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March 11, 2011

Mr. Paresh C. Khatri
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: **Fuel Leak Case #RO0000346**
Site Address: 3519 Castro Valley Boulevard, Castro Valley, CA

Dear Mr. Khatri:

SOMA's "Feasibility Study/Corrective Action Plan and Proposed Pilot Testing" report for the subject property has been uploaded to the State's GeoTracker database and Alameda County's FTP site for your review.

Thank you for your time in reviewing our report. If you have any questions or comments, please call me at (925) 734-6400.

Sincerely,

Mansour Sepehr, Ph.D., PE
Principal Hydrogeologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
No. C042928
Exp. 3-31-12
CIVIL
STATE OF CALIFORNIA

Enclosure

cc: Mr. Azim Shakoori w/enclosure
Mr. Matt Herrick w/Broadbent & Associates, Inc. w/enclosure

Feasibility Study/Corrective Action Plan and Proposed Pilot Testing

3519 Castro Valley Boulevard
Castro Valley, California

March 11, 2011

Project 2762

Prepared for

Mr. Mirazim Shakoori
3519 Castro Valley Boulevard
Castro Valley, California

SOMA ENVIRONMENTAL ENGINEERING, INC.
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PERJURY STATEMENT

Site Location: 3519 Castro Valley Boulevard, Castro Valley, CA

"I declare under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge".

Mirazim Shakoori
4313 Mansfield Drive
Danville, California 94506
Responsible Party

CERTIFICATION

SOMA Environmental Engineering, Inc. has prepared this report on behalf Mr. Mirazim Shakoori, for property located at 3519 Castro Valley Boulevard, Castro Valley, California. This report was prepared in response to January 13, 2011 correspondence from Alameda County Environmental Health Services, Environmental Protection Division.

Mansour Sepehr, PhD, PE
Principal Hydrogeologist

MANSOUR SEPEHR
No. C042928
Exp. 3-31-12

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1. INTRODUCTION

1.1 Overview

SOMA Environmental Engineering, Inc. (SOMA) has prepared this report on behalf of Mr. Mirazim Shakoori, for property located at 3519 Castro Valley Boulevard, Castro Valley, California. The report was prepared in compliance with Alameda County Environmental Health Services (ACEHS) Environmental Protection Division correspondence dated January 13, 2011.

New and reconstructed site wells have been sampled at least twice and concentrations of contaminants in the Shallow water-bearing zone (WBZ) have shown no significant changes. Specifically, benzene in the Shallow WBZ has been detected as high as 2,400 µg/L in a groundwater sample from SOMA-5 during the Fourth Quarter 2010 groundwater monitoring (GWM) event. Therefore, SOMA recommended preparation of a corrective action plan. ACEHS concurred with the proposed scope of work and requested preparation of Feasibility Study/Corrective Action Plan (FS/CAP) prepared in accordance with Title 23, California Code of Regulations, Section 2725.

According to above regulations and ACEHS correspondence, the FS/CAP must include:

1. Concise background of soil and groundwater investigations performed in connection with this case and an assessment of the residual impacts of the chemicals of concern (COCs) for the site and surrounding area where the unauthorized release has migrated or may migrate.
2. Detailed description of site lithology, including soil permeability, contamination cleanup levels and cleanup goals (in accordance with the San Francisco Regional Water Quality Control Board Basin Plan and appropriate ESL guidance for all COCs and for the appropriate groundwater designation) including the timeframe to achieve those cleanup goals, in accordance with 23 CCR Sections 2725, 2726, and 2727.
3. At least three viable alternatives for remedying or mitigating actual or potential adverse effects of the unauthorized release(s) in addition to the “no action” and “monitored natural attenuation” remedial alternatives. Each alternative shall be evaluated for cost effectiveness and the most cost-effective corrective action should be proposed.

1.2 Site Location and Description

The site is located on the corner of Redwood Road and Castro Valley Boulevard (Figure 1). Prior to 1989, the site was a Mobil gasoline service station. In 1989, British Petroleum (BP) purchased and operated the station until ownership was transferred to Mr. Mirazim Shakoori in 1993. The station was operated under the

Chevron brand until recently, and now operates as a Shell gasoline service station. Site features, including former and current USTs and former dispenser island, are shown in Figure 2. A concise background of soil and groundwater investigations performed in connection with this case and an assessment of the residual impacts of the chemicals of concern (COCs) for the site and the surrounding area are summarized in Appendix A.

2. UPDATED SITE CONCEPTUAL MODEL

The following summarizes historical site findings and interprets all data obtained to date to increase understanding of stability, extent, and impact of the contamination on public health and the environment. A site conceptual model (SCM) has been updated utilizing the most current site assessment and groundwater monitoring data. Figure 3 presents an updated flow chart for the SCM.

The objectives of this SCM are to:

1. Provide background for soil and groundwater investigations and evaluate the nature, and lateral and vertical extent of contamination, and its residual impacts
2. Provide a detailed description of site lithology, extent of soil and groundwater contamination, potential sensitive receptors, cleanup levels and cleanup goals
3. Identify potential human and environmental receptors that may be impacted by contamination associated with the site
4. Draw reasonable conclusions regarding the source, pathways, and receptor.
5. Evaluate risk to human health, safety, and the environment

2.1 Regional Geology and Hydrogeology

The site is located in the Coast Range Geomorphic Province, on the eastern side of San Francisco Bay, approximately 1 mile west of the Hayward Fault. The U.S. Geologic Survey (USGS) mapped the site as weakly consolidated, slightly weathered, poorly sorted, irregular interbedded clay, silt, sand, and gravel. In addition, in developed urban areas such as the Bay Area, earthwork construction often involves emplacement of artificial fill derived from nearby cuts or quarries; quite often, artificial fill is emplaced over native earth materials to provide level building pads and base rock for roadways.

Per ACEHS correspondence in 1994, the site is located in the Castro Valley Basin, an isolated structural basin surrounded on the west, north, and east by folded and faulted uplands comprised of Cretaceous sandstone, shale, and conglomerates of marine origin. The valley is bounded on the west by active traces of the Hayward fault. Sediments collected in the valley are mostly of fluvial origin and relatively thin (<100 feet thick). Based on overall structure and topography of the basin in which Castro Valley is located, heterogeneity of sediments (sands, silts, and clays), depth at which groundwater is first encountered and where it stabilizes, and past evidence at this and nearby sites, it is reasonable to conclude that groundwater may be present under confined or semi-confined conditions in the vicinity of the site.

2.2 Site Geology and Hydrogeology

The site is underlaid with interbedded silty clay, sandy silt/silty sand, clayey sand, and clayey silt. Locations of geologic cross-sections are shown in Figure 4. As shown in cross sections A-A’, B-B’, and B-A’ (Figures 5, 6, and 7), an unconsolidated sequence of permeable and relatively impermeable sediments underlies the site. Borehole logs for TWB-1 through TWB-5 and SOMA-4 demonstrate that these unconsolidated sequences continue off-site to the south, with no obvious changes in lithology. Groundwater monitoring wells have been installed at the site to monitor the encountered Shallow and the Semi-Confined WBZs.

The following wells are screened within the Shallow WBZ: SOMA-2, SOMA-3, SOMA-5, SOMA-7 and SOMA-8. Table below summarizes the well construction details.

Well ID	Total Depth (feet)	Screen Interval (feet bgs)
SOMA-2	15	10 to 15
SOMA-3	15	10 to 15
SOMA-5	15	5 to 15
SOMA-7	15	5 to 15
SOMA-8	15	5 to 15

The following wells are screened within the Semi-Confined WBZ: ESE-1R, ESE-2R, ESE-5R, MW-6R, MW-7R, SOMA-1, and SOMA-2. The table below summarizes the well construction details.

Well ID	Previous TD (feet)	Previous Screen Interval (feet bgs)	Total Depth (feet)	Screen Interval (feet bgs)
ESE-1R	30	10 to 30	25	18 to 25
ESE-2R	30	10 to 30	28	22 to 28
ESE-5R	24	9 to 24	24	18 to 24

MW-6R	30	18 to 30	28	22 to 28
MW-7R	30	18 to 30	30	24 to 30
SOMA-1	NA	NA	30	22 to 30
SOMA-4	NA	NA	23	16 to 23

Depth to the first-encountered groundwater at the site has been recorded at approximately 12 feet below ground surface (bgs) in the Shallow WBZ (when encountered) and between 18 and 31 feet bgs in the Semi-Confined WBZ, with groundwater later stabilizing to between 8.39 and 10.6 feet bgs (Shallow WBZ) and to between 6.5 and 11.50 feet bgs (Semi-Confined WBZ, except in DP-4 and DP-6, which stabilized only to 28 feet bgs and 19.79 feet bgs, respectively). During monitoring events, depth to groundwater in the Shallow WBZ ranged between 7.63 and 12.02, and between 2.36 and 12.02 feet bgs in the Semi-Confined WBZ. Sometimes the Shallow WBZ was not encountered during drilling, suggesting an element of discontinuity for that zone. For example, borings SB-6 (SOMA-6) and SB-9 (SOMA-9) were left open for 7 days but no water accumulated in these boreholes, suggesting that the Shallow WBZ is discontinuous in their vicinity.

The Shallow WBZ is composed of silty sand, sand, and clayey sand. Figure 4 shows the location of geologic cross-sections, and Figures 5 through 7 illustrate geologic cross-sections A-A’, B-B’ and B-A’. Semi-Confined WBZ is composed of silty sand, sand, and clayey sand. As seen in B-5 and ESE-4, this Semi-Confined WBZ narrows under the center of the site to an approximate 2-foot thickness. If viewed south from ESE-5, along TWB-5 and SOMA-4, the WBZ thickens to 10-15 feet, possibly due to fossilized stream channels (which can occur in fluvial depositional environments). Preferential flow (stream) channels have also been observed south (downgradient) of the Xtra Oil station across Redwood Road. The Semi-Confined WBZ appears to be continuous and extends off-site to the southeast. Below the Semi-Confined WBZ is a fairly homogenous silty clay unit that extends to 30 feet bgs, the greatest depths explored on-site during historical investigations. During historical soil and groundwater investigations, groundwater was observed in all explored areas of the Semi-Confined WBZ.

During the First Quarter 2011 groundwater monitoring event, groundwater was observed to flow south to southeasterly in the Shallow WBZ at an approximate gradient of 0.01833 feet/feet. Groundwater in the Semi-Confined WBZ was observed to flow southwesterly across the site at an approximate gradient of 0.01102 feet/feet. The Rose diagrams in Figure 2 demonstrate historical groundwater flow directions at the site and vicinity. Figures 8 and 9 show the most recent groundwater elevation contours in the Shallow and Semi-Confined WBZs.

2.3 Beneficial Uses of Groundwater

The Water Quality Control Plan (“Basin Plan”) for the San Francisco Bay Region adopted by California Regional Water Quality Control Board (CRWQCB), San Francisco Bay Region (Regional Board) declares that all surface and ground waters of the state are suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards unless total dissolved solids (TDS) exceed 3,000 mg/L (5,000 μS/cm, electrical conductivity, EC) and the well is not capable of sustaining a yield of 200 gallons per day.

During the Fourth Quarter 2010 GWM Event, TDS values were not recorded, but EC measurements event ranged from 626 μS/cm to 1,521 μS/cm. During the First Quarter 2011 GWM Event, TDS values were not recorded, but EC measurements ranged from 650 μS/cm to 1,640 μS/cm, which was consistent with historical observations.

Furthermore, according to California’s Groundwater Bulletin 118, the principal water-bearing formation of the Castro Valley Groundwater Basin (East Bay Plain) is alluvium of Pleistocene age, which unconformably overlies consolidated non–water-bearing rock of Jurassic age and underlies a thin surficial deposit of alluvium of Holocene age. The Pleistocene alluvium is a heterogeneous mixture of unconsolidated clay, silt, sand, and gravel with a maximum thickness of 80 feet. Per Bulletin 118, groundwater is unconfined and yields are limited, usually sufficient only for lawn irrigation. Per USGS (W-RIR 02-4259, 2003), this alluvium is part of the Newark aquifer that is present in the East Bay Flatlands to a depth of 30 to 130 feet bgs. Water in the aquifer is generally confined except near recharge areas along the mountain front. The uplands north, east, and west of the valley likely represent areas of groundwater recharge from rain infiltration to aquifers present in the valley. The major drainage through the valley is San Lorenzo Creek located approximately 0.75 mile east of the site. Note, however, that the municipal and domestic water supply beneficial use is not currently being utilized in the area of the site.

Based on observed current EC values and other supporting documentation, at this time it can be concluded that groundwater at the site is a current or potential source of drinking water. In general, the Basin Plan states that drinking water resources shall not contain concentrations of constituents that exceed the Maximum Contaminant Levels (MCLs).

2.4 Identification of Chemicals of Potential Concern

The goal of the SCM is to identify COCs and their presence in soil, soil vapor and groundwater, to determine whether COCs have been fully delineated in soil and groundwater.

Identified site-specific COCs include total petroleum hydrocarbons as gasoline (TPH-g); benzene, toluene, ethylbenzene, and total xylenes (collectively known as BTEX); methyl tertiary-butyl ether (MtBE); and tertiary-butyl alcohol (TBA). COCs have been detected in soil and groundwater beneath the site, including recently at concentrations that exceed California Regional Water Quality Control Board (CRWQCB) Environmental Screening Levels (ESLs) established for groundwater that is a current or potential source of drinking water (May 2008 Revision). Tables 1 through 4 summarize the detected soil and groundwater concentrations compared to respective ESLs. There has been no historical or current observation of free product in groundwater wells at the site.

2.5 Nearby Release Sites

Xtra Oil is an active gasoline station located at 3495 Castro Valley Boulevard, directly west of the site (Figure 2). A similar lithology is observed at this site, consisting primarily of silty and clay with coarser sediments observed below 18 to 19 feet bgs. Four 12,000-gallon USTs are currently at the site; these were installed in 1992 after removal of the former USTs. During the 1992 UST removal, surrounding soil was excavated from the tank pit and disposed of off-site. In 1990, MW-1 through MW-3 were installed at the Xtra Oil Station. TPH-g was detected in soil at 25 to 1,400 mg/kg. TPH as diesel (TPH-d) was detected at 120 mg/kg. Also during this time, three boreholes were advanced at the site; TPH-g was detected in these boreholes ranging from 450 to 2,000 mg/kg. MW-2 was destroyed in 1996 during the widening of Redwood Road. In 1997, MW-4 was installed. In 2007, a groundwater extraction system was installed in EW-1. In late 2007, MW-5 through MW-12 were installed on-site and off-site downgradient of the USTs. Groundwater monitoring events have been ongoing since 1990.

During the Semi-Annual 2010 GWM event (March through August) at this site, approximately 0.76 feet of free product was encountered in MW4 (adjacent to Redwood Road, approximately 120 feet west of the subject site boundary). A reported groundwater flow direction at Xtra Oil station has fluctuated from easterly toward the subject site to the south-southwesterly (rose diagram of groundwater flow direction is shown in Figure 2). During the latest GWM event dated October 2010, groundwater flow was southeasterly at a 0.007 ft/ft gradient.

The maximum detected TPH-g, TPH-d, and benzene concentrations were 58,000 µg/L, 13,000 µg/L, and 27,000 µg/L, respectively. Groundwater monitoring well OB-1 installed in the middle of Redwood Road lacked sufficient groundwater for sampling, and MW-8 installed within the eastern sidewalk west of groundwater monitoring well SOMA-4 exhibited TPH-d and TPH-g at 1,000 µg/L and 4,400 µg/L, respectively. Figure 2 shows locations of groundwater monitoring wells.

A Unocal station (20405 Redwood Road) is situated 0.2 miles north of the subject site on Redwood Road (Figure 1). Groundwater monitoring was conducted at this site from 1999 to 2009. Per the March 9, 2009 SCM report prepared for this site, depth to groundwater generally ranged between 8 and 15 feet bgs, with groundwater flowing southerly at a gradient between 0.001 and 0.012 ft/ft. Maximum TPH-g, TPH-d, and MtBE were detected at 320 µg/L, 3,600 µg/L, and 630 µg/L, respectively.

A former Merritt Tire Sales property (3430 Castro Valley Blvd) is situated approximately 500 feet west of the site (Figure 1). This site reported a 1.79 feet of free product in 2007. Groundwater flow direction is southeasterly at a gradient of 0.014 ft/ft.

Due to the relatively long distance to Unocal and Merritt sites, no significant impact from their contamination is expected on-site (although it should be noted that the subject site is located directly downgradient from Unocal station). At this time, upgradient wells SOMA-8 and MW-6R have shown no significant groundwater impact. Due to the closer proximity of 3495 Castro Valley Boulevard, this LUST site has a higher likelihood of contributing to the contamination at the subject site.

2.6 Remedial Goals and Risk Evaluation

As part of the remedial goal screening analysis, several available cleanup standards for petroleum-contaminated sites were reviewed. These standards included Preliminary Remediation Goals (PRGs) EPA Region 9, California Human Health Screening Levels (CHHSLs), and ESLs.

According to the General Plan, the site is zoned “general commercial,” and located in an area consisting primarily of commercial with residential, mixed use and public areas located downgradient from the site. All properties in the immediate vicinity and downgradient of the site are commercial. At this time, there are no plans to rezone the site or vicinity for residential land use. Figure 10 illustrates the zoning subdivision of the site and its general vicinity.

ESLs have been selected as the cleanup standard because these values are more conservative and would be more health protective. According to the RWQCB, the presence of a chemical in groundwater at concentrations below the corresponding ESL can be assumed not to pose a significant, long-term threat to human health and the environment. ESL screening levels are Tier 1 levels (conservative target risk and hazard levels) that take into consideration additive risk due to presence of multiple chemicals with similar target health effects. For carcinogens, the human health risk screening levels represented by ESLs are based on a target cancer risk of 10^{-6} for both residential and commercial exposure scenarios; this represents the lower end of the acceptable range of 10^{-4} and 10^{-6} recommended by the USEPA. Furthermore, as stated by CRWQCB, active remediation is generally warranted at sites where estimated cancer risk exceeds 10^{-6}.

Based on beneficial uses of groundwater and site zoning, the proposed remedial goals for the site are based on Tier 1 ESLs established by CRWQCB (Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater – May 2008), for groundwater that is a current or potential source of drinking water for the shallow soil of commercial/industrial land use. Since no deed restrictions are planned at this time, residential land use ESL values were also evaluated and both residential and commercial values are listed in Tables 1 through 4.

Representative site-specific COC concentrations were compared to ESLs. Soil and groundwater samples collected at this site have historically demonstrated concentrations moderately above listed ESLs (Tables 1 through 4).

COC	**Groundwater** *As current or potential source of drinking water* **(μg/L)**	**Soil <3.0 m (mg/kg)**	**Soil >3.0 m (mg/kg)**	**Soil Vapor Intrusion ($\mu g/m^3$)**	**Groundwater for Vapor Intrusion (in to Buildings) (μg/L)**
TPH-g	100	83	83	1,000	1,000
Benzene	1	0.044	0.044	84	540
Toluene	40	2.9	2.9	63,000	380,000
Ethyl-Benzene	30	2.3	3.2	980	170,000
Total Xylenes	20	2.3	2.3	21,000	160,000
MtBE	5	0.023	0.025	9,400	24,000
TBA	12	0.075	0.075	NL	NL

Note: NL = not listed; California Regional Water Quality Control Board, Interim Final November 2007, revised May 2008, Environmental Screening Limits, Tables A, C, E, F1-a.

To evaluate potential health risks associated with on-site and off-site occupants, hypothetical residents, and future construction workers, SOMA compared representative chemical concentrations at the site to established ESLs. The ESLs were used to establish initial cleanup goals, prioritize areas of concern, estimate the potential health risks, and determine whether further evaluation is warranted. The presence of a chemical at concentration exceeding an ESL does not indicate that adverse impact to the human health or environment will occur. SOMA evaluated potential exposure routes for the on- and off-site areas (Figure 3). Although the site is capped with concrete and no soil is exposed at the surface, at this time, as a conservative measure, site analytical data was compared to ESLs for residential, commercial, and trench workers exposure scenario and to ESLs for groundwater as a current or potential source of drinking water. As shown in Tables 1 through 4, existing TPH-g in soil north of the former USTs, and TPH-g, benzene, MtBE, and TBA in groundwater along the southern portion of the site and off-site to the south, exceed corresponding ESLs intended to address human health, groundwater protection, and nuisance concerns for construction/trench worker exposure scenario.

In accordance with the RWQCB Interim Guidance, dated January 5, 1996, the site was evaluated to determine whether it qualifies as a "low-risk soil" or "low-risk groundwater" case. Low-risk cases are those that satisfy all of the following:

1. The leak has been stopped and ongoing sources, including free product, have been removed or remediated.
2. The site has been adequately characterized.
3. The dissolved hydrocarbon plume is not migrating.
4. No water wells, deeper drinking water aquifers, surface water, or sensitive receptors are likely to be impacted.
5. The site presents no significant human health risk. Risk for all constituents of concern must be evaluated using residential exposure criteria with a 10^{-6} carcinogenic risk level and a chronic hazard quotient of one (1).
6. The site presents no significant risk to the environment.

Due to the elevated COCs in soil and groundwater (above ESL levels) and presence of potential receptors that could be exposed to contaminated groundwater or vapors, at this time the site does not meet the criteria for "low risk", and therefore a feasibility study should be implemented.

2.7 Extent of Soil and Groundwater Contamination

For purposes of evaluating risk, the source is defined as the environmental medium/media containing elevated contaminant concentrations associated with the release.

- The origin of the release was attributed to the leaking UST, dispenser, and product piping.
- In 1988, holes were observed in an old 380-gallon waste oil tank (located to the east of the site building) during its replacement. In 1988, this waste oil tank was replaced with a double-walled, 2,000-gallon UST. Confirmation soil sampling beneath the waste oil tank (8.5 feet bgs) revealed benzene and toluene at 0.0068 mg/kg and 0.0095 mg/kg, respectively. Composite sample of excavated soil revealed total oil and grease detection of 100 mg/kg.
- In May 2000, an apparently leaking shear valve was discovered in the southern dispenser island piping.
- In 2003 three single-walled USTs (installed in 1984), with capacities of 6,000, 8,000, and 10,000 gallons were removed from an area southeast of

the existing canopy. The three former USTs included a 10,000-gallon tank for regular unleaded gasoline, an 8,000-gallon tank for super unleaded, and a 6,000-gallon tank for plus unleaded. Also in 2003, a 2,000-gallon UST used for waste oil (located east of the site building) was removed and dispenser islands were upgraded.

- The two double-walled replacement USTs, with capacities of 12,000 and 20,000 gallons, were installed in 2003 at a new location northwest of the existing canopy. In addition to the removal and replacement of the USTs, dispensers and product lines were removed and replaced.
- During the UST removal and replacement, approximately 1,520 tons of impacted soil and gravel were transported to an off-site facility (Forward Landfill) for disposal. During excavation groundwater as well as free product was observed entering the UST pit where the former USTs were installed. The free product was skimmed and stored in six 55-gallon drums. The collected product was disposed of off-site under appropriate waste manifests.
- Confirmation soils sampling during UST removal and replacement activities revealed minor residual TPH-g contamination in the southwestern excavation wall and MtBE above ESL in most of the sidewall samples. The highest TPH-g detection during this time was in sample PL1 (near pumps 5 and 6) detected at 530 mg/kg.
- Excavated areas of former USTs were backfilled with drain rock up to 7 feet bgs, followed by 2 feet of native soil backfill and another 2.5 feet of imported sandy fill and aggregate base to below concrete. The waste oil UST pit was partially backfilled with clean stockpiled gravel that was removed from the UST excavation, and backfilled to grade with imported materials. Site history is included as Appendix A.
- Confirmation soil and groundwater sampling conducted during UST decommissioning is summarized in Tables 1 and 2. Sampling locations are shown in Figure 2.

Information needed to define the source was gathered during historical site assessments; the following sections include an evaluation of the lateral and vertical extent of the following:

- COCs in unsaturated zone soil
- COCs in saturated zone soil and the smear zone
- COCs in groundwater (Shallow and Semi-Confined WBZs)

No free product is currently present in site groundwater monitoring wells. Results of this evaluation are documented below.

2.7.1 Lateral and Vertical Extent of Soil Contamination

This section evaluates contamination extent in soil beneath the site.

Based on recent investigations by Delta Environmental (September 2008) and SOMA (August 2009 and 2010), residual soil impact (TPH-g) exists between 9 and 10 feet bgs in the vicinity of SOMA-7 (980 mg/kg). Historical sampling of SB-2 boring advanced along the western property boundary exhibited TPH-g at 230 mg/kg between 7.5 and 8 feet bgs. Residual contamination was also observed along the eastern portion of the site, in the vicinity of the former USTs. During the recent investigations, TPH-g ranged from 26 mg/kg at DP-5 (20 feet bgs) to 720 mg/kg in B-3 (12 feet bgs). TPH-g levels were 380 mg/kg at SOMA-5 (11 feet bgs) and 13 mg/kg at SB-6 (SOMA-6 location) at 11.5 feet bgs. Boring locations are shown in Figure 2. Soil analytical data, which includes concentrations for all COCs, are presented in Table 1.

Minor isolated pockets of residual contamination were also observed between 15 and 17 feet bgs, but only TPH-g, in B-1 (120 mg/kg), was slightly above the ESL of 83 mg/kg for shallow or deep soils where groundwater is a current or potential drinking water source. Figure 11 illustrates TPH-g concentration in soil between 4 and 12 feet bgs. Figure 11A shows a concentration vs. depth graph, which illustrates the TPH-g distribution with depth. As could be seen from this graph, in general, soil contamination (concentrations exceeding ESL) extends from a several feet below ground surface to approximately 12 feet bgs. Figure 12 illustrates TPH-g between 15 and 17 feet bgs.

As time passes after a contaminant release, accumulations of light non-aqueous phase liquid (LNAPL) at or near the water table are susceptible to smearing within a vertical interval from seasonal fluctuations in water-table elevations, forming a smear zone. The smear zone is defined as an area where free product occurred in the soil and was then smeared across the soil when the water table fluctuated between historical high and low water table elevations. Historically, groundwater in Shallow WBZ wells has fluctuated between 7.33 and 12.02 feet bgs, creating a smear zone where residual soil contamination is located.

2.7.2 Lateral and Vertical Extent of Contamination in Groundwater

Based on existing analytical data derived from the recent GWM event (February 2011) and the current well installation and replacement (August 2010) as well as numerous historical investigations, the Shallow WBZ appears to be the most impacted along the southern portion of the site. Observed concentrations in Shallow WBZ are elevated near former waste oil UST and UST pit, and the former pump island located in the western portion of the site.

During the most resent GWM event, the highest TPH-g and benzene were detected in SOMA-5 at 4,900 µg/L and 1,600 µg/L, respectively. The second highest concentrations of above COCs were detected in SOMA-7 at 1,900 µg/L and 380 µg/L, respectively. MtBE concentrations were highest at SOMA-5 (94 µg/L), with concentrations above ESL (5 µg/L) also observed in SOMA-7 (5.2 µg/L) and SOMA-3 (32 µg/L).

The petroleum hydrocarbon (PHC) plume in the Semi-Confined WBZ appears to be also situated along the southern portion of the site, near the former waste oil tank and downgradient of the former USTs. TPH-g and benzene were observed above ESL in ESE-1R at 1,400 µg/L, and 96 µg/L, respectively. TPH-g was detected in well ESE-5R at 140 µg/L.

Historically, ESE-2R and SOMA-4 exhibited elevated concentrations for many COCs, during the latest GWM event; only minor MtBE detections were documented. MtBE was detected in wells ESE-1R, ESE-2R, MW-7R, SOMA-1, and SOMA-4 at 22 µg/L, 12 µg/L, 5.3 µg/L, 5.3 µg/L, and 1.5 µg/L, respectively.

TPH-d (August 2010, Table 2) was also highest at ESE-1R (1,600 µg/L), with TPH-d also observed in ESE-2R (250 µg/L), ESE-5R (190 µg/L), and MW-7R (200 µg/L). TPH-d contamination appears to be limited to the vicinity of the site. However, since TPH-d is not part of the standard monitoring event analysis, its concentrations trends were not evaluated at this time.

TPH-g and benzene dropped significantly in ESE-5R after reconstruction and fluctuated in ESE-1R, while concentrations are still elevated in SOMA-5 and SOMA-7, suggesting that the majority of contamination along the southern portion of the site is in the Shallow WBZ. Groundwater analytical data is presented in Tables 2, 3 and 4.

2.8 Plume Behavior and Stability

Dissolved plume mass changes over time can be an indicator of the type of plume existing at the site. If the source area is finite in size, or if the source material generating the dissolved plume is highly weathered, the flux of contaminants out of the source area and into the dissolved plume will decrease to zero over time (Hyman, Dupont, 2001). This decrease will cause the total mass of contaminant in the dissolved plume to decrease over time. To estimate the degradation rate of contaminants within the plume resulting from this finite source, the changes over time of total contaminant dissolved plume mass were analyzed.

To evaluate the movement of the contaminant plume, COC concentrations versus distance were plotted. Figure 17 shows MtBE concentrations within the plume decrease with distance from the former USTs. This graph also illustrates that SOMA-2 might not be directly downgradient from the source area and is likely located closer toward the outer edge of the plume, since MtBE concentrations are typically higher in the most downgradient well SOMA-3 as compared to SOMA-2. MtBE concentrations in SOMA-3 fluctuate, with an increase during the latest monitoring indicating that the MtBE plume is slowly advancing beyond SOMA-3.

TBA is seen to increase near the former UST pit, with a sharp drop in TBA in ESE-2 and an increase at MW-7 (MW-7R) (Figure 19). Figures 18, 20, and 21 show MtBE, TPH-g and TBA concentrations with distance along the southern property boundary. The TPH-g plume is stable and decreasing beneath ESE-5. The TPH-g plume is relatively stable and confined to site areas, the MtBE plume is stable and possibly advancing slowly beyond SOMA-3, and the TBA plume has advanced to well MW-7 (MW-7R), southeast of the site.

To assess stability of the contaminant plume. SOMA evaluated historical contamination trends for on-site and off-site wells. Historical concentration vs. time graphs (which include data from 1992 to 2000, Appendix C). As can be seen from these graphs, after the 2003 UST removals, COC concentrations dropped in ESE-2, MW-7, and SOMA-1. MtBE is observed to migrate off-site, passing SOMA-2 from October 2004 through September 2007 and concentrations increased in SOMA-3 from early 2006, until dropping below ESLs during recent monitoring events. TPH-g was elevated in SOMA-4 until August 2006, when levels dropped below ESL and have remained constant at approximately 10 µg/L. Removal of the former USTs did not appear to have impacted concentrations at well ESE-5, where TPH-g concentrations have fluctuated with spikes in early 2005 and 2006, when concentrations jumped from 2,500 and 3,500 µg/L to nearly 5,000 µg/L. TPH-g levels have decreased with some minor fluctuations. The UST removal appears to have affected MtBE concentrations in ESE-1. Since 2003, MtBE in ESE-1 has decreased. Benzene and TPH-g concentrations have fluctuated, but remained around 100-200 µg/L for benzene and around 1,000 µg/L for TPH-g. This suggests that the plume affecting these wells did not result from the documented 2000 piping release, but continued elevated concentrations suggest that the plume affecting these wells is moving across the lower portion of the site, in an easterly direction.

Concentration vs. time and groundwater elevation vs. time illustrating trends that include data from 2000 to present time for wells ESE-1 (ESE-1R), ESE-2 (ESE-2R), ESE-5(ESE-5R), SOMA-1, SOMA-5, and SOMA-7 are shown on Figures 22 through 27, respectively. As seen from these figures, almost all COC concentrations have been steadily decreasing over time.

SOMA evaluated contaminant degradation rates in order to analyze the time course of contaminant mass changes in groundwater. The first-order attenuation rate constant calculations were conducted. This evaluation was conducted to determine whether water quality goals could be achieved within a reasonable time frame without active remediation. During this evaluation, SOMA utilized ESL values as more conservative cleanup goals protective of human health and the environment and concentrations vs. time rate constants (k point) were used for estimating how quickly remediation goals could be met at the site without any active remediation.

Natural attenuation processes include a variety of physical, chemical, and/or biological processes that act without human intervention to reduce the mass or concentration of contaminants in soil and ground water. These in situ processes include biodegradation, dispersion, dilution, sorption, volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants. The overall impact of natural attenuation processes at a given site can be assessed by evaluating the rate at which contaminant concentrations are decreasing either spatially or temporally.

The first order attenuation rate constant, utilizing concentration vs. time attenuation constant, was utilized during this evaluation, where a rate constant, in units of inverse time (e.g., per day), is derived as the slope of the natural logarithm concentration vs. time curve, measured at a selected groundwater monitoring locations (EPA, 2002) . Natural logarithm of COC in Shallow and Semi-Confined WBZ wells were plotted vs. time (Appendix C); in order to achieve a time line relationship. During this process, sampling dates were converted to years, with the initial sampling date assumed to have the initial concentration at t equals 0. Historical concentration graphs illustrating concentration trends from the year 1992 to the year 2000 are attached in Appendix C.

It should be noted that attenuation rate calculations could be affected by uncertainty from a number of sources, such as the design of the monitoring network, seasonal variations, uncertainty in sampling methods, limited number of data, and the heterogeneity in most groundwater plumes.

It should be noted that many of the site wells have been recently reconstructed to avoid the cross screening of the two WBZ, however since not enough data has been generated since the reconstruction, the old and the new data were utilized in this evaluation. It is anticipated that since previously the Semi-confined WBZ wells were screened through the more impacted shallow as well as the less impacted deeper zone, combining the two (old and new) data sets would likely yield a more conservative prediction of degradation, since currently the Semi-Confined wells are only screened through the less impacted WBZ.

The first-order degradation rate equation is described as follows:

$$C = C_o e^{-k_1 t} \quad [1]$$

Where:

C *Contaminant concentration at time (t), in units of mass per volume*
Co *Initial contaminant concentration at t equals 0 in units of mass per volume*

$-k_1$ *First-order degradation rate, 1/time; a plot of contaminant vs. time produces a non-linear relationship that could be linearized by plotting the natural log of contaminant concentration vs. time. The slope of this linearized relationship is equal to ($-k_1$)*

Furthermore, the time (t) to reach the remediation goal at each monitoring well was calculated utilizing the following equation:

$$t = \frac{-Ln\left[\frac{C_{goal}}{C_{start}}\right]}{-\mathrm{k}_1} \qquad [2]$$

Where:

t *Time to reach remedial goal*

C_{goal} *Clean-up concentration for a given contaminant*

The line equations were generated for wells ESE-1 (ESE-1R), ESE-2 (ESE-2R), ESE-5(ESE-5R), SOMA-1, SOMA-5, and SOMA-7 (Degradation graphs are included in Appendix C). Based on generated line equations the length of time to reach remediation goals were estimated, the estimates are included in Table 5. The table below summarizes these estimates.

COC	**ESE-1 (ESE-1R)**	**ESE-2 (ESE-2R)**	**ESE-5 (ESE-5R)**	**SOMA-1**	**SOMA-5**	**SOMA-7**
Degradation Estimates (Years from today)						
TPH-g	15.67	NA	74.61	*below C goal*	7.24	4.25
TPH-g (Alt.)	-	-	-4.96	-	-	-
Benzene	**NA (increasing trend)**	*below C goal*	*below C goal*	*below C goal*	**88.20**	**NA (increasing trend)**
MtBE	1.94	3.99	7.86	0.08	8.80	-0.04
TBA	18.22	*below C goal*	*below C goal*	10.47	37.18	1.60

NA - Not applicable

Negative year values, indicate that concentration goal has already been reached or is about to be reached

It should be noted that rate calculations can be affected by uncertainty from a number of sources, factors such as seasonal variations and the heterogeneity in most ground-water plumes, or uncertainties related to the gathered data (due to the fact that the pre-well-reconstruction and post-well-reconstruction data were evaluated together).

As can be seen from above table, the time required to reach cleanup goals for the Shallow WBZ varied based on type of COC and ranged from approximately -0.04 (at or below clean-up goal) to 88.2 years. For the Semi-Confined WBZ the longest times to reach clean-up goals were calculated for well ESE-1 for TPH-g and TBA. The impact of utilizing both data sets (pre and post-well reconstruction) is most evident in ESE-5 (ESE-5R) where during the most recent GWM event TPH-g was detected at 140 µg/L at concentrations approaching ESL. However, the estimated time for concentrations to decrease to below ESL was 74.61 years. This occurred because relatively steady pre-well-reconstruction concentrations were observed, generating a gentle sloping concentration trend. However, once cross-screening of the Shallow and Semi-Confined WBZ was eliminated, the concentration decreased significantly. In order to evaluate what the degradation rate might actually be, the *C start* concentration of 140 ug/L (instead of the one suggested by the concentration trend) was utilized, reducing the years to reach the below ESL concentrations from 82.61 to -4.96, suggesting that concentrations are at or around clean-up goal. Therefore, it is recommended that above degradation estimates be reevaluated when more post-well-reconstruction data becomes available.

Since no slug or pumping tests have been conducted at the site, hydraulic conductivities were estimated based on sediment type and other descriptive features. Both Shallow and Semi-Confined WBZs are comprised of silty sands (SM) and sandy silts (ML) and some sands (SP). With sands being more predominant in the Semi-Confined WBZ. Therefore, hydraulic conductivities can be estimated between 10^{-5} and 10^{-2} (cm/s), between 0.0282 ft/day and 28.2 ft/day, respectively.

The behavior of the plume margin is of concern when defining dissolved contaminant plume behavior. In order to evaluate contaminant transport, and time required for the on-site dissolved contaminant plume to reach the nearest sensitive receptor, SOMA first evaluated site specific seepage velocity utilizing Darcy's law.

$$V = -K\Delta h \qquad [3]$$

Where:

V - Darcy's velocity

-K- Conductivity (estimated)

Δh -Hydraulic gradient (0.01833 ft/ft-based on the latest groundwater-monitoring event (in Shallow WBZ)

Δh -Hydraulic gradient (0.01102 ft/ft-based on the latest groundwater-monitoring event (in Semi-Confined WBZ)

Based on Darcy's velocity, a seepage or average linear velocity, representing the average rate at which the water moves between two wells as calculated utilizing the following equation:

$$Vx = \frac{v}{n} \qquad [4]$$

Where:
Vx *- Seepage velocity*
-n- effective porosity (estimated at 0.32 based on composition of the water bearing units).

Utilizing equation [3], Darcy's velocities were calculated between 0.00052 feet/day and 0.517 feet/day for the Shallow WBZ and between 0.00031 feet/day and 0.3108 feet/day, respectively, for the Semi-Confined WBZ.

Utilizing equation [4], seepage velocities were calculated between 0.0016 feet/day and 1.615 feet/day, respectively, for the Shallow WBZ and between 0.00097 feet/day and 0.971 feet/day, respectively for the Semi-Confined WBZ.

Utilizing the very liberal assumed retardation coefficient of 10 for TPH-g which would allow evaluation of the worst case scenario for TPH-g migration, the contaminant velocity was calculated (by dividing the seepage velocity (Vx) by the aforementioned retardation coefficient). A more conservative retardation of 58 was utilized for TPH-g during mass calculation. The range of TPH-g contaminant velocities was estimated between 1.62E-0.4 feet/day (0.059 feet/year) and 1.62E-01 feet/day (58.96 feet/year) for the Shallow WBZ and between 9.71E-0.5 feet/day (0.035 feet/year) and 9.71E-02 feet/day (35.45 feet/year) for the Semi-Confined WBZ.

It is also known that less retarded contaminants, such as MtBE (retardation coefficient of 1) will move faster with the same velocity as groundwater. Based on available data, and as seen in the concentration vs. distance trend documented in Figure 17, the margin of the MtBE plume has already advanced beyond the property boundary.

2.9 Contaminant Mass Evaluation

Information about the amount of contaminant mass in the target remedial area is useful when considering remediation options and evaluating cleanup progress. In order to evaluate the cost-effective remedial alternatives, SOMA estimated the contaminant mass in adsorbed and dissolved phases below and above the water table. Soil screening data, recent quarterly groundwater monitoring data and other site assessment information was used to assess the mass. During this mass calculation, since no free product was observed at the site wells, it was assumed that no free product is present in the subsurface at this time. The simplified mass estimation method described below was used solely for the purposes of determining the effectiveness of remedial alternatives. The process of mass calculation relies on inference and extrapolation of data and judgment in estimating data elements where there is great variability and a high margin of error. Since this mass calculation utilized a combination of old (starting from 1995) and new (2010) soil analytical data, it is anticipated that the estimated mass may underestimate or overestimate the actual site conditions.

BTEX compounds have relative high toxicity and are the hydrocarbon constituents with the highest effective solubility. MtBE also has very high effective solubility and relatively low biodegradation potential and therefore has the longest plumes. MtBE has lower toxicity than benzene, but due to its low taste and odor threshold has a low ESL as well. While the rest of the hydrocarbons make up the majority of contaminant mass in the subsurface, they account for lesser risk posed to human health or groundwater quality due to their lower toxicity and/or lower mobility in the environment. Since TPH-g as a constituent makes up the majority of mass, SOMA evaluated its mass in soil and groundwater beneath the site. Benzene and MtBE were also evaluated as secondary contributors.

Given site contaminant characteristics, the transport mechanisms for on-site contamination can be hypothesized. When petroleum is released into the environment, it is typically released as LNAPL. Following a petroleum release, LNAPL moves vertically downward through the unsaturated zone in response to gravity and capillary forces until it encounters a water table. The rate of migration is determined primarily by the stratification and permeability of the native soil materials. Some horizontal spreading will occur within the vadose zone during vertical migration. Accumulations of LNAPL at or near the water table are susceptible to smearing within a vertical interval from fluctuations in water-table elevations due to seasonal change forming a smear zone.

2.9.1 Mass Within Saturated Thickness of Shallow and Semi-Confined WBZs

The following describes calculations performed to estimate the contaminant mass located in adsorbed and dissolved phases within the Shallow and Semi-Confined WBZs. Historical and current sampling results were utilized; this estimate evaluated the total mass of TPH-g as the main contributor to the contaminant mass, as well as benzene and MtBE as the secondary contributors.

The methodology used to calculate the total mass of COCs present within the study area is described below. Chemicals in groundwater are in either dissolved or adsorbed phase. To calculate the total mass of chemicals (dissolved and adsorbed phase), detected concentrations of each chemical at different sampling wells were utilized.

Calculations were conducted using the following steps:

- A grid of 10 x 10 feet was overlaid at the top of the TPH-g, benzene, and MtBE plumes within Shallow and Semi-Confined WBZs.
- Using the linear interpolation routine (kriging interpolation technique) and utilizing concentration of each chemical at each sampling location, the COC concentrations were interpolated at the center of each grid cell, referenced above. Therefore, the most recent COC concentrations at each well were utilized.
- Based on lithologic logs, it was established that the saturated thickness of the water bearing formation could be conservatively estimated. For purpose of this mass estimate, an assumption was made that the saturated thickness across the study area is uniform and is averaged at 5 feet for the Shallow and at 6.5 feet for the Semi-Confined WBZs. Using an estimated porosity of the saturated thickness of 0.32 and approximated saturated thickness of 5 feet, the volume of the water at each grid cell of the Shallow WBZ was estimated at 160 ft^3 and for Semi-Confined at 208 ft^3. During this calculation, an assumption was made that the entire porous space between soil particles is filled with groundwater.
- Total mass of TPH-g, benzene, and MtBE at any given cell was calculated by multiplying its estimated concentration of a given chemical by volume of water and its retardation coefficient. The retardation coefficients for each COC were calculated: calculation details are reflected in Table 6. Multiplying by a retardation coefficient takes into account the adsorbed mass, as well as the dissolved mass of any given chemical within the saturated profile of the WBZ. The data used in the computation of the total mass in the study area that needs remediation are included in Appendix D.

Assessment results indicated that within the Shallow WBZ approximately **57** pounds of TPH-g, **2.19** pounds of benzene, and **0.032** pounds of MtBE exist in dissolved and adsorbed phases within the saturated sediments that must be addressed in order to achieve remedial cleanup goals proposed for the site. Assessment results also indicated that within Semi-Confined WBZ, approximately **8.87** pounds of TPH-g, **0.018** pounds of benzene, and **0.012** pounds of MtBE exist in dissolved and adsorbed phases within the saturated sediments. Table 6 summarizes mass calculation details.

2.9.2 Mass in Soil above the Shallow WBZ

Following is a discussion of methodologies and assumptions used in estimating the mass in soil. The area of impact from 4 feet bgs to approximately 12 feet bgs was evaluated. An approach similar to that discussed in the section above was utilized. Based on geologic logs, average thickness of the impacted zone was delineated utilizing the historical soil analytical data (Table 1). Figure 11A illustrates TPH-g distribution with depth.

In order to avoid underestimating the contaminant mass present, maximum concentrations at each sampling location were utilized. Using the above approach, a linear interpolation routine (kriging interpolation technique) and the maximum COC concentrations of TPH-g at each sampling location, contaminant mass was calculated at the center of each grid cell within the study area. Figure 11 illustrates the lateral and vertical extent of TPH-g in soil; the data utilized in preparation of above map was also utilized during the current mass calculation. SOMA utilized an ESL of 83 mg/kg as a boundary condition; any concentrations outside this boundary were excluded from this evaluation.

All grid cells within each study area were uniform, and were 10 feet in length, 10 feet in width and an average of 5 feet in thickness. Even though the study interval was between 4 and 12 feet bgs, the 5-foot COC impacted thickness was selected as an average thickness, since the contamination tended to vary with depth and did not continuously encompass the entire 4 to 12-foot sampling interval (in the past the observed seasonal groundwater fluctuation within Shallow WBZ was approximately 5 feet). Depth to first-encountered groundwater at the site has historically been at 12 feet bgs in the Shallow WBZ. Due to low COC concentrations (slightly above ESL) at greater depths (between the two WBZs) their mass was not evaluated at this time. The volume of impacted soils at each cell within the evaluated interval was calculated by multiplying the area of each cell by its thickness.

The impacted shallow soils consist primarily of sandy silts, clayey silts and sandy clays. Therefore, the estimated density and porosity for above geologic units was utilized. Mass of impacted soil at each study cell was calculated by multiplying the soil volume by estimated bulk density of 82.4 lb/ft^3. Calculated soil volume at each cell was multiplied by the cell-specific interpolated concentration, and a conversion factor to arrive at total hydrocarbon mass in pounds. Table 6 summarizes the mass estimates for TPH-g; Appendix D contains supporting documentation reflecting calculations for each cell at the study area. Assessment results indicated that approximately **468** lb of TPH-g are adsorbed to soils within the studied sampling interval beneath the site.

Table 6 also summarizes the contaminant mass distribution in shallow soils and Shallow and Semi-Confined WBZs at the site. It should be noted that due to approximations used in these calculations a minor overlap of contaminant mass within shallow soils and the Shallow WBZ could exist. As can be seen from this table, approximately **468.45** pounds of TPH-g are adsorbed to shallow soils, and the contaminant mass total for the major COC within the Shallow and Semi-Confined WBZs was **68.23** pounds (for an estimated total of **536.68** lbs). It should be noted that the process of mass calculation relies on inference and extrapolation of data and judgment in estimating data elements where there is great variability and a high margin of error; therefore, this mass estimate should be updated in the future if new data become available.

2.10 Overview of COCs Distribution

Based on the results from historical as well as the most recent well installation report (September 27, 2010) and groundwater monitoring activities at the site, the following was determined:

1. Based on analytical data from historical site investigations and ongoing GWM events, the Shallow and Semi-Confined WBZs both appear to be impacted with TPH-g and TPH-d along the western and southern portions of the site, with the highest concentrations observed in Shallow WBZ wells SOMA-5 (TPH-g at 14,000 µg/L) and SOMA-7 (TPH-d at 2,100 µg/L). MtBE concentrations were elevated in all wells except upgradient wells (MW-6R and SOMA-8) with the highest concentrations observed in Shallow WBZ well SOMA-5 (150 µg/L).
2. TPH-g and benzene concentrations dropped significantly in ESE-5R after reconstruction, while concentrations are elevated in SOMA-7, suggesting that the majority of contamination along the western portion of the site is in the Shallow WBZ.
3. MtBE concentrations appear to be highest at SOMA-5 and follow the flow of groundwater within the Shallow WBZ. Within the Semi-Confined WBZ, MtBE contamination is centered in MW-1R and along the southern portion of the property and off-site areas.
4. Based on the response of groundwater within ESE-1R, ESE-2R, MW-6R, and MW-7R, groundwater in these wells appear to be under pressure, suggesting the WBZ is semi-confined.
5. Soil contamination has been delineated vertically and horizontally, with contamination predominantly limited to 12 feet bgs along the southern portion of the site.
6. Groundwater contamination has been laterally and vertically delineated within the Shallow and Semi-Confined WBZs. Contamination in both WBZs is centered on the southern portion of the site with only some MtBE contamination extending off-site. The lateral extent of contamination is delineated by limited to non-detectable COC concentrations in downgradient SOMA-3 for the Shallow WBZ and downgradient SOMA-4 for the Semi-Confined WBZ.

2.11 Identification of Exposure Pathways and Potential Receptors

The site is located in an area of mixed commercial and residential properties. Currently, the on-site, single-story building houses station office and a food mini-mart. Commercial bank building abuts the site on the east and commercial buildings of various uses abut the station on the south. Residential properties are mainly located beyond upgradient to the site to the north, northwest and east. The only downgradient residential area in the site vicinity is located approximately 400 feet to the southwest of the site (Figure 2). Based on historical rose diagram of groundwater flow direction, also shown in Figure 2, the groundwater flow direction at the site has fluctuated between southerly and easterly, with the predominant trend to the southeast.

During the First Quarter 2011 GWM event, groundwater in the Perched WBZ was observed to flow south to southeasterly in Shallow WBZ at an approximate gradient of 0.01833 feet/feet. Groundwater in the Semi-Confined WBZ flows southwesterly across the site at an approximate gradient of 0.01102 feet/feet

SOMA evaluated Geotracker records and nearby sites, and evaluated these along with historical sensitive receptor survey conducted in August 2006. Review of records from the Department of Water Resources District identified 14 properties as having well(s) on their premises. Of these, five were reported to have irrigation wells. The remaining nine properties (locations) were reported to have monitoring or decommissioned wells. All five irrigation wells were located to the northeast (upgradient of the site) and are not expected to be impacted by contaminant plumes migrating off-site. Based on records obtained from the Alameda County Public Works Agency, 11 properties were identified as having well(s) on their premises. Of the 11 properties, two were reported to have irrigation wells; the remaining nine were reported to have decommissioned well(s), monitoring wells, or soil borings on their premises. From the two identified irrigation wells, one (No 11) is located upgradient, and the other (No 4) is located approximately 2,000 feet downgradient from the site. Utilizing the most liberal contaminant velocity of 58.96 feet per year (utilizing 10 as retardation coefficient) for TPH-g plume in Shallow WBZ, it would take approximately 33 years for the hypothetical TPH-g plume with constant plume concentrations to reach the nearby receptor. However, it should be noted that due to low retardation coefficients, less time will be required for MtBE, benzene, and TBA plumes to migrate to the downgradient areas. Although the off-site wells have shown detectable levels of MtBE and TBA in both WBZs in the past, the concentrations remain relatively low and decrease notably with distance from the source area. Therefore, it can be concluded that at this time the downgradient irrigation well (No 4), is not likely to be impacted by the contaminant plume in the immediate future; however, due to relatively fast migration of less retarded plumes, exposure to impacted groundwater is still considered to be a viable exposure pathway; although likely not a complete pathway, due to large distances and relatively small concentrations involved. No new wells were identified during the review of Geotracker records. Figure 28 (Figure 28A) illustrates locations of these sensitive receptors.

To evaluate whether existing utility lines, including water, sewer, and storm drain lines, are acting as preferential flow paths, utility maps of the site vicinity were obtained from the Castro Valley Sanitary District and Alameda County Public Works Department. As Figure 29 shows, no sewer main, storm or water lines pass through the site. A sewer, storm, water and high-pressure gas main pass the site along Redwood Road and Castro Valley Boulevard at depths from 2 to

7.2 feet bgs. Private lines that connect the site to the main sewer, storm, and main water lines run at approximately 4 feet bgs. Since depth to groundwater in Shallow WBZ wells has fluctuated in the past between 7.33 and 12.02 feet bgs, it is likely that during periods of elevated groundwater table, the private or public utility lines along Redwood road could be temporarily submerged and act preferential flow pathways facilitating a more rapid plume migration to downgradient areas.

Public records also indicated presence of seven potential sensitive receptors (facilities) within a ½-mile radius of the site. These receptors consisted of educational facilities such as learning centers and schools. Figure 30 illustrates locations and lists names of these sensitive receptors. As illustrated in this figure, most are located up- or crossgradient from the site. One learning center (Kumon Math And Reading Center) is located at 20894 Redwood Road, Castro Valley approximately 150 to 200 feet south (downgradient) from the site. This is an after-school math and reading enrichment program and is classified as part of elementary education.

Based on data from obtained from the sensitive receptor survey, as well as low to non detectable concentrations in the most downgradient site wells there is no immediate threat from exposure to site groundwater contaminants for individuals living or working in the vicinity of this site.

Based on information obtained from the Castro Valley General Plan, Castro Valley Creek, a tributary to the San Lorenzo Creek, is located approximately 200 feet to the east-southeast. Figure 30 shows the location of the creek in relation to the site. The section of the creek adjacent to the site and running from Castro Valley Boulevard north to Pine Street was identified by the Alameda County Public Works Department as an improved channel with “Oak Riparian Woodland/ Wildlife Corridor.” The creek’s base flow channel is unlined and is approximately 15 to 20 feet wide. No special-status species were reported to use the Castro Valley Creek or its vicinity as their habitat. Although Castro Valley Creek is a potentially sensitive environment, because no special-status species were reported to inhabit this creek and the creek’s relative non-proximity to the site, the likelihood of significant impact from site groundwater contaminants is minimal.

Based on the above, exposed population/receptors of on- and off-site contaminants were determined to be:

1. Current and future on-site workers
2. Current and future off-site commercial workers and residents

The COCs detected in groundwater within the Shallow WBZ can volatilize and travel by diffusion toward the land surface and possibly enter into the on-site as well as the nearby commercial buildings and residential properties. At these exposure points, they may cause adverse health effects to workers in commercial buildings and residents living nearby. The current and future on-site workers, downgradient adjacent commercial buildings, and down gradient residential properties have been identified as potential receptors.

For off-site receptors, the only source of chemicals is impacted groundwater. For current and future on-site workers, both contaminated soil and groundwater are sources of chemicals. It appears that the only exposure pathway in off-site areas is inhalation of volatile emissions from the groundwater and incidental ingestion of groundwater.

To evaluate potential health risks associated with on- and off-site occupants, hypothetical residents, and future construction workers, SOMA compared representative chemical concentrations at the site to established ESLs. In order to identify potential for vapor intrusion, current soil data was reviewed with respect to ESLs and groundwater monitoring data was reviewed with respect to the ESL values listed in Table F-1a of the California Regional Water Quality Control Board (RWQCB) Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater (May 2008). TPH-g and benzene concentrations near the site building (especially SOMA-5) were detected at maximum concentrations of 4,900 and 1,600 µg/L, above the recommended maximums for vapor intrusion into buildings, 1,000 and 540 µg/L, respectively. Since soils above the Shallow WBZ consist primarily of fine grain materials, in order to establish whether vapor intrusion is a complete exposure pathway, it may be advisable to conduct a soil gas study adjacent to the southern property boundary to the west and east of the station building.

The ESLs were used to establish initial cleanup goals, prioritize areas of concern, estimate the potential health risks, and determine whether further evaluation is warranted. The presence of a chemical at concentration exceeding an ESL does not indicate that adverse impact to human health or environment will occur. SOMA evaluated the potential exposure routes for the on- and off-site areas (Figure 3). Although the site is capped with concrete and no soil is exposed at the surface, at this time, as a conservative measure, site analytical data was compared to ESLs for residential, commercial, and trench workers exposure scenario and to ESLs for groundwater as a current or potential source of drinking water. As shown in Tables 1 through 4, many COC concentrations in groundwater and soil, especially along the southern portion of the site, exceed corresponding ESLs intended to address human health, groundwater protection, and nuisance concerns. Figure 3 shows the comprehensive SCM flowchart based on the *ASTM E-1689-55 Standard Guide for Developing SCM for Contaminated Sites*.

3. FEASIBILITY STUDY AND CORRECTIVE ACTION PLAN

Because the California Water Resources Control Board (CWRCB) recognizes that corrective actions would likely yield some level of residual contamination, it developed the following assumptions to be utilized during the corrective action planning process:

1) Cleanup of all contaminated soil and dissolved product in groundwater is not always necessary to protect public health and the environment. However, it is desirable to clean up soils and groundwater to the maximum extent practical to reduce any future risk.
2) All free product floating on groundwater should be removed, unless neither threat to beneficial uses of water nor danger to residents/workers from fire or explosion exists. (No free product has been observed in any site wells).

3.1 Remediation Target Zones

Based on results of previous assessments and quarterly groundwater monitoring/ sampling events conducted at the site, the following remediation target zones were evaluated:

1. Shallow soils above 12 feet bgs in the vicinity of pump islands and to the west and east of the station building
2. Saturated thickness of the Shallow WBZ in the southern portion of the site in dissolved and adsorbed (smear zone) phases. This zone is impacted with PHCs above acceptable levels for protecting human health and the environment and thus warrants active remedial action.
3. Saturated thickness of the Semi-Confined WBZ in the southern portion of the site (mainly in well ESE-1R) in dissolved and adsorbed phases. This zone is impacted with PHCs above acceptable levels for protecting human health and the environment and thus warrants active remedial action. However, since Semi-Confined WBZ wells were just recently reconstructed and are no longer cross-screening the impacted shallow and deeper zones, at this time it is recommended to continue groundwater monitoring for several quarters to determine whether concentrations will continue to decline and natural attenuation is occurring. During the November 2010 GWM, TPH-g was detected in well ESE-1R at 100 µg/L and benzene at 5.8 µg/L, whereas the February 2011 event revealed an increase to 1,400 µg/L and 96 µg/L, respectively. Based on the foregoing, groundwater in the Semi-Confined WBZ is not targeted for active remediation at this time.

3.2 Evaluation of No Action Alternative and Natural Attenuation

Due to the elevated COCs at the site, the no-action alternative was not recommended at this time. Natural attenuation relies on natural mass reduction processes to achieve site-specific remediation objectives within a reasonable time frame that is comparable to other more active remedial methods. Aquifers within soil of higher permeability (e.g., sands and gravel) are favorable to biodegradation; however, they also allow faster horizontal and vertical migration of the contaminant plume. Soils with lower permeability (e.g., clays and silts) increase the rate of biodegradation; however, migration is also retarded. Monitoring contaminant concentrations over a time period generates the primary evidence for the occurrence of natural attenuation. If natural attenuation is occurring, the plume will shrink and migrate more slowly than expected. The many factors involved during natural attenuation include aerobic and anaerobic biodegradation, dispersion, volatilization, and adsorption. Of these, biodegradation is the only component that results in a significant reduction of petroleum mass. PHCs and their constituents are generally biodegradable as long as indigenous microorganisms have an adequate supply of nutrients and electron acceptors, and biological activity is not inhibited by substances toxic to the organisms. Aerobic biodegradation tends to occur at the fringe of the dissolved plume and consumes oxygen, which, if not replaced, can limit the effectiveness of further aerobic biodegradation. Anaerobic biodegradation is predominant at the core of the plume and occurs much more slowly than aerobic biodegradation. To date, no attenuation parameters have been collected at the site for evaluation of the process of natural attenuation. Groundwater flow rates are an important factor in the calculation of movement toward an identified receptor. Flow rates will also influence the re-oxygenation process. Systems with low oxygen content can hinder aerobic biodegradation. It is widely accepted that oxygen levels greater than or equal to 2 mg/L in groundwater (2% in soil) are conducive to aerobic biodegradation. Other indications of well-aerated groundwater are shown by the presence of chemicals in their oxidized state (Fe3+, Mn4+, NO3-, and $SO4_{2-}$). Extreme temperatures prohibit microbial growth. The optimum temperature range is from 5 C to 45 C. Optimum pH should be 6 to 8.

The primary evidence of occurring natural attenuation exists, as illustrated by the declining COC concentration trends, however, long time spans for degradation to occur to below ESL are anticipated. For example (as shown in Section 2.8) it was estimated that TPH-g degradation to below ESL would require between 4.25 and 15.67, and even possibly 74.61 years (although the highest estimate is likely erroneous, as discussed above). The least favorable predictions concern the degradation of benzene. Benzene exhibited an increasing trend in SOMA-7 and ESE-1, and it was calculated that it would require approximately 89 years in order for benzene to reach the remediation goals for groundwater that is a current or potential source of drinking water. This indicated that attenuation alone may not be adequate to address the existing site contamination. Furthermore, in order to fully evaluate the progress of natural attenuation, the following data (not previously assessed at the site) should be gathered during the next four GWM events: DO, ORP, Fe^{+2}, NO_{3-}, and SO_4^{-2}.

Also, natural attenuation should be considered only at low-risk groundwater sites contaminated by leaking petroleum fuel USTs, as defined by CRWQCB's January 5, 1996 interim guidance (discussed in an earlier section), and when a feasibility study supports the economics of a long-term commitment. Since at this time the site could not be qualified as a low-risk groundwater site, natural attenuation would not be appropriate for addressing all remedial target zones identified above.

3.3 Evident Data Gaps for Selecting a Corrective Action for the Site

The following summarizes apparent obstacles for preparation of a complete and comprehensive CAP:

- No data results obtained from any treatability or pilot study(ies) exist at this time. These data are the basis for the remedial design and typically demonstrate the effectiveness of the proposed remediation system(s). Data analysis, which evaluates and compares the suitable corrective actions, utilizes these data.
- Since no pilot studies were completed, it is extremely difficult to estimate the amount of time required to achieve proposed cleanup goals for each proposed remedial alternative.
- Since no pilot studies were done, it is also difficult to provide a site-specific cost comparison of the various methods. Cost analyses would include all aspects of the proposed corrective action (e.g., planning, construction, operation, maintenance, reporting, verification monitoring, disposal, and decommissioning).

Therefore, as part of this report, SOMA conducted screening evaluation for several remedial approaches and proposed further pilot testing.

3.4 Evaluation of Appropriate Remedial Alternatives

Applicable remediation technologies for a CAP are identified and evaluated in the following sections. As mentioned earlier, a no-action alternative was rejected due to the nature and extent of the contamination present in relation to potential sensitive receptors. Table 7 summarizes feasibility of screened remedial approaches. As could be seen from above table, several approaches could be utilized at the site.

The following technologies were evaluated:

A. In Situ Technologies

In situ technologies involve reduction of affected media toxicity, mobility or volume without removal of the media from the subsurface. Advantages of in situ technologies can include reduction in waste or treatment residuals requiring disposal, reduction of treated media volume, and reduced potential for worker and public short-term exposures. Disadvantages of in situ technologies typically include reduced effectiveness due to soil heterogeneity, difficulty with verification of remediation progress assessment, and possible contribution to migration of dissolved petroleum hydrocarbons.

B. Ex Situ Technologies

Ex situ technologies involve reduction of affected media toxicity, mobility or volume after removal of the media from the subsurface. Advantages of ex situ technologies can include effectiveness in plume migration control, availability of remedial equipment, and increased success using well-understood and proven technologies. Disadvantages of ex situ technologies typically include greater volumes of affected media requiring treatment, disposal of waste or treatment residuals, and greater potential for short-term exposure of site workers and the public. Ex situ, technologies applicable to the site include excavation, SVE, and MPE including two-phase and dual-phase extraction methods. Extracted groundwater could be treated by adsorption onto activated carbon. After treatment, groundwater is usually discharged to the local sewer system or to surface water drainage under a National Pollution Discharge Elimination System (NPDES) permit.

C. Containment Technologies

Containment technologies are used to prevent migration of petroleum hydrocarbons from the site and protect groundwater beneficial uses. Implementation of a mechanical barrier system will be impractical in a developed an urban commercial setting.

D. Institutional Controls

Institutional controls (ICs) are used to prevent exposure of persons to affected media during corrective actions. ICs do not reduce toxicity, mobility or volume of affected media. Appropriate ICs for implementation at the site include groundwater use restrictions. Institutional controls, such as deed restrictions and safety procedures for construction workers, might be placed on the site to restrict land development to commercial use and minimize exposure. At this time, ICs are not considered feasible as a remediation option for the site.

3.5 Evaluated Technologies

The following appeared to be suitable for site remediation and were evaluated in more detail:

1. Soil excavation and off-site disposal
2. Soil vapor extraction
3. Multi-phase extraction
4. Groundwater extraction and treatment
5. Air sparging
6. Enhanced aerobic bioremediation and chemical oxidation

3.5.1 Soil Excavation and Off-Site Disposal

Soil excavation and off-site disposal is a well-proven and readily implementable technology, and a very common method of removing hazardous materials from a site. Contaminated material is removed and transported to permitted off-site treatment and/or disposal facilities. Excavation and off-site disposal is applicable to the complete range of contaminant groups with no particular target group.

Limitations of excavation:

- Physical dangers involved in working with heavy excavation equipment.
- Prohibitively high costs if the excavated volume is large or if the source materials removed are subject to land disposal restrictions that lead to high ex situ treatment costs.

Advantages of excavation:

- Source materials that can contaminate the groundwater system are removed quickly.
- Contaminant migration out of the source area stops as soon as excavation is completed.
- Excavation can compare favorably in cost and timeframe to in situ treatments where source areas are small and easily defined.
- Its perceived simplicity may make it more acceptable to responsible parties and stakeholders than innovative technologies.

Based on available data, it was determined that soil contamination extends to approximately 12 feet bgs; therefore, excavation beyond 12 feet bgs should not be necessary. Although excavation would not need to extend beyond 12 feet bgs, it was deemed to be a less desirable remedial option at this time, due to the fragmented nature of soil contamination. This fragmentation would likely require at least two excavation sites located in the immediate vicinity of the site building, resulting in unnecessary negative long-term impact on the site business and relatively high excavation costs per ton of addressed soil, in addition to the inadequacy of this alternative in remediating impacted groundwater beneath the site. However, it should be noted that excavation is an effective remedial approach for addressing shallow soil contamination at the site. Due to the fragmented nature of soil contamination and logistical issues associated with its implementation, SOMA recommends conducting pilot testing for other remedial approaches first and re-evaluating the cost of excavation as compared to other remedial options, before making a final determination.

3.5.2 Soil Vapor Extraction

Soil vapor extraction (SVE) is a remedial alternative typically used to remove PHCs impacting unsaturated soils. Advantages include ease of implementation with commonly available equipment, and potential for increase of bioremediation rates under some conditions. Disadvantages include limited recovery rate by diffusion, limited effectiveness in heterogeneous soils, and some safety and operational concerns related to presence of high concentration vapors, and upwelling of the Shallow WBZ. Due to the fine-grained nature of the shallow soil, SVE might be less effective than some other remedial options in addressing soil contamination at the site, and ineffective in remediating groundwater contamination at the site.

3.5.3 Multi-Phase Extraction

Multi-phase extraction (MPE) combines soil and groundwater treatment for remediating contamination. This alternative consists of extracting vapor and liquids from a common well, rather than from wells specifically designed to allow extraction of vapor and/or groundwater only. Vapor and liquid are removed from each well using a high vacuum pump (such as a liquid ring pump), with liquids decanted into a separate holding tank (knockout pot), and the resulting separate phases (liquid and vapor) treated using granular activated carbon (GAC), internal combustion engine (ICE), CatOx, air stripper, or other method, followed by discharge of the treated effluent to ambient air, and/or to the sanitary sewer or storm drain. Different configurations, such as dual- or two-phase extraction, can be achieved based on unique site-specific requirements.

MPE can accelerate removal of soil and dissolved groundwater contamination and remediate capillary fringe and smear zone soils with minimal disturbance to the site. MPE is most effectively implemented in areas, such as the site, with saturated soils exhibiting moderate to low hydraulic conductivity (silty sands, silts, and clayey silts). By lowering the groundwater table at the point of vapor extraction, MPE enables venting of soil vapors through previously saturated and semi-saturated (capillary fringe) soils. High vacuums typically associated with dual phase extraction (DPE) systems enhance both soil vapor and groundwater recovery rates.

The following disadvantages are associated with MPE:

- costs to implement are high at sites with high-permeability soil

- may generate large quantities of groundwater that require treatment
- requires specialized equipment with sophisticated control capacity
- requires control and monitoring during operation

Due to fragmentation of the smear zone, fine-grained nature of the WBZ and the high cost of continued MPE operation, this method may not be the most cost effective if utilized over a long period. However, due to the limited mass and nature of soil impact, and the ability of this technology to remediate saturated and unsaturated soils, it will be more effective than SVE in remediating the shallow soil and groundwater contamination at the site. Since MPE has the potential to be effective at the site, further pilot testing is necessary to determine cost effectiveness of this remedial option.

3.5.4 Groundwater Extraction and Treatment

A groundwater pump-and-treat system (GWETS) alone will not be effective in remediating the shallow soil contamination at the site; however, it will aid in containment of the plume and remediation of the dissolved contaminant mass. Therefore, since GWET will not address all target areas, it was evaluated only for effectiveness in remediating groundwater impact of the Shallow WBZ.

The basic components of a GWETS include groundwater extraction, aboveground treatment, disposal of treated water, groundwater monitoring in the subsurface, and process monitoring in the treatment system. A short-term goal of the GWET would include plume containment, and a long-term goal would include groundwater cleanup. Extraction from groundwater extraction wells by a down-hole electrical pump is more cost effective than installation of a groundwater extraction system. The GWETS has the capability to create a capture zone, preventing contaminant plume migration and reducing dissolved-phase COC concentrations in the source area, and thus expediting remediation and restoring groundwater quality in the WBZ. At this time pilot testing for other remedial technologies is proposed, however this option will be reevaluated as part of CAP.

3.5.5 Air Sparging

Air sparging (AS) is an in situ remedial technology that reduces concentrations of volatile constituents in petroleum products that are adsorbed to soils and dissolved in groundwater. This technology, involves the injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase. The air is then vented through the unsaturated zone. Air sparging is most often used together with soil vapor extraction (SVE), but it can also be used with other remedial technologies such as MPE. AS has been found effective in reducing concentrations of volatile organic compounds (VOCs) found in petroleum products at UST sites. AS is generally more applicable to lighter gasoline constituents, because they readily transfer from dissolved to gaseous phase.

When AS is combined with vapor extraction, the system creates a negative pressure in the unsaturated zone through a series of extraction wells that would be installed in the downgradient area (near the site building) to control the vapor plume migration. When utilized in this manner, air bubbles containing chemicals in the form of soil gas are removed from the subsurface. As such, this can remove chemicals from saturated and unsaturated media. One of the limitations of AS is the fact that system performance often times may be difficult to measure or interpret. As injected air rises through the formation, it may volatilize and remove adsorbed VOCs in soils within the saturated zone, as well as strip dissolved contaminants from groundwater. AS also oxygenates groundwater and soils, enhancing potential for biodegradation at sites with contaminants that degrade aerobically.

Air injected into aquifer materials has been shown to typically migrate in channels. If air bubbles form and move, the bubbles would likely induce advective water flow, resulting in substantial contact between the air and aquifer materials. However, an average grain size of 2.0 millimeters or larger is necessary for bubble flow to occur. If bubbles do not form, air will flow in channels and primarily have contact with the contaminated soil and groundwater within these channels. Generally, a more desirable air channel distribution is achieved in uniform, coarse-grained soils. Sparging in fine-grained or highly stratified soils may require very high pressures that approach or exceed soil fracturing. Presence of coarser-grained soils in the areas of greater contamination, the type of contamination that will readily volatilize, and lack of visible free product and impermeable layers, indicates that this technology may be successful at the site. Based on subsurface conditions (fine-grained sediments in the shallow subsurface) and contaminant concentrations, it was determined that AS alone may not reduce the contaminant mass to below acceptable levels warranting site closure. Based on field studies conducted by others (Calclean, www.calclean.com), it is established that in general, AS tends to significantly improve MPE effectiveness.

The introduction of air through several sparge wells stimulates in situ aerobic biodegradation of dissolved-phase petroleum hydrocarbons by increasing subsurface oxygen concentrations and enhances COC volatilization. Based on nature of soil contamination, this approach alone will not be effective in addressing all impacted site areas. However, it may also be utilized as an enhancement to either SVE of MPE. At this time, pilot testing is necessary to determine if utilizing air sparging combined with MPE will be a cost effective and feasible approach for enhancing the remediation at the site. An initial pilot testing of AS effectiveness will allow to quickly gauge whether AS is likely to be effective, moderately effective, or ineffective.

3.5.6 Enhanced Aerobic Bioremediation and Chemical Oxidation

This alternative includes introduction of an oxidizing compound or oxygen releasing compound (ORC), or both (for example ORC or RegenOx) into the subsurface via injection wells or borings. Enhanced aerobic bioremediation technologies are used to accelerate naturally occurring in-situ bioremediation of PHCs, and some fuel oxygenates such as MtBE, by indigenous microorganisms in the subsurface. Petroleum contaminant decomposition and in situ destruction may be accomplished using chemical oxidation technologies. In contrast to other remedial technologies, contaminant reduction during chemical oxidation can be seen in short time frames (e.g., weeks or months).

The introduced compounds are selected to facilitate degradation of the dissolved-phase hydrocarbons without requiring extraction or removal of effluent, vapor, or water from the subsurface. This alternative may require the installation of injection wells and/or wells to facilitate introduction of selected compounds and monitoring of the subsurface to assess treatment results. Due to the shallow nature of the source area, chemical injection shallower than 5 feet bgs may cause foaming and resurfacing through cracks in the ground of injected substances. Although it does not appear that this approach will be most desirable for addressing the near surface soil contamination (for which excavation will be the most effective alternative), injection may be effective in addressing groundwater contamination and deeper source areas.

Therefore, SOMA proposes evaluating whether injection of ORC and RegenOx will be effective at the site. RegenOx is a two-part chemical oxidant capable of treating a broad range of soil and groundwater contaminants without negative effects on aquifer/soil geochemistry or significant adverse impact on subsurface utilities (part A is an oxidant, part B an activator). ORC is a food-grade calcium oxy-hydroxide powder, which when hydrated will allow a controlled release of molecular oxygen for up to 12 months. RegenOx and ORC were selected for this site for their high effectiveness and low environmental impact. RegenOx is designed as an aggressive and fast acting (several weeks to 1 month) high-contaminant-concentration reducing technology (by means of oxidation); ORC is designed to stimulate aerobic biodegradation for extended periods up to 12 months after a single injection event, and to maximize contaminant remediation. During PHC treatment, in addition to oxidation of PHCs, RegenOx also produces a fair amount of oxygen as a result of oxidation, providing for advantageous and seamless transition from in situ oxidation to enhanced aerobic bioremediation. Product information sheets are included in Appendix E. Since injection has the potential to be effective at the site, further pilot testing is necessary to determine cost effectiveness of this remedial option.

4. PROPOSED PILOT TESTING

Based on the above feasibility study, SOMA recommends conducting two pilot testing events in order to determine whether MPE, MPE enhanced with AS, or chemical oxidation will be feasible alternatives for the site.

Results of the proposed pilot testing will be utilized in evaluating feasible remedial alternatives, and preparation of the CAP.

During the pilot testing, SOMA proposes to perform the following:

Task 1:	Test Preparation, Notifications, and Health and Safety Plan Preparation
Task 2:	Installation of Observation Wells
Task 3:	MPE and Air Sparging Pilot Testing
Task 3:	Injection Pilot Testing
Task 4:	Report Preparation

4.1 Test Preparation, Notifications, and Health Safety Plan Preparation

SOMA will prepare a site-specific Health and Safety Plan (HASP). The HASP will be prepared according to the Occupational Safety and Health Administration (OSHA), “Hazardous Waste Operation and Emergency Response” guidelines (29 CFR 1910.120) and the California Occupational Safety and Health Administration (Cal/OSHA) “Hazardous Waste Operation and Emergency Response” guidelines (CCR Title 8, section 5192). The HASP is designed to address safety provisions during field activities and protect the field crew from physical and chemical hazards resulting from drilling and sampling. The HASP establishes personnel responsibilities, general safe work practices, field procedures, personal protective equipment standards, decontamination procedures, and emergency action plans. The HASP will be reviewed and signed by field staff and contractors prior to beginning field operations.

In accordance with conditions of the various-locations Bay Area Air Quality Management District (BAAQMD) air discharge permit for the mobile treatment system unit (MTS) to be used for pilot testing. SOMA will prepare a permit modification because pilot testing may exceed 5 days/120 hours. Upon approval of the permit modification, SOMA will inform BAAQMD of the location, date and duration of the test and the vapor treatment to be utilized, and notify ACEHS a minimum of 72 hours in advance of pilot testing. Provisions will be made for on-site pretreatment of extracted groundwater utilizing granulated activated carbon (GAC) vessels and discharge, under the appropriate discharge permit, to the on-site wastewater inlet. A temporary wastewater discharge permit from the City of Castro Valley will be obtained prior to initiating pilot testing.

SOMA will obtain all appropriate drilling permits for installation of proposed observation wells, to be utilized during the proposed pilot testing, and make all appropriate notifications to the ACEHS and Underground Service Alert (USA) prior to drilling. USA will be notified to verify that the drilling areas are clear of underground utilities. Following USA clearance, SOMA will retain a private utility locator to survey proposed drilling areas and locate any additional subsurface conduits.

4.2 Proposed Installation of Observation Wells for MPE Pilot Testing

SOMA proposes utilizing the two most impacted southerly wells, SOMA-5 and SOMA-7 (2-inch wells screened from 5 to 15 feet bgs). Since observation wells are necessary when determining effectiveness of MPE pilot testing, and existing on-site wells are inadequate to provide complete coverage, SOMA proposes installation of two additional Shallow WBZ observation wells, which could also be used in future monitoring events. SOMA proposes installing the two observation wells utilizing hollow stem auger (HSA) drilling methods. General field procedures are summarized in Appendix E.

SOMA proposes installing two 2-inch shallow observation wells, OB-1 and OB-2, installed approximately 8 to 15 feet from the designated extraction wells. Well locations are illustrated in Figure 31. As can be seen from this figure, another area of elevated COC concentrations in soil exists north of the former USTs at B-3 sampling location. If MPE pilot testing proves effective, additional extraction wells may to be installed in order to provide a more complete radius of influence. Note that well SOMA-5 is situated between the two former UST excavations, backfilled with drain rock up to 7 feet bgs (creating potential preferential pathways in the vicinity). Since the proposed OB wells will be utilized during AS, both wells are positioned up-gradient from their respective extraction wells.

During installation of observation wells, the drilling crew will core the concrete surface, drill (utilizing HSA), and continuously sample well borings for lithologic logging purposes and chemical content. In addition, cored soil will be checked for attributes characteristic of smear zone, hydrocarbon odors, and visual staining, and screened using a photoionization detector (PID). PID readings will be noted on boring logs. SOMA proposes collecting soil samples if varied lithologies or highly impacted areas are encountered during drilling. Upon soil sampling, both ends of each sampling tube will be secured using Teflon tape and tubes will be immediately placed in a chilled ice chest. Soil samples will be delivered to a California state-certified laboratory under appropriate chain-of-custody protocol for analysis.

Since the Shallow WBZ was not laterally continuous at SB-6 and SB-9 locations, SOMA proposes allowing the water to stabilize at each advanced observation well, before proceeding with its construction. Screening intervals at SOMA-5 and SOMA-7 wells will be utilized as a guideline when determining appropriate screening for the proposed observation wells. All observation wells will be installed with 2-inch-diameter PVC casings with 0.02-inch-wide by 1.5-inch-long factory-slotted perforations (or other appropriate perforation); the upper portion of each well will consist of blank PVC. A 2/12 sand pack filter will be emplaced around the screens and surged to consolidate the filter packs and eliminate voids. The filter packs will be emplaced to a height of at least 1- foot above the top of the screens. The filter pack will be sealed with at least a 2-foot-thick hydrated bentonite plug followed by an annular grout seal of neat cement. A PVC cap will be fitted to the bottom casing, without adhesives or tape, to protect the extraction well from accidental damage or tampering; traffic rated utility box with internal steel protective covers and locking caps will be placed over the extraction wellhead, and will be set in concrete and resting flush with existing grade. During the proposed pilot testing, provisions will be made to equip the wellheads with appropriate compression fittings.

4.2.1 Development and Survey

SOMA will develop proposed observation wells a minimum of 72 hours following installation. Proper development will facilitate more effective pilot testing. The observation wells will be developed by bailing out sediment-rich groundwater followed by pumping and surging. This process will continue until purged groundwater clarifies substantially and groundwater quality parameters have stabilized. Groundwater stabilization parameters will be maintained during the development process and records of this data will be included as an appendix to SOMA's well installation report.

SOMA proposes surveying all newly installed observation wells, as they may be utilized in future monitoring events, by a licensed surveyor to comply with GeoTracker requirements. The survey report will be included as an appendix to SOMA's well installation report. Latitude and longitude coordinates will be surveyed to Zone III NAD 83 datum, and the elevation coordinate to NAVD 88 datum from GPS observations. Survey data will be uploaded to the GeoTracker database

4.2.2 Laboratory Analyses

Soil samples collected during observation point installation will be analyzed for the following:

- TPH-g
- BTEX, MtBE
- VOCs and fuel oxygenates, additives and lead scavengers including TBA, ETBE, DIPE, TAME, 1,2-DCA, EDB, and ethanol.

Above analysis will be conducted using USEPA Method 8260B (full list), except for TPH-g which will utilize Method 8015.

