DRAFT
REMEDIAL ACTION PLAN
OU-2: E STREET REMEDIATION
E and Grotto Streets Plumes
Eureka, California
RB Case No. 1NHU630

March 2015

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1.0 INTRODUCTION

This *Draft OU-2 Remedial Action Plan* ("*Draft RAP*") has been prepared by West Environmental Services & Technology, Inc., (WEST) on behalf of Norman's Dry Cleaners ("Norman's") formerly located at 2907 E Street in Eureka, California, within the E and Grotto Streets plumes ("the Site;" Figure 1-1). This *Draft RAP* presents the proposed remedial actions to address volatile organic compounds (VOCs) in soil and groundwater along the sewer line beneath E Street in Eureka, California.

This *Draft RAP* presents the cleanup for Operable Unit 2 (referred to as OU-2) of the E and Grotto Streets plumes. The Site has been separated into areas called Operable Units or OUs to facilitate the environmental cleanup for the releases of the dry cleaner solvent tetrachloroethene (PCE) and gas station related petroleum hydrocarbons. The separation of the cleanup into OUs allows each OU, or area, to proceed on its own schedule to accommodate the unique aspects of the remedial efforts.

OU-2 consists of soil and A-Zone groundwater cleanup beneath E Street. To allow time for input from the interested parties, the work on OU-2 is not anticipated to begin until June 2015. A Draft RAP for the OU-1, which consists of the soil, soil gas and shallow or A-Zone groundwater on the property at 2907 E Street, was prepared and submitted to the California Regional Water Quality Control Board – North Coast Region (Regional Water Board) in March 2015 (WEST, 2015). OU-3 consists of the deeper or B-Zone groundwater. Work on OU-3 is anticipated to begin in late-2016 following adequate time to monitor the effectiveness of the OU-1 and OU-2 remedial efforts on the B-Zone groundwater.

The *Draft RAP* includes: a summary of Site investigations; a Conceptual Site Model (CSM); data evaluation; screening of remedial technologies; and selection of a recommended remedial alternative. The recommended remedial alternative to address VOCs in soil and groundwater is Alternative No. 4 – Electrical Resistance Heating (ERH) with Institutional Controls (ICs) and

Monitoring Natural Attenuation (MNA) with Sewer Grouting. Implementation of the *Draft RAP* is being overseen by the Regional Water Board under case number 1NHU630.

The *Draft RAP* has been developed in accordance with the requirements of §300.430 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) 300 (final rule promulgated 3/8/90), as provided by relevant portions of §§ 101-121 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Regulatory guidance used in the development of this *Draft RAP* include: the United States Environmental Protection Agency's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988); and the *State Water Resources Control Board Resolution 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code 13304* (SWRCB, 1996).

1.1 BACKGROUND

Union Oil Company of California (Unocal) operated a gasoline service station at 2907 E Street from 1964 to 1979 (Regional Water Board, 2003). Operation of the service station included the use of: two 10,000-gallon gasoline underground storage tanks (USTs); one 280-gallon waste oil UST; and fuel dispenser islands. The service station ceased operations in 1979 and the fuel USTs were removed in 1980. Following modifications to the service station building, Norman's operated a dry cleaner at 2907 E Street between 1980 and 2014. Tetrachloroethene (PCE) was used in the dry cleaning process until 2005.

Investigations conducted at the Site in April 1998 revealed the presence of TPH and VOCs, including PCE in soil and groundwater at the Site. In May 2000, Unocal undertook investigation of the petroleum-retail-sales-related discharges. Norman's undertook the investigation of the dry cleaner related releases. In July 2003, the Regional Water Board issued Cleanup and Abatement Order R1-2003-088 ("*Order*") for the groundwater contamination at the Site (Regional Water Board, 2003). The *Order* required delineation of the horizontal and vertical extent of the soil and

groundwater contamination and preparation of a *Feasibility Study/Remedial Action Plan* to address the contamination.

Subsequently, more than 160 soil samples, 83 soil gas samples and 128 depth-discrete groundwater samples have been collected. In addition, 47 monitoring wells were installed and 59 sampling events have occurred. Based on an analysis of the Site investigation data, it appears that TPH was released from the USTs and PCE was released as a dense non-aqueous phase liquid (DNAPL) and has been retarded in its vertical movement by the presence of a lower permeable zone, i.e., aquitard. Borings advanced during the investigations have revealed an aquitard present at approximately 10-feet to 12-feet below ground surface, which separates the shallow groundwater (A-Zone) from the deeper groundwater (B-Zone). Laboratory analysis of samples collected from the A-Zone/B-Zone aquitard has revealed PCE up to 250,000 micrograms per kilogram (µg/kg) in soil and 20,600 micrograms per liter (µg/l) in groundwater. Sampling of B-Zone groundwater has revealed PCE up to 17,000 µg/l (MW-11B).

Soil sampling has also revealed the presence of TPH as gasoline (TPHg) up to 5,400 milligrams per kilogram (mg/kg) and the aromatic petroleum related VOC benzene up to 6,600 µg/kg in soil samples from near the former fuel USTs. Groundwater sampling from downgradient of the former USTs has revealed TPHg up to 110,000 µg/l and benzene up to 3,900 µg/l. Investigations near the location of the waste oil UST have revealed TPH as motor oil (TPHmo) up to 2,500 mg/kg in soil. Groundwater sampling from downgradient of the former service station drain line in E Street revealed TPHmo up to 3,000 µg/l.

Pursuant to the *Order*, a *Feasibility Study/Pilot Study Work Plan* ("*FS/PS Work Plan*") was submitted by Norman's in June 2007 (WEST, 2007a). The *FS/PS Work Plan* presented the proposed approach to evaluate potential remedial technologies to address the releases of TPH and VOCs at the Site. The preliminary technology screening presented in the *FS/PS Work Plan* indicated that further evaluations, i.e., pilot studies, were needed. Pilot studies were recommended for ISCO, i.e., ozone sparging of groundwater, as it was identified as a potentially cost-effective means to address dissolved-phase VOCs in groundwater downgradient of E and

Grotto Streets. SVE pilot testing was also recommended, as it is the presumptive remedy for VOCs in soil. Bench-Scale and pilot studies were also proposed for use of *in situ* chemical flushing (ISCF) as it was identified as an emerging promising technology for the cost-effective removal of DNAPL from the subsurface.

Between 2008 and 2011, SVE and ISCF pilot studies were conducted near the dry cleaner building at 2907 E Street and an ISCO pilot study was performed downgradient and west of E Street. The findings from the pilot studies indicated that SVE could be effective in removing contaminants from the vadose zone soil and ISCF was effective in removing DNAPL from the A-Zone/B-Zone aquitard. ISCO was also found to be effective in reducing dissolved-phase VOCs from B-zone groundwater when combined with vent wells and SVE.

In February 2012, WEST presented alternatives to address the VOCs and petroleum hydrocarbons at the Site in a *Draft Feasibility Study Remedial Action Plan* (*Draft FSRAP*). After review of the *Draft FSRAP*, the Regional Water Board submitted a letter requesting modifications and clarification to WEST's *Draft FSRAP* (Regional Water Board, 2012). A *Revised Draft FSRAP* was submitted in August 2012, which incorporated changes in response to the Regional Water Board comments (WEST, 2012).

Following input from the local community on the scope of the August 2012 *Revised Draft FSRAP*, a stakeholders working group meeting was held in December 2014. During the meeting, representatives of the community provided comments and expressed concerns regarding the potential impacts of future cleanup work. Some local businesses expressed an interest in having work within E Street (OU-2) be conducted at night to minimize disruptions to their operations. The local businesses also expressed a preference for contractors working on the cleanup to use local hotels, restaurants and suppliers, to the extent practical. Additional stakeholder working group meetings will be held following the issuance of the *Draft OU-2 RAP*.

This *Draft RAP* presents the proposed remedial actions to address chemicals in soil and groundwater beneath E Street as well as address the conditions of the sanitary sewer main. This

Draft RAP also includes: a summary of investigations: a CSM; identification of cleanup goals; screening of remedial action technologies; identification and evaluation of potential remedial alternatives. A comparative analysis of the alternatives using United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (CalEPA) evaluation criteria demonstrates that Alternative 4 – ERH with Institutional Controls and MNA with Sewer Grouting is the most appropriate option for the OU-2 remediation.

1.2 DRAFT RAP ORGANIZATION

The *Draft RAP* has been organized as follows:

- Site Description, including a summary of the history of the Site and associated chemical use (Section 2.0);
- Summary of Investigations, including a description of the investigations and associated pilot studies (Section 3.0);
- Data Evaluation, including an updated CSM and human health risk assessment (Section 4.0);
- Remedial Action Objectives, including an analysis of applicable regulatory requirements and development of PRGs (Section 5.0);
- Feasibility Study, including the identification and screening of appropriate remedial technologies and the assemblage of remedial action alternatives (Section 6.0)
- Evaluation of Remedial Action Alternatives, including an analysis using the NCP criteria (Section 7.0); and
- Implementation Plan, which describes the actions to implement the preferred remedial alternative (Section 8.0).

2.0 SITE DESCRIPTION

The gently sloping Site is located near the intersection of E Street and Grotto Street in Eureka, Humboldt County, California, at an elevation of approximately 130-feet above Mean Sea Level (MSL; Figure 2-1). Features at the Site include: the former Unocal service station building, which was converted for the commercial dry cleaning operations; asphalt paved parking areas; the south-north flowing sanitary sewer main within E Street; sewer manhole within the E Street and Grotto Street intersection; and residential neighborhoods to the west. The Site is bounded by: Henderson Street to the north; F Street to the east; a retail shopping center to the south; and Lowell Street to the west (Figure 2-1).

2.1 REGIONAL GEOLOGIC AND HYDROGEOLOGIC SETTING

The regional geology near the Site is composed of marine terrace deposits of Holocene dune sands and alluvium, the Pleistocene Hookton Formation, the Wildcat Series and the Franciscan formation rocks within the Coast Ranges Geomorphic Province (DWR, 2004). The Holocene dune sands are composed of beach and dune sands with thickness greater than 100-feet. The Holocene alluvial deposits are composed of clays, sands and gravels, and are fluvial in origin. The Hookton Formation is present underlying the alluvial deposits and is composed of loosely consolidated clays, silts sands and gravels with inter-fingering of marine clays. The marine and non-marine Wildcat Series deposits underlay the Hookton Formation and are composed of five formations, which consist of sandstones, marine siltstones and claystones. The Franciscan formation consists of greywacke, shale, siltstone, basalt and chert with intrusions of basalt, serpentine and gabbro.

Faults in the vicinity of the Site include the Freshwater Fault, which runs along the western side of the Coastal Ranges to the east of Eureka and the Little Salmon Fault, which extends from the Pacific Ocean south of Eureka. The Freshwater Fault disrupts the Cretaceous-Tertiary marine sediments to the west and the Franciscan formation to the east (W&K, 2001).

The Site is located within the Eureka Plain Groundwater Basin (DWR, 2004). The Eureka Plain Groundwater Basin is bounded by the Little Salmon Fault to the south, Humboldt Bay and Arcata Bay to the west-northwest; and by the Wildcat Series deposits to the east. Groundwater within the Eureka Plain Groundwater Basin is located within the Hookton Formation and to a lesser extent within the Holocene dune and beach sands. Groundwater occurs as an unconfined aquifer within the dune and alluvial deposits. Regional groundwater flow near the Site is reported to be in a northwesterly direction (WEST, 2008a).

2.1.1 Municipal Drinking Water

The groundwater in the City of Eureka (City) is not used as the municipal drinking water supply. Municipal drinking water is supplied by the Humboldt Bay Municipal Water District from groundwater supply wells within the Mad River located northeast of Arcata, California (City of Eureka, 2006). The Humboldt Bay Municipal Water District groundwater supply wells draw groundwater from depths of approximately 60-feet to 90-feet below the riverbed of the Mad River (City of Eureka, 2006). The Humboldt Bay Municipal Water District delivers the groundwater to the City's water treatment plant for chlorination, fluoridation and then distribution to its citizens. A summary of the groundwater beneficial use designations is included in Section 4.2.5 of this *Draft RAP*.

2.1.2 Private Water Supply Wells

In May 2002, SounPacific Environmental Services (SounPacific), on behalf of Norman's, conducted a study to identify potentially threatened private water supply wells. The study included: a door-to-door search for domestic and/or industrial wells; identification of surface water bodies; and identification of springs within a 1,000-foot radius of the Site. The survey was conducted within the City of Eureka public utility service district where property owners are required to be on City water; however, properties constructed prior to the 1950s were considered as potential candidates for domestic wells (SounPacific, 2002).

Results of the study revealed four domestic wells that were not in use located upgradient of the Site. In addition, four monitoring wells were located at a Beacon gas station located approximately 500-feet south and cross-gradient of the Site.

2.2 SURFACE WATER

Water bodies near the Site include Humboldt Bay is located approximately 1.5 miles to the west. An unnamed creek is located approximately 0.4 miles southwest of the Site. The creek drains to Martin Slough, which flows to the south and west and drains to the mouth of the Elk River where it discharges to Humboldt Bay. During the 2002 SounPacific investigations, no surface water bodies or springs were discovered in the study area, although the beginning of a tributary that drains to Humboldt Bay was identified outside of the 1,000-foot study area radius near Lowell Street and Williams Street.

2.3 SITE GEOLOGY

The geology at the Site consists of unconsolidated and interbedded coarse-grained and fine-grained units, which overlie cemented sands (Figure 2-2). The fine-grained units are primarily composed of silts, sandy silts, clayey silts and peat. The coarse-grained units are composed of silty sands/sands. An approximately two-foot to seven-foot thick silt/clay layer (A-Zone/B-Zone aquitard) separates the coarse-grained units between approximately one-foot and 12-feet below ground surface. The top of A-Zone/B-Zone aquitard was encountered near the ground surface within borings advanced along the eastern edge of the Site. The A-Zone coarse-grained water bearing unit does not appear to be present along the eastern edge of the Site. The top of the A-Zone/B-Zone aquitard was encountered at approximately nine-feet below ground surface in borings advanced west of the building at the Site.

Investigations have revealed an approximately 15-foot to 20-foot thick sand/silty sand zone that extends beneath the silt/clay layer to a depth between approximately 30-feet and 40-feet below ground surface. Underlying the sand/silty sand zone, interbedded fine-grained material

composed of silts, sandy silts/silty sands and clays were encountered between approximately 40-feet and 70-feet below ground surface. Cemented sands were also encountered in borings underlying the unconsolidated coarse-grained and fine-grained units.

2.4 SITE HYDROGEOLOGY

The hydrogeology at the Site has been characterized as being comprised of two water-bearing zones: (1) the "shallow aquifer " also referred to as "A-Zone;" and (2) the "deep aquifer," also referred to as "B-Zone" (ENSR, 2007). The A-Zone is unconfined and extends from approximately four-feet below ground surface to approximately nine-feet below ground surface near E and Grotto Streets. Hydraulic testing of the A-Zone revealed an average hydraulic conductivity of 1.1E-04 centimeters per second (cm/sec; WEST, 2012). The A-Zone is separated from the B-Zone by a fine-grained low permeability silty clay/sandy silt aquitard. Testing of the aquitard material has revealed hydraulic conductivities ranging between 1.1E-07 cm/sec to 4.8E-09 cm/sec.

The B-Zone aquifer is mainly composed of a 15-foot to 20-foot thick sand/silty sand zone, which extends from the base of the silt/sandy silt aquitard to approximately 30-feet to 40-feet below ground surface. The basal contact of the B-Zone aquifer is located approximately 30-feet to 40-feet below ground surface and is composed of interbedded fine-grained materials including silts, sandy silts/silty sands and clays (Figure 2-2). Hydraulic testing of the B-Zone revealed an average hydraulic conductivity of 2.9E-03 cm/sec (WEST, 2012).

2.4.1 Groundwater Elevation and Flow Direction

Depth to water in the A-Zone ranges seasonally from approximately 4.35-feet below ground surface (MW-8A in December 2010) to approximately 7.53-feet below ground surface (MW-9A in May 2007). During 13 of the preceding 16 quarterly groundwater-monitoring events groundwater flow direction in the A-Zone aquifer was reported to the west to north-northwest with a hydraulic gradient ranging from 0.005 to 0.02-feet per foot (Table 2-1). During the

Second Quarter 2014, the groundwater elevation in the A-Zone ranged from 128.45-feet above MSL at KMW-21A to 130.76-feet above MSL at MW-13A (Appendix A).

Depth to the potentiometric groundwater surface in the confined B-Zone has ranged from 3.50-feet below ground surface (MW-17B in March 2011) to 14.31-feet below ground surface (MW-27BD in January 2014). Groundwater monitoring in the B-Zone aquifer has revealed flow to the northwest during 13 of the preceding 17 groundwater-monitoring events with a hydraulic gradient ranging from 0.006- to 0.013-feet per foot (Table 2-1). During the Second Quarter 2014, the groundwater elevation in the B-Zone ranged from 124.73-feet above MSL at MW-11B to 128.26-feet above MSL at KMW-14B (Appendix A). A summary of groundwater elevations and horizontal flow gradients and directions are presented in Table 2-1.

Groundwater monitoring has revealed a seasonally varying vertical downward hydraulic gradient between the A-Zone and B-Zone. Hydraulic gradients have varied up to 0.67-feet per foot between paired monitoring wells MW-9A and MW-9B. Similar hydraulic gradients have been observed in: paired monitoring wells MW-8A and MW-8B (up to 0.60-feet per foot); paired monitoring wells MW-10A and MW-10B (up to 0.57-feet per foot); and paired monitoring wells MW-11A and MW-11B (up to 0.52-feet per foot). The depth to groundwater measurements, groundwater elevations, hydraulic gradient, and groundwater flow direction are summarized in Table 2-1. The groundwater elevations, flow direction and gradient are depicted on Figures 2-3 and 2-4 and in Appendix A.

2.5 HISTORICAL SITE USE

2.5.1 Residential

The 1920 Sanborn Fire Insurance Map depicts three residences on the property at 2907 E Street, formerly 2901 through 2917 E Street. A 1947 oblique aerial photograph also depicts three residential structures on the property (Shuster, 1947). A 1964 property survey depicts two residential dwellings on the property at 2907 E Street (W&K, 1964). A drawing of the property

prepared in 1966 depicted three sewer laterals draining the former locations of the residential dwellings (Parker Engineering, 1966).

2.5.2 Former Gasoline Service Station Operations

From 1964 to 1979, a Unocal gasoline service station operated on the southeast corner of E Street and Grotto Street portion of the Site. Facilities utilized by the service station included: a single story service building with two repair bays; two 10,000-gallon gasoline USTs; one 280-gallon waste oil UST; fuel dispenser islands; and a grease interceptor. The grease interceptor was installed in the "lubrication room," and provided collection of liquid wastes from the floor drain installed near the hydraulic hoists (Parker Engineering, 1966). The gasoline USTs and dispenser islands were removed in 1980 following the closure of the service station. A 1966 drawing depicts the installation of new sewer piping around the gasoline USTs to facilitate drainage from the lavatories and the work sink located in the lubrication room (Parker, 1966).

2.5.3 Historical Chemical Use

Service station operations included the use of: gasoline; greases; lubricating oils and solvents (Union Oil, 1979). Subsequently, the service station building was retrofitted in 1980 for use as a commercial dry cleaner. Dry cleaner operations at the Site included the use of PCE until 2005. During 2005 and early-2006, dry cleaning was not conducted at the Site. In mid-2006, the dry cleaner resumed on-site dry cleaning using a silicon-based chemical. From 1981 to 1982, trichlorotrifluoroethane (Freon 113) was used for drapery cleaning. In addition, various proprietary "spotting chemicals" have been used in removing stains from fabrics, including Picrin (TCE), Pyratex (glycol ether) and Jinx Ink (isopropyl acetate).

From 1980 to 1984, waste products containing PCE were stored in areas on the east side of the building for off-Site disposal. Since 1984, waste products from dry cleaning operations have been transported and recycled by Safety Kleen (Regional Water Board, 2003).

2.6 CURRENT USE OF NEIGHBORING PROPERTIES

The neighboring properties are currently used for commercial purposes, including a restaurant, bar, pharmacy and post office.

3.0 SUMMARY OF INVESTIGATIONS

Soil, soil gas and groundwater investigations have been conducted at the Site since 1998. Pilot studies were also conducted between August 2008 and December 2011. The pilot studies were conducted to evaluate the potential remedial technologies including: ISCF; ISCO and SVE. A summary of the investigations and associated findings is presented below.

3.1 SOIL INVESTIGATIONS

Soil investigations were conducted at the Site between 1998 and 2011 at the locations depicted on Figure 3-1. Investigations have been conducted on behalf of Norman's by Clearwater, SounPacific, Winzler & Kelly (W&K), Calibre Systems, Inc. (Calibre) and WEST. Unocal has retained Environmental Resolutions, Inc. (ERI), ENSR Corporation (ENSR) and Conestoga-Rovers & Associates (CRA) to conduct soil and groundwater investigations and groundwater monitoring at the Site. Ground Zero Analysis (GZA) has conducted investigations on behalf of the City. A summary of the findings from the investigations is presented below. The soil analytical data are summarized in Table 3-1. The soil analytical data from the samples collected along E Street are depicted on Figure 3-1.

