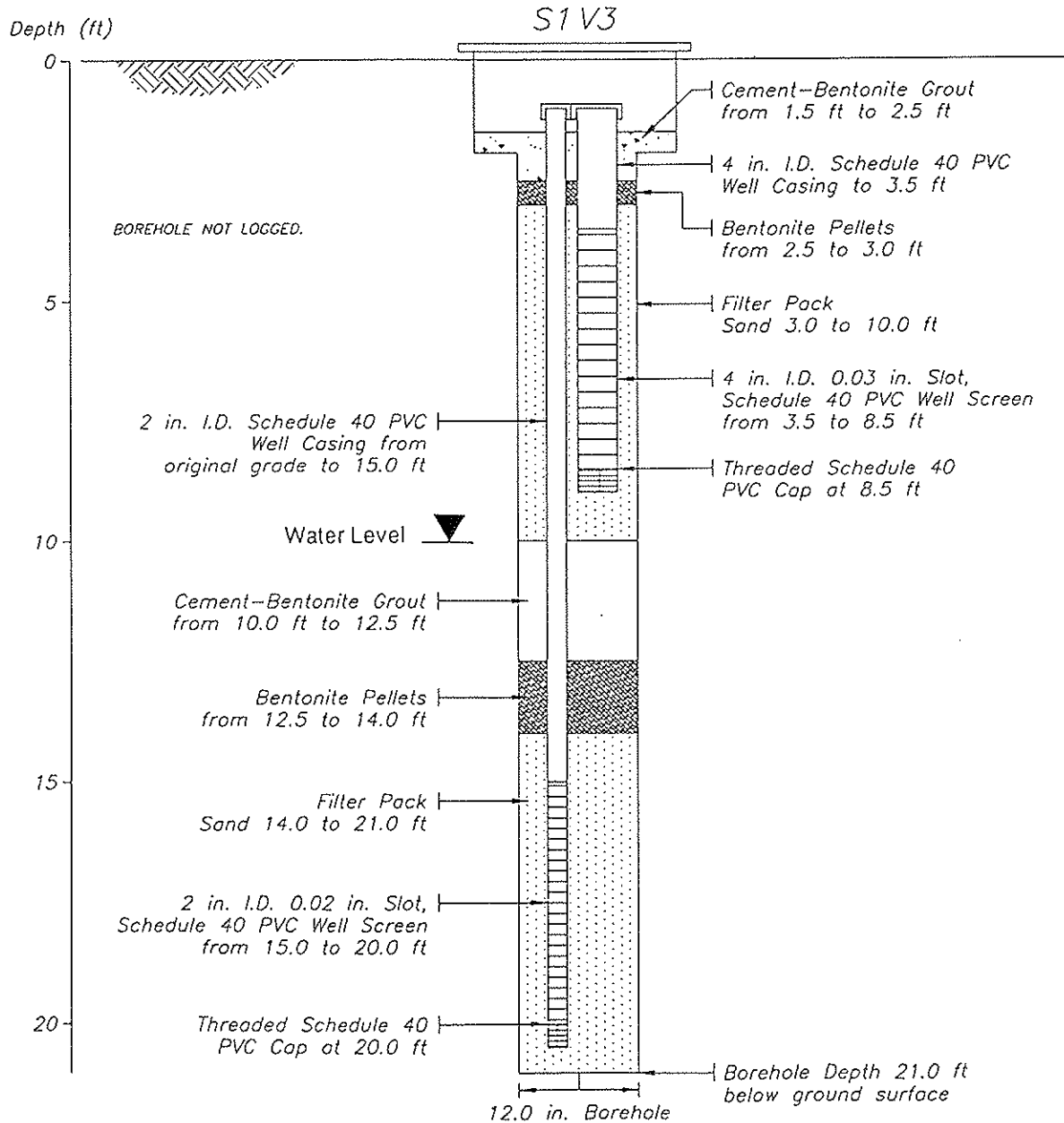
Inches Driven	Inches Recover	Blows/6" Sampler	OVA Reading	WELL DETAIL	DEPTH (Feet)	GRAPHIC LOG	SURFACE CONDITIONS	DESCRIPTION by:
					0		Asphalt.	L. Gardner <i>[Signature]</i>
		20			1	CL		Silty clay; ~50% large subrounded gravel (up to 3cm); light brown.
		13			2	CL		Silty clay; <10% subrounded gravel 0.1-0.5cm; dark brown.
		10	0		3	CL		Silty clay; light brown mottled green; localized sand; poorly sorted subrounded and angular gravel 0.5-210cm; gravel and sand 50%.
		4			4	CL		
		5			5	CL		
		10	3.4		6	CL		
		8			7	CL		
		10			8	CL		
		15	3.4		9	CL		
		8			10	CL		
		12			11	CL		
		12	170		12			
		3			13			
		7			14			
		10	>1,000		15			
		5			16			
		8			17			
		10	>1,000		18			
					19			
					20			
			>1,000					

Well specifications:

- 4" PVC casing
- 0.20 slotted screen
- #3 Lonestar sand

Water first encountered at 11ft but quickly rose to 8ft.