4.2.3 Waste Collection, Storage and Disposal

Soil cuttings and wastewater generated during installation activities will be temporarily stored on-site in a secure area in DOT-rated 55-gallon steel drums pending characterization, profiling, and transport to an approved disposal-recycling facility. Each drum will be labeled with site address, contents, date of accumulation, and contact phone number.

4.3 MPE Pilot Testing

SOMA proposes conducting MPE combined and air sparging pilot testing within the Shallow WBZ where the highest contaminant concentrations have been observed, utilizing SOMA-5 and SOMA-7 as extraction wells and OB-1 an OB-2 as observation (sparging) wells, and vice-versa. If during OB well installation a more contaminated or more permeable areas than those observed in wells SOMA-5 and SOMA-7 are encountered, the OB wells may be also used as primary extraction wells. Other on-site wells will also be used as observation wells to evaluate MPE influence in their vicinity.

4.3.1 Pilot Test Objectives

The overall objective of proposed pilot testing is to determine whether selected technologies are sufficiently effective and capable of achieving the removal of contaminant mass in the most efficient, cost effective and timely manner.

The first site-specific objective of MPE pilot testing is to lower the groundwater table to increase the volume of semi-saturated soil through which airflow and volatilization of constituents occur. The second objective is to remove soil vapor and groundwater from the impacted zone for treatment. The third objective is to achieve sufficient contaminant mass removal and evaluate effectiveness of the proposed technology and assess site conditions with regard to the possibility of full-scale implementation.

Pilot test results will be utilized to determine the following:

- Zone of Influence (ZOI) Evaluation: provide indications of vadose and saturated zone response to the application of vacuum. Effective ZOI can be discerned through monitoring a variety of data, including vacuum in soil gas monitoring wells and hydraulic heads in monitoring wells. ZOI will be determined by utilizing monitoring point vacuum gauges, wellhead and monitoring point vacuum from wellhead vacuum gauges and groundwater fluctuations utilizing data loggers or water level meters.
- Mass Removal: determine whether tested technologies can accomplish removal of contaminant mass at satisfactory rates. Mass removal rates will be evaluated to determine whether, if applied over a longer time, the

technology has potential to significantly reduce mass. It should be noted, however, that it can be difficult to accurately determine long-term mass removal trends based on short-term pilot testing since rates of mass removal will likely decline over time. Thus, the rate observed during pilot testing should not be expected to continue over a long period. Prior to recommending the appropriate technology, contaminant mass will be re-evaluated to allow more thorough evaluation of effectiveness of proposed remedial technologies.

- Subsurface Soil Properties/Parameters Evaluation: provide further information about the nature and variability of site-specific subsurface parameters, such as air permeability, field-identified hydraulic conductivity of the formation, and airflow rate, to be used in calculating mass removal rates and contaminant distribution.
- Groundwater pump rates: evaluate volume of extracted groundwater during the event.
- Discharge Concentrations/Design Parameters: establish initial levels of contaminants in extracted gas and liquid. These data will be used for treatment system design and discharge permitting.
- Cost: evaluate cost of full-scale system implementation and operation, as well as assessment of duration of soil and groundwater remediation.

4.3.2 Pilot Test Duration

To accomplish the above scope of work, SOMA proposes conducting a 5-day MPE pilot test. However, MPE pilot testing should continue long enough to achieve stable conditions and a steady-state dewatering of the water-bearing unit, and to obtain necessary data to evaluate its effectiveness. The typical period to approach steady-state dewatering varies, however, based on field observations. Five-day tests typically provide information necessary to determine effectiveness. However, an extended pilot test can be conducted as well (with prior ACEHS approval), if during the 5 days the system has not reached equilibrium or not enough data has been obtained to judge MPE effectiveness. In addition, a longer test will allow evaluation of long-term changes in soil vapor concentrations to be used in evaluating how concentrations will vary over time. Therefore, longer testing can aid in more accurate estimation of the time required for full remediation. Toward the end of the proposed 5-day test period, SOMA will evaluate all available data and determine whether sufficient data has been collected. If, based on this preliminary data review, extended testing is necessary, SOMA will contact ACEHS before the end of the 5 days to discuss the possibility of an extended pilot test (possibly 10 days).

4.3.3 Pilot Test Configuration

Duration of extraction from each well will be evenly distributed over the testing period, or if concentrations in one well reach steady state, then extraction will be switched to a different well to allow concentrations in that well to rebound. SOMA will utilize individual wells or all wells simultaneously, to evaluate individual and combined efficiencies. Figure 32 shows a typical layout and process flow diagram for a mobile MPE system. During implementation of MPE pilot testing, SOMA will follow guidelines and procedures documented in US Army Corps of Engineers Manual “Multi-Phase Extraction.” (US ACEM, 1999). All pertinent pilot testing information including but not limited to operation guidelines and field data sheet templates are attached as Appendix E. The layout of the pilot test is illustrated in Figure 32.

During proposed pilot testing, SOMA will evaluate the two primary MPE system configurations for effectiveness at the site: dual-phase extraction (DPE) and two-phase extraction (TPE). General configuration diagrams are included in Appendix E. DPE utilizes separate mechanical systems for pumping groundwater and extracting soil vapor from the smear zone. TPE utilizes a single vacuum pump to extract both groundwater and soil vapor through small-diameter drop tube (stinger) piping inserted in the well. The most cost-effective MPE configuration for each specific situation is determined by aquifer permeability and the corresponding yield of air and water. The water production rate needed to dewater the smear zone, and the induced vacuum generated for soil vapor extraction, will determine which system is appropriate.

If the water production rate is high (>2 gpm/well), DPE will be utilized. If the water production rate is low (<2 gpm/well), then TPE configuration will be utilized. If the induced vacuum is high (8 to 10 inches of mercury), then TPE is appropriate. If the induced vacuum is low (4 to 6 inches of mercury), DPE is more appropriate.

4.3.4 Pertinent Test Equipment

Most pilot systems are installed for temporary operation only. Compact equipment and treatment units that can be easily connected are very beneficial, especially when operating within a high traffic area with limited access and available space (e.g., gasoline station, loading dock). In some cases, however, pilot testing may represent the first phase of a staged implementation at the site. In this case, it may be desirable to oversize the equipment and equipment shelters in anticipation of future phases of the project. Therefore, SOMA proposes utilizing a self-contained mobile treatment system (MTS) during the pilot test. The layout of the pilot test is illustrated in Figure 32.

Employment of compact equipment and an MTS unit is effective because it can be easily conducted in high traffic areas with limited access and available space. Below are details.

1. The MTS is equipped with electrical generator, air compressor, liquid ring vacuum pump rated at 25-horsepower and 428 standard cubic feet per minute, electrical submersible pumps, air/water separator vessel, discharge hoses and traffic-rated hose ramps, drop tubes (stingers), and a thermal oxidizer for vapor treatment. The oxidizer operates under a valid various locations BAAQMD permit.
2. The MTS has adequate flow/vacuum range for site-specific soil type and the system is equipped with vacuum pressure relief dilution valves and temperature gauges.
3. MTS is self sufficient with capability to generate its own power utilizing diesel powered generator
4. A flow measurement device will allow for measurement of total flow; a sampling port to sample influent and effluent also be available. Samples will be collected throughout the pilot test to provide sufficient data to evaluate system efficiency.
5. All piping materials utilized during pilot testing will be appropriate for site contamination; aboveground lines connecting the individual extraction wells and the treatment system unit will be protected by rubberized traffic-rated ramps to allow for uninterrupted station operation.
6. The oxidizer for treatment of extracted vapor operates under valid various-locations BAAQMD permit.
7. Extracted soil vapor concentrations will be measured with an appropriately calibrated FID or PID.

As discussed above, two possible MPE system configurations, DPE and TPE, can be utilized. During the pilot test, influent flow rates will be regulated to achieve maximum system efficiency. Furthermore, care will be taken to seal the tops of all wells from the atmosphere to prevent short-circuiting of airflow. This will be achieved by installing a valve at the top of each monitoring/observation point, which will normally be closed but can be opened to take measurements or make necessary pilot test adjustments.

The downhole stinger utilized during pilot testing will consist of flush-threaded Schedule 40 PVC well casing (stinger) connected by flexible hose to the MTS, and slowly extended deeper into the extraction well as groundwater is removed from the well casing/screen by vacuum. Stinger depth will vary based on the pilot testing response parameters but likely will be slowly lowered until it reaches a steady state dewatering at 1 foot from the bottom of the extraction well. Due to the low water recharge rates observed during well installation, a possible complete extraction well dewatering could be seen.

Vacuum generated by the pilot test will be measured at the observation point using a magnehellic vacuum gauge (Dwyer) attached to a barb fitting connected to the air-tight valve. The gauge will have minimum range of 0.1 inches of water to 1.0 inches of water. Should vacuums greater than the minimum range be detected during the pilot test, a gauge with higher range will be substituted.

Depth to water changes in observation wells will be recorded throughout the test utilizing appropriate data loggers or water level probes. As necessary, all equipment utilized in pilot testing will be calibrated according to manufacturer's specifications.

4.3.5 Pilot Test Monitoring Methods

The following summarizes test monitoring methods to be utilized during pilot testing:

1. Above-ground vacuum and fluid flow. Measurements for above-ground vacuum are typically taken in two places: at the well head and at the inlet to the above-ground pilot system equipment (e.g., immediately upstream of the gas/liquid separator). The vacuum difference between the extraction equipment and the well head will provide an indication of the pressure drop over the conveyance piping. Vacuum measurements taken at the wellhead also give an indication of the vacuum being applied to the vadose zone.
2. Above-ground gas flow rate during TPE. Measurement of the extracted gas flow rate is performed using appropriate measuring devices. Measurement of gas velocity is typically performed using a Pitot tube, hot-wire anemometer, venturi meter, or other appropriate device positioned downstream of the point where liquid is removed from the extracted gas stream.
3. Above-ground liquid flow rate during TPE. Measurement of extracted liquid flow is performed by measuring the volume of liquid that is discharged from the gas-liquid separator over a given time interval (e.g., recording the flow rate of water pumped from the separator).
4. Above-ground fluid flow during DPE. During DPE, measurements should be taken from individual wells and from the combined gas and liquid streams emanating from multiple wells, if multiple wells are used.
5. Contaminant mass removal. Contaminant mass removal is calculated by multiplying the flow rate of gas or liquid extracted from the subsurface by the corresponding contaminant concentration in the gas or liquid stream.
6. Vacuum influence within the unsaturated zone. This can be monitored from observation wells using differential pressure gauges, which measure the difference between the pressure applied to the gauge and atmospheric pressure (i.e., they read "gauge" pressure).
7. Response of the water table to MPE. This is an important indication of the influence of MPE on the saturated zone. Drawdown is monitored by

placement of data loggers or water level meters in observation wells screened across the water Table. Drawdown is the hydrostatic head measured at such transducers prior to MPE, less that measured during MPE.

8. Measurements of drawdown. Coupled with measurements of liquid flow, applied vacuum, and elevation head at the pump inlet, this can be used with an appropriate analytical solution to estimate the transmissivity of that portion of the formation that is intersected by the well screen.

4.3.6 Proposed Baseline, Test, and Post-Test Data Collection

All wells utilized in pilot testing will be sampled prior to initiating testing and at least one week after pilot testing. To minimize costs, pilot testing ideally will be coordinated with the scheduled groundwater monitoring event for either the pre- or post-test sampling. Further post-test sampling will be conducted by evaluating contaminant concentrations in short-term and longer-term effects on site contamination.

Groundwater elevations will be measured at observation wells as well as existing groundwater monitoring wells using an electrical water level meter graduated in tenths of inches. Before start of pilot testing, water-level meters will be calibrated against each other in the field by measuring known water levels in existing monitoring wells.

Before pilot testing begins, all appropriate gauges will also be calibrated in the field, in accordance with manufacturer recommendations. Each observation well will be vacuum tested through an airtight valve attached to the airtight well cap observing any evidence of air leakage around the cement/bentonite grout seal of the well. Foam, such as shaving foam, will be used to detect such leaks; the foam collapses if air leakage under vacuum is occurring. If leakage is evident, the well will be repaired and, if not feasible, it will not be used as a vacuum monitoring/extraction well.

4.3.7 Pilot Testing Start-up and Operation

During initial startup, SOMA will check for blockages, piping leaks, equipment functioning, and safety of the overall test setup and operation. Over the first two hours of the test, and when a new well or combination of wells is utilized, data from observation wells will be collected more frequently (every 10, 30, 60, 90, and 120 minutes). Thereafter, groundwater and vacuum measurements will be recorded daily, at a minimum of every 4 hours during daytime operating hours.

Prior to insertion of the stinger, the total depth of each well, utilized at any given time, and depth to groundwater will be measured. The stinger utilized will consist of flush-threaded Schedule 40 PVC well casing or flexible hose connected to the MTS, and slowly extended deeper into the extraction well as groundwater is removed from the well casing/screen by vacuum, until the bottom of the stinger is at approximately 1 foot from the bottom of the well.

The MTS system will operate continuously throughout the pilot test; however no overnight data collection is proposed at this time. Following initial startup, MTS operational data will be measured at approximately the same frequency as observation wells and include:

1. Oxidizer temperature and pump/air temperature as displayed on the MTS control panel.
2. Pump/air temperature as displayed on the MTS control panel.
3. Total flow will be measured within the treatment system using a pilot tube after the vacuum pump outlet before the oxidizer.
4. Dilution flow will be read directly at the gas flow gauge at the air dilution flow control valve before the liquid ring pump. Flow will be reported in scfm units.
5. Total liquids removed will be read by the flow meter after the transfer pump attached to the bottom of the knockout pot.
6. Vacuum generated by the pilot test will be measured at the observation wells as well as existing groundwater monitoring wells. Induced vacuum will be measured using a magnehellic vacuum gauge (Dwyer), attached to a barbed fitting attached to an airtight well cap with expanding gasket fitted to the inside of the well casing. The gauge will have a minimum range of 0.1 inches of water to 5-10 inches of water. Should vacuums greater than the maximum range be detected during the pilot test, a gauge with higher range will be substituted.
7. Vapor samples and concentration readings will be taken on the discharge side of the liquid ring pump. Vapor samples will be collected in Tedlar bags and submitted to a California state-certified environmental laboratory for analyses. Samples will be collected at achievement of steady-state drawdown, in the beginning and at the end of the test. A sample will also be obtained from the oxidizer stack within 24 hours of the start of pilot test to demonstrate compliance with BAAQMD various-locations permit conditions.
8. Water table elevation changes will be measured utilizing appropriate water level instrumentation.
9. Extracted soil vapor concentrations will be measured with an appropriately calibrated flame ionization detector (FID) or PID calibrated to hexane.

Appendix E includes MTS Operational Data Sheets and MTS Monitoring Point Data Sheets for recording data.

The above data will be collected to determine the following:

- Gas phase mass removal and groundwater extraction rate - increase at higher applied vacuum is favorable
- Water table elevation changes - indication of zone of pumping influence. Steeper cone of depression may increase gravity gradient for LNAPL flow to well
- Groundwater mass removal - increase may indicate that pumping is occurring from source area

Sections above detail procedures and measurements to be taken before, during and after pilot testing. Operational and monitoring data will be collected periodically during testing.

Appropriate groundwater samples will be collected from the effluent line to demonstrate compliance with the temporary waste discharge permit, which will be utilized for groundwater disposal.

Appendix E includes MTS Operational Data Sheets and MTS Monitoring Point Data Sheets for recording data. MTS operational data will include oxidizer temperature, pump/air temperature, total flow, dilution flow, well flow, and total liquids removed by vacuum.

4.3.8 Laboratory Sample Analysis

Collected groundwater samples will be analyzed for the following:

- TPH-g (EPA Method 8260)
- VOCs (EPA Method 8260, full list including 1,2-DCA)

Collected vapor samples will be used to evaluate contaminant mass removal rates. Vapor samples collected during the pilot test will be analyzed for the following:

- TPH-g and BTEX using USEPA Test Methods TO-3 and TO-15 (full list).

4.3.9 Effluent Treatment Provisions

In order to minimize costs associated with groundwater disposal, SOMA proposes utilizing on-site treatment of extracted groundwater utilizing a GAC, and subsequent discharge of treated groundwater to a public sewer system under appropriate temporary discharge permits. Groundwater extracted during the pilot test will be stored on-site (Baker Tank), treated, and discharged to the local sanitary sewer at the on-site sewer drop cleanout.

Extracted vapor will be treated using an on-board thermal/catalytic oxidizer and discharged to the atmosphere under appropriate various-locations BAAQMD permit.

4.3.10 Projected Schedule

The workplan will be implemented upon receipt of written authorization from ACEHS, and cost preapproval from the CWRCB Underground Storage Tank Cleanup Fund program. We anticipate that the proposed work, including observation wells installation, can be completed in six weeks following receipt of the required permits and approvals.

4.4 Air Sparging Pilot Testing

4.4.1 AS Pilot Testing Summary

Field pilot studies are necessary to adequately design and evaluate any AS system. For cost saving purposes, the proposed observation wells (proposed in sections above) will be used during AS and MPE pilot testing. In addition, because sparging can induce migration of constituents, pilot tests without vapor extraction are generally not conducted. MPE will be utilized concurrently with AS to determine whether MPE effectively controls the vapor plume and whether AS improves the efficiency of MPE. Improvement in MPE efficiencies will be determined by evaluating the difference in influent vapor concentrations and mass removal rates during MPE testing alone and during MPE enhanced by AS. At this time, no dedicated sparge wells screened specifically for AS (targeting lower areas) are proposed.

Prior to preparations for the AS pilot testing, as part of the groundwater monitoring event that precedes the pilot test, SOMA proposes analyzing the groundwater for dissolved iron. Special consideration must be given if iron concentration is greater than 10 mg/L, but less than 20 mg/L, because periodic maintenance will be required for the permanently installed air sparging treatment system to remain operable. Sites with iron concentrations exceeding 20 mg/L will not be suitable for AS. If dissolved iron concentrations are below 10 mg/L, AS will be considered a suitable remedial technology and SOMA will proceed with proposed pilot testing.

Once the MPE portion of testing is complete, SOMA will utilize AS in combination with MPE. During this phase of pilot testing, MPE will be implemented in the same way as described in above sections.

It is anticipated that equal time will be allocated to each stage of the test (MPE and AS), though adjustments based on observed field conditions may be made. The duration of each phase will be determined in the field based on the observed field parameters. The AS portion of the test will be conducted with the sparging point operating at variable sparge pressures (e.g., 5 pounds psig, 10 psig, etc.) and different depths (feet below dissolved phase plume). The vapor equilibrium will be obtained prior to changing the sparge rate or depth. When no change in vapor emission rates from baseline occurs, the AS system may not be controlling the sparge vapor plume, possibly due to soil heterogeneity. The duration of each test will depend on the time it takes for the measured parameters to reach equilibrium. Frequency of data collection will be largely based on site-specific factors. Field screening will be conducted for hydrocarbons with an FID or a PID. Gas samples will be collected for field screening in appropriate Tedlar bags.

Cycling or pulsing of the air flow during operation of an AS system promotes mixing of water in the treatment zone, effectively increasing contact between air and contaminated aquifer materials and reducing the effects of diffusion limitations and contaminant concentration gradients that form during continuous operation (EPA, 1997). Accordingly, SOMA proposes utilizing continuous as well as pulsing air injection during pilot testing to determine whether such operation will increase operation efficiency.

If AS is implemented at the site, provisions will be made for MPE system air removal rates to be at least five times greater than sparge system air injection rates; this will help to eliminate possible explosive hazards from developing during system operation.

4.4.2 AS Test Location and Equipment

The air injection system consists primarily of an injection well, injection blower or pump, and ancillary equipment to include a pressure relief valve, inlet filter, and flow control valve to meter injection rates. The AS equipment will consist of a 7.5-horsepower (or other appropriate size) trailer-mounted rotary vane compressor, equipped with pressure gauge, flow meter, and manifold for up to three AS wells, a typical pilot test schematic is shown on Figure 33.

Temporary aboveground plumbing and electrical connections will be utilized during pilot testing; care will be taken to ensure that the blower power supplies are adequate to prevent thermal overload, and that the air supply piping is compatible with the blower outlet temperatures. The surface mechanical system will be tested prior to injecting subsurface air to verify that the components work as designed. Injection pipes or tubing may be connected to the riser using threaded connections, fittings, or no-hub connectors; care will be taken to prevent air leakage at joints. It is advantageous to finish the well-head completion with a tee, with air injection from the side and a threaded plug on the top to allow ready access to the well for sampling or gauging. A check valve may be necessary for pulsed injection to prevent backflow up the well following shutdown.

DO concentrations (pre and post test) within the saturated zone could be used to estimate the extent of potential contaminant removal through biodegradation and an approximation of ZOI. Groundwater elevation changes will be monitored via water elevation probes in water table monitoring wells. Monitoring will be initiated immediately prior to commencing injection (to establish baseline conditions), and as continuously as practicable for each parameter during initial transient conditions. AS data sheets, which will be utilized for data collection during pilot testing, are attached in Appendix E.

Pilot testing equipment will be set up to allow control of the flow rate and pressure within each extraction/sparge location. During pilot testing SOMA will monitor vapor extraction rates, water extraction rates, air injection rates, vacuum/air pressure, and vacuum influence in nearby wells. Depth to groundwater will be measured before, during and after testing.

4.5 Injection Pilot Test

SOMA proposes evaluating effectiveness of subsurface injection utilizing DP (Geoprobe) drilling technology. General field procedures are summarized in Appendix E. Prior to implementing any injection, SOMA proposes preliminary aquifer volume testing in the form of injection of a non-reactive (tap water) material. SOMA proposed injecting a volume of water that is approximately 25 percent greater than the anticipated volume of compound, to determine if subsurface hydrogeology will be conducive to injection of aforementioned contaminants.

This pilot testing will occur after the proposed MPE, pending permitting process and availability of necessary equipment. Results of this pilot testing will be utilized to determine the effectiveness of this approach and to design an effective injection grid based on observed subsurface conditions and contaminant concentrations in the treatment area. Based on known site geology and contaminant distribution, preliminary injection estimates were evaluated. The anticipated injection volumes are provided in Appendix E.

For the aquifer volume testing, SOMA will utilize the proposed IPT-1 and IPT-2 borings, shown in Figure 31. The estimated volume of water to be injected is 105 gallons through each injection point. This testing will help verify aquifer capacity to accept the designed volume of chemical compounds discussed above, and help establish pumping/injection rates to be used during the injection process. Aquifer testing results will be utilized to evaluate and adjust the proposed treatment injection volumes. Due to the limited nature of COC contamination in the Semi-Confined WBZ, this zone is not the target remedial zone. However, if the elevated COCs in well ESE-1R will not continue to decline in future quarters (post well-reconstruction), an active remedial action may be needed in the future. Therefore, for cost saving purposes, SOMA proposes that injection pilot testing be conducted on both WBZs, since it can be done through a single DPT borehole, allowing for testing of deeper zone at a fraction of the cost. Therefore, SOMA proposes advancing each test boring to 25 (30) feet bgs and injecting tap water into both WBZs.

The aquifer test borings will be advanced using DP technology rig (Geoprobe 8040). DPT is an efficient method of advancing soil borings while preventing cross-contamination. It involves hydraulically hammering a set of steel rods into the subsurface with an injection rod attached. Appendix E describes the standard operating procedure for injecting substance into a boring using a Geoprobe pump with capabilities of up to 2,000 PSI. The injection point will be advanced to total depth and the water will be injected from the bottom of each boring throughout the entire anticipated treatment interval up to 3 feet bgs. Observations of more permeable areas and their respective injection rates will be documented on field notes and will be made part of final report. Once injection is complete, test borings will decommissioned according to Cal/EPA guidelines with a neat-cement grout mixture and completed at the surface with rapid-set cement grout and jet-black dye at the top to match existing grade.

The water injection rates as well as the final quantity of injected water will be evaluated to determine whether the test was very effective, moderately effective, or ineffective. If pilot testing shows this approach to be very effective, it will be evaluated against other pilot testing remedial options to determine the most cost-effective remedial alternative. If it shows to be moderately effective, further evaluation may be conducted to determine whether different configurations or methodology may yield better results. For example, a more closely spaced injection grid may be evaluated for cost effectiveness. If this approached is not effective during aquifer testing, it will not be evaluated further.

Soil and wastewater generated during boring activities will be temporarily stored on-site in separate labeled DOT-rated 55-gallon steel drums pending characterization, profiling, and transportation to an approved disposal/recycling facility under appropriate waste manifests.

4.6 Report Preparation

Upon completion of all field activities, SOMA will prepare a report documenting: observation wells, installation activities, pilot testing implementation and data evaluation, and conclusions and recommendations.

Data collected during the pilot tests will be analyzed and used to determine the following:

- Air/water flow rate necessary to achieve steady-state dewatering in each of the extraction wells
- Mass removal rate from each extraction well, cumulative if multiple wells are used, and mass removal trends and calculations

- Site specific configuration evaluation DPE vs. TPE
- Concentration and mass removal trends
- ZOI
- Subsurface properties
- Potential groundwater extraction rates
- Discharge concentrations/ design parameters
- Contaminant mass removal rates calculation and system effectiveness

The section reporting MPE pilot testing activities will also include the following:

- A description of the MPE pilot test, procedures and field equipment utilized, duration of test, and parameters measured, with and without AS implementation.
- Results of monitored field parameters and chemical analyses of samples collected during the pilot test (a diagram identifying test equipment and where measurements were made, identification of the casing to stinger vacuum ratio and its impact on the use of MPE; calculations for mass removal rate (lb/day). SOMA will also present an evaluation of measured drawdown versus dewatering; ZOI; graphs of vacuum and depth to groundwater versus distance from extraction wells; evaluation of groundwater production rates. If mass removal rates are considered satisfactory, and cumulative recoveries are sustained, MPE may be deemed a feasible remedial alternative. Furthermore, groundwater monitoring and MPE results will be utilized to calculate site-specific conductivity parameters, evaluate pumping rates, hydraulic gradients, and groundwater and contaminant velocities.
- A discussion and summary of test findings regarding the feasibility of utilizing MPE technology to effectively remediate the smear zone at the site, including vacuum pressure drops, subsurface air and groundwater flow rates, response of the vadose and saturated zone to the pilot test. Effectiveness and cost evaluation of MPE if determined feasible for future site implementation (if initial mass removal rates are greater than 15 pounds/day/well, and cumulative recoveries are sustained, there is demonstrated potential for significant post-remediation concentration reduction, and MPE is likely to be feasible.) This section will also include a discussion concerning AS effectiveness and its impact on MPE efficiency.

The section reporting water injection pilot testing activities will include results and methodology utilized during advancement of injection borings and evaluation of water injection effectiveness. It will evaluate the subsurface conditions with respect to water injection rates per each WBZ and the quantity of injected groundwater. If the proposed water quantity is successfully injected in to the subsurface in the timely manner, the chemical injection is likely to be feasible.

These estimates will be used to estimate the quantity of chemicals that the formation will be able to receive and aid in determining cost effectiveness of this remedial approach as compared to others. The report will also provide SOMA's conclusions and recommendations.

5. CONCLUSIONS AND RECOMMENDATIONS

1. Based on analytical data from historical site investigations and ongoing monitoring events, the Shallow and Semi-Confined WBZs both appear to be impacted with COCs along the western and southern portions of the site, with the highest concentrations observed in Shallow WBZ wells SOMA-5 and SOMA-7.
2. TPH-g and benzene concentrations dropped significantly in ESE-5R after reconstruction, suggesting that the majority of contamination along the western portion of the site is in the Shallow WBZ. MtBE concentrations also appear to be highest at SOMA-5, although MtBE is the only COC, which has been detected during the latest monitoring event in the off-site areas in both Shallow and Semi-Confined WBZs.
3. Soil contamination has been delineated vertically and horizontally, with contamination predominantly limited to 12 feet bgs along the southern portion of the site.
4. Groundwater contamination has been laterally and vertically delineated within the Shallow and Semi-Confined WBZs. Contamination in both WBZs is centered on the southern portion of the site with some MtBE contamination extending off-site. The lateral extent of contamination is delineated by limited to non-detectable COC concentrations in downgradient SOMA-3 for the Shallow WBZ and downgradient SOMA-4 for the Semi-Confined WBZ. The majority of contaminant mass is located in the shallow soils and in Shallow WBZ in the vicinity of site building, former USTs, and piping.

5. TPH-g and benzene concentrations near the site building (SOMA-5) were detected at 4,900 µg/L and 1,600 µg/L, above recommended maximums for vapor intrusion into buildings (1,000 µg/L and 540 µg/L, respectively). Although soils above the Shallow WBZ consist primarily of fine grain materials which retard vapor migration, in order to definitively establish whether vapor intrusion is a complete exposure pathway for the site and adjacent downgradient properties, it may be advisable to conduct a soil gas study adjacent to the southern property boundary west and east of the station building.

6. Decreasing concentration trends were observed in most site wells with exception of benzene in ESE-1R and SOMA-7. Since Semi-Confined WBZ wells were just recently reconstructed and are no longer cross-screening the impacted shallow and deeper zones, at this time it is recommended to continue groundwater monitoring for several consecutive quarters to

determine whether concentrations will continue to decline. In addition to standard monitoring, SOMA recommends evaluating pertinent natural attenuation indicators for this WBZ (e.g., DO, ORP, Fe $^{+2}$, NO_{3-}, and SO_4^{-2}). Therefore, in order to evaluate the decrease in COC concentrations (especially in Semi-Confined WBZ wells), SOMA recommends conducting the next several monitoring events on a quarterly basis.

7. Since at this time the site could not be characterized as a low risk case, SOMA proposes implementing field pilot testing for MPE, AS, and injection, to aid in preparation of the CAP. SOMA will install proposed observation wells, implement field-testing, and prepare a report summarizing results, findings, and recommendations. This report will also include a discussion regarding feasibility and cost effectiveness of utilizing the evaluated technologies and review of other remedial options in order to select the most feasible and cost-effective remedial alternative for addressing site contamination.

6. REFERENCES

California Environmental Protection Agency. Guidance Manual for Monitoring Well Design and Construction for Hydrologic Characterization. July 1995.

California State Water Resources Control Board. Leaking Underground Fuel Tank Guidance Manual Version 2.0 – October 4, 2010.

US EPA. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites. A Guide for Corrective Action Plan Reviewers. EPA 510-R-04-002. May 2004.

US Army Corps of Engineers. Engineering and Design. Multi Phase Extraction. EM 1110-1-4010. 1 June 1999.

California Regional Water Quality Control Board San Francisco Bay Region. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Interim Final - November 2007 (Revised May 2008)

CERTIFICATION

SOMA Environmental Engineering, Inc. has prepared this report on behalf Mr. Mirazim Shakoori, for property located at 3519 Castro Valley Boulevard, Castro Valley, California. This report was prepared in response to January 13, 2011 correspondence from Alameda County Environmental Health Services, Environmental Protection Division.

Mansour Sepehr, PhD, PE
Principal Hydrogeologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
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Exp. 3-31-12
CIVIL
STATE OF CALIFORNIA

FIGURES

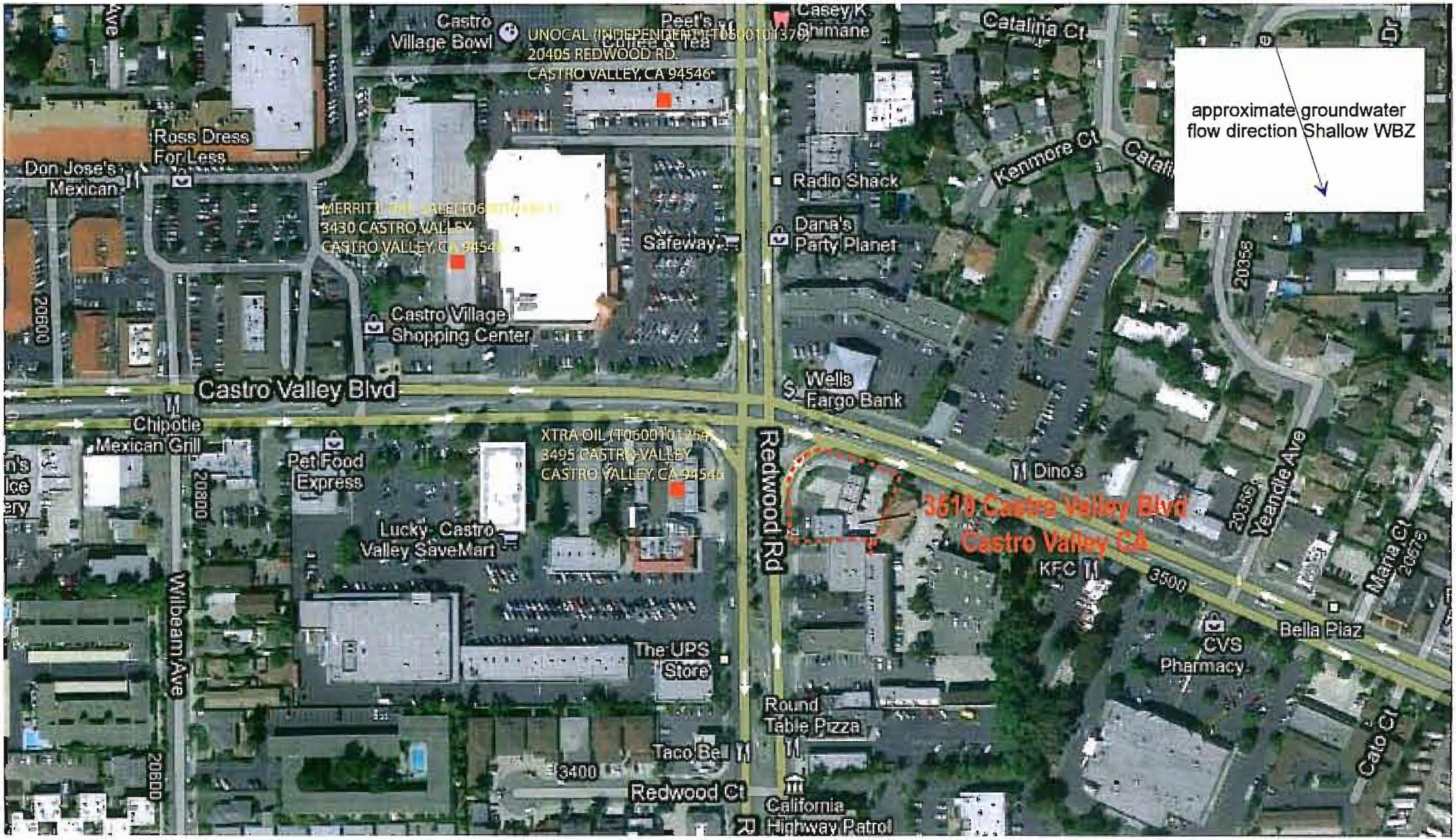

Figure 1: Site vicinity map.

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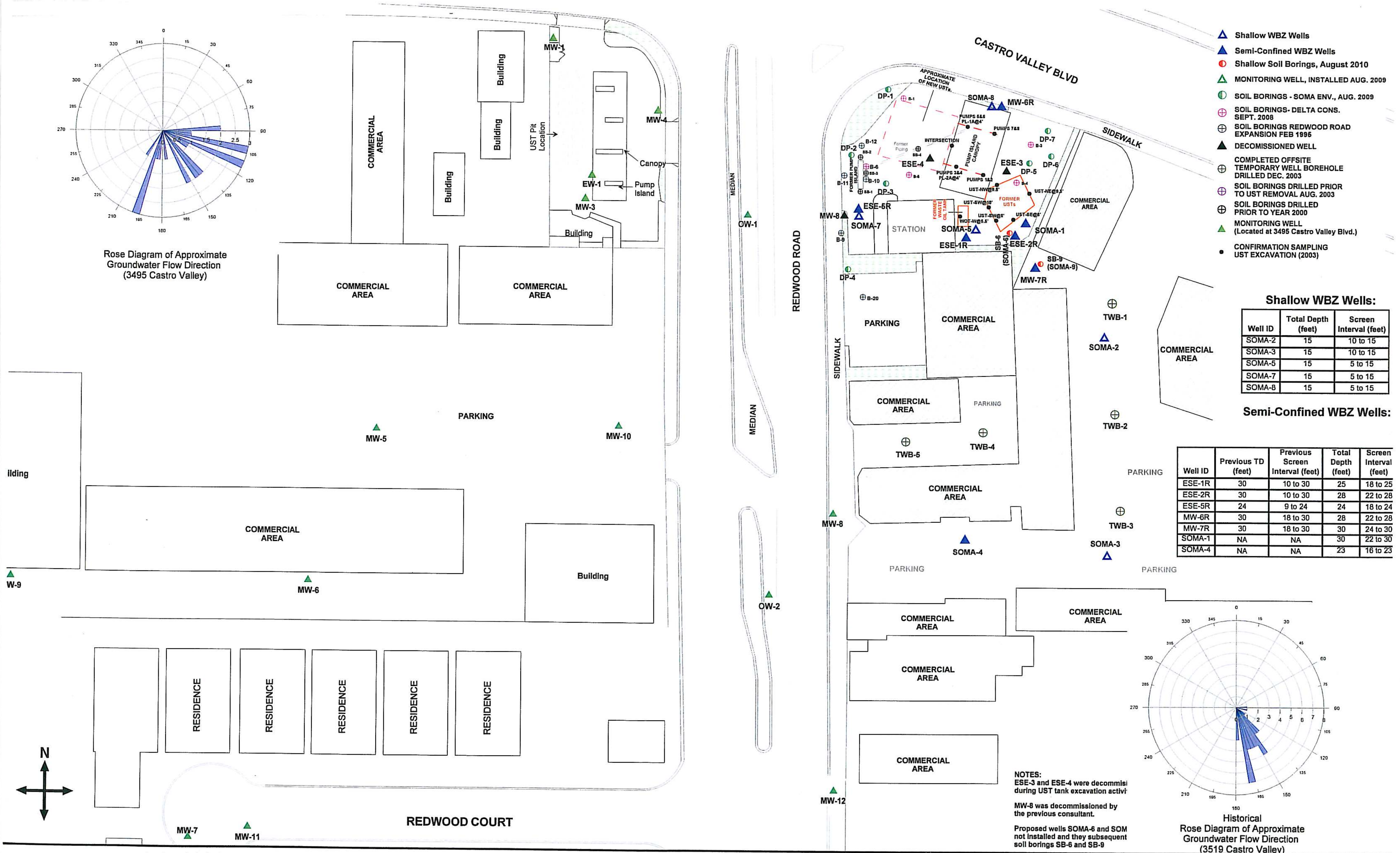


Shallow WBZ Wells:

Well ID	Total Depth (feet)	Screen Interval (feet)
SOMA-2	15	10 to 15
SOMA-3	15	10 to 15
SOMA-5	15	5 to 15
SOMA-7	15	5 to 15
SOMA-8	15	5 to 15

Semi-Confined WBZ Wells:

Well ID	Previous TD (feet)	Previous Screen Interval (feet)	Total Depth (feet)	Screen Interval (feet)
ESE-1R	30	10 to 30	25	18 to 25
ESE-2R	30	10 to 30	28	22 to 28
ESE-5R	24	9 to 24	24	18 to 24
MW-6R	30	18 to 30	28	22 to 28
MW-7R	30	18 to 30	30	24 to 30
SOMA-1	NA	NA	30	22 to 30
SOMA-4	NA	NA	23	16 to 23

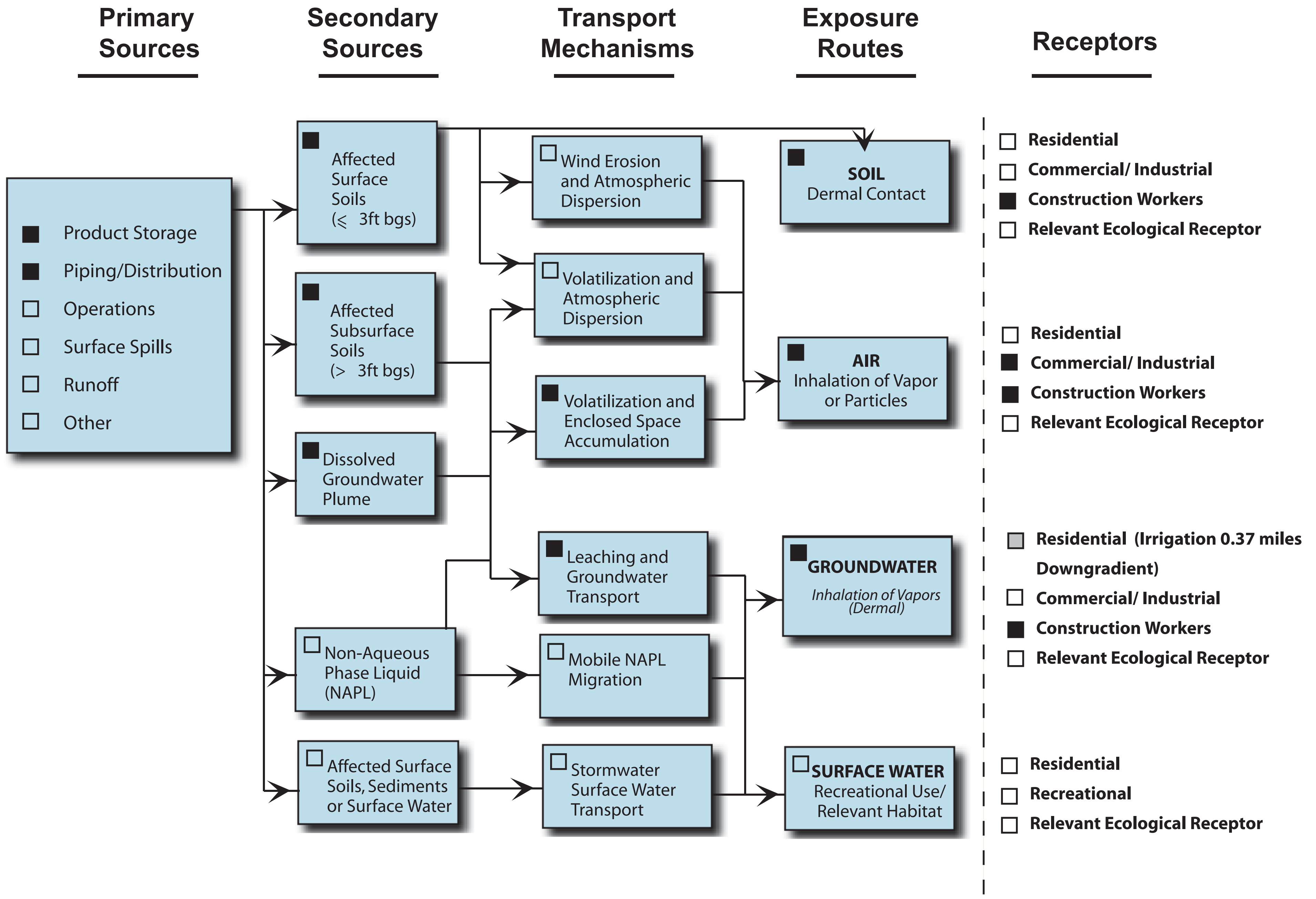
NOTES:
ESE-3 and ESE-4 were decommisi
during UST tank excavation activi

MW-8 was decommissioned by
the previous consultant.

Proposed wells SOMA-6 and SOM
not installed and they subsequent
soil borings SB-6 and SB-9

Figure 2: Site map showing locations of existing monitoring wells, decommissioned wells, offsite temporary well boreholes, monitoring wells installed by SOMA, and monitoring wells located at neighboring service station.

3519 Castro Valley Blvd., Castro Valley, CA



Source: ASTM E-1689-95 Standard Guide for Developing Conceptual Site Models for Contaminated Sites

Figure 3: Updated SCM Flow Chart

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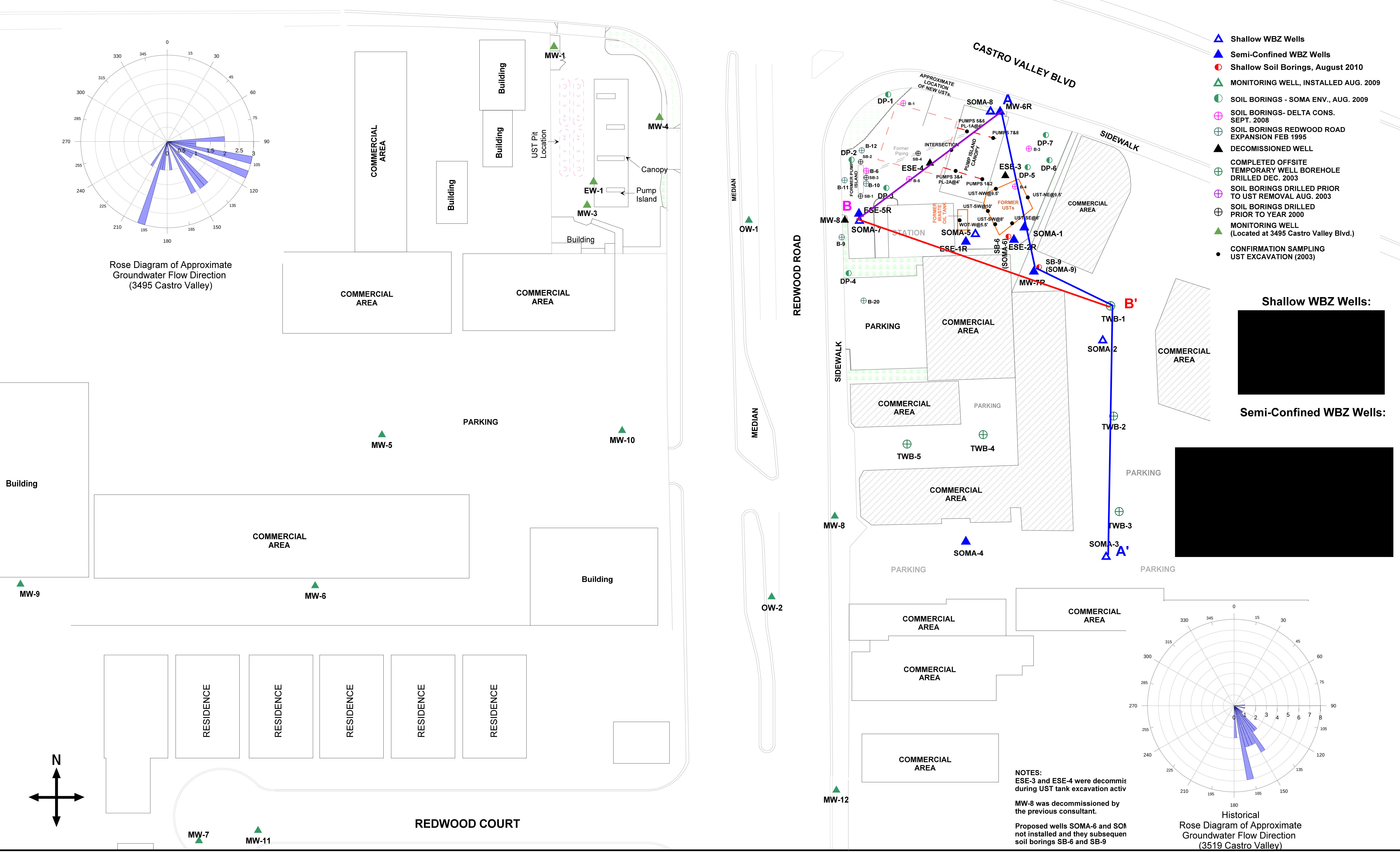

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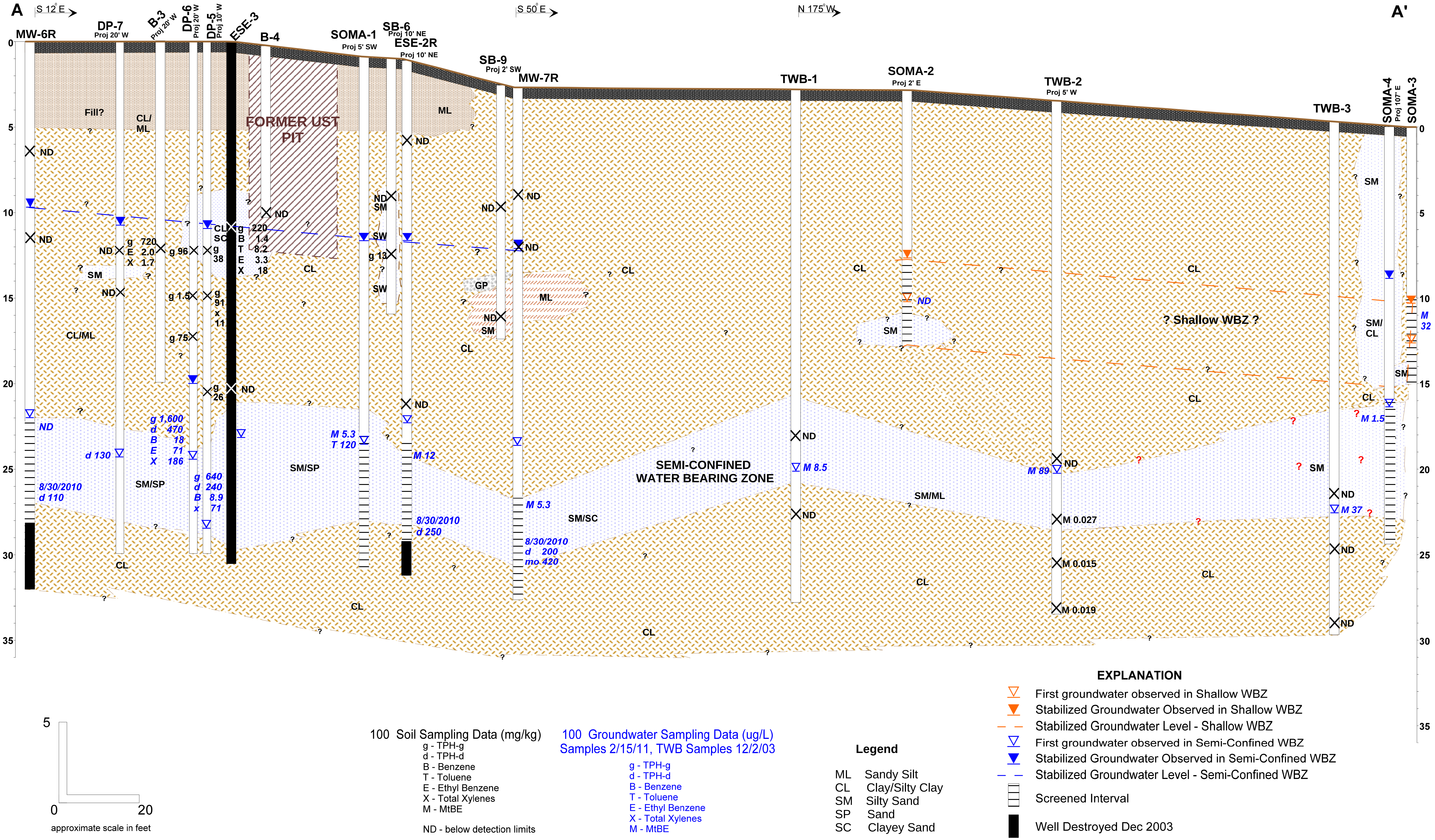
MW-8 was decommissioned by
the previous consultant.

Proposed wells SOMA-6 and SOM
not installed and they subsequen
soil borings SB-6 and SB-9

Figure 4: Site Map Showing Locations of Geological Cross-Sections

SOMA ENVIRONMENTAL ENGINEERING, INC.



100 Soil Sampling Data (mg/kg)
g - TPH-g
d - TPH-d
B - Benzene
T - Toluene
E - Ethyl Benzene
X - Total Xylenes
M - MtBE

ND - below detection limits

100 Groundwater Sampling Data (ug/L)
Samples 2/15/11, TWB Samples 12/2/03
g - TPH-g
d - TPH-d
B - Benzene
T - Toluene
E - Ethyl Benzene
X - Total Xylenes
M - MtBE

ND - below detection limits

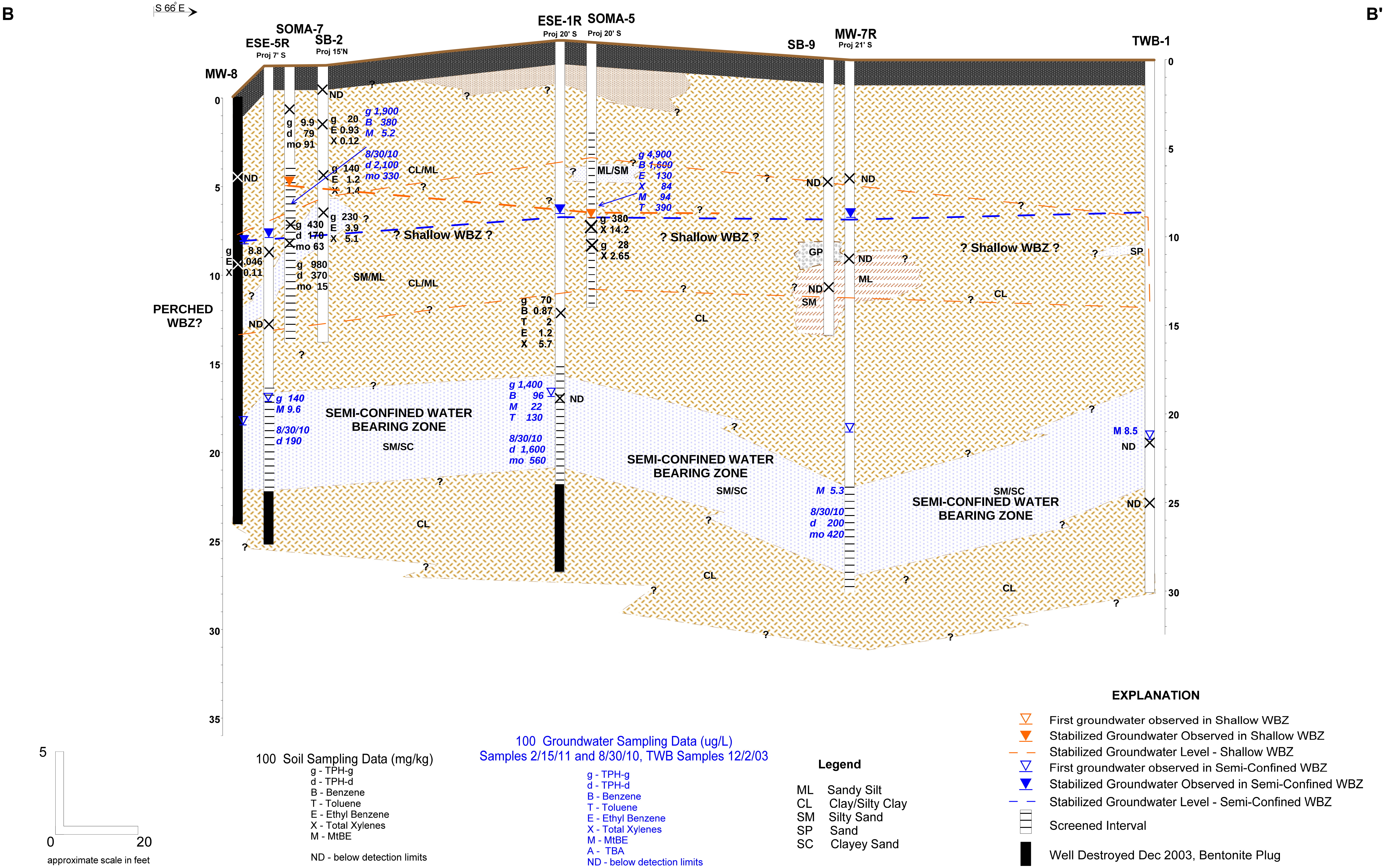
Legend

ML	Sandy Silt
CL	Clay/Silty Clay
SM	Silty Sand
SP	Sand
SC	Clayey Sand

EXPLANATION

▽	First groundwater observed in Shallow WBZ
▼	Stabilized Groundwater Observed in Shallow WBZ
– –	Stabilized Groundwater Level - Shallow WBZ
▽	First groundwater observed in Semi-Confined WBZ
▼	Stabilized Groundwater Observed in Semi-Confined WBZ
– –	Stabilized Groundwater Level - Semi-Confined WBZ
☰	Screened Interval
■	Well Destroyed Dec 2003

Figure 5: Geologic Cross-Section A-A'



100 Soil Sampling Data (mg/kg)
g - TPH-g
d - TPH-d
B - Benzene
T - Toluene
E - Ethyl Benzene
X - Total Xylenes
M - MtBE

ND - below detection limits

100 Groundwater Sampling Data (ug/L)
Samples 2/15/11 and 8/30/10, TWB Samples 12/2/03
g - TPH-g
d - TPH-d
B - Benzene
T - Toluene
E - Ethyl Benzene
X - Total Xylenes
M - MtBE
A - TBA
ND - below detection limits

Legend

ML	Sandy Silt
CL	Clay/Silty Clay
SM	Silty Sand
SP	Sand
SC	Clayey Sand

EXPLANATION

▽	First groundwater observed in Shallow WBZ
▼	Stabilized Groundwater Observed in Shallow WBZ
— —	Stabilized Groundwater Level - Shallow WBZ
▽	First groundwater observed in Semi-Confined WBZ
▼	Stabilized Groundwater Observed in Semi-Confined WBZ
— —	Stabilized Groundwater Level - Semi-Confined WBZ
☰	Screened Interval
▮	Well Destroyed Dec 2003, Bentonite Plug

Figure 6: Geologic Cross-Section B-B'

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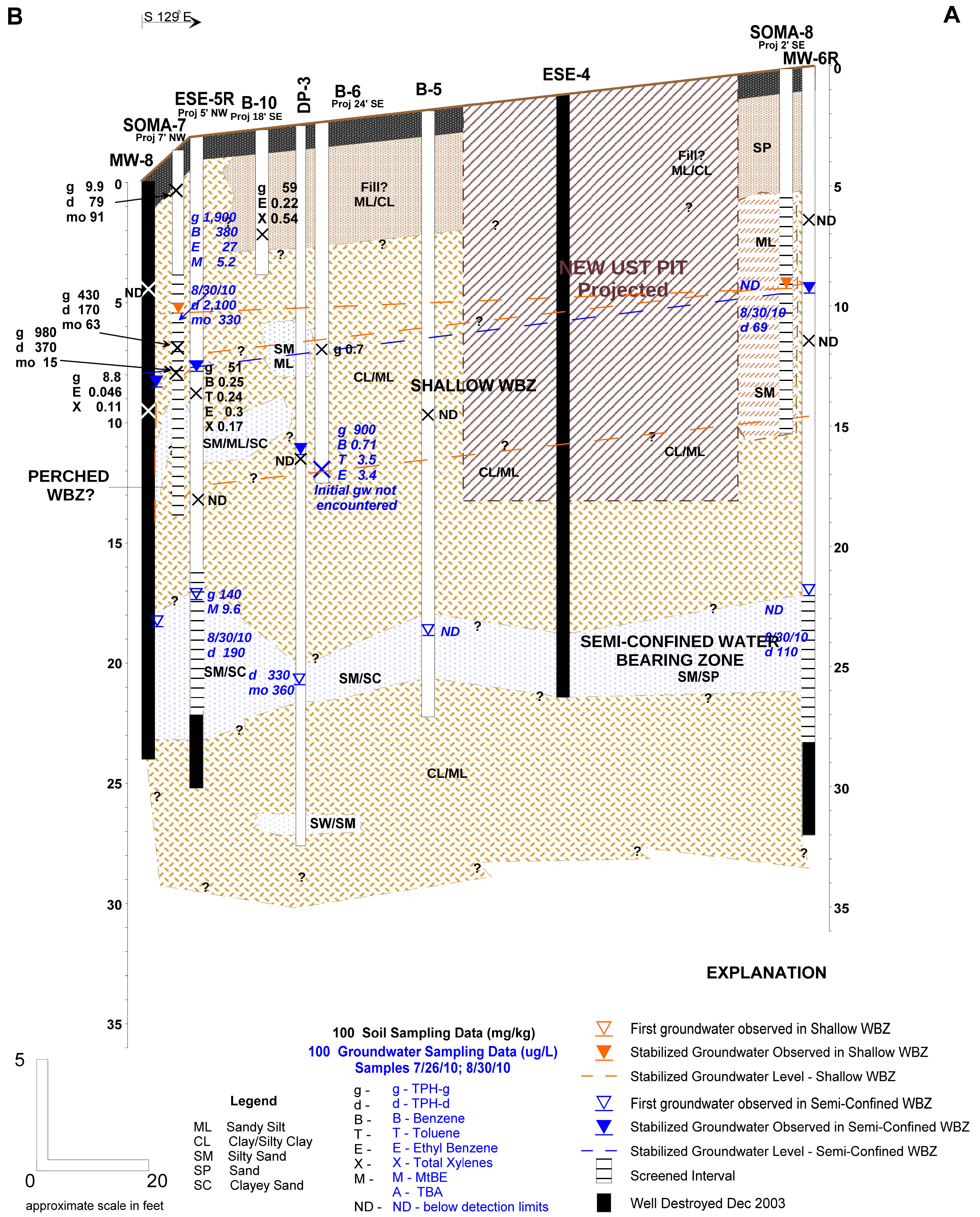


EXPLANATION

100 Soil Sampling Data (mg/kg)

100 Groundwater Sampling Data (ug/L)
Samples 7/26/10; 8/30/10

Legend

ML	Sandy Silt
CL	Clay/Silty Clay
SM	Silty Sand
SP	Sand
SC	Clayey Sand

g -	g - TPH-g
d -	d - TPH-d
B -	B - Benzene
T -	T - Toluene
E -	E - Ethyl Benzene
X -	X - Total Xylenes
M -	M - MtBE
	A - TBA
ND -	ND - below detection limits

▽	First groundwater observed in Shallow WBZ
▼	Stabilized Groundwater Observed in Shallow WBZ
— —	Stabilized Groundwater Level - Shallow WBZ
▽	First groundwater observed in Semi-Confined WBZ
▼	Stabilized Groundwater Observed in Semi-Confined WBZ
— —	Stabilized Groundwater Level - Semi-Confined WBZ
☰	Screened Interval
■	Well Destroyed Dec 2003

Figure 7: Geologic Cross-Section B-A'

SOMA ENVIRONMENTAL ENGINEERING, INC.

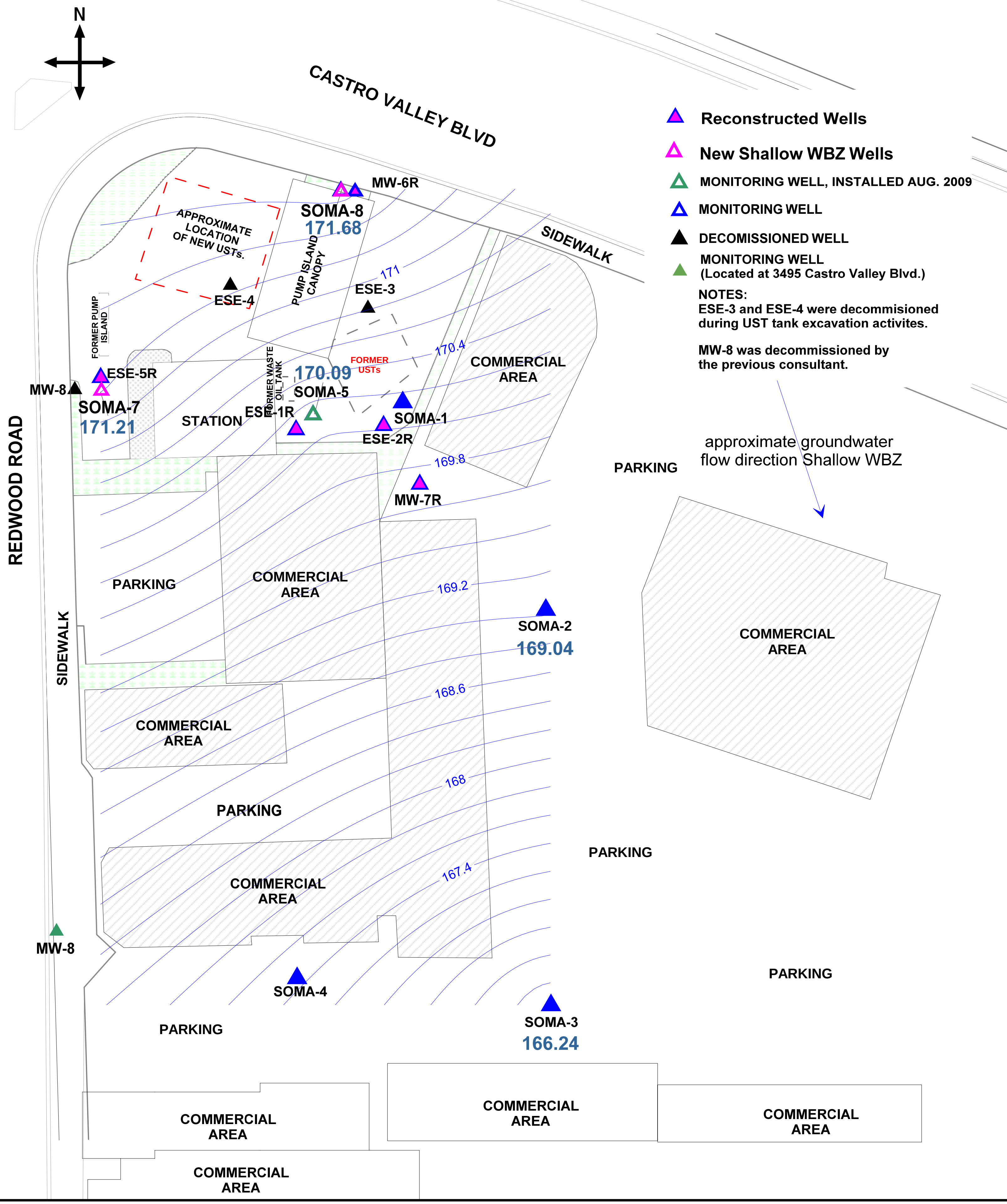
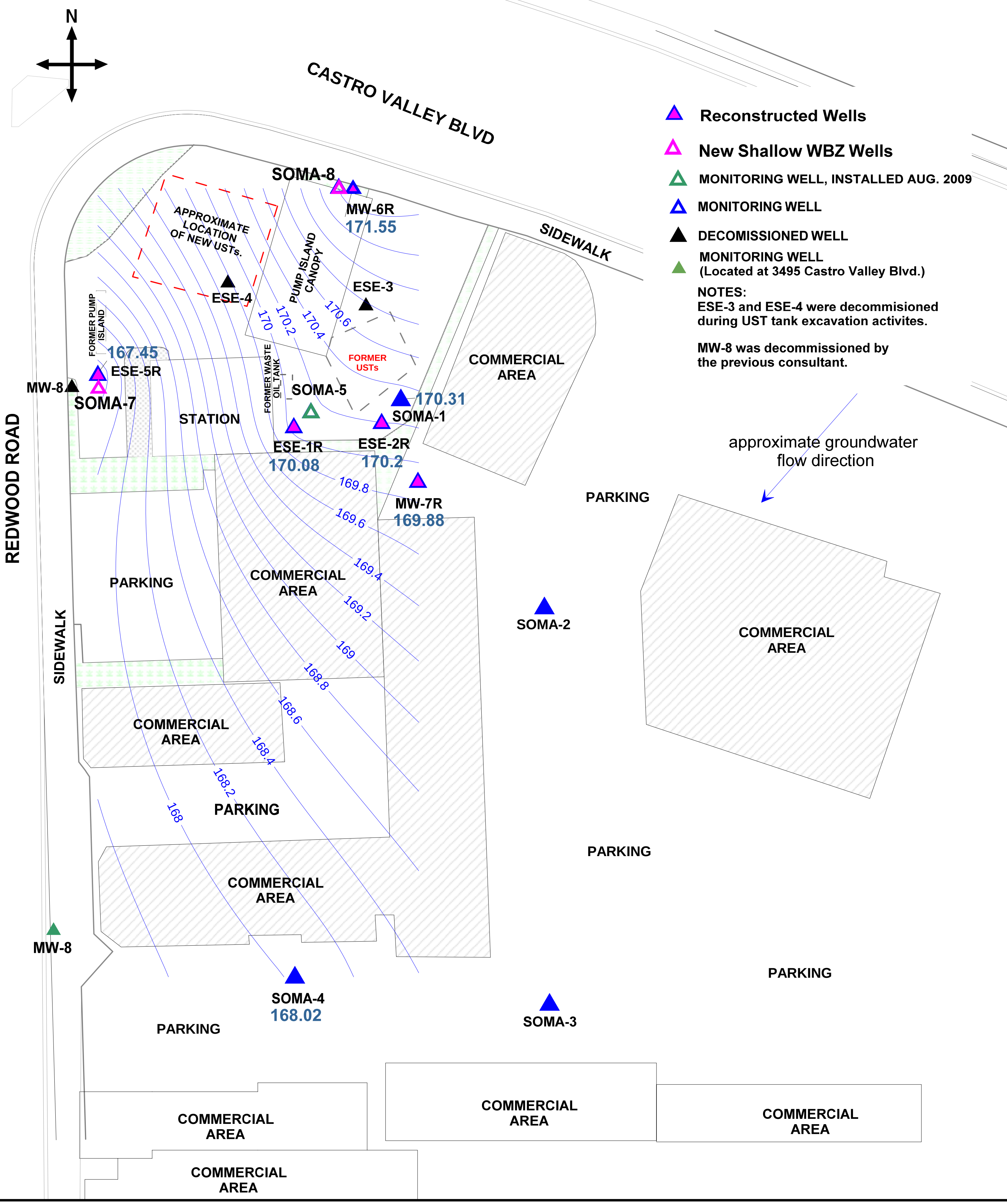


Figure 8: Groundwater Elevation Map – Shallow WBZ

SOMA ENVIRONMENTAL ENGINEERING, INC.



NOTES:
ESE-3 and ESE-4 were decommisioned during UST tank excavation activites.

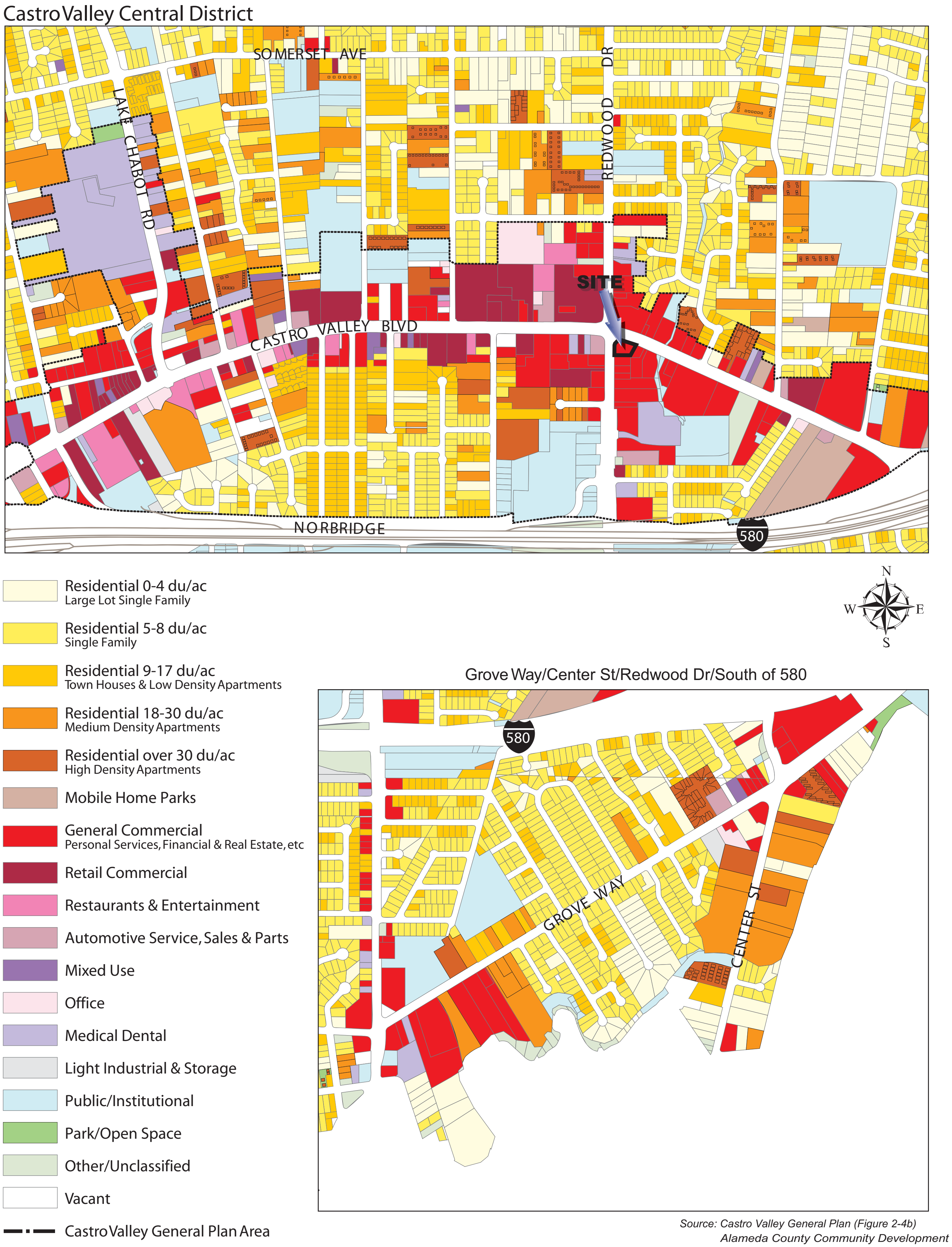
MW-8 was decommissioned by the previous consultant.

approximate scale in feet

0 40 80

Figure 9: Groundwater Elevation Map – Semi-Confined WBZ

SOMA
ENVIRONMENTAL ENGINEERING, INC.



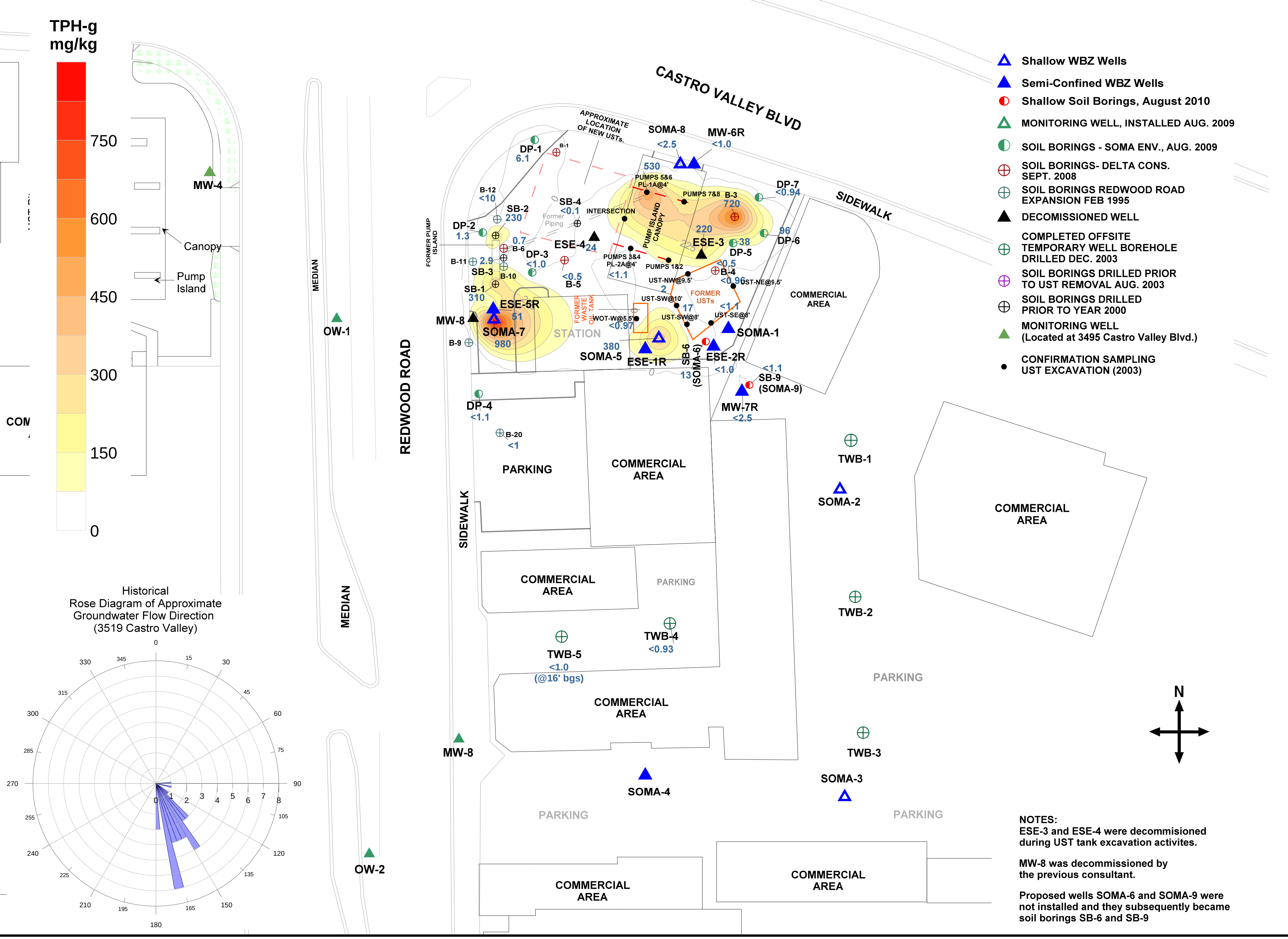
Source: Castro Valley General Plan (Figure 2-4b) Alameda County Community Development Agency, 2004; and Dyett & Bhatia fieldwork.

0 500 1000 2000

FEET

Figure 10: Zoning Map

SOMA ENVIRONMENTAL ENGINEERING, INC.



NOTES:
ESE-3 and ESE-4 were decommisioned during UST tank excavation activites.

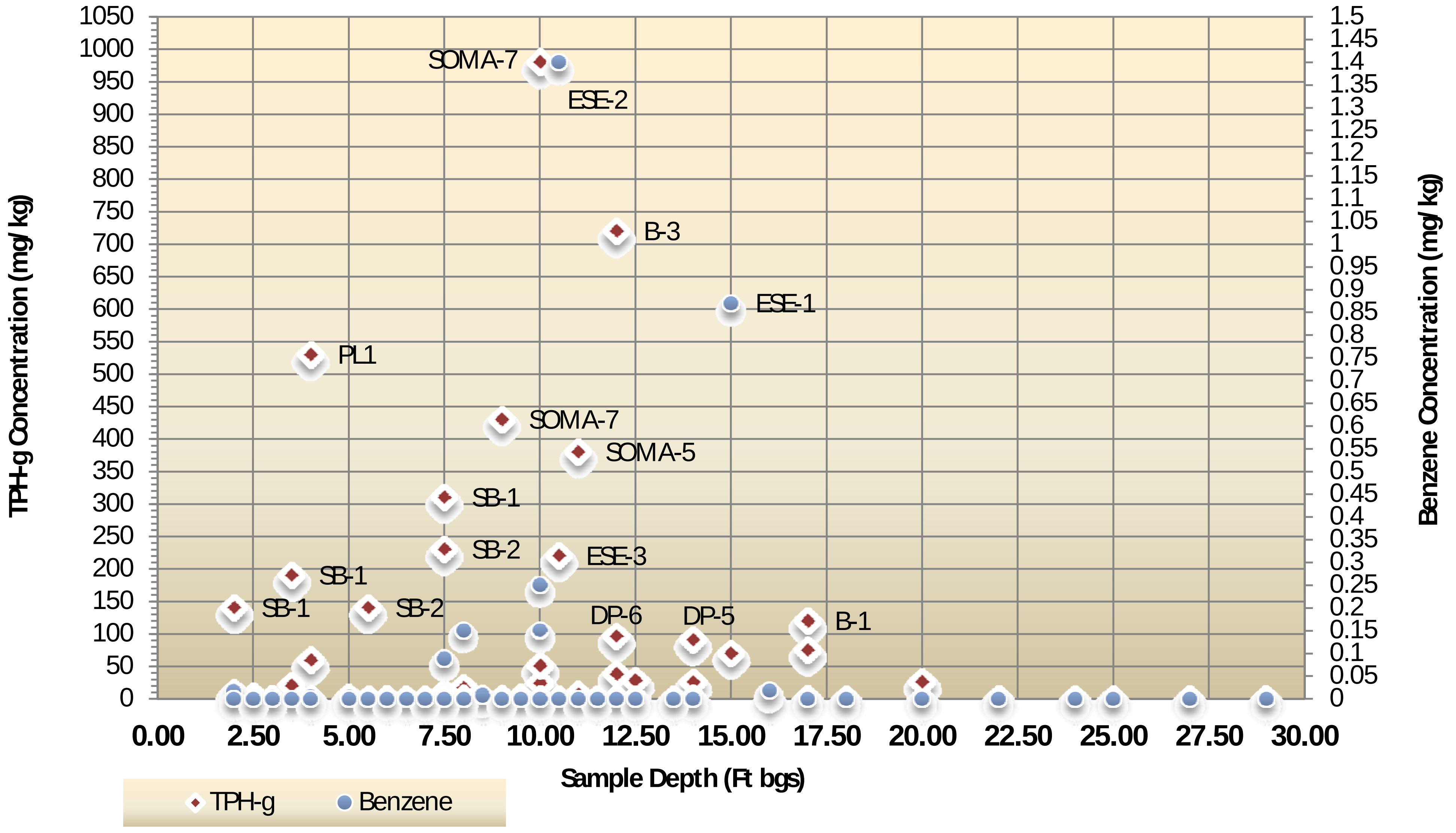
MW-8 was decommissioned by the previous consultant.