3.1.1 Clearwater – 1998

In 1998, on behalf of Norman's, Clearwater advanced seven borings, B-1 to B-7, at the Site for collection of soil and groundwater samples (Clearwater, 1998). The six soil samples were collected from 5.5-feet below ground surface. Laboratory analysis of the soil samples revealed PCE in one soil sample collected from boring B-7 at 90 µg/kg.

3.1.2 W&K – 2000

In 2000, on behalf of Norman's, W&K collected soil samples during the installation of groundwater-monitoring wells MW-2 and MW-3. PCE was reported up to 250,000 µg/kg in soil

samples collected from the boring for monitoring well MW-3 at 5.5-feet below ground surface. The soil sample from 10-feet below ground surface from the monitoring well MW-3 boring was reported to contain PCE at 1,700 µg/kg; the samples collected from 15.5-feet and 19-feet below ground surface did not contain PCE above the laboratory-reporting limit.

3.1.3 ERI – 2000 to 2003

In 2000, on behalf of Unocal, ERI conducted investigation activities, which included: installation of groundwater-monitoring well MW-1. Monitoring well MW-1 was constructed to a depth of 25-feet below ground surface with a well screen extending from four-feet to 25-feet below ground surface. Soil samples were collected from the boring advanced for the installation of monitoring well MW-1 at five-feet and 10-feet below ground surface. A composite soil sample, S-SPI-(1-4), was collected from the soil stockpile generated from drilling activities.

In 2002 and 2003, ERI collected soil samples during the installation of groundwater-monitoring wells MW-4, MW-5, MW-6, MW-7, MW-8B, MW-9B and MW-10B. The ERI investigations revealed the petroleum related VOCs ethyl benzene up to 6,200 µg/kg (MW-8B), xylenes up to 35,700 µg/kg and trimethylbenzenes (TMB) up to 28,300 µg/kg in the soil samples from monitoring well MW-8B boring at five-feet below ground surface. PCE was reported to be present in soil samples collected from the A-Zone/B-Zone aquitard at 470 µg/kg (MW-9B).

3.1.4 Calibre – 2006

In 2006, Calibre collected seven soil samples from borings SP-1 to SP-7 advanced at 2907 E Street from a depth of approximately four-feet below ground surface. Four borings, SP-1, SP-2, SP-5 and SP-6 were advanced on the eastern side of the building at 2907 E Street. Three of the borings, SP-3, SP-4 and SP-7, were advanced on the western side of the building. Laboratory analysis of the soil samples revealed PCE up to 410 µg/kg in the soil sample collected from boring SP-2.

3.1.5 WEST – 2008

On behalf of Norman's, WEST advanced 25 borings in February 2008 (A-1 to A-3, B-1 to B-3, C-1, C-2, C-3, D-1, D-3 to D-5, 15B/E-1, E-2 to E-7, E-9, E-10, and G1 to G-4) and three borings in June 2008 (D-6 to D-8) for collection of soil samples (Figure 3-1). A grid pattern of borings was used west of the building at 2907 E Street. A line of borings was advanced along the alignment of the sewer main in E Street. The borings were advanced between four- and 20-feet below ground surface.

Laboratory analysis of the soil samples revealed the maximum concentration of PCE at 31,600 μg/kg in the sample collected from the west side of the building at 2907 E Street from boring C-2 at 10-feet below ground surface. Laboratory analysis of the other soil samples collected from the west side of the building at 2907 E Street revealed PCE ranging from 206 μg/kg to 2,310 μg/kg. Trichloroethene (TCE) and dichloroethene (DCE) were reported in the soil sample from boring A-1 at 9.5-feet at 3.48 μg/kg and 13.9 μg/kg, respectively. A summary of the analytical results is presented in Table 3-1.

The second highest concentration of PCE in soil samples was reported at 22,000 μg/kg in the sample from five-feet below ground surface collected in boring D-8 advanced on the east side of the building at 2907 E Street. PCE in soil samples from other borings advanced on the east side of the building were reported to range from 1.63 μg/kg to 218 μg/kg.

Laboratory analysis revealed the maximum concentration of TPHmo at 79.3 mg/kg and TPH as diesel (TPHd) at 20.0 mg/kg in the sample from boring D-7 at five-feet below ground surface. Soil samples from boring D-8 were reported to also contain TPHmo at 40.2 mg/kg in the sample collected at five-feet below ground surface. The sample from boring D-6 collected at 10-feet below ground surface was reported to contain TPHmo at 25.4 mg/kg.

Laboratory analysis of samples collected from borings advanced in E Street revealed PCE at 5,040 μg/kg and 4,050 μg/kg, in samples from borings E-9 and E-10 at 9.5-feet below ground

surface, respectively. Laboratory analysis of soil samples collected at nine-feet below ground surface in borings E-5 and E-6 were reported to contain PCE at 823 µg/kg and 257 µg/kg, respectively. Laboratory analysis of soil samples collected from boring E-3 at nine-feet below ground surface revealed PCE at 8.56 µg/kg, benzene at 16.6 µg/kg and xylenes at 2.40 µg/kg.

3.1.6 ENSR - 2008

Between March and June 2008, ENSR, on behalf of Unocal, advanced 18 borings (GP-1 to GP-18; Figure 3-1) between five-feet and 20-feet below ground surface for collection of 88 soil samples at the Site. Nine of the borings, GP-1 to GP-9, were advanced on the western side of the building. Two borings, GP-10 and GP-16, were advanced north of the building. Seven borings, GP-11 to GP-15, GP-17, and GP-18, were advanced on the eastern side of the building.

Laboratory analysis of the soil samples analyzed for VOCs revealed: PCE up to 24,000 µg/kg (GP-12; collected at 12.5-feet below ground surface); TCE up to 900 µg/kg (GP 12; collected at 16-feet below ground surface); DCE up to 56 µg/kg (GP-12; collected at six-feet below ground surface); and 1,1,1-trichloroethane (TCA) up to 8.0 µg/kg (GP-12; collected at 12.5-feet below ground surface). Laboratory analysis of the soil samples collected from boring GP-8 at six-feet below ground surface revealed the highest concentrations of TPHg and the petroleum related VOCs, i.e., benzene, toluene, ethyl benzene, xylenes and TMB at 5,400 mg/kg, 6,600 µg/kg, 140,000 µg/kg, 110,000 µg/kg, 550,000 µg/kg, and 240,000 µg/kg, respectively. TPHmo was reported up to 2,500 mg/kg in the sample collected from boring GP-17 at five-feet below ground surface.

ENSR also advanced three borings (GT-1 to GT-3) for the collection of 13 soil samples for geotechnical testing. The soil samples were collected from six-feet to 17.5-feet below ground surface and included the collection of A-Zone soil, A-Zone/B-Zone aquitard and B-Zone soil. The geotechnical characterization revealed that the A-Zone soil was predominantly silty sand (SM) and poorly graded sand (SP), with less than 15 percent fines and a hydraulic conductivity ranging from 1.49E-03 cm/sec to 3.40E-05 cm/sec as determined using ASTM D5084C.

Testing of the A-Zone/B-Zone aquitard material revealed predominantly clay (CL) with greater than 70 percent fines and hydraulic conductivities ranging from 2.8E-08 cm/sec to 4.75E-09 cm/sec. The B-Zone soil was characterized as predominantly silty sands with hydraulic conductivities ranging from 3.03E-04 cm/sec to 4.55E-09 cm/sec (Table 3-2).

3.1.7 WEST - 2009

In February 2009, WEST advanced three borings (C-2A, C-2B, and C-2C) for collection of soil samples for use in the ISCF bench-scale testing (Figure 3-1). The borings were advanced near boring C-2. Laboratory analysis of the soil samples revealed PCE up to 101,000 µg/kg in the sample collected at 11-feet below ground surface from boring C-2B.

3.1.8 GZA - 2011

In October 2011, GZA, on behalf of the City, advanced five borings, HP-7, HP-8, HP-9, HP-11 and HP-12, for the collection of soil and groundwater samples within the E Grotto Streets (Figure 3-1). The soil samples were collected from the A-Zone/B-Zone aquitard and along the eastside of E Street at approximately 9.5-feet below ground surface (HP-7, HP-8 and HP-9) and from the B-Zone sediments at approximately 33-feet below ground surface downgradient of the E and Grotto Streets intersection (HP-12).

PCE was reported to be present up to 4,100 µg/kg (HP-7) in the soil samples collected from the A-Zone/B-Zone aquitard. TPHmo and benzene were also reported to be present up to 48 mg/kg and 290 µg/kg, respectively, in the soil sample collected from boring HP-9 (Table 3-1). However, the analytical laboratory noted that the sample did “not have the peak pattern of fresh motor oil…[and] the result represents the amount of material in the motor oil range.” PCE was not reported to be present in the soil sample collected from boring HP-12 above the laboratory-reporting limit.

3.2 SOIL GAS INVESTIGATIONS

In April 2007, seven soil gas samples, W-1 to W-5, W-10 and W-11 were collected at 2907 E Street. The soil gas samples were collected near the: east side of the building (W-1); north side of the building (W-2); northwest corner of the property (W-3); near the grease interceptor drain line (W-4); sewer lateral (W-5); and along the west side of the building (W-10 and W-11).

In February 2008, soil gas samples were collected from three borings (A-1, W-1A and W-2A). Laboratory analysis of the soil gas sample collected from boring W-1A, advanced south of the building at 2907 E Street revealed PCE at 1,980,000 micrograms per cubic meter ($\mu g/m^3$) and DCE at 33,400 $\mu g/m^3$. Laboratory analysis of the soil gas sample collected from boring A-1, located in the parking area at 2907 E Street revealed PCE at 2,910 $\mu g/m^3$. The soil gas sample collected from boring W-2A, located north of the building at 2907 E Street was reported to contain PCE at 245 $\mu g/m^3$ and toluene at 19.6 $\mu g/m^3$. Other VOCs were not reported to be present above their respective laboratory-reporting limits. A summary of the soil gas sample analytical results is presented in Table 3-3.

Following collection of the soil gas samples, intrinsic air permeability testing of the soil was conducted. The soil permeability was estimated at approximately 1.8E-07 centimeters squared (WEST, 2007b).

In December 2008, soil gas samples were collected from three borings (W-12, W-13 and W-14) along the west side of E Street (Figure 3-1). Laboratory analysis of the soil gas sample collected from borings W-12 to W-14 revealed: PCE up to 127 $\mu g/m^3$ (W-12); TCM up to 60 $\mu g/m^3$ (W-benzene up to 21.1 $\mu g/m^3$ (W-13); and toluene up to 24.7 $\mu g/m^3$ (W-13). Other VOCs were not reported to be present above their respective laboratory-reporting limits (Table 3-3).

In October 2013, GZA advanced 13 borings between 3.5- feet and 4.5-feet below ground surface for collection of soil gas samples (GZA, 2013a). Eight sample locations (W-15, W-17, W-18, W-20, W-21, W-23, W-24, and W-26) were advanced as temporary soil vapor wells and five (W-

16, W-19, W-22, W-25, and W-27) were installed as permanent soil vapor monitoring wells within the commercial/residential community to the west of 2907 E Street (Figure 3-1).

Sampling of the vapor probes located along E Street has revealed PCE ranging from less than the laboratory-reporting limit of 7.8 $\mu g/m^3$ (W-15) to 480 $\mu g/m^3$ (W-16). The only other VOC detected in soil gas samples collected along E Street was benzene at up to 21.1 $\mu g/m^3$ (W-13).

Sampling conducted in the alley between D and E Streets revealed that PCE was the only VOC present at concentrations ranging from less than the laboratory-reporting limit of 7.2 $\mu g/m^3$ (W-18) to 32 $\mu g/m^3$ (W-19). Samples collected from along D Street and the alley between D and Williams Streets did not reveal the presence of VOCs, including PCE above the laboratory-reporting limits. The soil gas sample collected along Henderson Street revealed PCE at 100 $\mu g/m^3$ in October 2013 and at 69 $\mu g/m^3$ (W-27) in February 2014.

Sampling of the vapor well W-16 conducted in February 2014 revealed PCE up to 180 $\mu g/m^3$. Other VOCs were not detected above their respective laboratory-reporting limits during the February 2014 sampling event. A summary of the soil gas sample analytical results is presented in Table 3-3. The soil gas analytical data from the samples collected along E Street are depicted on Figure 3-2.

3.3 MEMBRANE INTERFACE PROBE (MIP) INVESTIGATION

Twenty-eight borings were advanced using a Membrane Interface Probe (MIP) in February 2008 operated by Fisch Drilling of Hydesville, California, a California C-57 licensed well driller contractor. Ten borings (15B/E-1 to E-10) were advanced along E Street. Four borings were advanced along Grotto Street, G1 to G-4, near the intersection with E Street. Fourteen borings were advanced in the parking area and behind the building at 2907 E Street, A-1 to A-3, B-1, C-1, C-3, D-1, D-3 to D-5, E-11, E-12, G-5 and G-6. The MIP borings were advanced to the basal contact between the A-Zone and the A/B-Zone aquitard.

Electron Capture Detector (ECD) readings up to 1,000,000 microvolts (μV) were reported from boring D-4, advanced on the east side of the building at 2907 E Street, from approximately two-feet to four-feet below ground surface. The ECD readings of approximately 1,000,000 μV corresponded with electrical conductivity (EC) readings ranging from 2-milliSiemens per meter (mS/m) to 20 mS/m. On the west of the building at 2907 E Street, ECD readings up to 1,000,000 μV were reported in soil at approximately nine-feet below ground surface. The 1,000,000 μV readings corresponded with an increase of EC readings from 10 mS/m to 50 mS/m.

Fourteen MIP borings were advanced in E Street. The maximum reading on the ECD was 970,000 μV at 7.9-feet below ground surface in boring E-10. The EC reading from boring E-10 increased from 10 mS/m to 48 mS/m between 8.2-feet and nine-feet below ground surface. MIP readings from boring E-9 revealed a maximum ECD reading of 620,000 μV at eight-feet below ground surface (WEST, 2008b)

3.4 GROUNDWATER INVESTIGATIONS

Groundwater investigations have been conducted at the Site since 1998. The investigations have included the collection of depth discrete groundwater samples, installation and sampling of groundwater monitoring wells and pilot testing of groundwater treatment technologies. A summary of the groundwater investigation findings is presented below. A summary of the groundwater sample analytical results is presented in Table 3-4. The groundwater analytical data from the samples collected within the A-Zone along E Street are depicted on Figure 3-3.

3.4.1 Clearwater – 1998

In 1998, on behalf of Norman's, Clearwater advanced seven borings, B-1 to B-7, at the Site for collection of samples (Clearwater, 1998). The groundwater samples were collected from five-feet below ground surface. Laboratory analysis of the groundwater samples revealed: PCE up to 880 μg/l (B-7); and TPHg up to 9,500 μg/l; benzene up to 75 μg/l; toluene up to 45 μg/l; ethyl benzene up to 590 μg/l and xylenes up to 1,300 μg/l in the sample collected from boring B-1.

3.4.2 Calibre – 2006

Calibre advanced 14 borings in November 2006 to characterize A-Zone groundwater (SP-1 to SP-7 and SP-14); and A-Zone and B-Zone groundwater (SP-9 to SP-13 and SP-15). Eight groundwater samples were collected from borings advanced at 2907 E Street (SP-1 to SP-7 and SP-14) and six groundwater samples were collected from borings SP-9 to SP-13 and SP-15 in the A-Zone. A summary of the groundwater sample analytical results is presented in Table 3-4.

Laboratory analysis of the groundwater samples, SP-1 to SP-7 and SP-14, collected from the A-Zone revealed the maximum concentration of PCE at 10,000 µg/l in the sample collected from boring SP-4 located along the western side of the building. The six off-Site groundwater samples, SP-9 to SP-13 and SP-15, collected from the A-Zone revealed the maximum concentration of PCE at 2.4 µg/l in the sample collected from boring SP-12 located along the western side of E Street.

Six B-Zone groundwater samples were collected from borings SP-9 to SP-13 and SP-15 at approximately 14-feet below ground surface (Calibre, 2007). Laboratory analysis of the six off-Site groundwater samples, SP-9 to SP-13 and SP-15, collected from the B-Zone revealed the maximum concentration of PCE at 1,100 µg/l in the sample collected from boring SP-10 located along the southern side of Grotto Street between D Street and E Street.

3.4.3 WEST - 2007

In April 2007, WEST advanced four borings, W-6 to W-9, downgradient of the intersection of E and Grotto Streets (Figure 2-1). Eleven multi-depth discrete groundwater samples were collected between approximately 15-feet below ground surface and 52-feet below ground surface from the four borings.

Laboratory analysis of groundwater samples collected from boring W-6, located near the intersection of E and Grotto Streets, between 15-feet and 52-feet below ground surface revealed

PCE at: 10,300 µg/l at 15-feet below ground surface; and 533 µg/l in the sample collected at approximately 30-feet below ground surface. PCE was not reported above the laboratory-reporting limit of 0.500 µg/l in the sample collected below the basal contact at approximately 52-feet below ground surface. Laboratory analysis of the groundwater samples collected from downgradient boring W-9, located on Lowell Street approximately 600-feet downgradient from boring W-6, revealed PCE at 136 µg/l in the sample collected at 30-feet below ground surface.

In October 2007, nine multi-depth discrete groundwater samples were collected between approximately 15-feet below ground surface and 30-feet below ground surface from three borings advanced on Williams Street (W-12 and W-14) and B Street (W-13 (Figure 2-1). Laboratory analysis of the groundwater samples collected from boring W-12, advanced to the north of the sample location W-8 on Williams Street, revealed PCE at 59.8 µg/l at 22-feet below ground surface and 50.3 µg/l at 30-feet below ground surface. Laboratory analysis of the sample collected from boring W-12 at 15-feet below ground surface did not reveal the presence of PCE above the laboratory-reporting limit of 0.500 µg/l. Laboratory analysis of the groundwater samples collected from boring W-13, advanced in B Street did not reveal the presence of PCE above the laboratory-reporting limit of 0.500 µg/l at 15-feet, 22-feet and 30-feet below ground surface.

Laboratory analysis of the groundwater samples collected from boring W-14, advanced south of W-8 near the intersection of Grotto and Williams Streets revealed PCE at 138 µg/l at 22-feet below ground surface and 43.7 µg/l at 30-feet below ground surface. Laboratory analysis of the groundwater samples collected from boring W-14 at 15-feet below ground surface did not reveal the presence of PCE above the laboratory-reporting limit of 0.500 µg/l

3.4.4 WEST – 2008

In February, April and June 2008, WEST collected groundwater samples from 39 borings, A-1 to A-3, B-1 to B-3, C-1 to C-3, D-6, E-2 to E-22, G-1 to G-6, 15A and 15B/E-1. A grid pattern of

borings was used west of the building at 2907 E Street. A line of borings was advanced along the alignment of the sewer main in E Street. The borings were advanced between 9.5- and 30-feet below ground surface.

Laboratory analysis of the groundwater samples revealed the maximum concentration of PCE at 20,600 µg/l in the sample collected at 10-feet below ground surface in boring B-1, advanced on the west side of the building at 2907 E Street. Laboratory analysis of groundwater samples collected from borings advanced near boring B-1 revealed PCE ranging from 1,890 µg/l to 8,800 µg/l; TCE up to 49.6 µg/l; and DCE up to 54.6 µg/l. Laboratory analysis of the groundwater sample collected from boring 15A at 11.5-feet below ground surface revealed PCE up to 5,610 µg/l. Depth discrete groundwater samples from the northwest portion of the property at 2907 E Street revealed PCE in the A-Zone up to 2.52 µg/l and in the B-Zone up to 2.36 µg/l.

The maximum concentration of PCE in groundwater beneath E Street was reported in the B-Zone groundwater sample collected from boring E-19 at 16-feet below ground surface at 4,690 µg/l. The groundwater sample collected from 10-feet below ground surface in boring E-19 was reported to contain PCE at 125 µg/l; and the sample from 25-feet below ground surface in boring E-19 was reported to contain PCE at 0.570 µg/l.

Laboratory analysis of the groundwater sample collected from boring E-9 (located to the south of E-19) at 9.5-feet below ground surface revealed PCE at 911 µg/l; TCE at 58.3 µg/l; DCE at 610.8 µg/l; and chloroethene (CE) at 16.0 µg/l. PCE in the groundwater sample from boring E-10 was reported at 4,290 µg/l in the sample from 9.5-feet below ground surface.

Groundwater samples from borings E-15 and E-16, advanced near the intersection of E and Grotto Streets were reported to contain PCE at 2,300 µg/l at 12-feet below ground surface and 2,210 µg/l at 13-feet below ground surface, respectively. Laboratory analysis of groundwater samples collected from boring E-21 revealed PCE at: 1,150 µg/l at 15-feet below ground surface; 1.69 µg/l at 21-feet below ground surface; and below the laboratory-reporting limit in the

samples from 10-feet and 30-feet below ground surface. A summary of the groundwater analytical results is presented in Table 3-4.