CLUSTER WELL: V3/S1  
WELL COMPLETION DIAGRAM



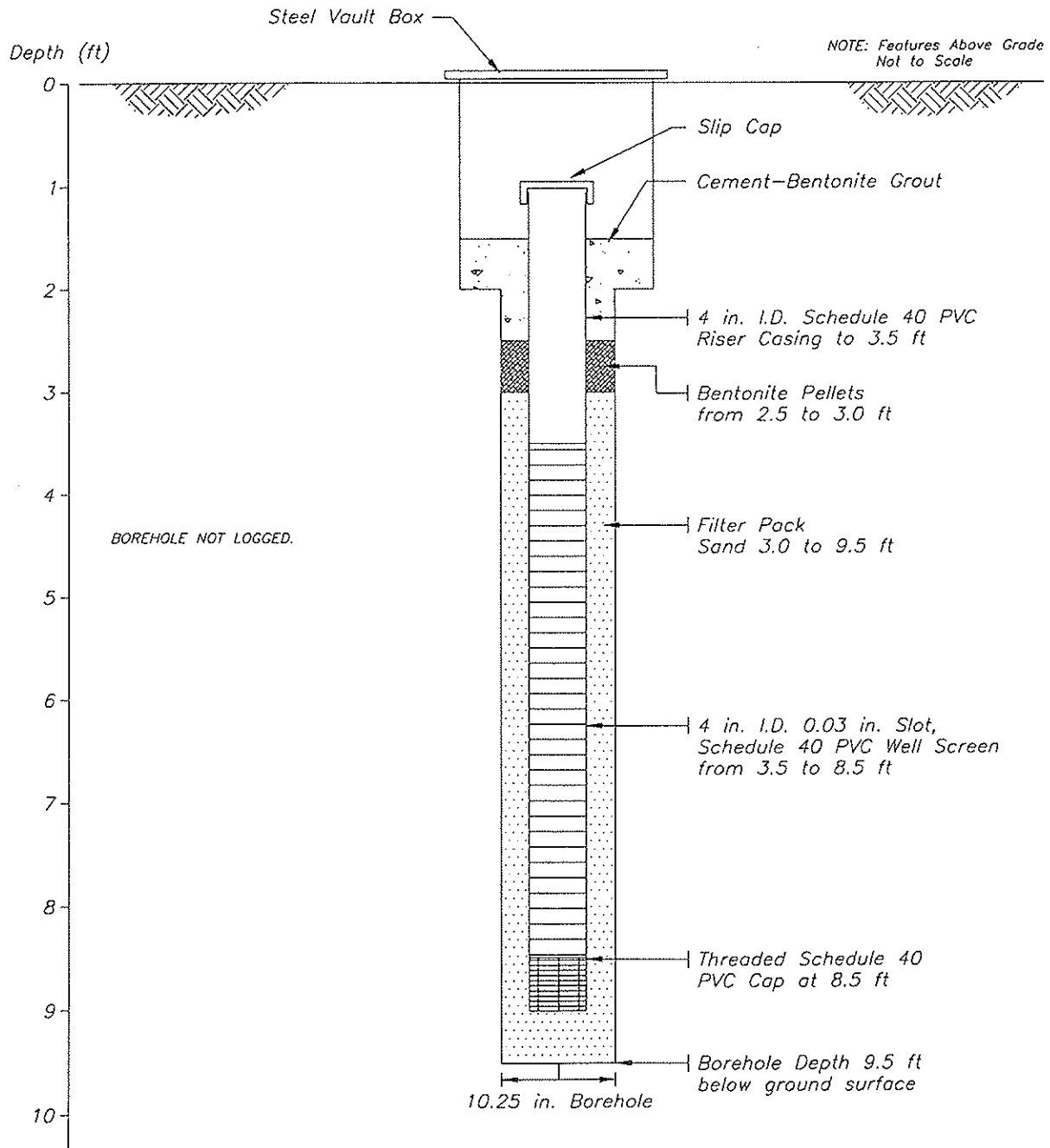
ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company

Site: Facility No. 2128

Location: RICHMOND, CA

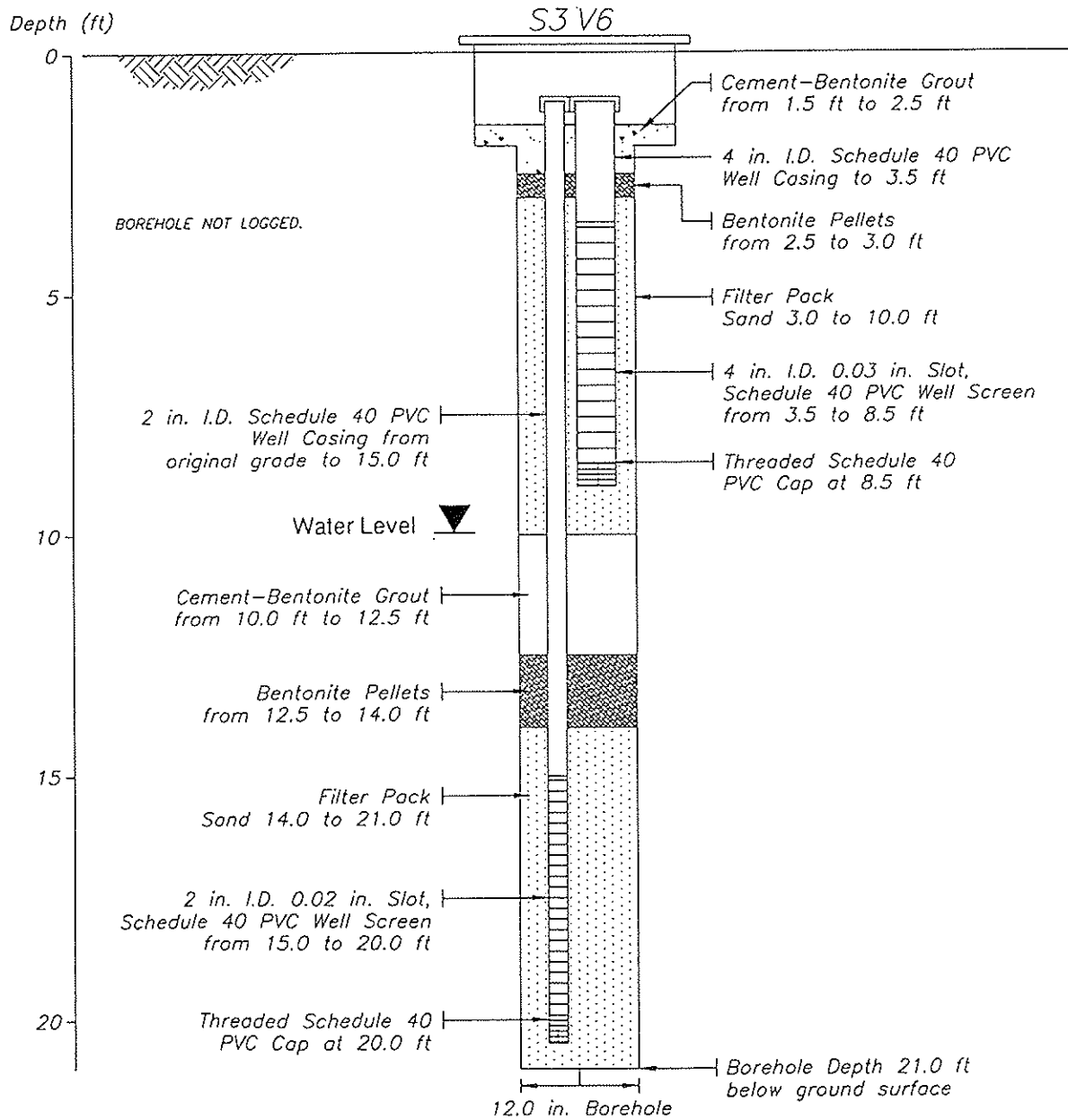
WELL NO: V5  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company  
Site: Facility No. 2128  
Location: RICHMOND, CA