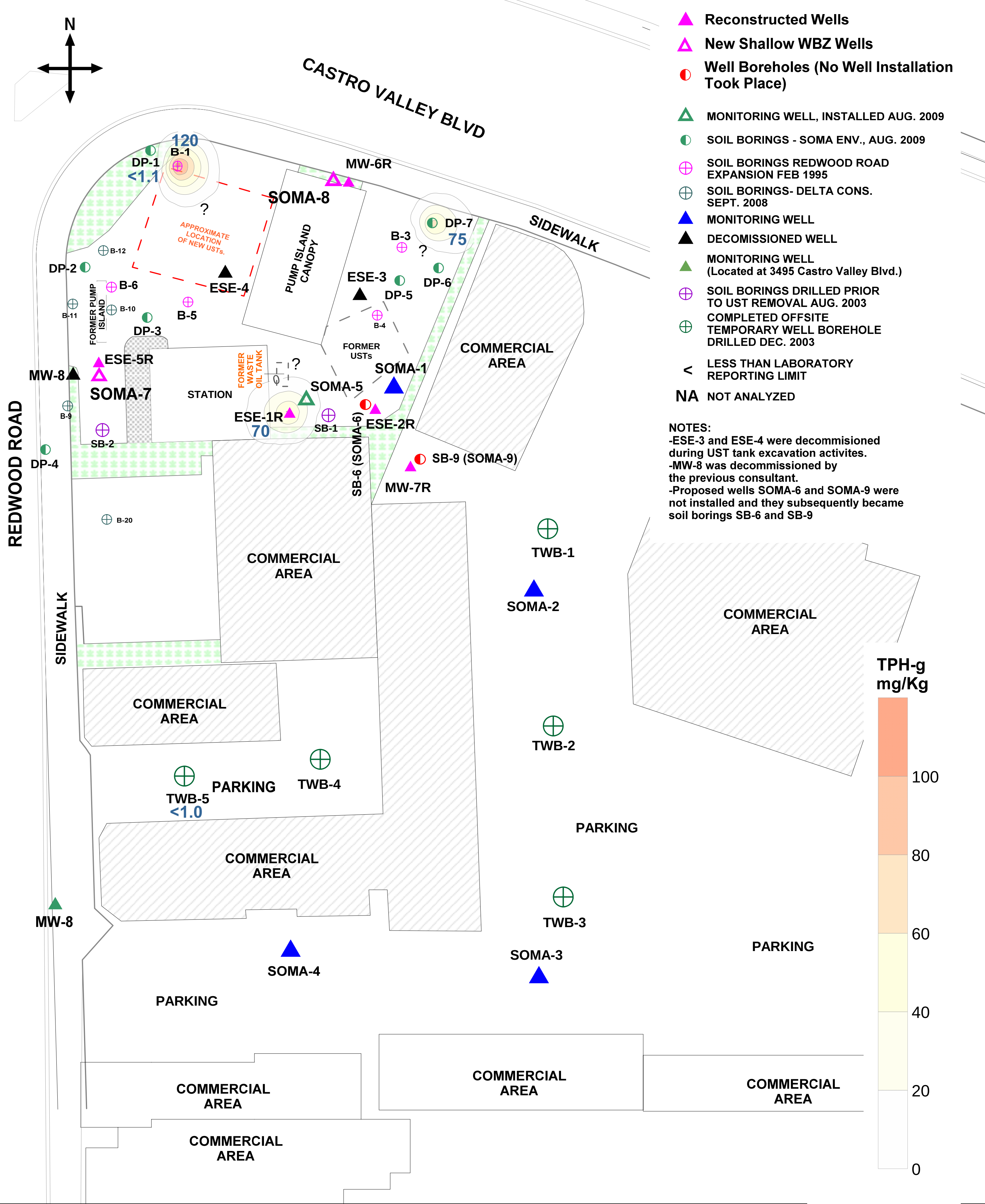
Proposed wells SOMA-6 and SOMA-9 were not installed and they subsequently became soil borings SB-6 and SB-9

Figure 11: Contour Map Showing TPH-g Concentrations in Soil from 4 to 12 feet bgs

SOMA ENVIRONMENTAL ENGINEERING, INC.

Figure 11A: TPH-g Concentration in Soil vs. Depth





- Reconstructed Wells
- New Shallow WBZ Wells
- Well Boreholes (No Well Installation Took Place)
- MONITORING WELL, INSTALLED AUG. 2009
- SOIL BORINGS - SOMA ENV., AUG. 2009
- SOIL BORINGS REDWOOD ROAD EXPANSION FEB 1995
- SOIL BORINGS- DELTA CONS. SEPT. 2008
- MONITORING WELL
- DECOMISSIONED WELL
- MONITORING WELL (Located at 3495 Castro Valley Blvd.)
- SOIL BORINGS DRILLED PRIOR TO UST REMOVAL AUG. 2003
- COMPLETED OFFSITE TEMPORARY WELL BOREHOLE DRILLED DEC. 2003

< LESS THAN LABORATORY REPORTING LIMIT

NA NOT ANALYZED

NOTES:
-ESE-3 and ESE-4 were decommisioned during UST tank excavation activites.
-MW-8 was decommissioned by the previous consultant.
-Proposed wells SOMA-6 and SOMA-9 were not installed and they subsequently became soil borings SB-6 and SB-9

Figure 12: Contour Map Showing TPH-g Concentrations in Soil from 15 to 17 feet bgs

ENVIRONMENTAL ENGINEERING, INC.

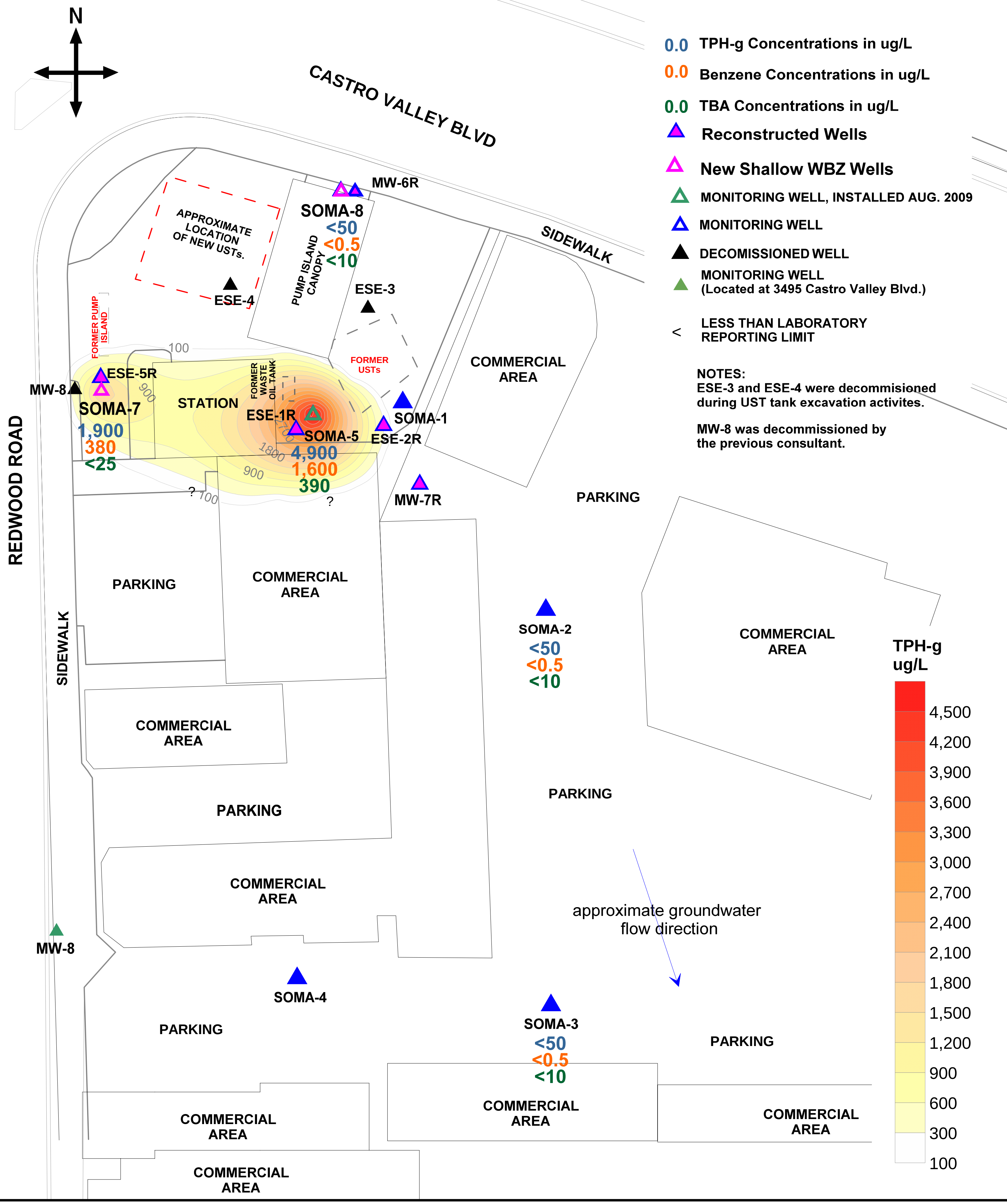
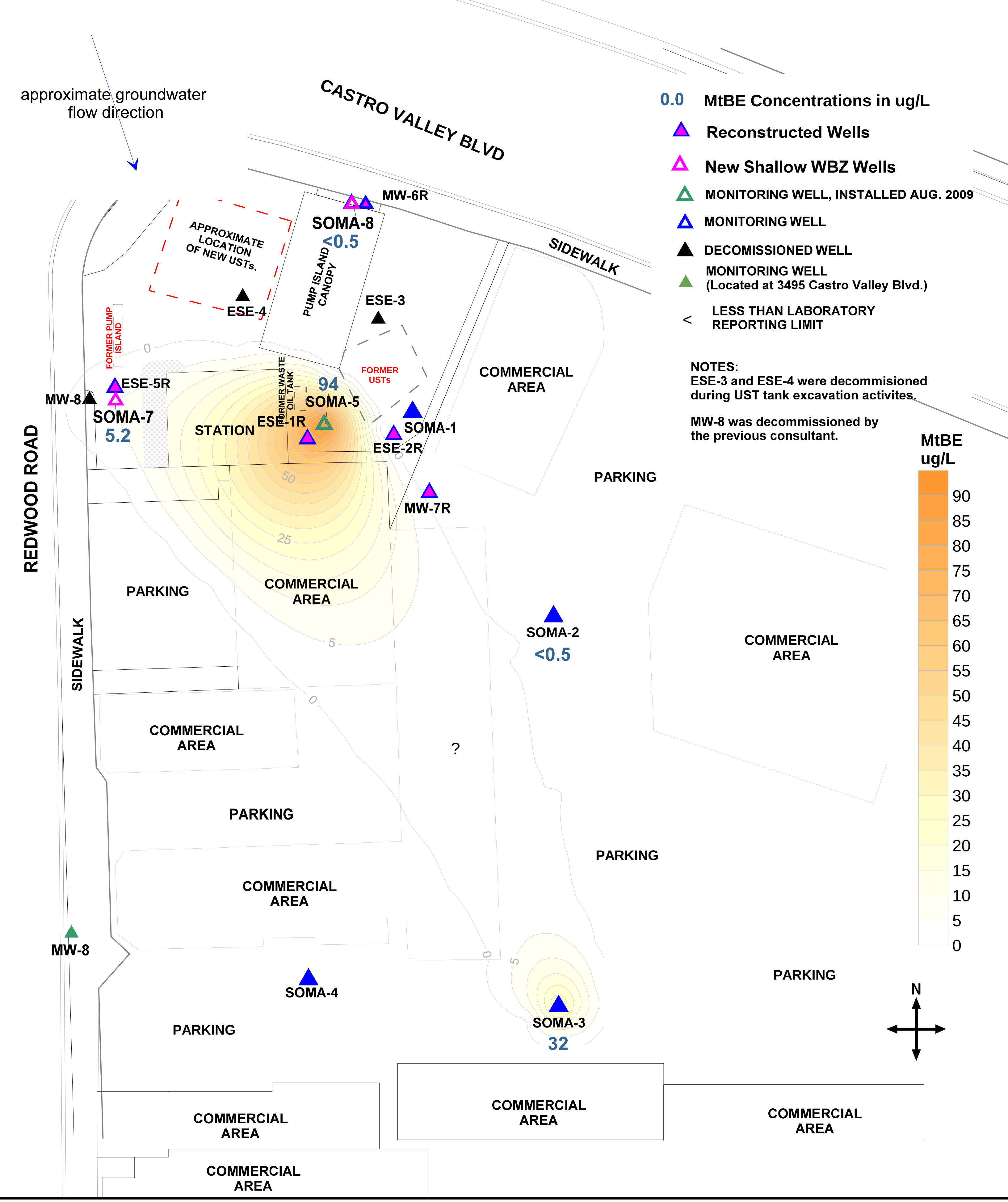


Figure 13: Map of TPH-g, Benzene, and TBA Concentrations in Shallow WBZ Wells, February 14, 2011

SOMA ENVIRONMENTAL ENGINEERING, INC.

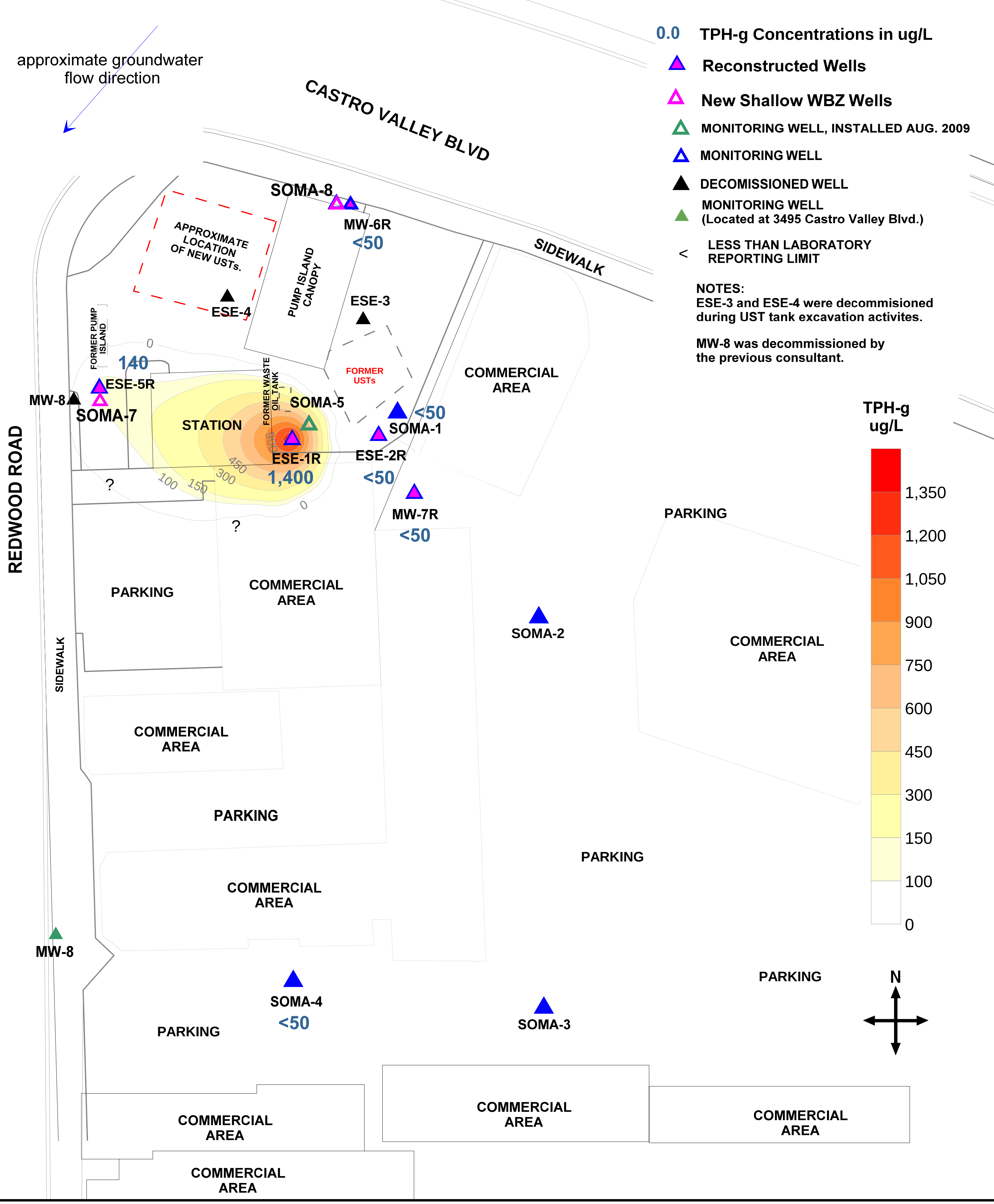


approximate scale in feet

0 40 80

Figure 14: Map of MtBE Concentrations in Shallow WBZ Wells, February 14, 2011

SOMA ENVIRONMENTAL ENGINEERING, INC.



approximate scale in feet

0 40 80

Figure 15: Contour Map of TPH-g Concentrations in Semi-Confined WBZ Wells, February 14, 2011

SOMA ENVIRONMENTAL ENGINEERING, INC.

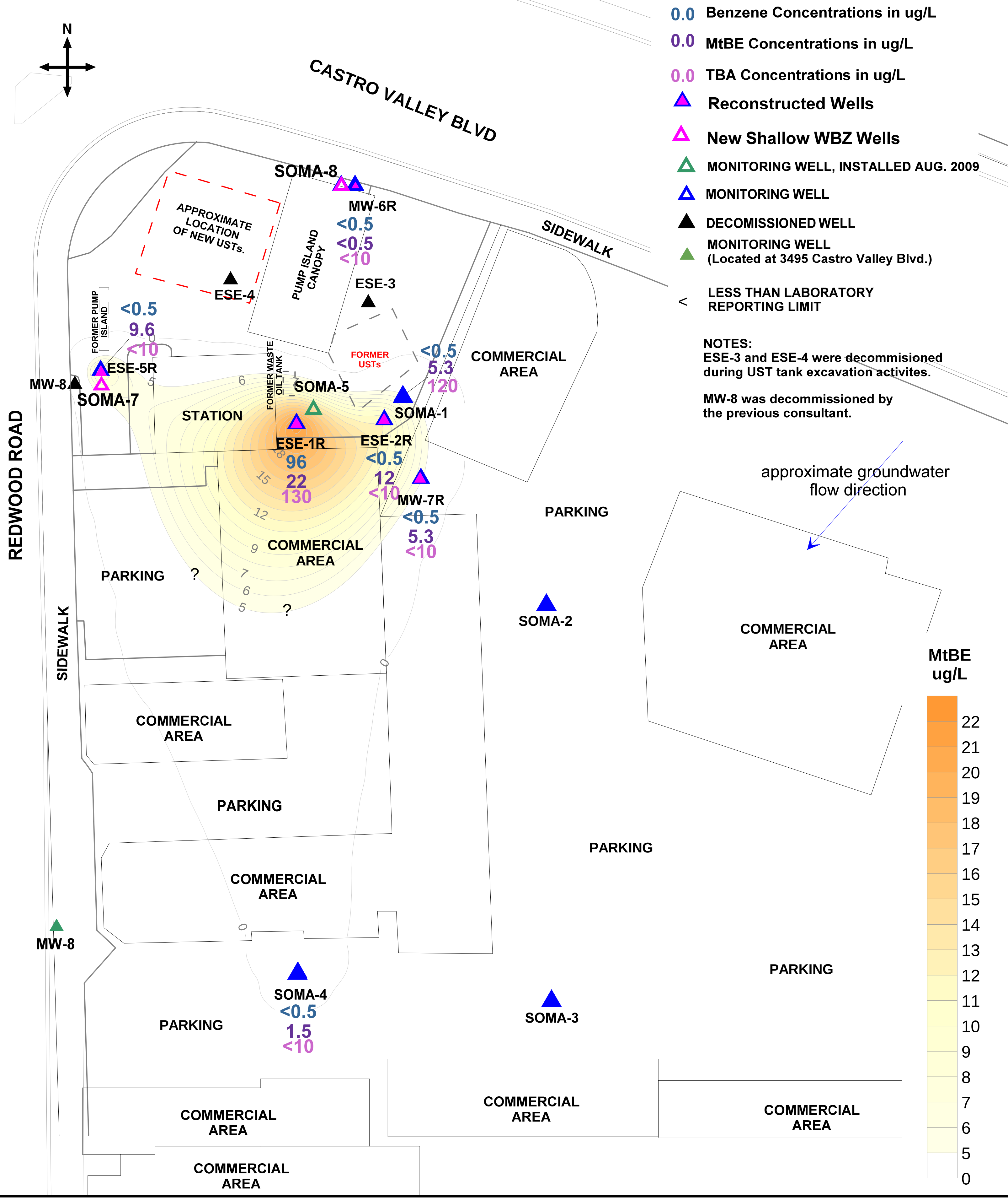


Figure 16: Map of Benzene, MtBE and TBA Concentrations in Semi-Confined WBZ Wells, February 14, 2011

SOMA ENVIRONMENTAL ENGINEERING, INC.

Figure 17: MtBE Concentrations vs. Distance from Former USTs

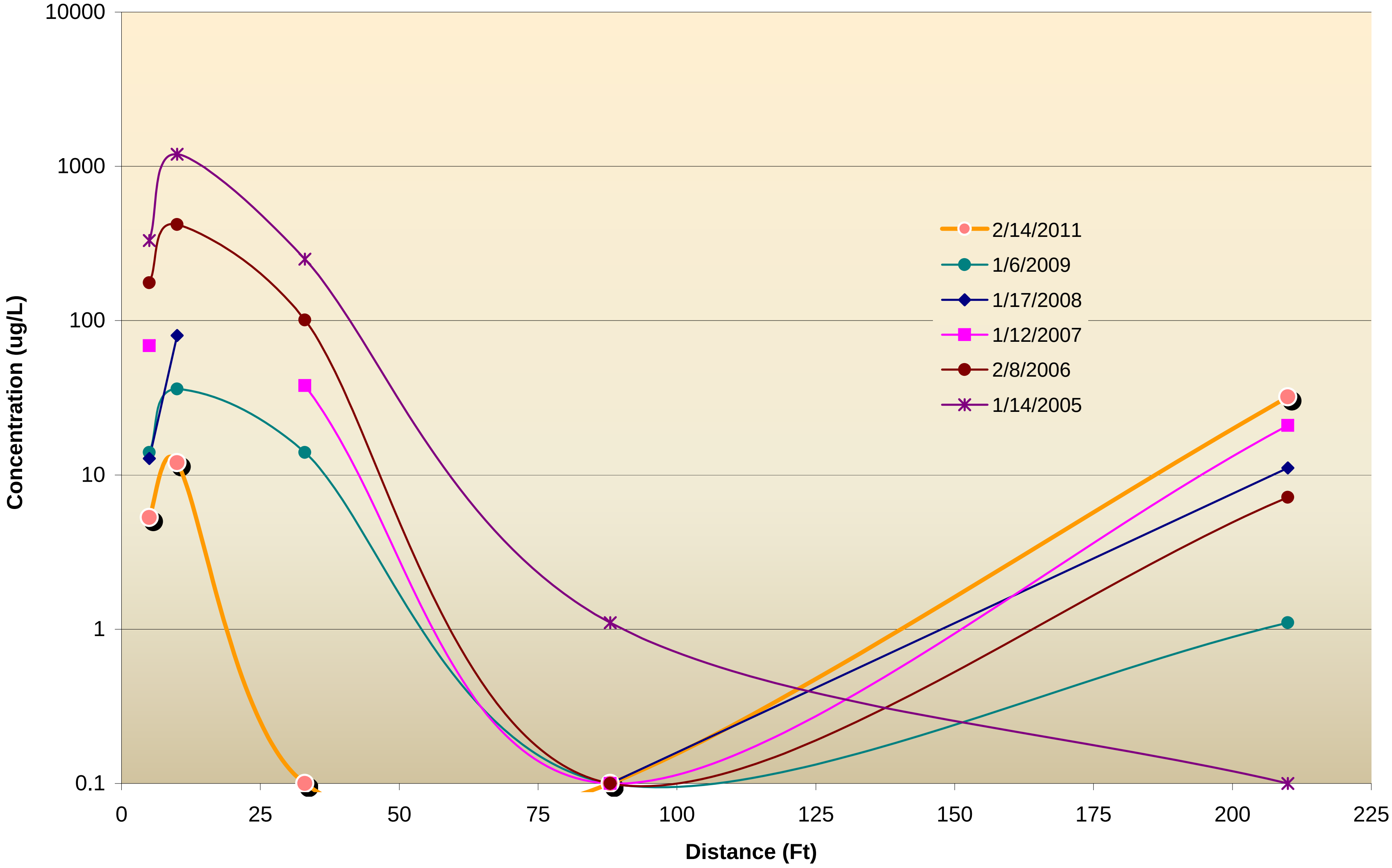


Figure 18: MtBE Concentrations vs. Distance along Southern Edge of Property

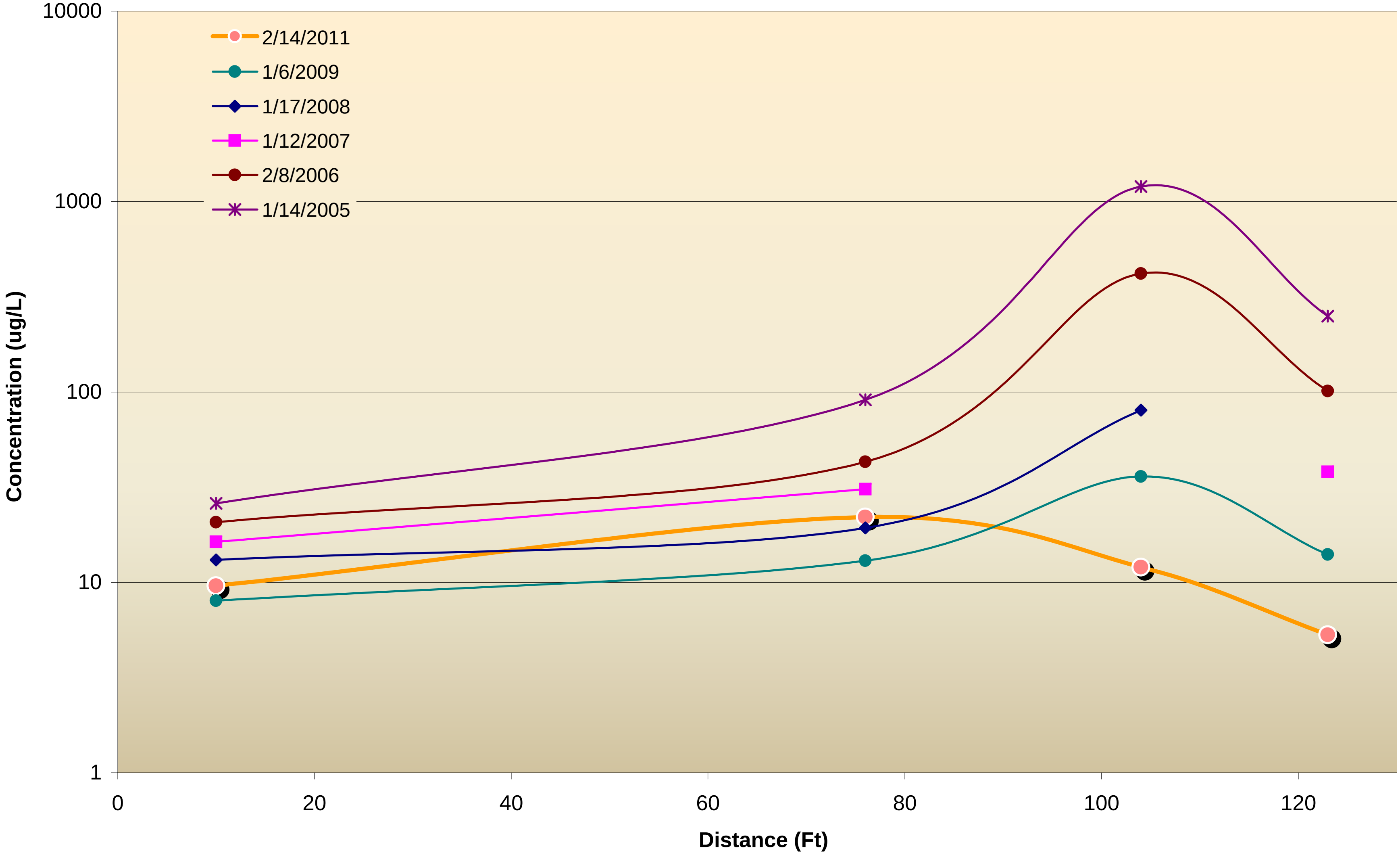


Figure 19: TBA Concentrations vs. Distance from Former USTs

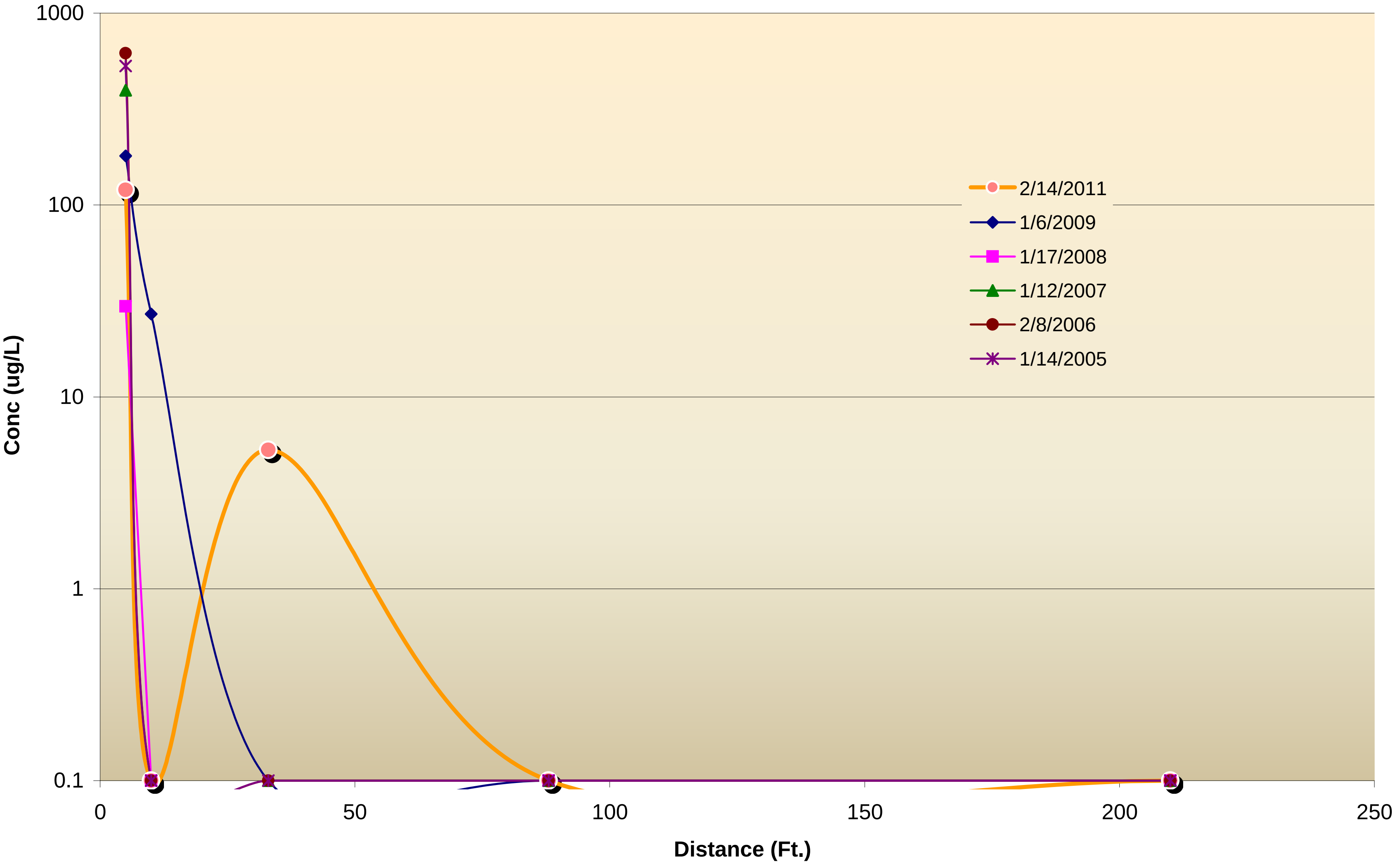


Figure 20: TPH-g Concentrations vs. Distance along Southern Edge of Property

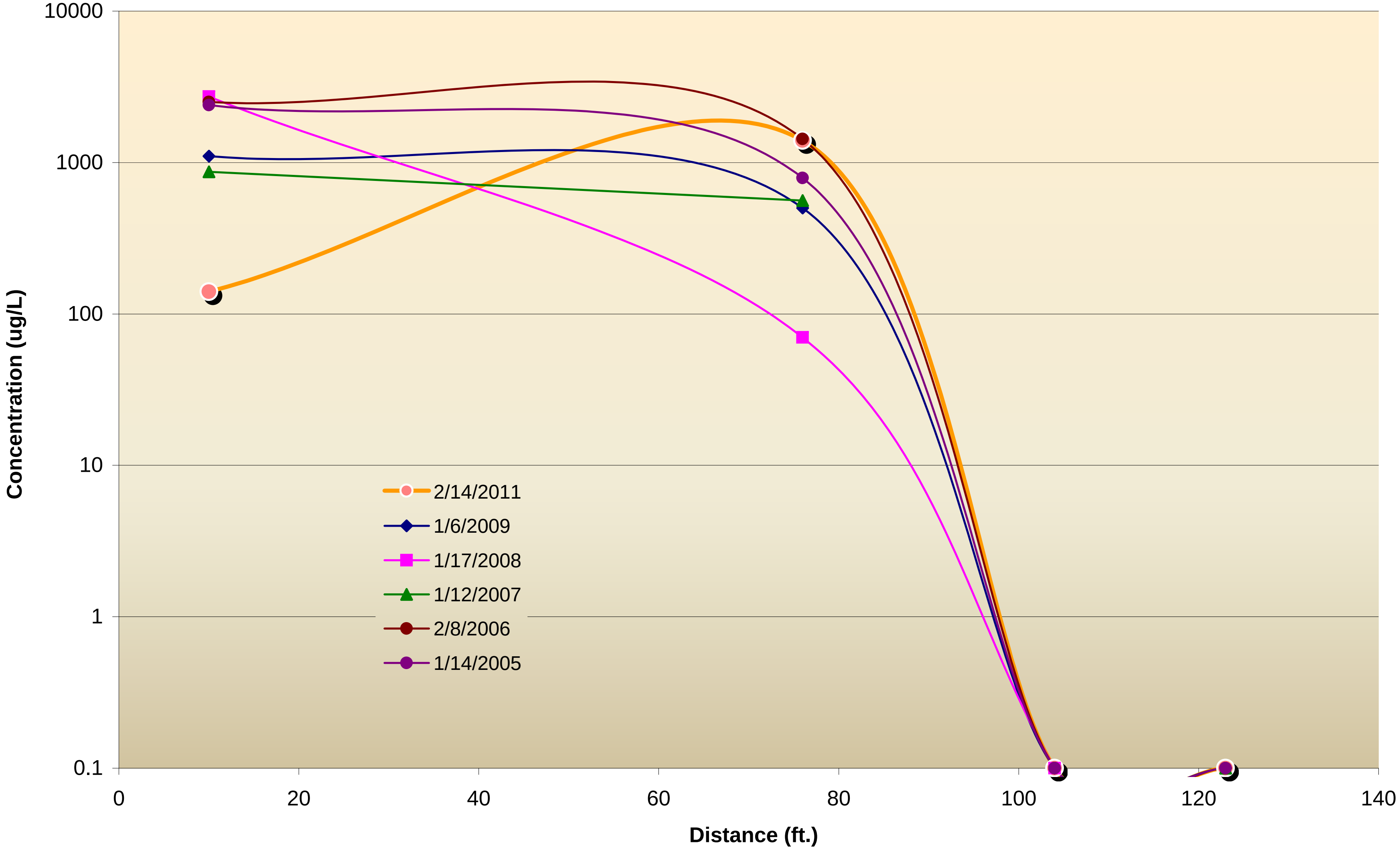


Figure 21: TBA Concentrations vs. Distance along Southern Edge of Property

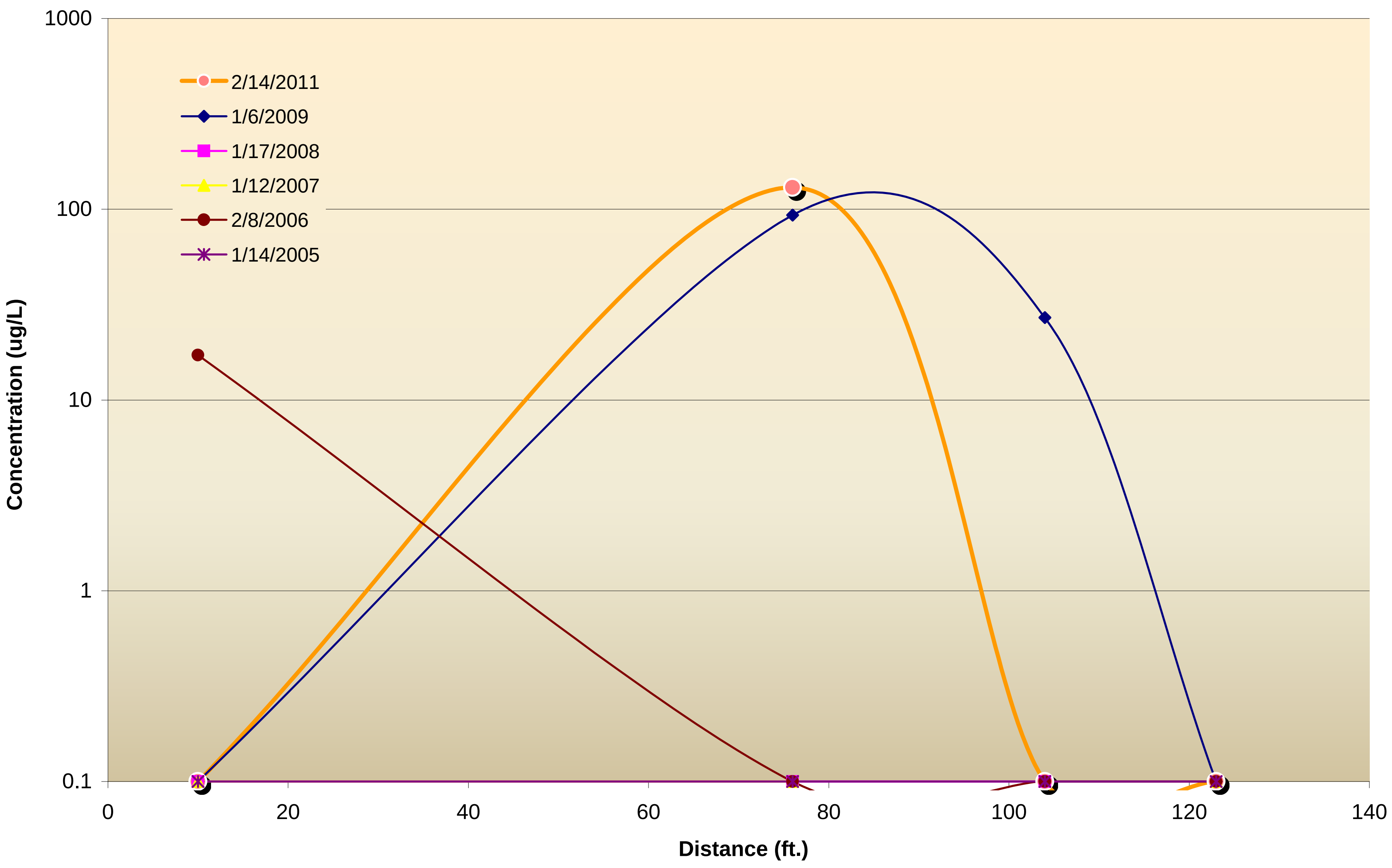


Figure 22: Contaminant and Groundwater Elevation Trends in Well ESE-1 (ESE-1R)

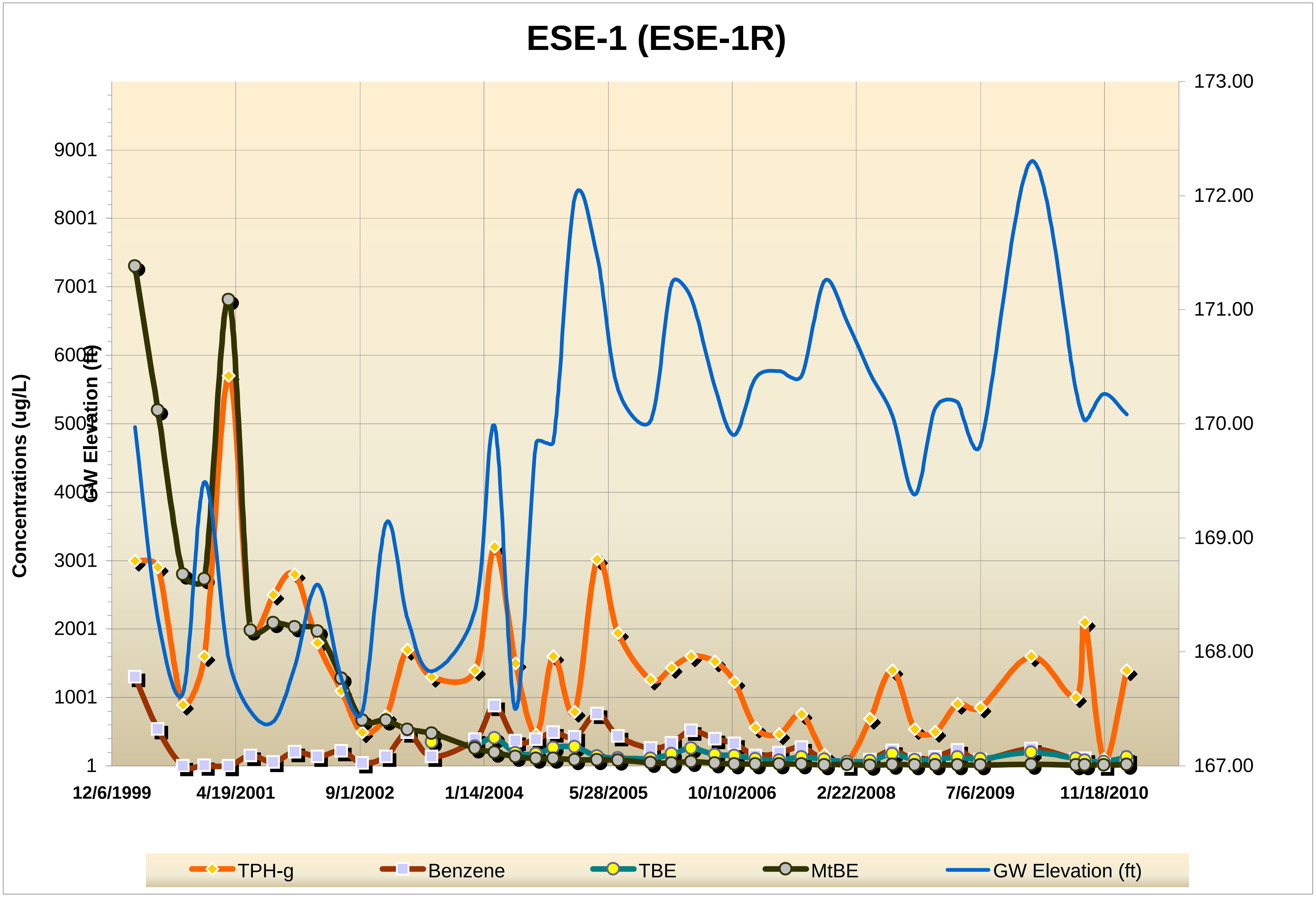


Figure 23: Contaminant and Groundwater Elevation Trends in Well ESE-2 (ESE-2R)

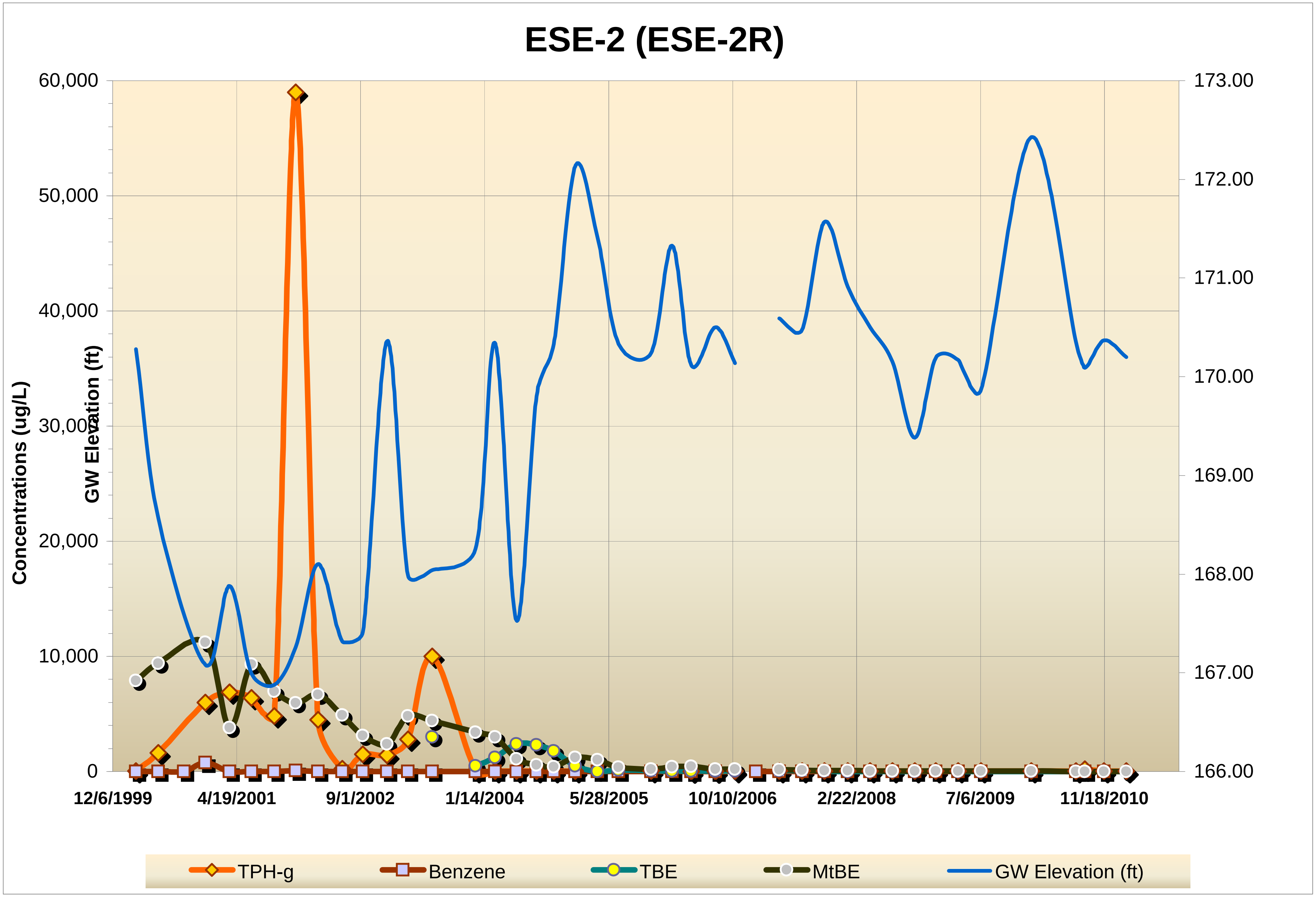


Figure 24: Contaminant and Groundwater Elevation Trends in Well ESE-5 (ESE-5R)

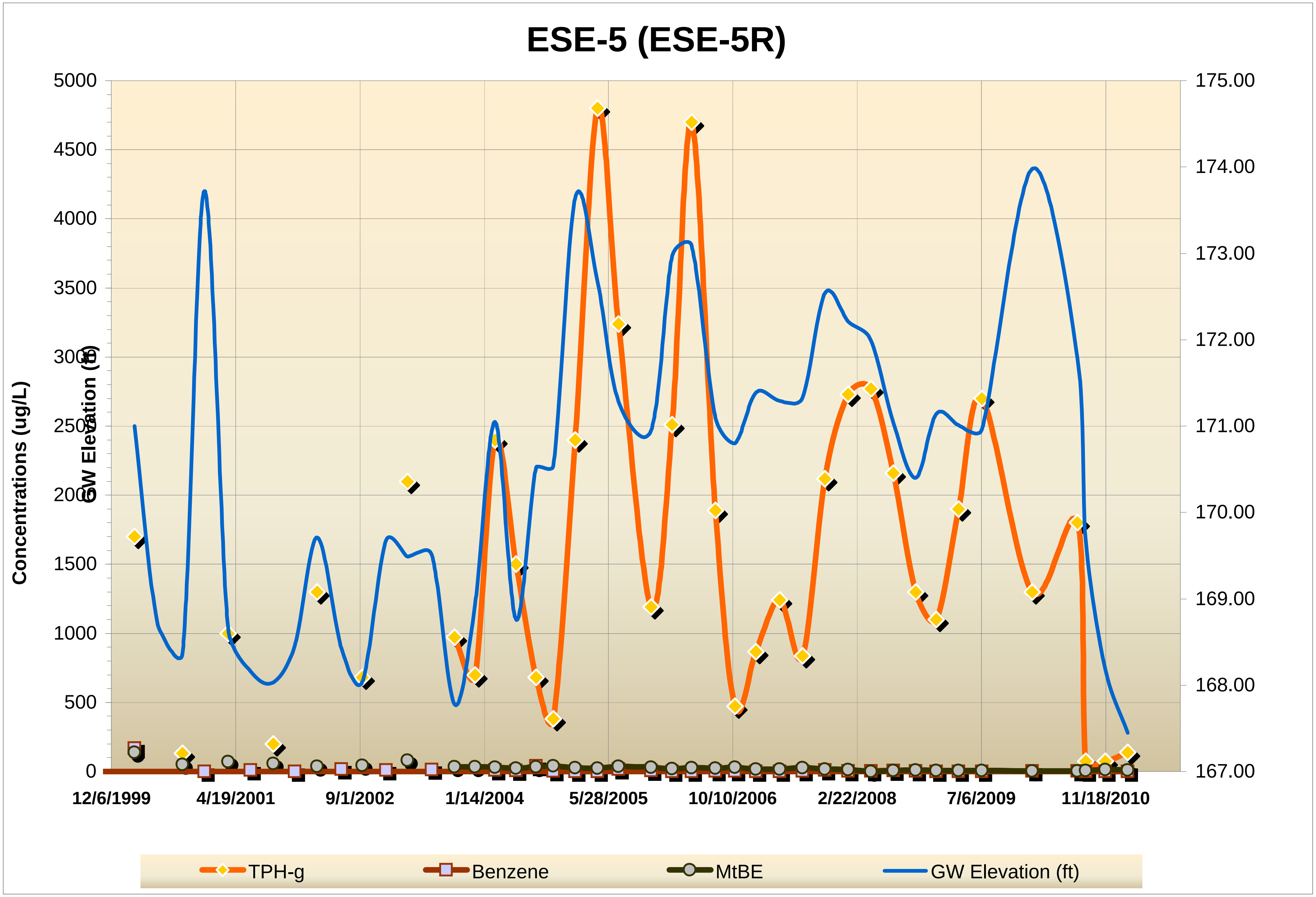


Figure 25: Contaminant and Groundwater Elevation Trends in Well SOMA-1

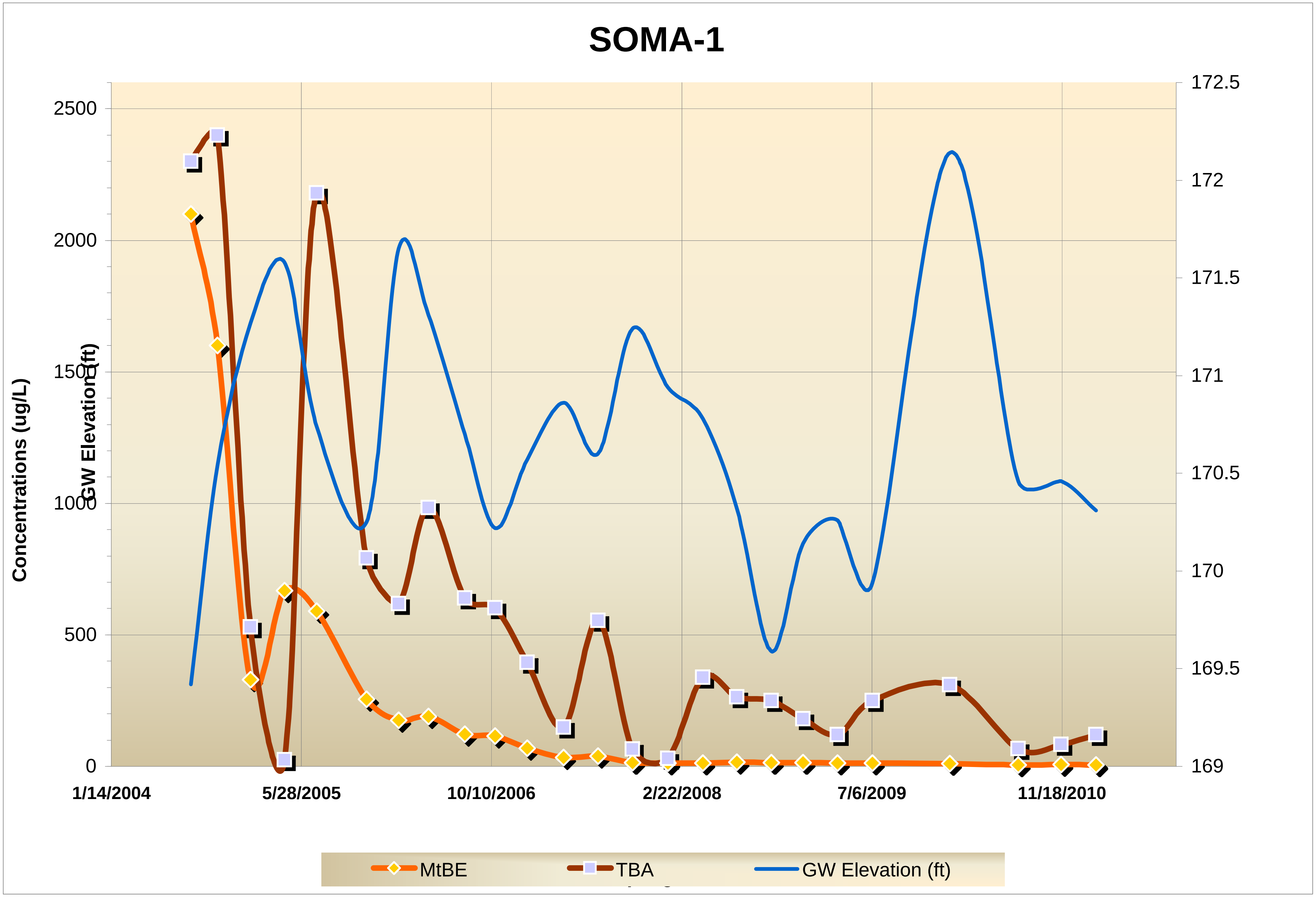


Figure 26: Contaminant and Groundwater Elevation Trends in Well SOMA-5

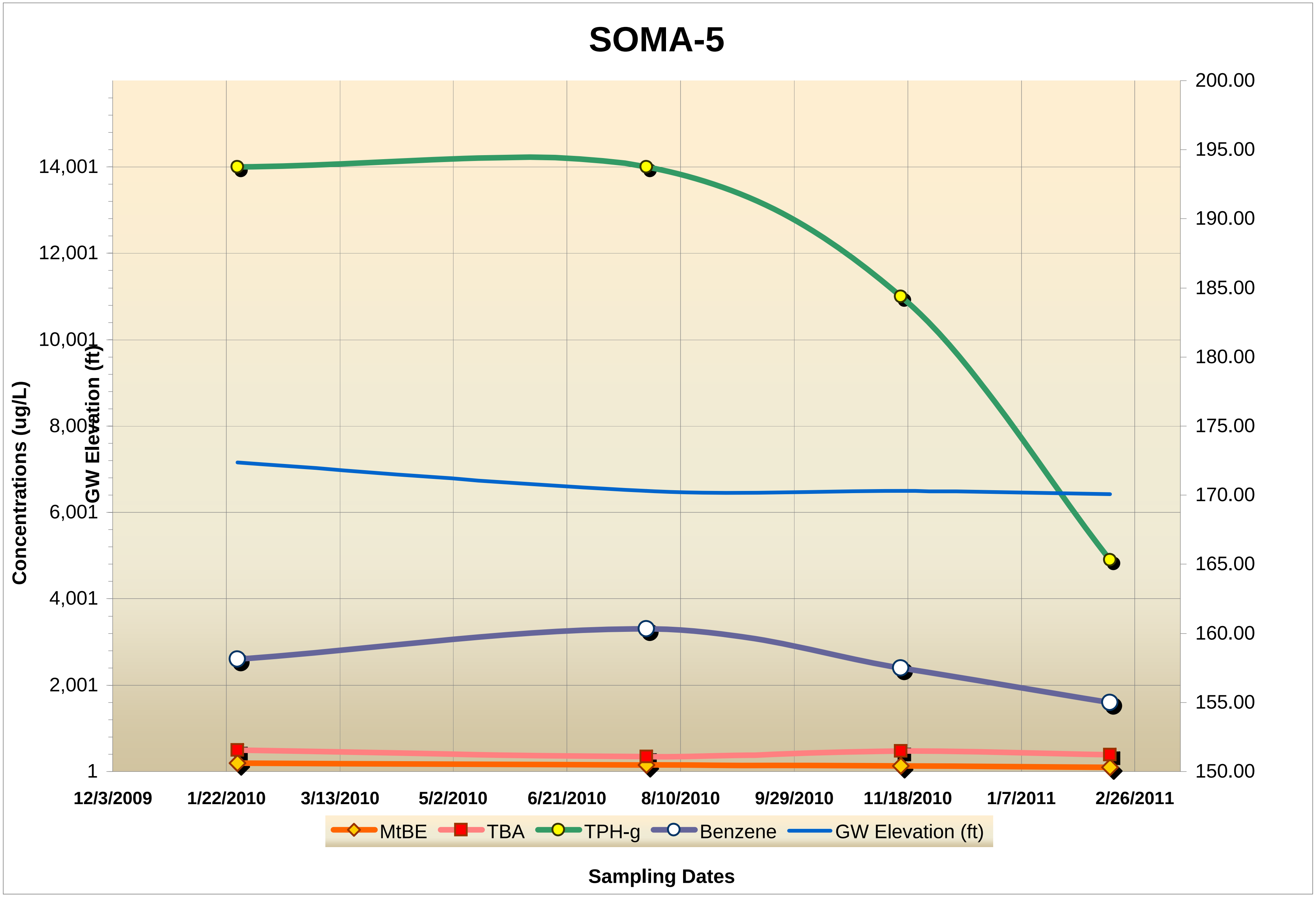
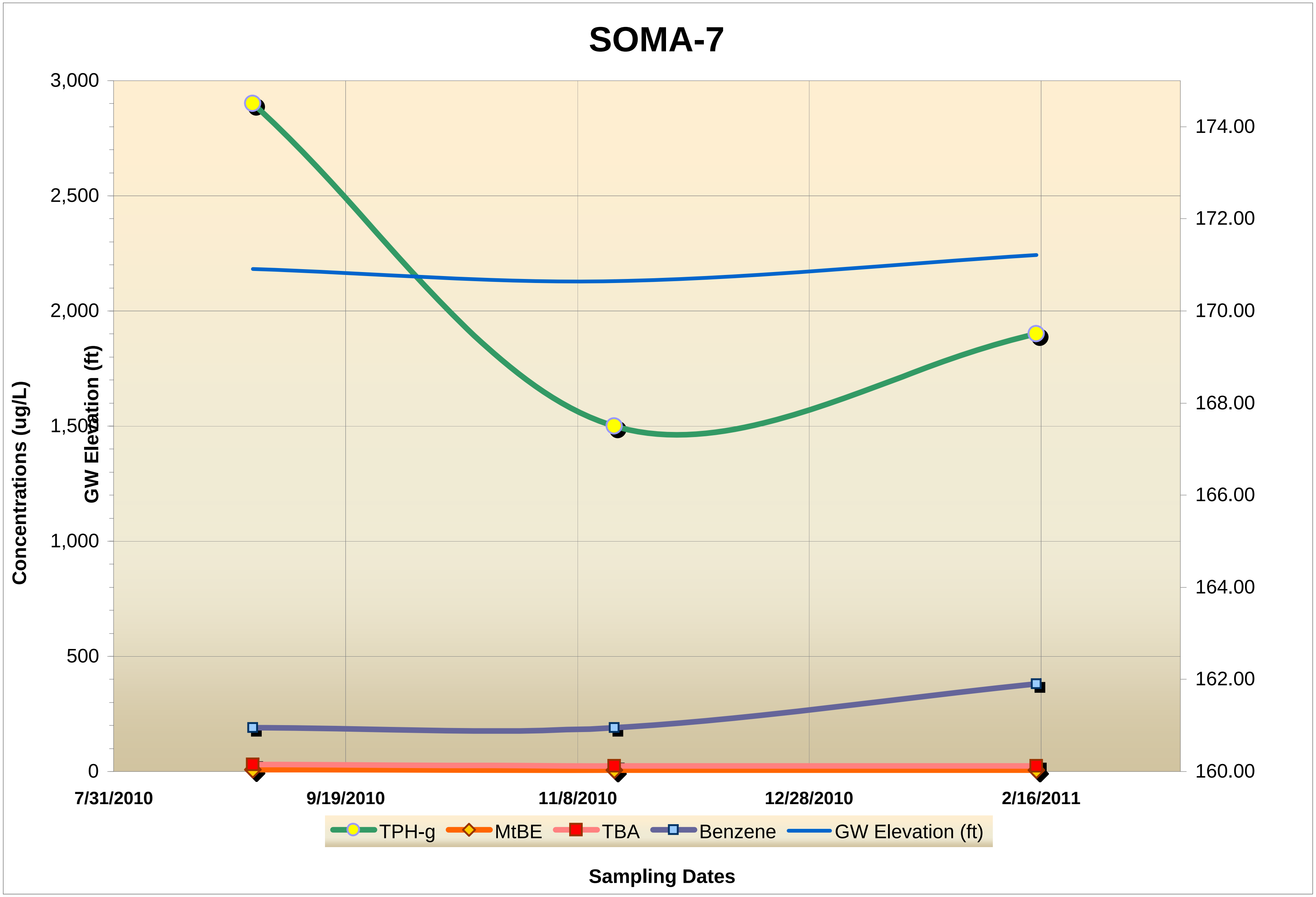


Figure 27: Contaminant and Groundwater Elevation Trends in Well SOMA-7



Aerial Source: Imagery (c) 2006 Aerials Express (Yahoo Inc.)

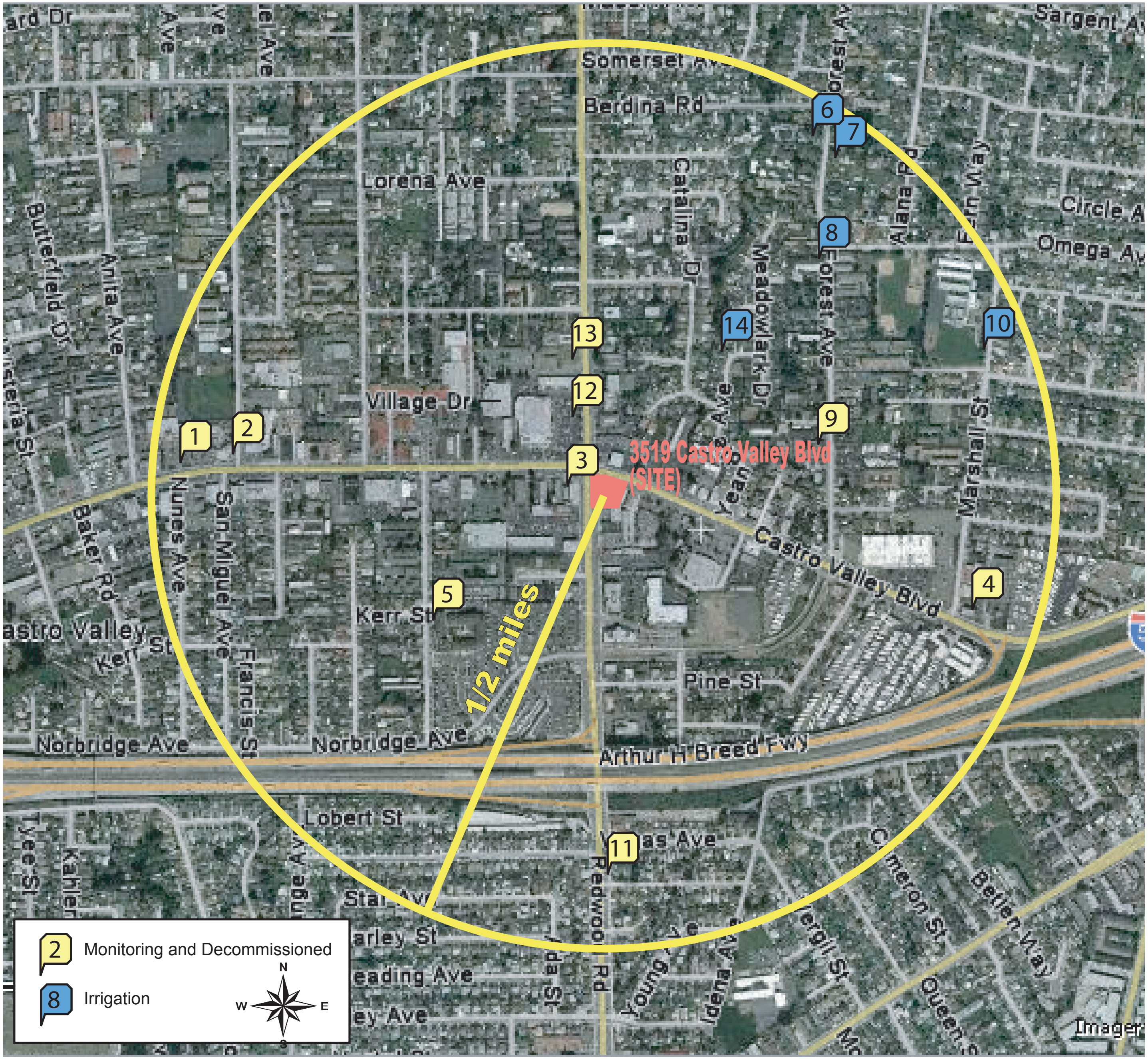
Map ID	Well Count	Address	Owner	Drilldate	TD	Diam	Use
1	1	19945 FOREST	MR. WEHE	3/78	51	8	DES
2	2	20450 REDWOOD RD	EXXON OIL	8/77	50	0	Unknown
3	3	20680 FOREST AV	G.G. PAUL KASMER	Oct-73	20	0	DES
4	4	2633 VEGAS AV	ANNA WEEDEN	4/77	24	4	Irrigation
5	5	3234 Castro Valley Blvd	Mitzi Stockel	Apr-90	8	2	BOR
	6	3234 Castro Valley Blvd	Mitzi Stockel	Apr-90	16	2	Monitoring
	7	3234 Castro Valley Blvd	Mitzi Stockel	Apr-90	16	2	Monitoring
	8	3234 Castro Valley Blvd	Mitzi Stockel	Apr-90	16	2	Monitoring
	9	3234 Castro Valley Blvd	Mitzi Stockel	May-90	23	2	Monitoring
	10	3234 Castro Valley Blvd	Mitzi Stockel	May-90	20	2	Monitoring
6	11	3369 Castro Valley Blvd	Chevron USA	Oct-93	20	2	Monitoring
	12	3369 Castro Valley Blvd	Chevron USA	Oct-93	20	2	Monitoring
	13	3369 Castro Valley Blvd	Chevron USA	Oct-93	20	2	Monitoring
	14	3369 Castro Valley Blvd	Chevron USA	Oct-93	20	2	Monitoring
7	15	3430 Castro Valley Blvd	Goodyear	Dec-96	16	2	Monitoring
	16	3430 Castro Valley Blvd	Goodyear Tire & Rubber Co	9/94	20	2	Monitoring
	17	3430 Castro Valley Blvd	Goodyear Tire & Rubber Co	9/94	20	2	Monitoring
	18	3430 Castro Valley Blvd	Goodyear Tire & Rubber Co	9/94	20	2	Monitoring
8	19	3533 JAMISON WAY	R. NAHAS CO.	?	25	5	DES
	20	3533 JAMISON WAY	R. NAHAS CO.	?	20	5	DES
9	21	3559 JAMISON WAY	R. NAHAS CO.	Dec-75	56	0	DES
10	22	3889 Castro Valley Blvd	VIP Service (MW1)	Nov-93	20	2	Monitoring
	23	3889 Castro Valley Blvd	VIP Service (MW2)	Nov-93	20	2	Monitoring
	24	3889 Castro Valley Blvd	VIP Service (MW3)	Nov-93	20	2	Monitoring
11	25	4057 STEVENS ST	R. FORQUEN	?	70	8	Irrigation

approximate scale

0 0.25 mile 0.5 mile

Figure 28: Sensitive Receptor Survey Map Based on the Data Obtained from the Alameda County Public Works Agency

SOMA ENVIRONMENTAL ENGINEERING, INC.



Aerial Source: Imagery (c) 2006 Aerials Express (Yahoo Inc.)

Map ID	Address		Use
1	2973	Castro Valley BLVD, Castro Valley	Unknown
2	3098	Castro Valley BLVD, Castro Valley	Monitoring
3	3495	Castro Valley blvd, Castro Valley	Monitoring
4	3940	Castro Valley blvd, Castro Valley	Monitoring
5	21000	Wilbeam Ave, Castro Valley	Monitoring
6	19861	Forest Ave, Castro Valley	Irrigation
7	19910	Forest Ave, Castro Valley	Irrigation
8	20115	Forest Ave, Castro Valley	Irrigation
9	20551	Forest Ave, Castro Valley	Unknown
10	20287	MARSHALL ST, Castro Valley	Irrigation
11		Redwood Rd and Watson St	Destruction
12	20629	Redwood Rd, Castro Valley	Monitoring
13	20405	Redwood Road, Castro Valley	Monitoring
14	20283	Yeandle Ave, Castro Valley,	Irrigation
Wells Outside the 1/2 Mile Radius			
15	22447	Charlene Way, Castro Valley	Irrigation
16	1792	Crescent Avenue, Castro Valley	Monitoring
17	2146	Grove Way, Castro Valley	Extraction
18	2416	Grove Way, Castro Valley	Domestic
19	22315	Redwood Rd, Castro Valley	Monitoring
20		GROVE WAY AT REDWOOD RD, Castro Valley	Monitoring
21	4589	JAMES AVE, Castro Valley	Irrigation
22	18878	Redwood Rd, Castro Valley	Test well

approximate scale

0 0.25 mile 0.5 mile

Figure 28A: Sensitive Receptor Survey Map Based on the Data Obtained from the Department of Water Resources

ENVIRONMENTAL ENGINEERING, INC.

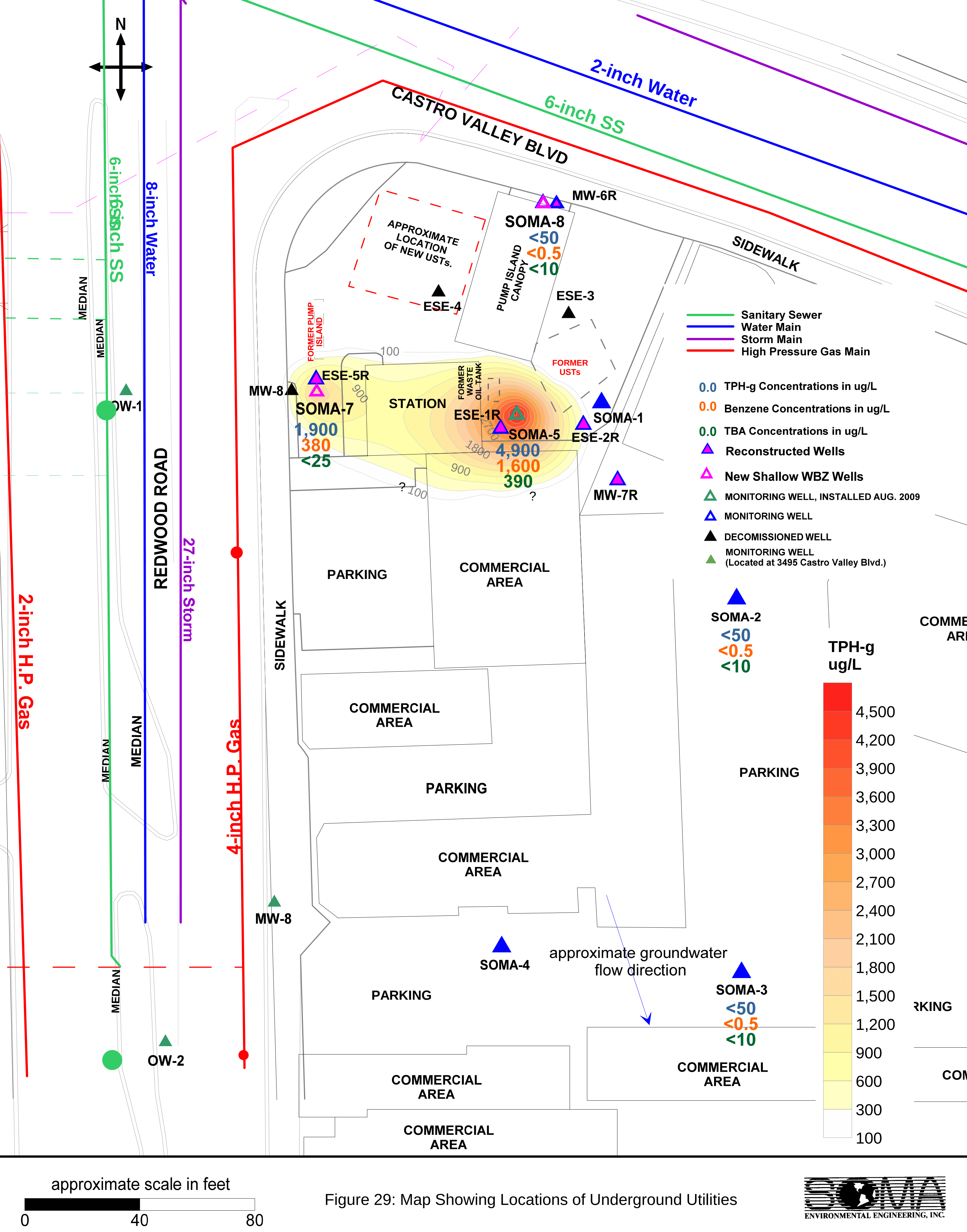
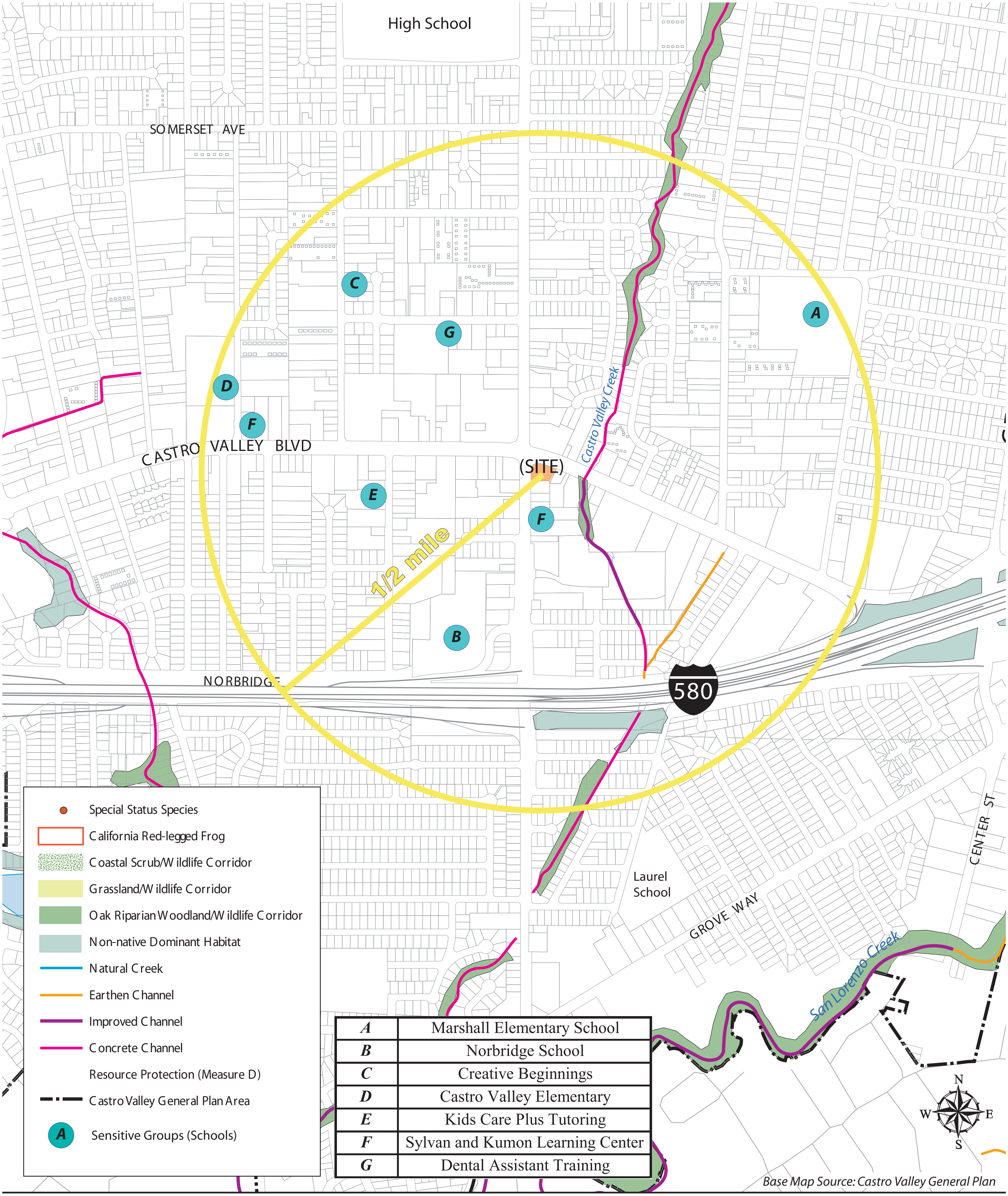


Figure 29: Map Showing Locations of Underground Utilities

SOMA ENVIRONMENTAL ENGINEERING, INC.



A	Marshall Elementary School
B	Norbridge School
C	Creative Beginnings
D	Castro Valley Elementary
E	Kids Care Plus Tutoring
F	Sylvan and Kumon Learning Center
G	Dental Assistant Training

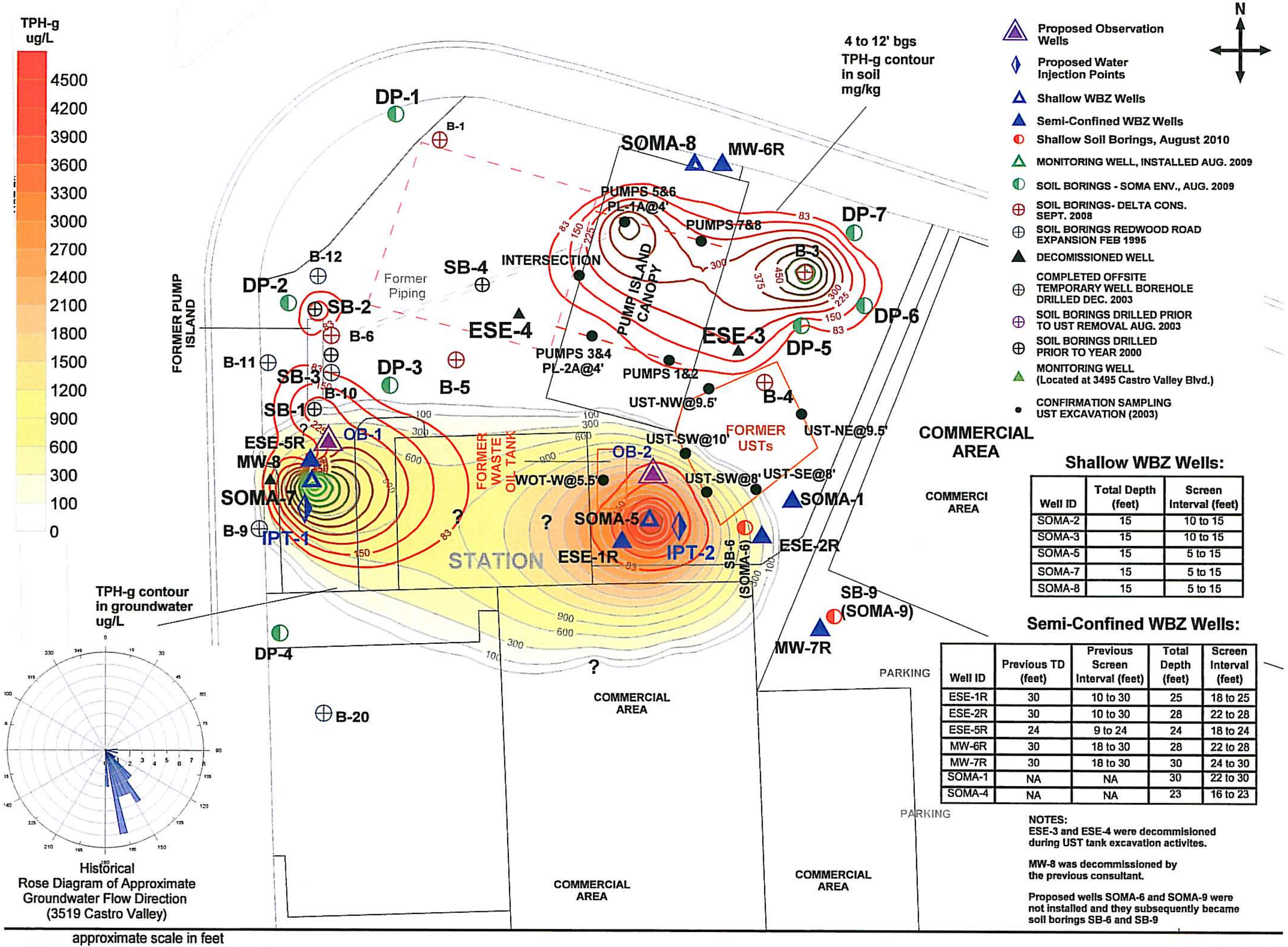
Base Map Source: Castro Valley General Plan

approximate scale

0 0.25 miles

Figure 30: Map Showing Locations of Other Relevant Sensitive Receptors

SOMA ENVIRONMENTAL ENGINEERING, INC.