3.4.5 GZA – 2011

In October 2011, GZA, on behalf of the City, advanced five borings HP-7, HP-8, HP-9, HP-11 and HP-12 for the collection of groundwater samples from the A-Zone and B-Zone aquifers (Figure 3-1). Groundwater samples were collected between approximately seven-feet and 9.5-feet below ground surface within the A-Zone near the A-Zone/B-Zone aquitard. Laboratory analysis of the groundwater samples from A-Zone revealed PCE up to 530 µg/l, TCE up to 1,600 µg/l and chemicals in the TPHmo range up to 3,000 µg/l in the sample from boring HP-7 (Table 3-4). However, the analytical laboratory noted that the sample did "not have the peak pattern of fresh motor oil…[and] the result represents the amount of material in the motor oil range." Benzene was also reported to be present up to 3,900 µg/l in the sample collected from boring HP-9. In addition, the analytical laboratory reported the presence of chemicals in the TPHg range, based on analysis using USEPA Method 8260B. However, the laboratory noted that the "sample does not present a peak pattern consistent with gasoline."

Multi-depth discrete groundwater samples were also collected from the borings between 13-feet and 34-feet below ground surface within the B-Zone. Laboratory analysis of the groundwater samples collected between 13-feet and 15-feet below ground surface were reported to contain PCE up to 9,500 µg/l in the sample from boring HP-7 located along E Street and up to 7,000 µg/l in the sample collected downgradient of E and Grotto Streets intersection from boring HP-11. Chemicals in the TPHmo range were also reported in the groundwater samples at 1,600 µg/l (HP-8) and at 2,300 µg/l (HP-11). However, the analytical laboratory noted that the sample did "not have the peak pattern of fresh motor oil…[and] the result represents the amount of material in the motor oil range." In addition, the analytical laboratory reported the presence of chemicals in the TPHg range (up to 8,400 µg/l), based on analysis using USEPA Method 8260B. However, the laboratory noted that the "sample does not present a peak pattern consistent with gasoline."

The groundwater samples collected between approximately 20-feet to 25-feet below ground surface by GZA were reported to contain PCE up to 1,800 µg/l (HP-9). Chemicals in the TPHmo range were also reported in the samples collected between 20-feet and 25-feet below ground surface at 1,400 µg/l (HP-7); 500 µg/l (HP-8) and 500 µg/l (HP-11). However, the analytical laboratory noted that the sample did "not have the peak pattern of fresh motor oil…[and] the result represents the amount of material in the motor oil range." The groundwater samples collected by GZA between approximately 30-feet and 34-feet below ground surface were reported to contain PCE at 9.4 µg/l (HP-11) and 89 µg/l (HP-12; Table 3-4).

3.4.6 GZA – 2013

Between September and October 2013, GZA, on behalf of the City, advanced eight borings HPW-15, HPW-17, HPW-18, HPW-20 to HPW-23, and HPW-25 for the collection of groundwater samples (Figure 2-1). Groundwater samples were collected between approximately eight-feet and 17-feet below ground surface (GZA, 2013a). Laboratory analysis of the groundwater samples revealed PCE up to 680 µg/l (HPW-17) and TCM up to 11 µg/l (HPW-20). A summary of the groundwater sample analytical results is presented in Table 3-4.

3.5 GROUNDWATER MONITORING

Between 2000 and 2002, groundwater monitoring wells (MW-1 to MW-5) were installed at the Site and monitoring wells MW-6 and MW-7 were installed upgradient of the Site. Monitoring wells MW-1 to MW-5 were constructed with screened intervals in both the A-Zone and B-Zone, i.e., screened across the A-Zone/B-Zone aquitard (Figure 2-1). Monitoring wells MW-1 to MW-3 were sampled during 15 quarterly events. Monitoring wells MW-4 to MW-7 were sampled during eight quarterly events. The seven monitoring wells were abandoned in 2005 due to: concerns regarding the screened intervals connecting the A-Zone with the B-Zone for monitoring wells MW-1 to MW-5; and the lack of or low-level detections of VOCs in monitoring wells MW-6 and MW-7. In 2003, three "nested" groundwater monitoring well sets, i.e., MW-8A and

MW-8B, MW-9A and MW-9B and MW-10A and MW-10B, were installed. Monitoring well construction details are presented in Table 3-5.

In May 2005, one "nested" groundwater monitoring well set, i.e., MW-11A and MW-11B was installed. Groundwater monitoring wells MW-11A and MW-11B were constructed with a screened interval between four-feet below ground surface and nine-feet below ground surface, and between 12-feet below ground surface and 22-feet below ground surface respectively.

In February 2008, one "nested" groundwater monitoring well set, i.e., MW-13A and MW-13B was installed at the Site. Monitoring well MW-13A was installed with a screened interval between five-feet below ground surface and 10-feet below ground surface. Monitoring well MW-13B was installed with a screened interval between 18-feet below ground surface and 28-feet below ground surface.

In April 2008, two downgradient monitoring wells, i.e., MW-16B and MW-17B were installed (Figure 2-1). Monitoring well MW-16B was installed in the alley between D and Williams Streets with a screened interval between 20-feet below ground surface and 30-feet below ground surface. Monitoring well MW-17B was installed in the alley between Lowell and C Streets with a screened interval between 20-feet below ground surface and 30-feet below ground surface (Figure 2-1).

In February 2009, monitoring well MW-12B was constructed in the B-Zone within Williams Street with a screened interval between 15-feet below ground surface and 30-feet below ground surface. In October 2009, nested monitoring wells MW-15A and MW-15B were installed approximately 70-feet south of 2907 E Street, within the sidewalk located on the east side of E Street. Monitoring well MW-15A was installed with a screened interval between five-feet below ground surface and 10-feet below ground surface. Monitoring well MW-15B was installed with a screened interval between 14.5-feet below ground surface and 24.5-feet below ground surface.

Between November 2012 and March 2014: one nested groundwater monitoring well set, i.e., UMW-13A/B, was installed by CRA; 15 groundwater monitoring wells (MW-18BS/BD, MW-19BS/BD, MW-20BS/BD, MW-21BD, MW-22BS/BD, MW-23BD, MW-24BD, MW-26BD, MW-27BD, and MW-28BS/BD) were installed by GZA; and seven monitoring wells (KMW-14A/B, KMW-19B, KMW-20A, KMW-21A, KMW-22B, and KMW-23B) were installed by WEST at the Site (Figure 2-1). Groundwater monitoring well construction details are presented in Table 3-5.

3.5.1 A-Zone Well Groundwater Monitoring

Groundwater samples have been collected during 38 quarterly events from the A-Zone monitoring wells (Figure 2-1). A summary of the findings from the quarterly monitoring is presented below and in Table 3-6.

3.5.1.1 PETROLEUM HYDROCARBONS

Sampling of the A-Zone groundwater monitoring wells has revealed the presence of TPHg and petroleum related VOCs. The concentrations of TPHg in groundwater have ranged up to 42,000 µg/l (MW-8A). The concentration of benzene in the A-Zone groundwater monitoring wells has ranged up to 5,400 µg/l (MW-8A). Toluene, ethyl benzene and xylenes have been detected in A-Zone groundwater monitoring wells up to 3,800 µg/l, 4,000 µg/l and 12,200 µg/l, respectively (MW-8A).

Laboratory analysis of the groundwater samples collected from A-Zone monitoring wells has also revealed: n-butylbenzene up to 150 µg/l (MW-8A); isopropyl benzene up to 170 µg/l (MW-8A); n-propylbenzene up to 490 µg/l (MW-8A); naphthalene up to 740 µg/l (MW-8A); 1,3,5-TMB up to 740 µg/l (MW-8A); 1,2,4-TMB up to 3,000 µg/l (MW-8A; Table 3-6).

3.5.1.2 CHLORINATED VOLATILE ORGANIC COMPOUNDS (CVOCS)

Groundwater samples collected from the A-Zone monitoring wells have revealed the presence of PCE up to 2,610 µg/l (MW-9A). Other CVOCs have been detected in groundwater including: TCE up to 18.3 µg/l (MW-9A); trans-1,2-DCE up to 0.65 µg/l (MW-10A); cis-1,2-DCE up to 13 µg/l (MW-8A); TCA up to 1.3 µg/l (MW-9A); and trichloromethane (TCM) up to 6.1 µg/l (MW-10A; Table 3-6).

3.5.2 B-Zone Well Groundwater Monitoring

Groundwater samples have been collected during 37 quarterly events from the B-zone monitoring wells (Figure 2-1). A summary of the findings from the quarterly monitoring is presented below and in Table 3-6.

3.5.2.1 PETROLEUM HYDROCARBONS

Sampling of the B-zone groundwater monitoring wells has revealed the presence of TPHg and related VOCs. The concentrations of TPHg in B-Zone groundwater monitoring well samples have ranged from 22,000 µg/l (MW-8B) to below the laboratory-reporting limit of 2.00 µg/l (MW-12B). The concentration of benzene in the B-zone groundwater samples has ranged from 790 µg/l (MW-8B) to below the laboratory-reporting limit of 0.50 µg/l (MW-9B). The concentration of toluene has ranged from 29 µg/l (MW-8B) to below the laboratory-reporting limit of 0.50 µg/l (MW-9B). The concentration of ethyl benzene has ranged from 280 µg/l (MW-10B) to below the laboratory-reporting limit of 0.50 µg/l (MW-9B). The concentration of xylenes has ranged from 75 µg/l (UMW-13B) to below the laboratory-reporting limit of 0.50 µg/l (MW-9B).

Other petroleum related VOCs have been detected in groundwater including: n-butylbenzene up to 11.5 µg/l (UMW-13B); TMB up to 51 µg/l (UMW-13B); naphthalene up to 92 µg/l (MW-8B);

isopropyl benzene up to 54 µg/l (MW-10B); and n-propylbenzene up to 59.0 µg/l (MW-10B; Table 3-6).

3.5.2.2 CVOCs

Sampling of the B-zone groundwater monitoring wells has revealed the presence of CVOCs, primarily PCE. PCE has been detected in groundwater up to 17,000 µg/l (MW-11B). Other CVOCs have been detected in groundwater including: TCE up to 180 µg/l (MW-11B); trans-1,2-DCE up to 1.6 µg/l (MW-10B); cis-1,2-DCE up to 85 µg/l (MW-11B); 1,1-DCE up to 2.4 µg/l (MW-11B); TCA up to 2.9 µg/l (MW-9B and MW-11B); TCM up to 2.9 µg/l (MW-11B); and CE up to 6.2 µg/l (MW-10B). A summary of the analytical results is presented in Table 3-6.

3.6 SEWER INVESTIGATIONS

The utility investigations included the performance of a closed-circuit television (CCTV) inspection of the sewer main beneath E Street. The defects observed in the CCTV inspection of the sewer main included: broken pipe segments; offset joints; grease buildup; sags; leakage; and evidence of surcharged conditions. The observations also included two apparently uncapped sewer lines entering the manhole in E and Grotto Streets. These conditions were confirmed in the CCTV inspections conducted by the City on July 5 and October 23, 2007. The noted deficiencies are to be addressed during the OU-2 remediation.

On January 13, 2013, GZA on behalf of the City conducted an inspection of the sewer line along E Street, and the manhole at the intersection of E and Grotto Streets. The investigations were conducted to appraise the conditions of the sewer line, manhole and soil in these areas and consisted of excavating the soil beneath the manhole and along the sewer line on E Street (GZA, 2013b). Soil samples were collected from the manhole excavation between approximately 86- and 104-inches and from the sewer excavation between approximately 78- and 84-inches for physical parameters analysis. Laboratory analysis of the soil samples collected from the manhole excavation revealed a non-plastic poorly graded silty sand. Soil samples collected from the

sewer excavation were reported to be a non-plastic to slightly-plastic poorly graded silty sand (GZA, 2013b).

In February 2014, WEST, on behalf of Normans', exposed the sewer line and manhole within E Street to address the data gaps identified after City of Eureka and Unocal investigations conducted between November 2012 and January 2013. Environmental Business Solutions, Inc. (EBS), a licensed class A General Engineering contractor with Hazardous Substances Removal Certificate, and Gregg Drilling & Testing, Inc. (Gregg Drilling), of Martinez, California, a licensed C-57 well drilling contractor, assisted WEST with the excavations and soil sampling.

The excavations were advanced: on E Street, between Grotto and Harris Streets (sewer excavation); and at the intersection of E and Grotto Streets (manhole excavation). During the excavations, WEST collected soil samples between 30-inches and 126-inches below ground surface from beneath and along the sanitary sewer and manhole in E Street and analyzed for soil properties. Particle size analysis of the soil samples revealed a much coarser material not consistent with native material.

3.7 WATER LINE TESTING

On March 12, 2014, WEST conducted an electronic and acoustic testing of the City of Eureka water line beneath E Street between E and Harris Streets pursuant to WEST's *Sewer Investigation Work Plan* (WEST, 2013). The water line testing was conducted by American Leak Detection (AMD) of Redding, California. Based on the acoustical testing, AMD concluded that there was a substantial leak within the water line. Subsequently, an excavation of the water line within E Street was conducted by EBS on behalf of WEST, to confirm the findings from AMD's acoustical test. The excavation was advanced to three-feet and two-inches and revealed that the water line was leaking at a rate of three-gallons per minute. The leaking water line was repaired on April 1, 2014.

3.8 AQUIFER TESTING

In June 2008, slug tests were conducted from two A-Zone monitoring wells, FW-1, MW-13A and one B-Zone monitoring well MW-16B. Slug testing of monitoring well MW-13A was conducted by removing a known volume of water and monitoring recovery. In FW-1 and MW-16B, slug testing was conducted by displacing a known volume of water and monitoring recovery. For FW-1 a two-foot long three-inch diameter slug was used. For MW-16B, a 6-foot long and 1.25-inch diameter slug was used. Once equilibrium was reached, the slug was removed. This procedure was repeated a minimum of three times per well.

Changes in water level were monitored and recorded using a Level Troll 700 electronic data logger. The data logger was placed 0.2-feet above the bottom of the monitoring wells. The data logger was connected to a Rugged Reader pocket PC in the field. The Rugged Reader displayed continuous real-time readings from the data logger and was used to store the collected measurements. The slug test data were analyzed using the Hvorslev method. Based on the analysis, the average hydraulic conductivity was estimated at 1.1E-04 cm/sec for the A-Zone aquifer and 2.9E-03 cm/sec for the B-Zone aquifer (WEST, 2012).

3.9 ISCF PILOT STUDY

In April 2008, one flushing well, FW-1, and two vapor-monitoring wells, VP-1 and VP-2, were installed in preparation for the ISCF pilot study (Figure 3-1). During 2009, ISCF bench-scale testing indicated that approximately 49-percent of the PCE could be extracted with a 50-percent ethanol-water mixture. Details of the ISCF bench scale testing were presented in the *Revised In Situ Chemical Flushing Bench-Scale Study Report* (WEST, 2009).

The ISCF pilot test was conducted between December 14, 2009 and April 9, 2010. The ISCF pilot testing results indicated that ethanol flushing removed an estimated 32 percent of the PCE mass in the interrogated soil. Details of the pilot testing were provided in the *In Situ Chemical Flushing Pilot Scale Report* (WEST, 2010).

Groundwater and soil vapor monitoring were conducted between December 2009 and May 2011 pursuant to the Regional Water Board's *Monitoring and Reporting Order (MRO) No. R1-2009-0130* (Regional Water Board, 2009a). The ISCF monitoring indicated that residual chemicals used in the ISCF pilot testing did not negatively impact groundwater quality or aboveground structures. Details of the groundwater and vapor monitoring are provided in the *ISCF Monitoring Report, First Quarter 2011* (WEST, 2011a). During May 2011, the Regional Water Board approved cessation of the ISCF pilot test and rescinded MRO *No. R1-2009-0130* (Order No. R1-2011-0059; Regional Water Board, 2011a).

3.10 SOIL VAPOR EXTRACTION PILOT TEST

In September 2009, pilot-scale SVE testing was conducted at two locations at 2907 E Street. Pilot testing included flow rate step-tests, as well as helium tracer injection and capture. Wells SV-1 and FW-1 were used for extraction wells. Vapor points VP-1 and VP-2 were used to monitor vacuum influence during extraction. Vapor point VP-1 is located approximately eight-feet from FW-1, and vapor point VP-2 is located approximately eight-feet from SV-1.

Vapor extraction piping was attached to SV-1 and connected to the inlet of a trailer-mounted SVE system. Vacuum gages were installed at SV-1 as well as vapor point VP-1, located approximately eight-feet from SV-1. A dilution valve was installed downstream from SV-1. The dilution valve was opened to 100-percent, and the blower was started. Vacuum measurements at SV-1 and VP-1 were recorded. The dilution valve was then closed 50-percent, 75-percent and 87.5-percent. When the dilution valve was closed completely, groundwater entered the SVE piping. At 3.5-inches of mercury applied vacuum, a response of 0.25-inches of water was measured at VP-1. At 7-inches of mercury applied vacuum, a response of 0.5-inches of water was measured at VP-1. At 9.5-inches of mercury applied vacuum, a response of 1.0-inch of water was measured at VP-1.

While the dilution valve was closed 75-percent and the blower was running, 17 cubic feet of helium were injected into vapor point VP-1. Helium concentrations were monitored at SV-1

using a handheld helium detector. Measured helium concentrations in the extracted vapor ranged from 600 to 36,000 parts per million by volume (ppm_v), indicating a minimum radius of capture of eight-feet.

After completing pilot scale testing at SV-1, the extraction piping was connected to well FW-1. Vapor point VP-2, located approximately eight-feet from FW-1, was fitted with a vacuum gage. Stepped flow rate testing was conducted at FW-1 in a similar manner as SV-1, but helium was not injected. At 3.5-inches of mercury applied vacuum, a response of 0.70-inches of water was measured at VP-2. At seven-inches of mercury applied vacuum, a response of 1.0-inches of water was measured at VP-2. At nine-inches of mercury applied vacuum, a response of 1.5-inches of water was measured at VP-2. The measured vacuum influences indicate a radius of influence of at least eight-feet at the applied vacuums tested.

During testing, the extracted vapors from SV-1 and FW-1 were monitored for VOCs using a handheld photoionization detector (PID). The VOC concentrations measured in soil vapor extracted from SV-1 ranged from 0.6 ppm_v to 49 ppm_v. VOC concentrations in vapors extracted from FW-1 ranged from 1.3 ppm_v to 12.2 ppm_v.

3.11 ISCO/SVE PILOT STUDY

The ISCO pilot study was initiated in August 2008. Pursuant to the Regional Water Board's *Monitoring and Reporting Program No. R1-2008-0060 WDID No. 1B08011RHUM ("MRP";* Regional Water Board, 2008*)* samples were collected from the groundwater monitoring wells MW-12B, MW-16B and MW-17B and the soil vapor-monitoring well (OSVP-1) located near the sparge points on Williams Street (Figure 2-1). On February 12, 2009, monitoring well MW-12B was modified from a one-inch diameter to a six-inch diameter cased monitoring well. In May 2009, after the detection of PCE in the vapor monitoring well above screening levels for protection of indoor air, operation of the ISCO pilot study system was ceased. In addition, a soil gas sample was collected in October 2009 from approximately 30-feet east of the sparge points,

between vapor monitoring well OSVP-1 and the residential structure located at 2853 Williams Street (SG-1; Figure 2-1).

In May 2010, two SVE wells were installed on Williams Street in accordance with the approved January 2010 *ISCO/SVE Pilot Study Work Plan*. In August and September 2010, a pilot study of the ISCO/SVE system was conducted. In September 2010, the ISCO/SVE pilot study began operation utilizing the sparge wells and monitoring well, MW-12B as the SVE well. In October 2010, after the detection of PCE in the vapor sample from monitoring well OSVP-1 above the screening level for the protection of indoor air, the ISCO/SVE pilot study system was shutdown and soil vapor was extracted from the two SVE wells.

In January 2011, after adjustments were made to the ozone delivery system, the ISCO/SVE pilot study resumed operation. Following ISCO system shutdown in September 2011, PCE in groundwater samples from monitoring well MW-12B decreased from 764 µg/l (September 2011) to 5.10 µg/l (December 2011). Details of the ISCO/SVE pilot study testing are presented below.

3.11.1 SVE Well Installation

On May 18, 2010, SVE wells were installed along Williams Street approximately 5- and 10-feet from the existing vapor monitoring well (Figure 2-1). The SVE wells were installed using hollow stem auger drilling equipment operated by a California licensed C-57 well drilling contractor.

Following installation of the SVE wells, two-inch diameter Schedule 40 polyvinyl chloride (PVC) extraction piping was attached to the SVE wells and groundwater-monitoring well MW-12B. The extraction piping was then manifolded to the mobile temporary SVE system. The mobile temporary SVE system was equipped with an electric-powered blower outfitted with an air dilution valve upstream of the inlet.

A moisture knockout drum containing wire mesh was installed upstream of the blower inlet for coalescing soil moisture condensate. Pipe was attached to the pipe from the blower and connected to vapor phase granular activated carbon (GAC) vessels for treatment of extracted vapors before emission. A vacuum gauge was installed on the inlet pipe and a pressure gauge was attached to the outlet pipe from the blower.