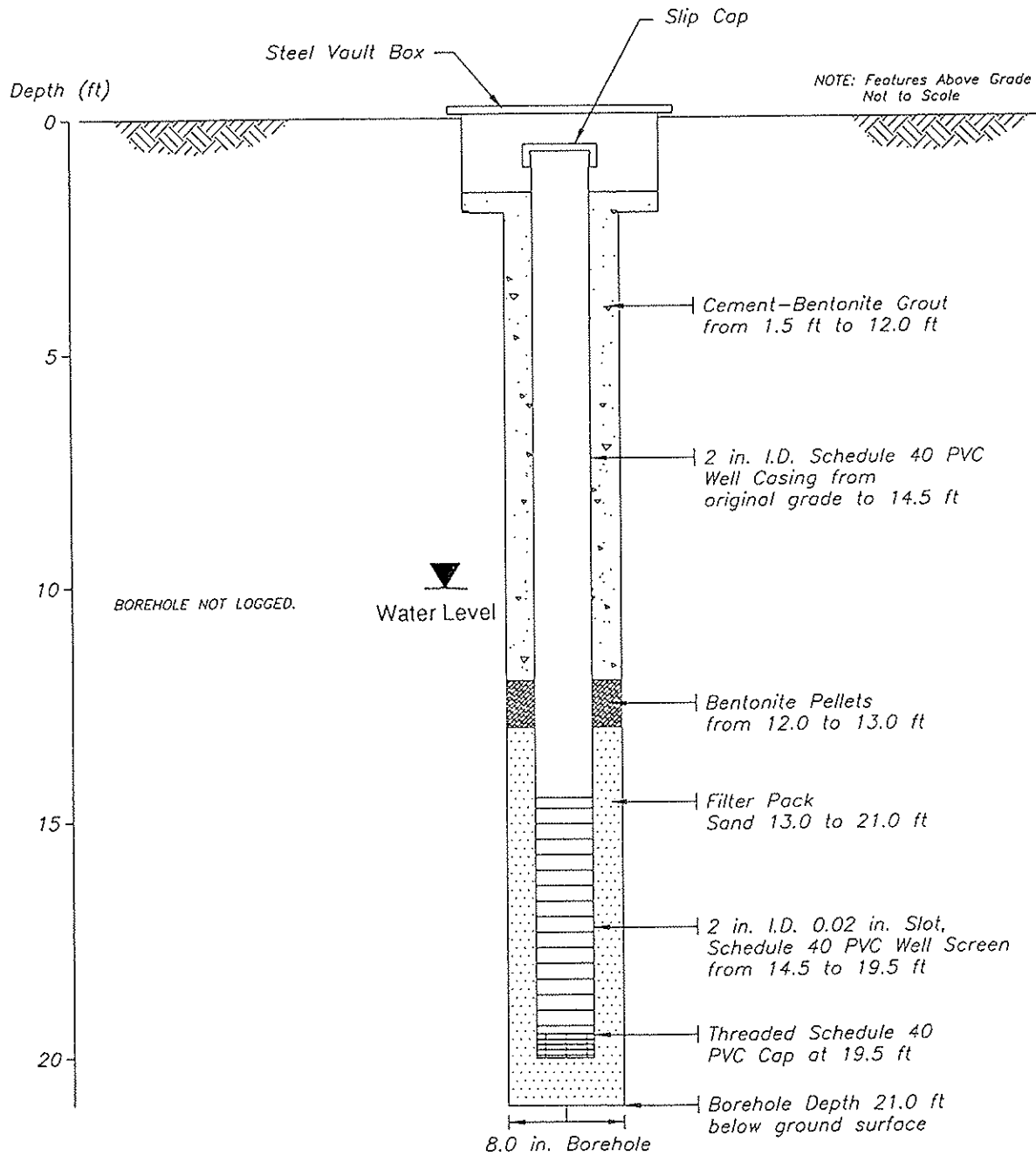
CLUSTER WELL: V6/S3  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company  
Site: Facility No. 2128  
Location: RICHMOND, CA