Shallow WBZ Wells:

Well ID	Total Depth (feet)	Screen Interval (feet)
SOMA-2	15	10 to 15
SOMA-3	15	10 to 15
SOMA-5	15	5 to 15
SOMA-7	15	5 to 15
SOMA-8	15	5 to 15

Semi-Confined WBZ Wells:

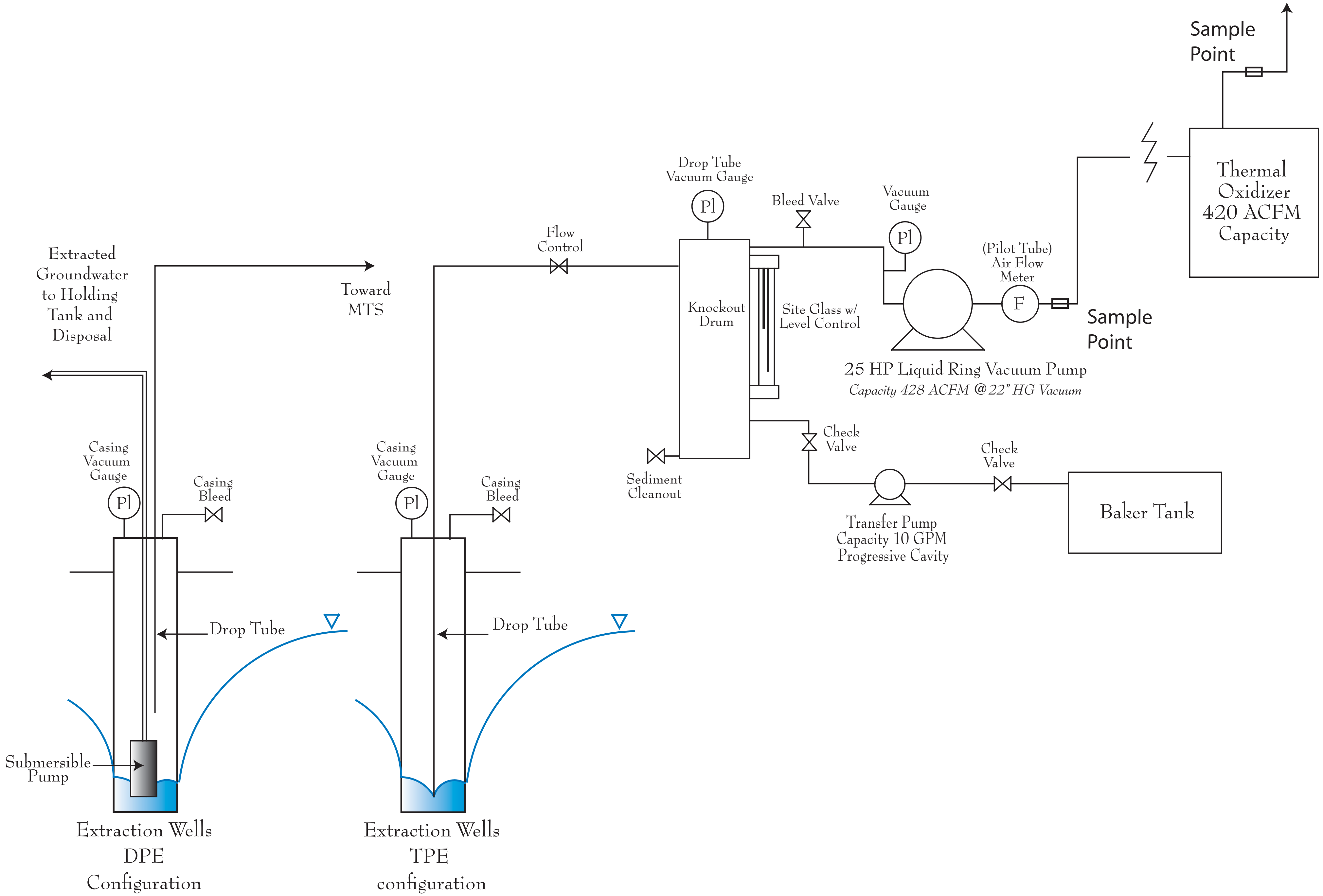
Well ID	Previous TD (feet)	Previous Screen Interval (feet)	Total Depth (feet)	Screen Interval (feet)
ESE-1R	30	10 to 30	25	18 to 25
ESE-2R	30	10 to 30	28	22 to 28
ESE-5R	24	9 to 24	24	18 to 24
MW-6R	30	18 to 30	28	22 to 28
MW-7R	30	18 to 30	30	24 to 30
SOMA-1	NA	NA	30	22 to 30
SOMA-4	NA	NA	23	16 to 23

NOTES:
ESE-3 and ESE-4 were decommisioned during UST tank excavation activites.

MW-8 was decommissioned by the previous consultant.

Proposed wells SOMA-6 and SOMA-9 were not installed and they subsequently became soil borings SB-6 and SB-9

Figure 31: Map Showing Locations of Proposed Observation and Injection Points



Not to Scale

Figure 32: Typical MPE Pilot Testing Layout

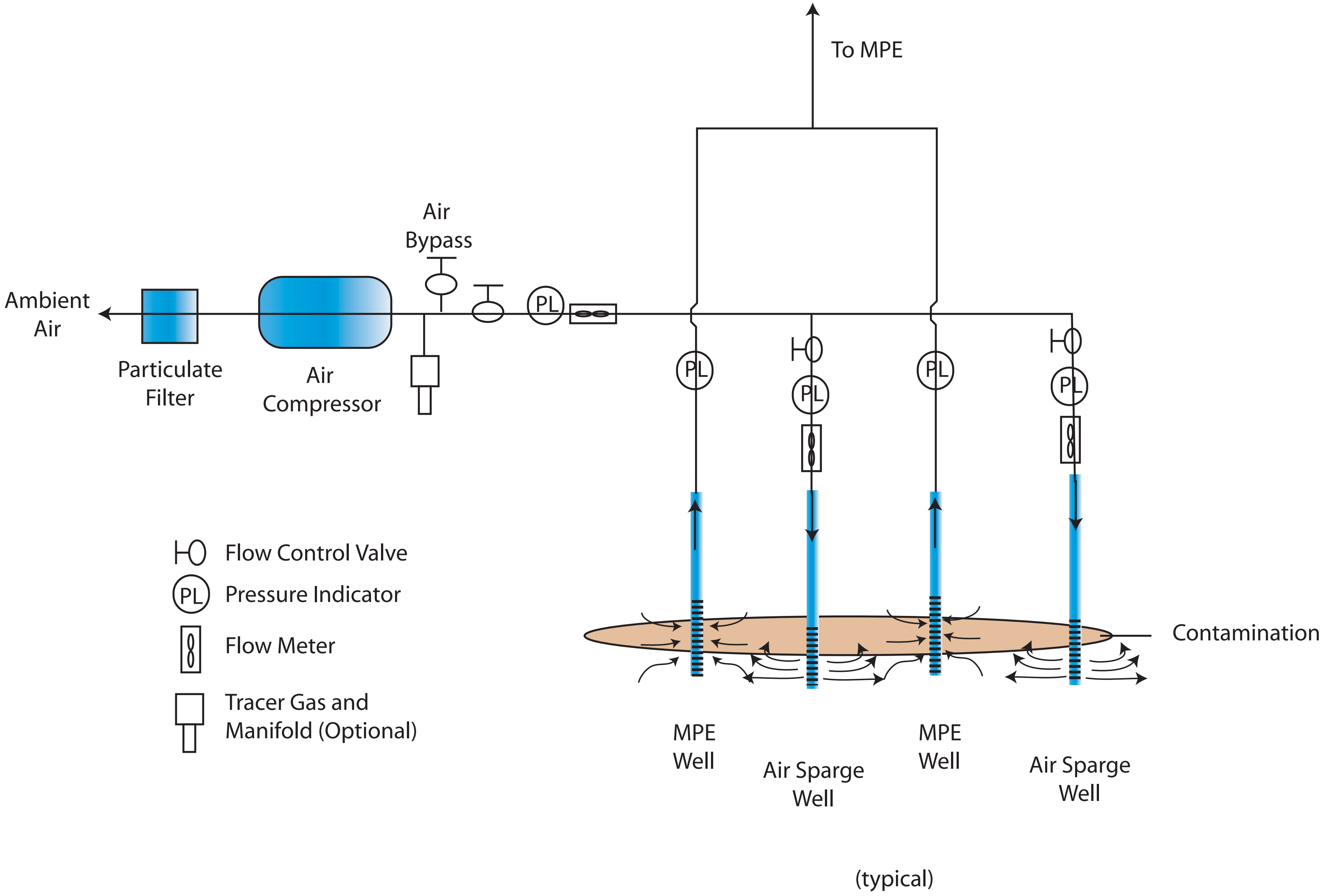


Figure 33: Typical Air Sparging Pilot Test Schematic

TABLES

Table 1

Historical Soil Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Depth (feet)	Sample Date	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-mo (mg/kg)	TOG (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)	Napthalene (mg/kg)	Lead (mg/kg)
WO1	Kaprealian	8.5	9/20/1988	<1.0	NA	NA	<1.0	0.0068	0.0095	<0.005	<0.005	NA	NA	NA
Comp A	Kaprealian	Composite	9/20/1988	<1.0	NA	NA	100	NA	NA	NA	NA	NA	NA	NA
Comp B	Kaprealian	Composite	10/4/1988	<1.0	<10	NA	<50	NA	NA	NA	NA	NA	NA	NA
ESE-1	Alisto	15	9/29/1992	70	<5.0	NA	<50	**0.87**	2	1.2	**5.7**	NA	NA	NA
ESE-1	Alisto	20	9/29/1992	<1.0	<5.0	NA	<50	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
ESE-2	Alisto	10.5	9/28/1992	<1.0	<5.0	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
ESE-2	Alisto	20	9/28/1992	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
ESE-3	Alisto	10.5	9/29/1992	**220**	NA	NA	NA	**1.4**	**8.2**	**3.3**	**18**	NA	NA	NA
ESE-3	Alisto	20	9/29/1992	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
ESE-4	Alisto	6.5	9/28/1992	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
ESE-4	Alisto	10	9/28/1992	24	NA	NA	NA	**0.15**	0.17	0.23	0.82	NA	NA	NA
ESE-5	Alisto	10	9/28/1992	51	NA	NA	NA	**0.25**	0.24	0.3	0.17	NA	NA	NA
ESE-5	Alisto	14	9/28/1992	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
B-9	ACC Env	2	12/5/1994	9.9	NA	NA	NA	0.016	<0.005	0.067	0.23	NA	NA	NA
B-9	ACC Env	4	12/5/1994	1	NA	NA	NA	0.0058	<0.005	0.0065	0.009	NA	NA	NA
B-10	ACC Env	4	12/6/1994	59	NA	NA	NA	<50	<0.005	0.22	0.54	NA	NA	NA
B-11	ACC Env	2	12/6/1994	<10	NA	NA	NA	<50	<0.005	<0.005	<0.005	NA	NA	NA
B-12	ACC Env	4	12/6/1994	<10	NA	NA	NA	<50	<0.005	<0.005	<0.005	NA	NA	NA
B-12	ACC Env	6	12/6/1994	<10	NA	NA	NA	<50	<0.005	<0.005	<0.005	NA	NA	NA
B-20	ACC Env	3	12/8/1994	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
B-20	ACC Env	5	12/8/1994	<1.0	NA	NA	NA	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
MW-6	Alisto	6 to 6.5	7/18/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.05	NA	NA	NA
MW-6	Alisto	11 to 11.5	7/18/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.05	NA	NA	NA
MW-7	Alisto	6 to 6.5	7/18/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.05	NA	NA	NA
MW-7	Alisto	11 to 11.5	7/18/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.05	NA	NA	NA
MW-8	Alisto	3.5 to 4	7/19/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.050	NA	NA	NA
MW-8	Alisto	7.5 to 8	7/19/1995	8.8	NA	NA	NA	<0.025	<0.025	0.046^{E}	0.11^{E}	NA	NA	NA
SB-1	Alisto	1.5 to 2	7/19/1995	**140**	NA	NA	NA	<0.1	<0.1	1.4	**4.1**	NA	NA	NA
SB-1	Alisto	3.5 to 4	7/19/1995	**190**	NA	NA	NA	<0.25	0.33	**4.5**	**18**	NA	NA	NA
SB-1	Alisto	7 to 7.5	7/19/1995	**310**	NA	NA	NA	**0.088**	0.088^{E}	0.41	2	NA	NA	NA
SB-2	Alisto	1.5 to 2	7/19/1995	<2.5	NA	NA	NA	<0.025	<0.025	<0.025	<0.05	NA	NA	NA
SB-2	Alisto	3.5 to 4	7/19/1995	20	NA	NA	NA	<0.025	<0.025	0.93^{E}	0.12^{E}	NA	NA	NA
SB-2	Alisto	5.5 to 6	7/19/1995	**140**	NA	NA	NA	<0.25	<0.25	1.2	1.4	NA	NA	NA
SB-2	Alisto	7.5 to 8	7/19/1995	**230**	NA	NA	NA	<0.25	<0.25	**3.9**	**5.1**	NA	NA	NA
SB-3	Alisto	3 to 3.5	3/8/1996	0.17	NA	NA	NA	0.004	0.011	<0.002	<0.002	0.002	NA	NA
SB-3	Alisto	5 to 5.5	3/8/1996	2.9	NA	NA	NA	0.005	0.012	<0.002	<0.002	0.003	NA	NA
SB-3	Alisto	8 to 8.5	3/8/1996	1.2	NA	NA	NA	**0.15**	0.28	<0.020	<0.020	0.059	NA	NA
SB-4	Alisto	2.5 to 3	3/8/1996	0.16	NA	NA	NA	<0.001	0.003	<0.002	<0.002	<0.001	NA	NA
SB-4	Alisto	5 to 5.5	3/8/1996	<0.1	NA	NA	NA	<0.001	0.003	<0.002	<0.002	<0.001	NA	NA

Table 1

Historical Soil Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Depth (feet)	Sample Date	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-mo (mg/kg)	TOG (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)	Napthalene (mg/kg)	Lead (mg/kg)
UST-NE	SOMA	9.5	9/4/2003	<0.96	<1.0	NA	NA	<0.0048	<0.0048	<0.0048	<0.0048	**0.059**	NA	NA
UST-NW	SOMA	9.5	9/4/2003	2^{H}	<1.0	NA	NA	<0.0047	<0.0047	0.007	<0.0047	**0.069**	NA	NA
UST-SE	SOMA	8	9/4/2003	<1.1	<1.0	NA	NA	<0.0053	<0.0053	<0.0053	<0.0053	<0.021	NA	NA
UST-SW	SOMA	8	9/4/2003	17^{H}	36^{LY}	NA	NA	<0.0049	0.044^{C}	0.28	0.112	**0.071**	NA	NA
UST-SW	SOMA	10	9/4/2003	<1.0	<1.0	NA	NA	<0.0052	<0.0052	<0.0052	<0.0052	**0.075**	NA	NA
WOT-W	SOMA	5.5	9/4/2003	<0.97	<0.99	NA	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.019	NA	6.3
Pumps 1&2	SOMA	2.5	9/11/2003	4.5^{HY}	NA	NA	NA	<0.0055	0.0055^{C}	0.016	0.0197^{C}	<0.022	NA	9.1
Pumps 3&4	SOMA	3	9/11/2003	<1.1	NA	NA	NA	<0.0054	<0.0054	<0.0054	<0.0054	<0.022	NA	6.9
Pumps 5&6	SOMA	3	9/11/2003	<1.1	NA	NA	NA	<0.0054	<0.0054	<0.0054	<0.0054	<0.022	NA	7.6
Pumps 7&8	SOMA	3	9/11/2003	<1.1	NA	NA	NA	<0.0053	<0.0053	<0.0053	<0.0053	<0.021	NA	18
Intersection	SOMA	3	9/11/2003	<1.1	NA	NA	NA	<0.0055	<0.0055	<0.0055	<0.0055	<0.022	NA	7.7
PL1[1]	SOMA	4	9/13/2003	**530^{HY}**	NA	NA	NA	<0.011	<0.011	0.34^{C}	0.524^{C}	<0.043	NA	NA
PL2[2]	SOMA	4	9/13/2003	<1.1	NA	NA	NA	<0.0055	<0.0055	<0.0055	<0.0055	<0.022	NA	NA
SB1- Comp	SOMA	Composite	8/20/2003	<1.0	NA	NA	NA	0.02^{C}	<0.0052	0.0098	0.013	**0.23**	NA	7.2
SB2 - Comp	SOMA	Composite	8/20/2003	390	NA	NA	NA	<0.13	<0.13	**2.8**	**9.8**	<0.5	NA	8.2
Comp 1	SOMA	Composite	9/3/2003	8.8	NA	NA	NA	<0.0054	<0.0054	0.032	0.049	<0.018	NA	10
Comp 2	SOMA	Composite	9/4/2003	<0.99	NA	NA	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	4.6
Comp 2R	SOMA	Composite	9/5/2003	21^{H}	4.8^{HLY}	NA	NA	<0.01	0.024^{C}	0.054^{C}	0.01^{C}	<0.041	NA	5.3
Comp ESE-3WA	SOMA	Composite	10/3/2008	<1.1	NA	NA	NA	<0.0055	<0.0055	<0.0055	0.008	<0.022	NA	4
TWB-1	SOMA	22	12/2/2003	<1.0	NA	NA	NA	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	NA	NA
TWB-1	SOMA	25	12/2/2003	<0.94	NA	NA	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA	NA
TWB-2	SOMA	22	12/2/2003	<1.1	NA	NA	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA	NA
TWB-2	SOMA	24	12/2/2003	<1.0	NA	NA	NA	<0.0048	<0.0048	<0.0048	<0.0048	**0.027**	NA	NA
TWB-2	SOMA	27	12/2/2003	<1.1	NA	NA	NA	<0.0043	<0.0043	<0.0043	<0.0043	0.015	NA	NA
TWB-2	SOMA	29	12/2/2003	<1.0	NA	NA	NA	<0.0047	<0.0047	<0.0047	<0.0047	0.019	NA	NA
TWB-3	SOMA	22	12/2/2003	<0.95	NA	NA	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
TWB-3	SOMA	25	12/2/2003	<0.95	NA	NA	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	NA
TWB-3	SOMA	29	12/2/2003	<1.0	NA	NA	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA	NA
TWB-4	SOMA	10	12/2/2003	<0.93	NA	NA	NA	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	NA	NA
TWB-4	SOMA	27	12/2/2003	<1.1	NA	NA	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA	NA
TWB-4	SOMA	29	12/2/2003	<0.98	NA	NA	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	NA
TWB-5	SOMA	16	12/2/2003	<1.0	NA	NA	NA	0.018	<0.0045	0.041	0.187	<0.0045	NA	NA
TWB-5	SOMA	18	12/2/2003	<0.93	NA	NA	NA	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	NA	NA
TWB-5	SOMA	29	12/2/2003	<0.97	NA	NA	NA	<0.0045	<0.0045	0.0051	0.018	<0.0045	NA	NA

Table 1

Historical Soil Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Depth (feet)	Sample Date	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-mo (mg/kg)	TOG (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)	Napthalene (mg/kg)	Lead (mg/kg)
B-1	Delta	17	8/28/2008	**120**	NA	NA	NA	<0.12	<0.12	<0.12	<0.24	<0.12	NA	NA
B-3	Delta	12	8/28/2008	**720**	NA	NA	NA	<0.5	<0.5	2	1.7	<0.5	NA	NA
B-4	Delta	10	8/28/2008	<0.5	NA	NA	NA	<0.005	<0.005	<0.005	<0.01	<0.005	NA	NA
B-5	Delta	12	8/28/2008	<0.5	NA	NA	NA	<0.005	<0.005	<0.005	<0.01	<0.005	NA	NA
B-6	Delta	9 to 10	8/28/2008	0.7	NA	NA	NA	<0.005	<0.005	<0.005	<0.01	<0.005	NA	NA
DP-1	SOMA	11	8/18/2009	6.1 Y	48 Y	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
DP-1	SOMA	14	8/18/2009	25 Y	35 Y	<5.0	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	NA
DP-1	SOMA	17	8/18/2009	<1.1	1.9 Y	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
DP-2	SOMA	8	8/17/2009	1.4 Y	4.3 Y	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
DP-2	SOMA	12	8/17/2009	1.3 Y	1.6 Y	<5.0	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA	NA
DP-3	SOMA	12	8/17/2009	<1.0	<0.99	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
DP-4	SOMA	6	8/17/2009	<1.1	<1.0	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
DP-4	SOMA	14	8/17/2009	<0.93	<1.0	<5.0	NA	<0.005	<0.005	<0.005	<0.005	<0.005	NA	NA
DP-5	SOMA	12	8/18/2009	38	16 Y	<5.0	NA	<0.047 a	<0.047 a	0.11 a	1.87 a	<0.047 a	NA	NA
DP-5	SOMA	14	8/18/2009	**91**	51 Y	22	NA	<0.25 b	<0.25 b	2.4 b	**11 b**	<0.25 b	NA	NA
DP-5	SOMA	20	8/18/2009	26	8.1 Y	<5.0	NA	<0.017 c	<0.017 c	<0.017 c	0.051 c	<0.017 c	NA	NA
DP-6	SOMA	12	8/18/2009	**96**	2.6 Y	<5.0	NA	<0.025 f	<0.025 f	0.54 f	0.2 f	<0.025 f	NA	NA
DP-6	SOMA	14	8/18/2009	1.5	3.9 Y	<5.0	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	NA
DP-6	SOMA	17	8/18/2009	75	9.9	<5.0	NA	<0.04 d	<0.04 d	0.22 d	0.84 d	<0.04 d	NA	NA
DP-7	SOMA	12	8/18/2009	<0.97	<1.0	<5.0	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA	NA
DP-7	SOMA	14	8/18/2009	<0.94	<0.99	<5.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA	NA
SOMA-5	SOMA	11	8/18/2009	**380**	31 Y	<5.0	NA	<0.25 b	<0.25 b	2.0 b	**14.2 b**	<0.25 b	NA	NA
SOMA-5	SOMA	12.5	8/18/2009	28	2.6 Y	<5.0	NA	<0.05 e	<0.05 e	0.4 e	**2.65 e**	<0.05 e	NA	NA

Table 1

Historical Soil Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Depth (feet)	Sample Date	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-mo (mg/kg)	TOG (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)	Napthalene (mg/kg)	Lead (mg/kg)
SB-6 (SOMA-6)	SOMA	9	8/9/2010	<1.1	<0.99	<5.0	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA
SB-6 (SOMA-6)	SOMA	11.5	8/9/2010	13 Y	5.3 Y	16.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA
SOMA-7	SOMA	2.5	8/9/2010	9.9 Y	79	91.0	NA	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	NA
SOMA-7	SOMA	9	8/9/2010	**430 Y**	**170**	63.0	NA	<0.25	<0.25	<0.25	<0.25	<0.25	**3.7**	NA
SOMA-7	SOMA	10	8/9/2010	**980 Y**	**370 Y**	15.0	NA	<2.5	<2.5	**9**	<2.5	<2.5	**13**	NA
SOMA-8	SOMA	7.5	8/9/2010	<1.0	<1.0	<5.0	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA
SOMA-8	SOMA	12.5	8/9/2010	<1.0	<0.99	<5.0	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA
SB-9 (SOMA-9)	SOMA	7	8/9/2010	<1.0	<1.0	<5.0	NA	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	NA
SB-9 (SOMA-9)	SOMA	13.5	8/9/2010	<1.1	<1.0	<5.0	NA	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	NA
ESL - Shallow Soil, Commercial				83	83	2500	2500	0.044	2.9	3.3	2.3	0.023	1.3	750
ESL - Deep Soils, Commercial				83	83	5000	5000	0.044	2.9	3.3	2.3	0.023	3.4	750

Notes:

< - not detected above laboratory reporting limits

NA - not analyzed

C - Presence confirmed but RPD between columns exceeds 40%

E - Analyte Amount Exceeds the Calibration Range

H - Heavier hydrocarbons contributed to the quantitation

L - Lighter Hydrocarbons contriuted to quantitiation

Y - Sample exhibits chromatographic pattern that does not resemble standard

1 - located adjacent to pumps 5&6

2 - located adjacent to pumps 3&4

Petroleum Hydrocarbons analyzed by EPA 8015, 8021, and 8260

TOG - Total Oil and Gas

ESL - Environmental Screening Level, California Regional Water Control Board, Interim Final November 2007, revised May 2008

a	Dilution factor 9.434
b	Dilution factor 50
c	Dilution factor 3.311
d	Dilution Factor 8.065
e	Dilution Factor 10
f	Dilution Factor 4.950

Table 2

Historical Grab Groundwater Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Date	TPH-g (µg/L)	TPH-d (µg/L)	TPH-mo (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L)	TBA (µg/L)
ESE-1	Alisto	7/28/1995	**190**	NA	NA	<0.5	<0.5	<0.5	<1.0	NA	NA
ESE-2	Alisto	7/28/1995	**2,000**	NA	NA	<2.5	<2.5	<2.5	<5.0	NA	NA
ESE-3	Alisto	7/28/1995	<50	NA	NA	<0.5	<0.5	<0.5	<1.0	NA	NA
ESE-4	Alisto	7/28/1995	<50	NA	NA	<0.5	<0.5	<0.5	<1.0	NA	NA
ESE-5	Alisto	7/28/1995	**520**	NA	NA	**15**	<0.5	1.7	1.3	NA	NA
ESE-5 QC1	Alisto	7/28/1995	**460**	NA	NA	**7.2**	<0.5	1.9	1.5	NA	NA
MW-6	Alisto	7/28/1995	<50	NA	NA	<0.5	<0.5	<0.5	<1.0	NA	NA
MW-7	Alisto	7/28/1995	<50	NA	NA	0.54[E]	0.54	<0.5	<1.0	NA	NA
MW-8	Alisto	7/28/1995	**1,100**	NA	NA	<2.5	<2.5	<2.5	<5.0	NA	NA
S-10	Alisto	7/28/1995	<50	NA	NA	<0.5	<0.5	<0.5	<1.0	NA	NA
Ex. UST Pit	SOMA	9/4/2003	**1,300**	NA	NA	**110**	**220**	18	**171**	**14,000**	NA
ESE-3 WA	SOMA	10/3/2003	**110**	NA	NA	<5.0	<5.0	0.59	1.2	3.3	NA
TWB-1	SOMA	12/2/2003	<50	NA	NA	<0.5	<0.5	<0.5	0.8	**8.5**	NA
TWB-2	SOMA	12/2/2003	<50	NA	NA	<0.5	<0.5	<0.5	<0.5	**89**	NA
TWB-3	SOMA	12/2/2003	<50	NA	NA	<0.5	<0.5	<0.5	<0.5	**37**	NA
TWB-4	SOMA	12/2/2003	<50	NA	NA	<0.5	<0.5	<0.5	2.3	<0.5	NA
TWB-5	SOMA	12/2/2003	**32,000**	NA	NA	**500**	13	**540**	**1,150**	**9.5**	NA
B-4	Delta	8/28/2008	<50	NA	NA	<0.5	<1.0	<1.0	<2.0	<1.0	<10
B-5	Delta	8/28/2008	<50	NA	NA	<0.5	<1.0	<1.0	<2.0	<1.0	<10
B-6	Delta	8/28/2008	**900**	NA	NA	0.71	3.5	3.4	<2.0	<1.0	<10
MW-1[1]	Delta	10/28/2008	<50	NA	NA	<0.5	<1.0	<1.0	<2.0	**15**	**38**
MW-2[1]	Delta	10/28/2008	74	NA	NA	<0.5	<1.0	<1.0	<2.0	**51**	<10
MW-3[1]	Delta	10/28/2008	<50	NA	NA	<0.5	<1.0	<1.0	<2.0	**19**	<10
MW-4[1]	Delta	10/28/2008	<50	NA	NA	<0.5	<1.0	<1.0	<2.0	<1.0	<10
DP-1	SOMA	8/18/2009	**210 Y**	**140 Y**	<300	<0.5	<0.5	<0.5	<0.5	<0.5	<10
DP-2	SOMA	8/17/2009	**130**	**340 Y**	**410**	<0.5	<0.5	3.7	<0.5	<0.5	<10
DP-3	SOMA	8/17/2009	<50	**330 Y**	**360**	<0.5	<0.5	<0.5	<0.5	1.9	<10

Table 2

Historical Grab Groundwater Analytical Data

3519 Castro Valley Blvd., Castro Valley

Sample ID	Consultant	Sample Date	TPH-g (μg/L)	TPH-d (μg/L)	TPH-mo (μg/L)	Benzene (μg/L)	Toluene (μg/L)	Ethyl Benzene (μg/L)	Total Xylenes (μg/L)	MtBE (μg/L)	TBA (μg/L)
DP-4	SOMA	8/17/2009	<50	**980 Y**	**570**	<0.5	<0.5	<0.5	<0.5	0.76	<10
DP-5	SOMA	8/18/2009	**640**	**240 Y**	<300	**8.9**	1.6	18	**71**	4.8	<10
DP-6	SOMA	8/18/2009	**1,600**	**470 Y**	<300	**18**	<0.5	**71**	**186**	<0.5	<10
DP-7	SOMA	8/18/2009	<50	**130 Y**	<300	<0.5	<0.5	<0.5	<0.5	<0.5	<10
SOMA-5	SOMA	9/21/2009	**16,000**	NA	NA	**1,300**	<10	**420**	**2,360**	**120**	**510**
ESE-1R	SOMA	8/30/2010	**2,100**	**1,600 Y**	**560**	**110**	5.2	19	**151**	**15**	**83**
ESE-2R	SOMA	8/30/2010	**200**	**250 Y**	<300	0.93	<0.50	1.3	13.5	**16**	<10
ESE-5R	SOMA	8/30/2010	75	**190 Y**	<300	<0.5	<0.5	<0.5	<0.5	**7.3**	<10
MW-6R	SOMA	8/30/2010	<50	**110 Y**	<300	<0.5	<0.5	<0.5	<0.5	<0.5	<10
MW-7R	SOMA	8/30/2010	<50	**200 Y**	**420**	<0.5	<0.5	<0.5	<0.5	**24**	<10
SOMA-7	SOMA	8/30/2010	**2,900**	**2,100 Y**	**330**	**190**	3.7	**74**	19.8	**8.4**	<33
SOMA-8	SOMA	8/30/2010	<50	69 Y	<300	<0.5	<0.5	<0.5	<0.5	<0.5	<10
ESL - Drinking Water			**100**	**100**	**100**	**1**	**40**	**30**	**20**	**5**	**12**
ESL - Non-Drinking Water			**210**	**210**	**210**	**46**	**130**	**43**	**100**	**1,800**	**18,000**

Notes:

1: Wells designated by Delta, Correct designation for monitoring wells is: MW-1 is ESE-1, MW-2 is ESE-2, MW-3 is SOMA-1, MW-4 is MW-6

ESL - Environmental Screening Level, California Regional Water Control Board, Interim Final November 2007, revised May 2008

Table 3
Historical Groundwater Elevations & Analytical Data
TPH-g, BTEX, MtBE
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
Semi-Confined WBZ Wells										
ESE-1	10/5/1992	177.69	11.22	166.47	2100	370	150	17	110	NA
	10/5/1992	177.69	NM	NM	2300	370	160	16	110	NA
	4/1/1993	177.69	8.79	168.90	5900	1500	410	110	390	NA
	6/29/1993	177.69	10.34	167.35	7600	2900	390	130	460	NA
	9/23/1993	177.69	10.91	166.78	2000	490	40	20	56	600
	9/23/1993	177.69	NM	NM	1500	420	39	19	56	550
	12/10/1993	177.69	9.93	167.76	1800	480	42	19	66	921
	12/10/1993	177.69	NM	NM	1500	380	38	17	55	770
	2/17/1994	177.69	9.64	168.05	1900	380	48	24	80	585
	2/17/1994	177.69	NM	NM	2200	430	42	19	65	491
	8/8/1994	177.69	11.72	165.97	2100	450	46	16	50	760
	10/12/1994	177.69	10.48	167.21	760	240	16	51	39	230
	1/19/1995	177.69	7.77	169.92	840	600	120	22	58	NA
	5/2/1995	177.69	8.69	169.00	2000	640	67	24	98	NA
	7/28/1995	177.69	10.12	167.57	190	<0.50	<0.50	<0.50	<1.0	NA
	11/17/1995	177.69	10.57	167.12	200	3.4	<1.0	1	<2.0	600
	2/7/1996	177.69	7.41	170.28	750	370	23	21	64	680
	4/23/1996	177.69	9.12	168.57	310	100	<1.0	<1.0	<1.0	1500
	7/9/1996	177.69	10.12	167.57	730	230	74	13	63	750
	10/10/1996	177.69	10.80	166.89	420	26	1.6	7.3	12	430
	1/20/1997	177.69	10.52	167.17	660	290	4.2	13	36	450
	4/25/1997	177.69	9.77	167.92	410	<0.5	<1.0	<1.0	<1.0	580
	7/18/1997	177.69	10.55	167.14	420	<0.5	<1.0	<1.0	<1.0	370
	10/27/1997	177.69	10.36	167.33	300	56	<1.0	6.5	<1.0	220

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-1 cont.	1/22/1998	177.69	7.52	170.17	4200	440	9	15	17.7	1300
	4/23/1998	177.69	8.80	168.89	15000	3400	190	910	900	4900
	4/23/1998	177.69	NM	NM	15000	2800	140	730	730	4400
	7/29/1998	177.69	9.73	167.96	NA	NA	NA	NA	NA	NA
	7/30/1998	177.69	NM	NM	15000	<2.5	<5.0	<5.0	<5.0	15000
	12/17/1998	177.69	9.51	168.18	2400	73	1	2.8	4.6	2000
	3/19/1999	177.69	8.65	169.04	4700	58	<1.0	<1.0	<1.0	4700
	6/23/1999	177.69	10.51	167.18	600	170	<1.0	7.2	5	3900
	9/27/1999	177.69	10.32	167.37	920	200	<25	<25	<25	4900
	12/9/1999	177.69	10.24	167.45	460	130	1.2	5.2	1.5	5100
	3/9/2000	177.69	7.72	169.97	3000	1300	120	80	140	7300
	6/8/2000	177.69	9.40	168.29	2900	540	9.7	20	17	5200
	9/18/2000	177.69	10.05	167.64	890	3.4	<0.5	1.4	<0.5	2800
	12/14/2000	177.69	8.20	169.49	1600	11.1	<0.5	<0.5	<0.5	2730
	3/21/2001	177.69	9.75	167.94	5700	2.28	<0.5	0.51	<1.5	6810
	6/18/2001	177.69	10.21	167.48	2000	152	0.669	3.62	2.34	1980
	9/18/2001	177.69	10.30	167.39	2500	57.1	<5.0	6.25	<15	2090
	12/13/2001	177.69	9.82	167.87	2800	208	6.05	8.54	9.66	2030
	3/14/2002	177.69	9.10	168.59	1800	140	6.31	4.5	9.41	1970
	6/19/2002	177.69	9.92	167.77	1100	220	2.02	4.23	3.8	1280
	9/10/2002	177.69	10.21	167.48	490	39	2.9	<2.0	4.9	670
	12/16/2002	177.69	8.56	169.13	730	140	6	3.2	9.1	670
	3/11/2003	177.69	9.40	168.29	1700	490	21	22	41	530
	6/17/2003	177.69	9.86	167.83	1300	140	<10	<10	<10	480
	12/9/2003	177.69	9.32	168.37	1400	390	12	14	26.1	260
	2/26/2004	177.69	7.71	169.98	3200	880	50	44	89	200
	5/21/2004	177.69	10.19	167.50	1500	370	10	14	25.2	140
	8/10/2004	180.24	10.41	169.83	460	390	7	8.1	15.4	110
	10/19/2004	180.24	10.40	169.84	1600	490	13	12	25.3	110

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation ^{1} (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-1 cont.	1/14/2005	180.24	8.26	171.98	790 Z	420	26	19	52	91
	4/14/2005	180.24	8.77	171.47	3020	766	25.6	21.3	25.26	88.2
	7/7/2005	180.24	9.94	170.30	1940	440	15.5	15.7	21	80.6
	11/15/2005	180.24	10.21	170.03	1260	259	6.2	8.2	10.81	45.8
	2/8/2006	180.24	9.01	171.23	1430	332	13.6	18.1	25.03	43
	4/27/2006	180.24	9.14	171.10	1,600	519	23.2	32.4	40.20	63.4
	8/1/2006	180.24	9.92	170.32	1,530	395	11.8	25.4	28.01	40
	10/19/2006	180.24	10.34	169.90	1,230	327	10.2	21.6	21.19	29.6
	1/12/2007	180.24	9.84	170.40	561	153	7.18	14.4	14.95	30.9
	4/17/2007	180.24	9.78	170.46	467	192	7.59	13.8	16.42	30.4
	7/17/2007	180.24	9.82	170.42	755	271	8.6	17.8	22.06	26.7
	10/16/2007	180.24	8.99	171.25	164	80.2	<2.0	5.24	2.47	16.6
	1/17/2008	180.24	9.35	170.89	70	10.8	<2.0	<0.5	<2.0	19.3
	4/17/2008	180.24	9.80	170.44	687	89.7	<2.0	4.01	5.30	8.79
	7/16/2008	180.24	10.17	170.07	1,400	223	3.88	12.6	17.88	18.1
	10/14/2008	180.24	10.86	169.38	540	95	2.7	7.7	18	15
	1/6/2009	180.24	10.10	170.14	500 ^{Y}	130	3	8.8	17.1	13
	4/6/2009	180.24	10.05	170.19	910 ^{Y}	230	2.4	11	12.1	17
	7/7/2009	180.24	10.42	169.82	850 ^{Y}	89	1.9	7.8	15.1	15
	1/27/2010	180.24	7.94	172.30	1,600	250	8.8	30	69	23
	7/26/2010	180.24	9.95	170.29	1,000	96	1.2	4.2	6	17
ESE-1R	8/30/2010	180.20	10.17	170.03	2,100	110	5.2	19	151	15
	11/16/2010	180.20	9.94	170.26	100	5.8	<0.5	1	<0.5	16
	2/15/2011	**180.20**	**10.12**	**170.08**	**1,400**	**96**	**1.7**	**14**	**7.9**	**22**

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-2	10/5/1992	178.23	11.68	166.55	300	5.4	16	3.9	45	NA
	4/1/1993	178.23	9.17	169.06	240	27	<0.5	17	2.6	123
	6/29/1993	178.23	10.88	167.35	1,700	260	24	110	23	NA
	6/29/1993	178.23	NM	NM	1,300	240	17	110	25	NA
	9/23/1993	178.23	11.56	166.67	240	3.1	0.5	0.6	2.5	643
	12/10/1993	178.23	10.48	167.75	250	2.4	2.4	1.5	11	940
	2/17/1994	178.23	10.06	168.17	900	<0.5	<0.5	<0.5	<0.5	930
	8/8/1994	178.23	11.11	167.12	750	<0.5	<0.5	<0.5	<0.5	1400
	10/12/1994	178.23	11.31	166.92	1,700	<0.5	<0.5	<0.5	<0.5	3000
	1/19/1995	178.23	8.25	169.98	300	2	0.9	0.7	1	NA
	5/2/1995	178.23	9.21	169.02	1,200	4	<2.5	<2.5	<5	NA
	7/28/1995	178.23	10.64	167.59	2,000	<2.5	<2.5	<2.5	<5	NA
	11/17/1995	178.23	11.13	167.10	3,600	<25	<25	<25	<50	12000
	11/17/1995	178.23	NM	NM	3,400	<25	<25	<25	<50	12000
	2/7/1996	178.23	7.94	170.29	450	<0.5	<1	<1	<1	2300
	4/23/1996	178.23	9.73	168.50	260	0.9	<1	<1	<1	8600
	7/9/1996	178.23	10.70	167.53	780	<2.5	<5	<5	<5	13393
	10/10/1996	178.23	11.39	166.84	2,900	<0.5	<1	<1	<1	12000
	1/20/1997	178.23	9.04	169.19	<250	<2.5	<5	<5	<5	13000
	4/25/1997	178.23	10.31	167.92	2,700	<0.5	<1	<1	<1	15000
	7/18/1997	178.23	11.02	167.21	11,000	<5	<10	<10	<10	11000
	10/27/1997	178.23	10.93	167.30	6,100	<2.5	<5.0	<5.0	<5.0	7100
	10/27/1997	178.23	NM	NM	6,600	<2.5	<5.0	<5.0	<5.0	7400
	1/22/1998	178.23	7.93	170.30	13,000	<0.5	<1	<1	<1	10000
	1/22/1998	178.23	NM	NM	13,000	<0.5	<1	<1	<1	10000
	4/23/1998	178.23	9.34	168.89	19,000	<5	<10	<10	<10	36000
	7/29/1998	178.23	10.29	167.94	NA	NA	NA	NA	NA	NA
	7/30/1998	178.23	NM	NM	19,000	<5	<10	<10	<10	36000
	12/17/1998	178.23	10.20	168.03	12,000	<5	<5	<5	<5	13000

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (μg/L)	Benzene (μg/L)	Toluene (μg/L)	Ethyl benzene (μg/L)	Total Xylenes (μg/L)	MtBE (μg/L) 8260B
ESE-2 cont	3/19/1999	178.23	9.02	169.21	18,000	160	<1	<1	<1	18000
	6/23/1999	178.23	9.99	168.24	280	<1	<1	<1	<1	16000
	9/27/1999	178.23	10.69	167.54	<500	<25	<25	<25	<25	12000
	12/9/1999	178.23	11.26	166.97	<50	<0.3	<0.3	<0.3	<0.6	12000
	3/9/2000	178.23	7.95	170.28	<50	1.6	<0.5	<0.5	<0.5	7900
	6/8/2000	178.23	9.66	168.57	1,600	<0.5	0.73	<0.5	2.2	9400
	12/14/2000	178.23	11.15	167.08	6,000	0.75	<0.5	<0.5	<0.5	11200
	3/21/2001	178.23	10.35	167.88	6,900	786	45.7	37.7	71.5	3790
	6/18/2001	178.23	11.24	166.99	6,400	<2.5	<2.5	<2.5	<7.5	9320
	9/18/2001	178.23	11.35	166.88	4,800	<12.5	<12.5	<12.5	<37.5	6960
	12/13/2001	178.23	10.97	167.26	59,000	0.592	<0.5	<0.5	<1	5940
	3/14/2002	178.23	10.13	168.10	4,500	76	<0.5	<0.5	<1	6660
	6/19/2002	178.23	10.91	167.32	250	<12.5	<12.5	<12.5	<25	4900
	9/10/2002	178.23	10.82	167.41	1,500	<5	<5	<5	6.3	3100
	12/16/2002	178.23	7.87	170.36	1,400	<5	<5	<5	<5	2400
	3/11/2003	178.23	10.24	167.99	2,800	<10	<10	<10	<10	4800
	6/17/2003	178.23	10.19	168.04	10,000	<100	<100	<100	<100	4400
	12/9/2003	178.23	9.97	168.26	<50	<0.5	<0.5	<0.5	<0.5	3400
	2/26/2004	178.23	7.89	170.34	<50	<0.5	<0.5	<0.5	<0.5	3000
	5/21/2004	178.23	10.70	167.53	<50	<0.5	<0.5	<0.5	<0.5	1100
	8/10/2004	180.79	10.99	169.80	<50	<0.5	<0.5	<0.5	<0.5	550
	10/19/2004	180.79	10.46	170.33	<50	<0.5	<0.5	<0.5	<0.5	410
	1/14/2005	180.79	8.66	172.13	<50	<8.3	<8.3	<8.3	<8.3	1200
	4/14/2005	180.79	9.38	171.41	<860	<2.15	<2.15	<2.15	<4.30	1020
	7/7/2005	180.79	10.46	170.33	<860	<2.15	<8.60	<2.15	<4.30	378
	11/15/2005	180.79	10.55	170.24	<50	<0.5	<2.0	<0.5	<1.0	210
	2/8/2006	180.79	9.46	171.33	<215	<2.15	<8.6	<2.15	<4.3	419
	4/27/2006	180.79	10.67	170.12	<100	1.71	<4.0	<1.0	<2.0	432
	8/1/2006	180.79	10.29	170.50	<100	2.83	<4.0	<1.0	<2.0	222
	10/19/2006	180.79	10.65	170.14	<50	0.8	<2.0	<0.5	<1.0	221

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-2 cont	1/12/2007	180.79	NM	NM	NA	NA	NA	NA	NA	NA
	4/17/2007	180.79	10.20	170.59	<50	3.17	<2.0	4.49	<2.0	158
	7/17/2007	180.79	10.31	170.48	<50	1.65	<2.0	<0.5	<2.0	105
	10/16/2007	180.79	9.22	171.57	<50	5.67	<2.0	<0.5	<2.0	73.9
	1/17/2008	180.79	9.88	170.91	<50.0	<0.50	<2.0	<0.50	<2.0	80.2
	4/17/2008	180.79	10.29	170.50	<50	<0.5	<2.0	<0.5	<2.0	45
	7/16/2008	180.79	10.64	170.15	<50	<0.5	<2.0	<0.5	<2.0	54
	10/14/2008	180.79	11.41	169.38	<50	<0.5	<0.5	<0.5	<0.5	41
	1/6/2009	180.79	10.60	170.19	<50	<0.5	<0.5	<0.5	<0.5	36
	4/6/2009	180.79	10.62	170.17	<50	<0.5	<0.5	<0.5	<0.5	30
	7/7/2009	180.79	10.92	169.87	<50	2.4	<0.5	<0.5	<0.5	32
	1/27/2010	180.79	8.36	172.43	<50	<0.5	<0.5	<0.5	<0.5	26
	7/26/2010	180.79	10.44	170.35	<50	<0.5	<0.5	<0.5	<0.5	13
ESE-2R	8/30/2010	180.7	10.61	170.09	200	0.93	<0.5	1.3	13.5	16
	11/16/2010	180.7	10.33	170.37	<50	<0.5	<0.5	<0.5	<0.5	18
	2/14/2011	**180.70**	**10.50**	**170.20**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**12**
ESE-3	10/5/1992	178.20	10.58	167.62	430	57	31	3.6	34	NA
	4/1/1993	178.20	8.14	170.06	2400	460	220	74	210	NA
	6/29/1993	178.20	9.72	168.48	280	56	14	15	13	NA
	9/23/1993	178.20	10.46	167.74	72	13	3.5	1.7	4.1	NA
	12/10/1993	178.20	9.30	168.90	270	71	32	6.1	33	NA
	2/17/1994	178.20	8.97	169.23	520	140	10	20	33	5.74
	8/8/1994	178.20	10.02	168.18	<50	8.8	1.6	1.6	2.3	<5.0
	10/12/1994	178.20	10.32	167.88	470	190	6.4	15	18	<5.0
	1/19/1995	178.20	7.40	170.80	330	260	27	21	20	NA
	5/2/1995	178.20	8.26	169.94	530	180	30	23	44	NA
	7/28/1995	178.20	9.54	168.66	<50	<0.50	<0.50	<0.50	<1	NA
	11/17/1995	178.20	10.04	168.16	<50	1.7	<0.50	<0.50	<1	<5.0

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation ^{1} (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-3 cont.	2/7/1996	178.20	7.08	171.12	<50	8.6	<1	<1	<1	<10
	4/1/2396	178.20	8.79	169.41	<50	7.6	<1	<1	<1	65
	7/9/1996	178.20	10.09	168.11	<50	12	2.6	2	3.9	26
	10/10/1996	178.20	10.48	167.72	NA	NA	NA	NA	NA	NA
	10/11/1996	178.20	NM	NM	260	140	<1	<1	2.6	<10
	1/20/1997	178.20	8.65	169.55	<50	1.5	1.7	<1	<1	14
	4/25/1997	178.20	10.02	168.18	<50	<0.5	<1	<1	<1	14
	7/18/1997	178.20	10.66	167.54	10000	1400	1400	300	1280	<250
	10/27/1997	178.20	9.83	168.37	<250	<2.5	<5.0	<5.0	36	<50
	1/22/1998	178.20	7.06	171.14	130	<0.5	<1.0	<1.0	<1.0	120
	4/23/1998	178.20	8.44	169.76	4800	560	<10	15	<10	4000
	7/29/1998	178.20	9.27	168.93	NA	NA	NA	NA	NA	NA
	7/30/1998	178.20	NM	NM	1800	6.2	<5.0	<5.0	<5.0	1700
	12/17/1998	178.20	9.15	169.05	600	54	<1.0	2.1	4.9	340/480
	3/19/1999	178.20	8.14	170.06	2000	260	4.4	13	28	870
	6/23/1999	178.20	9.44	168.76	290	91	<1.0	8.3	16	240
	9/27/1999	178.20	9.69	168.51	130	35	<1.0	2.7	3.8	100
	12/9/1999	178.20	10.99	167.21	380	84	1.7	8.7	6.3	160
	3/9/2000	178.20	7.12	171.08	950	190	4.6	39	62	350
	6/8/2000	178.20	10.92	167.28	300	37	<0.5	2.3	1.3	400
	9/18/2000	178.20	11.12	167.08	920	140	1.3	15	4.8	170
	12/14/2000	178.20	9.70	168.50	320	64	<0.5	6.24	1.76	201
	3/21/2001	178.20	10.07	168.13	680	80.5	0.546	21.1	18.2	398
	6/18/2001	178.20	11.42	166.78	380	47	<0.5	3.11	<1.5	242
	9/18/2001	178.20	11.55	166.65	340	54.8	<0.5	4.36	<1.5	79.7
	12/13/2001	178.20	10.12	168.08	270	31.4	<0.5	1.31	2.24	129
	3/14/2002	178.20	9.84	168.36	670	89.8	0.769	23.4	30.4	413
	6/19/2002	178.20	10.57	167.63	130	18.6	<0.5	<0.5	<1	166
	9/10/2002	178.20	9.90	168.30	88	12	<0.5	<0.5	<0.5	93
	12/16/2002	178.20	9.23	168.97	290	55	17	3.7	14	78

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-3 cont.	3/11/2003	178.20	9.05	169.15	100	3.4	<0.5	0.54	<0.50	140
	6/17/2003	178.20	9.30	168.90	520	17	<5	5.3	<5	130
ESE-4	10/5/1992	177.73	10.33	167.40	98	7.2	1.3	1.1	6.1	NA
	4/1/1993	177.73	7.88	169.85	550	93	20	23	33	NA
	6/29/1993	177.66	8.33	169.33	150	23	0.6	5.4	0.5	54
	9/23/1993	177.66	10.05	167.61	110	14	1.7	3.2	4.6	NA
	12/10/1993	177.66	8.95	168.71	110	21	7.2	4.2	10	28.75
	2/17/1994	177.66	8.65	169.01	210	26	1.2	4.7	11	113
	8/8/1994	177.66	9.76	167.90	76	9.6	<0.5	2	<0.5	62
	10/12/1994	177.66	9.62	168.04	<50	<0.5	<0.5	<0.5	<0.5	44
	1/19/1995	177.66	6.97	170.69	140	56	14	24	23	NA
	5/2/1995	177.66	7.85	169.81	130	21	2.8	8.6	8.2	NA
	7/28/1995	177.66	9.20	168.46	<50	<0.5	<0.5	<0.5	<1	NA
	11/17/1995	177.66	9.68	167.98	<50	<0.5	0.6	<0.5	<1	18
	2/7/1996	177.66	6.59	171.07	100	2.6	<1	1.6	4.1	42
	4/23/1996	177.66	8.30	169.36	160	37	15	16	31	43
	7/9/1996	177.66	9.21	168.45	60	17	1.5	6.8	11.6	27
	10/10/1996	177.66	9.97	167.69	NA	NA	NA	NA	NA	NA
	10/11/1996	177.66	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	18
	1/20/1997	177.66	7.68	169.98	<50	<0.5	<1.0	<1.0	<1.0	130
	4/25/1997	177.66	9.15	168.51	<250	<2.5	<5.0	<5.0	<5.0	<50
	7/18/1997	177.66	9.71	167.95	<50	15	<10	<10	<10	<100
	10/27/1997	177.66	9.38	168.28	<250	<2.5	<5.0	<5.0	<5.0	<50
	1/22/1998	177.66	6.59	171.07	<50	<0.5	<1.0	<1.0	<1.0	<10
	4/23/1998	177.66	7.90	169.76	<250	<2.5	<5.0	<5.0	<5.0	<50
	7/29/1998	177.66	8.96	168.70	NA	NA	NA	NA	NA	NA
	7/30/1998	177.66	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	<10
	12/17/1998	177.66	8.32	169.34	NA	NA	NA	NA	NA	NA

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-4 cont.	3/19/1999	177.66	7.71	169.95	NA	NA	NA	NA	NA	NA
	6/23/1999	177.66	8.78	168.88	NA	NA	NA	NA	NA	NA
	9/27/1999	177.66	9.27	168.39	NA	NA	NA	NA	NA	NA
	12/9/1999	177.66	9.21	168.45	NA	NA	NA	NA	NA	NA
	3/9/2000	177.66	6.82	170.84	NA	NA	NA	NA	NA	NA
	6/8/2000	177.66	8.72	168.94	NA	NA	NA	NA	NA	NA
	9/18/2000	177.66	8.72	168.94	NA	NA	NA	NA	NA	NA
	12/14/2000	177.66	8.61	169.05	NA	NA	NA	NA	NA	NA
	3/21/2001	177.66	8.61	169.05	NA	NA	NA	NA	NA	NA
	6/18/2001	177.66	9.24	168.42	NA	NA	NA	NA	NA	NA
	9/18/2001	177.66	9.35	168.31	NA	NA	NA	NA	NA	NA
	12/13/2001	177.66	8.53	169.13	NA	NA	NA	NA	NA	NA
	3/14/2002	177.66	8.44	169.22	NA	NA	NA	NA	NA	NA
	6/19/2002	177.66	10.97	166.69	NA	NA	NA	NA	NA	NA
	9/10/2002	177.66	9.27	168.39	NA	NA	NA	NA	NA	NA
	12/16/2002	177.66	6.90	170.76	NA	NA	NA	NA	NA	NA
	3/11/2003	177.66	8.83	168.83	NA	NA	NA	NA	NA	NA
	6/17/2003	177.66	8.84	168.82	NA	NA	NA	NA	NA	NA
ESE-5	10/5/1992	176.08	9.22	166.86	1300	200	3.8	1.2	18	NA
	4/1/1993	176.08	7.02	169.06	13000	2200	26	730	1000	NA
	4/1/1993	176.08	NM	NM	13000	2500	25	740	1100	NA
	6/29/1993	176.08	10.21	165.87	7600	1500	9.3	170	100	NA
	9/23/1993	176.08	10.64	165.44	560	19	1.2	0.9	1.8	NA
	12/10/1993	176.08	9.42	166.66	1700	300	3	76	110	14.07
	2/7/1994	176.08	9.35	166.73	3500	640	7.8	90	130	45.13
	8/8/1994	176.08	8.76	167.32	2600	210	4.6	9.4	4.4	33
	8/8/1994	176.08	NM	NM	2500	230	4.6	13	4.8	32
	10/12/1994	176.08	8.95	167.13	5600	560	9.5	75	21	79.2
	10/12/1994	176.08	NM	NM	6000	550	10	78	22	77

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-5 cont	1/19/1995	176.08	5.40	170.68	1900	620	<5	95	15	NA
	1/19/1995	176.08	NM	NM	1600	620	<5	93	17	NA
	5/2/1995	176.08	6.48	169.60	5700	1100	<10	180	58	NA
	5/2/1995	176.08	NM	NM	5300	1100	<10	180	58	NA
	7/28/1995	176.08	7.97	168.11	520	15	<0.50	1.7	1.3	NA
	7/28/1995	176.08	NM	NM	460	7.2	<0.50	1.9	1.5	NA
	11/17/1995	176.08	8.39	167.69	850	39	1.8	7.6	2.7	24
	2/7/1996	176.08	4.71	171.37	4100	670	6	190	140	<50
	4/23/1996	176.08	7.35	168.73	3000	570	<5	79	100	84
	7/9/1996	176.08	9.40	166.68	620	150	1.7	9.3	6.4	25
	10/10/1996	176.08	9.04	167.04	1100	29	<5	<5	<5	<50
	10/10/1996	176.08	NM	NM	1100	31	<5	<5	<5	<50
	1/20/1997	176.08	5.82	170.26	2100	980	<25	280	80	<250
	1/20/1997	176.08	NM	NM	2700	910	8.8	280	84	180
	4/25/1997	176.08	7.24	168.84	NA	NA	NA	NA	NA	NA
	4/28/1997	176.08	NM	NM	<250	7.9	<5.0	<5.0	<5.0	<50
	7/18/1997	176.08	7.86	168.22	1200	<5	<10	<10	<10	<100
	7/18/1997	176.08	NM	NM	630	31	<5.0	<5.0	<5.0	130
	10/27/1997	176.08	7.91	168.17	<250	5.4	<5.0	<5.0	<5.0	<50
	1/22/1998	176.08	4.64	171.44	170	7.7	<1.0	<1.0	<1.0	130
	4/23/1998	176.08	6.31	169.77	720	79	<5.0	9	<5.0	180
	7/29/1998	176.08	7.43	168.65	NA	NA	NA	NA	NA	NA
	7/30/1998	176.08	NM	NM	840	9.8	<1.0	4	<1.0	710
	12/17/1998	176.08	7.05	169.03	NA	NA	NA	NA	NA	NA
	3/19/1999	176.08	5.00	171.08	<250	<5.0	<5.0	<5.0	<5.0	<5.0
	6/23/1999	176.08	7.77	168.31	NA	NA	NA	NA	NA	NA
	9/27/1999	176.08	8.11	167.97	450	10	<5.0	6.3	<5.0	220
	12/9/1999	176.08	7.66	168.42	NA	NA	NA	NA	NA	NA

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-5 cont.	3/9/2000	176.08	5.08	171.00	1700	170	2.5	45	6.4	140
	6/8/2000	176.08	7.36	168.72	NA	NA	NA	NA	NA	NA
	9/18/2000	176.08	7.71	168.37	130	0.65	<0.50	0.71	<0.50	51
	12/14/2000	176.08	2.36	173.72	NA	NA	NA	NA	NA	NA
	3/21/2001	176.08	7.42	168.66	1000	10.3	<2.5	11	<7.5	70.8
	6/18/2001	176.08	7.92	168.16	NA	NA	NA	NA	NA	NA
	9/18/2001	176.26	8.23	168.03	200	0.868	<0.50	0.55	<1.5	57.5
	12/13/2001	176.26	7.80	168.46	NA	NA	NA	NA	NA	NA
	3/14/2002	176.26	6.55	169.71	1300	17.1	1.35	15.4	1.42	37.4
	6/19/2002	176.26	7.83	168.43	NA	NA	NA	NA	NA	NA
	9/10/2002	176.26	8.22	168.04	680	9.9	<5.0	<5.0	<5.0	44
	12/16/2002	176.26	6.58	169.68	NA	NA	NA	NA	NA	NA
	3/11/2003	176.26	6.77	169.49	2100	14	<2.5	15	3	80
	6/17/2003	176.26	6.75	169.51	NA	NA	NA	NA	NA	NA
	9/17/2003	176.26	8.48	167.78	970	10 C	<0.5	<0.5	5.3	34
	12/9/2003	176.26	7.32	168.94	700	6.5	<0.5	3.1	2.7 C	34
	2/26/2004	176.26	5.21	171.05	2400 H	41	2.8 C	18	2.4 C	29
	5/21/2004	176.26	7.50	168.76	1500	2.6 C	<0.5	2.1 C	2.1 C	25
	8/10/2004	178.80	8.28	170.52	680	<0.5	<0.5	<0.5	<0.5	33
	10/19/2004	178.80	8.26	170.54	380	<0.5	<0.5	<0.5	1.4	39
	1/14/2005	178.80	5.16	173.64	2400	18	1.4	22	2.1	26
	4/14/2005	178.80	6.13	172.67	4800	7.75	1.26	14.3	<1.0	23.1
	7/7/2005	178.80	7.52	171.28	3240	0.78	<2.0	1.18	<1.0	36.6
	11/15/2005	178.80	7.85	170.95	1190	0.51	<2.0	<0.5	<1.0	30
	2/8/2006	178.80	5.83	172.97	2510	1.91	<2.0	2.82	<1.0	20.7
	4/27/2006	178.80	5.71	173.09	4,700	2.76	<2.0	4.77	<1.0	28.3
	8/1/2006	178.80	7.71	171.09	1,890	0.7	<2.0	0.75	<1.0	24.7
	10/19/2006	178.80	8.00	170.80	474	<0.5	<2.0	3.39	<1.0	29
	1/12/2007	178.80	7.41	171.39	868	2.18	<2.0	2.66	<2.0	16.3
	4/17/2007	178.80	7.51	171.29	1,240	10.2	<2.0	10.4	2.37	17.2
	7/17/2007	178.80	7.47	171.33	836	3.1	<2.0	4.91	2.35	25.8
	10/16/2007	178.80	6.26	172.54	2,120	2.5	<2.0	6.19	2.61	17.5

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
ESE-5 cont.	1/17/2008	178.80	6.59	172.21	2,730	5.74	<2.0	14.3	<2.0	13.1
	4/17/2008	178.80	6.81	171.99	2,770	4.7	<2.0	15.9	<2.0	<0.5
	7/16/2008	178.80	7.76	171.04	2,160	0.9	<2.0	1.1	<2.0	6.28
	10/14/2008	178.80	8.40	170.40	1,300	<0.5	<0.5	0.6	<0.5	9.9
	1/6/2009	178.80	7.66	171.14	1,100 ^{Y}	0.61	<0.5	1.6	<0.5	8
	4/6/2009	178.80	7.79	171.01	1,900 ^{Y}	4.6	<0.5	9.3	0.59	5.3
	7/7/2009	178.80	7.84	170.96	2,700 ^{Y}	3.0	<0.5	2.3	<0.5	6.6
	1/27/2010	178.80	4.82	173.98	1,300 ^{Y}	0.76	<0.5	1.0	<0.5	3.5
	7/26/2010	178.80	7.01	171.79	1,800	0.75	<0.5	1.8	<0.5	2
ESE-5R	8/30/2010	178.64	8.97	169.67	75	<0.5	<0.5	<0.5	<0.5	7.3
	11/16/2010	178.64	10.46	168.18	74	<0.5	<0.5	<0.5	<0.5	12
	2/15/2011	**178.64**	**11.19**	**167.45**	**140**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**9.6**
MW-6	7/28/1995	179.24	10.00	169.24	<50	<0.50	<0.50	<0.50	<1.0	NA
	11/17/1995	179.24	10.44	168.80	<50	<0.50	<0.50	<0.50	<1.0	<5.0
	2/7/1996	179.24	7.68	171.56	<50	<0.5	<1.0	<1.0	<1.0	<10
	4/23/1996	179.24	9.33	169.91	<50	<0.5	<1.0	<1.0	<1.0	<10
	7/9/1996	179.24	10.10	169.14	<50	<0.5	<1.0	<1.0	<1.0	<10
	10/10/1996	179.24	11.00	168.24	<50	<0.5	<1.0	<1.0	<1.0	<10
	1/20/1997	179.24	8.70	170.54	<50	<0.5	<1.0	<1.0	<1.0	<10
	4/25/1997	179.24	10.16	169.08	<50	<0.5	<1.0	<1.0	<1.0	<10
	7/18/1997	179.24	10.66	168.58	<50	<0.5	<1.0	<1.0	<1.0	<10
	10/27/1997	179.24	10.25	168.99	<50	<0.5	<1.0	<1.0	<1.0	<10
	1/22/1998	179.24	7.76	171.48	<50	<0.5	<1.0	<1.0	<1.0	<10
	4/23/1998	179.24	9.10	170.14	<50	<0.5	<1.0	<1.0	<1.0	<10
	7/29/1998	179.24	10.40	168.84	NA	NA	NA	NA	NA	NA
	7/30/1998	179.24	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	<10
	12/17/1998	179.24	9.40	169.84	NA	NA	NA	NA	NA	NA
	3/19/1999	179.24	9.10	170.14	NA	NA	NA	NA	NA	NA
	6/23/1999	179.24	9.79	169.45	NA	NA	NA	NA	NA	NA
	9/27/1999	179.24	10.10	169.14	NA	NA	NA	NA	NA	NA
MW-6 cont.	12/9/1999	179.24	9.97	169.27	NA	NA	NA	NA	NA	NA

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation ^{1} (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
	3/9/2000	179.24	8.56	170.68	NA	NA	NA	NA	NA	NA
	6/8/2000	179.24	9.11	170.13	NA	NA	NA	NA	NA	NA
	9/18/2000	179.24	9.77	169.47	NA	NA	NA	NA	NA	NA
	12/14/2000	179.24	9.17	170.07	NA	NA	NA	NA	NA	NA
	3/21/2001	179.24	9.82	169.42	NA	NA	NA	NA	NA	NA
	6/18/2001	179.24	10.19	169.05	NA	NA	NA	NA	NA	NA
	9/18/2001	179.24	10.25	168.99	NA	NA	NA	NA	NA	NA
	12/13/2001	179.24	9.75	169.49	NA	NA	NA	NA	NA	NA
	3/14/2002	179.24	9.53	169.71	NA	NA	NA	NA	NA	NA
	6/19/2002	179.24	9.87	169.37	NA	NA	NA	NA	NA	NA
	9/10/2002	179.24	9.49	169.75	NA	NA	NA	NA	NA	NA
	12/16/2002	179.24	8.39	170.85	NA	NA	NA	NA	NA	NA
	3/11/2003	179.24	9.40	169.84	NA	NA	NA	NA	NA	NA
	6/17/2003	179.24	9.71	169.53	NA	NA	NA	NA	NA	NA
	9/17/2003	179.24	10.21	169.03	<50	<0.5	<0.5	<0.5	<0.5	<2.0
	12/9/2003	179.24	9.66	169.58	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	2/26/2004	179.24	7.83	171.41	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	5/21/2004	179.24	9.75	169.49	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	8/10/2004	181.80	10.28	171.52	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	10/19/2004	181.80	9.91	171.89	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/14/2005	181.80	8.40	173.40	<50	0.6	<0.5	<0.5	<0.5	<0.5
	4/14/2005	181.80	9.04	172.76	<200	<0.5	<0.5	<0.5	<1.0	<0.5
	7/7/2005	181.80	9.94	171.86	<200	<0.5	<2.00	<0.5	<1.00	<0.5
	11/15/2005	181.80	9.98	171.82	<50	<0.5	<2.0	<0.5	<1.0	<0.5
	2/8/2006	181.80	9.91	171.89	<50	<0.5	<2.0	<0.5	<1.0	<0.5
	4/27/2006	181.80	9.54	172.26	<50	<0.5	<2.0	<0.5	<1.0	<0.5
	8/1/2006	181.80	9.61	172.19	<50	<0.5	<2.0	<0.5	<1.0	0.51
	10/19/2006	181.80	10.23	171.57	<50	<0.5	<2.0	<0.5	<1.0	0.63
	1/12/2007	181.80	10.13	171.67	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	4/17/2007	181.80	10.22	171.58	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	7/17/2007	181.80	9.76	172.04	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	10/16/2007	181.80	9.82	171.98	<50	<0.5	<2.0	<0.5	<2.0	<0.5

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
MW-6 cont.	1/17/2008	181.80	9.43	172.37	<50	<0.50	<2.0	<0.50	<2.0	<0.5
	4/17/2008	181.80	9.54	172.26	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	7/16/2008	181.80	9.80	172.00	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	10/14/2008	181.80	10.48	171.32	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/6/2009	181.80	10.01	171.79	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	4/6/2009	181.80	10.15	171.65	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	7/7/2009	181.80	10.28	171.52	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/27/2010	181.80	8.28	173.52	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	7/26/2010	181.80	9.64	172.16	<50	<0.5	<0.5	<0.5	<0.5	<0.5
MW-6R	8/30/2010	181.34	9.55	171.79	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	11/15/2010	181.34	9.32	172.02	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	2/14/2011	**181.34**	**9.79**	**171.55**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**
MW-7	7/28/1995	176.55	9.25	167.30	<50	0.54	0.54	<0.50	<1.0	NA
	11/17/1995	176.55	9.73	166.82	1100	<10	<10	<10	<20	4000
	2/7/1996	176.55	6.48	170.07	610	<0.50	<1.0	<1.0	<1.0	2500
	2/7/1996	176.55	NM	NM	280	<0.50	<1.0	<1.0	<1.0	2600
	4/23/1996	176.55	8.37	168.18	110	<0.50	<1.0	<1.0	<1.0	3500
	4/23/1996	176.55	NM	NM	230	<0.50	<1.0	<1.0	<1.0	3500
	7/9/1996	176.55	9.24	167.31	230	<0.50	<1.0	<1.0	<1.0	4296
	7/9/1996	176.55	NM	NM	220	<0.50	<1.0	<1.0	<1.0	4400
	10/10/1996	176.55	10.05	166.50	NA	NA	NA	NA	NA	NA
	10/11/1996	176.55	NM	NM	1600	<0.50	<1.0	<1.0	<1.0	3000
	1/20/1997	176.55	7.51	169.04	<50	0.63	<1.0	<1.0	<1.0	2600
	4/25/1997	176.55	8.79	167.76	NA	NA	NA	NA	NA	NA
	4/28/1997	176.55	NM	NM	1500	<0.50	<1.0	<1.0	<1.0	3600
	4/28/1997	176.55	NM	NM	7700	3500	<25	74	37	<250
	7/18/1997	176.55	9.50	167.05	1400	<0.50	<1.0	<1.0	<1.0	2600
	10/27/1997	176.55	9.19	167.36	420	<0.50	<1.0	<1.0	<1.0	560

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
MW-7 cont.	1/22/1998	176.55	6.45	170.10	3100	<0.50	<1.0	<1.0	1.4	2300
	4/23/1998	176.55	8.02	168.53	3800	<0.50	<1.0	<1.0	<1.0	3800
	7/29/1998	176.55	8.88	167.67	NA	NA	NA	NA	NA	NA
	7/30/1998	176.55	NM	NM	500	<2.5	<5.0	<5.0	<5.0	<50
	7/30/1998	176.55	NM	NM	4700	<12	<25	<25	<25	4700
	12/17/1998	176.55	8.62	167.93	NA	NA	NA	NA	NA	NA
	3/19/1999	176.55	7.52	169.03	3800	<1.0	<1.0	<1.0	<1.0	3800
	6/23/1999	176.55	9.63	166.92	NA	NA	NA	NA	NA	NA
	9/27/1999	176.55	9.39	167.16	140	<10	<10	<10	<10	3800
	12/9/1999	176.55	9.94	166.61	NA	NA	NA	NA	NA	NA
	3/9/2000	176.55	6.72	169.83	<50	<0.50	<0.50	<0.50	<0.50	1400
	6/8/2000	176.55	7.38	169.17	NA	NA	NA	NA	NA	NA
	9/18/2000	176.55	9.18	167.37	190	<0.50	<0.50	<0.50	<0.50	580
	12/14/2000	176.55	8.13	168.42	NA	NA	NA	NA	NA	NA
	3/21/2001	176.55	8.98	167.57	1300	<0.50	<0.50	<0.50	<1.5	1460
	6/18/2001	176.55	9.68	166.87	NA	NA	NA	NA	NA	NA
	9/18/2001	176.55	9.80	166.75	<0.50	<0.50	<0.50	<0.50	<1.5	94.9
	12/13/2001	176.55	9.26	167.29	NA	NA	NA	NA	NA	NA
	3/14/2002	176.55	8.69	167.86	800	<0.50	<0.50	<0.50	<1.0	952
	6/19/2002	176.55	9.06	167.49	NA	NA	NA	NA	NA	NA
	9/10/2002	176.55	9.23	167.32	260	<2.0	<2.0	<2.0	<2.0	580
	12/16/2002	176.55	7.77	168.78	NA	NA	NA	NA	NA	NA
	3/11/2003	176.55	8.30	168.25	620	<2.5	<2.5	<2.5	<2.5	1100
	6/17/2003	176.55	9.51	167.04	NA	NA	NA	NA	NA	NA
	9/17/2003	176.55	9.52	167.03	<50	<0.5	<0.5	<0.5	<0.5	460
	12/9/2003	176.55	8.99	167.56	<50	<0.5	<0.5	<0.5	<0.5	420
	2/26/2004	176.55	6.55	170.00	<50	<0.5	<0.5	<0.5	<0.5	330
	5/21/2004	176.55	8.90	167.65	<50	<0.5	<0.5	<0.5	<0.5	630
	8/10/2004	179.11	9.58	169.53	<50	<0.5	<0.5	<0.5	<0.5	750
	10/19/2004	179.11	9.20	169.91	<50	<0.5	<0.5	<0.5	<0.5	550

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
MW-7 cont.	1/14/2005	179.11	7.25	171.86	<50	<2.0	<2.0	<2.0	<2.0	250
	4/14/2005	179.11	7.94	171.17	<200	<0.5	<0.5	<0.5	<1.0	285
	7/7/2005	179.11	9.08	170.03	<400	<1.0	<4.0	<1.0	<2.0	452
	11/15/2005	179.11	9.14	169.97	<50	<0.5	<2.0	<0.5	<1.0	110
	2/8/2006	179.11	7.93	171.18	<50	<0.5	<2.0	<0.5	<1.0	101
	4/27/2006	179.11	8.40	170.71	<50	<0.5	<2.0	<0.5	<1.0	131
	8/1/2006	179.11	8.89	170.22	<50	<0.5	<2.0	<0.5	<1.0	68.6
	10/19/2006	179.11	9.44	169.67	<50	<0.5	<2.0	<0.5	<1.0	65.5
	1/12/2007	179.11	8.91	170.20	<50	<0.5	<2.0	<0.5	<2.0	38
	4/17/2007	179.11	8.58	170.53	<50	<0.5	<2.0	<0.5	<2.0	24.7
	7/17/2007	179.11	9.04	170.07	<50	2.07	<2.0	<0.5	<2.0	29.3
	10/6/2007	179.11	7.88	171.23	<50	0.88	<2.0	<0.5	<2.0	5.26
	1/17/2008	179.11	NM	NM	NA	NA	NA	NA	NA	NA
	4/17/2008	179.11	8.85	170.26	<50	1.87	<2.0	<0.5	<2.0	21.6
	7/16/2008	179.11	9.34	169.77	<50	<0.5	<2.0	<0.5	<2.0	11.4
	10/14/2008	179.11	10.06	169.05	<50	0.78	<0.5	<0.5	<0.5	12
	1/6/2009	179.11	9.12	169.99	<50	<0.5	<0.5	<0.5	<0.5	14
	4/6/2009	179.11	9.28	169.83	<50	<0.5	<0.5	<0.5	<0.5	13
	7/7/2009	179.11	9.59	169.52	<50	<0.5	<0.5	<0.5	<0.5	15
	1/27/2010	179.11	6.98	172.13	<50	<0.5	<0.5	<0.5	<0.5	6.3
	7/26/2010	179.11	9.11	170.00	<50	<0.5	<0.5	<0.5	<0.5	6
MW-7R	8/30/2010	179.14	9.39	169.75	<50	<0.5	<0.5	<0.5	<0.5	24
	11/16/2010	179.14	9.10	170.04	<50	<0.5	<0.5	<0.5	<0.5	4.9
	2/14/2011	**179.14**	**9.26**	**169.88**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**5.3**
MW-8	7/28/1995	176.34	7.80	168.54	1,100	<2.5	<2.5	<2.5	<5.0	NA
	11/17/1995	176.34	8.29	168.05	8,300	75	5.3	670	240	140
	2/7/1996	176.34	4.99	171.35	2,300	33	<10	190	216	<100
	4/23/1996	176.34	6.09	170.25	2,000	390	<10	150	26	<250

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
QC-2	4/1/1993	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	6/29/1993	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	9/23/1993	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	12/10/1993	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	<5.0
	2/17/1994	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	8/8/1994	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	10/12/1994	NM	NM	NM	<50	<0.5	<0.5	<0.5	<0.5	NA
	1/19/1995	NM	NM	NM	<50	<0.5	<0.5	<0.5	<1.0	NA
	5/2/1995	NM	NM	NM	<50	<0.50	<0.50	<0.50	<1.0	NA
	7/28/1995	NM	NM	NM	<50	<0.50	<0.50	<0.50	<1.0	NA
	11/17/1995	NM	NM	NM	<50	<0.50	<0.50	<0.50	<1.0	<5.0
	2/7/1996	NM	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	<10
	4/23/1996	NM	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	<10
	7/9/1996	NM	NM	NM	<50	<0.5	<1.0	<1.0	<1.0	<10
SOMA-1	8/10/2004	180.95	11.53	169.42	84	<0.5	<0.5	1.5 C	2.2	2100
	10/19/2004	180.95	10.41	170.54	56	<0.5	<0.5	1.3 C	1.4 C	1600
	1/14/2005	180.95	9.68	171.27	58	<3.1	<3.1	<3.1	<3.1	330
	4/14/2005	180.95	9.37	171.58	<2200	<5.5	<5.5	<5.5	<11	668
	7/7/2005	180.95	10.21	170.74	<860	<2.15	<8.6	<2.15	<4.3	591
	11/15/2005	180.95	10.70	170.25	<50	<0.5	<2.0	1.1	<1.0	256
	2/8/2006	180.95	9.30	171.65	127	1.56	<2.0	3.23	3.12	176
	4/27/2006	180.95	9.64	171.31	81.6	1.14	<2.0	2.8	<1.0	189
	8/1/2006	180.95	10.25	170.70	<50	1.07	<2.0	1.46	<1.0	122
	10/19/2006	180.95	10.73	170.22	<50	0.68	<2.0	4.17	<1.0	116
	1/12/2007	180.95	10.38	170.57	<50	<0.5	<2.0	<0.5	<2.0	68.7
	4/17/2007	180.95	10.09	170.86	<50	5.76	<2.0	4.33	2.59	33.4
	7/17/2007	180.95	10.35	170.60	<50	14.8	<2.0	4.63	3.32	39.4
	10/16/2007	180.95	9.71	171.24	<50	5.7	<2.0	<0.5	<2.0	14.2

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (μg/L)	Benzene (μg/L)	Toluene (μg/L)	Ethyl benzene (μg/L)	Total Xylenes (μg/L)	MtBE (μg/L) 8260B
SOMA-1 cont.	1/17/2008	180.95	10.01	170.94	<50	1.02	<2.0	<0.5	<2.0	12.8
	4/17/2008	180.95	10.17	170.78	<50	3.13	<2.0	<0.5	<2.0	12.8
	7/16/2008	180.95	10.63	170.32	<50	10.6	<2.0	<0.5	<2.0	15.8
	10/14/2008	180.95	11.36	169.59	<50	1.1	<0.5	<0.5	<0.5	15
	1/6/2009	180.95	10.81	170.14	<50	0.6	<0.5	<0.5	<0.5	14
	4/6/2009	180.95	10.69	170.26	<50	<0.5	<0.5	<0.5	<0.5	12
	7/7/2009	180.95	11.01	169.94	<50	0.57	<0.5	1.2	0.91	12
	1/27/2010	180.95	8.81	172.14	<50	<0.5	<0.5	<0.5	<0.5	9.9
	7/26/2010	180.95	10.49	170.46	<50	<0.5	<0.5	<0.5	<0.5	5.9
	11/16/2010	180.95	10.49	170.46	<50	<0.5	<0.5	<0.5	<0.5	7.0
	2/15/2011	**180.95**	**10.64**	**170.31**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**5.3**
SOMA-4	8/10/2004	176.94	9.44	167.50	140	0.98	<0.5	7.8	<0.5	11
	10/19/2004	176.94	9.91	167.03	150	<0.5	<0.5	10	<0.5	8.8
	1/14/2005	176.94	8.36	168.58	500	3.7	<0.5	53	<0.5	7.6
	4/14/2005	176.94	7.89	169.05	<200	0.74	<0.5	3.21	<1.0	5.65
	7/7/2005	176.94	11.62	165.32	<200	<0.5	<2.0	0.56	<1.0	7.09
	11/15/2005	176.94	9.33	167.61	<50	<0.5	<2.0	<0.5	<1.0	8.6
	2/8/2006	176.94	9.18	167.76	55.8	<0.5	<2.0	0.85	<1.0	10.4
	4/27/2006	176.94	8.75	168.19	172	1.35	<2.0	8.83	<1.0	11.7
	8/1/2006	176.94	9.52	167.42	<50	0.52	<2.0	1.53	<1.0	14.1
	10/19/2006	176.94	9.51	167.43	<50	<0.5	<2.0	<0.5	<1.0	19.2
	1/12/2007	176.94	8.98	167.96	<50	<0.5	<2.0	<0.5	<2.0	20.4
	4/17/2007	176.94	8.96	167.98	<50	<0.5	<2.0	4.33	<2.0	15.8
	7/17/2007	176.94	9.31	167.63	<50	<0.5	<2.0	4.47	<2.0	13.3
	10/16/2007	176.94	8.96	167.98	<50	<0.5	<2.0	4.5	<2.0	8.57
	1/17/2008	176.94	8.84	168.10	<50	<0.5	<2.0	<0.5	<2.0	8.87
	4/17/2008	176.94	9.44	167.50	<50	<0.5	<2.0	<0.5	<2.0	1.22
	7/16/2008	176.94	9.52	167.42	<50	<0.5	<2.0	<0.5	<2.0	8.58
	10/14/2008	176.94	9.98	166.96	<50	<0.5	<0.5	<0.5	<0.5	9.7

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation ^{1} (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
SOMA-4 cont	1/6/2009	176.94	9.29	167.65	<50	<0.5	<0.5	<0.5	<0.5	10
	4/6/2009	176.94	9.31	167.63	<50	<0.5	<0.5	<0.5	<0.5	5.3
	7/7/2009	176.94	9.54	167.40	<50	<0.5	<0.5	<0.5	<0.5	7
	1/27/2010	176.94	7.35	169.59	<50	<0.5	<0.5	<0.5	<0.5	5.1
	7/26/2010	176.94	9.13	167.81	220	<0.5	<0.5	<0.5	<0.5	2.3
	11/15/2010	176.94	8.85	168.09	75	<0.5	<0.5	<0.5	<0.5	2.5
	2/14/2011	**176.94**	**8.92**	**168.02**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**1.5**
Shallow WBZ Wells										
SOMA-2	8/10/2004	178.99	10.69	168.30	<50	<0.5	<0.5	<0.5	<0.5	0.8
	10/19/2004	178.99	10.75	168.24	<50	<0.5	<0.5	<0.5	<0.5	2.4
	1/14/2005	178.99	9.45	169.54	<50	<0.5	<0.5	<0.5	<0.5	1.1
	4/14/2005	178.99	10.46	168.53	<200	<0.5	<0.5	<0.5	<1.0	<0.5
	7/7/2005	178.99	11.81	167.18	<200	<0.5	<2.0	<0.5	<1.0	<0.5
	11/15/2005	178.99	12.02	166.97	<50	<0.5	<2.0	<0.5	<1.0	1.61
	2/8/2006	178.99	11.88	167.11	<50	<0.5	<2.0	<0.5	<1.0	<0.5
	4/27/2006	178.99	10.95	168.04	<50	<0.5	<2.0	<0.5	<1.0	<0.5
	8/1/2006	178.99	11.85	167.14	<50	<0.5	<2.0	<0.5	<1.0	1.11
	10/19/2006	178.99	10.62	168.37	<50	<0.5	<2.0	<0.5	<1.0	1.36
	1/12/2007	178.99	10.26	168.73	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	4/17/2007	178.99	11.88	167.11	<50	<0.5	<2.0	<0.5	<2.0	0.87
	7/17/2007	178.99	10.84	168.15	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	10/16/2007	178.99	9.69	169.30	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	1/17/2008	178.99	9.62	169.37	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	4/17/2008	178.99	10.06	168.93	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	7/16/2008	178.99	10.63	168.36	<50	<0.5	<2.0	<0.5	<2.0	<0.5
	10/14/2008	178.99	11.26	167.73	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/6/2009	178.99	10.22	168.77	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	4/6/2009	178.99	10.38	168.61	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	7/7/2009	178.99	10.40	168.59	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/27/2010	178.99	8.19	170.80	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	7/26/2010	178.99	10.24	168.75	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	11/15/2010	178.99	10.04	168.95	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	2/14/2011	**178.99**	**9.95**	**169.04**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**

Table 3

Historical Groundwater Elevations & Analytical Data

TPH-g, BTEX, MtBE

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (μg/L)	Benzene (μg/L)	Toluene (μg/L)	Ethyl benzene (μg/L)	Total Xylenes (μg/L)	MtBE (μg/L) 8260B
SOMA-3	8/10/2004	176.81	9.97	166.84	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	10/19/2004	176.81	9.59	167.22	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	1/14/2005	176.81	8.23	168.58	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	4/14/2005	176.81	8.64	168.17	<200	<0.5	<0.5	<0.5	<1.0	<0.5
	7/7/2005	176.81	9.60	167.21	<200	<0.5	<2.0	<0.5	<1.0	<0.5
	11/15/2005	176.81	10.01	166.80	<50	<0.5	<2.0	<0.5	<1.0	5.1
	2/8/2006	176.81	8.80	168.01	<50	<0.5	<2.0	<0.5	<1.0	7.16
	4/27/2006	176.81	9.00	167.81	<50	<0.5	<2.0	<0.5	<1.0	14.2
	8/1/2006	176.81	9.91	166.90	<50	<0.5	<2.0	<0.5	<1.0	7.29
	10/19/2006	176.81	10.21	166.60	<50	<0.5	<2.0	<0.5	<1.0	41.4
	1/12/2007	176.81	9.73	167.08	<50	<0.5	<2.0	<0.5	<2.0	20.9
	4/17/2007	176.81	9.81	167.00	<50	<0.5	<2.0	<0.5	<2.0	32.1
	7/17/2007	176.81	10.06	166.75	<50	<0.5	<2.0	<0.5	<2.0	23.6
	10/16/2007	176.81	9.54	167.27	<50	<0.5	<2.0	<0.5	<2.0	22.3
	1/17/2008	176.81	9.06	167.75	<50	<0.5	<2.0	<0.5	<2.0	11.1
	4/17/2008	176.81	9.57	167.24	<50	<0.5	<2.0	<0.5	<2.0	23.7
	7/16/2008	176.81	10.25	166.56	<50	<0.5	<2.0	<0.5	<2.0	10.6
	10/14/2008	176.81	10.76	166.05	<50	<0.5	<0.5	<0.5	<0.5	19
	1/6/2009	176.81	9.53	167.28	<50	<0.5	<0.5	<0.5	<0.5	1.1
	4/6/2009	176.81	9.65	167.16	<50	<0.5	<0.5	<0.5	<0.5	5.7
	7/7/2009	176.81	10.19	166.62	<50	<0.5	<0.5	<0.5	<0.5	6
	1/27/2010	176.81	7.80	169.01	<50	<0.5	<0.5	<0.5	<0.5	56
	7/26/2010	176.81	9.67	167.14	<50	<0.5	<0.5	<0.5	<0.5	9.8
	11/15/2010	176.81	9.35	167.46	<50	<0.5	<0.5	<0.5	<0.5	30
	2/14/2011	**176.81**	**10.57**	**166.24**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**32**
SOMA-5	1/27/2010	180.31	7.94	172.37	14,000	2,600	1.5	800	914	190
	7/26/2010	180.31	9.99	170.32	14,000	3,300	<20	1,100	1,340	150
	11/15/2010	180.31	10.01	170.30	11,000	2,400	3.3	920	733	130
	2/15/2011	**180.31**	**10.22**	**170.09**	**4,900**	**1,600**	**<13**	**430**	**84**	**94**

Table 3
Historical Groundwater Elevations & Analytical Data
TPH-g, BTEX, MtBE
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	Top of casing elevation [1] (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl benzene (µg/L)	Total Xylenes (µg/L)	MtBE (µg/L) 8260B
SOMA-7	8/30/2010	178.54	7.63	170.91	2,900	190	3.7	74	19.80	8.4
	11/16/2010	178.54	7.89	170.65	1,500	190	2.1	41	8.30	5.7
	2/15/2011	**178.54**	**7.33**	**171.21**	**1,900**	**380**	**4**	**27**	**5.50**	**5.2**
SOMA-8	8/30/2010	181.57	9.89	171.68	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	11/15/2010	181.57	9.37	172.20	<50	<0.5	<0.5	<0.5	<0.5	<0.5
	2/14/2011	**181.57**	**9.89**	**171.68**	**<50**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**
Equipment Blanks										
EB-PMP	1/17/2008	NA	NA	NA	<50	<0.5	<2.0	<0.5	<2.0	<0.5
EB-PRB	1/17/2008	NA	NA	NA	<50	<0.5	<2.0	<0.5	<2.0	<0.5
EB-PMP2	1/17/2008	NA	NA	NA	<50	<0.5	<2.0	<0.5	<2.0	<0.5
EB-PRB2	1/17/2008	NA	NA	NA	<50	<0.5	<2.0	<0.5	<2.0	<0.5
ESL - Drinking Water					**100**	**1**	**40**	**30**	**20**	**5**
ESL - Non-Drinking Water					**210**	**46**	**130**	**43**	**100**	**1,800**

Notes:

< : Not detected above laboratory reporting limit.