3.11.2 ISCO/SVE Pilot Testing

In August 2010, pilot testing of the ISCO/SVE system was conducted. The pilot testing was conducted by extracting soil vapor from wells SVE-1 and SVE-2 while increasing flow rates and monitoring vacuum influences in nearby wells. Vapor extraction flow rates were calculated based on velocities measured with a hot wire anemometer. The effluent from the blower was monitored for VOCs using a PID calibrated with 100-ppm_v isobutylene gas.

Initially, soil vapor was extracted from well SVE-1 and vacuum measurements were taken at monitoring well OSVP-1 (located five-feet from SVE-1) and extraction well SVE-2 (located 15-feet from SVE-1). The extraction blower was stepped from 5-percent capacity to 8 percent capacity, 12-percent capacity, 25-percent capacity and 50 percent capacity. These settings produced flow rates of approximately 5, 8, 10, 15 and 20 cubic feet per minute (cfm) with applied vacuums of approximately 11, 13, 16, 25 and 40 inches of water, respectively. Stepping the SVE-1 extraction flow rate incrementally from 5 cfm to 20 cfm produced vacuum influences of between 0.27 and 0.90 inches of water at OSVP-1 and between 0.06 and 0.20 inches of water at SVE-2. The maximum VOC concentration measured with the PID was 2.2 ppm_v.

After completing testing of SVE-1, the extraction blower was connected to SVE-2. The blower was stepped at 5-percent capacity to 25-percent capacity, 40-percent capacity and 50-percent capacity. These blower settings produced flow rates of approximately 4, 12, 16 and 23 cfm with applied vacuums of approximately 9, 20, 34, and 40 inches of water, respectively. Stepping the flow rate incrementally from 4 to 23 cfm produced vacuum influences ranging from 0.22 to 0.40

inches of water at OSVP-1, and 0.14 to 0.30-inches of water at SVE-1. The maximum VOC measured with the PID was 2.7 ppm_v.

The next phase of pilot testing included connecting the blower to both SVE-1 and SVE-2 and monitoring the vacuum influence at OSVP-1. The blower was initially set at 50-percent capacity, producing a flow rate of approximately 20 cfm. The applied system vacuum at this blower was approximately 30-inches of water. A vacuum of approximately 1.6-inches of water was observed at well OSVP-1. The blower was then reduced to 40-percent capacity, which produced a flow rate of approximately 16 cfm with an applied vacuum of approximately 26-inches of water. At 40-percent capacity, a vacuum influence of approximately 1.5 inches of water was measured at OSVP-1. Monitoring with a PID did not reveal VOC concentrations over 0.4 ppm_v in the emission from the blower. The pilot testing revealed a minimum SVE radius of influence of 15-feet.

3.11.3 Pilot Test Monitoring

Following initiation of of ISCO pilot testing, PCE ranged between 764 µg/l (September 2011) to 1.72 µg/l (July 2009). Laboratory analysis of the groundwater samples collected during the June, September and October 2010 sampling events from monitoring well MW-12B revealed PCE concentrations at 5.65 µg/l, 489 µg/l and 402 µg/l, respectively. Laboratory analysis of the groundwater samples collected in 2011 from monitoring well MW-12B revealed PCE concentrations ranging between 764 µg/l (September) to 2.25 µg/l (October). Following ISCO pilot system shutdown in September 2011, PCE in groundwater decreased from 764 µg/l (September 2011) to 5 µg/l (December 2011). A summary of the ISCO groundwater monitoring analytical results is included in Table 3-6.

3.11.3.1 BACKGROUND WATER QUALITY

Pursuant to the *General WDRs*, groundwater samples were collected from monitoring well MW-12B to establish background water quality prior to the injection of oxidants as part of the ISCO

pilot study along Williams Street . Laboratory analysis of the groundwater samples collected from monitoring well MW-12B revealed the presence of metals including: barium at 41.1 µg/l; chromium at 4.14; cobalt at 1.46 µg/l; copper at 1.25 µg/l; iron at 449 µg/l; manganese at 43.8 µg/l; molybdenum at 1.19 µg/l; nickel at 3.77 µg/l; vanadium at 1.37 µg/l; and zinc at 6.96 µg/l. Hexavalent chromium was also detected at 34 µg/l. Laboratory analysis of the groundwater sample collected from MW-12B did not reveal presence of antimony, arsenic, beryllium, cadmium, lead, mercury, selenium, silver, thallium and uranium above the laboratory-reporting limits ranging from 0.200 µg/l to 1.00 µg/l.

3.11.3.2 SOIL GAS MONITORING

Laboratory analysis of baseline soil gas samples collected from OSVP-1 on September 8, 2010 revealed PCE at 12.3 µg/m^3. Analysis of soil gas samples collected on September 27, 2010 from the vapor monitoring well, OSVP-1 revealed PCE at 85.3 µg/m^3. On October 13, 2010, laboratory analysis of the soil gas sample collected from OSVP-1 revealed PCE at 14,000 µg/m^3. On October 29, 2010, operation of the ISCO system was ceased and set to run SVE only. Laboratory analysis of soil gas samples collected from OSVP-1 on December 23, 2010 revealed PCE at 24.5 µg/m^3.

The ISCO/SVE system began operations on January 8, 2011 operating 10 hours per day. Laboratory analysis of the soil gas sample collected from OSVP-1 on March 2, 2011 revealed PCE at 474 µg/m^3. Laboratory analysis of the soil gas sample collected from OSVP-1 between April and October 2011 revealed PCE ranging from 21.6 µg/m^3 (August) to 7,020 µg/m^3 (October). Laboratory analysis of the soil gas sample collected from OSVP-1 on December 2, 2011 revealed PCE at 1,370 µg/m^3. A summary of the ISCO/SVE pilot test soil gas monitoring analytical results is included in Table 3-3.

3.12 ISCO BENCH SCALE TESTING

CRA, on behalf of Unocal conducted bench-scale tests for ISCO during March through October 2011 (CRA, 2011). In April 2011, CRA advanced three soil borings (TSB-1, TSB-2 and TSB-3) within the former UST excavation for the collection of four soil samples for bench-scale chemical oxidant testing (Figure 3-1). The soil samples were reported to contain TPHg up to 810 mg/kg (TSB-1-3) and up to 0.35 mg/kg of benzene (Table 3-1).

Samples of the soil were mixed with catalyzed sodium persulfate solution or Fenton's Reagent at 5 percent, 10 percent and 15 percent solutions. Sodium hydroxide was added to the solutions to maintain the pH at 10.5 standard units (S.U.). The testing revealed that dosing sodium hydroxide catalyzed sodium persulfate at 75 grams per kilogram (gm/kg) resulted in TPHg concentrations being reduced by 56.1 percent to 66 percent. Based on the bench-scale testing, CRA concluded that up to 93 gm/kg, or 9.3 percent of sodium persulfate and 31 gm/kg (3.1 percent) of sodium hydroxide would be required for treating the TPHg in the soil matrix.

Leachability testing of the treated soil matrix revealed: arsenic at 301 µg/l; chromium at 229 µg/l; sodium at 3,960,000 µg/l; and bromate at 570 µg/l. The control samples were reported to contain: arsenic at 21.9 µg/l; chromium at 1.6 µg/l; sodium at 62,400 µg/l; and bromate at less than 5 µg/l. Based on its own studies, CRA expected that any material solubilized would be attenuated within a year from the final ISCO injection (CRA, 2011).

4.0 DATA EVALUATION

Analyses of the data collected have focused on the development or refinement of the CSM by presenting and analyzing data on source characteristics, the nature and extent of contamination, the contaminant transport pathways and fate and the affects on human health and the environment.

Data collection and analysis for the Site characterization is considered complete since the data quality objectives (DQOs) that were developed in the scoping (including any revisions during the investigations) have been met, the need for remedial actions is documented and the data necessary for the development and evaluation of remedial alternatives have been obtained (USEPA, 1988). The results of the remedial investigation are presented with an analysis of Site characteristics and the risk associated with such characteristics (i.e., the baseline human health risk assessment).

4.1 CONCEPTUAL SITE MODEL

Pursuant to State Water Resources Control Board (SWRCB) guidelines (Executive Order D-5-99 and Senate Bill 989) and NCP (USEPA, 1988), a CSM has been developed for the Site. The decision-making framework for Site investigations has centered on the development and continual modification of the CSM. The CSM developed for the Site represents the assemblage of all the data and information regarding Site conditions and identifies the general physical conditions that influence contaminant transport. The CSM is an "iterative 'living representation' of a site that summarizes and helps project teams visualize and understand available information" (USEPA, 2011). The CSM representing the current understanding of environmental conditions at the Site is summarized on Figures 4-1 and 4-2. An expanded summary of the CSM is included in the WEST August 2008 *Presentation of Updated Conceptual Site Model* (WEST, 2008).

The CSM was developed based on: known historical operations at the Site; review of historical building department drawings; Site investigation data; chemical properties; suspected chemical

release and transport mechanisms; and potential exposure scenarios. Based on a review of the findings from the recent investigations, the CSM has been updated to incorporate all of the data and accurately describe the fate and distribution of chemicals of concern.

The CSM presents a narrative and graphical description of Site characteristics to provide a foundation for understanding the Site. The CSM identifies the general physical conditions at the Site that influence contaminant transport. The CSM incorporates: the geology and hydrogeology; properties of the chemicals; chemical usage; identified sources; and transport mechanisms to explain the distribution of chemicals found at and downgradient of the Site (Figures 4-1 and 4-2).

The CSM for the Site describes the distribution of petroleum hydrocarbons and VOCs in soil and groundwater at the Site as originating from releases during the operation of the former service station and dry cleaner. The analytical data, which indicate that PCE may be present as a DNAPL is consistent with the CSM. The CSM explains the distribution of VOCs in the subsurface as having been influenced by transport and subsequent releases from sanitary sewers, e.g., sampling has revealed concentrations of PCE indicative of DNAPL near the sewers. The CSM also attributes the distribution of VOCs in groundwater as having been influenced by the screening of monitoring wells across multiple water-bearing zones.

4.1.1 Hydrogeology of Site

The hydrogeology at the Site has been characterized as being comprised of two water-bearing zones: the A-Zone and B-Zone (ENSR, 2007). The A-Zone is separated from the B-Zone by an approximately two-foot to seven-foot thick fine-grained silt/clay aquitard. The B-Zone extends from the base of the aquitard to approximately 35-feet below ground surface.

The groundwater flow direction in the A-Zone is predominantly to the west to west-northwest with a hydraulic gradient ranging between 0.005-feet per foot to 0.02-feet per foot. The groundwater flow direction in the B-Zone is predominantly to the northwest with a hydraulic gradient ranging between 0.006-feet per foot to 0.013-feet per foot. The downward vertical

gradient between the A-Zone and B-Zone has ranged between approximately 0.10-feet per foot to approximately 0.55-feet per foot. Groundwater monitoring has also revealed a seasonally varying vertical downward hydraulic gradient between the A-Zone and B-Zone. The downward vertical hydraulic gradient between the A-Zone and B-Zone appears to have influenced the vertical migration of VOCs through preferential pathways. Approximately 30 pounds of PCE migrated from the A-Zone to the B-Zone through monitoring wells MW-4 and MW-5 during the 29 months that the cross-screened wells were present (Feenstra, 2012).

The groundwater hydraulic properties testing revealed an average hydraulic conductivity in the A-Zone of approximately 1.1E-04 cm/sec. Based on average hydraulic gradient of approximately 0.010-feet per foot, the average groundwater velocity in the A-Zone groundwater has been estimated at approximately six-feet per year. Using the physical properties of the aquifer matrix, the retardation factor for PCE in the A-Zone has been calculated at approximately 2.9, which results in an average PCE velocity of approximately two-feet per year.

The B-Zone groundwater has an estimated hydraulic conductivity of 2.9E-03 cm/sec, with an average hydraulic gradient of 0.02-feet per foot. Using these parameters, the B-Zone groundwater velocity has been estimated at approximately 154-feet per year. The retardation factor for PCE in the B-Zone has been calculated at approximately 2.4, which results in an average PCE velocity in the B-Zone of approximately 63-feet per year.

4.1.2 Nature and Extent of Source

The CSM for the Site indicates contributions of petroleum hydrocarbons and VOCs in soil, soil gas and groundwater at the Site as originating from releases during service station operations and CVOCs during dry cleaning operations. In addition, the release of PCE from the sanitary sewers appears to be a source of groundwater contamination.

4.1.2.1 DNAPL

The investigation data suggest that PCE was likely released in DNAPL form at 2907 E Street and from the sewer main beneath E Street. The presence of PCE at concentrations greater than one percent of the aqueous solubility of 150,000 µg/l, i.e., 1,500 µg/l; USEPA, 1996b) indicates the potential for DNAPL (USEPA, 1992). Where PCE is found in groundwater at concentrations greater than 10 percent of the aqueous solubility, i.e., 15,000 µg/l, the presence of DNAPL is highly likely (USEPA, 1993).

The distribution of PCE in groundwater indicates that DNAPL has a very high potential to be present at the A-Zone/B-Zone aquitard. PCE has been reported at up to 20,600 µg/l in a groundwater sample collected from the basal contact with the A-Zone/B-Zone aquitard at 10-feet below ground surface near the building at 2907 E Street indicating that DNAPL PCE is highly likely to be present in this area. PCE was also found at 4,290 µg/l in the depth-discrete groundwater sample collected from along the sewer main in E Street, also indicating the likely presence of DNAPL in this area.

While PCE has been found at greater than 1,500 µg/l in the B-Zone groundwater, the vertical distribution of PCE in the B-Zone does not indicate that DNAPL is present in this deeper water-bearing zone. The lower concentrations at deeper intervals and higher concentrations near the A-Zone/B-Zone aquitard indicate that PCE has been introduced to the B-Zone in dissolved phase.

4.1.2.2 VADOSE-ZONE SOURCE

The soil and soil gas investigations have revealed a limited extent of PCE in vadose-zone materials. The highest detection of PCE in soil was reported at 250,000 µg/kg in the sample collected at 5.5-feet to six-feet below ground surface east of the building at 2907 E Street (MW-3) and near the former waste oil UST. The concentration of PCE in soil decreased by over three orders of magnitude in the saturated zone sample collected from 10-feet below ground surface from the same boring (MW-3) with a reported concentration of 1,700 µg/kg. The vertical

distribution of PCE at this location is consistent with a release in the area, i.e., higher concentrations closer to the surface.

The PCE in soil samples from other locations within 30-feet of MW-3 near the building revealed lower concentrations, e.g., SP-1 at 190 µg/kg and SP-2 at 410 µg/kg, but with the presence of PCE degradation products TCE and DCE. The PCE degradation products TCE and DCE have only been found in vadose zone soil samples collected from the rear of the property and near the former waste oil UST. The occurrence of degradation products in soil from this area is consistent with the co-presence of petroleum hydrocarbons from the former waste-oil UST, which would promote the anaerobic degradation of the PCE.

TPHmo was detected up to 2,500 mg/kg near the former waste oil UST in the sample collected from boring GP-17. PCE, TCE and DCE were also co-present at 860 µg/kg, 43 µg/kg and 9.5 µg/kg in the same sample. Similarly, TPHmo was detected at 760 mg/kg in the sample collected from boring GP-18 near the former waste oil UST. PCE, TCE and DCE were also co-present at 20,000 µg/kg, 87 µg/kg and 20 µg/kg, respectively. These data indicate that the PCE was likely released co-present with the TPHmo.

The PCE in the vadose zone soil sample collected at six-feet below ground surface from the boring MW-9B revealed PCE at 20 µg/kg. The presence and distribution of PCE in soil from boring MW-9B is consistent with the preferential movement of PCE along utility lines present in this portion of the property, e.g., sewer lateral. Sampling near the sewer main beneath E Street revealed PCE up to 5,040 µg/kg at 9.5-feet below ground surface (E-9). Sampling shallower that six-feet below ground surface along E Street did not reveal the presence of PCE or other VOCs.

The April 2007 soil gas sampling revealed a pattern of PCE distribution in the subsurface consistent with that found in soil, i.e., higher concentrations near the rear of the building at 2907 E Street and following along an alignment of buried drainage lines. The highest detection of PCE was found in the soil gas sample collected from location W-1A at 1,980,000 $\mu g/m^3$ located east of the building near soil sample GP-15. Similar to the pattern of degradation products found

in the soil samples collected from this area, DCE (33,400 μg/m^3) was also detected in the sample from W-1A. PCE in soil gas was reported at 229,000 μg/m^3 in the soil gas sample collected from W-1 located near former monitoring well MW-3.

PCE was reported at 98,100 μg/m^3 (duplicate at 97,400 μg/m^3) in the soil gas sample collected from W-10 located near SP-3 (PCE at 720 μg/l in groundwater) located approximately 50-feet southwest and hydraulically cross-gradient from W-1. The relative difference in soil gas and groundwater concentrations indicates that vadose-zone soil gas is influenced by materials present above the groundwater table. The PCE degradation product TCE was also found in the soil gas sample collected from W-10 at 2,330 μg/m^3, consistent with the findings of degradation products in W-1.

The soil gas sample collected from W-11, approximately 40-feet to the north of W-10 and 60-feet west-northwest of W-1 revealed PCE at 3,400 μg/m^3. PCE in groundwater in this area has been reported at 10,000 μg/l (SP-4), confirming that the concentration of PCE in soil gas is related primarily to vadose-zone materials.

Sampling of soil gas along E Street revealed concentrations of PCE up to 460 μg/m^3 (W-16), which is not consistent with a vadose-zone source being present in this area.

Based on an analysis of this data, the vadose-zone sources appear located east of the building at 2907 E Street and follow an alignment to the west-southwest along the subsurface wastewater utility lines. PCE also appears to have been released to groundwater along the sewer main beneath E Street, but in the saturated zone.

4.1.2.3 SERVICE STATION OPERATIONS

The findings of the investigation confirmed that the presence of TPH and related VOCs originated from historical operation of the service station. Investigations revealed the presence of petroleum related VOCs in groundwater including: benzene, toluene, ethyl benzene and xylenes,

also known as BTEX; 1,2,4-TMB; 1,3,5-TMB; isopropyl benzene; and naphthalene. Similarly, laboratory analysis of soil samples collected on the property at 2907 E Street also revealed the presence of gasoline related VOCs including: benzene; xylenes; 1,2,4-TMB; and 1,3,5-TMB.

The gasoline related VOCs have been detected (with the exception of MW-11A) in samples from all A-Zone monitoring wells, including former monitoring wells MW-6 and MW-7, which were located upgradient of the USTs and dispenser islands. The service station operation releases are being addressed through OU-1 remediation.

4.1.3 Fate and Transport

Once released, the TPH and VOCs have migrated through the subsurface. The migration of the TPH and VOCs has been influenced by subsurface utility lines and other preferential pathways, including the monitoring wells screened across the A-Zone/B-Zone aquitard.

4.1.3.1 SUBSURFACE UTILITY LINES

The CSM explains the distribution of TPH and PCE in groundwater as having been influenced by preferential migration along the subsurface drain lines at 2907 E Street and beneath E Street (WEST, 2008b). The highest reported concentration of PCE in groundwater samples collected at 2907 E Street was 14,000 µg/l in the sample from MW-3 in 2001. Similar concentrations of PCE were found in samples collected from approximately 60-feet downgradient of monitoring well MW-3, e.g., 20,600 µg/l (B-1), 7,920 µg/l (C-1), 10,000 µg/l (SP-4) and 4,900 µg/l (MW-4 in 2003), near subsurface utilities.

Laboratory analysis of groundwater samples collected from approximately 40-feet downgradient to the northwest of monitoring well MW-4 have generally revealed PCE at least two orders of magnitude lower, e.g., 31 µg/l (MW-8B in 2005) and 82 µg/l (MW-10B in 2005). Similarly, groundwater samples collected from areas where subsurface utilities are not present have revealed a decrease in PCE concentrations of at least one order of magnitude lower, e.g., 720 µg/l

(SP-3) and 610 μg/l (SP-7). The presence of PCE in groundwater at similar and/or higher concentrations farther from the rear of the building indicates that there has been preferential movement, i.e., release of PCE to the A-Zone groundwater along the on-Site subsurface utility lines.

4.1.3.2 MONITORING WELLS

The distribution of VOCs in the B-Zone appears to have been influenced by the steep vertical gradient and the migration through monitoring wells screened across the A-Zone/B-Zone aquitard. Groundwater-monitoring wells installed at the Site in October 2000 (MW-1 to MW-3) and November 2002 (MW-4 and MW-5) were screened across the A-Zone/B-Zone aquitard presenting a pathway for cross-contamination to the deeper zone (ENSR, 2004).

The long screened monitoring wells were conduits for contaminant migration (Regional Water Board, 2009b). It has been acknowledged that "[d]issolved phase constituents of concern (PCE and fuel constituents) may have moved from Zone A into Zone B due to the downward vertical hydraulic gradient and screen lengths connecting Zone A and Zone B" (Regional Water Board, 2009b). Due to the hydraulic head difference, i.e., downward vertical gradient of more than five-feet, the presence of the cross-screened monitoring wells provided a conduit for the movement of contaminants from the A-Zone groundwater to the B-Zone groundwater "[b]ecause these wells are screened across two aquifers, a conduit exists between the aquifers allowing for potential cross contamination" (ENSR, 2004). The groundwater-monitoring wells that were screened across both aquifers were present until they were abandoned in May 2005.