WELL NO: S2  
WELL COMPLETION DIAGRAM



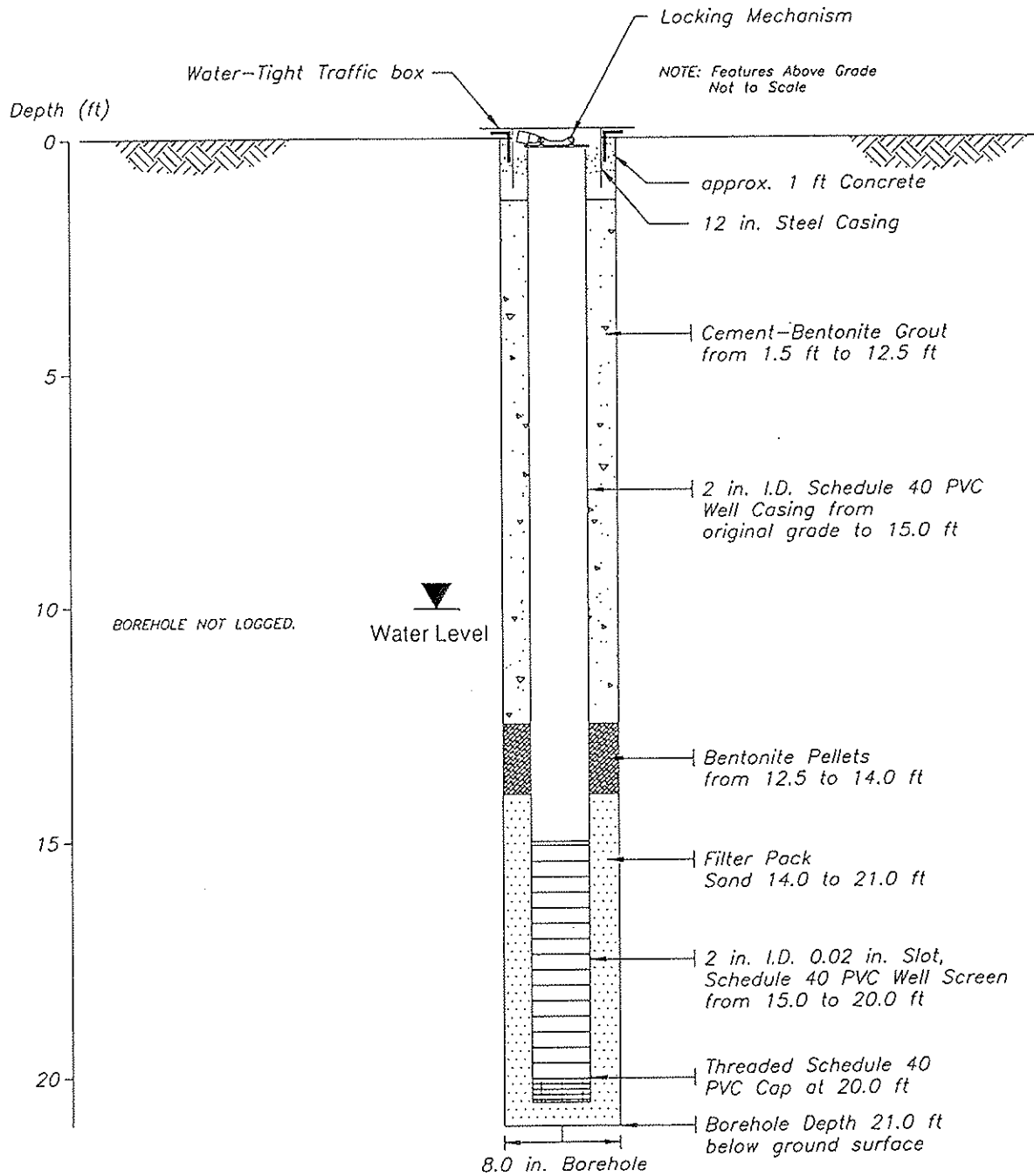
ENGINEERING, SCIENCE, AND TECHNOLOGY

Client: ARCO Products Company

Site: Facility No. 2128

Location: RICHMOND, CA

WELL NO: S4  
WELL COMPLETION DIAGRAM



ENGINEERING, SCIENCE, AND TECHNOLOGY

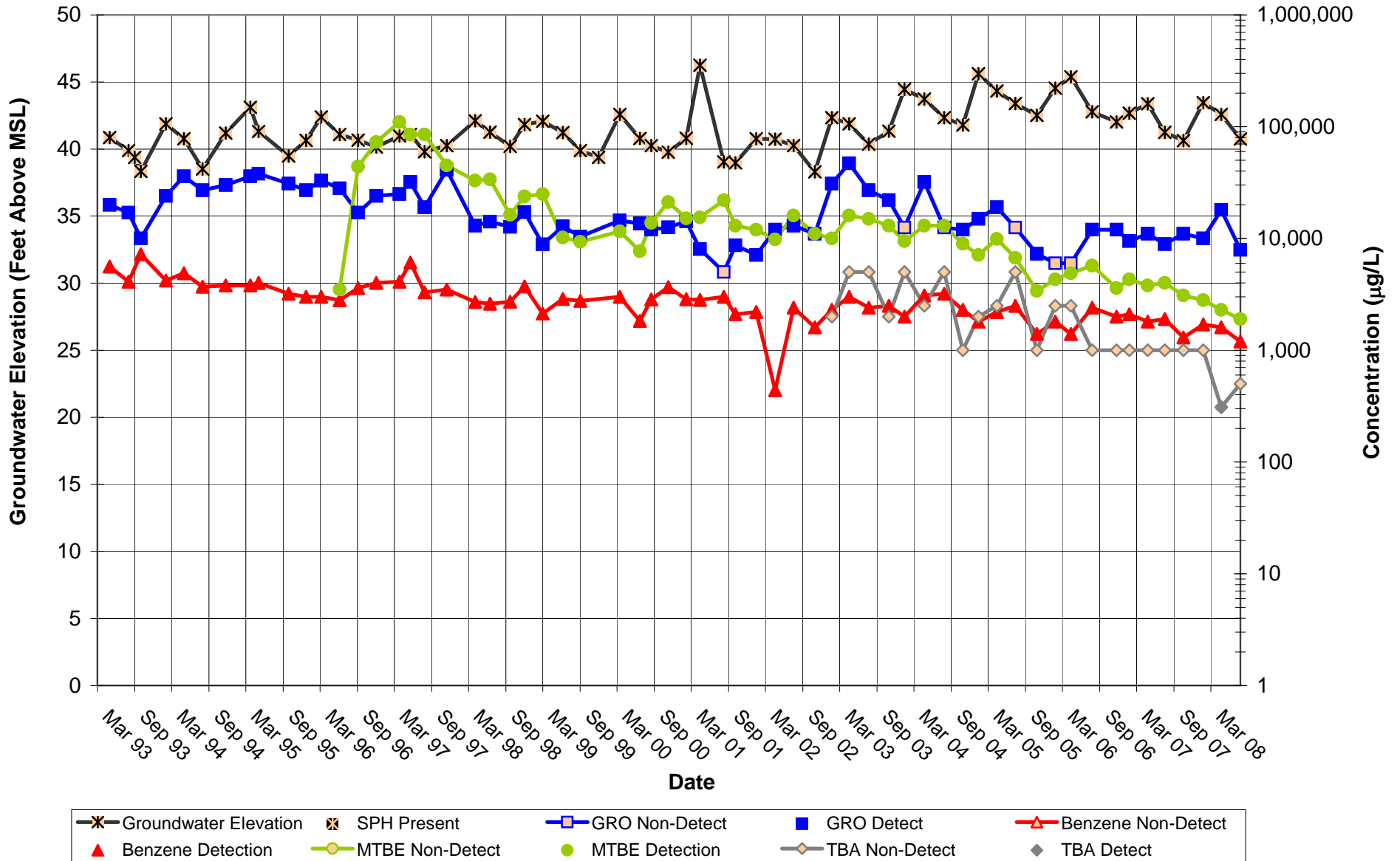
Client: ARCO Products Company  
Site: Facility No. 2128  
Location: RICHMOND, CA