1 Top of Casing Elevations were resurveyed by Kier & Wright Engineers Surveyors of Pleasanton, CA on June 21, 2004.

C: Presence confirmed, but RPD between columns exceeds 40%.

H: Heavier hydrocarbons contributed to the quantitation.

NA: Not Applicable/Not Analyzed. Due to construction activities in the Third Quarter 2003, which consisted of the replacement of the USTs and dispensers, wells ESE-1 & ESE-2 were inaccessible. Well ESE-2 also inaccessible during the First Quarter 2007.
Well MW-7 had a car parked over it and was inaccessible during the First Quarter 2008 monitoring event

NM: Not Measured
Well ESE-2 was covered over with dirt during the First Quarter 2007 monitoring event.
Well MW-7 had a car parked over it and was inaccessible during the First Quarter 2008 monitoring event.

Equipment Blanks (EB-PRB & EB-PMP) were done to make sure decon efforts were adequate.

Z: Sample exhibits unknown single peak or peaks.

The Third Quarter 2003 was the first time that SOMA analyzed groundwater samples at the site.

The Third Quarter 2004 was the first time that SOMA analyzed groundwater samples at wells SOMA-1 to SOMA-4.

August 2010, reconstruct ESE-1R, ESE-2R, ESE-5R, MW-6R, MW-7R; install SOMA-7, SOMA-8. 8/30/10 investigation sampling

ESLs - ESL- Environmental Screening Levels (California Regional Water Quality Control Board, Interim Final, November 2007, Revised May 2008

Table 4

Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (μg/L)	DIPE (μg/L)	ETBE (μg/L)	TAME (μg/L)	ETHANOL (μg/L)	1,2-DCA (μg/L)	EDB (μg/L)
Semi-Confined WBZ Wells								
ESE-1	6/17/2003	<400	<10	<10	18	NA	NA	NA
	9/17/2003	NA	NA	NA	NA	NA	NA	NA
	12/9/2003	290	<1.0	<1.0	9.5	<2,000	<1.0	<1.0
	2/26/2004	410	<0.5	<0.5	9.7	<1000	<0.5	<0.5
	5/21/2004	190	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	8/10/2004	180	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	10/19/2004	270	<0.7	<0.7	4.4	<1400	9.9	<0.7
	1/14/2005	280	<1.3	<1.3	<1.3	<2,500	<1.3	<1.3
	4/14/2005	144	<2.15	<2.15	<8.6	<4300	<2.15	<2.15
	7/7/2005	119	<2.15	<2.15	<8.6	<4300	<2.15	<2.15
	11/15/2005	107	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	2/8/2006	181	<2.15	<2.15	<8.6	<4300	<2.15	<2.15
	4/27/2006	261	<2.15	<2.15	<8.6	<4300	<2.15	<2.15
	8/1/2006	165	<1.0	<1.0	<4.0	<2000	<1.0	<1.0
	10/19/2006	154	<1.0	<1.0	<4.0	<2000	<1.0	<1.0
	1/12/2007	103	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	4/17/2007	80.5	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	7/17/2007	128	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	10/16/2007	98.7	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	1/17/2008	61.5	<0.5	<0.5	2.52	<1000	<0.5	<0.5
	4/17/2008	76.4	<0.5	<0.5	<2.0	<1000	59.2	<0.5
	7/16/2008	179	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
	10/14/2008	87	<0.5	<0.5	2.6	<1000	<0.5	<0.5
	1/6/2009	93	<1.0	<1.0	<1.0	<2000	<1.0	<1.0
	4/6/2009	130	<1.0	<1.0	<1.0	<2000	<1.0	<1.0
	7/7/2009	100	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	200	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	110	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
ESE-1R	8/30/2010	83	<0.71	<0.71	3.4	<1,400	<0.71	<0.71
	11/16/2010	64	<0.5	<0.5	0.94	<1,000	<0.5	<0.5
	2/15/2011	**130**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**

Table 4
Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	ETHANOL (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)
ESE-2	6/17/2003	<4000	<100	<100	<100	NA	NA	NA
	9/17/2003	NA	NA	NA	NA	NA	NA	NA
	12/9/2003	500	<13	<13	77	<25,000	<13	<13
	2/26/2004	1200	<0.5	<0.5	92	<1,000	<0.5	<0.5
	5/21/2004	2400	<10	<10	25	<20,000	<10	<10
	8/10/2004	2300	<2.5	<2.5	12	<5,000	<2.5	<2.5
	10/19/2004	1800	<3.6	<3.6	8.6	<7100	<3.6	<3.6
	1/14/2005	470	<8.3	<8.3	28	<17,000	<8.3	<8.3
	4/14/2005	<10.8	<2.15	<2.15	17.9	<4,300	<2.15	<2.15
	7/7/2005	109	<2.15	<2.15	9.7	<4,300	<2.15	<2.15
	11/15/2005	64.7	<0.5	<0.5	3.43	<1,000	<0.5	<0.5
	2/8/2006	46.4	<2.15	<2.15	11	<4,300	<2.15	<2.15
	4/27/2006	47.7	<1.0	<1.0	8.29	<2,000	<1.0	<1.0
	8/1/2006	20.6	<1.0	<1.0	4.67	<2,000	<1.0	<1.0
	10/19/2006	28.9	<0.5	<0.5	4.55	<1,000	<0.5	<0.5
	1/12/2007	NA	NA	NA	NA	NA	NA	NA
	4/17/2007	60.8	<0.5	<0.5	3.85	<1,000	<0.5	<0.5
	7/17/2007	62.3	<0.5	<0.5	2.95	<1,000	<0.5	<0.5
	10/16/2007	46	<0.5	<0.5	2.21	<1,000	<0.5	<0.5
	1/17/2008	18.8	<0.5	<0.5	3.38	<1,000	<0.5	<0.5
	4/17/2008	18.8	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	9.95	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	0.85	<1,000	<0.5	<0.5
	1/6/2009	27	<0.5	<0.5	0.83	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	18	<0.5	<0.5	0.56	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
ESE-2R	8/30/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/16/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
ESE-3	6/17/2003	<200	<5.0	<5.0	<5.0	NA	NA	NA
ESE-5	9/17/2003	<10	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	12/9/2003	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/26/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	5/21/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	8/10/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	10/19/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5

Table 4
Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	ETHANOL (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)
ESE-5 cont.	1/14/2005	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/14/2005	17	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/7/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	11/15/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	8.7	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	15.4	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	11.5	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	17.2	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	5.44	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
ESE-5R	8/30/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/16/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/15/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
MW-6	9/17/2003	<10	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	12/9/2003	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/26/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	5/21/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	8/10/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	10/19/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/14/2005	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/14/2005	<2.5	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/7/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	11/15/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5

Table 4

Historical Groundwater Analytical Data

Gasoline Oxygenates & Lead Scavengers

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	ETHANOL (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)
MW-6 contd.	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
MW-6R	8/30/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/15/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
MW-7	9/17/2003	<10	<0.5	<0.5	9.8	<1,000	<0.5	<0.5
	12/9/2003	<25	<1.3	<1.3	8.1	<2,500	<1.3	<1.3
	2/26/2004	<10	<0.5	<0.5	9.9	<1,000	<0.5	<0.5
	5/21/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	8/10/2004	<25	<1.3	<1.3	19	<2,500	<1.3	<1.3
	10/19/2004	<100	<5.0	<5.0	11	<10,000	<5.0	<5.0
	1/14/2005	<40	<2.0	<2.0	5.1	<4,000	<2.0	<2.0
	4/14/2005	2.62	<0.5	<0.5	4.57	<1,000	<0.5	<0.5
	7/7/2005	55.6	<1.0	<1.0	10.2	<2,000	<1.0	<1.0
	11/15/2005	10.6	<0.5	<0.5	2.07	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	2.19	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	2.63	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	11.6	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	13.3	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	NA	NA	NA	NA	NA	NA	NA
	4/17/2008	8.63	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5

Table 4
Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (µg/L)	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	ETHANOL (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)
MW-7R	8/30/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/16/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
SOMA-1	8/10/2004	2300	<6.3	<6.3	53	<13,000	<6.3	<6.3
	10/19/2004	2400	<13	<13	36	<25,000	<13	<13
	1/14/2005	530	<3.1	<3.1	7.1	<6,300	<3.1	<3.1
	4/14/2005	<27.5	<5.5	<5.5	<22	<11,000	<5.5	<5.5
	7/7/2005	2180	<2.15	<2.15	12.9	<4,300	<2.15	<2.15
	11/15/2005	792	<0.5	<0.5	5.01	<1,000	<0.5	<0.5
	2/8/2006	618	<0.5	<0.5	3.67	<1,000	<0.5	<0.5
	4/27/2006	983	<0.5	<0.5	3.48	<1,000	<0.5	<0.5
	8/1/2006	639	<0.5	<0.5	2.27	<1,000	<0.5	<0.5
	10/19/2006	603	<0.5	<0.5	2.25	<1,000	<0.5	<0.5
	1/12/2007	396	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	148	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	555	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	65	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	29.6	<0.5	<0.5	2.06	<1,000	<0.5	<0.5
	4/17/2008	339	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	264	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	250	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	180	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	120	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	250	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	310	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	68	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/16/2010	84	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/15/2011	**120**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
SOMA-4	8/10/2004	<10	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	10/19/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/14/2005	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/14/2005	<2.5	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/7/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	11/15/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5

Table 4

Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (μg/L)	DIPE (μg/L)	ETBE (μg/L)	TAME (μg/L)	ETHANOL (μg/L)	1,2-DCA (μg/L)	EDB (μg/L)
SOMA-4 contd	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	3.98	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	6.31	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/15/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
Shallow WBZ Wells								
SOMA-2	8/10/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	10/19/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/14/2005	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/14/2005	<2.5	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/7/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	11/15/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	14.6	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	2.58	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5

Table 4

Historical Groundwater Analytical Data

Gasoline Oxygenates & Lead Scavengers

3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (μg/L)	DIPE (μg/L)	ETBE (μg/L)	TAME (μg/L)	ETHANOL (μg/L)	1,2-DCA (μg/L)	EDB (μg/L)
SOMA-2 cont.	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/15/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
SOMA-3	8/10/2004	<10	<0.5	<0.5	<0.5	<1000	<0.5	<0.5
	10/19/2004	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/14/2005	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/14/2005	<2.5	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/7/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	11/15/2005	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	2/8/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/27/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	8/1/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/19/2006	<10	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/12/2007	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2007	6.72	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/17/2007	7.6	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/16/2007	9.96	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	4/17/2008	6.05	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	7/16/2008	<2.0	<0.5	<0.5	<2.0	<1,000	<0.5	<0.5
	10/14/2008	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	4/6/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	7/7/2009	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	1/27/2010	<10	<0.5	<0.5	0.8	<1,000	<0.5	<0.5
	7/26/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/15/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
SOMA-5	1/27/2010	500	<13	<13	<13	<25,000	<13	<13
	7/26/2010	<400	<20	<20	<20	<40,000	<20	<20
	11/15/2010	480	<2.0	<2.0	<2.0	<4,000	<2.0	<2.0
	2/15/2011	**390**	**<13**	**<13**	**<13**	**NA**	**<13**	**<13**
SOMA-7	8/30/2010	<33	<1.7	<1.7	<1.7	<3,300	<1.7	<1.7
	11/16/2010	<25	<1.3	<1.3	<1.3	<2,500	<1.3	<1.3
	2/15/2011	**<25**	**<1.3**	**<1.3**	**<1.3**	**NA**	**<1.3**	**<1.3**

Table 4

Historical Groundwater Analytical Data
Gasoline Oxygenates & Lead Scavengers
3519 Castro Valley Blvd, Castro Valley, CA

Monitoring Well	Date	TBA (μg/L)	DIPE (μg/L)	ETBE (μg/L)	TAME (μg/L)	ETHANOL (μg/L)	1,2-DCA (μg/L)	EDB (μg/L)
SOMA-8	8/30/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	11/15/2010	<10	<0.5	<0.5	<0.5	<1,000	<0.5	<0.5
	2/14/2011	**<10**	**<0.5**	**<0.5**	**<0.5**	**NA**	**<0.5**	**<0.5**
Equipment Blanks								
EB-PMP	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
EB-PRB	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
EB-PMP2	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
EB-PRB2	1/17/2008	<2.0	<0.5	<0.5	<2.0	<1000	<0.5	<0.5
ESL - Drinking Water		**12**	NL	NL	NL	NL	0.5	0.05
ESL - Non-Drinking Water		**18,000**	NL	NL	NL	NL	200	150

Notes:
< :   Not detected above laboratory reporting limit.
NA: Not Analyzed. Due to construction activities in the Third Quarter 2003, which
consisted of the replacement of the USTs and dispensers, wells ESE-1 & ESE-2 were inaccessible.
Well ESE-2 was inaccessible duirng the First Quarter 2007, dirt was covered over well
Well MW-7 had a car parked over it and was inaccessible during the First Quarter 2008 monitoring event.
The Third Quarter 2003 was the first time that SOMA analyzed groundwater samples at the Site.
The Third Quarter 2004 was the first time that SOMA analyzed groundwater samples at wells SOMA-1 to SOMA-4.

Gasoline Oxygenates:	Lead Scavengers:
TBA: tertiary butyl alcohol	1,2-DCA: 1,2-Dichloroethane
DIPE: isopropyl ether	EDB: 1,2-Dibromoethane
ETBE: ethyl tertiary butyl ether	
TAME: methyl tertiary amyl ether	
Ethanol	

August 2010, reconstruct ESE-1R, ESE-2R, ESE-5R, MW-6R, MW-7R; install SOMA-7, SOMA-8. 8/30/10 investigation sampling

ESLs - ESL- Environmental Screening Levels (California Regional Water Quality Control Board, Interim Final, November 2007, Revised May 2008

Table 5

Degradation Rates Evaluation (First-Order Attenuation Rate Constants)

3519 Castro Valley Blvd, Castro Valley, CA

COC	LN (C goal)	Equation	ESE-1 (ESE-1R) (Years from 1992)	Years from Today	Equation	ESE-2 (ESE-2R) (Years from 1992)	Years from Today	Equation	ESE-5 (ESE-5R) (Years from 1992)	Years from Today
TPH-g	4.6	$y = 8.8988e^{-0.019x}$	34.67	15.67	*below C goal*	NA	NA	$y = 7.3539e^{-0.005x}$	*93.61*	*74.61*
TPH-g (Alternate)	4.6	-	-	-	-	-	-	$y = 7.3539e^{-0.005x}$	*14.04*	*-4.96*
Benzene	0	$y = 3.885e^{0.014x}$	*NA (increasing trend)*		*below C goal*	NA	NA	*below C goal*	NA	NA
MtBE	1.6	$y = 22.039e^{-0.125x}$	20.94	1.94	$y = 27.855e^{-0.124x}$	22.99	3.99	$y = 11.233e^{-0.103x}$	18.86	7.86
TBA	2.48	$y = 7.5912e^{-0.03x}$	37.22	18.22	*below C goal*	NA	NA	***below C goal***	NA	NA

COC	LN (C goal)	Equation	SOMA-1 (Years from 2004)	Years from Today	Equation	SOMA-5 (Years from 2010)	Years from Today	Equation	SOMA-7 (Years from 2010)	Years from Today
TPH-g	4.6	*below C goal*	NA	NA	$y = 9.7535e^{-0.097x}$	7.74	7.24	$y = 7.7997e^{-0.111x}$	4.75	4.25
Benzene	0	*below C goal*	NA	NA	$y = 8.038e^{-0.05x}$	88.70	88.20	$y = 5.140e^{0.274x}$	NA (increasing trend)	
MtBE	1.6	$y = 7.1958e^{-0.231x}$	6.48	0.08	$y = 5.2936e^{-0.128x}$	9.30	8.80	$y = 2.0657e^{-0.542x}$	0.46	-0.04
TBA	2.48	$y = 6.6098e^{-0.058x}$	16.87	10.47	$y = 6.1379e^{-0.024x}$	37.68	37.18	$y = 3.357e^{-0.143x}$	2.10	1.60

The first-order degradation rate equation is described as follows:

$$C = C_o e^{-k_1 t} \qquad [1]$$

Where:

C	*Contaminant concentration at time (t), in units of mass per volume*
Co	*Initial contaminant concentration at t equals 0 in units of mass per volume*
$-k_1$	*First-order degradation rate, 1/time; a plot of contaminant vs. time produces a non-linear relationship that could be linearized by plotting the natural log of contaminant concentration vs. time. The slope of this linearized relationship is equal to ($-k_1$)*

"-" *Negative years value, indicates that COC goal has already been reached or is about to be reached*

Table 6
Contaminant Mass Evaluation
3519 Castro Valley Blvd, Castro Valley, CA

Chemical of Concern (COC)	Bulk Density [a] (g/cm3)	Porosity (n)	Organic Carbon Partition Coefficient (K oc) [cm3/g]	Fraction of Organic Carbon (foc) g/g*	Distribution Coefficient (Kd) [cm3/g]	Retardation Coefficient (Rd)	Total Mass [c] (lb)
Shallow WBZ							
TPH-g	1.64	0.32	5000	0.002	10	52.25	**57.10**
Benzene	1.64	0.32	59	0.002	0.118	1.60475	**2.19**
MtBE	1.64	0.32	6	0.002	0.012	1.0615	**0.032**
						TOTAL (lb):	***59.32***
Semi-Confined WBZ							
TPH-g	1.64	0.32	5000	0.002	10	52.25	**8.87**
Benzene	1.64	0.32	59	0.002	0.118	1.60475	**0.018**
MtBE	1.64	0.32	6	0.002	0.012	1.0615	**0.012**
						TOTAL (lb):	***8.91***
Shallow Soil							
TPH-g	1.32	-	-	-	-	-	**468.45**
						TOTAL (lb):	***468.45***
						Grand Total	536.68

Note:

[a] Bulk Density= silty clay loam and sandy loam (ρb)

[c] For details refer to report attachment

COC- Contaminant Of Concern

NA- Not Applicable

* U.S EPA Soil Screening Guidance: User's Guide. EPA/540/R-96/0188, April 1996

Organic carbon partition coefficients (K oc) were obtained from "August 2007 Update to Environmental Screening Levels (“ESLs”) Technical Document, (VLOOKUP table)

The EPA’s Soil Screening Guidance recommends 0.2% (0.002 g/g) as the default concentration of organic carbon for subsurface soils.

Equations used (Mass within WBZ):

Mass in WBZ=Porosity*Concentration*Volume*Rd

Rd=1+(Kd*ρb/n)

Kd=Koc*foc

Table 7
Remedial Approaches Pre-Screening
3519 Castro Valley Blvd, Castro Valley, CA

	Development Status	**O&M**	**Capital**	**System Reliability**	**Relative Costs**	**Time**	**Availability**	**VOCs**	**Fuels**	**TOTAL**
Shallow Soil Contamination 0-12 feet bgs										
Excavation	4	4	3	4	1	4	4	3	3	**30**
MPE	4	2	3	3	3	3	4	4	4	**30**
GWET	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical Oxidation	4	2	3	3	3	4	4	3	2	**28**
ORC Injection	4	2	3	2	3	3	4	4	4	**29**
Groundwater Contamination Shallow WBZ										
Excavation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MPE	4	2	3	3	3	3	4	4	4	**30**
Air Sparging as MPE Enhancer	*4*	*2*	*3*	*3*	*3*	*3*	*4*	*4*	*4*	***30***
GWET	4	1	1	4	1	1	4	3	3	**22**
Chemical Oxidation	4	4	3	3	3	4	4	3	2	**30**
ORC Injection	4	2	3	2	4	3	4	4	4	**30**
MNA	4	3	4	3	4	1	4	4	4	**31**

Rating Codes for Effectiveness Evaluation:

1	*Below average, level of effectiveness highly dependent upon specific contaminant and its application*
2	*Average*
3	*Above average to average*
4	*Above average*

Above screening is preliminary, each technology will be evaluated further upon completion of pilot testing

APPENDIX A
Site History and Previous Site Activities

Violation History

A Notice of Violation (NOV) was issued in June 1991 due to non-compliance issues at the station; a second NOV was issued in October 1991. An Unauthorized Release was detected during the 1992 Preliminary Site Assessment. A second Unauthorized Release was reported in May 2000, due to a leaking shear valve on piping in the former UST pit. The site underwent remodeling in December 2003, when the former UST pit was excavated and four USTs were removed. Soils were over excavated to 12 feet bgs; the shallow soil (top 5 feet) was reused to backfill the new UST pit, after confirmation sampling determined that no chemicals of potential concern (COCs) were present. The remaining soil and purge water were transported off-site for disposal. The upgraded gasoline USTs, with capacities of 12,000 gallons and 20,000 gallons, as well as new piping and distribution lines, were installed during remodeling. A former dispenser island (and possible source of on-site contamination) was located along the western side of the site and was removed sometime prior to the 1995 Phase II Site Investigation (BP).

Previous Activities

1984: Three single-walled fiberglass underground storage tanks (USTs) with capacities of 6,000 gallons, 8,000 gallons, and 10,000 gallons, were installed in the southeastern portion of the site. A former dispenser island reportedly existed on the west side of the site; however, there was no available information about the dispenser removal date.

1988: A 1,000-gallon, double-walled, fiberglass waste oil tank (WOT) was installed to replace the previous 380-gallon WOT. In September, Kaprealian Engineering, Inc. removed the original 380-gallon WOT and observed holes in this UST. As a result, confirmation soil samples were collected from the bottom of the excavation. The following analytical soil results were observed: benzene and toluene were detected at 6.8 µg/kg and 9.5 µg/kg, respectively; total petroleum hydrocarbons (TPH) and total oil and grease (TOG) constituents were not detected.

September and October 1992: Environmental Science & Engineering, Inc. (ESE) drilled five soil boreholes and converted them into monitoring wells (ESE-1 through ESE-5). Soil and groundwater samples were collected during well installation. In the soil samples, the maximum level of soil contamination was detected in monitoring well borehole ESE-5 at 220,000 µg/kg TPH as gasoline (TPH-g); 1,400 µg/kg benzene; 8,200 µg/kg toluene; 3,300 µg/kg ethylbenzene; and 18,000 µg/kg xylenes. In the groundwater samples collected from ESE-1, maximum concentrations were TPH-g at 2,300 µg/L; benzene at 370 µg/L; toluene at 160 µg/L; ethylbenzene at 17 µg/L; and xylenes at 110 µg/L.

<u>July 1995</u>: Three additional monitoring wells were installed: two on-site wells, MW-6 and MW-8, and one off-site well, MW-7.

<u>July 1995</u>: Sampling around former pump island (SB-1 and SB-2) revealed detections of TPH-g and BTEX. Soil analytical data is summarized in Table 1.

<u>April 1996</u>: Well MW-8, located on the western margin of the site, was decommissioned to accommodate the road-widening project along Redwood Boulevard.

<u>August 20, 2003</u>: Prior to UST removal, SOMA oversaw drilling of two boreholes by Vironex. The boreholes were drilled in order to characterize the soil for landfill acceptance criteria.

<u>September 2003</u>: Three single-walled, fiberglass USTs, with capacities of 6,000 gallons, 8,000 gallons, and 10,000 gallons, were removed and replaced with two new double-walled, fiberglass USTs with capacities of 12,000 gallons and 20,000 gallons. In addition, the dispensers, product lines, and vent lines were removed and replaced. Soil below 5 feet bgs was disposed of off-site. Shallow soil was used as backfill material for the former UST pit after confirmation.

<u>Third Quarter 2003</u>: Two monitoring wells, ESE-3 and ESE-4, were decommissioned due to construction activities.

<u>Fourth Quarter 2003</u>: In December, SOMA oversaw drilling of off-site temporary well boreholes TWB-1 through TWB-5 to determine the horizontal extent of off-site petroleum hydrocarbon contamination.

<u>June 2004</u>: On June 10, SOMA installed on- and off-site monitoring wells: SOMA-1 in the southeastern section of the site, and SOMA-2 to SOMA-4 south and southeast of the site. Kier and Wright Engineers Surveyors, of Pleasanton, California, surveyed all site wells on June 21.

<u>August 2006:</u> SOMA conducted a sensitive receptor survey and it was concluded that no irrigation or domestic wells, and no sensitive groups or environments, evaluated during this sensitive receptor survey and located within ½-mile radius have the potential to be impacted by the site's contaminants at this time

<u>Third Quarter 1993 to Present</u>: On-going quarterly groundwater monitoring events have been conducted at the site.

<u>September 2008:</u> Shell Oil conducted a Phase II investigation. Elevated TPH-g concentrations 900 µg/L in groundwater and 720 mg/kg in soil were observed in the borings. Based on these elevated readings, Shell Oil filed a UST

Unauthorized Release Report with Alameda County Environmental Health on September 24, 2008.

February 2009: Per ACEHD correspondence dated January 8, 2009, SOMA prepared a Site Conceptual Model and workplan to address data gaps at the site. SOMA proposed advancing soil borings to further define the lateral and horizontal extent of COC impact to vadose zone and the WBZ (up to 31 feet bgs). Per the ACEHD correspondence dated March 27, 2009, SOMA submitted a workplan addendum which was approved by the ACEHD on July 10, 2009 which reduced the number of DP borings from 9 to 7 and proposed the advancement of a shallow groundwater monitoring well within the vadose zone (screened across the potentiometric surface) to determine the appropriateness of the screening interval for existing wells at the site.

August 2009: SOMA conducted a soil and groundwater investigation at the site, advancing seven soil borings and installed shallow groundwater monitoring well SOMA-5 to determine if groundwater at the site is confined or semi-confined. TPH-g was elevated in groundwater samples from DP-1 and DP-2 (210 µg/L and 130 µg/L, respectively) along the northwestern portion of the site and in DP-5 and DP-6 (640 µg/L and 1,600 µg/L, respectively) along the eastern portion of the station (north of the former USTs). TPH-d was elevated in all groundwater samples, with concentrations between 130 µg/L and 980 µg/L (DP-7 and DP-4, respectively). TPH-mo was observed only along the western portion of the site, in DP-2 through DP-4, with concentrations ranging from 360 µg/L to 570 µg/L. Based on elevated TPH concentrations along the northwestern portion of the site it appears that plume commingling might be occurring. It was determined that wells of ESE-1, ESE-2, ESE-5, MW-6 and MW-7 appear to be screened excessively long and are causing cross-contamination.

March 2010: SOMA submitted a workplan suggesting replacing (reconstructing) ESE-1, ESE-2, ESE-5, MW-6 and MW-7 with wells screened within the confined WBZ and installing four additional groundwater monitoring wells (SOMA-6 through SOMA-9) adjacent to the reconstructed wells (within 5 feet) and completed within the shallow zone.

September 2010: SOMA submitted a report documenting site well reconstruction and shallow well installation, per workplan submitted in March 2010. Due to their excessively long screening intervals, ESE-1, ESE-2, ESE-5, MW-6 and MW-7 were reconstructed with screening entirely within the Semi-Confined WBZ. To further characterize the Shallow WBZ, SOMA advanced four borings, converting two of those borings into shallow groundwater monitoring wells (SOMA-7 and SOMA-8).

APPENDIX B

Boring Logs

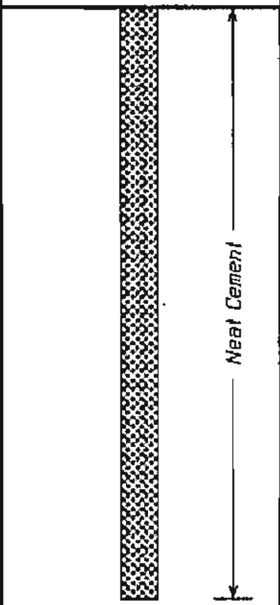
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING [redacted] SB-1

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-138-03* DATE DRILLED: *07/19/95*
CLIENT: *BP Oil Company*
LOCATION: *3519 Castro Valley Boulevard, Castro Valley, CA.*
DRILLING METHOD: *Hollow-stem auger (8"); 2" split-spoon sampler*
DRILLING COMPANY: *Soils Exploration Srvs.* CASING ELEVATION: *N/A*
LOGGED BY: *C. Ladd* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	DEPTH feet	SAMPLES	SOIL CLASS	GEOLOGIC DESCRIPTION
					8" Concrete
8,10,10	1008		■	CL	silty CLAY: black, damp, very stiff; medium plasticity.
8,8,14	1898		■		Same: brown, damp, very stiff; Fe oxide stain; minor fines.
12,18,18	113	5	■	ML	clayey SILT: brown mottled gray, damp, hard; Fe oxide staining; minor fines; < 1% subrounded gravel to 1/4"-diameter.
8,14,20	334.2		■		Same: at 7 feet, root traces; calcium carbonate on fractures.
8,14,21	217	10	■	ML	clayey SILT: red/brown mottled gray, damp, hard; Fe oxide stain; some very fine-grained sand; root traces present.
10,18,20	286		■		Same: at 11.5 feet.
18,18,23	10.3		■	CL	silty CLAY: brown mottled gray, damp, hard; root traces to approximately 3%.
15,18,21	8.4	15	■		Same: at 15.5 feet.
					Soil boring terminated at 18 feet.
		20			
		25			
		30			

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

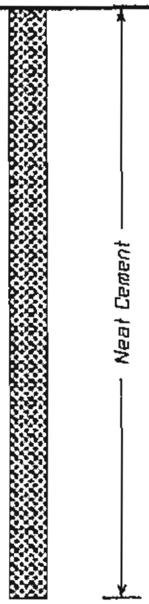
LOG OF BORING [redacted]

SB-2

Page 1 of 1

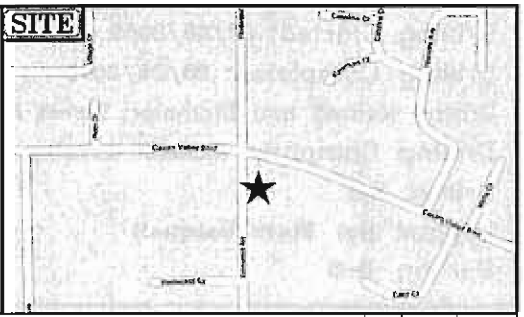
SEE SITE PLAN

ALISTO PROJECT NO: 10-138-03 DATE DRILLED: 07/19/95
CLIENT: BP Oil Company
LOCATION: 3519 Castro Valley Boulevard, Castro Valley, CA.
DRILLING METHOD: Hollow-stem auger (8"); 2" split-spoon sampler
DRILLING COMPANY: Soils Exploration Srys. CASING ELEVATION: N/A
LOGGED BY: C. Ladd APPROVED BY: Al Sevilla



BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
				8" Concrete
15,18,21	3.3		CL	[redacted] CLAY: black, damp, very stiff; < 1% Fe oxide stain; low plasticity.
15,16,23	10.0		ML	[redacted] SILT: gray mottled brown, damp, hard; Fe oxide stain approximately 5%; minor fines; root traces present.
12,18,21	285.8	5		Same: gray with white calcium voids and red/brown, damp, hard; Fe oxide stain; root traces; minor fines.
18,14,20	222.1		ML	[redacted] SILT: red/brown, damp, hard; root traces; fine-grained sand; some clay.
13,15,18	3.4	10		[redacted] SILT: brown mottled gray, damp, hard; root traces to 4%; Fe oxide stain; some very fine-grained sand.
14,18,20	1.1			Same: at 11.5 feet.
19,21,21	0.3		CL	[redacted] CLAY: brown mottled gray, damp, hard; root traces to 1%; minor fines.
14,18,20	0	15		Same: at 15.5 feet.
				Soil boring terminated at 16 feet.
		20		
		25		
		30		

Drilling Started: **08/28/2008**
Drilling Completed: **08/28/2008**
Drilling Method and Diameter: **Direct Push; 2" diameter**
Drilling Company: **Cascade Drilling**
Drilled By:
Logged By: **Steve Harquail**
Boring: **B-6**



Depth (feet)	Samples	Recovery (%)	PID (ppm)	LITHOLOGIC DESCRIPTION	USCS	Graphic Log	Depth (feet)
				No Recovery – Air Knifed to 5 feet below ground surface (bgs)			
2							2
4				5.00'			4
				Clayey Silt: Dark brown/black, firm.	ML		
6							6
				Dark brown, hard, damp, with 5% sand.			
8							8
10	▮	95	86.0				10
				Tan, brown/light tan mix, hard.			
12							12
				Damp			
14							14
		40	0.0	*With 5–10% sand* 15.00'			

Boring Terminated at 15 feet bgs.

▼ Initial Water Level (Not Encountered)

▮ DIRECT PUSH Sample Collected for Laboratory Analysis

DELTA

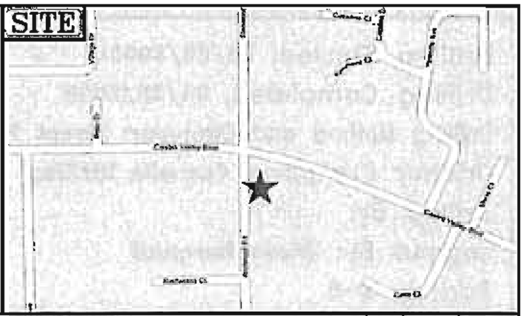
CASHL–BADW–A
10-03-2008 | DATE 10-10-2008
CALIFORNIA | D-BY CRF | R-BY A.D.
FILE SH1445-B6

SHELL FACILITY NO. 171445
3519 Castro Valley Blvd.
Castro Valley, California

Soil Boring Log
B-6

FIGURE

Drilling Started: 08/28/2008
Drilling Completed: 08/28/2008
Drilling Method and Diameter: **Direct Push; 2" diameter**
Drilling Company: **Cascade Drilling**
Drilled By:
Logged By: **Steve Harquail**
Boring: **B-5**



Depth (feet)	Samples	Recovery (%)	PID (ppm)	LITHOLOGIC DESCRIPTION	USCS	Graphic Log	Depth (feet)
				No Recovery – Air Knifed to 5 feet below ground surface (bgs)			
2							2
4				5.00'			4
6				*Clayey Silt: Dark brown, with 10% sand.* *Hard, dry.* *Brown/tan/rust color mix.*	ML		6
8							8
10		80	0.0	*Dark brown, very hard.*			10
12	▮			*Brown, dry.*			12
14		80	0.0	*Brown, very hard, dry, with 10% sand.*			14
16							16
18							18
20		70	0.0	21.00'			20
				Silty Sand: Brown, damp. 22.00'	SM		
22	▼			*Sand: Brown, homogenous, wet.* 23.00'	SP		22
				Silty Clay: Brown/light tan, soft, dry.	CL		
24		80	0.0	25.00'			24

Boring Terminated at 25 feet bgs.

▼ Initial Water Level (22' bgs)

▮ DIRECT PUSH Sample Collected for Laboratory Analysis

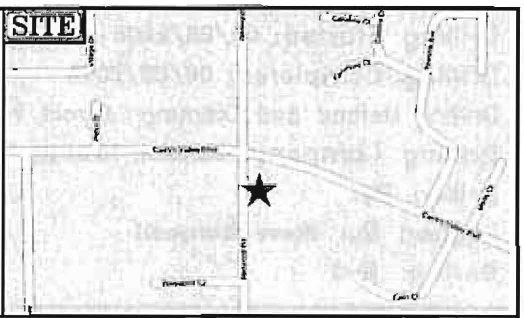
CASHL-BADW-A
10-03-2008 | 10-10-2008
CALIFORNIA | CRF | A.D.
SH1445-B5

SHELL FACILITY NO. 171445
3519 Castro Valley Blvd.
Castro Valley, California

Soil Boring Log
B-5

FIGURE

Drilling Started: **08/28/2008**
Drilling Completed: **08/28/2008**
Drilling Method and Diameter: **Direct Push; 2" diameter**
Drilling Company: **Cascade Drilling**
Drilled By:
Logged By: **Steve Harquail**
Boring: **B-4**



Depth (feet)	Samples	Recovery (%)	PID (ppm)	LITHOLOGIC DESCRIPTION	USCS	Graphic Log	Depth (feet)
				No Recovery – Air Knifed to 5 feet below ground surface (bgs)			
2							2
4				5.00'			4
				Sandy Silt: Blackish, hard.	ML		
6							6
8							8
	▮		0.0				
10	▮	95		*Gravel 1", cobbles 1.25", light tan/light gray, damp/wet.* 10.00'			10

Boring terminated at 10 feet bgs.

▼ Initial Water Level (Not Encountered)

▮ DIRECT PUSH
Sample Collected for
Laboratory Analysis

DELTA

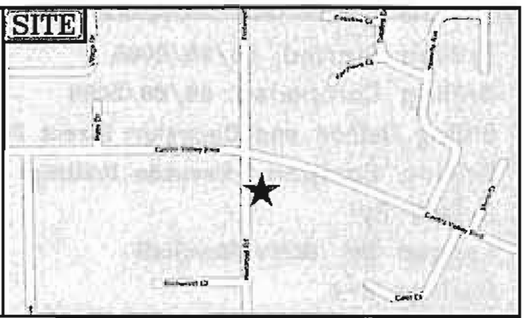
CASHL-BADW-A
10-03-2008 | R-DATE 10-10-2008
PROJECT CALIFORNIA | D-BY CRF | R-BY A.D.
FILE SH1445-B4

SHELL FACILITY NO. 171445
3519 Castro Valley Blvd.
Castro Valley, California

Soil Boring Log
B-4

FIGURE

Drilling Started: **08/28/2008**
Drilling Completed: **08/28/2008**
Drilling Method and Diameter: **Direct Push; 2" diameter**
Drilling Company: **Cascade Drilling**
Drilled By:
Logged By: **Steve Harquail**
Boring: **B-3**



Depth (feet)	Samples	Recovery (%)	PID (ppm)	LITHOLOGIC DESCRIPTION	USCS	Graphic Log	Depth (feet)
				No Recovery – Air Knifed to 5 feet below ground surface (bgs)			
2							2
4				5.00'			4
				Sandy Silt: Dark brown/black mix, hard.	ML		
6				6.50'			6
				Clayey Silt: Brown, with 3% sand.	ML		
8							8
				With 20% greenish color.			
10		100	0.0	*Greenish-brown, hard, dry.*			10
			83.0				
12	▮						12
				Medium to low plasticity.			
14							14
		100	6.3	15.00'			
				Sandy Silt: Tan/light tan/reddish, hard, dry.	ML		
16							16
18							18
				Tan, homogenous, firm, dry.			
20		85	0.0	20.00'			20

Boring terminated at 20 feet bgs.

▼ Initial Water Level (Not Encountered)

▮ DIRECT PUSH Sample Collected for Laboratory Analysis

DELTA

CASHL-BADW-A
10-03-2008 R-DATE 10-10-2008
CALIFORNIA D-BY CRF R-BY A.D.
FILE SH1445-B3

SHELL FACILITY NO. 171445
3519 Castro Valley Blvd.
Castro Valley, California

Soil Boring Log
B-3

FIGURE

ESE-1

Environmental Science & Engineering, Inc.
A CILCORP Company

BORING LOG AND WELL COMPLETION SUMMARY

[redacted]

Page 1 of 1

WELL COMPLETION

Completion Depth: 30 Feet

Size/Type	From	To
Casing: 2" Diam. Sched. 40 PVC	10 Feet	0 Feet
Screen: 2" Diam. Sched. 40 Slotted (0.02") PVC	30 Feet	10 Feet
Filter: #3 Sand	30 Feet	9 Feet
Seal: Bentonite	9 Feet	7.5 Feet
Grout	7.5 Feet	0 Feet

Well Cap or Box: Flush Mounted Well Box

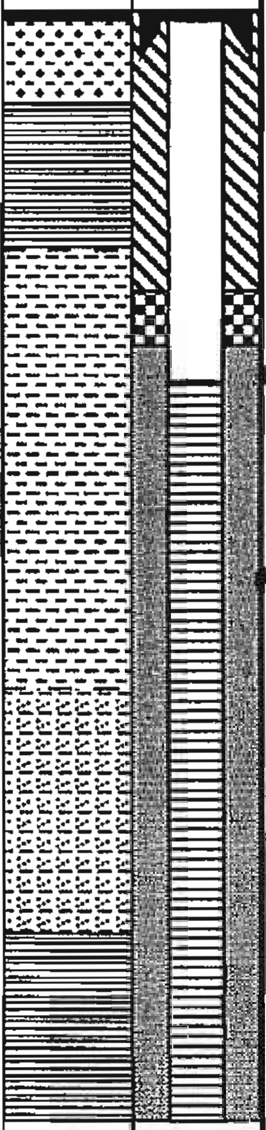
Project Name: BP Oil Company
Project No: 6-92-5428
Location: BP Station #11105
3519 Castro Valley Boulevard
Castro Valley, CA

Driller: Soils Exploration Services, Inc.
Method: HSA
Hole Diameter: 8"
Total Depth: 30 Feet
Ref. Elevations:
Logged By: Chris Valchell

Dates:
Start: 9-29-92
Finish: 9-29-92

Depth (ft)	Lithologic Description	USC	Sample/Blows	Vapor	Remarks Water, drilling/completion, summary, sample type
0	Asphalt FILL GRAVEL	GM			
	NATIVE [redacted]black, stiff, damp, no odor.	CL			
5	[redacted]black, 10-20% coarse, very stiff, damp, no odor.		2 7 9	7	SAMPLE @ 5 FEET
	[redacted]lue-grey, 10-20% coarse, very stiff, damp, heavy hydrocarbon odor.				
10	As above, with orange mottles.		4 8 11	[redacted]	SAMPLE @ 10.5 FEET
	[redacted]range with blue-grey mottles, 5-10% medium grained sand, stiff, damp, heavy hydrocarbon odor.	ML			
15	As above, no odor. $\frac{70,000}{830}$		3 7 8	[redacted]	SAMPLE @ 15 FEET
20	[redacted]d-brown, 10-20% coarse sand, 70-80% medium sand, dense, moist, no odor.		2 4 6	6	▼ SAMPLE @ 20 FEET [redacted]
	As above[redacted]	SM	2 3 6		
	[redacted]rey with orange mottles, 30-40% medium grained sand, stiff, moist, no odor.				
25	[redacted]grey, damp, stiff, no odor.	CL	2 3 4		
30					TOTAL DEPTH = 30 FEET

Graphic Log



REGISTERED GEOLOGIST
SUSAN G. WICKHAM
STATE OF CALIFORNIA

sample conc. – TPH/benzene (ug/kg)

ESE-2

Environmental Science & Engineering, Inc.
A CILCORP Company

BORING LOG AND WELL COMPLETION SUMMARY

[redacted]

WELL COMPLETION

Completion Depth: 30 Feet

	Size/Type	From	To
Casing:	2" Diam. Sched. 40 PVC	10 Feet	0 Feet
Screen:	2" Diam. Sched. 40 Slotted (0.02") PVC	30 Feet	10 Feet
Filter:	#3 Sand	30 Feet	9 Feet
Seal:	Bentonite	9 Feet	7.5 Feet
	Grout	7.5 Feet	0 Feet

Well Cap or Box: Flush Mounted Well Box

Project Name: BP Oil Company
Project No: 6-92-5428
Location: BP Station #11105
3519 Castro Valley Boulevard
Castro Valley, CA

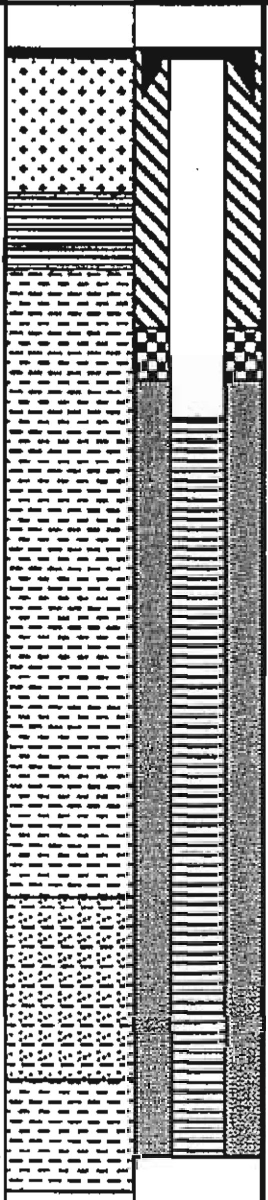
Page 1 of 1

Driller: Soils Exploration Services, Inc.
Method: HSA
Hole Diameter: 8"
Total Depth: 31 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Dates:
Start: 9-29-92
Finish: 9-29-92

Depth (ft)	Lithologic Description	USC	Sample/ Blows	Vapor	Remarks Water, drilling/completion, summary, sample type
0	Asphalt FILL GRAVEL	GP			
5	NATIVE [redacted]ack, stiff, damp, no odor.	CL	3 3 6	20	SAMPLE @ 4.5 FEET
	[redacted]y with orange mottles, stiff, damp, slight odor.				
10	ND As above, heavy hydrocarbon odor.	ML	5 7 9	25	SAMPLE @ 10.5 FEET
15	[redacted]nge with grey mottles, stiff, damp, heavy hydrocarbon odor.		6 13 16	15	SAMPLE @ 14.5 FEET
20	[redacted]ange, 50-60% medium to coarse grained sand, stiff, damp, no odor. ND		6 14 14		SAMPLE @ 20 FEET
				10	[redacted]
25	[redacted]ange-brown, 5-10% silt, medium to coarse grained sand, dense[redacted]no odor.	SM	9 15 13		
	[redacted]rey, stiff,[redacted]no odor.	ML	3 5 6 3 5 6		
30					STANDARD PEN.
					TOTAL DRILLED DEPTH = 30 FEET TOTAL DEPTH = 31 FEET

Graphic Log



Environmental Science & Engineering, Inc.
A CILCORP Company

BORING LOG AND WELL COMPLETION SUMMARY

ESE-3
[redacted]

Page 1 of 1

WELL COMPLETION

Completion Depth: 30 Feet

Size/Type	From	To
Casing: 2" Diam. Sched. 40 PVC	10 Feet	0 Feet
Screen: 2" Diam. Sched. 40 Slotted (0.02") PVC	30 Feet	10 Feet
Filter: #3 Sand	30 Feet	9 Feet
Seal: Bentonite	9 Feet	7.5 Feet
Grout	7.5 Feet	0 Feet

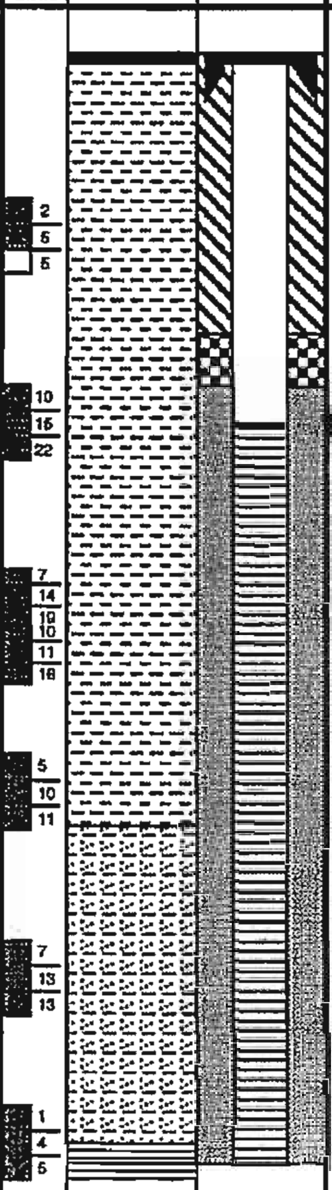
Well Cap or Box: Flush Mounted Well Box

Project Name: BP Oil Company
Project No: 6-92-5428
Location: BP Station #11105
3519 Castro Valley Boulevard
Castro Valley, CA

Driller: Soils Exploration Services, Inc.
Method: HSA
Hole Diameter: 8"
Total Depth: 30.5 Feet
Ref. Elevations:
Logged By: Chris Valchelf

Dates:
Start: 9-29-92
Finish: 9-29-92

Depth (ft)	Lithologic Description	USC	Sample/Blows	Vapor	Remarks Water, drilling/completion, summary, sample type
0	Asphalt FILL [redacted]eddish brown, 20-30% medium to coarse grained sand, dense, damp, no odor.				
	NATIVE [redacted]ack, 5-10% medium to coarse grained sand, stiff, damp, no odor.				
5	As above, with orange-red mottles.		2 5 5	4	SAMPLE @ 5 FEET
	[redacted]ive, 5-10% fine grained sand, stiff, damp, no odor.				
	[redacted]range-yellow-brown, 20-30% medium grained sand, stiff, damp, slight hydrocarbon odor.	ML			
10	As above, grey mottling, heavy hydrocarbon odor. 220,000 / 1400		10 15 22	[redacted]	SAMPLE @ 10.5 FEET
	As above, 30-40% medium to coarse grained sand, no odor.				
15			7 14 19 10 11 18	5	SAMPLE @ 15.5 FEET
	[redacted]ght brown, some sand, 5-10% medium, stiff, damp, no odor.				
20	(ND)		5 10 11	10	SAMPLE @ 20 FEET
	[redacted]ght brown, 10-20% silt, medium grained sand, dense, [redacted] no odor.				
					[redacted]
25	As above.	SM	7 13 13		NO SAMPLE COLLECTED
30	[redacted]light brown, stiff, damp, no odor.	CL	1 4 5		STANDARD PEN. TOTAL DRILLED DEPTH = 30 FEET TOTAL DEPTH = 30.5 FEET



REGISTERED GEOLOGIST
SUSAN S. WICKHAM
#3851
STATE OF CALIFORNIA

sample conc. — TPH / benzene (ug/kg)

ESE-4

Environmental Science & Engineering, Inc.
A CILCORP Company

BORING LOG AND WELL COMPLETION SUMMARY

[redacted]

Page 1 of 1

WELL COMPLETION

Completion Depth: 25 Feet

Size/Type	From	To
Casing: 2" Diam. Sched. 40 PVC	7 Feet	0 Feet
Screen: 2" Diam. Sched. 40 Slotted (0.02") PVC	25 Feet	7 Feet
Filter: #3 Sand	25 Feet	6 Feet
Seal: Bentonite	6 Feet	4 Feet
Grout	4 Feet	0 Feet

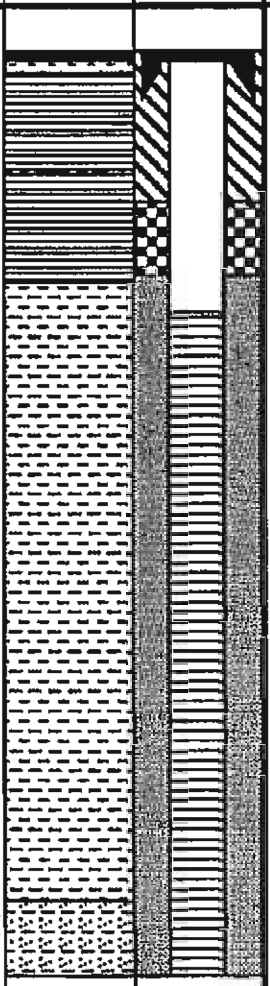
Well Cap or Box: Flush Mounted Well Box

Project Name: BP Oil Company
Project No: 6-92-5428
Location: BP Station #11105
3519 Castro Valley Boulevard
Castro Valley, CA

Driller: Soils Exploration Services, Inc.
Method: HSA
Hole Diameter: 8"
Total Depth: 25 Feet
Ref. Elevations:
Logged By: Mike Edmonson

Dates:
Start: 9-28-92
Finish: 9-28-92

Graphic Log



Depth (ft)	Lithologic Description	USC	Sample/Blows	Vapor	Remarks Water, drilling/completion, summary, sample type
0	Asphalt FILL-GRAVEL NATIVE	GP			
	[redacted] brown, 10-20% fine to coarse sand, stiff, damp.				
	[redacted] black, medium stiff, damp, organic odor.	CL			
5			4 6 8		SAMPLE @ 5-6.5 FEET
	[redacted] olive, medium stiff, damp, hydrocarbon odor.			0	
	[redacted] brown with olive mottling, 10-25% fine sand, 20-35% fine to coarse sand (10.5-11 feet), stiff, damp.				
10	$\frac{24,000}{150}$ →		7 12 16	0	SAMPLE @ 10-11.5 FEET
		ML			
15	As above, grey mottling[redacted]crease in sand content at 16.2 feet.		6 6 8		SAMPLE @ 15-16.5 FEET
20	As above, brown.		6 9 11		SAMPLE @ 20-21.5 FEET
			2 3 4		SAMPLE @ 21.5-23 FEET
	[redacted] brown, medium stiff, moist.				
	[redacted] brown, 40% fines, fine grained sand, medium dense[redacted]	SM	3 5 7		SAMPLE @ 23-24.5 FEET
25					TOTAL DEPTH = 25 FEET
30					

SUSAN S. WICKHAM
#3851

Sample conc. — TPH / benzene (ug/Kg)

ESE-5

ESE Environmental Science & Engineering, Inc.
A CILCORP Company

BORING LOG AND WELL COMPLETION SUMMARY

[redacted]

WELL COMPLETION

Completion Depth: 24 Feet

Size/Type	From	To
Casing: 2" Diam. Sched. 40 PVC	9 Feet	0 Feet
Screen: 2" Diam. Sched. 40 Slotted (0.02") PVC	24 Feet	9 Feet
Filter: #3 Sand	24 Feet	8 Feet
Seal: Bentonite	8 Feet	5.5 Feet
Grout	5.5 Feet	0 Feet

Well Cap or Box: Flush Mounted Well Box

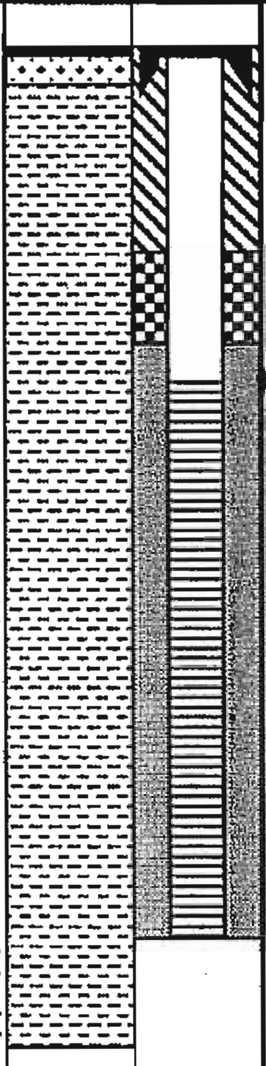
Project Name: BP Oil Company   Project No: 6-92-5428
Location: BP Station #11105
3519 Castro Valley Boulevard
Castro Valley, CA

Driller: Soils Exploration Services, Inc.
Method: HSA
Hole Diameter: 8"   Total Depth: 27 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Page 1 of 1

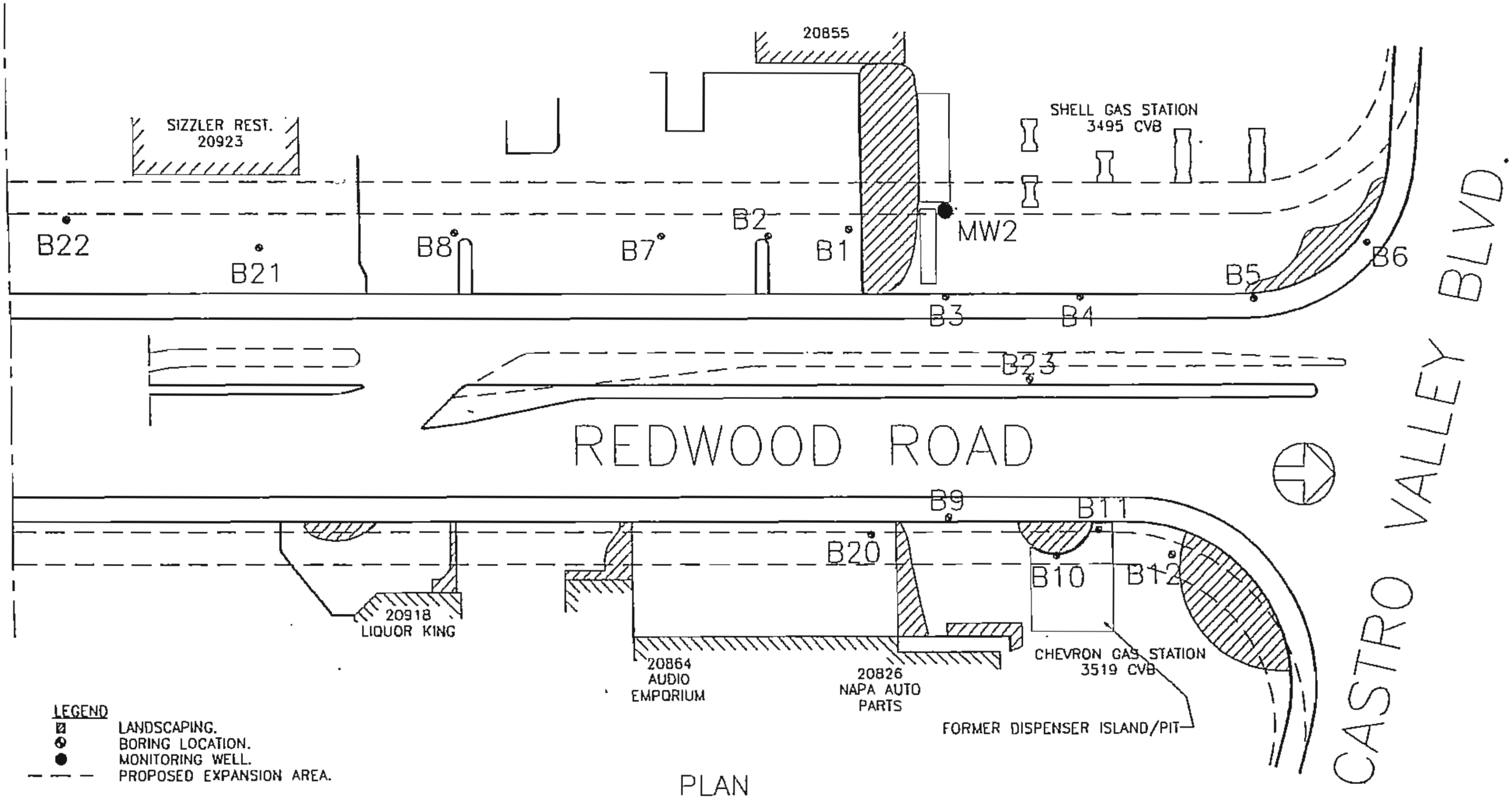
Dates:
Start: 9-28-92
Finish: 9-28-92

Depth (ft)	Lithologic Description	USC	Sample/Blows	Vapor	Remarks Water, drilling/completion, summary, sample type
0	Asphalt FILL [redacted]	GP			
	NATIVE [redacted]black-grey, 20-30% medium to coase grained sand, stiff, damp, slight hydrocarbon odor.				
5	[redacted]ive with blue-grey mottling, 25-30% fine to coarse grained sand, stiff, damp, slight hydrocarbon odor.		3 4 5	40	SAMPLE @ 5 FEET
	[redacted]ive, decrease in sand content, stiff, damp, slight hydrocarbon odor.			[redacted]	
10	57,800 / 250 →		5 8 11		SAMPLE @ 10 FEET
	[redacted]ive with blue-grey mottle, 80-90% silt and clay, stiff, damp.	ML			
	[redacted]range-brown with minor mottling, 30-40% fine to coarse grained sand, stiff, damp.				
	[redacted]ght brown, stiff, damp, no odor.		7 12 12	6.5	SAMPLE @ 14 FEET
15			6 9 12		STANDARD PEN.
					▼ [redacted]
	As abov[redacted], slight increase in sand content.		8 10 10		
20					
	As above, orange-brown, dry.		10 21 22		
25			8 12 12		
	As above, damp.				TOTAL DRILLED DEPTH = 24 FEET TOTAL DEPTH = 27 FEET
30					



REGISTERED GEOLOGIST
SUSAN B. WICKHAM
#3551
STATE OF CALIFORNIA

Sample conc. — TPH/benzene (ug/kg)



PLAN

SCALE: 1" = 50.00'

FIG. No. 2 PRJ. No. 6163-1	ACC ENVIRONMENTAL CONSULTANTS, INC. 1000 ATLANTIC AVENUE SUITE 110 ALAMEDA, CA 94501 (510) 522-8188 • FAX: (510) 865-5731	SITE PLAN REDWOOD RD. CASTRO VALLEY, CA	DATE JAN 1995 DRAWN KMN

EQUIPMENT: Pneumatic Sampler
LOGGED BY: M. Kaltreider
PROJECT: Redwood Road
START DATE: 12/5/94

Environmental Control Associates, Inc. Geoprobe Sampler.	HNu (ppm)	SAMPLE #	Sample Interval	Depth (feet)	
Munsell Color Scale			▨	0	Concrete/Baserock: sandy gravel
	100	B9-2	■		Brown mottled olive grey sandy clay (CL), with15% fine grain sand (interperted as fill material) plastic, stiff, moist, hydrocarbon odor.
			▨	2	
	15	B9-4	■		
(Gley 5G - 4/1)			▨	4	Dark olive grey mottled olive brown, clay (CL) with 5% fine grain sand, slight mottling, stiff, plastic, moist.
	50	B9-6	■		
			▨	6	Dark olive grey mottled brown, sandy clay (CL), with 15% fine grain sand, medium stiff, plastic, moist.
(7.5YR - 4/4)	5	B9-8	■		
			▨	8	Brown sandy clay (CL) with 30% fine grain sand, med. stiff, plastic, moist.
(2.5Y - 4/3)	5	B9-10	■		
				10	BOTTOM OF BORING @ 10 feet
				12	
				14	
				16	
				18	
				20	
				22	
				24	
				26	
				28	

ACC ENVIRONMENTAL CONSULTANTS
1000 ATLANTIC AVEUNUE, SUITE 110
ALAMEDA, CA 94501

JOB NO: 6163-1

DATE: 12/22/94

LOG OF BORING=B9
Redwood Road Expansion
Phase II Site Assessment
Castro Valley, CA

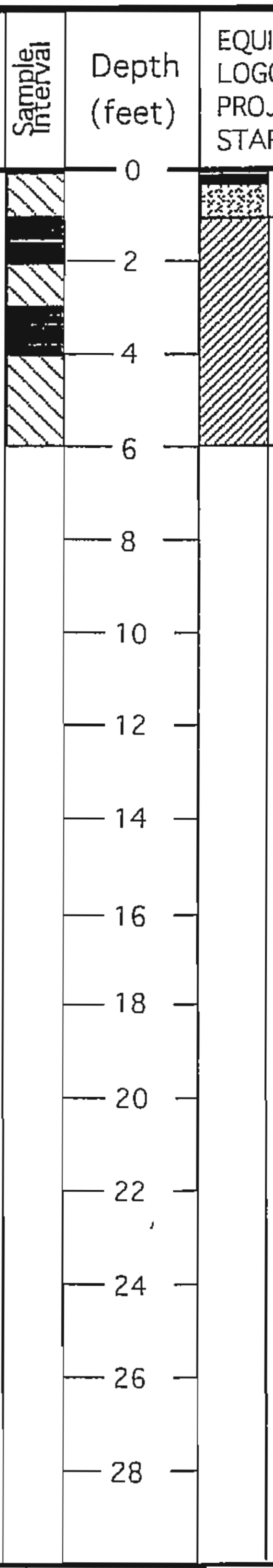
Environmental Control
Associates, Inc.
Geoprobe Sampler.

EQUIPMENT: Pneumatic Sampler
LOGGED BY: M. Kaltreider
PROJECT: Redwood Road
START DATE: 12/6/94

Munsell Color Scale

(Gley 5G - 4/1)

HNu (ppm)	SAMPLE #
10	B10-2
50	B10-4



Concrete/Baserock: sandy gravel.

Black sandy clay (CL), with 30% fine grain sand, very plastic, stiff, moist.

Black silty to sandy clay (CL) with 10% sand, plastic, med. stiff, moist.

Poor recovery, sand, interperted as fill material, no sample collected.

BOTTOM OF BORING @ 6 feet

ACC ENVIRONMENTAL CONSULTANTS
1000 ATLANTIC AVEUNUE, SUITE 110
ALAMEDA, CA 94501

JOB NO: 6163-1

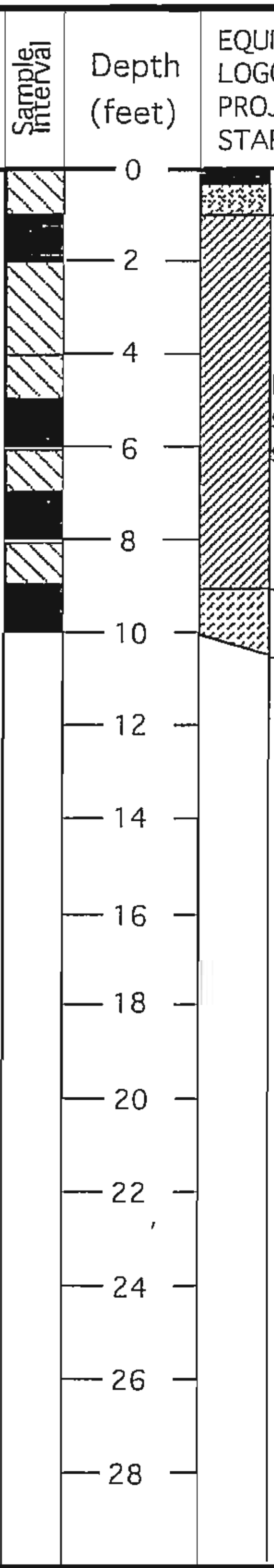
DATE: 12/22/94

LOG OF BORING B10
Redwood Road Expansion
Phase II Site Assessment
Castro Valley, CA

Environmental Control
Associates, Inc.
Geoprobe Sampler.

EQUIPMENT: Pneumatic Sampler
LOGGED BY: M. Kaltreider
PROJECT: Redwood Road
START DATE: 12/6/94

Munsell Color Scale	HNu (ppm)	SAMPLE #	
			Asphalt/Baserock: sandy gravel.
(10YR - 2/2)	0	B11-2	Very dark brown silty clay (CL) with 10% fine grain sand, slight mottling and roots, plastic, med. stiff, moist.
			Poor recovery, no sample collected.
(Gley 5GY - 4/1)	0	B11-6	Dark greenish grey mottled brown, sandy clay (CL) with 30% fine grain sand, stiff, plastic, moist.
	200	B11-8	Same as above, sand content increases to approximately 40% with depth, hydrocarbon odor.
(2.5Y - 4/3)	300	B11-10	Brown clayey sand (SC) with 50% fine grain sand, med. dense, moist.
			BOTTOM OF BORING @ 10 feet



ACC ENVIRONMENTAL CONSULTANTS
1000 ATLANTIC AVEUNUE, SUITE 110
ALAMEDA, CA 94501

JOB NO: 6163-1

DATE: 12/22/94

LOG OF BORING B11
Redwood Road Expansion
Phase II Site Assessment
Castro Valley, CA

EQUIPMENT: Pneumatic Sampler
LOGGED BY: M. Kaltreider
PROJECT: Redwood Road
START DATE: 12/6/94

Environmental Control Associates, Inc. Geoprobe Sampler.	HNu (ppm)	SAMPLE #	Sample Interval	Depth (feet)	
Munsell Color Scale				0	Asphalt/Baserock: sandy gravel.
					Poor recovery, no sample collected.
				2	Brown sandy clay (CL) with 15% fine grain sand, slight mottling, plastic, soft, very moist.
(10YR - 2/2)	0	B12-4		4	
(Gley 5GY - 4/1)	0	B12-6		6	Dark greenish grey mottled brown, sandy clay (CL) with 40% fine grain sand, stiff, plastic, moist.
(2.5Y - 4/3)	200	B12-8		8	Brown clayey sand (SC) with 50% fine grain sand, med. dense, moist.
					BOTTOM OF BORING @ 8 feet
				10	
				12	
				14	
				16	
				18	
				20	
				22	
				24	
				26	
				28	

ACC ENVIRONMENTAL CONSULTANTS
1000 ATLANTIC AVEUNUE, SUITE 110
ALAMEDA, CA 94501

JOB NO: 6163-1

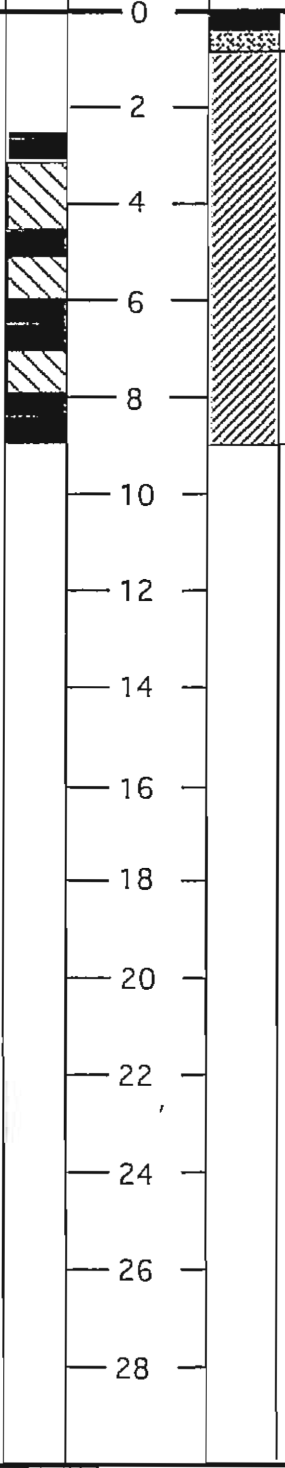
DATE: 12/22/94

LOG OF BORING B12
Redwood Road Expansion
Phase II Site Assessment
Castro Valley, CA

Environmental Control Associates, Inc.
Geoprobe Sampler.

EQUIPMENT: Pneumatic Sampler
LOGGED BY: M. Kaltreider
PROJECT: Redwood Road
START DATE: 12/6/94

Munsell Color Scale	HNu (ppm)	SAMPLE #
	0	B20-3
(10YR - 4/3)	0	B20-5
	0	B20-7
	0	B20-9



Asphalt/ baserock: sandy gravel.

Brown sandy clay (CL) with 15% sand, plastic, slight mottling, stiff, moist.

Mottling and sand content (35% fine grain sand), increases with depth.