4.1.4 Lateral Extent of TPH and VOCs

The groundwater investigations have defined the lateral extent of TPH and VOCs in the A-Zone and B-Zone groundwater aquifers.

4.1.4.1 LATERAL EXTENT OF TPH AND VOCS IN A-ZONE GROUNDWATER

Groundwater flow in the A-Zone is primarily to the west to west-northwest. The lateral extent of TPH and VOCs in groundwater has been delineated upgradient to the east by samples from monitoring wells MW-6 and MW-7, which did not reveal the presence of these constituents above the laboratory-reporting limits. The samples collected from monitoring wells MW-13A and MW-15A have provided cross-gradient A-Zone groundwater quality data delineating the extent of TPH to less than the laboratory-reporting limits and VOCs to the north and south to less than 5 µg/l (WEST, 2008c).

Samples from downgradient A-Zone groundwater monitoring well MW-11A have provided delineation of TPHg and benzene in groundwater to the west-northwest to less than laboratory-reporting limits of 50 µg/l and 0.5 µg/l, respectively. PCE has been found in downgradient A-Zone groundwater monitoring well MW-11A up to approximately 4.4 µg/l, during the preceding four sampling events. Depth discrete A-Zone groundwater samples SP-9, SP-10, SP-11, E-2 and E-21 have provided downgradient delineation of PCE, TCE and DCE in groundwater to below the laboratory reporting limits of 0.5 µg/l.

4.1.4.2 LATERAL EXTENT OF TPH AND VOCS IN B-ZONE GROUNDWATER

The groundwater flow direction within the B-Zone is to the northwest. The lateral extent of TPH and VOCs in B-Zone groundwater has been delineated upgradient to the east by samples from monitoring wells MW-6 and MW-7, which did not reveal the presence of these constituents above the laboratory-reporting limits. The samples collected from monitoring wells MW-13B and MW-15B have provided cross-gradient B-Zone groundwater quality data delineating the extent of VOCs to the north and south of 2907 E Street to less than the laboratory-reporting limits. The downgradient extent of TPHg and related VOCs in B-Zone groundwater has been defined by samples from monitoring well MW-11B with TPHg less than the laboratory-reporting limit of 50 µg/l and benzene less than 5 µg/l (WEST, 2008c).

Cross-gradient delineation of VOCs in the B-Zone groundwater to the north of the intersection of E and Grotto Streets has been provided by depth discrete groundwater samples from boring 15B with PCE at 39.8 µg/l at 22-feet below ground surface and less than the laboratory reporting limit of 0.5 µg/l at 30-feet below ground surface. Cross-gradient delineation of VOCs in B-Zone groundwater to the south of E and Grotto Streets has been defined by samples from boring E-21 with PCE at 1.69 µg/l at 21-feet below ground surface and less than the laboratory-reporting limit of 0.5 µg/l at 30-feet below ground surface. The downgradient presence of VOCs in B-Zone groundwater has been delineated to less than the laboratory-reporting limit of 0.5 µg/l by samples from monitoring well MW-17B.

4.1.4.3 B-ZONE PCE VELOCITY

Based on the estimated velocity of PCE in the B-zone of approximately 60-feet per year, it would take approximately 100 years for the PCE in the B-zone to reach Humboldt Bay located approximately 1.3 miles northwest from the intersection of E Street and Grotto Street. However, laboratory analysis groundwater samples collected from monitoring well MW-17B in 2011, located approximately 1,000-feet downgradient of E and Grotto Streets (Figure 2-1), indicated that PCE has not reached this location at concentrations above the laboratory-reporting limits.

4.1.5 Vertical Extent of TPH and VOCs

The April 2007 groundwater investigations provided data on the vertical extent of PCE in groundwater. Cone penetration test (CPT) borings generated data on the subsurface lithology that more fully characterized the nature of the B-Zone groundwater aquifer. Based on the CPT electronic logs and the verification soil sampling, the B-Zone is mainly composed of a 15-20 foot sand/silty sand zone. The basal contact beneath the sand/silty sand zone is present at approximately 30-feet to 40-feet below ground surface and composed of fine-grained silts and clays.

Laboratory analysis of groundwater samples collected from boring W-6, located near the intersection of E Street and Grotto Street between 15-feet and 52-feet below ground surface revealed PCE at 10,300 µg/l at 15-feet below ground surface. Lower concentrations of PCE were detected in the groundwater samples collected from boring W-6: at 533 µg/l in the sample collected at the basal contact at approximately 30-feet below ground surface. PCE was not reported to be present above the laboratory-reporting limit of 0.500 µg/l in the sample collected below the basal contact at approximately 52-feet below ground surface. Based on the subsurface lithology and groundwater analytical data, it appears the vertical extent of PCE is confined to the sand/silty sand zone above the basal contact in the B-Zone aquifer.

4.2 RISK EVALUATION

A human health risk evaluation was conducted to identify the chemicals and media in which they occur that may require remediation in OU-2 to protect the public health and the environment and to assist in developing health-based protection cleanup goals. The assessment was prepared which estimated potential risks posed by chemicals under the following scenarios: existing commercial worker exposure and hypothetical potential residential exposure. The risk evaluation consisted of the following components: (1) selection of chemicals of concern (COCs); (2) exposure assessment; (3) identification of appropriate remedial goals for each media; and (4) risk characterization.

4.2.1 Selection of Chemicals of Concern

Based on the data and the continued commercial and residential land use in the area, a CSM was developed for OU-2 (Figures 4-1 to 4-3). The CSM incorporates known historical operations at and near the Site, typical environmental fate and transport of chemicals and appropriate exposure scenarios. The COCs were selected for the HHRA based on the laboratory analytical data from samples collected at the Site and include VOCs detected in soil, soil gas and groundwater.

4.2.2 Exposure Assessment

The CSM was used to identify potentially complete exposure pathways for chemicals beneath E Street. Those potentially complete pathways were quantitatively evaluated in the risk for the existing commercial use. Pavement covers the Site and surrounding area, therefore, there are no complete exposure pathways to soil at the Site. The presence of VOCs in soil gas indicates a potentially complete exposure pathway to these chemicals through vapor inhalation. Groundwater was identified as a medium of concern based on the hypothetical ingestion of groundwater. Soil erosion to surface water was not evaluated as a potential pathway due to the existing pavement covering. In addition, the soil containing VOCs is located beneath the sewer main at depths where direct exposure is not anticipated, except potentially to construction workers. Based on the groundwater elevation measurements and downgradient concentrations, the movement of groundwater to surface water was not identified as a potentially complete pathway.

An ecological screening assessment indicated that the Site and surrounding areas do not contain suitable habitat to sustain wildlife. Due to the lack of suitable ecological habitat at the Site, there are no potentially complete exposure pathways to sensitive non-human receptors. A summary of the potential exposure pathways is presented on Figure 4-3.

Where sample data were limited in an exposure area or the spatial distribution was variable, the maximum-detected concentration of the chemicals in the exposure area was used to evaluate the upper bound risk. In accordance with CalEPA guidance, the maximum soil gas concentrations were used to evaluate the threat posed by vapor intrusion (CalEPA, 2005). Similarly, based on the spatial distribution of COCs in groundwater, the maximum groundwater concentrations were used to evaluate the risk posed by this exposure route.

4.2.3 Identification of Appropriate Remedial Goals

The PRGs are the initial or proposed cleanup goals developed to evaluate Site conditions and identify the necessity for response actions. The PRGs are conservative threshold values below which particular chemicals are believed to present no significant risk to humans or natural resources that might be exposed to the particular hazardous material (USEPA, 2004).

The PRGs will be refined into remedial goals based on cost, technical feasibility, community acceptance, schedule and other risk management considerations. Development of remedial goals constitutes a core component of the development and screening of potential remedial alternatives conducted during the Feasibility Study. It should be noted that until the final remedy is approved, these PRGs, whether ARARs-based or risk-based, constitute initial cleanup levels, not final cleanup goals (NCP, 40CFR 300.430(e)(2)(i)).

Chemical specific PRGs were developed from two general sources: concentrations based on appropriate or relevant and applicable requirements (ARARs); and concentrations based on published, but non-promulgated screening levels or To-Be-Considered (TBC) criteria (e.g., USEPA Region IX Regional Screening Levels).

Based on the identified exposure pathways, PRGs were selected for chemicals in soil, soil gas and groundwater from applicable ARARs and TBCs. Concentration-based ARARs for selection of PRGs include: Regional Board Basin Plan numerical water quality objectives; CDPH drinking water maximum contaminant levels (MCLs); and the Office of Environmental Health Hazard Assessment (OEHHA) Public Health Goals (PHGs). The TBCs considered in the selection of PRGs include: USEPA Region IX RSLs and California Environmental Protection Agency (CalEPA) California Human Health Screening Levels (CHHSLs). The ARARs and TBCs identified and evaluated for the Site are summarized in Table 4-1.

The selected PRGs are designed to identify concentrations in environmental media that require further evaluation, trigger further investigation and provide an initial cleanup goal, as applicable.

Concentrations above these levels should not automatically trigger a response action. However, exceeding a PRG suggests that further evaluation of the risks potentially posed by Site contaminants is appropriate. A discussion of the ARARs and TBCs used in selection of the PRGs are presented below.

4.2.3.1 ARARs AND TBCs

CERCLA Section 121 (d)(2)(A) requires that remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. CERCLA Section 121 (d)(2)(A)(ii) requires state ARARs to be met if they are more stringent than federal requirements. In addition, the NCP published in 40 CFR Part 300, requires that local ordinances, unpromulgated criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in the development of remedial objectives be listed as "to be considered" (TBC) criterion.

The NCP and California regulations require compliance with ARARs in the selection of remedial actions. The NCP defines applicable requirements as a promulgated Federal or State standard that addresses specifically a hazardous constituent, remedial action, location or other circumstance. The NCP defines a relevant and appropriate requirement as a promulgated Federal or State requirement that addresses problems or situations sufficiently similar to those encountered, even though the requirement is not legally applicable. A requirement may be relevant but not appropriate, given site-specific circumstances; such a requirement would not be an ARAR. If only part of a requirement is relevant and appropriate, then only that portion needs to be addressed.

ARARs may be chemical-specific, action-specific or location-specific. Chemical-specific ARARs are health- or risk-based concentration limits, such as Federal or State drinking water standards for specific chemicals. Action-specific ARARs are technology-based requirements that are triggered by the specific remedial actions. An example of an action-specific ARAR is the National Pollutant Discharge Elimination System (NPDES) requirements, which regulate the

discharge of pollutants to surface water. Location-specific ARARs impose restrictions, based on site characteristics, on certain types of activities. Examples of location-specific ARARs include possible requirements associated with remedial activities in areas designated as wetlands, flood plains or historic sites; or those requirements imposed by the *Order*.

Non-promulgated advisories or guidance, referred to as to-be-considered (TBCs), may also be incorporated into the evaluation of potential remedies. Superfund remedies are not required to meet TBCs, but they may be used in the selection of remedies in the absence of ARARs. TBC criteria should be considered when determining the degree of remediation necessary to protect human health and the environment.

Site-specific TBC criteria include the USEPA's *Risk Assessment Guidance for Superfund, Parts A and B* (USEPA, 1989) and *Soil Screening Guidance Manual* (USEPA, 1996a), which provide methodologies from determining the potential threat posed by COCs at the Site and for calculating soil screening levels (SSLs) for protection of groundwater beneficial uses.

Chemical-specific ARARs and TBCs identified for consideration included: CalEPA CHHSLs; USEPA RSLs; Regional Water Board's *Water Quality Control Plan for the North Coast Region (Basin Plan)* numerical WQOs; CDPH drinking water MCLs; and the Office of Environmental Health Hazard Assessment (OEHHA) Public Health Goals (PHGs).

Other ARARs and TBCs include the tasks and cleanup goals incorporated into the Cleanup and Abatement Order R1-2003-0088. In addition, the Draft Cleanup and Abatement Order R1-2009-0021 (Draft Order) is a TBC for the Site. The ARARs and TBCs identified and evaluated for the Site are summarized in Table 5-1.

4.2.3.2 ARARs and TBCs for Soil

There are no published chemical-specific ARARs for VOCs in soil. However, the *Order* prescribes that cleanup activities must comply with Title 23, Chapter 15 of California Code of Regulations (CCR), which regulates concentrations that remain in wastes, including soil, to

protect beneficial use of waters of the state. Title 23 of the CCR, Chapter 3, Subchapter 15, Discharges of Waste to Land, is an ARAR as it regulates wastes that "contain pollutants which, under ambient environmental conditions...could be released at concentrations in excess of applicable water quality objectives, or could cause degradation of waters of the state." The method for determining the concentration in soil of a chemical that does not pose a threat to waters of the state above applicable levels is referred to as the Designated Level Methodology (DLM).

In addition, the USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites ("RSLs") are TBCs for soil cleanup levels for protection of public health. The RSLs were published by the USEPA and combine current toxicity values with standardized exposure factors to estimate concentrations in soil that are protective of humans, including sensitive groups over a lifetime on a screening-level basis.

4.2.3.3 GROUNDWATER PROTECTION

The movement of leachate to groundwater was identified as a potential route of migration due to the designation of the groundwater at the Site as a potential drinking water source, i.e., the groundwater at the Site is designated as potential municipal supply (MUN). The determination of concentrations of chemicals in that are protective of groundwater resources were developed in a manner consistent with the *Designated Level Methodology for Waste Classification and Cleanup Level Determination* (Regional Water Board, 1989) using a one-dimensional transport of water and COCs through the unsaturated soil column.

The soil concentrations for protection of groundwater were derived using a combination of Site-specific and default values in standardized equations presented in USEPA's *Soil Screening Guidance* (USEPA, 1996a). The evaluation was performed to simulate the one-dimensional transport of water and contaminants through an unsaturated soil column. The evaluation used a soil-water partition equation to estimate concentrations of chemicals in infiltrated water. The soil-water partition equation relates concentrations of chemicals adsorbed to soil organic carbon

to soil leachate concentrations. The equations allows for the calculation of the soil concentration that corresponds to the target soil leachate concentration, i.e., water quality objective.

The use of the soil/water partition equation, however, is based on an infinite source of chemicals extending to the top of the aquifer. Therefore, a mass-limit evaluation was also performed. The mass-limit equation provides for an estimate of the soil concentration that is protective when the entire volume of contamination leaches over the exposure duration. The results of the mass-limit evaluations are compared to the soil/water partition results and the higher of the two values was selected.

The input data to the equations included: soil bulk density, soil porosity and fraction of organic carbon content (f_{oc}); chemical partitioning constants (K_{oc}), chemical-specific Henry's law coefficients and chemical-specific water quality objectives. Using the input data and the *Soil Screening Guidance* methodologies, the concentration of COCs in soil that are protective of groundwater quality were calculated for the chemicals found in soil.

Using the results of the mass limit leaching evaluation, Site-specific soil concentrations for protection of the beneficial uses of groundwater have been calculated at: 54 µg/kg for PCE; 718 µg/kg for TCE; 5,400 µg/kg for DCE; 90 µg/kg for benzene; 45 mg/kg for TPHg and 90 mg/kg for TPHmo (WEST, 2012).

4.2.4 ARARs and TBCs for Soil Gas

There are no promulgated ARARs for soil gas. TBC criteria for VOCs in soil gas include CHHSLs, which provides Tier 1 screening levels for soil gas concentrations protective of indoor air from vapor intrusion. In lieu of updating the CHHSLs, the California DTSC's Office of Human and Ecological Risk (HERO) issued a memorandum (Note 3) in August 2013 that provided its recommended methodology for using USEPA Regional Screening Levels (RSLs) with California modified toxicity criteria for soil gas and indoor air (HERO, 2014). TBCs also

include the HERD Soil Gas Screening Model, which can be used to develop chemical-specific risk-based soil gas concentrations for the protection of indoor air (HERD, 2011).

4.2.5 ARARs and TBCs for Groundwater

ARARs for groundwater include the adopted *Order*, SWRCB Resolutions 68-16 and 92-49 and the Basin Plan and CDPH MCLs. TBCs include the Draft Order and OEHHA PHGs.

The Regional Water Board adopted *Order* prescribes RAOs and numerical WQOs for the Site. Therefore, the *Order* is an ARAR. The WQOs for groundwater in the *Order* include: 5 µg/l for PCE and TCE; 6 µg/l for cis-DCE and 10 µg/l for trans-1,2-DCE. The Draft Order, which was circulated for comment in February 2009, also identifies WQOs for groundwater. As the Draft Order is not adopted, it is a TBC criterion for cleanup goals. The WQOs for groundwater in the Draft Order include: 0.06 µg/l for PCE; 0.8 µg/l for TCE; 6 µg/l for 1,2-cis-DCE; TPHg at 5 µg/l; benzene at 0.15 µg/l; toluene at 40 µg/l; ethyl benzene at 29 µg/l and xylenes at 17 µg/l.

The narrative RAOs in the *Order* indicate, "cleanup to background is the presumptive standard." However, the *Order* acknowledges that alternative cleanup levels, i.e., greater than background concentrations, shall be permitted only if the Dischargers demonstrate that: it is not feasible to attain background levels; the alternative cleanup levels will not unreasonably affect present and anticipated beneficial uses of such water and will not result in water quality less than prescribed in the Basin Plan and Policies adopted by the SWRCB and Regional Water Board.

4.2.5.1 STATE WATER RESOURCES CONTROL BOARD REQUIREMENTS

4.2.5.1.1 Porter-Cologne Water Quality Control Act

The California Porter-Cologne Water Quality Control Act or Water Code requires consideration for the protection of water resources. The Water Code requires the Regional Water Quality Control Boards (Regional Water Boards) to define the beneficial uses of their respective water

bodies. Consistent with the Regional Water Board's *Water Quality Control Plan* ("*Basin Plan*"), water at the Site is designated as a potential municipal supply (Regional Water Board, 2011b).

The *Basin Plan* uses maximum contaminant levels (MCLs) for the protection of existing and/or potential beneficial use of water as municipal water supplies. The *Basin Plan* provides numerical objectives for municipal supply sources containing a variety of chemicals. The USEPA and CDPH have established respective Federal and State primary MCLs for inorganic compounds.

Although, the *Basin Plan* does not specify an allowable concentration in water for some chemical of potential concerns (COPCs), the *Basin Plan* does identify that water designated for municipal supply shall not contain substances in concentrations that cause a taste and odor nuisance or otherwise adversely affect beneficial uses. In the cases where MCLs or secondary MCLs have not been established, taste and odor thresholds in water from published references were used to identify applicable water protection goals.

4.2.5.1.2 State Water Resources Control Board Resolution 92-49

Pursuant to SWRCB Resolution No. 92-49, groundwater-containing concentrations above applicable numerical water quality objectives must obtain the requisite level of water quality within a reasonable timeframe. In general, target cleanup levels for groundwater are based on the numerical water quality objectives as designated in the *Basin Plan* (Regional Water Board, 2011b). The *Basin Plan* also includes narrative water quality objectives that require that waters "shall not contain taste- or odor-producing substances in concentrations that…adversely affect beneficial uses."

The groundwater near the Site has been designated to have the potential beneficial use of municipal and domestic water supply (MUN). The *Basin Plan* identifies the CDPH drinking water MCLs as numerical water quality objectives for the MUN beneficial use.

4.2.5.2 PRGs FOR SOIL

The PRGs were selected from either published chemical-specific ARARs or developed by back-calculating the individual COC concentrations that would result in a total ILCR less than 1E-6 and an HI of less than 1.0. In addition, resource protection based soil remedial goal concentrations were developed based on evaluation of the potential migration of COCs to groundwater (WEST, 2012). Based on a comparison of the human-health risk-based concentrations and the resource-protection based concentrations, soil PRGs have been selected based on groundwater protection (Table 5-2).

The calculated Site-specific PRGs are summarized in Table 5-2. Use of the resource-based protection soil concentrations results in an estimated human health ILCR of 1.2E-6 and an HI of 1.2 for the commercial worker exposure scenario.

4.2.5.3 PRGs FOR SOIL GAS

Soil gas PRGs were developed using modified RSLs pursuant to HERO Note 3 using the attenuation factors identified by CalEPA 0.001 for existing commercial structures. The default attenuation factor was developed for existing commercial structures based on the average attenuation factors developed by OEHHA for 16 volatile organic compounds using the Johnson & Ettinger Model (HERD, 2011).

Based on a future residential use in the community west of E Street, the default attenuation factor of 0.002 and the indoor air RSLs for residential indoor air of 0.41 $\mu g/m^3$, the residential PRG for PCE was calculated at 205 $\mu g/m^3$.

Based on a future commercial use along E Street, the default attenuation factor of 0.001 and the indoor air RSLs for commercial indoor air of 2.08 $\mu g/m^3$, the commercial PRG for PCE was calculated at 2,080 $\mu g/m^3$. Based on the indoor air PRG of 0.42 and the default attenuation factor of 0.001, the soil gas PRG for benzene was calculated at 420 $\mu g/m^3$.