## **Attachment D**

# **Dissolved Hydrocarbon Versus Time Graphical Presentations**

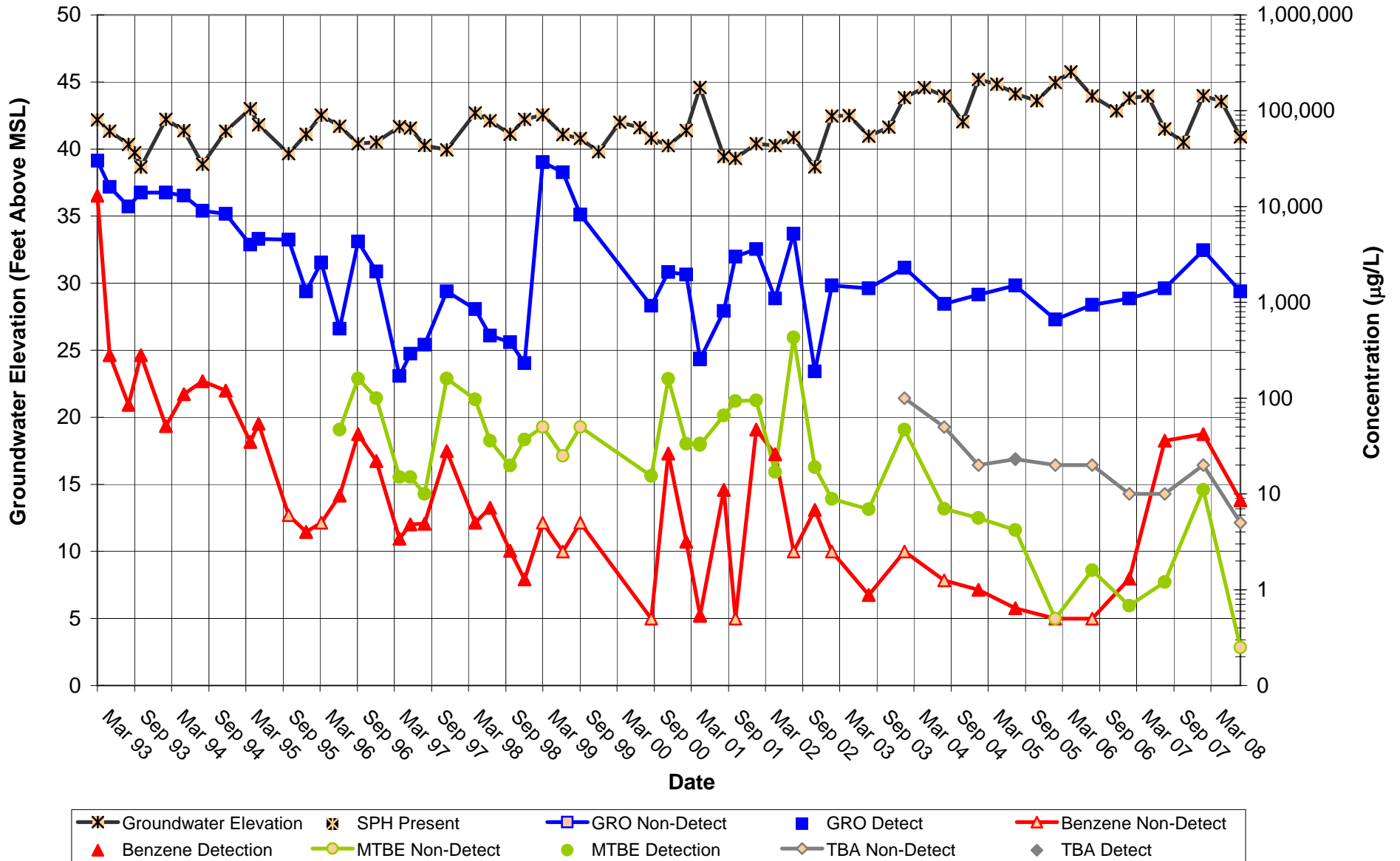
**ARCO Service Station No. 2128  
BC-1 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