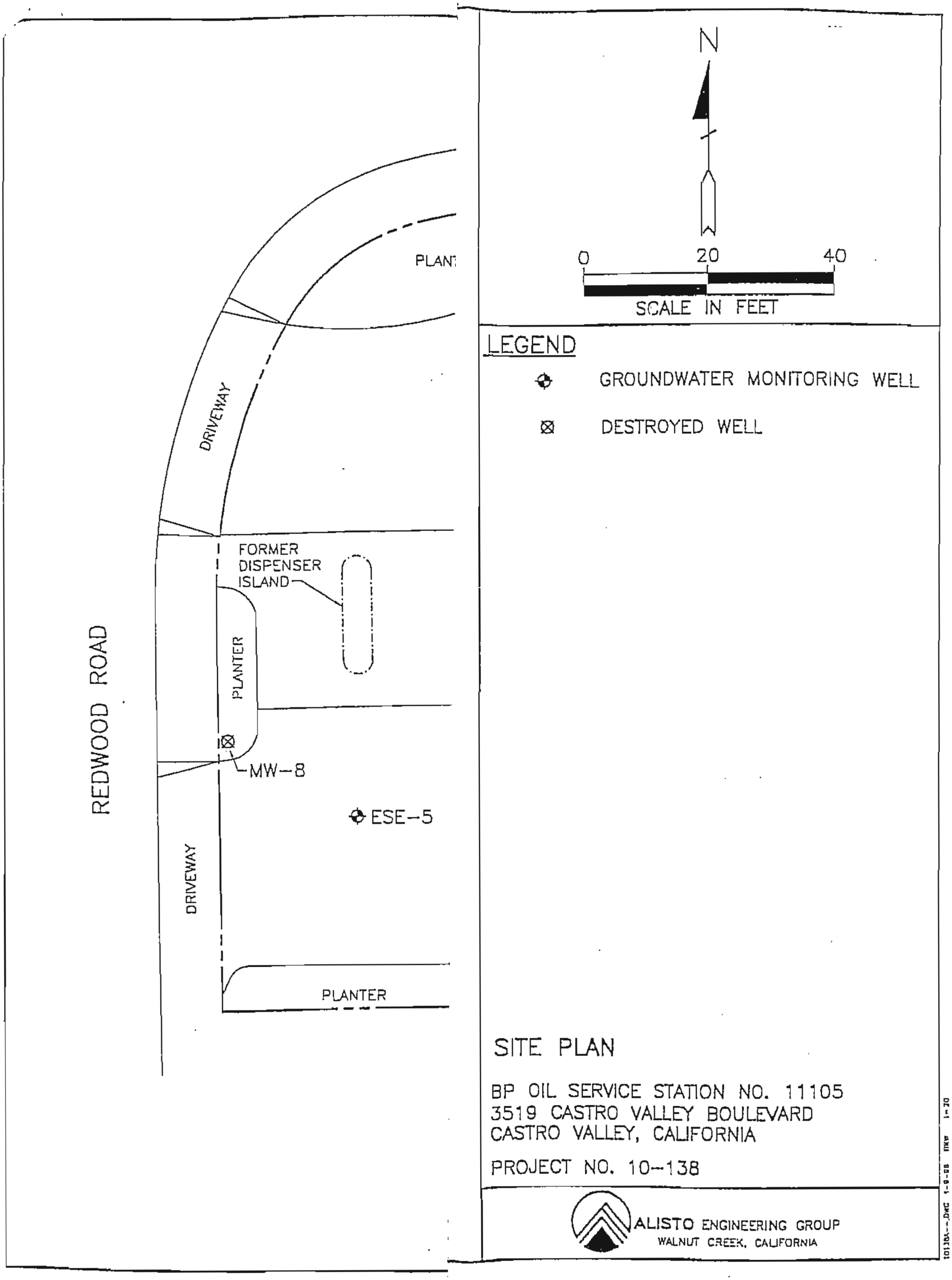
BOTTOM OF BORING @ 9 feet

ACC ENVIRONMENTAL CONSULTANTS
1000 ATLANTIC AVENUE, SUITE 110
ALAMEDA, CA 94501

JOB NO: 6163-1

DATE: 12/22/94

LOG OF BORING B20
Redwood Road Expansion
Phase II Site Assessment
Castro Valley, CA



LEGEND

⌖ GROUNDWATER MONITORING WELL

⊠ DESTROYED WELL

SITE PLAN

BP OIL SERVICE STATION NO. 11105
3519 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA

PROJECT NO. 10–138

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

10138A--.DWG 1-9-98 RKW 1=20

GEOLOGIC LEGEND

COARSE-GRAINED SOILS	GRAVELS more than 1/2 of coarse fraction > No. 4 Sieve	LITTLE OR NO FINES	⁘	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
			●	GP	Poorly-graded gravels, gravel-sand mixtures
		APPRECIABLE NO FINES	⦙	GM	Silty gravels, gravel-sand-silt mixtures
			▨	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS more than 1/2 of coarse fraction < No. 4 Sieve	LITTLE OR NO FINES	○	SW	Well-graded sands, gravelly sands, little or no fines
			▭	SP	Poorly-graded sands, gravelly sands, little or no fines
		APPRECIABLE NO FINES	⋮	SM	Silty sands, sand-silt mixtures
			▨	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS	SILTS AND CLAYS Liquid limit < 50		‖	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			▨	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			⦙	OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit > 50		‖	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			▨	CH	Inorganic clays of high plasticity, fat clays
			▨	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			▩	Pt	Peat and other highly organic soils

SYMBOL LEGEND:

▧	Cement
░	Sand
▒	Bentonite
⌶	Driven Interval of Soil Sample
■	Sample preserved for possible analysis
☒	No sample recovered
▼	Stabilized water level
▽	Groundwater level encountered during drilling

LEGEND TO BORING LOGS

BP OIL SERVICE STATION NO. 11105
3519 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA

PROJECT NO. 10-138

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

102871--DWG 6-5-85 WAP 1-1

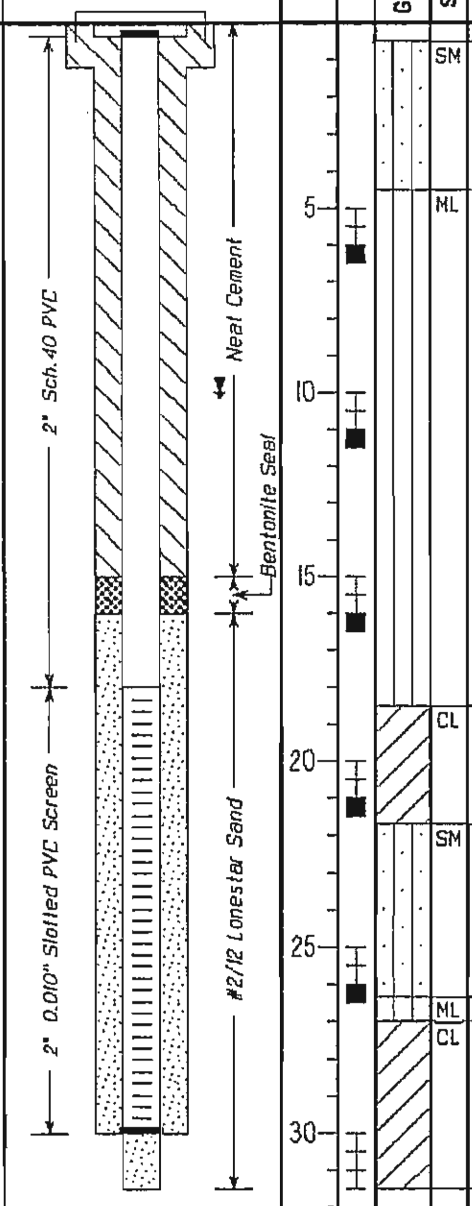
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING MW-6

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: 10-138-03   DATE DRILLED: 07/18/95
CLIENT: BP Oil Company
LOCATION: 3519 Castro Valley Boulevard, Castro Valley, CA.
DRILLING METHOD: Hollow-stem auger (8"); 2" split-spoon sampler
DRILLING COMPANY: Soils Exploration Srvs.   CASING ELEVATION: 179.24 'MSL
LOGGED BY: C. Ladd   APPROVED BY: Al Sevilla



BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
				Planter
			SM	sandy SILT: brown, dry. Observed from cuttings.
12,18,18	1.4	5	ML	clayey SILT: brown, damp, very stiff; minor fines; Fe oxide stain to approximately 3%.
20,43,24	1.7	10		Same: medium brown mottled with Fe oxide stain to 25%, damp, hard; root traces to aproximately 15%; minor fines.
16,19,22	1.1	15		Same: at 15 feet.
12,15,17	1.0	20	CL	silty CLAY: brown/gray, damp, hard.
			SM	At 22 feet, observed water on auger.
10,8,7	0	25		silty SAND: multi-color browns, saturated, medium dense; fine- to medium-grained sand.
			ML	clayey SILT: brown, wet; minor fines.
11,10,13	0	30	CL	silty-CLAY: brown, moist, very stiff; minor fines.
				Stabilized groundwater measured on July 28, 1995.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

MW-7

LOG OF BORING ~~MW-~~7

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-138-03* DATE DRILLED: *07/18/95*

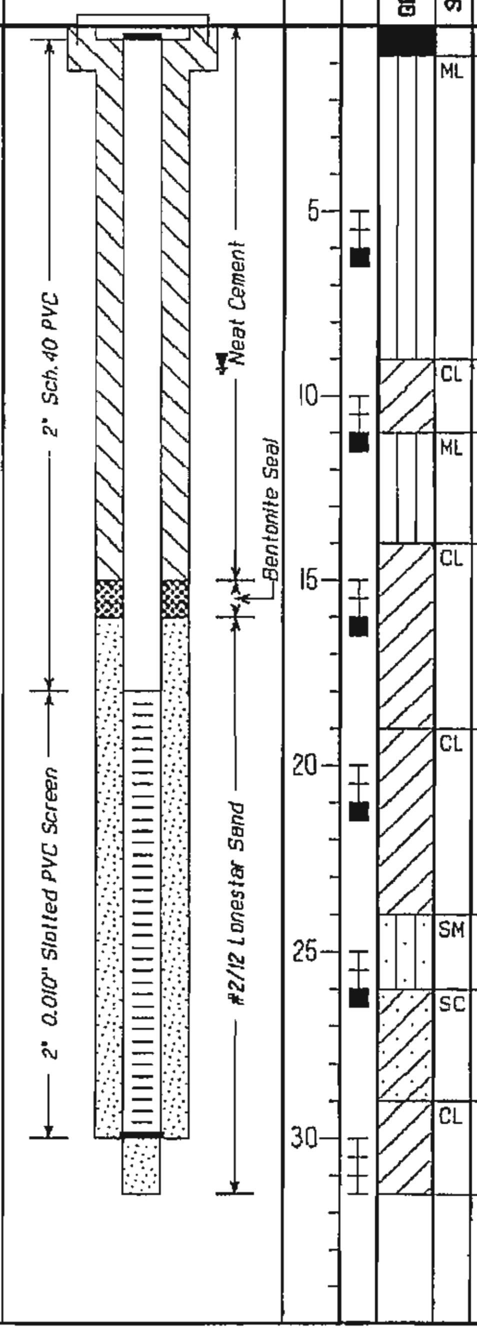
CLIENT: *BP Oil Company*

LOCATION: *3519 Castro Valley Boulevard, Castro Valley, CA.*

DRILLING METHOD: *Hollow-stem auger (8"); 2" split-spoon sampler*

DRILLING COMPANY: *Soils Exploration Srvs.* CASING ELEVATION: *178.55 'MSL*

LOGGED BY: *C. Ladd* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
				10" Concrete
15,18,14	10.0	5	ML	clayey SILT: dark brown, damp, very stiff; Fe oxide stain to approximately 5%.
14,23,17	10.0	10	CL	silty CLAY: brown/gray, damp, hard; Fe oxide stain to approximately 10%; rootlets to 10%; very fine-grained minor fines.
			ML	clayey SILT: red/brown, damp, hard; Fe oxide stain and rootlets; some fine-grained sand; occasional subrounded gravel to 1/4"-diameter.
15,20,24	8.7	15	CL	silty CLAY: brown, damp, hard; Fe oxide stain; occasional subrounded gravel to 1/4"-diameter; minor fines.
17,17,18	6.1	20	CL	CLAY: brown/gray, wet, hard; rootlets to 5%; Fe oxide stain to approximately 3%; minor fines.
11,11,15	0	25	SM	silty SAND: brown, wet, medium dense; fine-grained sand.
			SC	clayey SAND: brown/gray, wet to saturated, medium dense; fine- to medium-grained sand; minor fines.
8,10,13	0	30	CL	silty CLAY: brown/gray, moist, very stiff; some very fine-grained sand.
				Stabilized groundwater measured on July 28, 1995.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

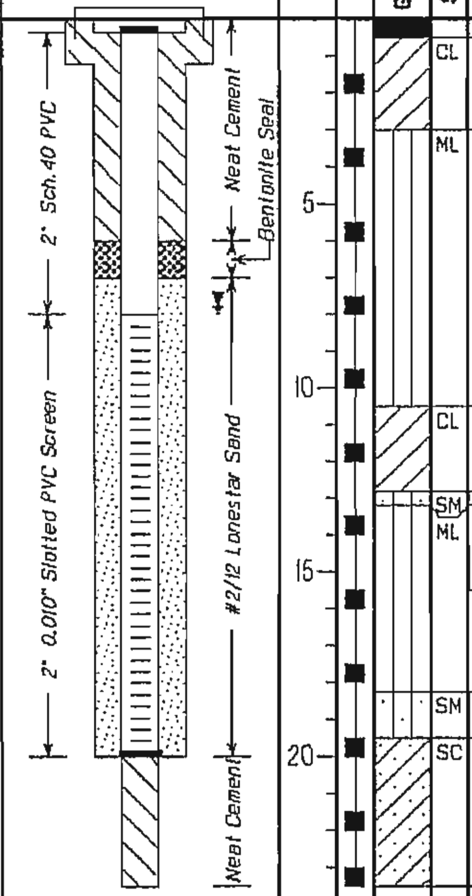
LOG OF BORING [redacted] MW-8

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-138-03* DATE DRILLED: *07/19/95*
CLIENT: *BP Oil Company*
LOCATION: *3519 Castro Valley Boulevard, Castro Valley, CA.*
DRILLING METHOD: *Hollow-stem auger (8"); 2" split-spoon sampler*
DRILLING COMPANY: *Soils Exploration Srvs.* CASING ELEVATION: *176.34 'MSL*
LOGGED BY: *C. Ladd* APPROVED BY: *Al Sevilla*

BLOWS/6 IN.	PID VALUES
8,11,10	6.8
7,8,11	6.0
13,15,18	329
20,24,28	310
15,21,22	51
20,17,23	4.8
18,18,23	4.4
12,18,22	4.0
15,15,19	4.0
10,14,12	4.1
18,18,20	3.5
18,21,20	4.0



SOIL CLASS	GEOLOGIC DESCRIPTION
	Planter
CL	silty CLAY: black, damp, very stiff; Fe oxide stain to 3%; rootlets to 5%.
ML	clayey SILT: brown, damp, very stiff; Fe oxide stain and root traces.
	Same: gray, damp, very stiff; minor fines.
	Same: red/brown mottled gray, damp, hard; root traces present; minor fines.
	Same: at 9.5 feet.
CL	silty CLAY: brown mottled gray, damp, hard.
SM	silty SAND (dense): red/brown, damp to slightly moist, dense; fine- to medium-grained sand; <1% rootlets.
ML	clayey SILT: at 13.5 feet, light brown to brown, damp, hard; rootlets present; minor fines.
	Same: at 15.5 feet, mottled light brown and red.
	Same: at 17.5 feet.
SM	silty SAND: red/brown, wet to saturated, medium dense; fine- to medium-grained sand; <1% root traces.
SC	clayey SILT: brown, wet, very stiff; root traces 5%.
	silty CLAY: brown, damp, hard; rootlets to approximately 40%; minor fines.
	sandy SILT: brown, damp, hard; some fine- to medium-grained sand.
	Stabilized groundwater measured on July 28, 1995.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING MW-8

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-138-03* DATE DRILLED: *07/19/95*

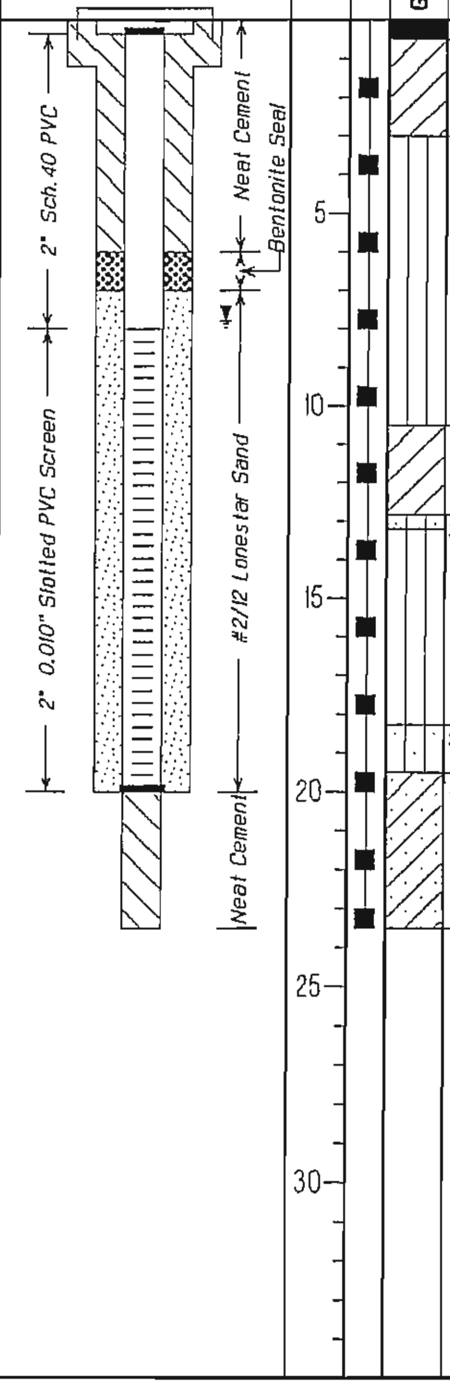
CLIENT: *BP Oil Company*

LOCATION: *3519 Castro Valley Boulevard, Castro Valley, CA.*

DRILLING METHOD: *Hollow-stem auger (8"); 2" split-spoon sampler*

DRILLING COMPANY: *Soils Exploration Srvs.* CASING ELEVATION: *176.34 'MSL*

LOGGED BY: *C. Ladd* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES
9,11,10	8.8
7,9,11	8.0
13,15,18	329
20,24,28	310
15,21,22	51
20,17,23	4.8
18,18,23	4.4
12,18,22	4.0
15,15,18	4.0
10,14,12	4.1
18,18,20	3.5
18,21,20	4.0

SOIL CLASS	GEOLOGIC DESCRIPTION
	Planter
CL	silty CLAY: black, damp, very stiff; Fe oxide stain to 3%; rootlets to 5%.
ML	clayey SILT: brown, damp, very stiff; Fe oxide stain and root traces.
	Same: gray, damp, very stiff; minor fines.
	Same: red/brown mottled gray, damp, hard; root traces present; minor fines.
	Same: at 9.5 feet.
CL	silty CLAY: brown mottled gray, damp, hard.
SM	silty SAND (lense): red/brown, damp to slightly moist, dense; fine- to medium-grained sand; <1% rootlets.
ML	clayey SILT: at 13.5 feet, light brown to brown, damp, hard; rootlets present; minor fines.
	Same: at 15.5 feet, mottled light brown and red.
	Same: at 17.5 feet.
SM	silty SAND: red/brown, wet to saturated, medium dense; fine- to medium-grained sand; <1% root traces.
SC	clayey SILT: brown, wet, very stiff; root traces 5%.
	silty CLAY: brown, damp, hard; rootlets to approximately 40%; minor fines.
	clayey SILT: brown, damp, hard; some fine- to medium-grained sand.
	Stabilized groundwater measured on July 28, 1995.

ENVIRONMENTAL ENGINEERING, INC.	GEOLOGIC LOG OF BOREHOLE: DP-1	PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 22 Ft.
Stable GW: 10.05 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				Hand Auger to 5 ft.				
0.0	5		CL-ML	SILTY CLAY: Dark brown, very high dry strength, no dilatancy, low toughness, moist, no HCl reaction, soft, medium plastic, no Petroleum Hydrocarbon (PHC) odor.				
0.0			CL	SANDY LEAN CLAY: Brown, very high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, firm, low plastic, no PHC odor.		▼		
110.3	10		CL	SANDY LEAN CLAY: Brown with gray-green mottling, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, medium plastic, PHC odor, about 40% fine- to medium-grained sand.	X			
41.7			ML	SANDY LEAN CLAY: Brown, very high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, firm, low plastic, slight PHC odor, which becomes stronger @ 13 ft, about 40% fine- to medium-grained sand.	X			
27.2 19.7 5.7	15 20		CL-ML	SILTY CLAY: Brown, very high dry strength, no dilatancy, medium tough, moist, no HCl reaction, hard, low plasticity, slight PHC odor. At 15.5, PHC odor becomes stronger and color becomes gray-green. Slight PHC odor	X			
			CL	SANDY LEAN CLAY: Brown, high dry strength, low dilatancy, low toughness, moist, no HCl reaction, firm, low plasticity, no PHC odor, about 40% fine- to medium-grained sand.		▽		
3.5			CL	LEAN CLAY: Light brown, very high dry strength, low dilatancy, medium toughness, wet, no HCl reaction, firm, medium plastic, no PHC odor.				
	25		SM	SILTY SAND: Light brown, low dry strength, low toughness, moist to wet, no HCl reaction, firm, nonplastic, no PHC odor, about 70% fine- to medium-grained sand.				

COMMENTS: TD @ 30 ft., Visual-Manual method ASTM 2488-09a
Depth to stable groundwater: 10.05 ft.

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-1

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 22 Ft.
Stable GW: 10.05 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
0.0			**SM**	SILTY SAND: Light brown, low dry strength, low toughness, moist to wet, no HCl reaction, firm, nonplastic, no PHC odor, about 70% fine- to medium-grained sand.					
			SC	CLAYEY SAND: Light brown, very high dry strength, medium dilatancy, low toughness, wet, no HCl reaction, very soft, low plasticity, no PHC odor, about 70% fine- to medium-grained sand. Becomes moist and firm at 29 ft.					
	30								
	35								
	40								
	45								
	50								

COMMENTS: TD @ 30 ft., Visual-Manual method ASTM 2488-09a
Depth to stable groundwater: 10.05 ft.

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 25 Ft.
Stable Groundwater: 6.50 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL
			Hand auger to 5 ft.		
0.0	5	CL-ML	SILTY CLAY: Black, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, soft, medium plasticity, slight Petroleum Hydrocarbon (PHC) odor.		
					▼
4.7			Becomes gray-green and firm at 7 ft.		
32.2		CL-ML	SILTY CLAY: Light brown, high dry strength, no dilatancy, medium tough, moist, no HCl reaction, PHC odor, hard, low plasticity.	✕	
37.2	10				
11.4				✕	
0.0					
	15	CL	SANDY LEAN CLAY: Brown, high dry strength, no dilatancy, medium tough, moist, no HCl reaction, hard, medium plastic, no PHC odor, about 30% fine- to coarse-grained sand.		
0.0					
3.0		CL-ML	SILTY CLAY: Light brown, high dry strength, no dilatancy, medium tough, moist, no HCl reaction, no PHC odor, hard, low plasticity.		
0.0	20				
0.0					
	25				▽

COMMENTS: TD @ 30 Ft., Visual-Manual Method ASTM 2488-09a
Depth to Stable Groundwater: 6.50 Ft.

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 25 Ft.
Stable Groundwater: 6.50 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
0.0		▨	**SC**	CLAYEY SAND: Brown, high dry strength, slow dilatancy, medium tough, wet, no HCl reaction, soft, medium plastic, no PHC odor, about 60% fine-to medium-grained sand.		▮			
	30								
	35								
	40								
	45								
	50								

COMMENTS: TD @ 30 Ft., Visual-Manual Method ASTM 2488-09a
Depth to Stable Groundwater: 6.50 Ft.

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-3

PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 22 Ft.
Stable Groundwater: 11.50 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON / CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				Hand auger to 5 ft.				
0.0	5	▨	CL-ML	SILTY CLAY: Black, very high dry strength, very slow dilatancy, medium toughness moist, no HCl reaction, soft, no Petroleum Hydrocarbon (PHC) odor.				
		▨	CL-ML	SILTY CLAY: Greenish-gray with some orange mottling, very high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, no PHC odor.				
2.1	10	░	SC	CLAYEY SAND: Greenish-brown, high dry strength, medium tough, very moist, no HCl reaction, soft, weak cementation, medium plastic, no PHC odor.				
		▨	CL	SANDY LEAN CLAY: Light brown, very high dry strength, low dilatancy, medium toughness, moist, no HCl reaction, very hard, medium plastic, no PHC odor, about 25% fine- to medium-grained sand.		▼		
0.0		▨	CL-ML	SILTY CLAY: Dark greenish-gray, very high dry strength, soft, slow dilatancy, medium toughness, moist, no HCl reaction, firm, medium plasticity, no PHC odor. Becomes light brown @ 13 ft.	✕			
		▨	CL	LEAN CLAY: Brown, very high dry strength, no dilatancy, medium tough, moist, no HCl reaction, very hard, medium plastic, no PHC odor.				
	15	▨	CL-ML	SILTY CLAY with Sand: Light brown, very high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, ~15% fine- to coarse-grained sand.				
0.0 0.0		▨	CL	LEAN CLAY: Brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, very hard, medium plasticity, no PHC odor.				
	20	▨	CL-ML	SILTY CLAY: Orange-brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, medium plastic, no PHC odor.				
		░	SC	CLAYEY SAND: Gray-green, high dry strength, slow dilatancy, low toughness, moist, no HCl reaction, firm, low plasticity, no PHC odor, ~60% fine- to coarse-grained sand.		▽		
0.0		░	SW-SC	WELL GRADED SAND with clay: Green-brown, wet, fine- to coarse-grained sand, ~ 10% fines, no PHC odor, weak cementation.				
		▨	CL	LEAN CLAY: Light-brown, high dry strength, slow dilatancy, medium tough, moist, no HCl reaction, very hard, medium plastic, no PHC odor.				
	25			No Recovery				

COMMENTS: TD @ 30 Ft., Visual-Manual Method ASTM 2488-09a
Depth to stable groundwater: 11.50 ft

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-3

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 22 Ft.
Stable Groundwater: 11.50 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED: SPLIT SPOON	SAMPLED: CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				No Recovery		▨			
0.0		░	**SW-SC**	WELL-GRADED SAND with clay: Greenish-brown, wet, fine- to coarse-grained sand, ~ 10% fines, weak cementation, no PHC odor.		▨			
		▨	**CL**	LEAN CLAY: Light-brown, high dry strength, slow dilatancy, medium tough, moist, no HCl reaction, very hard, medium plastic, no PHC odor.		▨			
	30								
	35								
	40								
	45								
	50								

COMMENTS: TD @ 30 Ft., Visual-Manual Method ASTM 2488-09a
Depth to stable groundwater: 11.50 ft

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-4

PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 31 ft.
Stable Groundwater: 28 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				Hand Auger to 5 Ft.				
0.7	5		CL	SANDY LEAN CLAY: Olive brown w/ some orange mottling, very high dry strength, no dilatancy, high toughness, moist, no HCl reaction, firm, high plasticity, ~30% fine-to coarse-grained sands, course grains angular to sub-rounded, no Petroleum Hydrocarbon (PHC) odor.	X			
4.5			SW	WELL-GRADED SAND with gravel: Brown, fine- to coarse-grained sand, about 25% rounded to sub-angular gravel up to 1 in., dry, weak cementation, no PHC odor.				
0.3	10		CL	SANDY LEAN CLAY with gravel: Orange-brown, high dry strength, no dilatancy, medium toughness, moist, CaCO3 nodules - strong HCl reaction, hard, moderate cementation, medium plastic, no PHC odor, ~ 30% fine- to coarse-grained sand, about 15% subrounded gravel up to 1/2 in.				
			SC	CLAYEY SAND: Brown, medium dry strength, no dilatancy, medium toughness, dry, no HCl reaction, soft, weak cementation, medium plastic, ~65% fine- to coarse- sand, no PHC				
6.3	15		CL	SANDY LEAN CLAY: Orange-brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, medium plasticity, ~ 45% fine-to coarse- sand, no PHC odor.	X			
5.7				No Recovery				
	20		CL-ML	SILTY CLAY: Brown with orange mottling, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, firm, medium plastic, no PHC odor.				
2.2	25		CL-ML	SILTY CLAY: Brown, high dry strength, low dilatancy, low toughness, moist - 6 in. very moist at 26 ft, no HCl reaction, firm, medium plastic, no PHC odor.				

COMMENTS: TD @ 32 ft., Visual-Manual Method ASTM 2488-09a
Depth to stable groundwater: 28.00 ft

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-4

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/17/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 31 ft.
Stable Groundwater: 28 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
		▨	**CL-ML**	SILTY CLAY: Brown, high dry strength, low dilatancy, low toughness, moist - 6 in. very moist at 26 ft, no HCl reaction, firm, medium plastic, no PHC odor.		▮			
6.2		▨	**CL**	SANDY LEAN CLAY: Orange-brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, medium plasticity, ~ 45% fine- to coarse-grained sand, no PHC odor.		▮			
3.5	30	▨	**CL-ML**	SILTY CLAY: Orange-brown, high dry strength, no dilatancy, medium toughness, no HCl reaction, moist to very moist, firm, no PHC odor.		▮	▼		
2.4		▨	**SC**	CLAYEY SAND: Brown, high dry strength, low dilatancy, low toughness, wet, no HCl reaction, soft, medium plastic, no PHC odor, about 70% fine- to coarse-grained sand.		▮	▽		
	35								
	40								
	45								
	50								

COMMENTS: TD @ 32 ft., Visual-Manual Method ASTM 2488-09a
Depth to stable groundwater: 28.00 ft

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-5

PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 28 ft.
Stable Groundwater: 10.29 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				Hand auger to 5 ft.				
0.0	5		CL	SANDY LEAN CLAY: Dark brown, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, soft, medium plasticity, no Petroleum Hydrocarbon (PHC) odor, about 40% fine- to medium-grained sand.				
			CL	SANDY LEAN CLAY: Orange-brown, high dry strength, slow dilatancy, medium tough, moist, no HCl reaction, firm, nonplastic, about 35% fine- to medium-grained sand.				
0.0			CL-ML	SILTY CLAY: Dark brown, high dry strength, slow dilatancy, medium toughness, no HCl reaction, firm, low plasticity, no PHC odor.				
11.3	10		CL	SANDY LEAN CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, PHC odor, about 25% fine- to medium-grained sand.		▼		
98.1			CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, PHC odor.	✕			
36.4	15		CL-ML	SILTY CLAY: Brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, medium plasticity, slight PHC odor.	✕			
19.1			CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, PHC odor.				
21.2			CL	SANDY LEAN CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, PHC odor, about 25% fine- to coarse-grained sand.				
58.4	20		CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, PHC odor.	✕			
			CL-ML	SILTY CLAY: Light brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor.				
11.7	25		SM	SITLY SAND: Light brown, low dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, soft, nonplastic, no PHC odor, about 65% fine- to medium-grained sand.				

COMMENTS: TD @ 30 ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 10.29 ft

GEOLOGIC LOG OF BOREHOLE: DP-5

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

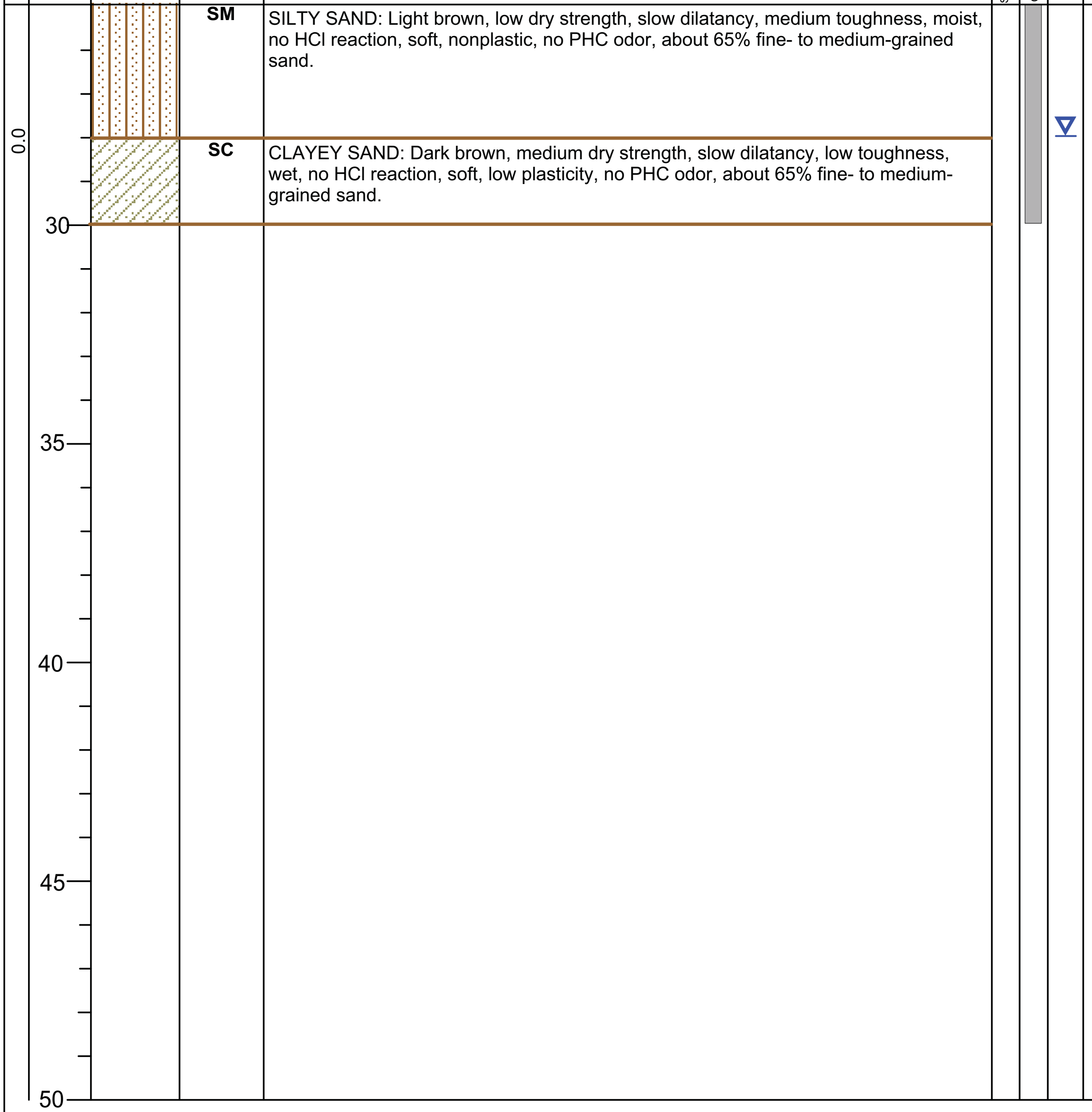
CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 28 ft.
Stable Groundwater: 10.29 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr



PID ppm	DEPTH	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON / CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
0.0		SM	SILTY SAND: Light brown, low dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, soft, nonplastic, no PHC odor, about 65% fine- to medium-grained sand.	CORE			
		SC	CLAYEY SAND: Dark brown, medium dry strength, slow dilatancy, low toughness, wet, no HCl reaction, soft, low plasticity, no PHC odor, about 65% fine- to medium-grained sand.	CORE	∇		

COMMENTS: TD @ 30 ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 10.29 ft

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-6

PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: DP

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 24 Ft.
Stable Groundwater: 19.79 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				Hand auger to 5 ft.				
0.0	5		CL	SANDY LEAN CLAY: Dark brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, firm, medium plasticity, no Petroleum Hydrocarbon (PHC) odor, about 40% fine- to medium-grained sand.				
0.0			CL	SANDY LEAN CLAY: Orange-brown, high dry strength, slow dilatancy, med tough, moist, no HCl reaction, firm, nonplastic, no PHC odor, about 30% fine- to medium-grained sand.				
			CL-ML	SILTY CLAY: Dark brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, no PHC odor.				
2.1	10		CL	SANDY LEAN CLAY: Brown, high dry strength, low dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, about 30% fine- to medium-grained sand. Slight PHC odor @ 11.5 ft.				
213.3			CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, slight PHC odor.	☒			
19.6	15		CL-ML	SILTY CLAY: Brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, medium plasticity, slight PHC odor.	☒			
14.9			CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, slight PHC odor.				
			CL	SANDY LEAN CLAY: Brown, high dry strength, low dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, about 30% fine- to medium-grained sand.	☒	▼		
0.0	20		CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, low plasticity, slight PHC odor.				
			CL-ML	SILTY CLAY: Light brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor.		▽		
0.0			SM	SILTY SAND: Light brown, low dry strength, no dilatancy, low toughness, wet, no HCl reaction, soft, nonplastic, no PHC odor, about 55% fine- to medium-grained sand.				
	25							

COMMENTS: TD @ 30 Ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 19.79 ft

GEOLOGIC LOG OF BOREHOLE: DP-6

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

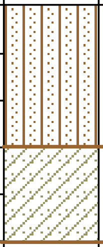
CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 24 Ft.
Stable Groundwater: 19.79 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON / CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
0.0			**SM**	SILTY SAND: Light brown, low dry strength, no dilatancy, low toughness, wet, no HCl reaction, soft, nonplastic, no PHC odor, about 55% fine- to medium-grained sand.	CORE			
			SC	CLAYEY SAND: Dark brown, medium dry strength, slow dilatancy, low toughness, wet, no HCl reaction, soft, low plasticity, no PHC odor, about 60% fine- to medium-grained sand.	CORE			
	30							
	35							
	40							
	45							
	50							

COMMENTS: TD @ 30 Ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 19.79 ft

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-7

PAGE 1 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 24 Ft.
Stable Groundwater: 10.32 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
			Hand auger to 5 ft.				
0.0	5	CL	SANDY LEAN CLAY: Dark brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, very soft, low plasticity, no Petroleum Hydrocarbon (PHC) odor, about 35% fine- to medium-grained sand. (only recovered 6 in. of soil in sampling tube)				
0.0		CL	As above.				
	10	ML	SANDY SILT: Reddish-brown, low dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, firm, nonplastic, no PHC odor, about 30% fine- to medium-grained sand.		▼		
0.0		CL-ML	SILTY CLAY: Dark brown, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, very soft, medium plastic, no PHC odor.	✕			
		SM	SILTY SAND: Reddish-brown, low dry strength, low dilatancy, low toughness, moist, no HCl reaction, hard, nonplastic, no PHC odor, about 65% fine- to coarse-grained sand.				
3.6		CL-ML	SILTY CLAY: Dark brown, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, very soft, medium plastic, no PHC odor.	✕			
	15	CL	SANDY LEAN CLAY: Brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor, about 40% fine- to coarse-grained sand.				
0.0		CL-ML	SILTY CLAY: Dark brown, high dry strength, no dilatancy, low toughness, moist, no HCl reaction, very soft, medium plastic, no PHC odor.				
0.0		CL	SANDY LEAN CLAY: Brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor, about 40% fine- to coarse-grained sand.				
0.0 0.0	20	CL-ML	SILTY CLAY: Light brown, high dry strength, low dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor.				
		ML	SANDY SILT: Light brown, low dry strength, low dilatancy, low toughness, moist, no HCl reaction, firm, nonplastic, no PHC odor, about 25% fine- to coarse-grained sand.		▽		
	25	SM	SILTY SAND: Light brown, low dry strength, slow dilatancy, low toughness, wet, no HCl reaction, soft, nonplastic, no PHC odor, about 60% fine- to medium-grained sand.				

COMMENTS: TD @ 30 Ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 10.32 ft

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: DP-7

PAGE 2 OF 2

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: Direct Push

BORING DIAMETER: 2 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION: N/A

DEPTH TO GW: First Encountered: 24 Ft.
Stable Groundwater: 10.32 Ft.

T.O.C. TO SCREEN: N/A

SCREEN LENGTH: N/A

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
		▥	**SM**	SILTY SAND: Light brown, low dry strength, slow dilatancy, low toughness, wet, no HCl reaction, soft, nonplastic, no PHC odor, about 60% fine- to medium-grained sand. Dry from 27.5 ft to 28 ft.		▮			
0.0		▨	**SC**	CLAYEY SAND: Dark brown, medium dry strength, slow dilatancy, low toughness, wet, no HCl reaction, soft, low plasticity, no PHC odor, about 65% fine- to medium-grained sand. (only recovered 6 in. of soil in sampling tube)		▮			
	30								
	35								
	40								
	45								
	50								

COMMENTS: TD @ 30 Ft., Visual-Manual Method, ASTM 2488-09a
Depth to stable groundwater: 10.32 ft

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: SOMA-5

PAGE 1 OF 1

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: DP

BORING DIAMETER: 8 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION:

DEPTH TO GW: Not Encountered
Stable GW: 10.48 Ft.

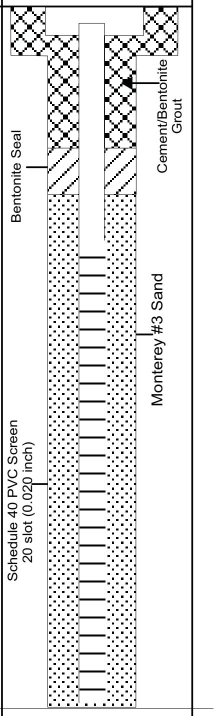
T.O.C. TO SCREEN: 5 Ft.

SCREEN LENGTH: 10 Ft.

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS
				Hand auger to 5 ft.				
	5	▨	**CL**	SANDY LEAN CLAY: Dark brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, soft, low plasticity, no Petroleum Hydrocarbon (PHC) odor.		▮		
		▨	**ML**	SANDY SILT: Brown, low dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, nonplastic, no PHC odor.		▮		
		▨	**CL-ML**	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor.		▮		
	10	▨		Becomes greenish-brown with PHC odor at 10.5 ft.		▮ X X	▼	
	15							
	20							
	25							

WELL DIAGRAM



COMMENTS: TD @ 15 Ft., Visual-Manual Method, ASTM 2488-09a

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE TWB-5

Boring Location:

See Site Map.

Project: 2762

Site Location: 5516 Castro Valley Blvd
Castro Valley CA

Drilling Method: DPT

Driller: Vironex

Logged By: E. Jennings

Date Drilled: Dec. 2, 2003

Casing Elevation: NA

Depth to 1st Groundwater: 17 ft

Approved By: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED core	SAMPLED split spoon	GW LEVEL	WELL DIAGRAM
				4" concrete over 6" base rock.				
			CL	Hand augured cutting.				
0	5		CL	CLAYEY SILT/SILTY CLAY: grayish brown; medium stiff; damp; slightly plastic; low estimated permeability (LEK). No petroleum hydrocarbon (PHC) odor.				NO TEMPORARY WELL CASING INSTALLED
191	10			As above w/ strong PHC odor.				
				As above becoming reddish brown; stiff to very stiff. Strong PHC odor.				
				As above becoming grayish brown; soft to medium stiff; moist. Slight PHC odor.				
0	15		CL	SILTY CLAY w/ some Fine Sand: reddish brown; soft to medium stiff; moist to wet; <20% fine sand. LEK. Slight PHC odor.			▼	
				2-4" stringer of fine sand and gravelly, silty clay lense; well sorted and poorly graded.				
0	20			As above becoming medium stiff to very stiff.				
				As above becoming soft; saturated. MEK-HEK.				
0	25							

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE TWB-5

Page 2 of 2

Boring Location:

See Site Map.

Project: 2552

Site Location: 5519 Castro Valley Blvd
Castro Valley CA

Drilling Method: DPT

Driller: Vironex

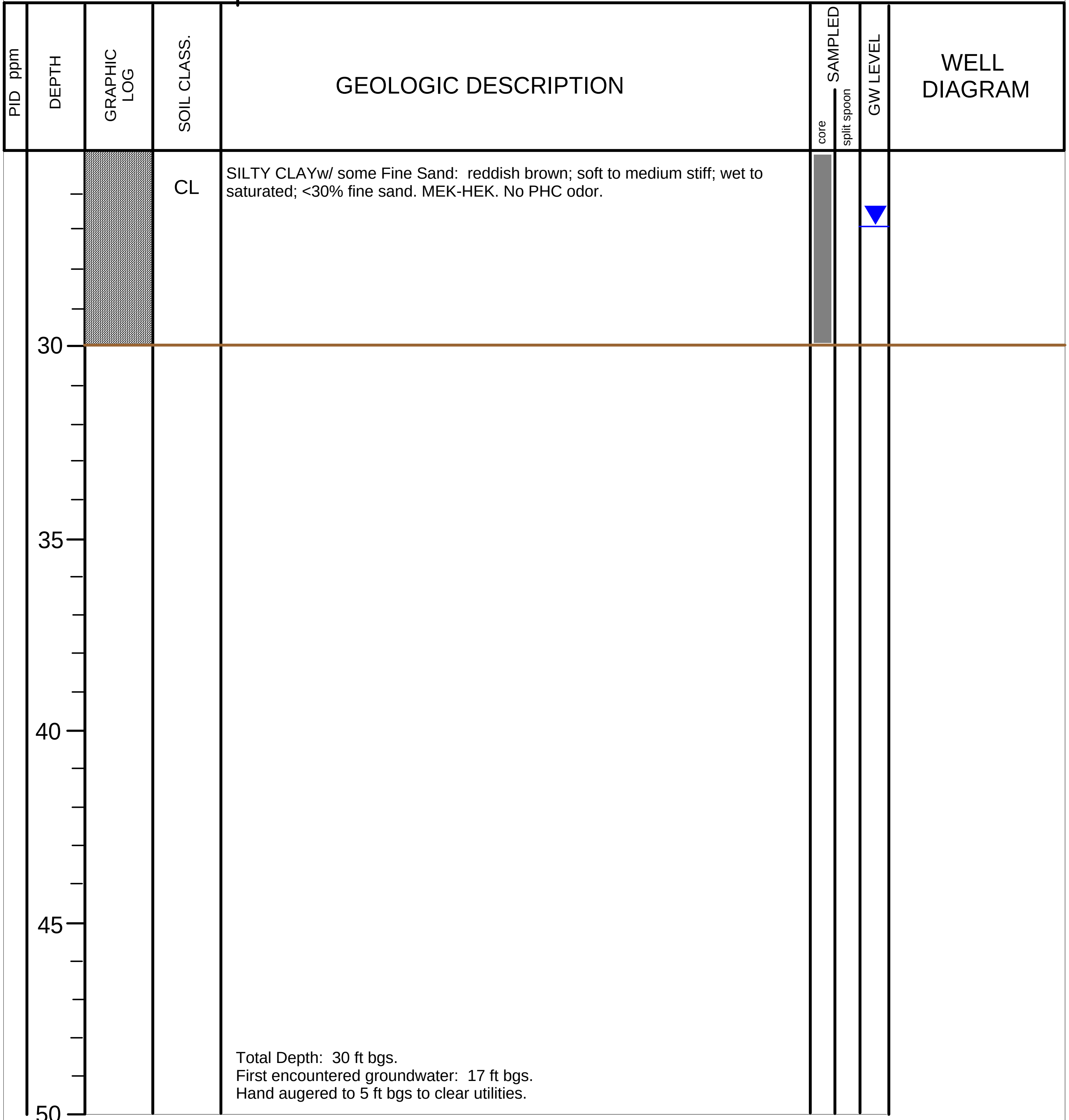
Logged By: E Jennings

Date Drilled: Dec. 2, 2003

Casing Elevation: NA

Depth to 1st Groundwater: 25-28 ft

Approved By: M Sepehr



SILTY CLAYw/ some Fine Sand: reddish brown; soft to medium stiff; wet to saturated; <30% fine sand. MEK-HEK. No PHC odor.

Total Depth: 30 ft bgs.
First encountered groundwater: 17 ft bgs.
Hand augered to 5 ft bgs to clear utilities.

SOMA
ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE TWB-4

Boring Location:

See Site Map.

Project: 2762
Site Location: 5516 Castro Valley Blvd
Castro Valley CA
Drilling Method: DPT
Driller: Vironex
Logged By: E. Jennings

Date Drilled: Dec. 2, 2003
Casing Elevation: NA
Depth to 1st Groundwater: 25-28 ft
Approved By: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED core	SAMPLED split spoon	GW LEVEL	WELL DIAGRAM
		■		4" concrete over 6" base rock.				NO TEMPORARY WELL CASING INSTALLED
		▨	CL	Hand augured cutting.				
0	5	▨	CL	CLAYEY SILT/SILTY CLAY w/ some Sand: brown; medium stiff; damp; slightly plastic. Low to medium estimated permeability (LEK-MEK). No petroleum hydrocarbon (PHC) odor.	▮			
80	10	▨		As above becoming brown to grayish brown; medium stiff to very stiff. LEK. Moderate PHC odor.	▮			
60		▨			▮			
10	15	▨			▮			
		▨	CL	SILTY CLAY: brown; stiff; damp; plastic. LEK. No PHC odor.	▮			
4		▨			▮			
		▨		6" stringer of fine sand and gravelly, silty clay lense at 18'.	▮			
0	20	▨			▮			
		▨		6" stringer of sand and gravelly, silty clay lense at 21'.	▮			
3		▨			▮			
		▨		As above becoming soft to medium stiff; increasing moisture with depth.	▮			
0	25							

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE TWB-4

Boring Location:

See Site Map.

Project: 2552
Site Location: 5519 Castro Valley Blvd
Castro Valley CA
Drilling Method: DPT
Driller: Vironex
Logged By: E Jennings

Date Drilled: Dec. 2, 2003
Casing Elevation: NA
Depth to 1st Groundwater: 25-28 ft
Approved By: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED core	SAMPLED split spoon	GW LEVEL	WELL DIAGRAM
		▨	CL	SILTY CLAY: brown; soft; moist; plastic. LEK-MEK. No PHC odor.	■		▼	
	30							
	35							
	40							
	45							
	50			Total Depth: 30 ft bgs. First encountered groundwater: 25-28 ft bgs. Hand augered to 5 ft bgs to clear utilities.				

SOMA
ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE SOMA-1

BORING LOCATION

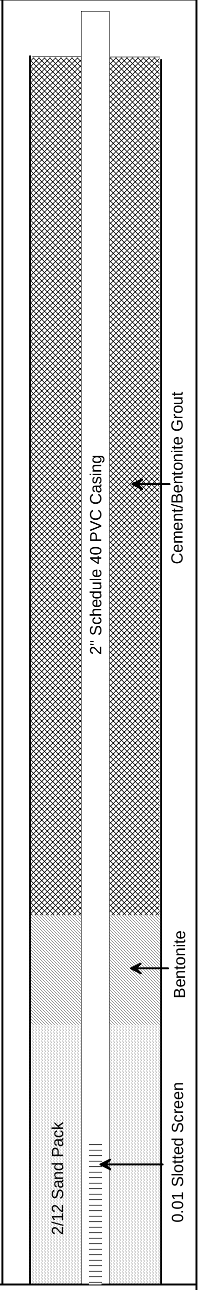
SEE SITE MAP

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd
Castro Valley, CA
DRILLING METHOD: Hollow Stem Auger.
DRILLER: Gregg Drilling & Testing
LOGGED BY: E Jennings

DATE DRILLED: June 10, 2004
CASING ELEVATION:
DEPTH TO 1ST GW: 22'
APPROVED BY: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED (split spoon / core)	GW LEVEL	BLOWCOUNTS
				4" concrete over 4-6" base rock	HAND AUGERED TO 5'		
	5		CL	SILTY CLAY: dark brown, very soft, moist to very moist, high plasticity; Medium to high estimated permeability (MEK-HEK). No petroleum hydrocarbon (PHC) odor.			3 7 9
	10		CL/ML	SILTY CLAY/ CLAYEY SILT: gray mottled orange brown, med. stiff to stiff, damp, slight plasticity; Low estimated permeability (LEK). No PHC odor.			7 11 13
	15		CL/ML	As above. Becomes gray and slight bluish gray. Moderate to strong PHC odor.			13 18 20
	20		ML/SM	SANDY SILT/SILTY SAND with some Clay: gray brown and slight orange brown, med. dense and med. stiff, moist; 40-60% fine to med. sand; LEK-MEK. No PHC odor.		▽	6 11 16 8 10 10 5 6 10
	25						

WELL DIAGRAM



ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE SOMA-1

PAGE 2 OF 2

BORING LOCATION

SEE SITE MAP

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd
Castro Valley, CA

DRILLING METHOD: Hollow Stem Auger.

DRILLER: Gregg Drilling & Testing

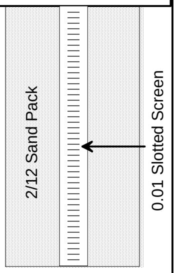
LOGGED BY: E Jennings

DATE DRILLED: June 10, 2004

CASING ELEVATION:

DEPTH TO 1ST GW: 22'

APPROVED BY: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED split spoon	SAMPLED core	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
			SP/SM	SAND and SILTY SAND: gray brown and light orange brown, med. dense, saturated; 40-70% fine to med. sand; HEK. No PHC odor.					
			ML/CL	CLAYEY SILT/ SILTY CLAY: dark brown, wet to saturated; HEK. No PHC odor.					
				SILTY CLAY: gray brown slightly mottled orange brown, med stiff, moist to very moist; LEK-MEK. No PHC odor.					
	30			TOTAL DEPTH 30' Groundwater first encountered at 22' and stabilized at 11.56'					
	35								
	40								
	50								
	55								

SOMA
ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE SOMA-2

PAGE 1 OF 1

BORING LOCATION

SEE SITE MAP

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd
Castro Valley, CA

DRILLING METHOD: Hollow Stem Auger.

DRILLER: Gregg Drilling & Testing

LOGGED BY: E Jennings

DATE DRILLED: June 10, 2004

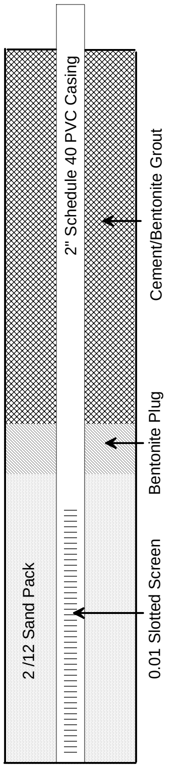
CASING ELEVATION:

DEPTH TO 1ST GW: Approx 12'

APPROVED BY: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED split spoon / core	GW LEVEL	BLOWCOUNTS
			CL	4" concrete over 4-6" base rock	HAND AUGERED TO 5'		
	5		CL	SILTY CLAY with some FINE SAND: dark brown and gray brown slightly mottled orange brown, soft and med. stiff, moist, med. to high plasticity; <30% fine sand; Low to medium estimated permeability (LEK-MEK). No petroleum hydrocarbon (PHC) odor.			2 7 8
	10			As above. Light gray and light gray brown and reddish orange brown with depth.		▽	10 13 26
			SM	FINE SILTY SAND: reddish brown and light gray brown, med. dense, very moist; 40-60% fine sand; MEK to high estimated permeability (HEK). No PHC odor.			7 6 7
	15			TOTAL DEPTH 15'			
				Groundwater first encountered at 12' and stabilized at 10.60'			
	20						
	25						

WELL DIAGRAM



ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE SOMA-3

PAGE 1 OF 1

BORING LOCATION

SEE SITE MAP

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd
Castro Valley, CA

DRILLING METHOD: Hollow Stem Auger.

DRILLER: Gregg Drilling & Testing

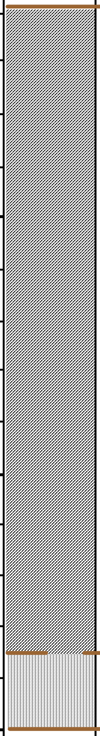
LOGGED BY: E Jennings

DATE DRILLED: June 10, 2004

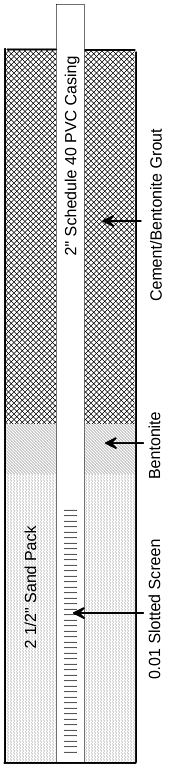
CASING ELEVATION:

DEPTH TO 1ST GW: Approx 12'

APPROVED BY: M Sepehr



PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED split spoon	SAMPLED core	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
			CL	4" concrete over 4-6" base rock	HAND AUGERED TO 5'				
	5		CL	SILTY CLAY with some FINE SAND: gray brown mottled orange brown, med. stiff dense, moist slightly plastic; <30% fine sand; Low estimated permeability (LEK). No petroleum hydrocarbon (PHC) odor.		▮		7 7 8	
	10			As above. Reddish brown and moist with depth.		▮		9 8 9	
							▽		
			SM	FINE SILTY SAND: reddish brown slightly mottled gray, med. dense, very moist to wet; 40-60% wery fine to fine sand; High estimated permeability (HEK). No PHC odor.		▮		5 5 6	
	15			TOTAL DEPTH 15'					
				Groundwater first encountered at 12' and stabilized at 9.90'					
	20								
	25								



ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE SOMA-4

PAGE 1 OF 1

BORING LOCATION

SEE SITE MAP

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd
Castro Valley, CA

DRILLING METHOD: Hollow Stem Auger.

DRILLER: Gregg Drilling & Testing

LOGGED BY: E Jennings

DATE DRILLED: June 10, 2004

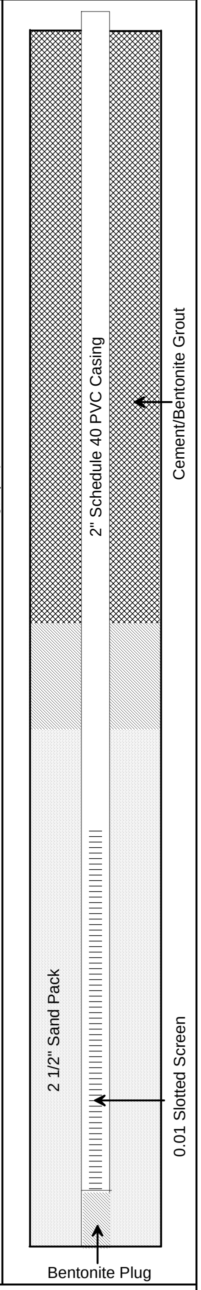
CASING ELEVATION:

DEPTH TO 1ST GW: Approx 16'-17'

APPROVED BY: M Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	SAMPLED split spoon / core	GW LEVEL	BLOWCOUNTS
				4" concrete over 4-6" base rock	HAND AUGERED TO 5'		
	5		SM	FINE SILTY SAND with some CLAY: gray to grayish brown mottled orange brown, med. dense, damp to moist; 40-60% fine sand; Low to med. estimated permeability (LEK). No petroleum hydrocarbon (PHC) odor.			26 50 11 14 23
	10		SM/CL	SILTY SAND/ SILTY CLAY: reddish brown, dense and med. stiff, damp; LEK. Slight PHC odor.			
	15		CL	SILTY CLAY: brown, med. stiff to stiff, damp to moist, slightly plastic; LEK. No PHC odor.			9 9 9
			SM	SILTY SAND with some CLAY: gray and slight yellow brown, med. dense, very moist to wet; <60% fine sand; MEK to high estimated permeability (HEK). No PHC odor.		▽	
	20		SM/ML	SILTY SAND/ SANDY SILT: gray brown slightly mottled orange, med. dense, wet to saturated; 40-60% fine sand; MEK-HEK. No PHC odor.			7 11 6 8 8
			CL	SILTY CLAY with some SAND: gray brown slightly mottled orange brown, med. stiff, moist; LEK-MEK. No PHC odor.			
	25			TOTAL DEPTH 24.5'			

WELL DIAGRAM



Groundwater first encountered at 16-17' and stabilized at 9.32'

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: SOMA-5

PAGE 1 OF 1

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd.
Castro Valley

DRILLER: Gregg Drilling & Testing

DRILLING METHOD: DP

BORING DIAMETER: 8 in.

LOGGED BY: E. Hightower

DATE DRILLED: 8/18/2009

CASING ELEVATION:

DEPTH TO GW: Not Encountered
Stable GW: 10.48 Ft.

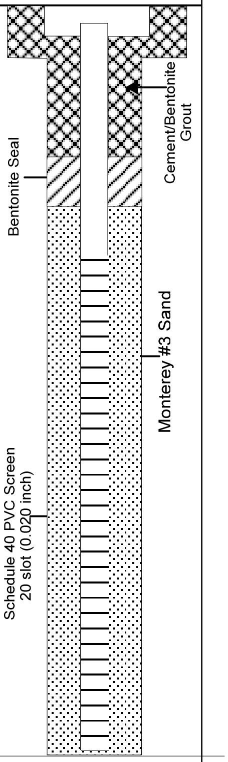
T.O.C. TO SCREEN: 5 Ft.

SCREEN LENGTH: 10 Ft.

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS
				Hand auger to 5 ft.				
	5		CL	SANDY LEAN CLAY: Dark brown, high dry strength, no dilatancy, medium toughness, moist, no HCl reaction, soft, low plasticity, no Petroleum Hydrocarbon (PHC) odor.				
			ML	SANDY SILT: Brown, low dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, nonplastic, no PHC odor.				
			CL-ML	SILTY CLAY: Brown, high dry strength, slow dilatancy, medium toughness, moist, no HCl reaction, hard, low plasticity, no PHC odor.				
	10			Becomes greenish-brown with PHC odor at 10.5 ft.		☒ ☒	▼	
	15							
	20							
	25							

WELL DIAGRAM



COMMENTS: TD @ 15 Ft., Visual-Manual Method, ASTM 2488-09a

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: SOMA-6

PAGE 1 OF 1

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
DRILLER: RSI Drilling
DRILLING METHOD: Hollow Stem Auger
BORING DIAMETER: 8-inch
LOGGED BY: Erica Fisker

DATE DRILLED: August 9, 2010
CASING ELEVATION: NA
First Encountered GW: Not encountered
Stablized GW: DRY
T.O.C. TO SCREEN: NA
SCREEN LENGTH: NA
APPROVED BY: Mansour Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
		▓	AC	10-inch Concrete Core					
0.0 0.9		▨	CL	Hand Auger top 5 feet, Fill top 1 foot SANDY LEAN CLAY: Dark brown, firm, dry to damp, medium plastic, medium dilatancy, medium to high toughness, medium dry strength, ~40% fine to coarse-grained sand, no Petroleum Hydrocarbon (PHC) odor Becomes light brown, low dry strength, and very soft at 3 feet					
0.9	5	▨	CL	LEAN CLAY: Dark brown, damp, high plasticity, medium toughness, medium dry strength, slow dilatancy, soft to firm, ~10% fine-grained sand, no PHC odor		▮			
0.4 0.6		░	SM	SILTY SAND: Medium brown with black and rust mottling, ~68 % fine to medium grained sand, firm, ~32% silt: low plastic, low dry strength, slow dilatancy As above: becomes light brown with light grey mottling and fine- to coarse-grained sand	X	▮			
3.0	10	░	SW	WELL GRADED SAND w/silt: blue grey with light brown and CaCO3 mottling, dry, very soft, ~90 % fine- to coarse-grained sand, ~10% silt: low plastic, no dilatancy, no dry strength, low toughness, PHC staining, strong PHC odor	X	▮			
320		░	SW	WELL GRADED SAND: light brown with grey mottling, loose, fine- to coarse-grained sand, ~10% silt, CaCO3 mottling, dry to damp, strong PHC odor		▮			
4.5		▨	CL	SANDY CLAY: Reddish-brown with grey mottling, hard to very hard, medium toughness, medium plastic, low dilatancy, ~30% fine- to coarse-grained sand		▮			
	15								
	20								
	25								

COMMENTS: Left open with trench plate secured with asphalt and drum, checked daily for water
8/16/10, boring dry; abandoned borehole by tremie grouting and finished to grade with concrete

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: SOMA-7

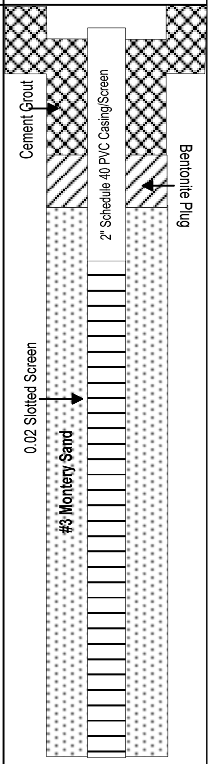
PAGE 1 OF 1

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
DRILLER: RSI Drilling
DRILLING METHOD: Hollow Stem Auger
BORING DIAMETER: 8-inch
LOGGED BY: Erica Fisker

DATE DRILLED: August 9, 2010
CASING ELEVATION: 178.54 Ft.
First Encountered GW: Not encountered
Stablized GW: 8.3 Feet
T.O.C. TO SCREEN: 5 Feet
SCREEN LENGTH: 10 Feet
APPROVED BY: Mansour Sepehr

PID ppm	DEPTH	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS
	0	AC	2-inch Asphalt				
87.5		CL	Hand Auger top 5 feet SANDY LEAN CLAY: Brown, gravelly fill with silt and sand to 1.4 feet bgs, Dark grey-black w/blue-green staining, soft, damp, fine- to coarse-grained sand, low to medium plastic, slow dilatancy, medium toughness, strong Petroleum Hydrocarbon (PHC) odor Some brown mottling starts at 4 feet bgs	X			
236.5 138.7	5	CL	SANDY LEAN CLAY: Blue-grey with black mottling and PHC staining, asphalt scattered througout core, fine- to coarse-grained sand, 5% gravel up to 1.5 inch, low to medium plastic, medium toughness, slow dilatancy, damp. Moist at 9 feet, brown mottling at 10 feet	X	▮	▼	
630	10	SM	SILTY SAND: Light grey, damp, very fine- to fine-grained sand, brown mottling, loose, ~17% silt, low plastic, slow dilatancy, low toughness, low dry strength, PHC odor	X	▮		
20.5		CL	SANDY LEAN CLAY: Brown with grey mottling, fine- to coarse-grained sand (~20%), hard, dry to damp, slow dilatancy, medium toughness, medium plastic, no PHC odor below 12.5 feet.		▮		
	15						
	20						
	25						

WELL DIAGRAM



COMMENTS: Left open with trench plate secured with 55-gallon drum, set well 8/10/2010.
DTW on 8/10/10: 8.39 feet bgs, sheen, PHC odor

GEOLOGIC LOG OF BOREHOLE: SOMA-8

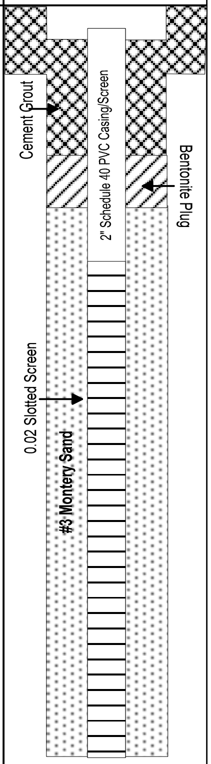
PAGE 1 OF 1

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
DRILLER: RSI Drilling
DRILLING METHOD: Hollow Stem Auger
BORING DIAMETER: 8-inch
LOGGED BY: Erica Fisker

DATE DRILLED: August 9, 2010
CASING ELEVATION: 181.57 Ft.
First Encountered GW: Not encountered
Stablized GW: 9.86 Feet
T.O.C. TO SCREEN: 5 Feet
SCREEN LENGTH: 10 Feet
APPROVED BY: Mansour Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS
1.5			SP	Hand Auger top 5 feet POORLY GRADED SAND w/GRAVEL: Reddish-brown, dry to damp, loose, medium- to very coarse-grained sand, fine-grained rounded to sub-rounded gravel (~10%), no Petroleum Hydrocarbon (PHC) odor				
			ML	SANDY SILT: Dark brown, soft, damp, medium to high plastic, slow dilatancy, low toughness, low dry strength, fine- to coarse-grained sand decreasing with depth, no PHC odor				
1.2	5		ML	SANDY SILT: Dark brown, dry to damp, soft to firm, low to medium plastic, medium dry strength, medium toughness, slow dilatancy, fine- to medium-grained sand, no PHC odor. Color change to light brown mottling at 7 ft.				
1.1					X			
				dry at 9 feet, CaCO3 nodules with rust mottling			▼	
1.2	10		SM	SILTY SAND: Reddish-brown, dry, loose, very fine- to fine-grained sand, ~25% silt: low plastic, low toughness, slow dilatancy, low dry strength, no PHC odor Black speckling and mottling begins at 11 feet				
1.4					X			
				Sand becomes fine- to coarse-grained at 14 feet				
	15							
	20							
	25							

WELL DIAGRAM



COMMENTS: Left open with trench plate secured with 55-gallon drum, set well 8/10/2010.
DTW on 8/10/10: 9.86 feet bgs, sheen, PHC odor

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: SOMA-9

PAGE 1 OF 1

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

DRILLER: RSI Drilling

DRILLING METHOD: Hollow Stem Auger

BORING DIAMETER: 8-inch

LOGGED BY: Erica Fisker

DATE DRILLED: August 9, 2010

CASING ELEVATION: NA

First Encountered GW: Not encountered
Stablized GW: DRY

T.O.C. TO SCREEN: NA

SCREEN LENGTH: NA

APPROVED BY: Mansour Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED (SPLIT SPOON / CORE)	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
			AC	4-inch Asphalt, 6-inch Concrete				
0.5 0.1			**CL-ML**	Hand Auger top 5 feet SILTY CLAY: Dark brown, damp to moist, firm to very firm, medium plastic, medium toughness, slow dilatancy, Fe oxide staining/mottling, no Petroleum Hydrocarbon (PHC) odor. Large chunks of concrete at 2.5 feet bgs				
0.0	5		**CL-ML**	SILTY CLAY: Dark brown with black and rust mottling, damp, soft to firm, highly plastic, medium toughness, slow dilatancy, medium dry strength, ~10% very fine to fine-grained sand, some CaCO3 nodules, no PHC odor Increasing CaCO3 with depth, Sand becomes fine- to coarse-grained, increase to ~10%	╳			
0.5	10		**GP**	POORLY GRADED GRAVEL w/sand and silt: grey to light brown, damp, loose.				
0.0			**SM**	SILTY SAND: Reddish-brown, damp, loose, black specks, no toughness, no plastic, slow dilatancy, no dry strength, ~30% fines with increasing silt with depth, no PHC odor	╳			
	15							
	20							
	25							

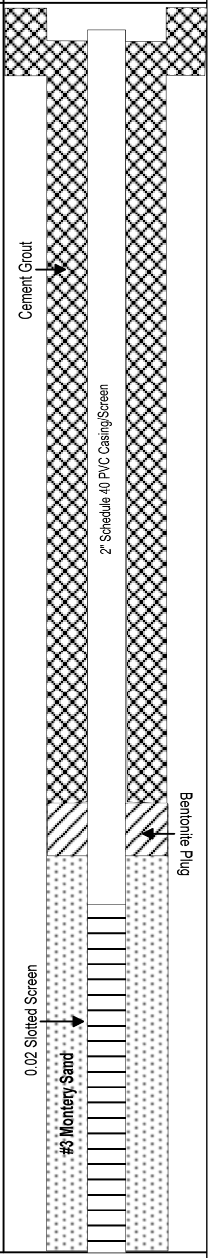
COMMENTS: Left open with trench plate secured with asphalt and drum, checked daily for water
8/16/10, borehole dry. abandoned borehole by tremie grouting and finishing to grade with asphalt

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: ESE-1R

PAGE 1 OF 2

PROJECT: 2762	DATE DRILLED: August 10, 2010
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley	CASING ELEVATION: 180.20 Ft.
DRILLER: RSI Drilling	First Encountered GW: 9.95 Ft. Stablized GW: 10.17 Ft.
DRILLING METHOD: HSA	T.O.C. TO SCREEN: 18 Ft.
BORING DIAMETER: 10-inch	SCREEN LENGTH: 7 Ft.
LOGGED BY: E. Fisker	APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
	5 10 15 20 25			18-inch concrete core Existing well over drilled with 8-inch auger and all casing and annular seal removed Backfill 5 feet of hydrated bentonite Re-advanced with 10-inch auger to 25 Ft. TD and casing installed Sheen and odor observed in water within hole See Boring Log for ESE-1 (9/29/92) for geologic discription					

COMMENTS:

SOMA ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: ESE-1R

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

DRILLER: RSI Drilling

DRILLING METHOD: HSA

BORING DIAMETER: 10-inch

LOGGED BY: E. Fisker

DATE DRILLED: August 10, 2010

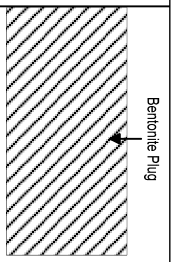
CASING ELEVATION: 180.70 Ft.

First Encountered GW: 9.95 Ft.
Stablized GW: 10.17 Ft.

T.O.C. TO SCREEN: 18 Ft.

SCREEN LENGTH: 7 Ft.

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well over drilled with 8-inch auger and all casing and annular seal removed Backfill 5 feet of hydrated bentonite Re-advanced with 10-inch auger to 25 Ft. TD and casing installed Sheen and odor observed in water within hole See Boring Log for ESE-1 (9/29/92) for geologic discription					
	30								
	35								
	40								
	45								
	50								

COMMENTS:

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: ESE-2R

PROJECT: 2762

DATE DRILLED: August 11, 2010

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

CASING ELEVATION: 180.70 Ft.

DRILLER: RSI Drilling

First Encountered GW: 10.44 Ft.
Stablized GW: 10.61 Ft.

DRILLING METHOD: HSA

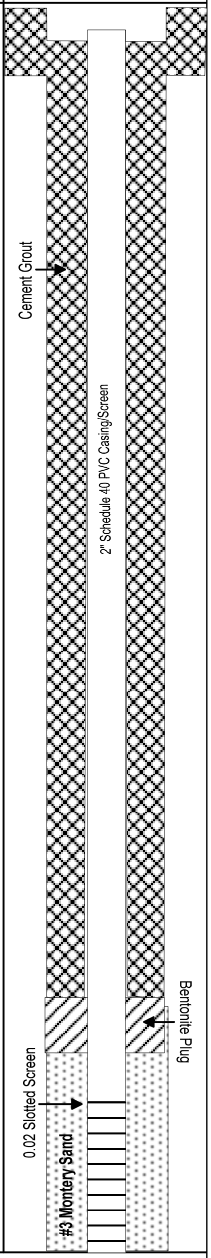
T.O.C. TO SCREEN: 22 Ft.

BORING DIAMETER: 10-inch

SCREEN LENGTH: 6 Ft.

LOGGED BY: E. Fisker

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
	5 10 15 20 25			18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Backfill 2 feet of hydrated bentonite Re-advanced with 10-inch auger to 28 Ft. TD and casing installed See Boring Log for ESE-2 (9/28/92) for geologic discription					

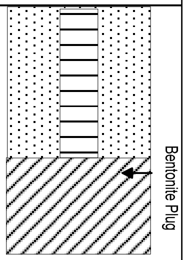
COMMENTS:

GEOLOGIC LOG OF BOREHOLE: ESE-2R

PAGE 2 OF 2

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
DRILLER: RSI Drilling
DRILLING METHOD: HSA
BORING DIAMETER: 10-inch
LOGGED BY: E. Fisker

DATE DRILLED: August 11, 2010
CASING ELEVATION: 180.70 Ft.
First Encountered GW: 10.44 Ft.
Stablized GW: 10.61 Ft.
T.O.C. TO SCREEN: 22 Ft.
SCREEN LENGTH: 6 Ft.
APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Backfill 2 feet of hydrated bentonite Re-advanced with 10-inch auger to 28 Ft. TD and casing installed See Boring Log for ESE-2 (9/28/92) for geologic discription					 Bentonite Plug
	30								
	35								
	40								
	45								
	50								

COMMENTS:

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: ESE-5R

PAGE 1 OF 1

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

DRILLER: RSI Drilling

DRILLING METHOD: HSA

BORING DIAMETER: 10-inch

LOGGED BY: E. Fisker

DATE DRILLED: August 10, 2010

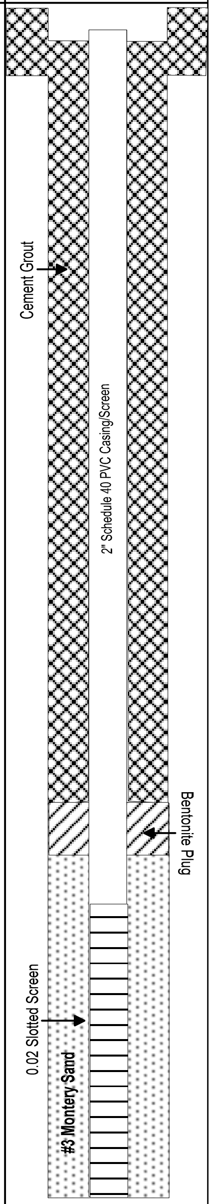
CASING ELEVATION: 178.64 Ft.

First Encountered GW: 7.01 Ft.
Stablized GW: 8.97 Ft.

T.O.C. TO SCREEN: 18 Ft.

SCREEN LENGTH: 6 Ft.

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
	5 10 15 20 25	▨	**CL**	18-inch concrete core Existing well over drilled with 8-inch auger and all casing and annular seal removed Re-advanced with 10-inch auger to 24 Ft. TD and casing installed Hand auger top 5 Feet due to proximily of unknown metal utility SANDY LEAN CLAY: Brownish-grey, petro staining, very fine- to fine-grained sand slow dilatancy, medium plastic, firm, medium tough. PHC odor to 3.5 Ft. bgs See Boring Log for ESE-5 (9/29/92) for geologic discription					

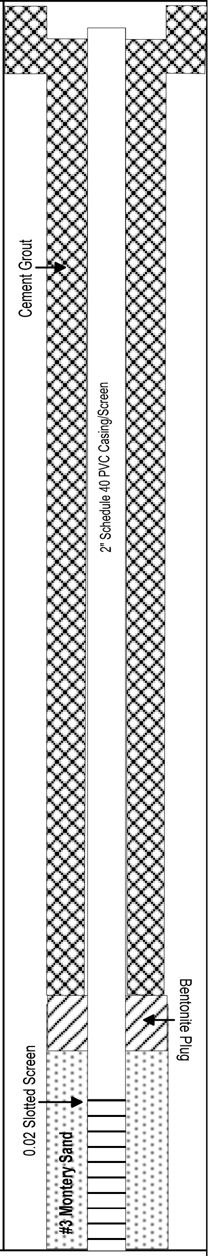
COMMENTS:

GEOLOGIC LOG OF BOREHOLE: MW-6R

ENVIRONMENTAL ENGINEERING, INC.

PROJECT: 2762
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
DRILLER: RSI Drilling
DRILLING METHOD: HSA
BORING DIAMETER: 10-inch
LOGGED BY: E. Fisker

DATE DRILLED: August 10, 2010
CASING ELEVATION: 181.34 Ft.
First Encountered GW: 9.64 Ft.
Stablized GW: 9.55 Ft.
T.O.C. TO SCREEN: 22 Ft.
SCREEN LENGTH: 6 Ft.
APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Backfill 2 feet of hydrated bentonite Re-advanced with 10-inch auger to 28 Ft. TD and casing installed See Boring Log for MW-6 (7/18/95) for geologic discription					
	5								
	10								
	15								
	20								
	25								

COMMENTS:

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: MW-6R

PROJECT: 2762

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

DRILLER: RSI Drilling

DRILLING METHOD: HSA

BORING DIAMETER: 10-inch

LOGGED BY: E. Fisker

DATE DRILLED: August 10, 2010

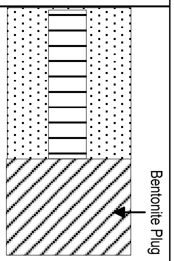
CASING ELEVATION: 181.34 Ft.

First Encountered GW: 9.64 Ft.
Stablized GW: 9.55 Ft.

T.O.C. TO SCREEN: 22 Ft.

SCREEN LENGTH: 6 Ft.

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Backfill 2 feet of hydrated bentonite Re-advanced with 10-inch auger to 28 Ft. TD and casing installed See Boring Log for MW-6 (7/18/95) for geologic discription					
	30								
	35								
	40								
	45								
	50								

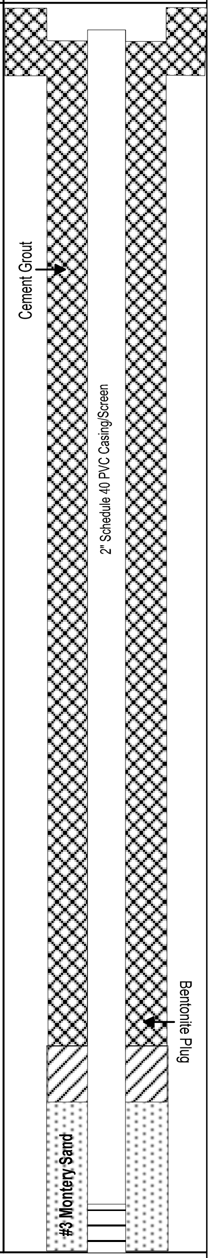
COMMENTS:

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: MW-7R

PAGE 1 OF 2

PROJECT: 2762
DATE DRILLED: August 11, 2010
SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley
CASING ELEVATION: 179.14 Ft.
DRILLER: RSI Drilling
First Encountered GW: 9.11 Ft.
Stablized GW: 9.39 Ft.
DRILLING METHOD: HSA
T.O.C. TO SCREEN: 24 Ft.
BORING DIAMETER: 10-inch
SCREEN LENGTH: 6 Ft.
LOGGED BY: E. Fisker
APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Re-advanced with 10-inch auger to 30 Ft. TD and casing installed See Boring Log for MW-7 (7/18/95) for geologic discription					
	5								
	10								
	15								
	20								
	25								

COMMENTS:

ENVIRONMENTAL ENGINEERING, INC.

GEOLOGIC LOG OF BOREHOLE: MW-7R

PROJECT: 2762

DATE DRILLED: August 11, 2010

SITE LOCATION: 3519 Castro Valley Blvd., Castro Valley

CASING ELEVATION: 179.14 Ft.

DRILLER: RSI Drilling

First Encountered GW: 9.11 Ft.
Stablized GW: 9.39 Ft.

DRILLING METHOD: HSA

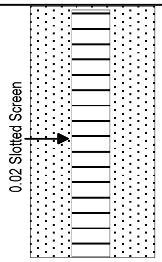
T.O.C. TO SCREEN: 24 Ft.

BORING DIAMETER: 10-inch

SCREEN LENGTH: 6 Ft.