4.2.5.4 PRGS FOR GROUNDWATER

The PRGs for groundwater were selected based on the narrative WQOs included in the *Order* and the numerical WQOs in the Draft Order. Groundwater PRGs for PCE, TCE, DCE, TPHg and benzene are their respective WQOs of 0.5 µg/l, 0.8 µg/l, 6.0 µg/l, 5 µg/l and 0.5 µg/l. In addition, the other petroleum related constituents PRGs for naphthalene, toluene, ethyl benzene, xylenes and 1,3,5-TMB are 14 µg/l, 40 µg/l, 29 µg/l, 17 µg/l and 15 µg/l, respectively.

However, these long-term WQOs might not be achievable. Industry experience shows that chlorinated solvents, such as PCE, often become sorbed onto low-permeability, clay-rich sediments that have limited capacity to desorb the contaminant back into groundwater, thereby decreasing remediation efficiency and increasing remediation time and cost. In addition, the low permeability, clay-rich units may retain VOCs for decades or longer and, during periods of no treatment, re-contaminate remediated groundwater and sediments. Therefore, attaining WQOs may not be possible. However, because the long-term WQOs are an ARAR, the achievability of these long-term PRGs will be reevaluated in the future, as additional monitoring and remediation performance data, and/or new remediation technologies become available. If appropriate, alternative cleanup goals will be evaluated.

4.2.6 Risk Characterization

Based on the comparison of Site soil, soil gas and groundwater data with the identified PRGs, remedial actions are necessary to address the presence of: VOCs at the Site.

4.2.6.1 SOIL CONDITIONS

PCE is present in A-Zone soil up to 5,040 µg/kg, which is above the PRG of 54 µg/kg for protection of groundwater. TCE and DCE were not reported to be present above their respective laboratory-reporting limits. Benzene was reported to be present A-Zone soil beneath E Street up

to 290 µg/kg, which is above its PRG of 90 µg/kg. However, the benzene in soil appears to originate from the former USTs at 2907 E Street.

Based on the above noted exceedances, remedial actions appear necessary to address potential leaching of PCE to groundwater. Based on the risk evaluations, the groundwater protection PRGs will also adequately provide protection for the direct exposure pathway for future commercial and/or construction workers.

4.2.6.2 SOIL GAS CONDITIONS

Soil gas sampling conducted at the Site has revealed the presence of PCE up to 480 µg/m^3 in samples collected along E Street, which is below the commercial PRG for protection of indoor air of 2,080 µg/m^3. Benzene was detected in a soil gas sample collected along E Street at up to 21.1 µg/m^3, which is less than its PRG for protection of indoor air of 420 µg/m^3. Toluene was detected in soil gas samples collected along E Street up to 24.7 µg/m^3, which is less than the PRG of 1,300,000 µg/m^3. Trichloromethane (TCM; also referred to as chloroform) was detected in soil gas samples ranging from 6.9 µg/m^3 to 200 µg/m^3, which are less than the PRG of 530 µg/m^3.

Sampling of soil gas in the residential community west of E Street revealed only the detection of PCE at concentrations ranging from less than the laboratory-reporting limit of 7.0 µg/m^3 to 100 µg/m^3, which were less than the residential PRG for protection of indoor air of 205 µg/m^3. Therefore, remedial actions do not appear necessary to address the potential migration of VOCs in soil gas.

4.2.7 Groundwater Conditions

Sampling has revealed groundwater containing PCE up to 4,290 µg/l in A-Zone groundwater along the E Street sewer line. TCE (up to 58.3 µg/l), DCE (up to 610.8 µg/l) and benzene (up to 518 µg/l) have also been detected above their WQOs of 0.5 µg/l, 0.8 µg/l, 6.0 µg/l, 5 µg/l and 0.5

µg/l in samples collected along E Street. In addition, naphthalene, toluene, ethyl benzene, xylenes and 1,3,5-TMB are present above their respective PRGs of: 14 µg/l, 40 µg/l, 29 µg/l, 17 µg/l and 15 µg/l. Therefore, based on the exceedances of the regulatory requirements, remedial actions are needed to address the theoretically future complete exposure pathway for ingestion of groundwater.

4.3 DATA GAP ANALYSIS

The assessment revealed that the CSM adequately describes the distribution of chemicals at the Site to support evaluation of groundwater cleanup alternatives.

5.0 REMEDIAL ACTION OBJECTIVES

The identification and evaluation of actions to address the presence of the TPH and VOCs at the Site has incorporated the regulatory requirements of the NCP, as well as State and local agency regulations. The NCP requires that remedial actions achieve a cleanup level that protects public health and the environment. Pursuant to 40CFR 430(e), remedial action objectives (RAOs) have been developed which address: (1) contaminants of concern, (2) media of concern, (3) potential exposure pathways, and (4) preliminary remediation goals. The RAOs are medium-specific goals designed for protecting human health and the environment. The RAOs are developed to meet applicable or relevant and appropriate requirements (ARARs) and other non-promulgated advisories, criteria, or guidance to be considered (also known as TBCs; Table 5-1).

RAOs for the Site are as follows:

- Prevent human ingestion of groundwater containing contaminant concentrations (single carcinogen) above the State and Federal Maximum Contaminant Limits (MCLs) and any more stringent water quality objectives (WQOs). The COCs for the Site, as well as the WQOs for these COCs are listed in Table 5-2.

- Prevent human incidental ingestion and direct dermal contact with contaminants in surface soil that pose an excess cancer risk greater than 1E-6 or a HI greater than 1, a cumulative excess cancer risk (all carcinogens) in excess of 1E-4 or a cumulative HI (non-carcinogens) greater than 1.

- Prevent human inhalation of VOCs volatilizing from subsurface soil to air that pose an excess cancer risk greater than 1E-6 or HI greater than 1, a cumulative excess cancer risk (all carcinogens) in excess of 1E-4, or a cumulative HI (all non-carcinogens) greater than 1.

6.0 FEASIBILITY STUDY

This section presents a summary of the screening evaluation of remedial technologies that could be applicable to attain RAOs at the Site. Consistent with the NCP (NCP, 40CFR300), the USEPA RI/FS Guidance Document (USEPA, 1988), and California Health and Safety Code, Chapter 6.85, general response actions, remedial technologies, and specific process options have been identified and screened for applicability to address the identified releases at the Site, based on their ability to achieve RAOs. Technologies that are technically feasible, implementable and potentially cost-effective have been combined to develop a range of remedial alternatives for detailed evaluation.

Based on the data evaluation, the media and chemicals requiring off-Site remediation have been identified as:

- VOCs in A-Zone soil and groundwater including VOCs in the A/B Aquitard material; and

- Sanitary sewer main beneath E Street.

6.1 IDENTIFICATION OF POTENTIAL REMEDIAL TECHNOLOGIES

Consistent with the NCP, applicable remedial technologies and process options were evaluated in the process of developing remedial alternatives that meet the RAOs for the Site. The technology types and process options that were considered technically implementable were evaluated using the criteria of effectiveness, implementability and relative cost.

6.1.1 Screening Criteria

In accordance with the USEPA RI/FS Guidance Document (USEPA, 1988), process options have been evaluated qualitatively based on their relative effectiveness, the feasibility of implementing

them at the Site, and their respective cost. These criteria are described further below. The screening for the groundwater options is summarized in Appendix B.

6.1.1.1 EFFECTIVENESS

The effectiveness of technically implementable remedial technologies is evaluated relative to other options within the same technology type. This evaluation focuses on: 1) the potential effectiveness of the process option to handle the estimated areas or volumes of media and meet the remediation goals identified in the RAOs; 2) the potential impacts to human health and the environment during implementation and any construction phase; and 3) the reliability and proven history of the technology with respect to the chemicals and conditions found at the Site.

6.1.1.2 IMPLEMENTABILITY

Implementability encompasses both the technical and institutional feasibility of implementing a particular technology, including obtaining necessary permits, the availability of treatment, storage and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the particular process.

6.1.1.3 COST

Cost plays a limited role in the screening of technology options, with relative capital and operation and maintenance costs being used rather than detailed cost estimates. At this stage, the cost analysis is made based on engineering assumptions and judgment. Each process option is evaluated as to whether costs are high, low or moderate relative to other technologies. If more costly technologies within a particular technology type yield no significant advantages or are less advantageous, then these options are eliminated from further consideration.

6.2 CONTAMINANT PROPERTIES

Based on the evaluations performed in Section 4, COCs are presented in soil and groundwater above PRGs identified for the Site. Chemicals of concern in excess of PRGs for the OU-2 include VOCs. Remedial technologies for these COCs were identified based preliminarily on contaminant properties and on their applicability to specific contaminants and media. The following section provides a summary of the relevant chemical properties used in the screening of potential remedial technologies.

6.2.1 Chlorinated VOCs

CVOCs are human-made chemicals that are used and produced in the manufacture of paints, adhesives, petroleum products, pharmaceuticals and refrigerants and are widely used in industry and in common household products. They often are compounds of solvents, hydraulic fluids, paint thinners and dry-cleaning agents commonly used in industrial and urban settings. Some chlorinated solvents are also found in such household products as spot removers, typing correction fluids, adhesives, automotive cleaners, inks and wood furniture cleaners. CVOCs are ethenes, i.e., carbon-carbon double bonds with one or more chlorine atoms, and have high vapor pressures, low-to-medium water solubilities and are heavier than water when released into the environment in pure phase, i.e., DNAPL. The most frequently used encountered chlorinated VOCs are PCE, TCE, DCE and CE. Under anaerobic conditions, chlorinated VOCs may be degraded through reductive dehalogenation to by-products including TCE, DCE and CE.

6.3 IDENTIFICATION OF REMEDIAL TECHNOLOGIES FOR A-ZONE SOIL AND GROUNDWATER

A preliminary screening was conducted of technologies using the criteria of effectiveness, feasibility and cost (WEST, 2007a). The resulting screening identified the use of: saturated zone soil excavation; ISCF; ERH and groundwater extraction and treatment (GWET) to address VOCs in A-Zone groundwater. In addition, monitored natural attenuation (MNA) was identified as

viable technologies to address residual contaminants in groundwater following active remediation.

The NCP requires the identification and evaluation of a limited number of remedial alternatives that attain site-specific remediation levels within different restoration time periods utilizing one or more different technologies. This section describes the potential technologies that have been considered to meet the RAOs for groundwater. General response actions considered to address VOCs in groundwater include:

- No Action (required);
- Institutional Controls;
- *In-Situ* Treatment; and
- *Ex-Situ* Treatment.

6.3.1 Initial Screening of Remedial Technologies

Based on the identified general response actions, an initial screening of potential remedial technologies was conducted. The initial screening was used to identify potential remedial technologies for screening level evaluations. Technology types and process options were identified from a review of USEPA guidance documents, a literature review of published articles on remediation of the COCs and media, and engineering experience. The universe of potentially applicable technologies was screened based on implementability and applicability. A summary of the technologies identified and a brief description of the initial screening for groundwater remediation are presented in Table B-1 in Appendix B.

6.3.2 Summary of Retained Technologies

A broad range of technologies has been evaluated for their potential effectiveness, implementability and cost. Several potentially viable process options were identified and retained for the *in situ* treatment technology. In accordance with USEPA RI/FS guidance (USEPA, 1988), a representative process option has been selected for further evaluation, to simplify the development and evaluation of remedial alternatives. The following technologies have been retained for use in developing remedial alternatives for groundwater at the Site:

- No Action (required);
- Institutional controls comprised of Land Use Covenants;
- *In situ* treatment, including: ISCF and ERH and
- *Ex-Situ* Treatment, including excavation with off-Site disposal and groundwater extraction and treatment.

6.3.2.1 NO ACTION

The No Action response action is used a baseline for comparison with other response actions. This alternative includes no additional actions beyond the periodic monitoring of groundwater. There are no specific remedial technology types or process options beyond these activities. Following completion of groundwater monitoring activities, monitoring wells at the Site would be abandoned and destroyed in accordance with permitting requirements.

6.3.2.2 INSTITUTIONAL CONTROLS

Institutional controls are legal and/or physical means of limiting or eliminating potential human exposures. The NCP emphasizes that institutional controls are meant to supplement engineering controls during all phase of cleanup and may be a necessary component of the completed remedy

(USEPA, 2000). Institutional controls include deed restrictions and land use covenants that limit Site access and land uses to protect human health. Institutional controls also can be effective, especially, when used in conjunction with other remedial technologies. In addition, if the cleanup does not result in unrestricted use, institutional controls can be used to limit potential exposure to subsurface contaminants by limiting activities on a property.

6.3.2.3 *IN-SITU* TREATMENT

In situ groundwater remediation technologies include: *in situ* physical/chemical treatment (air sparging, horizontal wells, hydraulic and pneumatic fracturing); natural attenuation; *in situ* chemical flushing; *in situ* stabilization/solidification; in-well vapor stripping; thermal treatment; biological treatment (bioslurping, intrinsic bioremediation, phytoremediation); and electrokinetics.

6.3.2.3.1 Monitored Natural Attenuation (MNA)

MNA is an *in situ* process whereby natural processes of contaminant degradation will reduce concentrations below cleanup standards. Groundwater monitoring is conducted to confirm that degradation is proceeding at rates consistent with meeting cleanup standards.

MNA has been identified by the USEPA to be a viable alternative for addressing impacts to groundwater (USEPA, 1999). Natural attenuation processes associated with the MNA include the biodegradation, dispersion, dilution, sorption, volatilization and transformation of contaminants. Of these processes, biological transformation, or biodegradation, is the natural attenuation process preferred by the USEPA because it reduces contaminant concentrations through mass reduction rather than relying upon dilution or dispersion.

The USEPA advises that due to the uncertainty associated with MNA, adequate performance monitoring and contingency remedies should be utilized (USEPA, 1999). A contingency remedy is a cleanup technology or approach specified in the site remedy decision document as a “backup” remedy in the event that the “selected” remedy fails to perform as anticipated.

The SWRCB also has concluded that passive bioremediation has been demonstrated to be effective in many instances, with a clean-up time within substantially the same time frame as a pump and treat technology. The SWRCB recommends that if the effectiveness of intrinsic bioremediation can be established at a given site, this process should be considered a viable treatment alternative (Senate Bill 1764 Advisory Committee, 1996). Furthermore, the guidance suggests that evidence be collected to demonstrate the effectiveness of the intrinsic bioremediation to contain and remove the existing contamination within a reasonable time frame.

6.3.2.3.2 ISCF

In situ chemical flushing pilot testing has been conducted at 2907 E Street through injection and extraction of solutions and was shown to be successful at reducing CVOC mass by approximately 32 percent in the interrogated area. Based on the pilot study results, this technology has been retained for further evaluation.

6.3.2.3.3 ERH

Electrical Resistive Heating is the use of electrical current in the contaminated zone to increase the soil temperature. The electrical resistance of the soil and groundwater causes an increase in temperature that volatilizes the residual VOCs. The electrodes can be installed using several different drilling or direct-push techniques, including angled or horizontal methods. The horizontal spacing between electrodes is usually between 14- and 24-feet (Beyke and Fleming, 2005).

While heating all soil, ERH preferentially heats the more conductive silt and clay first. Temperatures over 100 degrees Centigrade can be generated in the saturated zone. However, ERH can be effective at temperatures as low as 60 degrees Centigrade. An SVE system is used to remove the volatilized water and contaminated vapors from the subsurface. The contaminated vapors are treated prior to atmospheric release. The water condensate can be treated using granular activated carbon to remove the contaminants.

6.3.2.4 *EX-SITU* TREATMENT

6.3.2.4.1 Excavation

Saturated zone excavation can be an effective technology in removing both source material bound to geologic material, as well as the dissolved phase contaminants present in the interstitial saturated soil voids. Excavation can be accomplished using conventional excavators and/or use of oversized drilling augers, e.g., bucket augers. Excavation may also require the use of dewatering to control soil movement, e.g., upwelling, and breaching of the aquitard.

6.4 IDENTIFICATION OF REMEDIAL TECHNOLOGIES FOR SEWER REPAIR

6.4.1 Sewer Replacement

The traditional technique for rehabilitating defective sanitary sewers and associated appurtenances is excavation and replacement. Since sewer pipes in urbanized areas are, for the most part, located in the middle of streets, excavation and replacement creates traffic disruptions, which results in loss of productive time for workers within such areas. In addition to the cost associated with lost productive time for workers, additional costs are incurred during repair of excavated roads and other structures.

6.4.2 Trenchless Technologies

In an attempt to reduce the cost and disruptions associated with excavation and replacement, the sanitary sewer collection system rehabilitation industry has developed "no dig" (trenchless) technologies for sanitary sewer collection system rehabilitation. Trenchless technologies include: cured-in-place liner pipe (CIPP), deform/reform liner pipe, fold and formed liner pipe, slip liner pipe, and pipe bursting.

6.4.2.1 CURED-IN-PLACE LINER

Cured-in-place liner pipe (CIPP) is formed by inserting a resin-impregnated felt tube into a defective sewer pipe and curing it with hot water. After the liner pipe is installed and cured, a remote-controlled cutting device is used with a closed circuit TV camera to reopen service connections. The cured-in-place liner pipe method is best suited for sewer pipes with high I/I and defects such as missing pipe segments, offset joints, and cracked pipes. It is also suited for sewers with multiple bends. The cured-in-place liner pipe method is one of the oldest and most effective method for sanitary sewer collection system rehabilitation.

6.4.2.2 DEFORM/REFORM LINER

Deform/reform liner pipe is made of high-density polyethylene. The liner pipe is extruded in a round shape during the manufacturing process. The round pipe is then deformed using a combination of heat and pressure and wound onto spools ready for installation. During installation, the deformed pipe is pulled off the spool and inserted into an existing pipe through a manhole using an electric winch. Once in place, hot water or steam under pressure is fed through the inside of the deformed pipe to soften and reform the pipe. A remote-controlled cutting device with a closed-circuit TV camera is used to reopen service connections. The deform/reform liner pipe method is best suited for the rehabilitation of straight sewer pipe segments with few or no service laterals.

6.4.2.3 SLIPLINING

The slip liner pipe is a round pipe, which is inserted into an existing pipe through a process called sliplining. Slip liner pipes are manufactured of materials such as PVC, polyethylene, and fiberglass reinforced polyester. During installation, the liner pipe is pushed or pulled into an existing pipe through an excavated section of the existing pipe. The annular space between the existing pipe and the liner pipe is then grouted with a cement or chemical-based grout. Service connections are reinstated by excavation and reconnection using "Tees" or similar accessories.

The slip liner pipe method is best suited for the rehabilitation of large diameter sewer pipes with few or no service connections and pipes where the wastewater flow is difficult to divert.

6.4.2.4 PIPE BURSTING

The pipe bursting method involves breaking a pipe and inserting another pipe of equal or greater diameter. During installation, a cone-shaped tool is pushed or pulled through the inside of the pipe to be replaced. In the process, the cone-shaped tool breaks the existing pipe and forces the broken fragments into the surrounding ground. The cone-shaped tool tows the new pipe behind it, simultaneously installing it in place as it bursts the old pipe. The bursting tool has a slightly larger outside diameter than the new pipe and it has a diameter greater than the inside diameter of the old pipe. Service connections are reinstated through excavation and reconnection using a variety of methods including mechanical saddles and "Tees." The pipe bursting method is best suited for areas where the size of an existing sewer pipe is too small to handle current or anticipated wastewater flows.

6.4.2.5 JOINT GROUTING

Grouting can reduce or eliminate leaks in sewer lines and manholes by stabilizing and sealing the defect and the adjacent soil where the defect is not severe and the surrounding soil is stable enough to retain the grout. Grout can be applied over a large area such as manhole to manhole or at specific points along the mainline or at lateral joints. Epoxy resin or mortar is used in grouting localized defects. A chemical mix is used for flood grouting of a large section of sewer mains and laterals. In both cases the host pipe should be cleaned.

Localized grouting involves the use of inflatable packers, sized to the section of the pipe or service connection, to isolate the joint to be grouted from the rest of the sewer system allowing the controlled application of grout only to the part of the sewer sealed off by the packer. The packer initially is pulled into position over the joint or connection containing defects where it is inflated sealing off the area for grouting. Pipes feed grout to the packer, where injection ports

located in the area of the packer isolated by the packer and the pipe wall inject grout under pressure into the packer/pipe cavity, defects and soil outside the pipe surrounding the defects.

There are a variety of chemical grouts used for grouting of pipe joints and sewer connections. The grout should be compatible with the pipe materials and soil conditions surrounding the defect. To avoid clogging the feed pipes, two part epoxy resin grouts are fed to the packer in two pipes where it is mixed just prior to injection.

Once the space around the packer and the defect is filled with grout, and the soil surrounding the defect is saturated, the grout is held under pressure until it hardens in place forming a thin layer of grout on the pipe walls and a grout plug in the defect and the soil adjacent to the defect. After the grout has hardened, the packer is deflated and removed from the pipe and service restored.

6.5 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

Based on the results of the preceding screening-level evaluations, a range of general response actions and associated potential remedial options has been identified as required under the NCP. The retained remedial options have been assembled into comprehensive alternatives to meet the RAOs. The technology options were assembled into remedial action alternatives to address the identified releases.

Pursuant to USEPA guidance, alternatives can be developed to address affected media in a specific portion of the site or an entire study area. Alternatives for specific media and areas can be carried through the feasibility evaluations separately or combined into comprehensive alternatives. The alternatives developed herein combine specific remedial technologies for both the specific releases and the entire study area. Engineering judgment was used in assembling the alternatives for the various areas and media to provide combinations that address the RAOs and which provide adequate source control, Site-wide protectiveness, compatible interactions and reduction of cumulative risk from media and pathways.