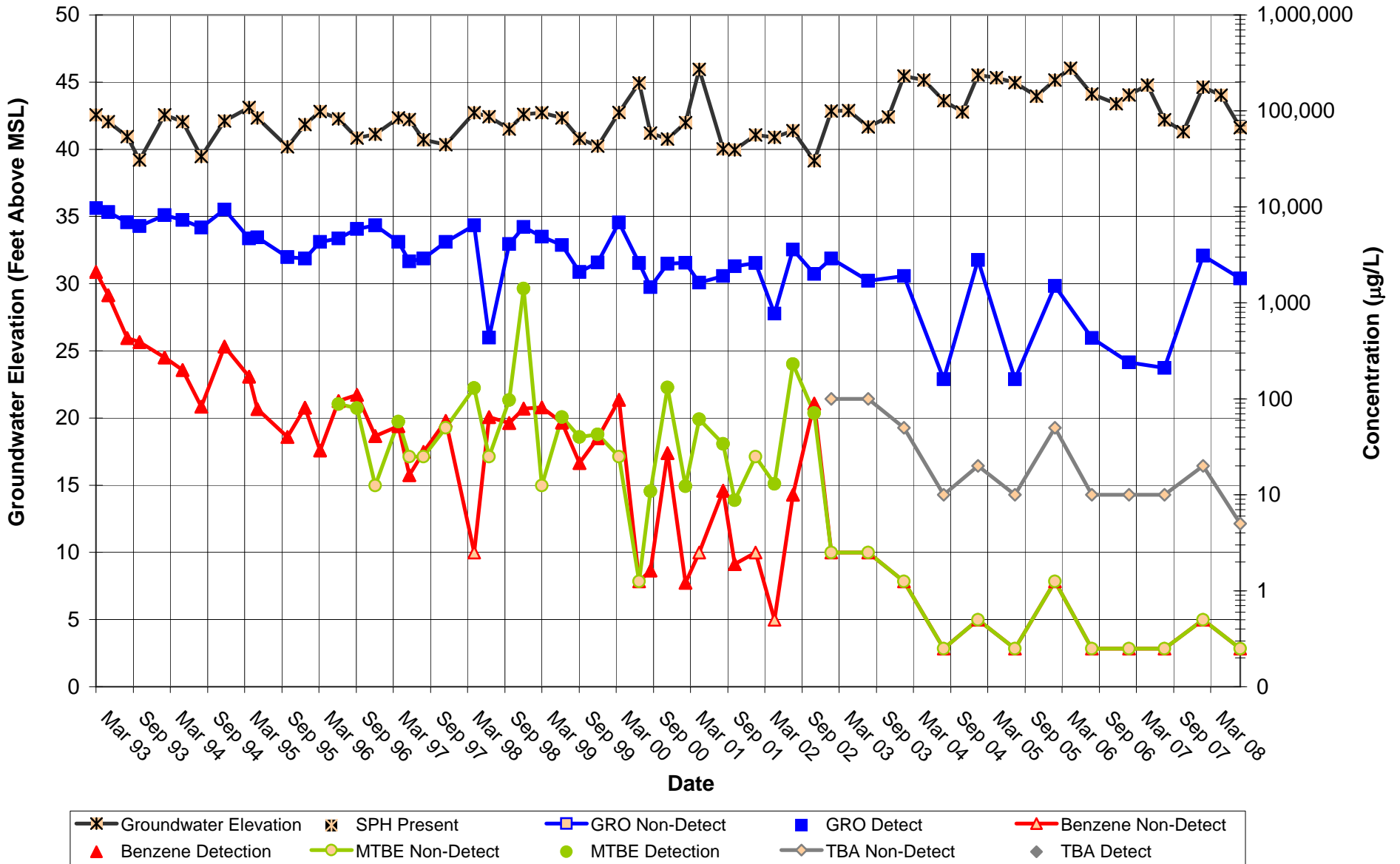
**ARCO Service Station No. 2128  
MW-2 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

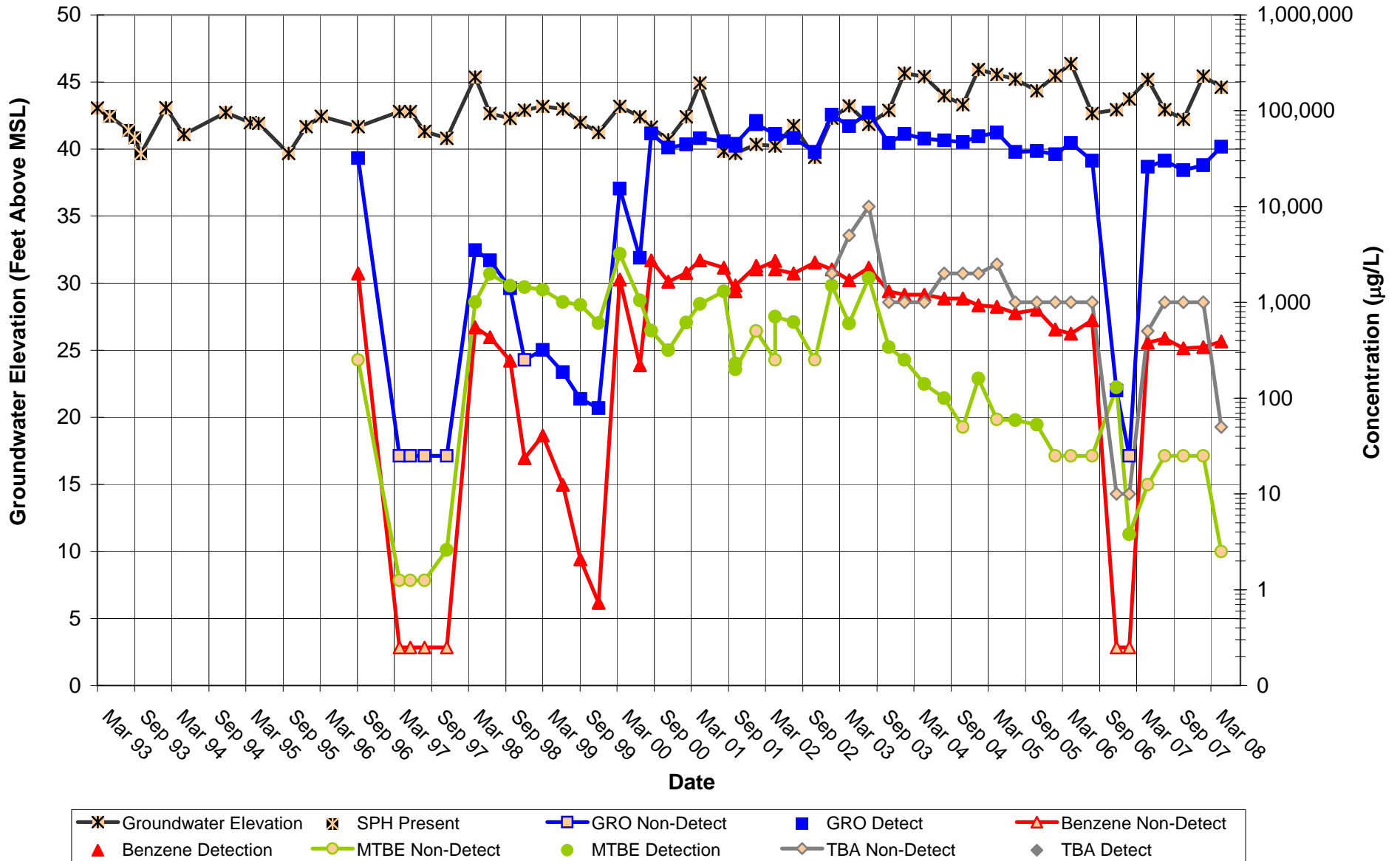
**ARCO Service Station No. 2128  
MW-3 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