LOGGED BY: E. Fisker

APPROVED BY: M. Sepehr

PID ppm	DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	SAMPLED SPLIT SPOON	SAMPLED CORE	GW LEVEL	BLOWCOUNTS	WELL DIAGRAM
				18-inch concrete core Existing well: over drilled to 30 Ft. with 8-inch auger and all casing and annular seal removed Re-advanced with 10-inch auger to 30 Ft. TD and casing installed See Boring Log for MW-7 (7/18/95) for geologic discription					
	30								
	35								
	40								
	45								
	50								

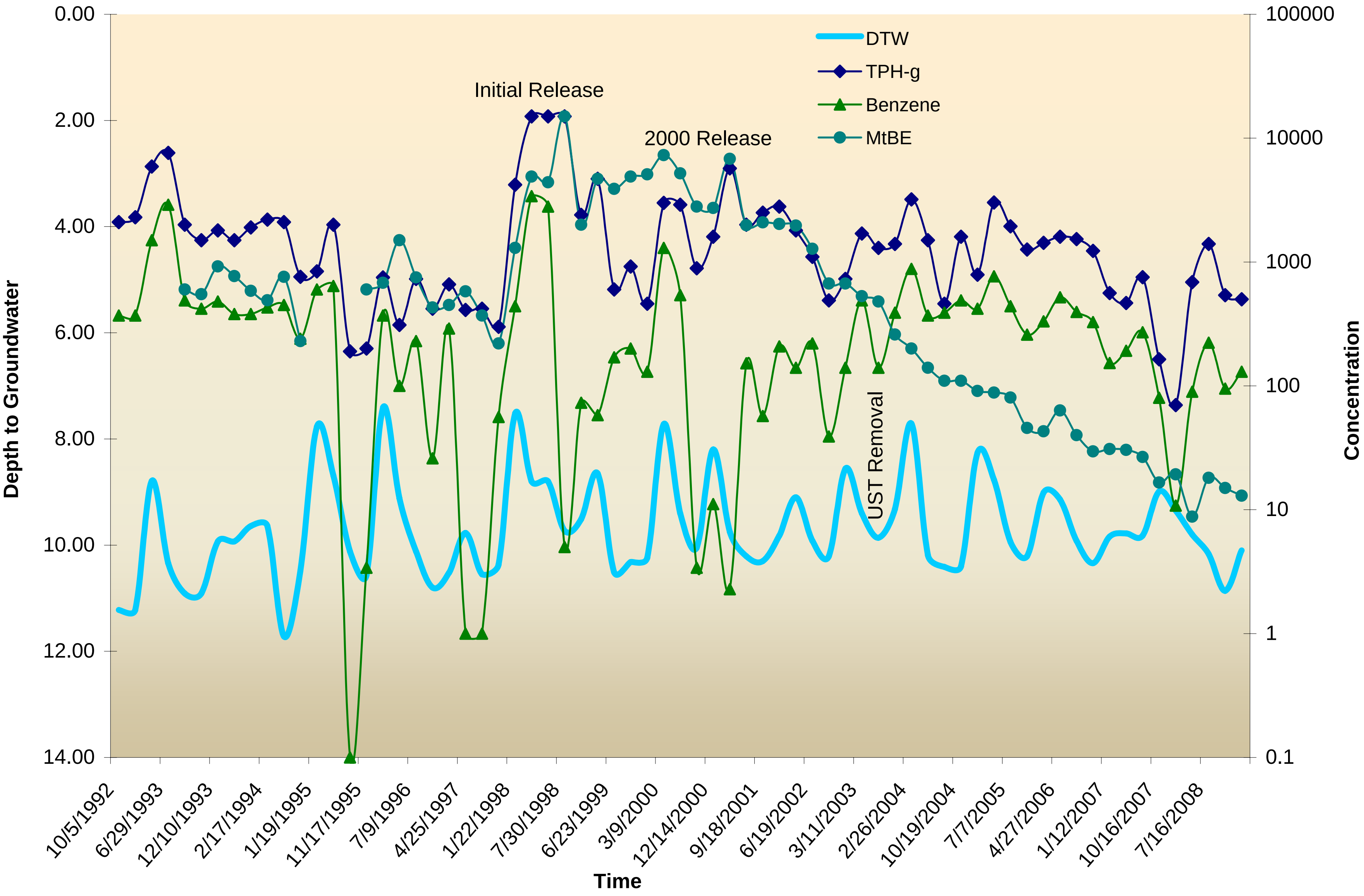
COMMENTS:

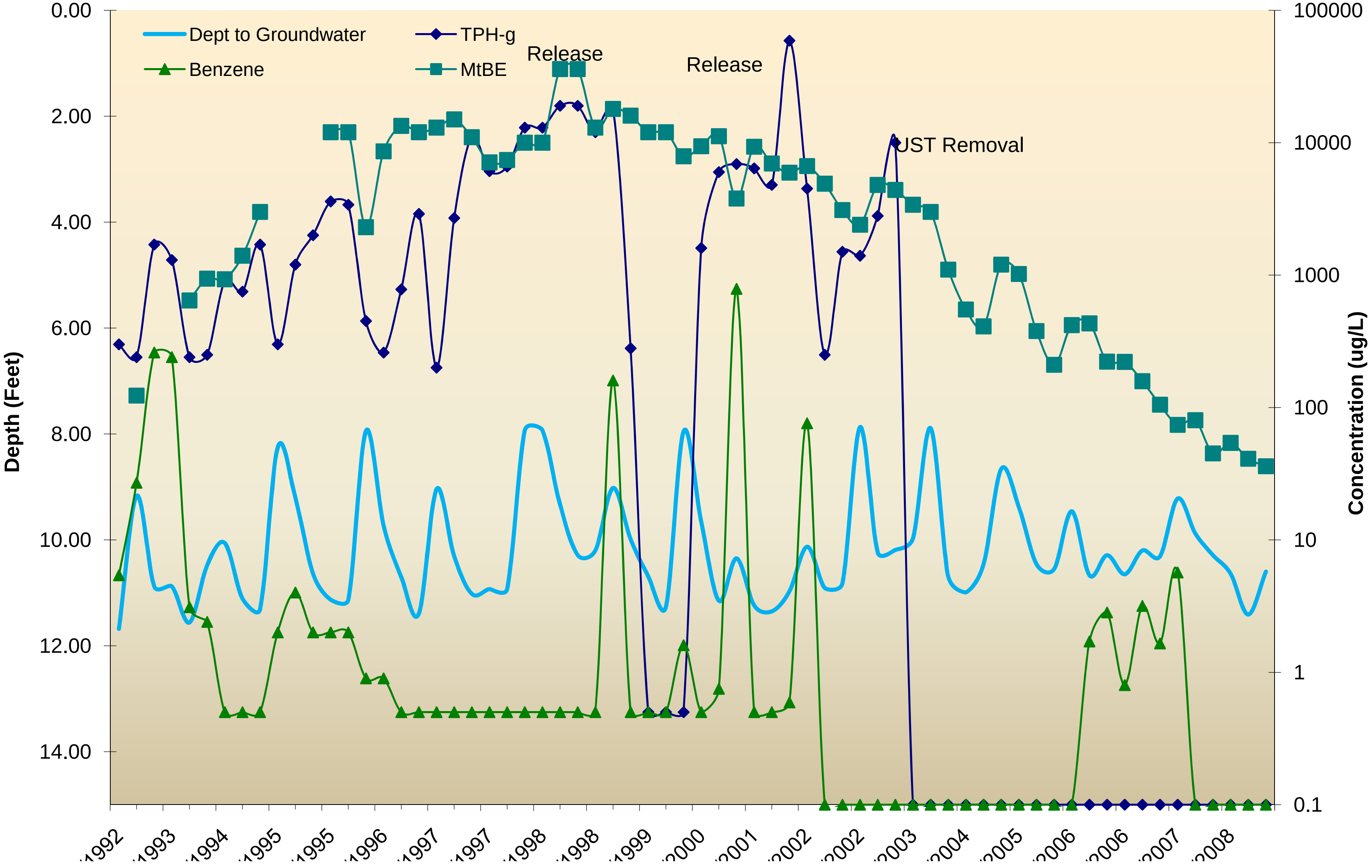
APPENDIX C

Concentration Trends

Historical Concentration Trends

(From 1992 to 2009)


0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Depth to Groundwater
100000
10000
1000
100
10
1
0.1
Concentration
DTW
TPH-g
Benzene
MtBE
Initial Release
2000 Release
UST Removal
10/5/1992
6/29/1993
12/10/1993
2/17/1994
1/19/1995
11/17/1995
7/9/1996
4/25/1997
1/22/1998
7/30/1998
6/23/1999
3/9/2000
12/14/2000
9/18/2001
6/19/2002
3/11/2003
2/26/2004
10/19/2004
7/7/2005
4/27/2006
1/12/2007
10/16/2007
7/16/2008
Time


Dept to Groundwater
TPH-g
Benzene
MtBE
Release
Release
UST Removal
Depth (Feet)
Concentration (ug/L)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
100000
10000
1000
100
10
1
0.1
1992
1993
1994
1995
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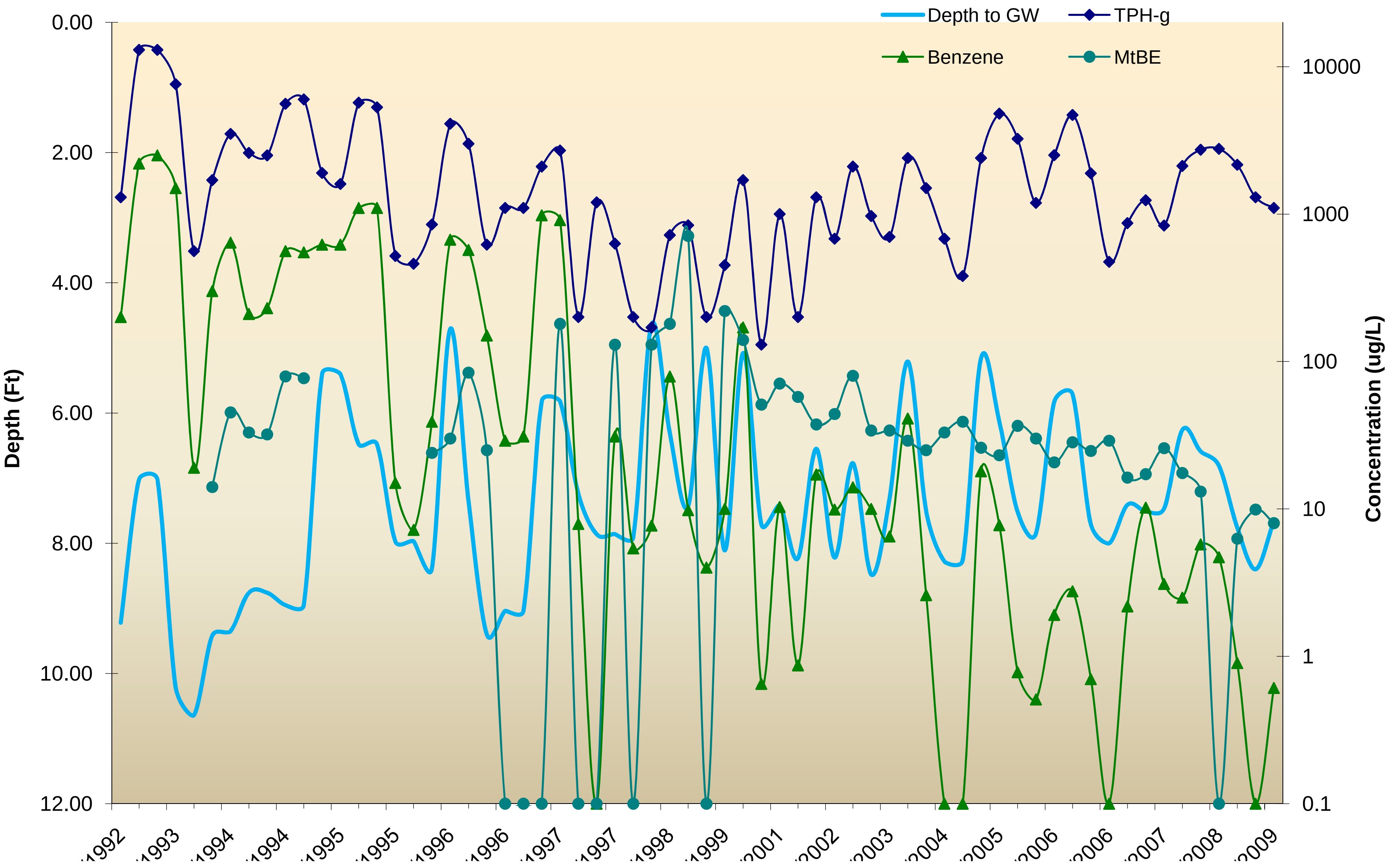
2004
2005
2006
2006
2007
2008


Depth to GW
TPH-g
Benzene
MtBE
Depth (Ft)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Concentration (ug/L)
10000
1000
100
10
1
0.1
1992
1993
1994
1994
1995
1995
1996
1996
1997
1997
1998
1999
2001
2002
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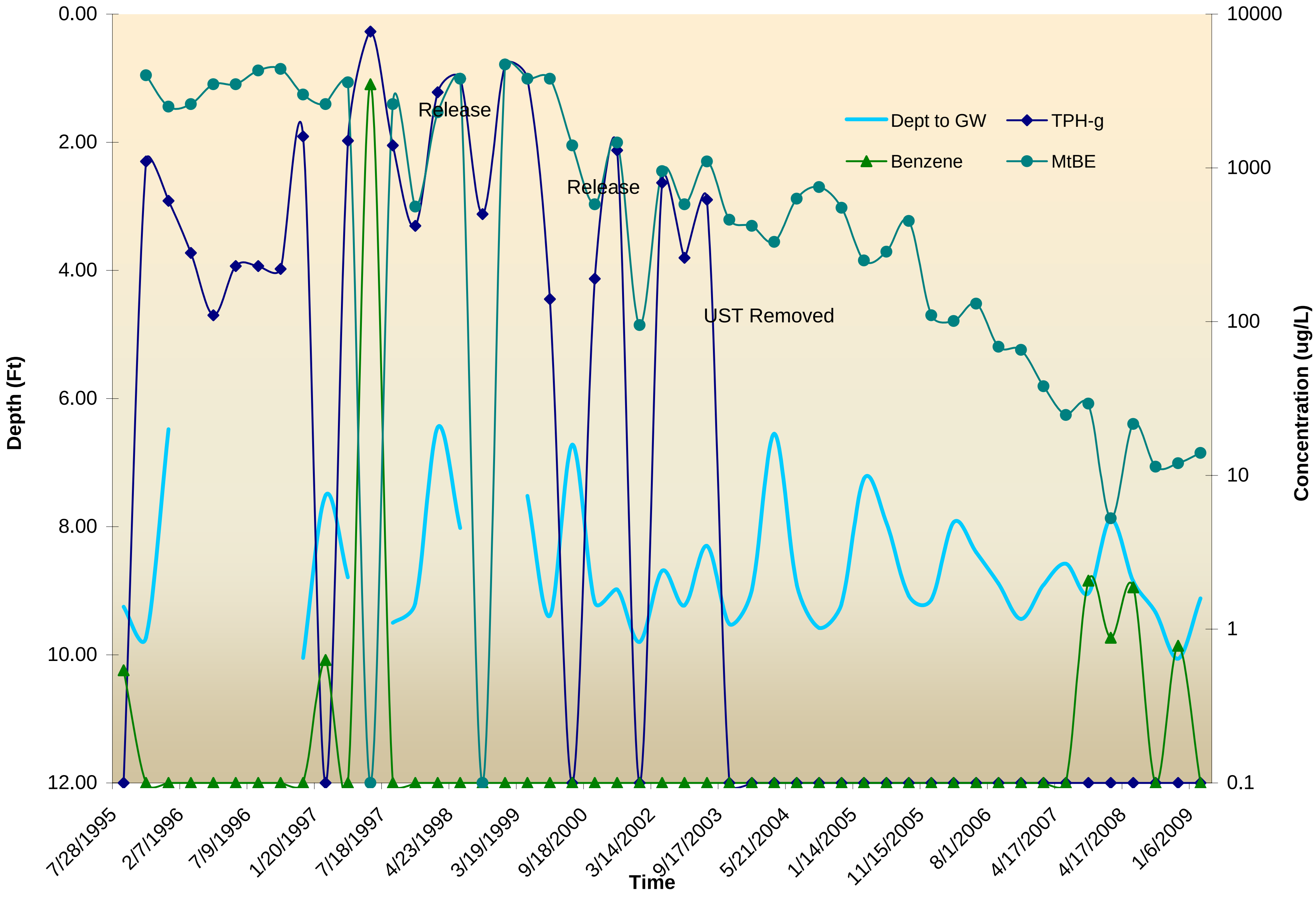
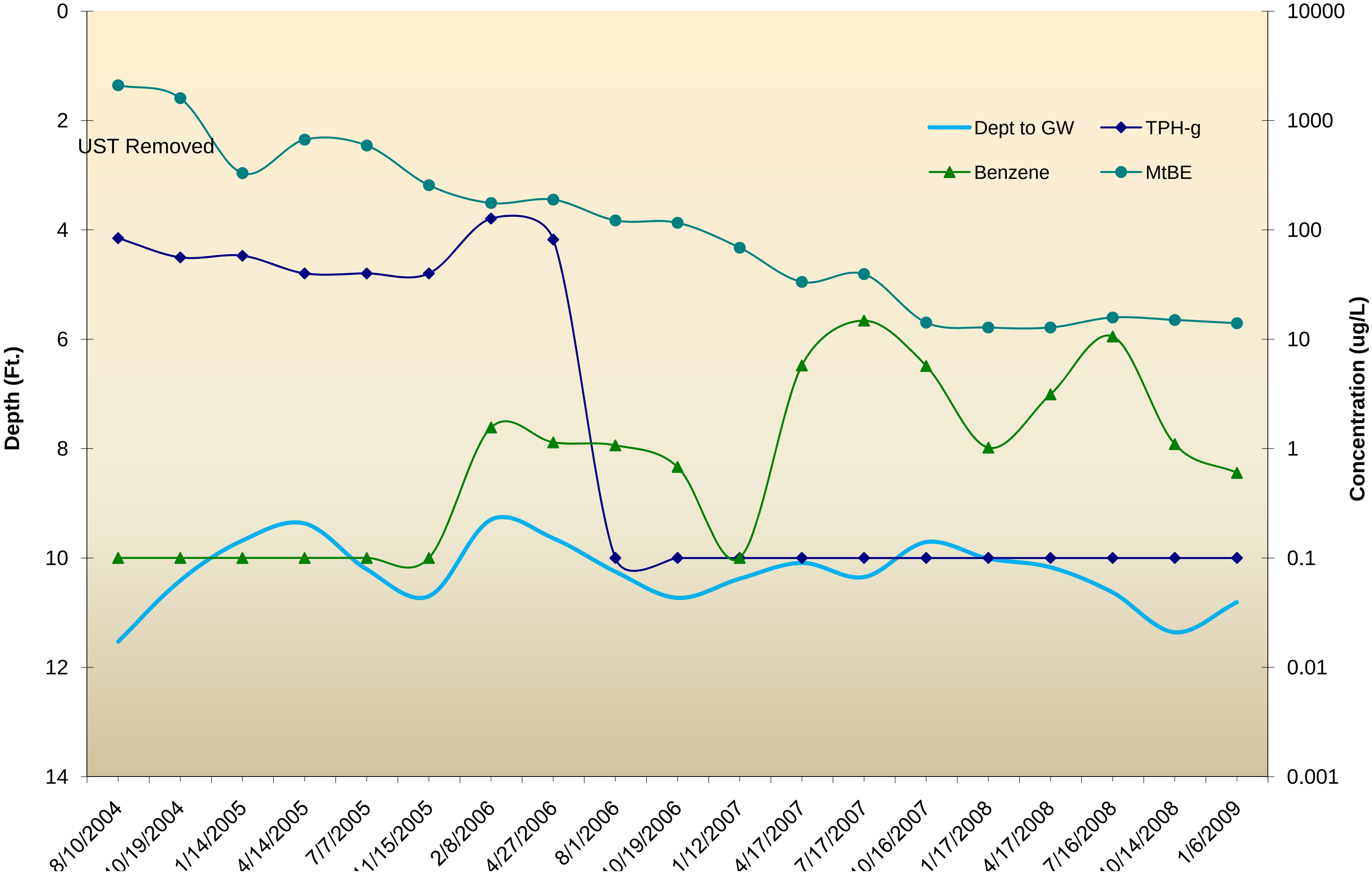
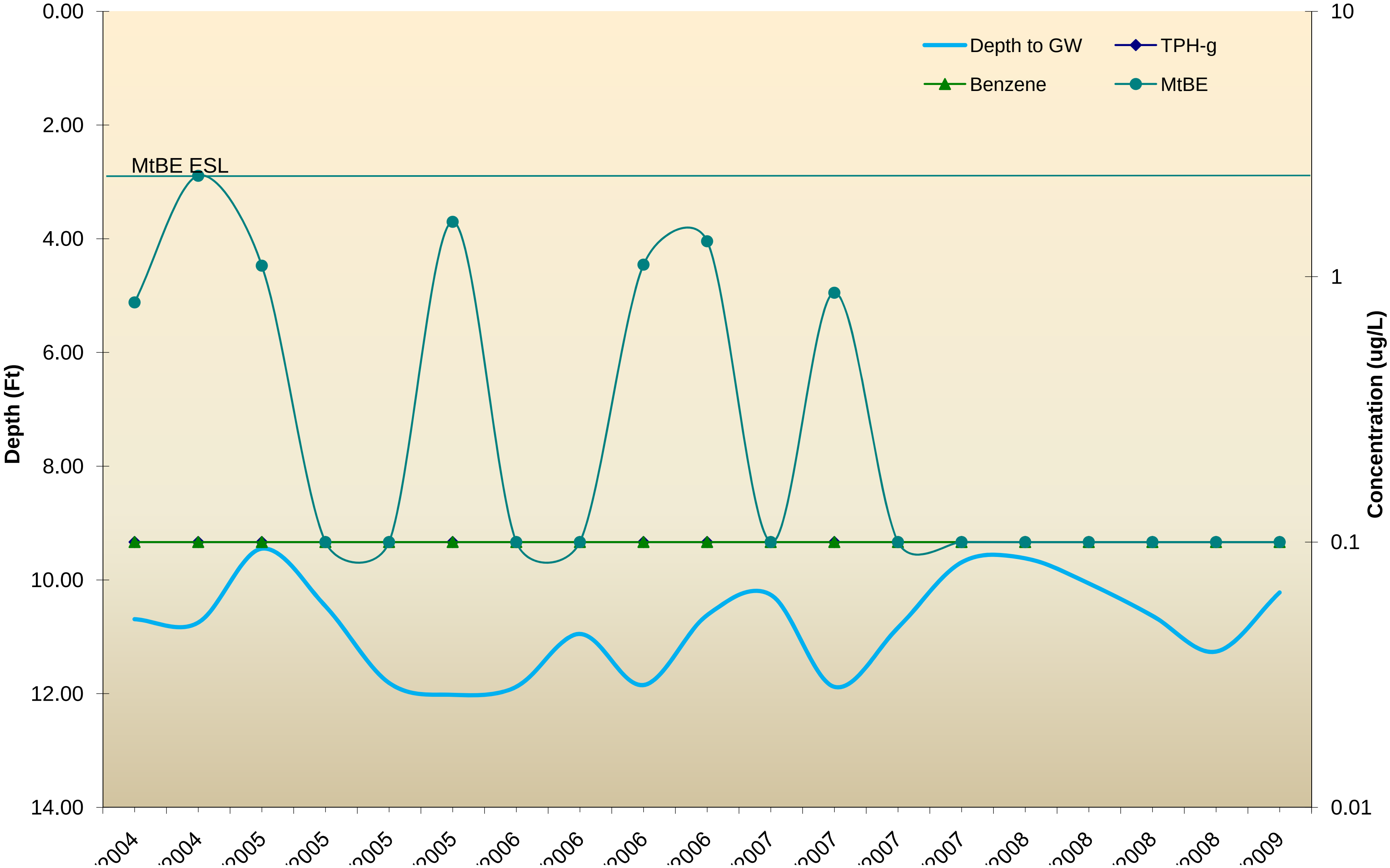
2005
2006
2006
2007
2008
2009

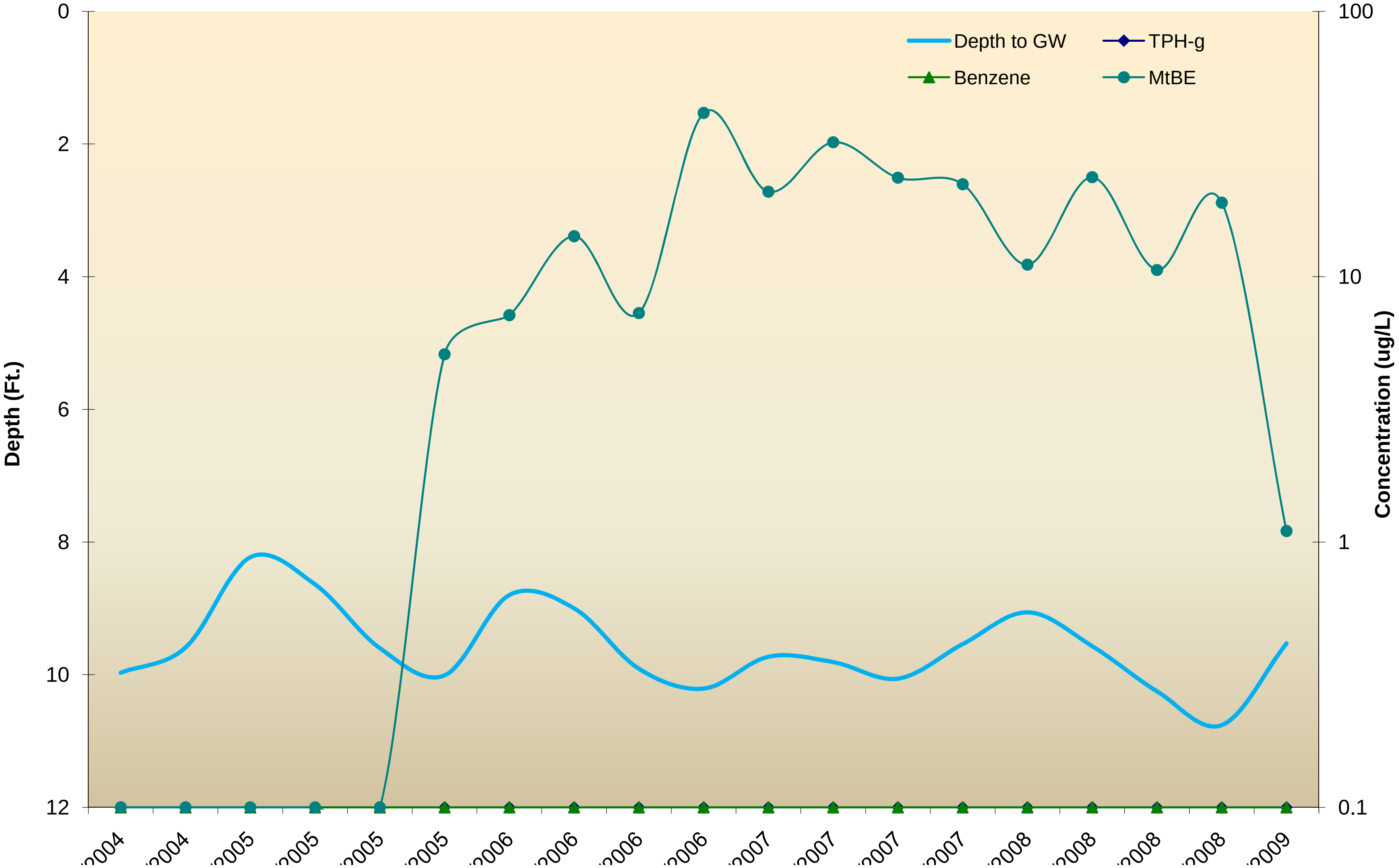


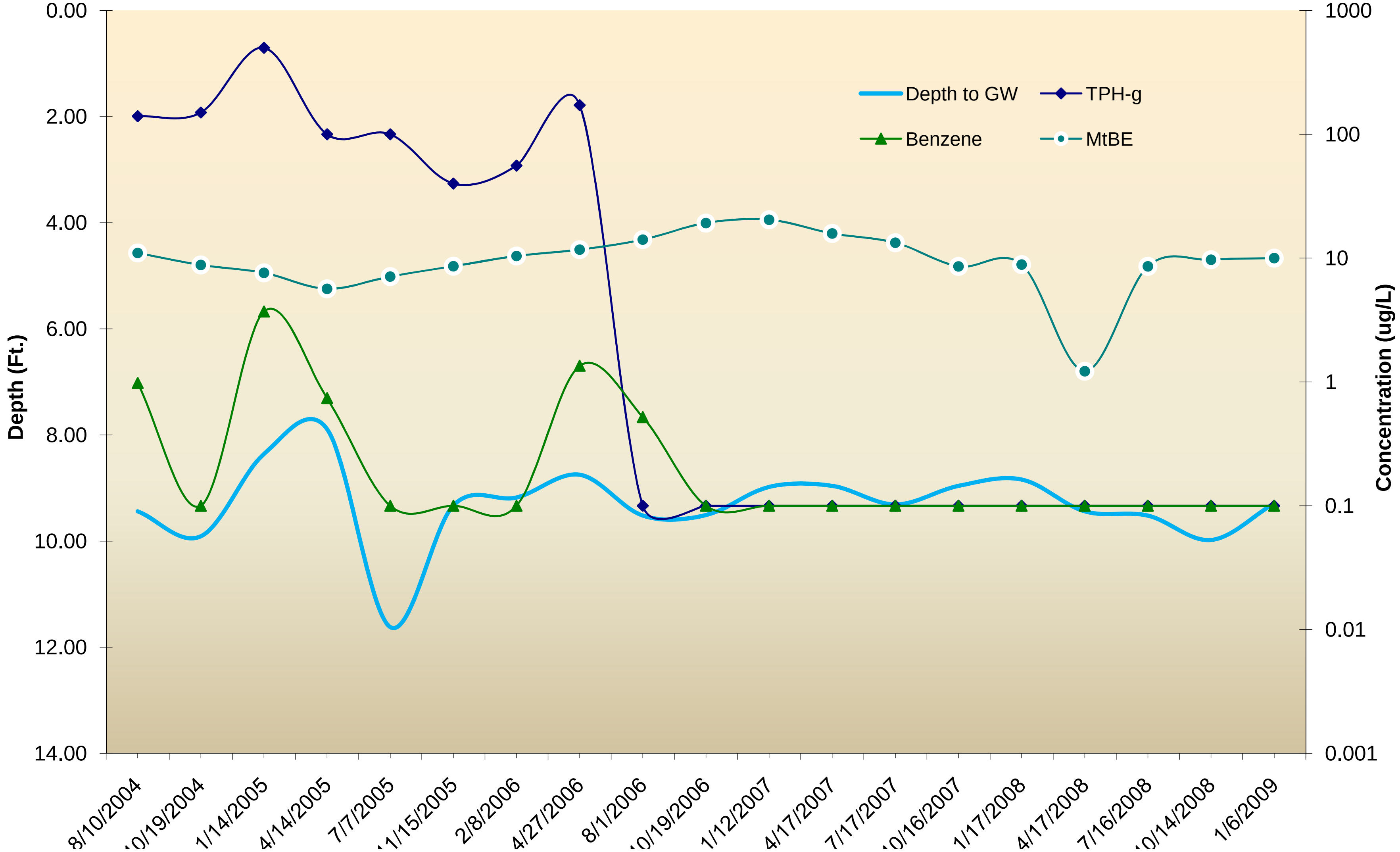
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Depth (Ft)
10000
1000
100
10
1
0.1
Concentration (ug/L)
7/28/1995
2/7/1996
7/9/1996
1/20/1997
7/18/1997
4/23/1998
3/19/1999
9/18/2000
3/14/2002
9/17/2003
5/21/2004
1/14/2005
11/15/2005
8/1/2006
4/17/2007
4/17/2008
1/6/2009
Time
Release
Release
UST Removed
Dept to GW
TPH-g
Benzene
MtBE



UST Removed
Dept to GW
TPH-g
Benzene
MtBE
Depth (Ft.)
Concentration (ug/L)
0
2
4
6
8
10
12
14
10000
1000
100
10
1
0.1
0.01
0.001
8/10/2004
10/19/2004
1/14/2005
4/14/2005
7/7/2005
11/15/2005
2/8/2006
4/27/2006
8/1/2006
10/19/2006
1/12/2007
4/17/2007
7/17/2007
10/16/2007
1/17/2008
4/17/2008
7/16/2008
10/14/2008
1/6/2009

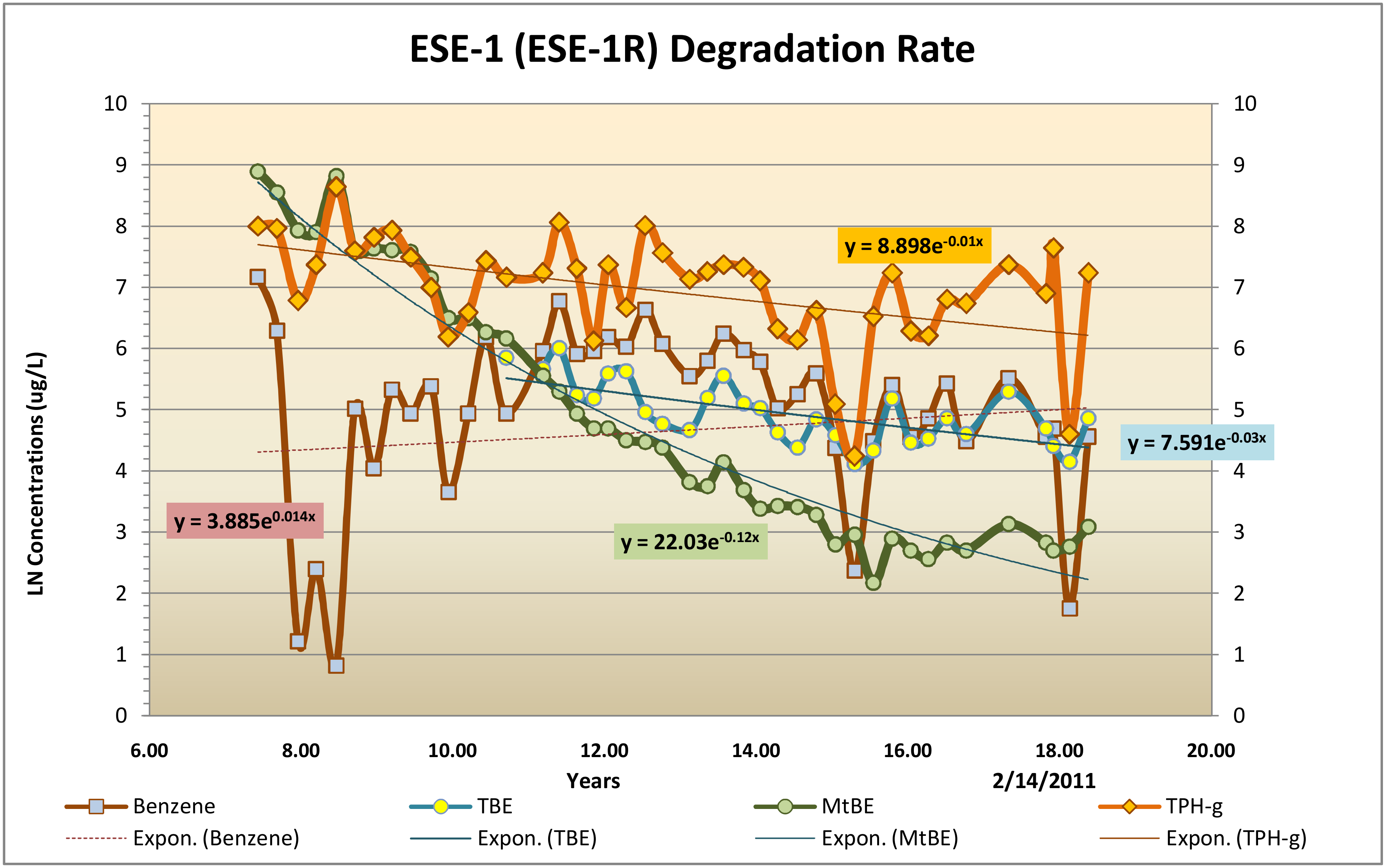

Depth to GW
TPH-g
Benzene
MtBE
MtBE ESL
Depth (Ft)
Concentration (ug/L)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
10
1
0.1
0.01
2004
2004
2005
2005
2005
2005
2006
2006
2006
2006
2007
2007
2007
2007
2008
2008
2008
2008
2009


Depth to GW
TPH-g
Benzene
MtBE
Depth (Ft.)
0
2
4
6
8
10
12
Concentration (ug/L)
100
10
1
0.1
2004
2004
2005
2005
2005
2005
2006
2006
2006
2006
2007
2007
2007
2007
2008
2008
2008
2008
2009

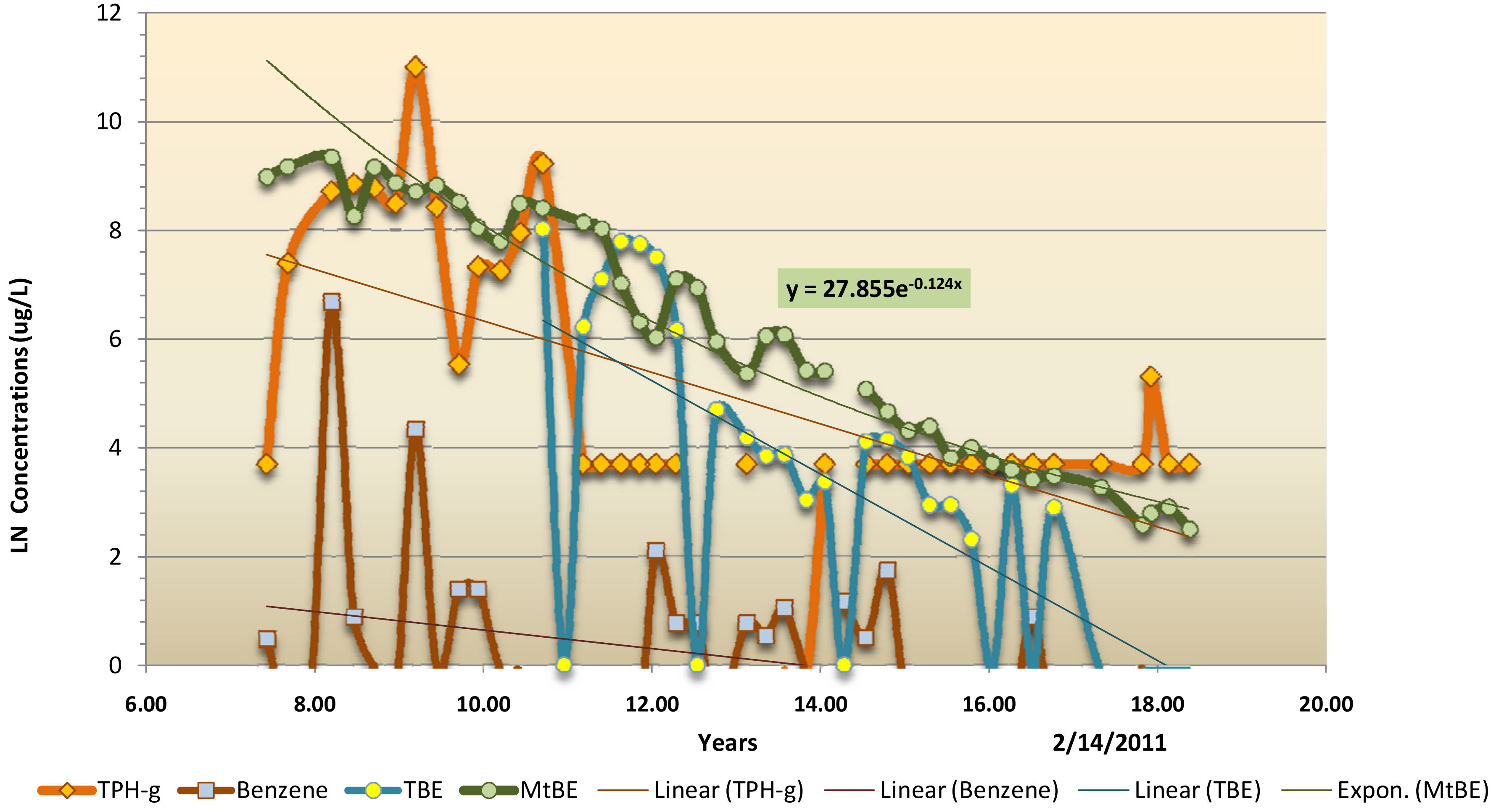

0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Depth (Ft.)
1000
100
10
1
0.1
0.01
0.001
Concentration (ug/L)
Depth to GW
TPH-g
Benzene
MtBE
8/10/2004
10/19/2004
1/14/2005
4/14/2005
7/7/2005
11/15/2005
2/8/2006
4/27/2006
8/1/2006
10/19/2006
1/12/2007
4/17/2007
7/17/2007
10/16/2007
1/17/2008
4/17/2008
7/16/2008
10/14/2008
1/6/2009

Concentration vs. Time Trends

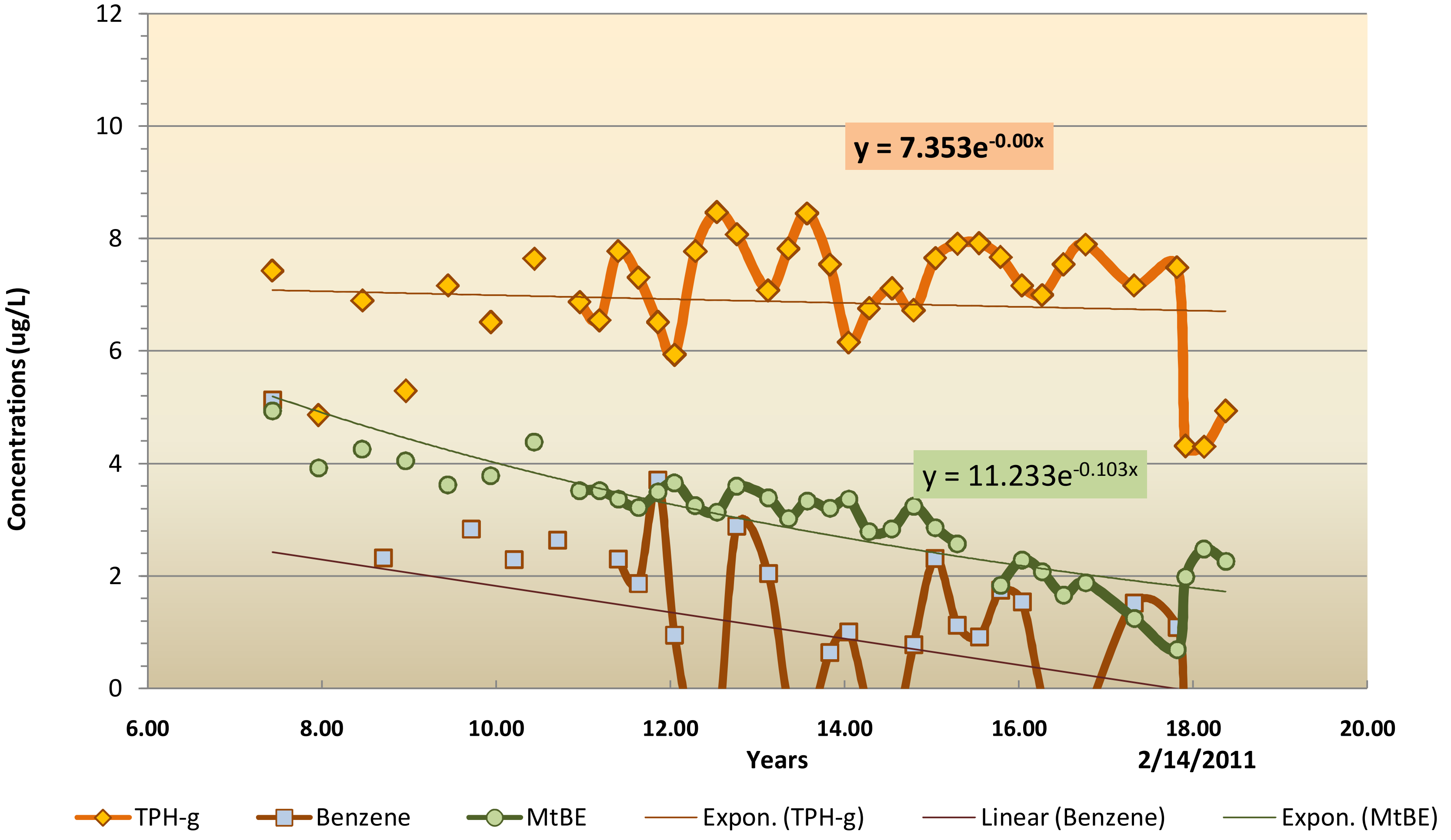
(2000 to current)

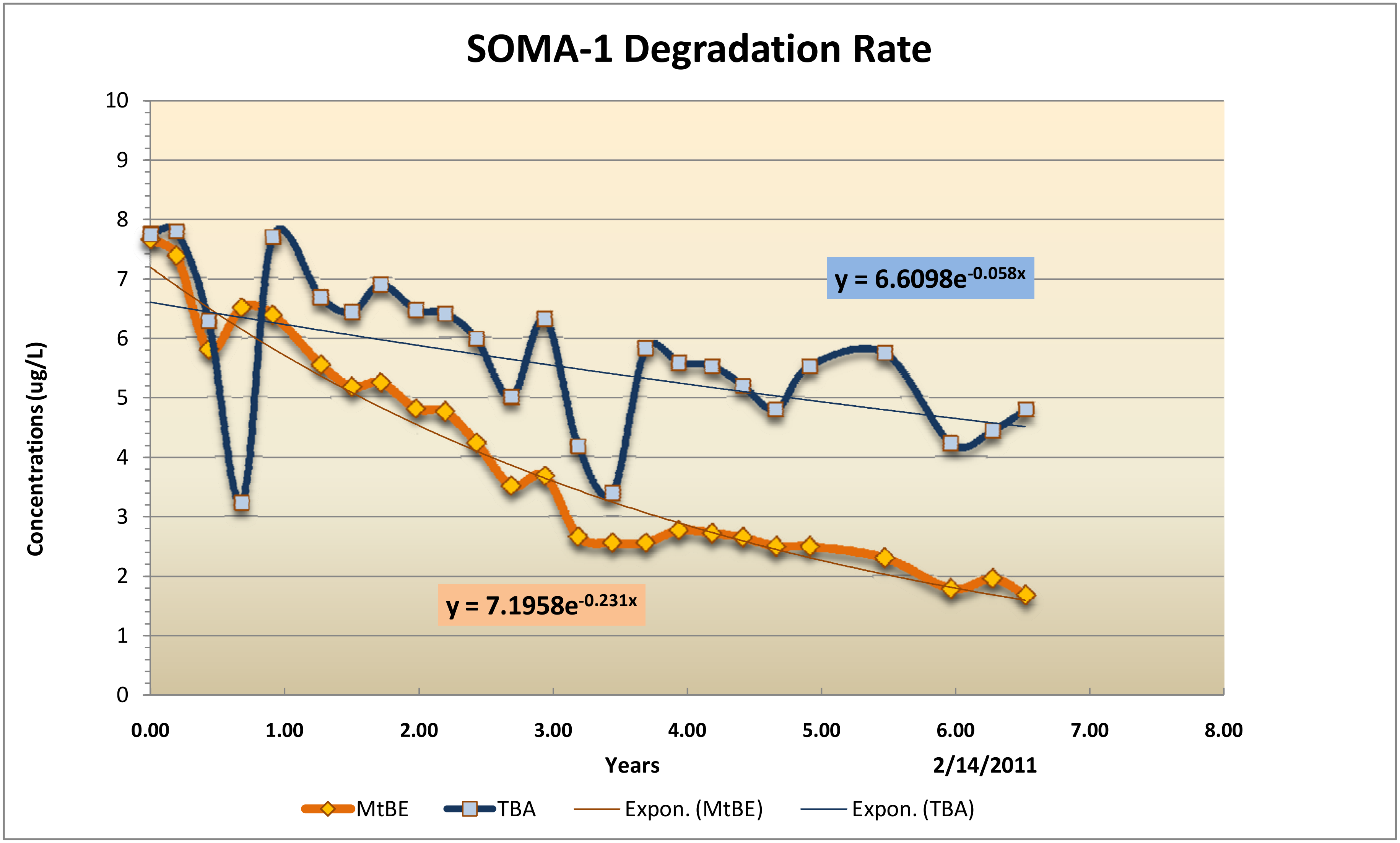

ESE-1 (ESE-1R) Degradation Rate
LN Concentrations (ug/L)
0
1
2
3
4
5
6
7
8
9
10
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Years
2/14/2011
y = 8.898e$^{-0.01x}$
y = 7.591e$^{-0.03x}$
y = 3.885e$^{0.014x}$
y = 22.03e$^{-0.12x}$
Benzene
TBE
MtBE
TPH-g
Expon. (Benzene)
Expon. (TBE)
Expon. (MtBE)
Expon. (TPH-g)

ESE-2 (ESE-2R) Degradation Rate

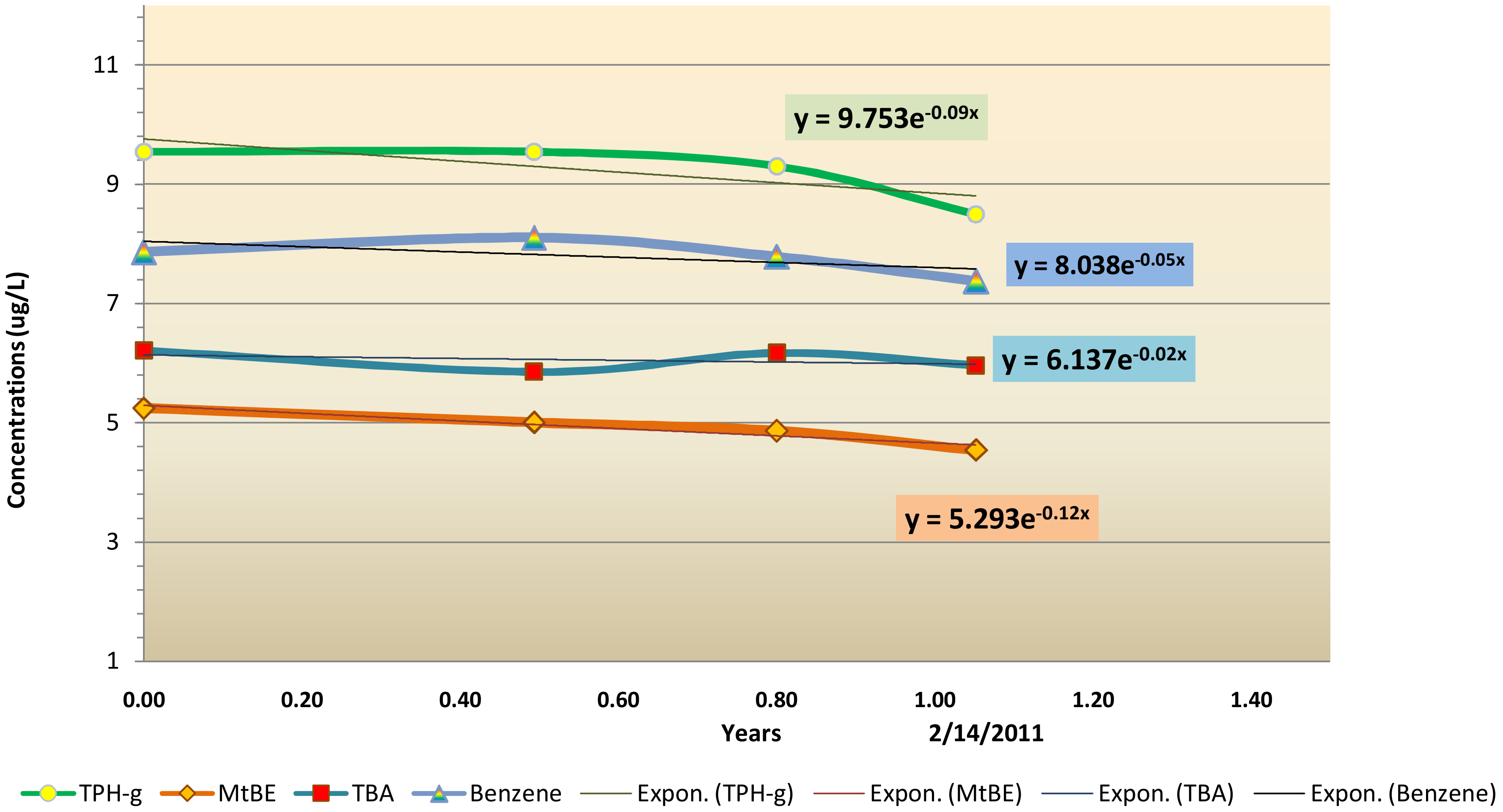


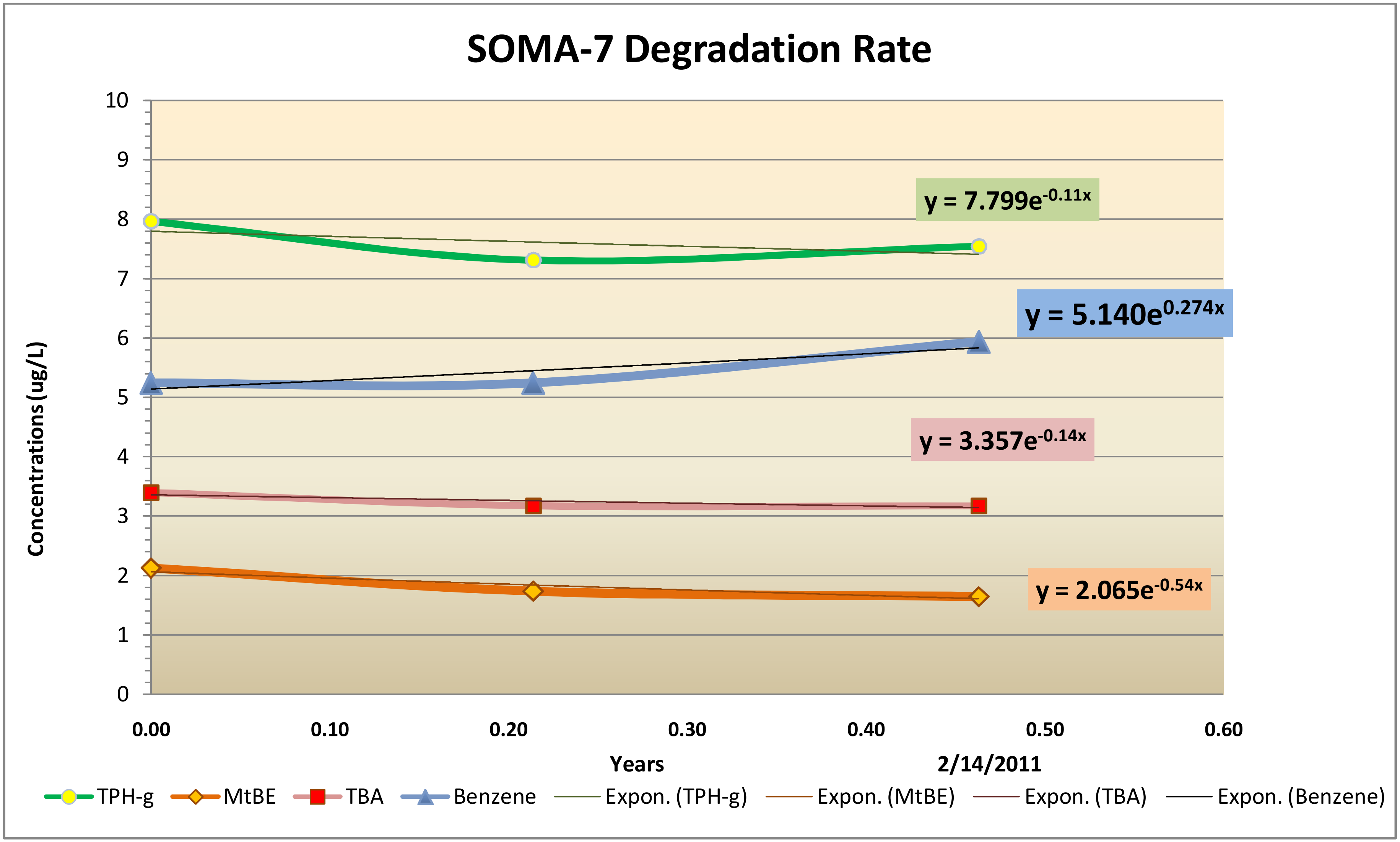
ESE-5 (ESE-5R) Degradation Rate




SOMA-1 Degradation Rate
10
9
8
7
6
5
4
3
2
1
0
Concentrations (ug/L)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Years
2/14/2011
y = 6.6098e^-0.058x
y = 7.1958e^-0.231x
MtBE
TBA
Expon. (MtBE)
Expon. (TBA)

SOMA-5 Degradation Rate




SOMA-7 Degradation Rate
Concentrations (ug/L)
10
9
8
7
6
5
4
3
2
1
0
y = 7.799e^-0.11x
y = 5.140e^0.274x
y = 3.357e^-0.14x
y = 2.065e^-0.54x
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Years
2/14/2011
TPH-g
MtBE
TBA
Benzene
Expon. (TPH-g)
Expon. (MtBE)
Expon. (TBA)
Expon. (Benzene)

APPENDIX D

Mass Calculation Supporting Documentation

Mass of TPH-g within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of TPH-g (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
213.64	319.33	118.0686029	160	52.25	6.24E-08	6.16E-02	**57.10**
285.72	290.56	133.5445843	160	52.25	6.24E-08	6.97E-02	
265.12	252.21	151.8497605	160	52.25	6.24E-08	7.93E-02	
182.75	252.21	152.787634	160	52.25	6.24E-08	7.98E-02	
151.86	261.8	175.4594035	160	52.25	6.24E-08	9.16E-02	
275.42	300.15	182.9417749	160	52.25	6.24E-08	9.55E-02	
285.72	280.97	203.6629743	160	52.25	6.24E-08	1.06E-01	
203.34	319.33	213.8992894	160	52.25	6.24E-08	1.12E-01	
193.05	252.21	224.2145173	160	52.25	6.24E-08	1.17E-01	
141.56	271.38	225.8552665	160	52.25	6.24E-08	1.18E-01	
275.42	261.8	233.1942415	160	52.25	6.24E-08	1.22E-01	
193.05	319.33	306.3371545	160	52.25	6.24E-08	1.60E-01	
203.34	252.21	306.9471269	160	52.25	6.24E-08	1.60E-01	
151.86	319.33	311.4041438	160	52.25	6.24E-08	1.63E-01	
254.83	252.21	319.3072041	160	52.25	6.24E-08	1.67E-01	
162.15	261.8	333.9911169	160	52.25	6.24E-08	1.74E-01	
141.56	309.74	349.9072321	160	52.25	6.24E-08	1.83E-01	
213.64	252.21	368.942164	160	52.25	6.24E-08	1.93E-01	
182.75	319.33	400.7504722	160	52.25	6.24E-08	2.09E-01	
244.53	309.74	433.9694943	160	52.25	6.24E-08	2.27E-01	
223.94	252.21	440.2272408	160	52.25	6.24E-08	2.30E-01	
172.45	261.8	446.1164557	160	52.25	6.24E-08	2.33E-01	
141.56	280.97	458.4081652	160	52.25	6.24E-08	2.39E-01	
162.15	319.33	473.7696145	160	52.25	6.24E-08	2.47E-01	
172.45	319.33	480.3353637	160	52.25	6.24E-08	2.51E-01	
244.53	252.21	485.7766549	160	52.25	6.24E-08	2.54E-01	
151.86	271.38	508.5429735	160	52.25	6.24E-08	2.65E-01	
234.23	252.21	520.0505009	160	52.25	6.24E-08	2.71E-01	
182.75	261.8	526.8797123	160	52.25	6.24E-08	2.75E-01	
141.56	300.15	600.7890761	160	52.25	6.24E-08	3.14E-01	
275.42	271.38	616.4697845	160	52.25	6.24E-08	3.22E-01	
141.56	290.56	621.9321071	160	52.25	6.24E-08	3.25E-01	
193.05	261.8	622.8380418	160	52.25	6.24E-08	3.25E-01	
275.42	290.56	653.2008765	160	52.25	6.24E-08	3.41E-01	
234.23	309.74	662.985599	160	52.25	6.24E-08	3.46E-01	
265.12	300.15	686.7565199	160	52.25	6.24E-08	3.58E-01	
203.34	309.74	690.1759536	160	52.25	6.24E-08	3.60E-01	
213.64	309.74	700.7636327	160	52.25	6.24E-08	3.66E-01	
162.15	271.38	719.3106132	160	52.25	6.24E-08	3.75E-01	
223.94	309.74	723.8138431	160	52.25	6.24E-08	3.78E-01	
265.12	261.8	729.9479997	160	52.25	6.24E-08	3.81E-01	
193.05	309.74	735.785871	160	52.25	6.24E-08	3.84E-01	
203.34	261.8	762.7114353	160	52.25	6.24E-08	3.98E-01	
151.86	309.74	803.8318464	160	52.25	6.24E-08	4.20E-01	
275.42	280.97	804.1721782	160	52.25	6.24E-08	4.20E-01	
172.45	271.38	828.7217798	160	52.25	6.24E-08	4.33E-01	
182.75	309.74	849.7954057	160	52.25	6.24E-08	4.44E-01	
151.86	280.97	864.4145662	160	52.25	6.24E-08	4.51E-01	
182.75	271.38	889.9420232	160	52.25	6.24E-08	4.65E-01	
213.64	261.8	955.9005131	160	52.25	6.24E-08	4.99E-01	
193.05	271.38	982.8558583	160	52.25	6.24E-08	5.13E-01	
172.45	309.74	1010.690099	160	52.25	6.24E-08	5.28E-01	
162.15	309.74	1080.059397	160	52.25	6.24E-08	5.64E-01	
193.05	300.15	1088.407028	160	52.25	6.24E-08	5.68E-01	
203.34	300.15	1127.233635	160	52.25	6.24E-08	5.88E-01	
162.15	280.97	1133.085176	160	52.25	6.24E-08	5.91E-01	
203.34	271.38	1165.482216	160	52.25	6.24E-08	6.08E-01	
182.75	280.97	1171.388604	160	52.25	6.24E-08	6.11E-01	
254.83	261.8	1183.070249	160	52.25	6.24E-08	6.18E-01	
151.86	290.56	1185.675236	160	52.25	6.24E-08	6.19E-01	
182.75	300.15	1186.335447	160	52.25	6.24E-08	6.19E-01	
172.45	280.97	1188.262365	160	52.25	6.24E-08	6.20E-01	
223.94	261.8	1198.732975	160	52.25	6.24E-08	6.26E-01	

Mass of TPH-g within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of TPH-g (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
193.05	280.97	1218.310875	160	52.25	6.24E-08	6.36E-01	
151.86	300.15	1224.165103	160	52.25	6.24E-08	6.39E-01	
193.05	290.56	1262.341449	160	52.25	6.24E-08	6.59E-01	
182.75	290.56	1294.734676	160	52.25	6.24E-08	6.76E-01	
213.64	300.15	1311.195951	160	52.25	6.24E-08	6.84E-01	
265.12	271.38	1348.879785	160	52.25	6.24E-08	7.04E-01	
203.34	290.56	1389.913859	160	52.25	6.24E-08	7.25E-01	
203.34	280.97	1400.236649	160	52.25	6.24E-08	7.31E-01	
172.45	300.15	1415.690787	160	52.25	6.24E-08	7.39E-01	
234.23	261.8	1417.409409	160	52.25	6.24E-08	7.40E-01	
244.53	261.8	1444.734198	160	52.25	6.24E-08	7.54E-01	
172.45	290.56	1446.356385	160	52.25	6.24E-08	7.55E-01	
213.64	271.38	1472.968459	160	52.25	6.24E-08	7.69E-01	
265.12	290.56	1552.531527	160	52.25	6.24E-08	8.10E-01	
162.15	290.56	1563.027571	160	52.25	6.24E-08	8.16E-01	
254.83	300.15	1598.064248	160	52.25	6.24E-08	8.34E-01	
223.94	300.15	1648.437937	160	52.25	6.24E-08	8.60E-01	
213.64	290.56	1716.113632	160	52.25	6.24E-08	8.96E-01	
162.15	300.15	1734.850074	160	52.25	6.24E-08	9.06E-01	
265.12	280.97	1737.196746	160	52.25	6.24E-08	9.07E-01	
213.64	280.97	1767.242008	160	52.25	6.24E-08	9.22E-01	
223.94	271.38	1909.668672	160	52.25	6.24E-08	9.97E-01	
234.23	300.15	2103.150254	160	52.25	6.24E-08	1.10E+00	
254.83	271.38	2128.070997	160	52.25	6.24E-08	1.11E+00	
223.94	290.56	2298.566214	160	52.25	6.24E-08	1.20E+00	
244.53	300.15	2312.915758	160	52.25	6.24E-08	1.21E+00	
223.94	280.97	2362.948232	160	52.25	6.24E-08	1.23E+00	
234.23	271.38	2378.866278	160	52.25	6.24E-08	1.24E+00	
244.53	271.38	2558.845893	160	52.25	6.24E-08	1.34E+00	
254.83	280.97	2965.498889	160	52.25	6.24E-08	1.55E+00	
254.83	290.56	2998.29749	160	52.25	6.24E-08	1.57E+00	
234.23	280.97	3178.102004	160	52.25	6.24E-08	1.66E+00	
234.23	290.56	3223.562711	160	52.25	6.24E-08	1.68E+00	
244.53	280.97	3773.90052	160	52.25	6.24E-08	1.97E+00	
244.53	290.56	4524.522799	160	52.25	6.24E-08	2.36E+00	
						56.17	

Mass of Benzene within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of Benzene (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
162.15	252.21	118.0686029	160	1.60	6.24E-08	1.89E-03	2.19
141.56	319.33	133.5445843	160	1.60	6.24E-08	2.14E-03	
172.45	328.92	151.8497605	160	1.60	6.24E-08	2.43E-03	
254.83	309.74	152.787634	160	1.60	6.24E-08	2.45E-03	
172.45	252.21	175.4594035	160	1.60	6.24E-08	2.81E-03	
285.72	271.38	182.9417749	160	1.60	6.24E-08	2.93E-03	
213.64	319.33	203.6629743	160	1.60	6.24E-08	3.26E-03	
151.86	261.8	213.8992894	160	1.60	6.24E-08	3.43E-03	
182.75	252.21	224.2145173	160	1.60	6.24E-08	3.59E-03	
285.72	290.56	225.8552665	160	1.60	6.24E-08	3.62E-03	
141.56	271.38	233.1942415	160	1.60	6.24E-08	3.74E-03	
265.12	252.21	306.3371545	160	1.60	6.24E-08	4.91E-03	
203.34	319.33	306.9471269	160	1.60	6.24E-08	4.92E-03	
275.42	300.15	311.4041438	160	1.60	6.24E-08	4.99E-03	
193.05	252.21	319.3072041	160	1.60	6.24E-08	5.12E-03	
151.86	319.33	333.9911169	160	1.60	6.24E-08	5.35E-03	
285.72	280.97	349.9072321	160	1.60	6.24E-08	5.61E-03	
141.56	309.74	368.942164	160	1.60	6.24E-08	5.91E-03	
162.15	261.8	400.7504722	160	1.60	6.24E-08	6.42E-03	
275.42	261.8	433.9694943	160	1.60	6.24E-08	6.96E-03	
193.05	319.33	440.2272408	160	1.60	6.24E-08	7.06E-03	
203.34	252.21	446.1164557	160	1.60	6.24E-08	7.15E-03	
182.75	319.33	458.4081652	160	1.60	6.24E-08	7.35E-03	
141.56	280.97	473.7696145	160	1.60	6.24E-08	7.60E-03	
162.15	319.33	480.3353637	160	1.60	6.24E-08	7.70E-03	
172.45	319.33	485.7766549	160	1.60	6.24E-08	7.79E-03	
254.83	252.21	508.5429735	160	1.60	6.24E-08	8.15E-03	
172.45	261.8	520.0505009	160	1.60	6.24E-08	8.34E-03	
151.86	271.38	526.8797123	160	1.60	6.24E-08	8.45E-03	
213.64	252.21	600.7890761	160	1.60	6.24E-08	9.63E-03	
141.56	300.15	616.4697845	160	1.60	6.24E-08	9.88E-03	
141.56	290.56	621.9321071	160	1.60	6.24E-08	9.97E-03	
182.75	261.8	622.8380418	160	1.60	6.24E-08	9.98E-03	
223.94	252.21	653.2008765	160	1.60	6.24E-08	1.05E-02	
244.53	309.74	662.985599	160	1.60	6.24E-08	1.06E-02	
162.15	271.38	686.7565199	160	1.60	6.24E-08	1.10E-02	
244.53	252.21	690.1759536	160	1.60	6.24E-08	1.11E-02	
151.86	309.74	700.7636327	160	1.60	6.24E-08	1.12E-02	
234.23	252.21	719.3106132	160	1.60	6.24E-08	1.15E-02	
193.05	261.8	723.8138431	160	1.60	6.24E-08	1.16E-02	
151.86	280.97	729.9479997	160	1.60	6.24E-08	1.17E-02	
193.05	309.74	735.785871	160	1.60	6.24E-08	1.18E-02	
172.45	271.38	762.7114353	160	1.60	6.24E-08	1.22E-02	
203.34	309.74	803.8318464	160	1.60	6.24E-08	1.29E-02	
182.75	309.74	804.1721782	160	1.60	6.24E-08	1.29E-02	
275.42	271.38	828.7217798	160	1.60	6.24E-08	1.33E-02	
213.64	309.74	849.7954057	160	1.60	6.24E-08	1.36E-02	
275.42	290.56	864.4145662	160	1.60	6.24E-08	1.39E-02	
234.23	309.74	889.9420232	160	1.60	6.24E-08	1.43E-02	
172.45	309.74	955.9005131	160	1.60	6.24E-08	1.53E-02	
162.15	309.74	982.8558583	160	1.60	6.24E-08	1.58E-02	
182.75	271.38	1010.690099	160	1.60	6.24E-08	1.62E-02	
265.12	300.15	1080.059397	160	1.60	6.24E-08	1.73E-02	
203.34	261.8	1088.407028	160	1.60	6.24E-08	1.74E-02	
223.94	309.74	1127.233635	160	1.60	6.24E-08	1.81E-02	
265.12	261.8	1133.085176	160	1.60	6.24E-08	1.82E-02	
151.86	290.56	1165.482216	160	1.60	6.24E-08	1.87E-02	
162.15	280.97	1171.388604	160	1.60	6.24E-08	1.88E-02	
151.86	300.15	1183.070249	160	1.60	6.24E-08	1.90E-02	
275.42	280.97	1185.675236	160	1.60	6.24E-08	1.90E-02	
172.45	280.97	1186.335447	160	1.60	6.24E-08	1.90E-02	
193.05	271.38	1188.262365	160	1.60	6.24E-08	1.90E-02	
182.75	300.15	1198.732975	160	1.60	6.24E-08	1.92E-02	

Mass of Benzene within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of Benzene (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
193.05	300.15	1218.310875	160	1.60	6.24E-08	1.95E-02	
182.75	280.97	1224.165103	160	1.60	6.24E-08	1.96E-02	
213.64	261.8	1262.341449	160	1.60	6.24E-08	2.02E-02	
172.45	300.15	1294.734676	160	1.60	6.24E-08	2.08E-02	
182.75	290.56	1311.195951	160	1.60	6.24E-08	2.10E-02	
172.45	290.56	1348.879785	160	1.60	6.24E-08	2.16E-02	
162.15	290.56	1389.913859	160	1.60	6.24E-08	2.23E-02	
203.34	300.15	1400.236649	160	1.60	6.24E-08	2.24E-02	
193.05	280.97	1415.690787	160	1.60	6.24E-08	2.27E-02	
193.05	290.56	1417.409409	160	1.60	6.24E-08	2.27E-02	
203.34	271.38	1444.734198	160	1.60	6.24E-08	2.32E-02	
162.15	300.15	1446.356385	160	1.60	6.24E-08	2.32E-02	
223.94	261.8	1472.968459	160	1.60	6.24E-08	2.36E-02	
254.83	261.8	1552.531527	160	1.60	6.24E-08	2.49E-02	
213.64	300.15	1563.027571	160	1.60	6.24E-08	2.51E-02	
203.34	290.56	1598.064248	160	1.60	6.24E-08	2.56E-02	
203.34	280.97	1648.437937	160	1.60	6.24E-08	2.64E-02	
265.12	271.38	1716.113632	160	1.60	6.24E-08	2.75E-02	
213.64	271.38	1734.850074	160	1.60	6.24E-08	2.78E-02	
234.23	261.8	1737.196746	160	1.60	6.24E-08	2.78E-02	
244.53	261.8	1767.242008	160	1.60	6.24E-08	2.83E-02	
265.12	290.56	1909.668672	160	1.60	6.24E-08	3.06E-02	
254.83	300.15	2103.150254	160	1.60	6.24E-08	3.37E-02	
223.94	300.15	2128.070997	160	1.60	6.24E-08	3.41E-02	
213.64	290.56	2298.566214	160	1.60	6.24E-08	3.68E-02	
213.64	280.97	2312.915758	160	1.60	6.24E-08	3.71E-02	
265.12	280.97	2362.948232	160	1.60	6.24E-08	3.79E-02	
223.94	271.38	2378.866278	160	1.60	6.24E-08	3.81E-02	
234.23	300.15	2558.845893	160	1.60	6.24E-08	4.10E-02	
254.83	271.38	2965.498889	160	1.60	6.24E-08	4.75E-02	
223.94	290.56	2998.29749	160	1.60	6.24E-08	4.81E-02	
223.94	280.97	3178.102004	160	1.60	6.24E-08	5.09E-02	
244.53	300.15	3223.562711	160	1.60	6.24E-08	5.17E-02	
234.23	271.38	3773.90052	160	1.60	6.24E-08	6.05E-02	
244.53	271.38	4524.522799	160	1.60	6.24E-08	7.25E-02	
254.83	280.97	4524.522799	160	1.60	6.24E-08	7.25E-02	
254.83	290.56	4524.522799	160	1.60	6.24E-08	7.25E-02	
234.23	280.97	4524.522799	160	1.60	6.24E-08	7.25E-02	
234.23	290.56	4524.522799	160	1.60	6.24E-08	7.25E-02	
244.53	280.97	4524.522799	160	1.60	6.24E-08	7.25E-02	
244.53	290.56	4524.522799	160	1.60	6.24E-08	7.25E-02	
						2.19	

Mass of MtBE within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of MtBE (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
229.6	208.53	5.260363075	208	1.06	6.24E-08	7.25E-05	0.032
279.07	218.56	5.513288477	208	1.06	6.24E-08	7.60E-05	
269.17	208.53	5.939685529	208	1.06	6.24E-08	8.19E-05	
328.53	78.175	5.960830105	208	1.06	6.24E-08	8.22E-05	
170.23	278.72	6.06747068	208	1.06	6.24E-08	8.36E-05	
170.23	298.78	6.195555331	208	1.06	6.24E-08	8.54E-05	
180.13	258.67	6.204439698	208	1.06	6.24E-08	8.55E-05	
269.17	278.72	6.260589912	208	1.06	6.24E-08	8.63E-05	
279.07	228.59	6.437827884	208	1.06	6.24E-08	8.87E-05	
279.07	248.64	6.633686704	208	1.06	6.24E-08	9.14E-05	
219.7	218.56	6.751191045	208	1.06	6.24E-08	9.31E-05	
239.49	208.53	6.860626563	208	1.06	6.24E-08	9.46E-05	
338.43	78.175	6.906694098	208	1.06	6.24E-08	9.52E-05	
279.07	238.61	6.958138931	208	1.06	6.24E-08	9.59E-05	
170.23	288.75	7.020228982	208	1.06	6.24E-08	9.68E-05	
259.28	208.53	7.024272704	208	1.06	6.24E-08	9.68E-05	
190.02	308.81	7.101605495	208	1.06	6.24E-08	9.79E-05	
249.38	208.53	7.410714185	208	1.06	6.24E-08	1.02E-04	
209.81	228.59	7.711159429	208	1.06	6.24E-08	1.06E-04	
190.02	248.64	7.794111216	208	1.06	6.24E-08	1.07E-04	
269.17	218.56	7.899673563	208	1.06	6.24E-08	1.09E-04	
199.92	238.61	8.414229217	208	1.06	6.24E-08	1.16E-04	
180.13	298.78	8.622755913	208	1.06	6.24E-08	1.19E-04	
348.32	68.147	9.056560626	208	1.06	6.24E-08	1.25E-04	
180.13	268.7	9.127886266	208	1.06	6.24E-08	1.26E-04	
229.6	218.56	9.539278304	208	1.06	6.24E-08	1.32E-04	
328.53	68.147	9.735376352	208	1.06	6.24E-08	1.34E-04	
199.92	308.81	9.780157222	208	1.06	6.24E-08	1.35E-04	
259.28	218.56	9.909760457	208	1.06	6.24E-08	1.37E-04	
269.17	228.59	10.05203046	208	1.06	6.24E-08	1.39E-04	
180.13	288.75	10.72529327	208	1.06	6.24E-08	1.48E-04	
180.13	278.72	10.81590798	208	1.06	6.24E-08	1.49E-04	
239.49	218.56	11.01686305	208	1.06	6.24E-08	1.52E-04	
249.38	218.56	11.07806551	208	1.06	6.24E-08	1.53E-04	
328.53	58.12	11.38684301	208	1.06	6.24E-08	1.57E-04	
348.32	48.093	11.71205722	208	1.06	6.24E-08	1.61E-04	
259.28	298.78	12.02289117	208	1.06	6.24E-08	1.66E-04	
219.7	228.59	12.14330662	208	1.06	6.24E-08	1.67E-04	
269.17	238.61	12.20346072	208	1.06	6.24E-08	1.68E-04	
190.02	258.67	12.32660806	208	1.06	6.24E-08	1.70E-04	
190.02	298.78	12.38881953	208	1.06	6.24E-08	1.71E-04	
269.17	268.7	12.94102987	208	1.06	6.24E-08	1.78E-04	
209.81	308.81	13.21525582	208	1.06	6.24E-08	1.82E-04	
259.28	228.59	13.38551586	208	1.06	6.24E-08	1.85E-04	
338.43	68.147	13.64711863	208	1.06	6.24E-08	1.88E-04	
209.81	238.61	13.96464317	208	1.06	6.24E-08	1.93E-04	
269.17	248.64	13.98933801	208	1.06	6.24E-08	1.93E-04	
199.92	248.64	14.19931725	208	1.06	6.24E-08	1.96E-04	
269.17	258.67	14.70319278	208	1.06	6.24E-08	2.03E-04	
229.6	228.59	15.18612549	208	1.06	6.24E-08	2.09E-04	
348.32	58.12	15.5160034	208	1.06	6.24E-08	2.14E-04	
190.02	268.7	15.66322722	208	1.06	6.24E-08	2.16E-04	
249.38	228.59	15.71358353	208	1.06	6.24E-08	2.17E-04	
190.02	288.75	15.97586047	208	1.06	6.24E-08	2.20E-04	
239.49	228.59	16.41283095	208	1.06	6.24E-08	2.26E-04	
190.02	278.72	17.0609206	208	1.06	6.24E-08	2.35E-04	
219.7	308.81	17.39989185	208	1.06	6.24E-08	2.40E-04	
239.49	308.81	17.41240781	208	1.06	6.24E-08	2.40E-04	
259.28	238.61	17.42114361	208	1.06	6.24E-08	2.40E-04	
338.43	48.093	17.53466349	208	1.06	6.24E-08	2.42E-04	
199.92	298.78	17.57483539	208	1.06	6.24E-08	2.42E-04	
219.7	238.61	18.94813919	208	1.06	6.24E-08	2.61E-04	
199.92	258.67	19.61020527	208	1.06	6.24E-08	2.70E-04	

Mass of MtBE within Shallow WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of MtBE (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
229.6	308.81	20.02011494	208	1.06	6.24E-08	2.76E-04	
209.81	248.64	20.83749441	208	1.06	6.24E-08	2.87E-04	
249.38	238.61	21.43928898	208	1.06	6.24E-08	2.96E-04	
259.28	248.64	21.91913572	208	1.06	6.24E-08	3.02E-04	
229.6	238.61	22.28975656	208	1.06	6.24E-08	3.07E-04	
199.92	288.75	23.05427062	208	1.06	6.24E-08	3.18E-04	
239.49	238.61	23.21120928	208	1.06	6.24E-08	3.20E-04	
199.92	268.7	23.6074218	208	1.06	6.24E-08	3.25E-04	
209.81	298.78	24.45917695	208	1.06	6.24E-08	3.37E-04	
338.43	58.12	24.46716503	208	1.06	6.24E-08	3.37E-04	
199.92	278.72	25.04980972	208	1.06	6.24E-08	3.45E-04	
259.28	258.67	26.64062687	208	1.06	6.24E-08	3.67E-04	
219.7	248.64	26.81214854	208	1.06	6.24E-08	3.70E-04	
209.81	258.67	27.51674458	208	1.06	6.24E-08	3.79E-04	
249.38	248.64	28.43332504	208	1.06	6.24E-08	3.92E-04	
259.28	288.75	29.11526384	208	1.06	6.24E-08	4.01E-04	
229.6	248.64	30.85397773	208	1.06	6.24E-08	4.25E-04	
259.28	268.7	30.95258912	208	1.06	6.24E-08	4.27E-04	
239.49	248.64	31.63154374	208	1.06	6.24E-08	4.36E-04	
209.81	288.75	32.32090311	208	1.06	6.24E-08	4.46E-04	
209.81	268.7	32.80129622	208	1.06	6.24E-08	4.52E-04	
259.28	278.72	33.00075901	208	1.06	6.24E-08	4.55E-04	
219.7	298.78	33.19847022	208	1.06	6.24E-08	4.58E-04	
209.81	278.72	34.9740039	208	1.06	6.24E-08	4.82E-04	
219.7	258.67	35.11134132	208	1.06	6.24E-08	4.84E-04	
249.38	258.67	37.03164533	208	1.06	6.24E-08	5.10E-04	
229.6	258.67	40.74588653	208	1.06	6.24E-08	5.62E-04	
249.38	298.78	40.88261865	208	1.06	6.24E-08	5.64E-04	
239.49	258.67	42.030637	208	1.06	6.24E-08	5.79E-04	
219.7	268.7	42.61729841	208	1.06	6.24E-08	5.87E-04	
229.6	298.78	43.18767303	208	1.06	6.24E-08	5.95E-04	
219.7	288.75	44.24956148	208	1.06	6.24E-08	6.10E-04	
219.7	278.72	46.86095889	208	1.06	6.24E-08	6.46E-04	
249.38	268.7	47.93122397	208	1.06	6.24E-08	6.61E-04	
239.49	298.78	50.83050172	208	1.06	6.24E-08	7.01E-04	
229.6	268.7	51.33219454	208	1.06	6.24E-08	7.08E-04	
239.49	268.7	54.94229419	208	1.06	6.24E-08	7.57E-04	
229.6	288.75	59.49387298	208	1.06	6.24E-08	8.20E-04	
229.6	278.72	60.04895248	208	1.06	6.24E-08	8.28E-04	
249.38	278.72	62.39098535	208	1.06	6.24E-08	8.60E-04	
239.49	278.72	70.42170837	208	1.06	6.24E-08	9.71E-04	
249.38	288.75	75.07601555	208	1.06	6.24E-08	1.03E-03	
239.49	288.75	79.13492708	208	1.06	6.24E-08	1.09E-03	
						0.03	