From the retained technologies, the following remedial action alternatives were developed to address the presence of VOCs in soil and groundwater at the Site:

- Alternative 1: No Action;
- Alternative 2: Excavation with off-Site Disposal with ICs and MNA with Sewer Replacement;
- Alternative 3: ISCF with ICs and MNA with Sewer Sliplining;
- Alternative 4: ERH with ICs and MNA with Sewer Grouting; and
- Alternative 5: Groundwater Extraction and Treatment (GWET) with ICs and MNA with Sewer Pipe Bursting

In accordance with the NCP and USEPA guidance documents, the potential alternatives (except no action) are designed to achieve compliance with the RAOs, including applicable ARARs. As required under CERCLA, the no action alternative provides a baseline from which to evaluate the other alternatives. The remedial action alternatives considered for further evaluation are presented and evaluated in detail in Section 7.

7.0 EVALUATION OF REMEDIAL ACTION ALTERNATIVES

This section presents a detailed analysis of the potentially applicable remedial alternatives to address impacted soil, soil gas and groundwater beneath the Site. Four remedial action alternatives, including the "No Action" alternative, were developed for the Site. The No Action alternative is included to serve as a baseline for evaluation of the other alternatives as required by CERCLA guidance.

The remedial alternatives were evaluated in accordance with USEPA guidance and the NCP. USEPA guidance and the NCP specify nine (9) criteria through which detailed analyses of remedial alternatives are performed. The first two (2) criteria of the nine (9) criteria are threshold factors that must be met in order for an alternative to be considered for implementation. Alternatives that satisfy the threshold criteria are further evaluated using the next five (5) criteria to compare and identify the major trade-offs among the remedial alternatives. The final two (2) criteria are modifying factors, which are governed by regulatory agencies and public input. Brief descriptions of the nine (9) criteria for evaluating the remedial alternatives are presented in the following sections.

7.1 FEDERAL CRITERIA

7.1.1 Threshold Criteria

1. Compliance with ARARs – this addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of environmental statutes, regulations, and/or whether there are grounds for applying a waiver.

2. Overall protection of human health and the environment – this addresses whether a remedy provides adequate protection to human health and the environment and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

7.1.2 Primary Balancing Criteria

3. Long-term Effectiveness – this refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved.

4. Reduction of Toxicity, Mobility or Volume through Treatment – this addresses the degree to which alternatives will reduce the toxicity, mobility, or volume of the contaminants causing site risks through treatment.

5. Short-term Effectiveness – this addresses the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability – this addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost – this includes estimated capital and operation and maintenance costs, usually combined as the total net present worth cost. In accordance with NCP guidance, due to the extended period that cleanup is anticipated to require, the present worth cost analyses were performed using 30-years of annualized expenses for all alternatives to provide a common basis for comparison (USEPA, 2000).

7.1.3 Modifying Criteria

8. State Acceptance – this indicates whether, based on its review of supporting documents and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

9. Community Acceptance – this will be assessed following a review of public comments received on the *Draft RAP* and supporting documents cord.

7.2 CALIFORNIA STATE CRITERIA

The evaluation and selection of the recommended remedial alternative has been prepared to comply with California Health and Safety Code Section 25356.1 and are summarized below. These State criteria correlate with the nine Federal criteria.

1. Health and safety risks posed by the conditions at the site. When considering these risks, the department or the regional board shall consider scientific data and reports which may have a relationship to the site. This criterion is fully considered under the Federal evaluation criterion of "Overall Protection of Human Health and the Environment."

2. The effect of contamination or pollution levels upon present, future, and probable beneficial uses of contaminated, polluted, or threatened resources. This criterion is fully considered under the Federal criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs." In the development of RAOs for this Site, previously described in this report, a Site beneficial uses analysis was conducted.

3. The effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses. The department or the regional board shall consider the extent to which remedial action measures are available that use, as a principal element, treatment that significantly reduces the volume, toxicity, or mobility of the hazardous substances, as opposed to remedial actions that do not use this treatment. The department or the regional board shall not select remedial action measures, which use offsite transport and disposal of untreated hazardous substances or contaminated materials if practical and cost-effective treatment technologies are available. The Federal criteria of "Overall Protection of Human Health

and the Environment" and "Compliance with ARARs" fully incorporate this State criterion.

4. Site-specific characteristics, including the potential for offsite migration of hazardous substances, the surface or subsurface soil, and the hydrogeologic conditions, as well as preexisting background contamination levels. This State criterion is fully considered in the Federal criterion of "Long-Term Effectiveness", Short-Term Effectiveness", and "Implementability."

5. Cost-effectiveness of alternative remedial action measures. In evaluating the cost-effectiveness of proposed alternative remedial action measures, the department or the regional board shall consider, to the extent possible, the total short-term and long-term costs of these actions and shall use, as a major factor, whether the deferral of a remedial action will result, or is likely to result, in a rapid increase in cost or in the hazard to public health or the environment posed by the site. Land disposal shall not be deemed the most cost-effective measure merely on the basis of lower short-term cost. This State criterion is fully considered in the Federal criteria entitled "Long-Term Effectiveness" and "Cost."

6. The potential environmental impacts of alternative remedial action measures, including, but not limited to, land disposal of the untreated hazardous substances as opposed to treatment of the hazardous substances to remove or reduce its volume, toxicity, or mobility prior to disposal. The Federal criteria of "Short-Term Effectiveness" and Long-Term Effectiveness" consider environmental impacts during and after the remedial action.

7.3 ANALYSIS OF ALTERNATIVES

7.3.1 Alternative No. 1: No Action

The No Action alternative is used as a baseline for evaluating the effectiveness, implementability and cost of other remedial alternatives. This alternative would consist of the destruction of the

groundwater monitoring wells in on-Site and off-Site areas. This scenario also would consist of no cleanup or monitoring efforts at the Site. Remaining chemical concentrations in groundwater would gradually be reduced over time by natural attenuation. Site access would be limited by the existing pavement and future Site development would be uncontrolled.

7.3.1.1 COMPLIANCE WITH ARARS

The No Action alternative fails to comply with most of the ARARs. The potential for exposures would remain without use of institutional and/or engineering controls. Natural attenuation of the VOCs in groundwater will occur, but no data will be generated to monitor the progress and used to determine whether additional response measures are necessary.

7.3.1.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment would not be achieved because there could be potential exposure to VOCs in soil, soil gas and groundwater under a future use. Therefore, the No Action alternative does not satisfy the threshold criterion.

7.3.1.3 LONG-TERM EFFECTIVENESS AND PERFORMANCE

The No Action alternative has no long-term effectiveness. Groundwater will improve at the rate of natural attenuation, but no data would be generated to evaluate its performance.

7.3.1.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The No Action alternative would reduce the toxicity, mobility, or volume of constituents in soil and groundwater at the rate of natural attenuation. The presence of VOC degradation products in groundwater shows that natural attenuation is occurring. Therefore, the toxicity, mobility, or volume of constituents in groundwater is reducing.

7.3.1.5 SHORT-TERM EFFECTIVENESS

RAOs would not be achieved. Existing risks remain during the short-term with no measures to restrict exposures.

7.3.1.6 IMPLEMENTABILITY

There is no element restricting implementability, as it requires no action.

7.3.1.7 COST

The cost for implementing this alternative (destruction of the monitoring wells) has been estimated at approximately $100,000.

7.3.2 Alternative No. 2: Excavation with off-Site Disposal with ICs and MNA with Sewer Replacement

Alternative No. 2 includes the excavation of CVOC affected soil from the A-Zone groundwater and A/B Aquitard off-Site to a depth of approximately 11-feet below ground surface. Excavation would remove saturated soil from the areas affected by CVOC releases including the associated A/B Aquitard (Figure 7-1). The excavation would involve the removal of approximately 1,600 cubic yards of soil. In addition, the E Street sewer would be excavated, along with source material in the upper portion of the A/B Aquitard to limit further migration of CVOCs into B-Zone groundwater. The scope of Alternative No. 2 also includes the replacement of the sanitary sewer main and manhole within E and Grotto Streets and backfill of the excavations with controlled low strength material in the A/B Aquitard zone and Class 2 aggregate base above.

This alternative employs conventional construction technologies to remove impacted soil off-Site. Excavated soil would be stockpiled, characterized and segregated or pre-profiled for disposal and direct hauled to a landfill. Since the excavation would extend into the groundwater,

this alternative includes provisions for: 1) sheetpiles to retain soil and utility protection along E Street; and 2) removal and treatment of groundwater, as necessary. The excavated areas would be backfilled to match existing surface materials and elevations.

Following impacted soil removal, natural attenuation processes should reduce concentrations of dissolved-phase VOCs in groundwater. Natural attenuation should continue until the groundwater concentrations decrease to levels that are consistent with the RAOs. The concentration levels will be evaluated using appropriate statistical techniques for assessing compliance with regulatory standards, such as those in SW-846 (USEPA, 2008b). MNA does not require monitoring until the concentrations in all wells are below cleanup standards. Instead, MNA can rely on plume-wide statistical assessment of concentrations. Once the statistical evaluation indicates that the PRGs will be achieved, MNA can be terminated. This criterion applies to both the primary remedy and the contingent remedy.

During the time that concentrations are decreasing in groundwater, institutional controls would be used to control potential exposures, e.g., the presence of VOCs in groundwater beneath the Site would be addressed using a *Land Use Covenant* (LUC). The LUC would be designed so that workers will not have direct contact with the shallow groundwater unless permitted in writing by the Regional Water Board. The LUC would include language that indicates limitations to not drill, bore, otherwise construct, or use a well for the purpose of extracting water for any use, including, but not limited to, domestic, potable, or industrial uses, unless expressly permitted in writing by the Regional Water Board. Further, the LUC would preclude drilling, boring, or excavating soil in the area without review and approval from the Regional Water Board and use of appropriate health and safety precautions. It would also require access to and non-interference with the groundwater-monitoring network. Institutional controls limiting the use of the Site to commercial purposes and maintaining hardscape covering would address any potential exposure to residual subsurface contaminants.

7.3.2.1 COMPLIANCE WITH ARARS

This alternative complies with the ARARs. Groundwater would achieve cleanup goals in a reasonable time, i.e., no exposures while concentrations continue to decrease through MNA or alternate cleanup goals are allowed.

7.3.2.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall, protection of human health and the environment would be achieved by land use controls. LUCs would control potential use of shallow groundwater as a drinking water source.

7.3.2.3 LONG-TERM EFFECTIVENESS

Groundwater quality should improve in the long-term through natural attenuation processes following source removal. Replacement of the sewer should control further leakage.

7.3.2.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Removal of source material will be effective in reducing the volume and mobility of COCs. Following source removal, the volume of COCs would continue to be reduced through natural attenuation processes.

7.3.2.5 SHORT-TERM EFFECTIVENESS

COCs in groundwater would be reduced through natural attenuation following source removal. LUCs limiting the use of shallow groundwater for drinking water would control exposure to COCs in the short-term.

7.3.2.6 IMPLEMENTABILITY

The methodologies in this alternative have been successfully implemented at other sites; however, it would result in disruptions to traffic and businesses during implementation due to the intrusive nature of the excavation. To address potential impacts on the community, work would be conducted at night.

7.3.2.7 COST

The cost for implementing this alternative has been estimated at approximately $3,622,000.

7.3.3 Alternative No. 3: ISCF with ICs and MNA with Sewer Sliplining

Alternative No. 3 consists of ISCF to remove source materials sorbed to the A-Zone/B-Zone aquitard. In lieu of excavation, Alternative No. 3 relies on ISCF to remove residual PCE from the A-Zone/B-Zone aquitard. ISCF would be implemented by installing a series of injection and capture wells to facilitate chemical flushing of the PCE from the aquitard materials. Based on the pilot study data, it has been estimated that approximately 30 flushing well pairs would be required for treatment of aquitard materials along the sewer line.

Due to the observed infiltration of groundwater into the E Street sewer, this option includes sliplining the pipe. The sliplining would require excavating sections of the existing pipe to facilitate installation. The annular space between the existing pipe and the liner pipe would be grouted with a cement or chemical-based grout. Service connections would be reinstated by excavation and reconnection using "Tees" or similar accessories.

Groundwater monitoring would be conducted to document the effectiveness of the measures and confirm that VOCs in groundwater will achieve the PRGs within a reasonable time. It is anticipated that groundwater monitoring would be conducted for five years on a semi-annual

basis and for five years annually. Following groundwater monitoring, the flushing wells would be destroyed.

7.3.3.1 COMPLIANCE WITH ARARS

This alternative complies with the ARARs. Groundwater would achieve cleanup goals through natural attenuation processes in a reasonable time, following ISCF treatment.

7.3.3.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment would be achieved by land use controls. LUCs would control potential use of shallow groundwater as a drinking water source.

7.3.3.3 LONG-TERM EFFECTIVENESS

Groundwater quality should improve in the long-term following ISCF treatment.

7.3.3.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The volume and mobility of COCs would be reduced through ISCF treatment. The volume of COCs would continue to be reduced following ISCF treatment.

7.3.3.5 SHORT-TERM EFFECTIVENESS

COCs in groundwater would be reduced through ISCF treatment. LUCs limiting the use of shallow groundwater for drinking water would control exposure to COCs in the short-term.

7.3.3.6 IMPLEMENTABILITY

The methodologies in this alternative have been successfully implemented at 2907 E Street and other sites; however, it would result in disruptions to traffic and businesses during implementation. Therefore, work would be conducted at night to the extent feasible.

7.3.3.7 COST

The cost for implementing this alternative has been estimated at approximately $3,672,000.

7.3.4 Alternative No. 4: ERH with ICs and MNA with Sewer Line Grouting

Alternative 4 includes the use of electrical current in the saturated contaminated zone to increase the soil temperature to address COCs from the A-Zone/B-Zone aquitard (Figure 7-1). The electrical resistance of the soil and groundwater causes an increase in temperature that volatilizes the residual VOCs. To improve the uniformity of heating and reduce local current densities at the electrodes, multiple phased arrays of electrodes are used with a central ground electrode that doubles as a vapor extraction well. This method increases the available current pathways as electrodes are phased so that current can flow from one electrode to any other electrode or to the neutral ground.

The electrodes can be installed using several different drilling or direct-push techniques, including angled or horizontal methods. The horizontal spacing between electrodes is usually between 10- and 25-feet (Beyke and Fleming, 2005). The trade-off in distance is between the cost of installing more electrodes and heating the soil more quickly or installing fewer electrodes and heating the soil over a longer time. Because the current density is highest at the electrodes, the applied voltage is dependent on the contact resistance. While heating all soil, Electrical Resistance Heating (ERH) preferentially heats the more conductive silt and clay first. Temperatures over 100 degrees Centigrade can be generated in the saturated zone. However, ERH can be effective at temperatures as low as 60 degrees Centigrade.

An SVE system would be used to remove volatilized water and contaminated vapors from the subsurface. The contaminated vapors flow will be conveyed through a condenser and treated prior to atmospheric release. The water condensate will be treated using granular activated carbon to remove the contaminants and fed back into the ground to facilitate further heating.

Performance monitoring would be conducted, which would include semi-annual sampling of monitoring wells for the first three-years, followed by five years of annual sampling.

Grouting would be used to seal the sewer lines and manhole. Grouting would be conducted using inflatable packers to isolate the joint and/or defects to be grouted from the rest of the sewer system allowing the controlled application of grout only to the part of the sewer sealed off by the packer. The packer initially would be pulled into position over the joint or connection containing defects where it is inflated sealing off the area for grouting. An aboveground pipe would be used to feed grout to the packer, where injection ports located in the area of the packer isolated by the packer and the pipe wall inject grout under pressure into the packer/pipe cavity, defects and soil outside the pipe surrounding the defects. To avoid clogging the feed pipes, two part epoxy resin grouts would be used and mixed just prior to injection.

7.3.4.1 COMPLIANCE WITH ARARS

This alternative complies with the ARARs. Groundwater would achieve cleanup goals in a reasonable time, i.e., no exposures while concentrations decrease to meet remedial goals or alternate cleanup goals are allowed.

7.3.4.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment would be achieved by land use controls. The ERH system should remove volatilized water and contaminated vapors from the subsurface. LUCs would control potential use of shallow groundwater as a drinking water source.

7.3.4.3 LONG-TERM EFFECTIVENESS

Soil, soil gas and groundwater quality should improve in the long-term through natural attenuation processes following implementation of ERH.

7.3.4.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Implementation of ERH would be effective in reducing the volume and mobility of COCs. Following ERH treatment, the volume of COCs would continue to be reduced through natural attenuation processes.

7.3.4.5 SHORT-TERM EFFECTIVENESS

Vapor intrusion and COCs in groundwater would be reduced following ERH treatment. ICs limiting the use of shallow groundwater for drinking water would control exposure to COCs during the time it takes to meet remedial goals.

7.3.4.6 IMPLEMENTABILITY

The methodologies in this alternative have been successfully implemented at other sites; however, it would result in disruptions to traffic and businesses during implementation.

7.3.4.7 COST

The cost for implementing this alternative has been estimated at approximately $2,705,000.

7.3.5 Alternative No. 5: Groundwater Extraction/Treatment w/ICs and MNA and Pipe Bursting

Groundwater containing dissolved-phase VOCs would be removed and hydraulically controlled by pumping from extraction wells and treated prior to discharge. Based on the hydraulic testing, it is anticipated that a total flow rate of approximately two gallons per minute (gpm) from an array of four extraction wells would be adequate to provide hydraulic control for the A-Zone groundwater. Based on the estimated extraction rate, and the sorption of VOCs to geologic materials, it is not likely that groundwater extraction would be effective in reducing concentrations to remedial goals, but could be used to control further migration of CVOCs in groundwater.

The presence of residual VOCs in groundwater would be addressed using LUCs. Groundwater monitoring would be conducted semi-annually for the first five years, then annually thereafter for 25-years. When groundwater remediation goals are reached, or alternative cleanup levels are established, the groundwater extraction and monitoring wells would be destroyed.

The pipe bursting technique would be used to replace the existing sewer line by breaking the existing pipe and inserting another pipe of equal diameter. During installation, a cone-shaped tool would be pushed or pulled through the inside of the pipe to be replaced. In the process, the service connections would be reinstated through excavation and reconnection using a variety of methods including mechanical saddles and "Tees".

7.3.5.1 COMPLIANCE WITH ARARS

This alternative complies with the ARARs. While it is unlikely that groundwater would achieve cleanup goals, i.e., there would be no exposures while concentrations continue or alternate cleanup goals are allowed.

7.3.5.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall, protection of human health and the environment would be achieved by LUCs. LUCs would control exposure until remediation goals are achieved, or alternate cleanup goals are approved.

7.3.5.3 LONG-TERM EFFECTIVENESS

Groundwater quality should improve through groundwater extraction, but it is unlikely that remediation goals would be achieved.

7.3.5.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The volume and mobility of COCs would be reduced through groundwater extraction.

7.3.5.5 SHORT-TERM EFFECTIVENESS

Groundwater quality would not improve in the short-term during groundwater extraction. LUCs limiting the use of shallow groundwater for drinking water would control exposure to COCs in the short-term.

7.3.5.6 IMPLEMENTABILITY

The methodologies in this alternative have been implemented at other sites with limited success in reaching cleanup goals; however, it could result in disruptions to traffic and businesses during implementation.

7.3.5.7 COST

The cost for implementing this alternative has been estimated at approximately $4,524,000.

7.4 COMPARATIVE ANALYSIS

A detailed comparison of the alternatives has been performed based on the threshold and primary balancing criteria previously described for the remedial alternatives. The USEPA requires that the selected alternative must protect human health and the environment, and comply with the ARARs. This comparative analysis evaluates the advantages and disadvantages of each alternative relative to one another so that the differences between the alternatives can be identified. A summary of the evaluation is presented in Table 7-1 and presented below.

7.4.1 Compliance with ARARs

Alternative No. 1 fails to comply with the majority of the ARARs. Alternative Nos. 2, 3 and 4 would comply with the identified ARARs for the Site. Alternative No. 5 would likely not achieve ARARs in the reasonable future.

7.4.2 Overall Protection of Human Health and the Environment

Alternative No. 1 would not achieve overall protection of human health with because there could be exposure to COCs in soil and groundwater. The No Action alternative does not satisfy the threshold criterion. With respect to groundwater, overall protection could not be evaluated, as the monitoring wells would be destroyed. No wells would be installed for domestic water uses.

Alternative No. 2 would be protective through land use controls. Therefore, overall protection of human health and the environment would be provided. Alternatives Nos. 3 and 4 would be protective of public health and the environment in the short and long term through reduction of groundwater concentrations. Alternative No. 5 is unlikely to reduce concentrations to safe drinking water levels, but LUCs would provide adequate protection from this pathway.

7.4.3 Long Term Effectiveness

Alternative No. 1 has no long-term effectiveness toward addressing the RAOs with the exception of the monitoring wells being removed. Alternatives 2 through 4 should be effective over the long-term through treatment and/or removal. The imposition of land use restrictions would assure the safety of future workers, including construction workers.