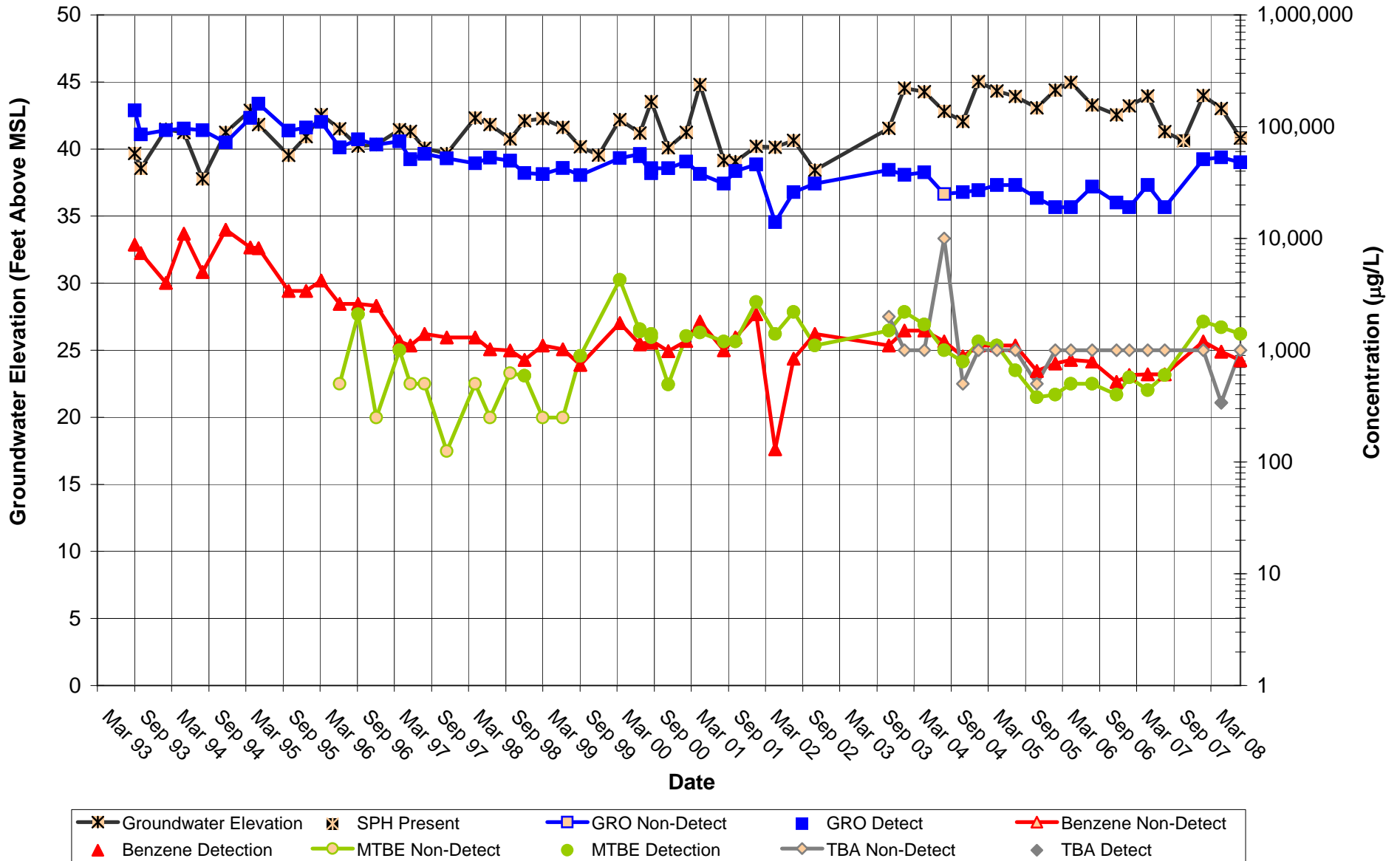
**ARCO Service Station No. 2128  
MW-4 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

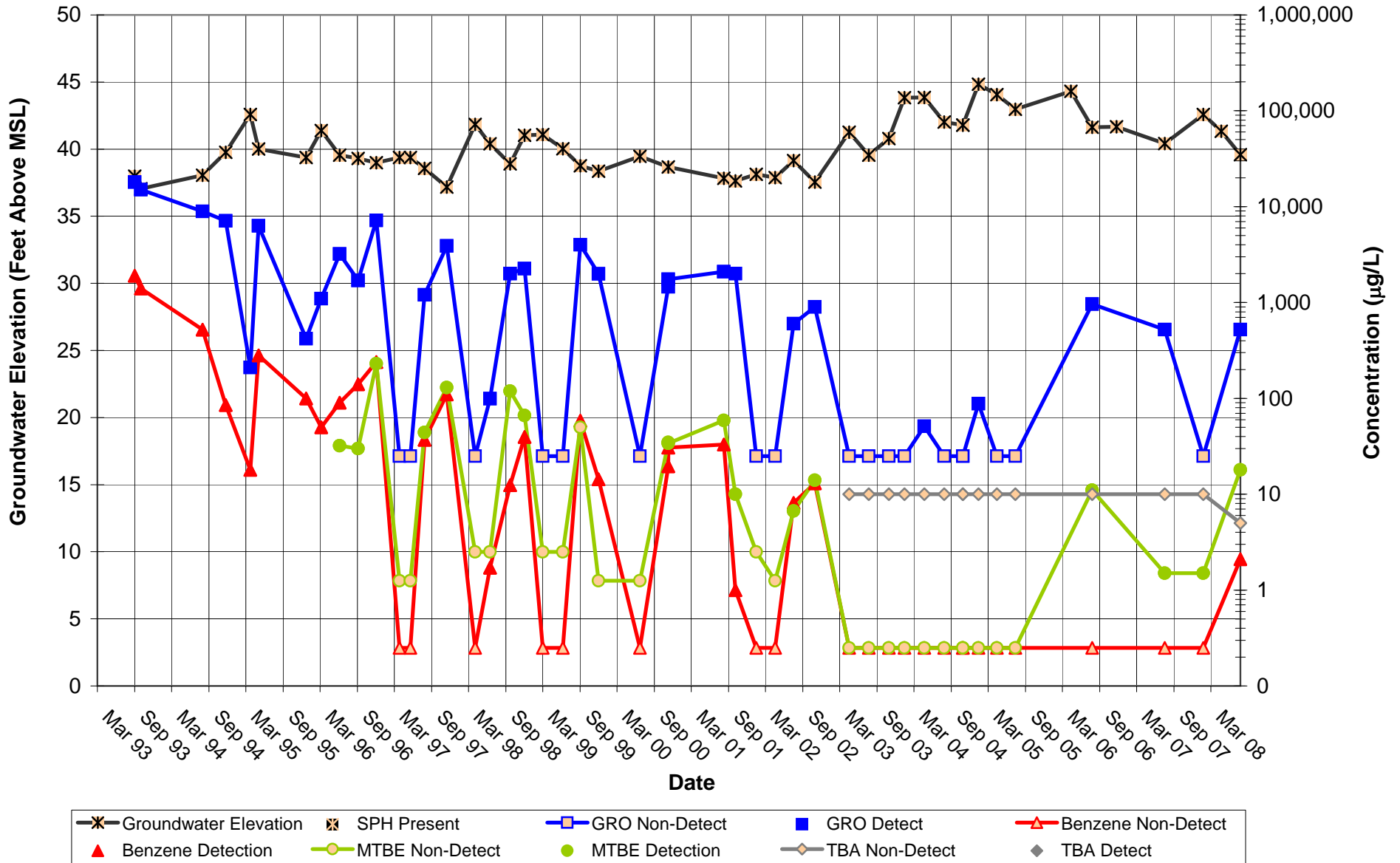
**ARCO Service Station No. 2128  
MW-5 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