Mass of TPH-g within Semi-Confined WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of TPH-g (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
173.71	282.92	107.4823578	208	52.25	6.24E-08	7.29E-02	**8.87**
194.27	263.73	115.2096816	208	52.25	6.24E-08	7.82E-02	
173.71	302.11	119.008759	208	52.25	6.24E-08	8.08E-02	
183.99	273.33	123.2431626	208	52.25	6.24E-08	8.36E-02	
183.99	302.11	124.5591283	208	52.25	6.24E-08	8.45E-02	
173.71	292.52	126.6695585	208	52.25	6.24E-08	8.60E-02	
163.43	302.11	130.2213319	208	52.25	6.24E-08	8.84E-02	
245.66	263.73	142.5290735	208	52.25	6.24E-08	9.67E-02	
194.27	302.11	151.0631418	208	52.25	6.24E-08	1.03E-01	
183.99	282.92	157.8457298	208	52.25	6.24E-08	1.07E-01	
183.99	292.52	159.0245527	208	52.25	6.24E-08	1.08E-01	
204.55	263.73	177.7130998	208	52.25	6.24E-08	1.21E-01	
194.27	273.33	194.9175074	208	52.25	6.24E-08	1.32E-01	
204.55	302.11	199.613921	208	52.25	6.24E-08	1.35E-01	
194.27	292.52	216.6075539	208	52.25	6.24E-08	1.47E-01	
194.27	282.92	233.4979082	208	52.25	6.24E-08	1.58E-01	
235.38	302.11	245.6575895	208	52.25	6.24E-08	1.67E-01	
214.83	263.73	251.8780095	208	52.25	6.24E-08	1.71E-01	
214.83	302.11	260.8825714	208	52.25	6.24E-08	1.77E-01	
204.55	273.33	300.1609093	208	52.25	6.24E-08	2.04E-01	
225.1	302.11	302.594546	208	52.25	6.24E-08	2.05E-01	
204.55	292.52	312.3838993	208	52.25	6.24E-08	2.12E-01	
235.38	263.73	322.78697	208	52.25	6.24E-08	2.19E-01	
225.1	263.73	327.4259943	208	52.25	6.24E-08	2.22E-01	
204.55	282.92	353.189351	208	52.25	6.24E-08	2.40E-01	
245.66	292.52	412.3536408	208	52.25	6.24E-08	2.80E-01	
214.83	273.33	453.5622731	208	52.25	6.24E-08	3.08E-01	
245.66	273.33	455.0427282	208	52.25	6.24E-08	3.09E-01	
214.83	292.52	456.6000456	208	52.25	6.24E-08	3.10E-01	
214.83	282.92	539.9813347	208	52.25	6.24E-08	3.66E-01	
225.1	292.52	645.6424896	208	52.25	6.24E-08	4.38E-01	
225.1	273.33	654.552179	208	52.25	6.24E-08	4.44E-01	
245.66	282.92	697.4094633	208	52.25	6.24E-08	4.73E-01	
235.38	292.52	763.4030965	208	52.25	6.24E-08	5.18E-01	
235.38	273.33	778.314373	208	52.25	6.24E-08	5.28E-01	
225.1	282.92	824.1445822	208	52.25	6.24E-08	5.59E-01	
235.38	282.92	1242.05534	208	52.25	6.24E-08	8.43E-01	
						7.99	

Mass of Benzene within Semi-Confined WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of Benzene (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
158	287.21	1.007688015	208	1.60	6.24E-08	2.10E-05	**0.018**
168	307.44	1.140388772	208	1.60	6.24E-08	2.38E-05	
238	307.44	1.551447176	208	1.60	6.24E-08	3.23E-05	
188	256.85	1.829410908	208	1.60	6.24E-08	3.81E-05	
168	297.32	2.19477046	208	1.60	6.24E-08	4.57E-05	
168	277.09	2.438453641	208	1.60	6.24E-08	5.08E-05	
178	307.44	2.748653944	208	1.60	6.24E-08	5.73E-05	
168	287.21	2.85643535	208	1.60	6.24E-08	5.95E-05	
178	266.97	3.175715851	208	1.60	6.24E-08	6.62E-05	
198	256.85	3.902540031	208	1.60	6.24E-08	8.13E-05	
188	307.44	4.449985182	208	1.60	6.24E-08	9.27E-05	
238	256.85	4.494439502	208	1.60	6.24E-08	9.37E-05	
178	297.32	4.734048724	208	1.60	6.24E-08	9.87E-05	
178	277.09	5.295756945	208	1.60	6.24E-08	1.10E-04	
208	256.85	5.591423881	208	1.60	6.24E-08	1.17E-04	
178	287.21	5.817744437	208	1.60	6.24E-08	1.21E-04	
198	307.44	6.407780785	208	1.60	6.24E-08	1.34E-04	
188	266.97	6.414836395	208	1.60	6.24E-08	1.34E-04	
218	256.85	6.534320712	208	1.60	6.24E-08	1.36E-04	
228	256.85	7.573479079	208	1.60	6.24E-08	1.58E-04	
228	307.44	7.597385607	208	1.60	6.24E-08	1.58E-04	
248	297.32	7.925879212	208	1.60	6.24E-08	1.65E-04	
188	297.32	8.145750243	208	1.60	6.24E-08	1.70E-04	
208	307.44	8.554259757	208	1.60	6.24E-08	1.78E-04	
188	277.09	9.610510591	208	1.60	6.24E-08	2.00E-04	
218	307.44	9.662969033	208	1.60	6.24E-08	2.01E-04	
188	287.21	10.21475838	208	1.60	6.24E-08	2.13E-04	
198	266.97	10.93877954	208	1.60	6.24E-08	2.28E-04	
248	266.97	11.44442388	208	1.60	6.24E-08	2.39E-04	
198	297.32	12.83257165	208	1.60	6.24E-08	2.67E-04	
198	277.09	15.98313763	208	1.60	6.24E-08	3.33E-04	
198	287.21	16.67630115	208	1.60	6.24E-08	3.48E-04	
208	266.97	16.95954911	208	1.60	6.24E-08	3.53E-04	
208	297.32	19.18866477	208	1.60	6.24E-08	4.00E-04	
218	266.97	24.53486597	208	1.60	6.24E-08	5.11E-04	
208	277.09	25.34796727	208	1.60	6.24E-08	5.28E-04	
208	287.21	26.19471022	208	1.60	6.24E-08	5.46E-04	
218	297.32	27.03901263	208	1.60	6.24E-08	5.64E-04	
238	266.97	29.30620152	208	1.60	6.24E-08	6.11E-04	
248	277.09	29.5191924	208	1.60	6.24E-08	6.15E-04	
238	297.32	29.86676271	208	1.60	6.24E-08	6.22E-04	
248	287.21	30.58380637	208	1.60	6.24E-08	6.37E-04	
228	266.97	31.70797777	208	1.60	6.24E-08	6.61E-04	
228	297.32	33.91720558	208	1.60	6.24E-08	7.07E-04	
218	277.09	38.93504105	208	1.60	6.24E-08	8.11E-04	
218	287.21	40.11441433	208	1.60	6.24E-08	8.36E-04	
228	277.09	57.00345804	208	1.60	6.24E-08	1.19E-03	
228	287.21	59.71156523	208	1.60	6.24E-08	1.24E-03	
238	277.09	66.50558149	208	1.60	6.24E-08	1.39E-03	
238	287.21	75.79979807	208	1.60	6.24E-08	1.58E-03	
						0.02	

Mass of MtBE within Semi-Confined WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of MtBE (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
236.39	209.24	5.041461347	208	1.06	6.24E-08	6.95E-05	0.012
256.1	219.18	5.048943584	208	1.06	6.24E-08	6.96E-05	
196.96	298.72	5.066641088	208	1.06	6.24E-08	6.98E-05	
167.4	288.78	5.084054225	208	1.06	6.24E-08	7.01E-05	
177.25	268.89	5.084622164	208	1.06	6.24E-08	7.01E-05	
265.95	229.12	5.110141107	208	1.06	6.24E-08	7.04E-05	
226.53	209.24	5.157405139	208	1.06	6.24E-08	7.11E-05	
157.54	308.67	5.22982916	208	1.06	6.24E-08	7.21E-05	
167.4	308.67	5.320984881	208	1.06	6.24E-08	7.34E-05	
177.25	298.72	5.474717072	208	1.06	6.24E-08	7.55E-05	
206.82	219.18	5.494008412	208	1.06	6.24E-08	7.57E-05	
196.96	229.12	5.524490655	208	1.06	6.24E-08	7.62E-05	
157.54	298.72	5.548368015	208	1.06	6.24E-08	7.65E-05	
177.25	278.84	5.55706257	208	1.06	6.24E-08	7.66E-05	
285.66	258.95	5.571267091	208	1.06	6.24E-08	7.68E-05	
285.66	288.78	5.723888853	208	1.06	6.24E-08	7.89E-05	
206.82	298.72	5.78534922	208	1.06	6.24E-08	7.98E-05	
187.11	249.01	5.830203723	208	1.06	6.24E-08	8.04E-05	
177.25	288.78	5.865799626	208	1.06	6.24E-08	8.09E-05	
246.24	219.18	6.082791789	208	1.06	6.24E-08	8.39E-05	
246.24	298.72	6.171971077	208	1.06	6.24E-08	8.51E-05	
216.68	219.18	6.281320398	208	1.06	6.24E-08	8.66E-05	
187.11	288.78	6.409330107	208	1.06	6.24E-08	8.84E-05	
187.11	258.95	6.569066577	208	1.06	6.24E-08	9.06E-05	
275.81	249.01	6.59747162	208	1.06	6.24E-08	9.09E-05	
236.39	219.18	6.631923222	208	1.06	6.24E-08	9.14E-05	
226.53	219.18	6.685110532	208	1.06	6.24E-08	9.22E-05	
196.96	239.06	6.694059793	208	1.06	6.24E-08	9.23E-05	
285.66	268.89	6.76931134	208	1.06	6.24E-08	9.33E-05	
256.1	229.12	6.812522698	208	1.06	6.24E-08	9.39E-05	
167.4	298.72	6.814252015	208	1.06	6.24E-08	9.39E-05	
206.82	229.12	6.852353534	208	1.06	6.24E-08	9.45E-05	
216.68	298.72	6.857146465	208	1.06	6.24E-08	9.45E-05	
265.95	239.06	7.011631083	208	1.06	6.24E-08	9.67E-05	
187.11	268.89	7.01787351	208	1.06	6.24E-08	9.67E-05	
187.11	278.84	7.027772602	208	1.06	6.24E-08	9.69E-05	
285.66	278.84	7.065586914	208	1.06	6.24E-08	9.74E-05	
196.96	288.78	7.360738441	208	1.06	6.24E-08	1.01E-04	
196.96	249.01	7.800504503	208	1.06	6.24E-08	1.08E-04	
216.68	229.12	7.874534944	208	1.06	6.24E-08	1.09E-04	
226.53	298.72	7.934892553	208	1.06	6.24E-08	1.09E-04	
246.24	229.12	7.97173987	208	1.06	6.24E-08	1.10E-04	
236.39	298.72	8.098021406	208	1.06	6.24E-08	1.12E-04	
206.82	239.06	8.29640786	208	1.06	6.24E-08	1.14E-04	
226.53	229.12	8.469221275	208	1.06	6.24E-08	1.17E-04	
236.39	229.12	8.524171173	208	1.06	6.24E-08	1.18E-04	
275.81	258.95	8.579672559	208	1.06	6.24E-08	1.18E-04	
196.96	258.95	8.666708293	208	1.06	6.24E-08	1.19E-04	
196.96	278.84	8.687324382	208	1.06	6.24E-08	1.20E-04	
206.82	288.78	8.895659214	208	1.06	6.24E-08	1.23E-04	
256.1	239.06	8.914745448	208	1.06	6.24E-08	1.23E-04	
196.96	268.89	9.052827019	208	1.06	6.24E-08	1.25E-04	
275.81	288.78	9.11055527	208	1.06	6.24E-08	1.26E-04	
265.95	249.01	9.170343342	208	1.06	6.24E-08	1.26E-04	
216.68	239.06	9.61458264	208	1.06	6.24E-08	1.33E-04	
206.82	249.01	9.695992096	208	1.06	6.24E-08	1.34E-04	
265.95	288.78	9.850350883	208	1.06	6.24E-08	1.36E-04	
275.81	268.89	10.14420136	208	1.06	6.24E-08	1.40E-04	
246.24	239.06	10.17997598	208	1.06	6.24E-08	1.40E-04	
226.53	239.06	10.47694039	208	1.06	6.24E-08	1.44E-04	
236.39	239.06	10.70317939	208	1.06	6.24E-08	1.48E-04	
206.82	278.84	10.8102472	208	1.06	6.24E-08	1.49E-04	
206.82	258.95	10.82949596	208	1.06	6.24E-08	1.49E-04	

Mass of MtBE within Semi-Confined WBZ

Cell Address (X)	Cell Address (Y)	Cell Concentration of MtBE (ug/L)	Cell Volume ft3	Retardation Coefficient (Rd)	Conversion Factor	Cell Mass Total (lb)	Mass Total (lb)
256.1	288.78	11.00087242	208	1.06	6.24E-08	1.52E-04	
275.81	278.84	11.04462443	208	1.06	6.24E-08	1.52E-04	
216.68	288.78	11.09425855	208	1.06	6.24E-08	1.53E-04	
256.1	249.01	11.2525285	208	1.06	6.24E-08	1.55E-04	
265.95	258.95	11.28372939	208	1.06	6.24E-08	1.56E-04	
206.82	268.89	11.34960361	208	1.06	6.24E-08	1.56E-04	
216.68	249.01	11.38663408	208	1.06	6.24E-08	1.57E-04	
226.53	249.01	12.63140983	208	1.06	6.24E-08	1.74E-04	
246.24	249.01	12.64055616	208	1.06	6.24E-08	1.74E-04	
265.95	268.89	12.85499566	208	1.06	6.24E-08	1.77E-04	
216.68	258.95	12.97096706	208	1.06	6.24E-08	1.79E-04	
265.95	278.84	13.05689818	208	1.06	6.24E-08	1.80E-04	
236.39	249.01	13.11832438	208	1.06	6.24E-08	1.81E-04	
256.1	258.95	13.55972066	208	1.06	6.24E-08	1.87E-04	
216.68	278.84	13.57164865	208	1.06	6.24E-08	1.87E-04	
216.68	268.89	13.94685169	208	1.06	6.24E-08	1.92E-04	
226.53	288.78	13.99699048	208	1.06	6.24E-08	1.93E-04	
246.24	288.78	14.41321	208	1.06	6.24E-08	1.99E-04	
226.53	258.95	14.78098478	208	1.06	6.24E-08	2.04E-04	
256.1	278.84	15.0268542	208	1.06	6.24E-08	2.07E-04	
246.24	258.95	15.19495515	208	1.06	6.24E-08	2.09E-04	
256.1	268.89	15.25259298	208	1.06	6.24E-08	2.10E-04	
236.39	258.95	15.67777456	208	1.06	6.24E-08	2.16E-04	
226.53	268.89	16.59313709	208	1.06	6.24E-08	2.29E-04	
236.39	288.78	16.80948829	208	1.06	6.24E-08	2.32E-04	
226.53	278.84	17.07818163	208	1.06	6.24E-08	2.35E-04	
246.24	268.89	17.50248081	208	1.06	6.24E-08	2.41E-04	
236.39	268.89	18.25465535	208	1.06	6.24E-08	2.52E-04	
246.24	278.84	18.50904932	208	1.06	6.24E-08	2.55E-04	
236.39	278.84	20.64951226	208	1.06	6.24E-08	2.85E-04	
						0.01	

APPENDIX E

Pilot Testing Related Documentation and General Field Procedures

GENERAL FIELD PROCEDURES

Hydraulic Push (GEOPROBE) Drilling

Utility Locating

Prior to drilling, boring locations are marked with white paint or other discernible marking and cleared for underground utilities through Underground Service Alert (USA). In addition, the first five feet of each borehole are air-knifed, or carefully advanced with a hand auger if shallow soil samples are necessary, to help evaluate the borehole location for underground structures or utilities.

Borehole Advancement

Pre-cleaned push rods (typically one to two inches in diameter) are advanced using a hydraulic push type rig for the purpose of collecting samples and evaluating subsurface conditions. The drill rod serves as a soil sampler, and an acetate liner is inserted into the annulus of the drill rod prior to advancement. Once the sample is collected, the rods and sampler are retracted and the sample tubes are removed from the sampler head. The sampler head is then cleaned, filled with clean sample tubes, inserted into the borehole and advanced to the next sampling point where the sample collection process is repeated.

Soil Sample Collection

The undisturbed soil samples intended for laboratory analysis are cut away from the acetate sample liner using a hacksaw, or equivalent tool, in sections approximately 6 inches in length. The 6-inch samples are lined at each end with Teflon® sheets and capped with plastic caps. Labels documenting job number, borehole identification, collection date, and depth are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests. The remaining collected soil that has not been selected for laboratory analysis is logged using the United Soil Classification System (USCS) under the direction of a State Registered Professional Geologist, and is field screened for organic vapors using a photo-ionization detector (PID), or an equivalent tool. Soil cuttings generated are stored in Department of Transportation (DOT) approved 55-gallon steel drums, or an equivalent storage container.

Groundwater Sample Collection

Once the desired groundwater sampling depth has been reached, a Hydropunch tip is affixed to the head of the sampling rods. The Hydropunch tip is advanced between approximately 6 inches to one foot within the desired groundwater sampling zone (effort is made to emplace the Hydropunch screen across the center and lower portion of the water table), and retracted to expose the Hydropunch screen.

Grab groundwater samples are collected by lowering a pre-cleaned, single-sample polypropylene, disposable bailer down the annulus of the sampler rod. The groundwater sample is discharged from the bailer to the sample container through a bottom emptying flow control valve to minimize volatilization.

Because the sampling section of the non-discrete groundwater sampler is not protected or sealed, this sampler should only be used where cross contamination from overlying materials is not a concern. Discrete groundwater samplers are driven to the sample interval, and then o-rings, a protective tube/sheath, and an expendable point provide a watertight seal.

Collected water samples are discharged directly into laboratory-provided, pre-cleaned vials or containers and sealed with Teflon-lined septum, screw-on lids. Labels documenting sample number, well identification, collection date, and type of preservative (if applicable, e.g., HCl for TPPH, BTEX, and fuel oxygenates) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests.

Borehole Completion

Upon completion of drilling and sampling, the rods are retracted. Neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, is introduced, *via* a tremmie pipe, and pumped to displace standing water in the borehole. Displaced groundwater is collected at the surface into DOT approved 55-gallon steel drums, or an equivalent storage container. In areas where the borehole penetrates asphalt or concrete, the borehole is capped with an equivalent thickness of asphalt or concrete patch to match finished grade.

Organic Vapor Procedures

Soil samples are collected for analysis in the field for ionizable organic compounds using a PID with a 10.2 eV lamp. The test procedure *involves* measuring approximately 30 grams from an undisturbed soil sample, placing this subsample in a Ziploc--type bag or in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The container is warmed for approximately 20 minutes (in the sun); then the headspace within the container is tested for total organic *vapor,* measured in parts per million as benzene (ppm; volume/volume). The instrument is calibrated prior to drilling. The results of the field-testing are noted on the boring logs. PID readings are useful for indicating relative levels of contamination, but cannot be used to evaluate petroleum hydrocarbon levels with the confidence of laboratory analyses.

Equipment Decontamination

Equipment that could potentially contact subsurface media and compromise the integrity of the samples is carefully decontaminated prior to drilling and sampling. Drill augers and other large pieces of equipment are decontaminated using high-pressure hot water spray. Samplers, groundwater pumps, liners and other equipment are decontaminated in an Alconox scrub solution and double rinsed in clean tap water rinse followed by a final distilled water rinse.

The rinsate and other wastewater are contained in 55-gallon DOT-approved drums, labeled (to identify the contents, generation date and project) and stored on-site pending waste profiling and disposal.

Soil Cuttings and Rinsate/Purge Water

Soil cuttings and rinsate/purge water generated during drilling and sampling are stored onsite in DOT-approved 55-gallon steel drums pending characterization. A label is affixed to the drums indicating the contents of the drum, suspected contaminants, date of generation, and the boring number from which the waste is generated. The drums are removed from the site by a licensed waste disposal contractor under manifest to an appropriate facility for treatment/recycling.

Hollow Stem Auger Drilling/ Well Installation

Utility Locating

Prior to drilling, boring locations are marked with white paint or other discernible marking, and cleared for underground utilities through Underground Service Alert (USA). In addition, the first five feet of each borehole are air-knifed, or carefully advanced with a hand auger if shallow soil samples are necessary, to help evaluate the presence of underground structures or utilities.

Borehole Advancement

Pre-cleaned hollow stem augers (typically 8 to 10 inches in diameter) are advanced using a drill rig for the purpose of collecting samples and evaluating subsurface conditions. Upon completion of drilling and sampling, if no well is to be constructed, the augers are retracted, and the borehole is filled with neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, through a tremmie pipe to displace standing water in the borehole. In areas where the borehole penetrates asphalt or concrete, the borehole is capped with an equivalent thickness of asphalt or concrete patch to match finish grade.

During the drilling process, a physical description of the encountered soil characteristics (i.e. moisture content, consistency or density, odor, color, and plasticity), drilling difficulty, and soil type as a function of depth are described on boring logs. The soil cuttings are classified in accordance with the uses.

Split-Spoon Sampling

The precleaned split spoon sampler lined with three 6-inch long brass or stainless steel tubes is driven 18 inches into the underlying soils at the desired sample depth interval. The sampler is driven by repeatedly dropping a 140-pound hammer a free fall distance of 30 inches. The number of blows (blow count) to advance the sampler for each six-inch drive length is recorded on the field logs. Once the sampler is driven the 18-inch drive length or the sampler has met refusal (typically 50 blows per six inches), the sampler is retrieved.

Of the three sample tubes, the bottom sample is generally selected for laboratory analysis. The sample is carefully packaged for chemical analysis by capping each end of the sample with a Teflon sheet followed by a tight-fitting plastic cap, and sealing the cap with nonvolatile organic compound (VOC), self-adhering silicon tape. A label is affixed to the sample indicating the sample identification number, borehole number, sampling depth, sample collection date and time, and job number. The sample is then annotated on a chain-of custody form and placed in an ice-filled cooler for transport to the laboratory.

The remaining soil samples are used for soil classification and field evaluation of headspace volatile organic vapors, where applicable, using a photo ionization or flame ionization detector calibrated to a calibration gas (typically isobutylene or hexane). VOC vapor concentrations are recorded on the boring logs.

Grab Groundwater Sample Collection

Grab groundwater samples are collected by lowering a pre-cleaned, single-sample polypropylene, disposable bailer down the borehole or temporary casing. The groundwater sample is discharged from the bailer to the sample container through a bottom emptying flow control valve to minimize volatilization.

Collected water samples are discharged directly into laboratory provided, pre-cleaned, vials or containers and sealed with Teflon-lined septum, screw-on lids. Labels documenting sample number, well identification, collection date and time, type of sample and type of preservative (if applicable, i.e. HCl for TPPH, BTEX, and fuel oxygenates) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests.

Groundwater Monitoring Well Installation and Development

Groundwater monitoring wells are constructed by inserting or tremmieing well materials through the annulus of the hollow stem auger. The groundwater monitoring wells are constructed with a screen interval determined from the encountered soil stratigraphy, to maintain a proper seal at the surface (minimum three feet), to allow flow from permeable zones into the well, and to avoid penetrating aquicludes. Groundwater wells are installed in accordance with the conditions of the well construction permit issued by the regulatory agency exercising jurisdiction over the project site.

The well screen generally consists of schedule 40 polyvinyl chloride (PVC) casing with 0.01 to 0.02-inch factory slots. As a rule, 0.01-inch slots are used in fine-grained silts and clays, and 0.02-inch slots are used in coarse-grained materials. The screen is then filter packed with #2/12 or #3 sand, or equivalent, for the 0.01 and 0.02 inch slots, respectively.

Once the borehole has been drilled to the desired depth, the well screen and blank well casing are inserted through the annulus of the hollow stem augers. The well screen is sand packed by tremmieing the appropriate filter sand through the annulus between the casing and augers while slowly retracting the augers. During this operation, the depth of the sand pack in the auger is continuously sounded to make sure that the sand remains in the auger annulus during auger retraction to avoid short-circuiting the well. The sand pack is tremmied to approximately two feet above the screen, at which time pre-development surging is performed to consolidate the sand pack. Additional sand is added as necessary so that the sand pack extends approximately two feet above top of screen. Following construction of the sand pack, a one to two foot thick bentonite seal is tremmied over the sand and hydrated in place. The remainder of the borehole is backfilled with Portland neat cement grout (or the equivalent), mixed at ratio of 6 gallons of water per 94 pounds of neat cement. The wellhead is then capped with a locking cap and secured with a lock to protect the well from surface water intrusion and vandalism.

The wellhead is further protected from damage with traffic a rated well box in paved areas or locking steel riser in undeveloped areas. The protective boxes or risers are set in concrete. The details of well construction are recorded on well construction logs.

Following well construction, the wells are developed in accordance with agency protocols by intermittently surging and bailing the wells. Development is determined to be sufficient once pH, conductivity, and temperature stabilize to within s 0.1, s 3%, and s 10%, respectively.

Groundwater Monitoring Well Sampling

Depth to Groundwater/SPH Thickness Measurements

Prior to the beginning of purging and sampling the wells, the depth to groundwater and thickness of SPH, if present, within each well casing are measured to the nearest 0.01 foot using either an electronic water level indicator or an electronic oil-water interface probe. This is done in within as narrow a period as possible, and before the first well is purged. Measurements are taken from a point of known elevation on the top of each well casing as determined in accordance with surveys by licensed land surveyors.

Groundwater Monitoring Well Purging

Groundwater wells are purged using low-flow protocol at a flow rate of less the 1 liter per minute using a bladder pump. The purge intake is placed opposite the portion of the saturated zone expected to contain the greatest hydrocarbon impact, and the depth of the purge intake is recorded during and after purging. The water level in each well is monitored, and care is taken that the well is not dewatered. The conductivity, temperature, and pH of the delivered effluent are monitored and recorded using a flow-through cell during purge operations. Purge operations are determined to be sufficient once three successive measurements of pH, conductivity, and temperature of the purged water at 3 to 5 minute intervals following the evacuation of on system or line volume vary by s 0.1, s 3%, and s 10%, respectively. System or line volumes, actual purge volumes, and the purging equipment used are recorded on the field data sheets.

Groundwater Sample Acquisition, Handling, and Analysis

Following purging operations, groundwater samples are collected from each of the wells, using a low-flow bladder pump. The groundwater sample is discharged from the pump tubing to the sample container before the water passes through the flow-through cell. The sampling equipment is recorded on the field data sheets.

Collected water samples are discharged directly into laboratory provided, pre-cleaned, and chemically preserved sample containers for the analyses requested. Preservatives are used in the samples if appropriate for the analyses, i.e., hydrochloric acid (HCI) for TPPH, BTEX, and fuel oxygenates by EPA Method 8260B.

Labels documenting sample number, well identification, collection date and time, type of sample and type of preservative (if applicable) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain of custody to a certified laboratory. The type of preservative used is documented on the chain of custody form.

To help assure the quality of the collected samples and to evaluate the potential for cross contamination during transport to the laboratory, a distilled-water trip blank accompanies the samples in the cooler. The trip blank is analyzed for the presence of volatile organic compounds of concern. For petroleum hydrocarbons, the trip blank is typically analyzed for TPPH, BTEX, and fuel oxygenates by EPA Method 8260.

Organic Vapor Procedures

Soil samples are collected for analysis in the field for ionizable organic compounds using a PID with a 10.2 eV lamp. The test procedure involves measuring approximately 30 grams from an undisturbed soil sample, placing this subsample **in** a Ziploc™-type bag or in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The container is warmed for approximately 20 minutes (in the sun); then the head-space within the container is tested for total organic vapor, measured in parts per million as benzene (ppm; volume/volume). The instrument is calibrated prior to drilling. The results of the field-testing are noted on the boring logs. PID readings are useful for indicating relative levels of contamination, but cannot be used to evaluate petroleum hydrocarbon levels with the confidence of laboratory analyses.

Equipment Decontamination

Equipment that could potentially contact subsurface media and compromise the integrity of the samples is carefully decontaminated prior to drilling and sampling. Drill augers and other large pieces of equipment are decontaminated using high-pressure hot water spray. Samplers, groundwater pumps, liners and other equipment are decontaminated in an Alconox scrub solution and double rinsed in clean tap water rinse followed by a final distilled water rinse.

The rinsate and other wastewater are contained in 55-gallon DOT-approved drums, labeled (to identify the contents, generation date and project) and stored on-site pending waste profiling and disposal.

Soil Cuttings and Rinsate/Purge Water

Soil cuttings and rinsate/purge water generated during drilling and sampling are stored on-site in DOT-approved 55-gallon steel drums pending characterization. A label is affixed to the drums indicating the contents of the drum, suspected contaminants, date of generation, and the boring number from which the waste is generated. A licensed waste disposal contractor removes the drums from the site to an appropriate facility for treatment/recycling.

Golden Gate
Remediation Technology

ADDRESS: ______________________________
PROJECT #: ______________________________

MTS OPERATIONAL DATA

DATE	TIME	OXIDIZER TEMPERATURE (F)	PUMP/AIR TEMPERATURE (F)	SEPARATOR TANK VACUUM (IN-Hg)	PUMP VACUUM (IN-Hg)	TOTAL FLOW (SCFM)	DILUTION FLOW (SCFM)	WELL FLOW (SCFM)	PITOT TUBE Δ PRESSURE (IN-H20)	PID (PPMV HEXANE)	FID (PPMV HEXANE)	WATER TOTALIZER	WATER FLOW RATE	EFFLUENT TEMPERATURE (F)

Golden Gate
Remediation Technology

SITE ADDRESS: ______________________

PROJECT #: ______________________

MTS MONITORING POINT DATA

DATE	TIME	WELL ID		WELL ID		WELL ID		WELL ID		WELL ID	
		VACCUM (IN WATER)	GW ELEVATION (FEET BELOW TOC)	VACCUM (IN WATER)	GW ELEVATION (FEET BELOW TOC)	VACCUM (IN WATER)	GW ELEVATION (FEET BELOW TOC)	VACCUM (IN WATER)	GW ELEVATION (FEET BELOW TOC)	VACCUM (IN WATER)	GW ELEVATION (FEET BELOW TOC)

TYPICAL
MPE

Monitoring And Control Equipment

Monitoring Equipment	Location In System	Example Of Equipment
Flow meter	○ At each wellhead ○ Manifold to blower ○ Blower discharge	○ Pitot tube ○ In-line rotameter ○ Orifice plate ○ Venturi or flow tube
Vacuum gauge	○ At each well head or manifold branch ○ Before and after filters upstream of blower ○ Before and after vapor treatment	○ Manometer ○ Magnehelic gauge ○ Vacuum gauge
Vapor temperature sensor	○ Manifold to blower ○ Blower discharge (prior to vapor treatment)	○ Bi-metal dial-type thermometer
Sampling port	○ At each well head or manifold branch ○ Manifold to blower ○ Blower discharge	○ Hose barb ○ Septa fitting
Vapor sample collection equipment (used through a sampling port)	○ At each well head or manifold branch ○ Manifold to blower ○ Blower discharge	○ Tedlar bags ○ Sorbent tubes ○ Sorbent canisters ○ Polypropylene tubing for direct GC injection
Control Equipment		
Flow control valves	○ At each well head or manifold branch ○ Dilution or bleed valve at manifold to blower	○ Ball valve ○ Gate/globe valve ○ Butterfly valve

Source: How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites. A Guide for Corrective Action Plan Reviewers, EPA May 2004

TYPICAL
Air Sparge

Monitoring And Control Equipment

Monitoring Equipment	Location In System	Example Of Equipment
Flow meter	❍ At each injection and vapor extraction well head ❍ Manifold to blower ❍ Stack discharge	❍ Pitot tube ❍ In-line rotameter ❍ Orifice plate ❍ Venturi or flow tube
Pressure gauge	❍ At each injection and vapor extraction well head or manifold branch ❍ Before blower (before and after filters) ❍ Before and after vapor treatment	❍ Manometer ❍ Magnehelic gauge ❍ Vacuum gauge
Vapor or air sparge temperature sensor	❍ Manifold to blower ❍ Blower or compressor discharge (prior to vapor treatment)	❍ Bi-metal dial-type thermometer ❍ Thermocouple
Sampling port	❍ At each vapor extraction well head or manifold branch ❍ Manifold to blower ❍ Blower discharge	❍ Hose barb ❍ Septa fitting
Control Equipment		
Flow control valves/ regulators	❍ At each vapor extraction well head or manifold branch ❍ Dilution or bleed valve at manifold to blower ❍ At header to each sparge point	❍ Ball valve ❍ Gate valve ❍ Dilution/ambient air bleed valve ❍ Gate valve ❍ Dilution/ambient air bleed valve

Source: How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites. A Guide for Corrective Action Plan Reviewers, EPA May 2004

REGENESIS

March 8, 2011 **Proposal No. BRG39121**

Elena Manzo
Soma Environmental
6620 Owens Drive
Pleasanton, CA 94588

Subject: **Application of ORC *Advanced* (Advanced Formula Oxygen Release Compound) to Accelerate the Natural Attenuation of Contaminants of Concern (COCs) at the 3519 Castro Valley site**

Dear Ms. Manzo:

Thank you for your interest in Regenesis and our Advanced formula Oxygen Release Compound (ORC *Advanced*™) product. We have reviewed the information that you provided for the above-referenced site. In the following sections of this proposal, we will discuss the use of ORC *Advanced*, design and cost information, delivery of ORC *Advanced* to the subsurface, a recommended groundwater monitoring program, and the performance goals for this particular project. In addition, this proposal should be considered preliminary because some assumptions were made regarding the current biogeochemical conditions of the aquifer and the extent of the contaminant plume requiring treatment. We look forward to working with you on developing a site-specific strategy that will help meet your objectives for the site.

Use of Advanced formula Oxygen Release Compound (ORC *Advanced*™) to Accelerate Bioremediation

Advanced formula Oxygen Release Compound (ORC *Advanced*) is a patented formulation of phosphate-intercalated calcium oxyhydroxide that is a timed-released source of oxygen. ORC *Advanced* releases oxygen in the dissolved-phase when it is hydrated. Numerous studies have shown that the lack of oxygen can limit the ability of naturally occurring microorganisms (aerobes) to degrade certain compounds. ORC *Advanced* provides terminal electron acceptors to support the oxidative biodegradation of many types of aerobically degradable compounds including but not limited to: petroleum-based hydrocarbons (e.g. Toluene) and chlorinated hydrocarbons (e.g. Vinyl Chloride). ORC *Advanced* is manufactured as a fine powder that can be installed in the subsurface in the following ways: (1) mixed with water to form a slurry that can be injected into both the saturated and unsaturated zones, and (2) added as a soil amendment to the backfill material used in excavation applications. The use of oxygen sources such as ORC *Advanced* is recognized as a sensible strategy for engineering accelerated bioattenuation at project sites contaminated with aerobically degradable compounds.

Preliminary Design and Cost Information for Full Scale Remediation

Based on the provided data and earlier conversations with you, Regenesis understands that the full-scale treatment at the subject site will consist of a grid-based design approach. This treatment strategy should reduce the levels of COCs in the target zone and downgradient. The design specifications for this treatment approach are found in a subsequent table.

Data and Assumptions used to design this ORC *Advanced*™ project

The following data was used to determine the quantity of ORC-A needed for this site-specific project:

<u>Area 1 – SOMA 5 Shallow</u>

- Estimated area requiring treatment: 40 ft x 30 ft
- Representative contaminant concentration: 4.9 mg/L TPHg, 1.6 mg/L benzene, .18 mg/L, ethylbenzene, .13 mg/L, .39 mg/L toluene, and xylene .084 mg/L
- Contaminated saturated zone thickness requiring treatment: 5 feet (10 to 15 feet bgs)
- Soil Type: clay
- Seepage Velocity: unknown

<u>Area 2 – SOMA 7 Shallow</u>

- Estimated area requiring treatment: 20 ft x 30 ft
- Representative contaminant concentration: 1.9 mg/L TPHg, 1.2 mg/L TPHd, .33 mg/L mo, and .38 mg/L benzene
- Contaminated saturated zone thickness requiring treatment: 5 feet (10 to 15 feet bgs)
- Soil Type: clay
- Seepage Velocity: unknown

<u>Area 3 – ES1R Deep</u>

- Estimated area requiring treatment: 40 ft x 30 ft
- Representative contaminant concentration: 1.4 mg/L TPHg, 1.6 mg/L TPHd, .096 mg/L benzene, .56 mg/L mo, .13 mg/L toluene
- Contaminated saturated zone thickness requiring treatment: 12 feet (18 to 30 feet bgs)
- Soil Type: silty sand
- Seepage Velocity: unknown

This project may need to be adjusted as detailed design and regulatory oversight issues are finalized.

ORC Treatment – Groundwater – Area 1	
Design Feature	**Specification**
Saturated thickness requiring treatment	5 feet
Treatment area	40 feet x 30 feet
Delivery point spacing and configuration	35 points spaced 6 feet on center within rows and 6 feet on center btw rows. Offset rows by 3 feet.
ORC dose rate in lbs/vertical foot of injection	6.9 lbs/ft (approx. 35 lbs/pt)
ORC material requirement	28 pts. X 5 feet x 6. lbs/ft = 1,200 lbs (rounded to 30 lbs increment)

ORC Treatment – Groundwater – Area 2	
Design Feature	**Specification**
Saturated thickness requiring treatment	5 feet
Treatment area	20 feet x 30 feet
Delivery point spacing and configuration	20 points spaced 6 feet on center within rows and 6 feet on center btw rows. Offset rows by 3 feet.
ORC dose rate in lbs/vertical foot of injection	5.5 lb/ft (approx 28 lbs/pt)
ORC material requirement	20 pts x 5 feet x 5.5 lbs/ft = 550 lbs

ORC Treatment – Groundwater – Area 3	
Design Feature	**Specification**
Saturated thickness requiring treatment	12 feet
Treatment area	40 feet x 30 feet
Delivery point spacing and configuration	20 points spaced 8 feet on center within rows and 8 feet on center btw rows. Offset rows by 4 feet.
ORC dose rate in lbs/vertical foot of injection	4.7 lb/ft (approx 52 lbs/pt)
ORC material requirement	20 pts x 11 feet x 4.7 lbs/ft = 1,125 lbs

ORC *Advanced*™ Product Requirement & Cost

The total amount of ORC-A required for this site is 2,875 lbs. At a unit cost of $8.50/lb the total cost is $24,437.50 plus shipping and sales tax. *The price quoted in this proposal is locked for 30 days.*

Total ORC *Advanced*™ Project Cost

The total cost of an ORC *Advanced*-accelerated bioremediation project can be estimated using the following items:

- ORC *Advanced*™ material, shipping fees, and sales tax
- Fieldwork costs associated with the installation of ORC *Advanced* (Customers are responsible for selecting the drilling subcontractor that will be used for the project.)
- Groundwater monitoring well construction (if additional monitoring wells are needed to properly monitor the performance of the project)
- All fieldwork and laboratory analysis associated with periodic groundwater monitoring events
- Consultant oversight and report generation

The costs presented in this proposal are for ORC *Advanced* material costs for a one-time application only. The need to re-apply ORC *Advanced* depends on your plume management strategy, site-specific biodegradation performance, and the ultimate remediation goals for the site as well as other technical or regulatory considerations. For grid-based treatments, one- to two- re-applications may be necessary over the duration of the project. Each re-application would most likely be done over a smaller area and the dose amount would be less than the initial application assuming that there is not an on-going source present. For barrier-based designs, re-applications will be necessary every year as long as there is a need to prevent contaminant migration. As can be seen, project costs are directly related to the period of time needed to achieve the site-specific goals.

Performance Goals for RegenOx Projects

The primary goals for a chemical oxidation project are to (1) rapidly reduce the mass of contaminants in the subsurface and (2) to stabilize and/or reduce the size of the contaminant plume. Please note that after the injection of any chemical oxidant to a contaminated aquifer, dissolved-phase contamination will be reduced initially, but will then rebound somewhat in most cases, as the sorbed contaminants become redissolved. It is therefore critically important to accurately estimate the mass of soil-bound contaminant within the subsurface and to anticipate and allow for this predictable rebound in dissolved-phase contaminants after the initial injection. It is for this reason that Regenesis strongly recommends the use of a series of three RegenOx injections performed 1 to 2 weeks apart.

Preliminary Aquifer Volume Testing

Prior to application of the RegenOx material, it is critical that a clear water injection be performed at the site. The injection a non-reactive (clear water) material at a volume that is approximately 25% greater than the anticipated application volume of RegenOx will provide good evidence of the aquifers capacity to accept the designed volume of RegenOx. Please note, the preliminary aquifer volume test should be conducted outside of the desired on-site treatment area(s) in order to avoid overloading the subsurface with clear-water before applying RegenOx on-site.

ORC *Advanced*™ Delivery to Contaminated Zone Using Direct-Push Equipment

This product is normally installed using direct-push drilling equipment. This delivery method calls for drive rods to be pushed to the bottom of the contaminated saturated zone, and then an ORC *Advanced*/water slurry (ORC *Advanced* slurry) is injected as the rods are withdrawn. Regenesis recommends using drive rods with an inner diameter of at least 5/8 of an inch to inject the ORC *Advanced* slurry. The use of smaller diameter drive rods increases the amount of pressure needed to properly deliver the material and can jeopardize the effectiveness of the installation. Using the proper drilling and related equipment reduces the time required to install this product.

As a rule, the ORC *Advanced* slurry used for direct-push installations has a solids content of 20% to 40% by weight. Typically, ORC *Advanced* slurries used during installation activities have a solids content of 30%, but this value may need to be adjusted in the field so that the required mass of ORC *Advanced* can be injected at each location. For example, less permeable soil types (e.g. clays) may require a higher ORC *Advanced* solids content since less slurry volume can be injected per location. The volume of water per injection location can be calculated from the following equation:

$$\text{Volume of water (gal/injection pt)} = \frac{\text{ORC Advanced lbs/hole}}{(8.34\ \text{lbs/gal water})(\%\ \text{ORC Advanced solids})}\left[1-(\%\ \text{ORC Advanced solids})\right]$$

One of the most critical aspects of a successful installation is having a pump that can properly install the material in the subsurface. Most direct-push contractors are equipped with grout pumps capable of installing ORC *Advanced* into the subsurface. Typically, the pumps used for these types of product applications should have a pumping rate of at least three gallons per minute and a pressure rating of at least 500 pounds per square inch (psi). Failing to specify and use the appropriate equipment for this type of product installation may increase field time and result in improper application of the material. If you have any questions about purchasing, renting, or specifying a pump for a project, please contact the Technical Service Group staff at Regenesis.

Recommended Groundwater Monitoring Program for ORC *Advanced*™ Projects

Monitoring of selected wells should be conducted to validate the enhancement of aerobic natural attenuation processes. The monitoring well network would ideally include wells from the following locations:

Inside treatment area	Provides information on geochemical conditions and contaminants needed for thorough evaluation of ORC *Advanced* design
Upgradient of treatment area	Provides a measure of contaminant mass and background aquifer redox conditions entering the treatment area

An initial or "pre-design" round of sampling should be performed to identify current groundwater conditions. These natural attenuation and geochemical parameters will be used accurately design a groundwater remediation plan using ORC *Advanced*. The monitoring protocol should call for standard low flow groundwater-sampling techniques and include the measurement of the following field/chemical parameters:

- all contaminants of concern
- field redox parameters: ORP, pH, dissolved oxygen
- nitrate, total and dissolved iron, sulfate, methane and chemical oxygen demand at selected wells within and outside treatment area

If practical, analyze some soil samples from the proposed treatment areas just below the water table for the contaminants of concern. This is useful in estimating the amount of hydrocarbon contamination that can continue to partition from the soil to the dissolved phase.

Performance Expectations

Site Characterization

This design/proposal is based upon site characteristics and professional opinions provided by your company. It is your responsibility to ensure that the site characteristics provided to Regenesis and subsequently used in this design are representative of actual site characteristics. Actual site characteristics e.g. identification of the appropriate vertical treatment zone, that vary from those provided for this design may directly affect the overall performance of the project.

Subsurface Product Delivery

Product delivery during application is of the highest importance in ensuring project success. Attention must be given to both horizontal and vertical placement of the product. The professional judgment of your associates should be used to identify the appropriate treatment zone (vertical and lateral). The identified treatment zone should consider the distribution of the targeted contaminant as well as variations in subsurface permeability that might preferentially channel the product during application. Finally, it is the responsibility your company to ensure that the field delivery methods used by the applier actually deliver the product into the identified treatment zone.

Project Responsibility

Regenesis trusts that the present proposal is sufficiently complete. Given the nature and extent of project factors beyond the control of Regenesis, it must be understood that the responsibility for successful project implementation remains with your company. However, as always, Regenesis would be pleased to assist with any technical support and product application advice we may be able to offer.

Regenesis Support

Regenesis is committed to supporting its customers with the highest level of service available in the remediation product industry. If you have any questions or require additional assistance with this design/proposal please contact us. If you are interested in a more comprehensive site data review and analysis or on-site application support services, Regenesis Technical Services staff is available to assist you on a fee basis. Please contact Jack Peabody at 925.944.5566 (jpeabody@regnesis.com) or me at 916.409.9331 (bgriffiths@regenesis.com).

Sincerely,

Brittain Griffiths
Applications Engineer

ORC *Advanced* Design Software for Grid Applications Using Slurry Injection

Sept 2005

Regenesis Technical Support: USA (949) 366-8000

www.regenesis.com

Site Name: 3519 Castro Valley Area 1
Location: Proposal No. BRG39121
Consultant:

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	40	ft			
Length of plume (parallel to gw flow direction)	30	ft		1,200	ft^2
Depth to contaminated zone	10	ft			
Thickness of contaminated saturated zone	5	ft			
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	clay				
Total porosity	0.45		Effective porosity:	0.1	
Hydraulic conductivity	0.001	ft/day		3.5E-07	cm/sec
Hydraulic gradient	0.005	ft/ft			
Seepage velocity	0.0	ft/yr		0.000	ft/day
Treatment Zone Pore Volume	2,700	ft^3		20,199	gallons

Dissolved Phase Oxygen Demand:	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	ORC-Adv Dose
Individual species that represent oxygen demand:	(mg/L)	(lb)	O_2/contaminant	(lb)
Benzene	1.60	0.3	3.1	5
Toluene	0.39	0.1	3.1	1
Ethylbenzene	0.13	0.0	3.2	0
Xylenes	0.08	0.0	3.2	0
MTBE	0.09	0.0	2.7	0
cis-1,2-DCE	0.00	0.0	0.7	0
Vinyl Chloride	0.00	0.0	1.3	0
TPHg	4.90	0.8	3.2	16
Mo	0.00	0.0	3.2	0
Reduced metals: Fe^{+2} and Mn^{+2}	10.00	1.7	0.1	1
TPH-g ▾	**<- pull-down menu**			
Measures of total oxygen demand				
Total Petroleum Hydrocarbons (see pull-down for Koc)	0.00	0.0	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.0	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.0	1.0	0

Parameters for Sorbed Phase Oxygen Demand:

Soil bulk density	1.76	g/cm^3 =	110	lb/cf
Fraction of organic carbon (foc)	0.01	range: 0.0001 to 0.01		

(Estimated using sorbed phase = foc*Koc*Cgw)	Koc	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	ORC-Adv Dose
(Adjust Koc as necessary to provide realistic estimates)	(L/kg)	(mg/kg)	(lb)	O_2/contaminant	(lb)
Benzene	123	1.97	1.3	3.1	24
Toluene	267	1.04	0.7	3.1	13
Ethylbenzene	327	0.43	0.3	3.2	5
Xylenes	298	0.25	0.2	3.2	3
MTBE	12	0.01	0.0	2.7	0
cis-1,2-DCE	80	0.00	0.0	0.7	0
Vinyl Chloride	2.5	0.00	0.0	1.3	0
TPHg	373.0	18.28	12.0	3.2	227
Mo	503.0	0.00	0.0	3.2	0
Measures of total oxygen demand					
Total Petroleum Hydrocarbons	373	0.00	0.0	3.1	0

Summary of Estimated ORC-Adv Requirements		Dissolved Phase ORC-Adv Demand (lbs)	Sorbed Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	☐	24	272	4.0	1,184	$10,500	<-
Total Petroleum Hydrocarbons	☐	0	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	☐	0	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	☐	0	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) -------------------------------> **1,200** **pounds ORC-Adv**

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft)	6.0	feet
# points per row	7	points/row
Spacing between rows (ft)	6.0	ft
# of rows	5	rows
Advective travel time bet. rows (days)	120000	days
Number of points in grid	35	points
ORC-Adv application rate	6.9	lbs/foot
Total ORC-Adv required	**1,200**	lbs of ORC-Adv

Slurry Mixing Volume for Injections

Pounds per location	34	pounds
Buckets per location	1.4	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	10	gallons
Total water for mixing all holes (gal)	336	gallons
Simple ORC-Adv Backfilling: min hole dia. for 67% slurry	4.3	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(ok)	

Project Summary			
Number of ORC-Adv delivery points (adjust as necessary for site)			35
ORC-Adv application rate in lbs/ft (adjust as necessary for site)			6.9
ORC-Adv bulk material for slurry injection (lbs)			1,200
Number of 25 lb ORC-Adv buckets			48.0
ORC-Adv bulk material cost ($/lb)		$	-
Cost for bulk ORC-Adv material		$	-
Shipping and Tax Estimates in US Dollars			
Sales Tax	rate: 0.00%	$	-
Total Material Cost		$	-
Shipping (call for amount)		$	-
Total Regenesis Material Cost		**$**	**-**

List Price has been adjusted

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + ORC-Adv injection interval (ft)		15
Total length for direct push for project (ft)		525
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		20.0
Required number of days		2
Mob/demob cost for injection subcontractor	$	-
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	-
Total injection subcontractor cost for application	$	-
Total Install Cost (not including consultant, lab, etc.)	**$**	**-**

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	**$**	**-**

ORC *Advanced* Design Software for Grid Applications Using Slurry Injection

Sept 2005

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

Site Name: 3519 Castro Valley Area 2
Location: Proposal No. BRG39121
Consultant:

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	20	ft			
Length of plume (parallel to gw flow direction)	30	ft		600	ft^2
Depth to contaminated zone	10	ft			
Thickness of contaminated saturated zone	5	ft			
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	clay				
Total porosity	0.45		Effective porosity:	0.1	
Hydraulic conductivity	0.001	ft/day		3.5E-07	cm/sec
Hydraulic gradient	0.005	ft/ft			
Seepage velocity	0.0	ft/yr		0.000	ft/day
Treatment Zone Pore Volume	1,350	ft^3		10,099	gallons

Dissolved Phase Oxygen Demand:	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	ORC-Adv Dose
Individual species that represent oxygen demand:	(mg/L)	(lb)	O_2/contaminant	(lb)
Benzene	0.38	0.0	3.1	1
Toluene	0.00	0.0	3.1	0
Ethylbenzene	0.00	0.0	3.2	0
Xylenes	0.08	0.0	3.2	0
MTBE	0.00	0.0	2.7	0
cis-1,2-DCE	0.00	0.0	0.7	0
TPHd	2.10	0.2	3.2	3
TPHg	1.90	0.2	3.2	3
Mo	0.33	0.0	3.2	1
Reduced metals: Fe^{+2} and Mn^{+2}	10.00	0.8	0.1	0

TPH-g ▾ <- pull-down menu

Measures of total oxygen demand				
Total Petroleum Hydrocarbons (see pull-down for Koc)	0.00	0.0	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.0	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.0	1.0	0

Parameters for Sorbed Phase Oxygen Demand:

Soil bulk density	1.76	g/cm^3 =	110	lb/cf
Fraction of organic carbon (foc)	0.01	range: 0.0001 to 0.01		

(Estimated using sorbed phase = foc*Koc*Cgw)	Koc	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	ORC-Adv Dose
(Adjust Koc as necessary to provide realistic estimates)	(L/kg)	(mg/kg)	(lb)	O_2/contaminant	(lb)
Benzene	123	0.47	0.2	3.1	3
Toluene	267	0.00	0.0	3.1	0
Ethylbenzene	327	0.00	0.0	3.2	0
Xylenes	298	0.25	0.1	3.2	2
MTBE	12	0.00	0.0	2.7	0
cis-1,2-DCE	80	0.00	0.0	0.7	0
TPHd	503.0	10.56	3.5	3.2	66
TPHg	373.0	7.09	2.3	3.2	44
Mo	503.0	1.66	0.5	3.2	10
Measures of total oxygen demand					
Total Petroleum Hydrocarbons	373	0.00	0.0	3.1	0

Summary of Estimated ORC-Adv Requirements		Dissolved Phase ORC-Adv Demand (lbs)	Sorbed Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	○	8	125	4.0	531	$4,923	<-
Total Petroleum Hydrocarbons	○	0	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	○	0	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	○	0	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) -------------------------------> **550** **pounds ORC-Adv**

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft)	6.0	feet
# points per row	4	points/row
Spacing between rows (ft)	6.0	ft
# of rows	5	rows
Advective travel time bet. rows (days)	120000	days
Number of points in grid	20	points
ORC-Adv application rate	5.5	lbs/foot
Total ORC-Adv required	**550**	lbs of ORC-Adv

Slurry Mixing Volume for Injections

Pounds per location	28	pounds
Buckets per location	1.1	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	8	gallons
Total water for mixing all holes (gal)	154	gallons
Simple ORC-Adv Backfilling: min hole dia. for 67% slurry	3.9	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(ok)	

Project Summary		
Number of ORC-Adv delivery points (adjust as necessary for site)		20
ORC-Adv application rate in lbs/ft (adjust as necessary for site)		5.5
ORC-Adv bulk material for slurry injection (lbs)		550
Number of 25 lb ORC-Adv buckets		22.0
ORC-Adv bulk material cost ($/lb)	$	-
Cost for bulk ORC-Adv material	$	-
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	-
Shipping (call for amount)	$	-
Total Regenesis Material Cost	**$**	**-**

List Price has been adjusted

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + ORC-Adv injection interval (ft)		15
Total length for direct push for project (ft)		300
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		20.0
Required number of days		1
Mob/demob cost for injection subcontractor	$	-
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	-
Total injection subcontractor cost for application	$	-
Total Install Cost (not including consultant, lab, etc.)	**$**	**-**

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	**$**	**-**

ORC *Advanced* Design Software for Grid Applications Using Slurry Injection

Sept 2005

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

Site Name: 3519 Castro Valley Area 3
Location: Proposal No. BRG39121
Consultant:

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	40	ft			
Length of plume (parallel to gw flow direction)	30	ft		1,200	ft^2
Depth to contaminated zone	18	ft			
Thickness of contaminated saturated zone	12	ft			
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silt				
Total porosity	0.4		Effective porosity:	0.15	
Hydraulic conductivity	1	ft/day		3.5E-04	cm/sec
Hydraulic gradient	0.005	ft/ft			
Seepage velocity	12.2	ft/yr		0.033	ft/day
Treatment Zone Pore Volume	5,760	ft^3		43,091	gallons

Dissolved Phase Oxygen Demand:

Individual species that represent oxygen demand:	Contaminant Conc. (mg/L)	Contaminant Mass (lb)	Stoichiometry (wt/wt) O_2/contaminant	ORC-Adv Dose (lb)
Benzene	0.10	0.0	3.1	1
Toluene	0.13	0.0	3.1	1
Ethylbenzene	0.00	0.0	3.2	0
Xylenes	0.08	0.0	3.2	1
MTBE	0.02	0.0	2.7	0
cis-1,2-DCE	0.00	0.0	0.7	0
THPd	1.60	0.6	3.2	11
TPHg	1.40	0.5	3.2	9
Mo	0.56	0.2	3.2	4
Reduced metals: Fe^{+2} and Mn^{+2}	10.00	3.6	0.1	2

TPH-g <- pull-down menu

Measures of total oxygen demand				
Total Petroleum Hydrocarbons (see pull-down for Koc)	0.00	0.0	3.1	0
Biological Oxygen Demand (BOD)	0.00	0.0	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.0	1.0	0

Parameters for Sorbed Phase Oxygen Demand:

Soil bulk density	1.76	g/cm^3	=	110	lb/cf
Fraction of organic carbon (foc)	0.005	range: 0.0001 to 0.01			

(Estimated using sorbed phase = foc*Koc*Cgw) (Adjust Koc as necessary to provide realistic estimates)	Koc (L/kg)	Contaminant Conc. (mg/kg)	Contaminant Mass (lb)	Stoichiometry (wt/wt) O_2/contaminant	ORC-Adv Dose (lb)
Benzene	123	0.06	0.1	3.1	2
Toluene	267	0.17	0.3	3.1	5
Ethylbenzene	327	0.00	0.0	3.2	0
Xylenes	298	0.13	0.2	3.2	4
MTBE	12	0.00	0.0	2.7	0
cis-1,2-DCE	80	0.00	0.0	0.7	0
THPd	503.0	4.02	6.4	3.2	120
TPHg	373.0	2.61	4.1	3.2	78
Mo	503.0	1.41	2.2	3.2	42
Measures of total oxygen demand					
Total Petroleum Hydrocarbons	373	0.00	0.0	3.1	0

Summary of Estimated ORC-Adv Requirements		Dissolved Phase ORC-Adv Demand (lbs)	Sorbed Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	○	28	251	4.0	1,117	$9,844	<-
Total Petroleum Hydrocarbons	○	0	0	2.0	0	$0	
Biological Oxygen Demand (BOD)	○	0	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	○	0	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) -------------------------------> **1,125** **pounds ORC-Adv**

Delivery Design for ORC-Adv Slurry		
Spacing within rows (ft)	8.0	feet
# points per row	5	points/row
Spacing between rows (ft)	8.0	ft
# of rows	4	rows
Advective travel time bet. rows (days)	240	days
Number of points in grid	20	points
ORC-Adv application rate	4.7	lbs/foot
Total ORC-Adv required	**1,125**	lbs of ORC-Adv

Slurry Mixing Volume for Injections		
Pounds per location	56	pounds
Buckets per location	2.3	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	16	gallons
Total water for mixing all holes (gal)	315	gallons
Simple ORC-Adv Backfilling: min hole dia. for 67% slurry	3.6	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(ok)	

Project Summary			
Number of ORC-Adv delivery points (adjust as necessary for site)			20
ORC-Adv application rate in lbs/ft (adjust as necessary for site)			4.7
ORC-Adv bulk material for slurry injection (lbs)			1,125
Number of 25 lb ORC-Adv buckets			45.0
ORC-Adv bulk material cost ($/lb)		$	-
Cost for bulk ORC-Adv material		$	-
Shipping and Tax Estimates in US Dollars			
Sales Tax	rate: 0.00%	$	-
Total Material Cost		$	-
Shipping (call for amount)		$	-
Total Regenesis Material Cost		**$**	**-**

List Price has been adjusted

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + ORC-Adv injection interval (ft)		30
Total length for direct push for project (ft)		600
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		10.0
Required number of days		2
Mob/demob cost for injection subcontractor	$	-
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	-
Total injection subcontractor cost for application	$	-
Total Install Cost (not including consultant, lab, etc.)	**$**	**-**

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	**$**	**-**

RegenOx Summary Page

Aug 2006

Regenesis Technical Support: USA (949) 366-8000

Site Name: SOMA 5
Location: Proposal no. BRG39121
Consultant:

Application Design Input Parameters

Width of plume (intersecting gw flow direction)	40	ft
Length of plume (parallel to gw flow direction)	30	ft
Thickness of contaminated zone	5	ft
Soil type	clay	

Design Summary - INITIAL APPLICATION ONLY

Number of RegenOx injection points (initial app)	12	pts
egenOx dose rate (oxidant + activator) (initial app)	10.5	lbs/ft Part A = 7 lbs
otal amount of water required for initial application	931	gallons Part B = 3.5 lbs
Total volume of RegenOx solution applied per foot of injection (initial app)	16.6	gallons/ft

Estimated number of RegenOx applications required (enter 1 through 6)	4

Summary of Estimated RegenOx Totals

Application number	Part A RegenOx Oxidant (lbs)	Part B RegenOx Activator (lbs)	Total RegenOx Material Requirement (lbs)	Cumulative Amount of Oxidant (Part A) Applied (lbs)	Cumulative Amount of Activator (Part B) Applied (lbs)	Cumulative RegenOx Cost	Total RegenOx Material Cost Per Application	Cost per cubic yard of soil treated ($/cubic yard)
First	420	210	630	420	210	$0	$0.00	$6.95
Second	420	210	630	840	420	$1,544	$1,543.50	$6.95
Third	420	210	630	1,260	630	$3,087	$1,543.50	$6.95
Fourth	420	0	420	1,680	630	$4,116	$1,029.00	$4.63
Fifth	0	0	0	0	0	$0	$0.00	$0.00
Sixth	0	0	0	0	0	$0	$0.00	$0.00
TOTALS	1,680	630	2,310	Volume discount if purchased all together			$0.00	$0.00

5%

(not including shipping or applicable taxes)

Water Per Point	Soultion Per Point
77.5 gallons	83 gallons

RegenOx Summary Page

Aug 2006

Regenesis Technical Support: USA (949) 366-8000

Site Name: SOMA 7
Location: Proposal no. BRG39121
Consultant:

Application Design Input Parameters

Width of plume (intersecting gw flow direction)	20	ft
Length of plume (parallel to gw flow direction)	30	ft
Thickness of contaminated zone	5	ft
Soil type	clay	

Design Summary - INITIAL APPLICATION ONLY

Number of RegenOx injection points (initial app)	6	pts
egenOx dose rate (oxidant + activator) (initial app)	10.5	lbs/ft Part A = 7 lbs
otal amount of water required for initial application	464	gallons Part B = 3.5 lbs
Total volume of RegenOx solution applied per foot of injection (initial app)	16.6	gallons/ft

Estimated number of RegenOx applications required (enter 1 through 6)	**2**

Summary of Estimated RegenOx Totals

Application number	Part A RegenOx Oxidant (lbs)	Part B RegenOx Activator (lbs)	Total RegenOx Material Requirement (lbs)	Cumulative Amount of Oxidant (Part A) Applied (lbs)	Cumulative Amount of Activator (Part B) Applied (lbs)	Cumulative RegenOx Cost	Total RegenOx Material Cost Per Application	Cost per cubic yard of soil treated ($/cubic yard)
First	**210**	**120**	**330**	210	120	$0	**$0.00**	$7.28
Second	**210**	**120**	**330**	420	240	$809	**$808.50**	$7.28
Third	**0**	**0**	**0**	0	0	$0	**$0.00**	$0.00
Fourth	**0**	**0**	**0**	0	0	$0	**$0.00**	$0.00
Fifth	**0**	**0**	**0**	0	0	$0	**$0.00**	$0.00
Sixth	**0**	**0**	**0**	0	0	$0	**$0.00**	$0.00
TOTALS	**420**	**240**	**660**			**Volume discount if purchased all together**	**$0.00**	$0.00

5%

(not including shipping or applicable taxes)

Water Per Point	Soultion Per Point
77.5 gallons	83 gallons

REGENESIS

Oxygen Release Compound (ORC®) Installation Instructions

(Direct-Injection Slurry Application)

SAFETY:

Pure ORC is shipped to you as a fine powder rated at -325 mesh (passes through a 44 micron screen). It is considered to be a mild oxidizer and as such should be handled with care while in the field. Field personnel should take precautions while applying the pure ORC. Typically, the operator should work upwind of the product as well as use appropriate safety equipment. These would include eye and respiratory protection, and gloves as deemed appropriate by exposure duration and field conditions.

Personnel operating the field equipment utilized during the installation process should have appropriate training, supervision and experience.

GENERAL GUIDELINES:

ORC may be installed in the contaminated saturated zone in the ground utilizing hand augered holes, Geoprobe® type hydraulic punch equipment, or hollow stem augers. This set of instructions is specific for Geoprobe equipment. Alternate instructions may be obtained from the Regenesis Technical Support Department.

For optimum results the ORC slurry installation should span the entire vertical contaminated saturated thickness, including the capillary fringe and "smear zone".

Two general installation approaches are available. The first is to backfill only the probe hole with slurry. This is a simple approach, in that it is easy, straightforward, and the location of the ORC slurry is precisely known after installation. However, this method requires significantly more probe holes than the alternative, and may take more time for the completion of the remediation process. A separate set of instructions for this method utilizing Geoprobe equipment is available from Regenesis.

The second method is to inject the slurry through the probe holes into the contaminated saturated zone. This method requires fewer probe holes, is less disruptive to the site, and aids the spread of oxygen by spreading the ORC source material. However, it may be difficult to know the exact, final disposition of the ORC installed with this method. This is the method described in these instructions.

Note: It is important that the installation method and specific ORC slurry point location be established prior to field installation. It is also important that the ORC slurry volume and solids content for each drive point be predetermined. The Regenesis Technical Service Department is available to discuss these issues, and Helpful Hints at the end of these instructions offers relevant information. Regenesis also has available Technical Bulletins covering source treatments with ORC.

SPECIFIC INSTALLATION PROCEDURES

1. Identify the location of all underground structures, including utilities, tanks, distribution piping, sewers, drains, and landscape irrigation systems.
2. Identify surface and aerial impediments.
3. Adjust planned installation locations for all impediments and obstacles.
4. Pre-mark the installation grid point locations, noting any that have special depth requirements.
5. Set up the Geoprobe unit over each specific point, following manufacturer recommended procedures. Care should be taken to assure approximate vertical probe holes.
6. Penetrate surface pavement, if necessary, following standard Geoprobe procedures.
7. Drive the 1 1/2" (one-and-one-half inch) pre-probe (part #AT-148B) with the expendable tip (part #AT142B) to the desired maximum depth. Standard 1" (one inch) drive rods (part AT104B) should be used, after the pre-probe. (Hint: Pre-counted drive rods should be positioned prior to the installation driving procedure to assure the desired depth is reached.)
8. Disconnect the drive rods from the expendable tip, following standard Geoprobe procedures.
9. Mix the appropriate quantity of ORC slurry for the current drive point. (See separate "Directions for ORC® Slurry Mixing" and Helpful Hints). **Note: Do not mix more slurry than will be used within a 30 minute period.**
10. Set up and operate an appropriate slurry pump according to manufacturer's directions. Based on our experience, a Geoprobe model GS-1000 pump is recommended. Connect the pump to the probe grout pull cap (GS-1054) via a 1 inch diameter delivery hose. The hose is then attached to the 1" drive rod with its quick connector fitting. Upon confirmation of all connections add the ORC slurry to the pump hopper/tank.
11. Withdraw the pre-probe and drive stem 4' (four feet). (Also note Helpful Hints - Operations at end of instructions.)
12. Optional pretreatment step. (See Helpful Hints - Operations at end of instructions). Pump one to two gallons of tap water into the aquifer to enhance dispersion pathways from the probe hole.
13. Pump the predetermined quantity of ORC slurry for the depth interval being injected. Observe pump pressure levels for indications of slurry dispersion or refusal into the aquifer. (Increasing pressure indicates reduced acceptance of material by the aquifer).
14. Remove one 4' section of the 1" drive rod. The drive rod will contain slurry. This slurry should be returned to the ORC bucket for reuse.
15. Repeat steps 11, 13, and 14 until treatment of the entire affected thickness has been achieved. It is generally recommended that the procedure extend to the top of the capillary fringe/smear zone.
16. Install an appropriate seal, such as bentonite, above the ORC slurry through the entire vadose zone. This helps assure that the slurry stays in place and prevents contaminant migration from the surface. Depending on soil conditions and local regulations, a bentonite seal can be pumped through the slurry pump or added via chips or pellets after probe removal.
17. Remove and decontaminate the drive rods and pre-probe.

18. Finish the probe hole at surface as appropriate (concrete or asphalt cap, if necessary).
19. Move to the next probe point, repeating steps 5 through 18.

HELPFUL HINTS:

A. Physical characteristics

A1. <u>Slurry</u>

The ORC slurry is made using the dry ORC powder (rated at -325 mesh). It makes a smooth slurry, with a consistency that depends on the amount of water used.

A thick, but pumpable, slurry that approaches a paste can be made by using 65-67% solids. This material would normally be used for back-filling a bore or probe hole. It is especially useful where maximum density is desired such as where ground water is present in the hole or there are heaving sands.

Thinner slurries can be made by using more water. Typical solids for the thinner slurries content will range from 35% to 62%. Such slurries are useful for injecting through a probe or bore hole into the saturated aquifer.

As a rule, it is best to mix the first batch of slurry at the maximum solids content one would expect to use. It can then be thinned by adding additional water in small increments. By monitoring this process, the appropriate quantities of water for subsequent batches can be determined.

The slurry should be mixed at about the time it is expected to be used. It is best to not hold it for more than 30 minutes. Thinner slurries, especially, can experience a separation upon standing. All ORC slurries have a tendency to form cements when left standing. If a slurry begins to thicken too much, it should be mixed again and additional water added if necessary.

Care should be taken with slurry that may be left standing in a grout pump or hose. Problems can generally be avoided by periodically re-circulating the slurry through the pump and hose back into the pump's mixing or holding tank.

A2. <u>Equipment</u>

Most geotechnical grout pumping equipment has a holding tank with a capacity sufficient for injection.

When applying measured volumes of ORC slurry to probe holes, it is sometimes useful to know the volumes and content of the delivery system lines. The following information may be useful in this regard.

Geoprobe pump: At the end of a pump stroke virtually no deliverable slurry remains in the pump.

5/8" O.D. connecting hose (10 feet long):	0.2 gallons (26 fluid ounces).
Four foot (4') length of 1" drive rod:	.04 gallons (5 fluid ounces).
Three foot (3') length of 1 1/2" pre-probe:	.03 gallons (4 fluid ounces).

Cleaning and maintenance:

Pumping equipment and drive rods can be lightly cleaned by circulating clear water through them. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

B. Operating characteristics

B1. Operations - General

Judgment will be needed in the field when injecting ORC slurries. In general, it is relatively easy to inject ORC slurries into sandy soils, and this can usually be accomplished at very moderate pressures. Silts and clays require more pressure, and may accept less slurry.

Careful observation of pressure during slurry pumping is the best indication of the effectiveness of the slurry injection. To test the soil's ability to accept the slurry and to "precondition" the injection point for the slurry, it is sometimes useful to inject a small volume of plain water prior to the slurry. Normally, one-half (0.5) gallons to two (2) gallons would be appropriate.

During injection, increasing pressure and decreasing flow rate are signs of refusal by the soil matrix to accept the slurry. The site geologist should determine whether to increase pressure, and possibly fracture ("frac") the soil matrix to achieve ORC slurry installation in a tight site that has refused the slurry at lower pressures.

B2. Fill Volumes

Probe hole back-filling

Probe hole capacities:

Per 10' (Ten Foot) Length			
Theoretical		**Operating Volume**	
(Gallons/Fluid Ounces/Cubic Inches)		**(Gallons/Fluid Ounces)**	
Sand, Silts & Clay		**Sand**	**Silts & Clay**
1" Diameter	.41 gal/52 fl. oz./94.2 cu. in.	.61 gal/78 fl. oz.	.51 gal/65 fl. oz.
1 1/2" Diameter	.92 gal/117 fl. oz./212.0 cu. in.	1.38 gal/176 fl. oz.	1.15 gal/146 fl. oz.
2" Diameter	1.63 gal/209 fl. oz./376.8 cu. in.	2.44 gal/313 fl. oz.	2.04 gal/261 fl. oz.
2 1/4" Diameter	2.06 gal/264 fl. oz./476.9 cu. in	3.09 gal/396 fl. oz.	2.57 gal/330 fl. oz.

Note that the operating volumes include a 50% excess above the theoretical volume in sands and 25% in clays and silts. This is important to successful treatment. The additional material allows for a small degree of infiltration of the slurry into the surrounding soil and fractures, as well as hole diameter variability. It is important to assure that the entire contaminated saturated zone is treated (including the capillary fringe), since this is often the area of highest pollution concentration. Failure to treat this area due to improper installation can undermine an otherwise successful remediation effort.

REGENESIS

February 26, 2007

RegenOx and ORC *Advanced* Simultaneous Application

RegenOx^{TM} is a two part chemical oxidant capable of treating a broad range of soil and groundwater contaminants. RegenOx was designed as an easily handled and applied high-contaminant-concentration mass reduction technology. RegenOx is an aggressive fast acting oxidative technology that can be coupled with a less aggressive slow release technology like Oxygen Release Compound Advanced (ORC *Advanced*) without negative effects on either products contaminant destructive ability or the aquifer/soil geochemistry.

ORC *Advanced*^{TM} is a state-of-the-art innovative product designed to stimulate aerobic bioremediation through controlled release of oxygen within the subsurface. It offers unparalleled, maximum oxygen release for periods up to 12 months on a single injection and is specifically designed to minimize oxygen waste while maximizing contaminant remediation.

Preliminary Aquifer Volume Testing

Prior to application of the RegenOx + ORC *Advanced* material, it is critical that a clear water injection be performed at the site. The injection a non-reactive (clear water) material at a volume that is approximately 25% greater than the anticipated application volume of RegenOx will provide good evidence of the aquifers capacity to accept the designed volume of RegenOx + ORC-*Advanced*.

RegenOx Solution Mixing Calculation

RegenOx s a two part product, the RegenOx Part A is an oxidant and the Part B is an activator. Depending on the relative aquifer capacity (effective pore volume) of the target zone soil matrix a RegenOx solution should be applied as a solution ranging from 3-5% by weight. The volume of water required to make a 3-5% RegenOx solution can be calculated using the formula provided below (a detailed discussion on RegenOx Mixing Instructions is attached).

Volume of water (gallons/vertical foot of injection):

$$\frac{\text{RegenOx Oxidizer lbs/foot}}{(8.34\text{ lbs/gal water})(\%\ RegenOx\_Oxidizer\text{ solids})}\left[1-(\%\ RegenOx\_Oxidizer\text{ solids})\right]$$

Quick Reference Solution Estimates

- Approximate 3% oxidant solution: 10 lbs of Part A oxidant mixed with 39 gallons of water.
- Approximate 4% oxidant solution: 10 lbs of Part A oxidant mixed with 29 gallons of water.
- Approximate 5% oxidant solution: 10 lbs of Part A oxidant mixed with 23 gallons of water.

ORC *Advanced* Solutions Mixing Calculation

ORC *Advanced* can be mixed in to a slurry solution ranging from 15-35% by weight with water. This slurry is well documented in the literature. For a detailed discussion of these techniques please see the ORC/ORC *Advanced* mixing instructions available on the Regenesis website (www.regenesis.com).

NOTE: for this coupled technology application we strongly recommend that ORC-A be applied as an amendment to the site specific design volume of RegenOx material. This will ensure that the more reactive RegenOx material is applied in a stable and format that will facilitate optimal oxidative contaminant destruction.

RegenOx + ORC-A Solution Mixing & Application

A solution ranging from 3-5% RegenOx solution can be easily mixed directly together with the recommended quantity of ORC *Advanced* and injected simultaneously as described below:

1. Prepare the site specific designed RegenOx Part A solution (3-5% solution).

2. Open the 5-gallon bucket and remove the pre-measured bag of ORC *Advanced* (each bag contains 25 lbs of ORC *Advanced*).

2. Measure and pour the ORC Advanced powder into the previously prepared RegenOx solution.

3. Use an appropriate mixing device to thoroughly mix the ORC *Advanced* into the RegenOx solution. A hand-held drill with a "jiffy mixer" or a stucco mixer on it may be used in conjunction with a small paddle to scrape the bottom and sides of the container. Standard environmental slurry mixers may also be used, following the equipment instructions for operation.

4. Transfer the contents of the mixing tank to the pump hopper using a gravity drain or a sump pump.

5. For some types of pumps (e.g. piston pumps), it may be desirable to perform a volume check prior to injecting RegenOx/ORC *Advanced.* Determining the volume displaced per pump stroke can be accomplished in two easy steps.

    a) Determine the number of pump strokes needed to deliver 3 gallons of RegenOx/ORC *Advanced* (use a graduated bucket for this)

    b) Divide the resulting 3 gallons by the results from the first step to determine the number of gallons of RegenOx/ORC *Advanced* delivered by each pump stroke.

6. Connect the delivery hose to the pump outlet and the delivery sub-assembly. Circulate RegenOx/ORC *Advanced* through the hose and the delivery sub-assembly to displace air in the hose.

7. Connect the sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the RegenOx/ORC *Advanced* through the delivery system to displace the water/fluid in the rods.

8. Slowly withdraw the drive rods. Commonly RegenOx/ORC *Advanced* injection progress at 1-foot intervals. However, continuous injection while slowly withdrawing single lengths of drive rod (3 or 4 feet) is an acceptable option. The pre-determined volume of RegenOx/ORC *Advanced* should be pumped into the aquifer across the desired treatment interval.

9. Remove one section of the drive rod. The drive rod may contain some residual RegenOx/ORC *Advanced* solution. Place the RegenOx/ORC *Advanced*-filled rod in a clean, empty bucket and allow the RegenOx/ORC *Advanced* to drain. Eventually, the RegenOx/ORC *Advanced* should be returned to the pump hopper for reuse.

10. Observe any indications of aquifer refusal. This is typically indicated by a high-pitched squeal in the pump's hydraulic system or (in the case of shallow applications) RegenOx/ORC *Advanced* "surfacing" around the injection rods or previously installed injection points. At times backpressure caused by gassing will impede pump movement. This can be corrected by bleeding the pressure off using a pressure relief/bypass valve (placed inline between the pump discharge and the delivery sub-assembly) and then resume pumping. If aquifer acceptance appears to be low, allow enough time for the aquifer to equilibrate prior to removing the drive rod.

11. Repeat steps 1 through 11 until treatment of the entire contaminated vertical zone has been achieved. It is recommended that the procedure extend to the top of the capillary fringe/smear zone, or to the top of the targeted treatment interval.

12. Install an appropriate seal, such as bentonite, above the RegenOx/ORC *Advanced* material through the entire vadose zone. Prior to emplacing the borehole seal, we recommend placing clean sand in the hole to the top of the RegenOx/ORC *Advanced* treatment zone (especially important in holes that stay open). Bentonite chips or granular bentonite should be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete should then be used as a surface seal.

13. Remove and clean the drive rods as necessary.

14. Finish the borehole at the surface as appropriate (concrete or asphalt cap, if necessary). We recommend a quick set concrete to provide a good surface seal with minimal set up time.

15. A proper borehole and surface seal assures that the RegenOx/ORC *Advanced* remains properly placed and prevents contaminant migration from the surface. Each borehole should be sealed immediately following RegenOx/ORC *Advanced* application to minimize RegenOx/ORC *Advanced* surfacing during the injection process. If RegenOx/ORC *Advanced* continues to "surface" up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer equilibrates and the RegenOx/ORC *Advanced* stops surfacing. If wells are used for RegenOx/ORC *Advanced* injection the injection wells and all nearby groundwater monitoring wells should be tightly capped to reduce potential for surfacing through nearby wells.

16. Periodically compare the pre- and post-injection volumes of RegenOx/ORC *Advanced* in the pump hopper using pre-marked volume levels. Volume level indicators are not on all pump hoppers. In

this case, volume level markings can be temporarily added using known amounts of water and a carpenter's grease pencil (Kiel crayon). We suggest marking the water levels in 3-gallon increments.

17. Move to the next probe point, repeating steps 1 through 17. We recommend that the next RegenOx/ORC *Advanced* injection point be as far a distance as possible within the treatment zone from the previous RegenOx/ORC *Advanced* injection point. This will further minimize RegenOx/ORC *Advanced* surfacing and short circuiting up an adjacent borehole. When possible, due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.

Pump Information

Regenesis has evaluated a number of pumps that are capable of delivering RegenOx/ORC *Advanced* to the subsurface at a sufficient pressure and volumetric rate. Although a number of pumps may be capable of delivering the RegenOx/ORC *Advanced* to the subsurface at adequate pressures and volume, each pump has a set of practical issues that make it difficult to manage in a field setting. In general, Regenesis strongly recommends using a pump with a minimum pressure rating of 200 pounds per square inch (psi) in sandy formations or 800 psi in silt, clay or weathered bedrock formations, and a minimum delivery rate of 5 gallons per minute (gpm). A lower gpm rated pump can be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a RegenOx/ORC *Advanced* injection.

Pump Cleaning

For best results, use a hot water pressure washer (150 - 170 °F or 66 - 77 °C) to clean equipment and rods periodically throughout the day. Internal pump mechanisms and hoses can be easily cleaned by circulating hot water and a biodegradable cleaner such as Simple Green through the pump and delivery hose. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

Personal Protective Equipment

Personnel working with or in areas of potential contact with RegenOx/ORC *Advanced* should be required at a minimum to be fitted with modified Level D personal protective equipment:

- Eye protection – Wear well sealed goggles or a face shield (face shield recommended for full face protection)
- Head – Hard hat when required
- Respiratory – Use dust respirator approved by NIOSH/MSA
- Hands – Wear neoprene gloves
- Feet – Wear steel toe shoes with chemical resistant soles or neoprene boots
- Clothing – Wear long sleeve shirts and long pant legs. Consider using a Tyvek® body suit, Carhartt® coverall or splash gear