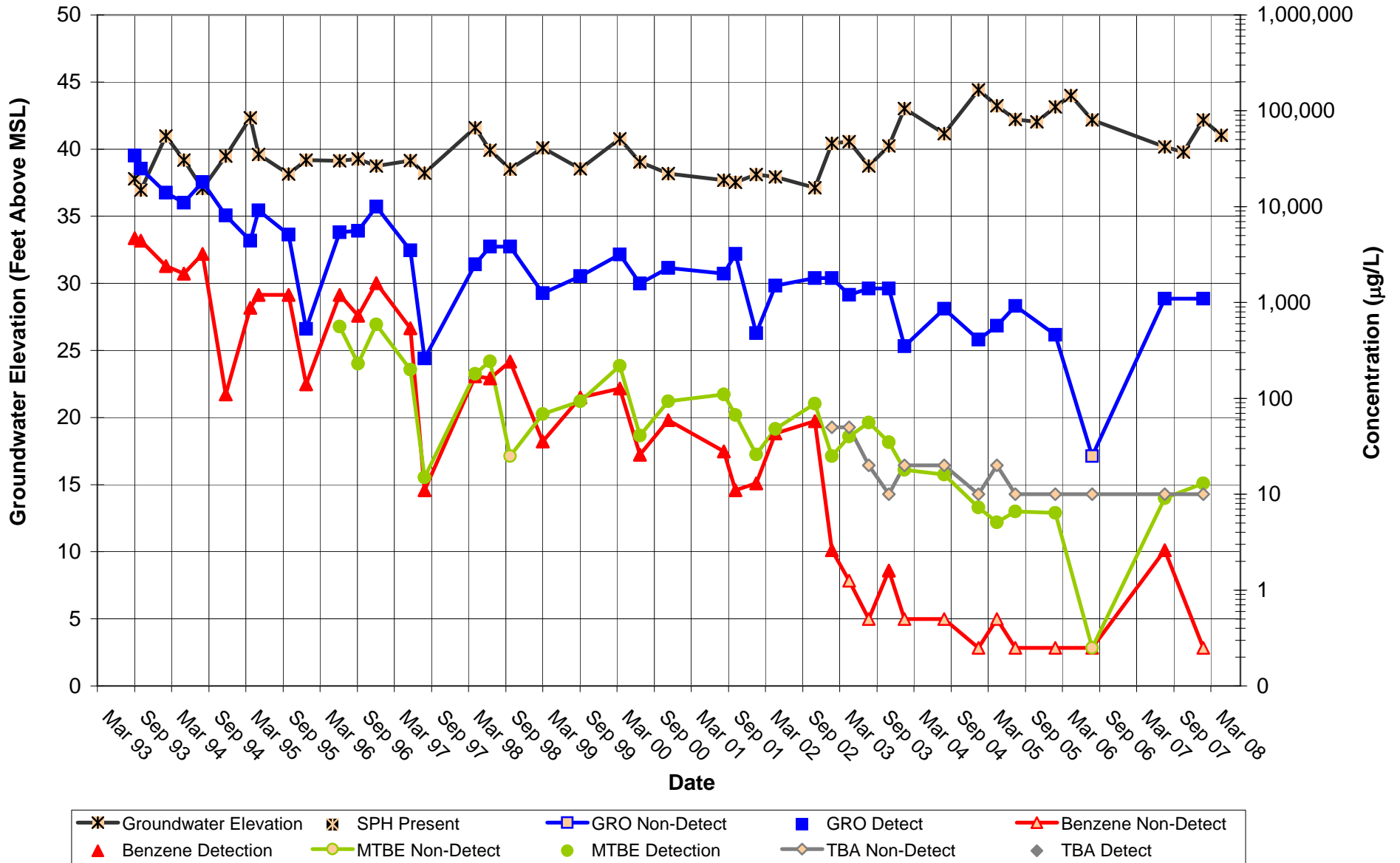
**ARCO Service Station No. 2128  
MW-6 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.

**ARCO Service Station No. 2128  
MW-7 Hydrograph**



**Notes**

1. No analytical samples were collected if SPH was present in the well during the sampling event.
2. Non-detected analytical results are graphed at a concentration of one-half of the laboratory reporting limit.
3. Trend lines are presented for reference purposes only and do not represent professional interpretation.
4. For additional information about data for a given sampling event (such as no data plotted), refer to Table 1.