Alternative No. 3 would be effective in the long-term because measures would be taken to achieve cleanup standards. ISCF would reduce source material. Similar to Alternatives Nos. 2 and 4, the imposition of land use restrictions would assure the safety of future workers and tenants, including construction workers. Alternative No. 5 is not likely to be effective in the long-term in reaching remedial goals for groundwater.

7.4.4 Reduction of Toxicity, Mobility, or Volume

Alternative No. 1 would not further reduce the toxicity, mobility or volume of constituents at a rate greater than natural attenuation. Alternative No. 2 would remove contaminants through excavation, but it would rely on attenuation processes for further reduction of COCs. Alternatives No. 3 and 4 would reduce the health risks associated with toxicity, mobility, and volume of constituents by removing COCs mass from groundwater while reducing contaminant mobility. Alternative No. 5 would reduce volume of COCs , but likely not significantly, while mobility of COCs in groundwater would be controlled through groundwater extraction and treatment.

7.4.5 Short-Term Effectiveness

No potential impacts are anticipated with Alternative No. 1 because of the lack of a remediation system or construction activities. Alternative No. 1 would potentially create additional risks to the community or environment due to the continuing presence of uncontrolled and non-

monitored hazardous substances at the Site. LUCs would be mandated for Alternatives No. 2 through No. 5 that would provide short-term effectiveness.

Alternatives Nos. 2 through 5 could create short-term risks since they involve active remediation. Short-term risks, such as health and safety practices and proper construction methods, would be addressed before implementation of these alternatives. Worker protection requirements for specific tasks also would be defined in health and safety plans, which would be prepared by qualified remediation contractors.

7.4.6 Implementability

Alternative No. 1 can be readily implemented because the components are already in place. Alternatives Nos. 2 and 4 can be readily implemented, as excavation is a conventional technology and ERH (Alternative No. 4) has been proven implementable based on success at other sites. Similarly, Alternative No. 3 relies on ISCF, for which the equipment, materials and labor to implement this technology are not commonly available. Alternative No. 5 is implementable as it relies on conventional technologies.

Local permits also would have to be obtained and approved by the various regulatory agencies and other stakeholders for the project. Appropriate design plans and specifications would be prepared in advance of permitting.

7.4.7 Cost

A comparison of the costs for the remedial alternatives is provided on Table 7-1. The total cost for Alternative No. 1 is estimated at approximately $100,000, and includes only the cost for destruction of monitoring wells. Long-term operations and maintenance costs would not be necessary.

Alternative No. 2 has been estimated at $3,622,000, which is more expensive than Alternatives Nos. 1 and 4, but less than Alternatives Nos. 3 and 5. Alternative No. 2 includes costs for excavation and off-Site disposal of vadose and saturated soil. Groundwater monitoring, following excavation would be conducted to demonstrate continued natural attenuation of groundwater quality. Upon completion of the monitoring, the monitoring wells would be destroyed. Land use restrictions would be imposed.

Alternative No. 3 has an estimated higher cost than Alternatives Nos. 2 and 4, at approximately $3,672,000. Alternative No. 3 includes costs for ISCF chemical injections and monitoring. Groundwater monitoring, following ISCF would be conducted to demonstrate achievement of groundwater quality objectives. Upon completion of the monitoring, the flushing and monitoring wells would be destroyed. Land use restrictions would be imposed.

Alternative No. 4 has the lowest estimated cost for alternatives that meet the threshold criteria, at approximately $2,705,000. Alternative No. 4 includes costs for installation, operation and monitoring of the ERH system. Groundwater monitoring, following ERH would be conducted to demonstrate continued achievement of groundwater quality objectives. Upon completion of the monitoring, the ERH system would be removed and monitoring wells would be destroyed. Land use restrictions would be imposed.

Alternative No. 5 has the highest estimated cost at approximately $4,524,000. Alternative No. 5 includes costs for extracting and treating groundwater as well as monitoring. Land use restrictions would be imposed.

7.5 PREFERRED REMEDIAL ACTION ALTERNATIVE

Based on the comparative analysis, Alternative No. 4 – ERH with ICs and MNA with Sewer Grouting is the preferred remedial alternative. Alternative No. 4 meets the threshold criteria with the lowest estimated cost. It also is anticipated to meet water quality objectives in a shorter time than Alternatives Nos. 4 and 5. While Alternatives Nos. 2 through 4 include the use of LUCs to

limit the use to shallow groundwater, Alternative No. 4 provides the same level of protection and compliance with ARARs as Alternatives Nos. 2 and 3, but at a lower cost. Details of the implementation plan for Alternative No. 4 are presented in the following section.

8.0 IMPLEMENTATION PLAN

The activities to be conducted prior to implementation of the preferred remedial action alternative include the following: obtaining approval from the Regional Water Board and soliciting input from the public. Prior to implementation, a remedial design/implementation plan (RD/IP) will be prepared that presents details of the proposed remedy elements, including: permitting; and health and safety. A summary of the major elements to be addressed as part of the approval process and RD/IP is presented below.

8.1 PUBLIC NOTIFICATION

Opportunities will be provided to obtain public input prior to the final selection of the remedial action alternative. Public participation activities will be conducted based on the level of community interest in the project. Opportunities will be provided to obtain public input during the evaluation process. Community acceptance will be addressed based on this input.

8.1.1 Stakeholder Working Group

Meetings will be held with members of the local business community and other potentially affected parties to solicit their input during the remedy selection process. It is anticipated that there will be two meeting with the community prior to selection of the remedy.

8.1.2 Fact Sheet and Public Notice

As part of the public communication, a fact sheet will be prepared and distributed that summarizes the Site history, and proposed remedial plan. In addition, a public notice will be placed in a local newspaper: announcing the availability of the *Draft RAP* for public review; informing the public of the proposed scope of the remedy; and identifying where documents will be available for review. In support of the public review process, project documents will be made available at public information repositories.

8.1.3 Public Comment Period

A 30-day public comment period will be held before finalizing the *Draft RAP*, during which time the community will have an opportunity to comment on the proposed remedy by contacting the Regional Water Board. The community will be notified of any significant changes to the *Draft RAP* based upon the comments received from the public.

8.2 REMEDIAL DESIGN AND IMPLEMENTATION PLAN

A *Remedial Design and Implementation Plan* (*RDIP*) will be prepared following public approval of the *Draft RAP* and prior to implementation of the proposed remedy. The *RDIP* will identify tasks to be conducted to implement the selected remedial actions and include: schedule for implementing the construction phase; technical and operation plans and engineering specifications. The *RDIP* will include: air monitoring specifications; description of the construction equipment to be employed; contractor information and licensing; post-remedial sampling and monitoring procedures (Sampling and Analysis Plan); project documentation and reporting; a timeline chart; and *Health and Safety Plan* (HASP).

8.3 PRE-IMPLEMENTATION ACTIVITIES

Prior to implementation, a *Health and Safety Plan* (*HASP*), including an air monitoring plan will be prepared. In addition, necessary permitting will be conducted to facilitate implementation.

8.3.1 Health and Safety

A *HASP* will be prepared to address worker health and safety during implementation of remediation activities including decontamination procedures, personal and area air monitoring during remediation activities, dust control, traffic plan and personal protective equipment. The Site *HASP* will be prepared in accordance with OSHA regulations for remedial activities

conducted by onsite personnel and contractors. The *HASP* would be submitted separately detailing health and safety procedures, compliance with OSHA air monitoring requirements.

8.3.1.1 CONTRACTOR QUALIFICATIONS

Pursuant to Business & Profession Code, contractors performing excavation of the contaminated soil will be required to have a Class A license with a Hazardous Substances Removal Certification. In addition, the contractor's work force will be required to have 40-hours of Occupation Safety Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training and use appropriate personal protection equipment (PPE) to control exposure to COCs. As appropriate, the contractor's personnel will also have current 8-hours of supervisory training prior to work at the Site.

8.3.1.2 NIGHT WORK

Based on input from the Stakeholders Working Group, work within E Street will be conducted at night to the maximum extent practicable. The night work will involve closing off E Street to traffic from Harris Street to Grotto Street. During this period, bus lines, emergency vehicles, etc., will be advised of alternate routes to use. The work will be scheduled to allow for re-opening E Street by 5AM to facilitate businesses in the area.

8.3.1.3 SITE CONTROL

Access to the Site will be controlled by the contractor to prevent unauthorized entry. Barricades should be maintained by the contractor during night work to limit entrance to the Site by unauthorized personnel and/or vehicles.

8.3.1.4 INHALATION EXPOSURE ACTION LEVELS

Inhalation of material containing chemicals in soil is a primary exposure route of concern. This exposure pathway will be controlled with the institution of best management practices to reduce human exposure to airborne dust and VOCs, proper hygienic practices and use of appropriate personal protective equipment (PPE). Worker protection action levels include: 2.5 mg/m^3 for respirable dust and 50 ppm_v for PCE and 0.5 ppm_v for benzene. Allowing for appropriate correction factors, the action levels for photoionization detector (PID) reading with a 10.6 electron volt (eV) bulb are 88 ppm_v for PCE and 1.0 ppm_v for benzene.

8.3.1.5 DERMAL EXPOSURE

Incidental dermal exposure to soil containing VOCs is a potential, but unlikely, exposure route of concern. This exposure pathway will be controlled with the institution of proper hygienic practices and use of appropriate PPE.

8.3.1.6 INGESTION EXPOSURE

Incidental ingestion of impacted materials is a potential exposure route of concern. This exposure pathway will be controlled with the institution of proper hygienic practices.

8.3.1.7 PHYSICAL HAZARDS

The remediation activities at the Site will utilize heavy equipment. Site activities may include the operation of drill rigs, transformers, excavators and trucks. Physical hazards associated with these activities include slips, trips, and falls, heavy equipment and truck operations, vehicular traffic, noise, electrical shock and heat stress.

8.3.1.8 DUST AND VAPOR CONTROL

Engineering controls will be implemented to control airborne particulates and vapors during remediation activities. The engineering controls will include: routine water applications; control of vehicle access; vehicle speed restrictions; covering of soil stockpiles; and rumble strips to limit soil track-out. Forced air ventilation and use of odor suppressants will also be implemented, as needed. In addition, public thoroughfares will be swept daily and temporary cessation of work activities implemented, as necessary, to control dust.

8.3.1.9 AIR MONITORING

Air monitoring will be performed within the Site and at the fenced perimeter of the Site to document that dust and vapor control measures are adequate for protection of workers and the public. The air monitoring will be conducted using: a Monitoring Instruments for the Environment, Inc. (MIE) data logging real time dust monitor, model PDR-1000 respirable air monitor (RAM), or equivalent; and a PID calibrated to 100 ppm_v as isobutylene gas with a 10.6 eV bulb.

8.3.2 Permitting

Prior to implementation of the actions, appropriate permits will be obtained. The necessary approvals, permits and licenses required by local, state and federal agencies will be obtained. Necessary permits are anticipated to include:

- Boring/Well Construction/Destruction permits – Humboldt County Environmental Health;
- Pacific Gas & Electric – Power drop for ERH system;
- Waiver or Waste Discharge Requirements/Notice of Intent – Regional Water Board;

- Authority to Construct/Permit to Operate – North Coast Unified Air Pollution Control District (NCUAPCD).

In addition, affected parties will be notified of the scheduled work dates approximately one week prior to commencing work.

8.3.3 Well Destruction

Prior to implementation of activities, existing groundwater monitoring wells within the treatment zones will be destroyed in accordance with Humboldt County Environmental Health Department requirements. The wells identified for destruction include KMW-20A and KMW-21A. The well will be destroyed either by drilling out the annulus to the total depth of each of the wells using hollow-stem auger equipment or by pressure grouting. The well destruction will be performed by a C-57 licensed well drilling contractor.

8.3.4 Power Supply

To provide adequate power for the ERH system, a supplemental power drop will be requested from PG&E. Based on the design parameters for the ERH system, an application will be submitted for provision of 800 amp, 480-volt (to provide 540 kW) of power.

8.3.5 Utility Clearance

Prior to implementation of the actions, appropriate notifications will be made to Underground Services Alert (USA) to locate and clear work areas for underground utilities at the Site. The work areas will also be cleared for underground utilities using a private underground utility locating contractor. Utility lines located in the vicinity of the proposed work will be protected to prevent any accidents and/or interruption of services.

8.4 PROPOSED REMEDY IMPLEMENTATION

Implementation of the preferred remedial alternative would be conducted at night to minimize inconvenience to businesses and/or residents. In addition, the work would be conducted in accordance to the City of Eureka regulations regarding noise disturbance. Details of the proposed remedy implementation are presented below.

8.4.1 Groundwater Treatment

Groundwater treatment with ERH involves the installation of electrodes and passing an electrical current through them. ERH requires the following components: power delivery systems; electrodes; electrical cables and the power to the electrodes; extraction wells for recovery of liquids, steam and contaminant vapors from the subsurface. Following groundwater treatment, a monitoring program will be implemented to determine if/when background concentrations will be attained. Details of the installation of these components are presented below. Figures depicting the ERH electrode layout and details are included in Appendix D.

8.4.1.1 POWER SYSTEM INSTALLATION

A power system capable of providing 500 kilowatt for the treatment will be installed on the property at 2907 E Street. The power control unit would be constructed with a silicon controlled rectifier and/or copper transformer. A silicon controlled rectifier allows computer-controlled adjustments of voltage and amps at the electrodes. A power control unit can fit inside a 20-foot ISO container and will include a multi-panel distribution center to supply power to auxiliary equipment, e.g., steam condenser, vacuum blowers and transfer pumps. Power will also be provided for Site lighting and security systems.

The power unit will be connected to the PG&E power supply using a temporary power drop. The power unit will also be equipped with a computer operated power control unit that will monitor power distribution to the electrodes and allow for remote operations monitoring and isolation

transformers that force ERH current to flow between the electrodes only, preventing ERH current from flowing to a distant electrical sink. The electrodes will be connected to the power unit using electrical cables installed within trenches.

8.4.1.2 ELECTRODE INSTALLATION

Electrodes will be installed within an approximately 4,000-square-foot treatment area. The co-located electrodes-SVE wells will be installed in a hexagonal pattern based on an approximately 12-foot spacing within the treatment area, i.e., approximately 33 electrodes. In addition, temperature monitoring points will also be installed within the treatment area along sensitive buried utilities. The electrode-SVE wells and temperature-monitoring points will be installed in borings advanced within the treatment area. The electrode-SVE borings will be advanced to approximately 11-feet below ground surface. The electrodes will be connected to a power control unit (PCU) to distribute and monitor the electrical power supply. A steam recovery and SVE treatment system will be installed to condense steam generated and treat extracted vapors prior to discharge to the atmosphere.

8.4.1.3 ERH WELL BORINGS

Borings will be advanced within the remediation area to a depth of approximately 11-feet below ground surface using drilling equipment operated by a California State C-57 licensed well drilling contractor. Once the target depth has been reached, steel casing will be installed within the borehole annulus. The casing will be slotted to facilitate recovery of steam. Following casing installation, a permeable sand will be placed between the borehole annulus and the slotted portion of the steel casing. A Portland Type II neat cement grout will then be placed above the permeable sand to the ground surface.

8.4.1.4 TEMPERATURE MONITORING POINT INSTALLATION

Two temperature-monitoring points will be installed within the treatment area monitor the subsurface temperatures from the ERH system. The temperature monitoring points will be installed within approximately six-diameter borings advanced using hydraulic direct push, hollow stem auger or mud rotary drilling equipment. The borings will be advanced to approximately 11-feet below ground surface. Once the target boring depth has been reached, blank pipe casing will be installed within the borehole annulus to the ground surface. Following casing installation, a string of thermocouples spaced approximately five-feet apart vertically will be lowered into the casing annulus. The thermocouples will then be connected to the PCU to monitor the subsurface temperature gradients.

8.4.1.5 CONVEYANCE PIPING

At the treatment areas are heated, the vacuum blower will be used to pull the steam and vapors from the subsurface to the treatment equipment. The conveyance piping will be constructed with Schedule 40 CPVC pipe, valves and fittings. Pipe diameters are anticipated to range from 1.5-inch at individual extraction points to four-inch at manifolds. The conveyance piping will be placed underground beneath E Street.

8.4.1.6 SVE SYSTEM

An SVE system will be installed to remove and treat steam and soil vapors generated from the ERH heating process. The SVE system will extract stream and vapors from the co-located electrode SVE wells using a 20 horsepower blower. Piping will connect the co-located electrode-SVE wells with the treatment system. The treatment system will include a condenser that will separate the soil vapors from the steam. The steam condensate will then be transferred to a cooling tower for reuse as drip water for the electrodes. Excess condensate will be characterized and treated, as necessary, prior to discharge to the City of Eureka publicly-owned

treatment works. The separated soil vapors will be treated separately using granular activated carbon (GAC) prior to discharge to the atmosphere under a permit from the NCUAPCD.

8.4.1.7 HYDRATION SYSTEM

To provide moisture to maintain the electrical conductance, the electrodes will be installed with a water hydration system. The system operates with automatic solenoid valves and small pumps to provide moisture to the electrodes. It is estimated that water flow will be approximately 1 to 2 gallons per minute.

8.4.1.8 SECURITY

The treatment system, which will be located at 2907 E Street, will be secured and electronically monitored to limit unauthorized access to the ERH equipment and electrodes. The area will be fenced and monitored with closed-circuit television (CCTV) security cameras equipped with internal motion sensors. If motion is sensed, the power to the electrodes will be turned off and an alarm will be provided to local commercial security service. If unauthorized entry is detected, local police will be notified. Once the situation has been adequately assessed and, when determined to be safe, the power will be restarted.

8.4.2 Sewer Line Repair

The sewer main beginning at the manhole in E Street and Grotto Street and progressing south along E Street, will be repaired. Approximately 180-feet of the six-inch diameter vitrified clay pipe (VCP) sewer main will be grouted. The grouting will use inflatable packers, sized to the section of the pipe or service connection, to isolate the joint to be grouted from the rest of the sewer system allowing the controlled application of grout only to the part of the sewer sealed off by the packer.

The packer initially will be pulled into position over the joint or connection containing defects where it is inflated, sealing off the area for grouting. Pipes will feed grout to the packer, where injection ports located in the area of the packer isolated by the packer and the pipe wall inject grout under pressure into the packer/pipe cavity, defects and soil outside the pipe surrounding the defects. To avoid clogging the feed pipes, two part epoxy resin grouts will be fed to the packer in two pipes where it is mixed just prior to injection.

Once the space around the packer and the defect is filled, the grout will be held under pressure until it hardens in place forming a thin layer of grout on the pipe walls and a grout plug in the defect and the soil adjacent to the defect. After the grout has hardened, the packer will be deflated and removed from the pipe and service restored.

8.4.3 Air Monitoring

Air monitoring will be conducted during activities to monitor worker safety and for protection of nearby workers. The air monitoring will be conducted using a PID calibrated to 100 ppm_v with isobutylene gas. Details of the air monitoring and worker protection action levels will be included in the *HASP*.

8.4.4 Equipment Decontamination

Equipment used for remediation will be dry brushed before leaving the Site. Trucks and roll-off bins exiting the Site will be inspected and logged for compliance with the Site decontamination requirements. To minimize the spread of soil, equipment will be cleaned prior to movement out of active work zones. The trucks and roll-off bins will be dry brushed for removal of material prior to exiting the Site.

Prior to exiting the work zone and Site, e.g., crossing public thoroughfares or completion of contaminated material excavation, the equipment will be cleaned. Details of the decontamination procedures will be included in the *HASP*.

8.4.5 Storm Water Control Measures

The activities should be performed in compliance with California State Water Resources Control Board (SWRCB) Water Quality Order 2009-0009-DWQ, the *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, NPDES No. CAS000002* ("the General Permit;" SWRCB, 2009). Storm water pollution control procedures should be implemented in accordance with the Best Management Practices (BMPs) as outlined by the *Stormwater Best Management Practice Handbook; Construction* (CSQA, 2003) and Caltrans *Construction Site Best Management Practices (BMPs) Manual* (Caltrans, 2003).

8.5 LAND USE RESTRICTIONS

An LUC will be prepared consistent with Regional Water Board policy and Section 13307.1 of the Water Code. The LUC will be finalized and recorded subject to Regional Water Board approval. The LUC will be recorded to identify specific land use restrictions associated with the Site. The LUC will preclude owners or occupants of the property from drilling, boring, or excavating at the Site without review and approval from the Regional Water Board and use of appropriate health and safety precautions for construction workers. The LUC will run with the land and stay in effect as long as hazardous substances limit the use of the property and until terminated by Regional Water Board.

The potential use of groundwater beneath the Site will be addressed using LUCs. The LUCs will be designed so that future owners will not have direct contact with the shallow groundwater unless permitted in writing by the Regional Water Board. The LUC will include language that indicates owners or occupants of the property should not drill, bore, otherwise construct, or use a well for the purpose of extracting water for any use, including, but not limited to, domestic, potable, or industrial uses, unless expressly permitted in writing by the Regional Water Board. It will also require access to and non-interference with the groundwater-monitoring network.

8.6 MONITORING AND REPORTING PROGRAM

A groundwater monitoring and reporting program (MRP) will be submitted under separate cover. The monitoring program will be designed to generate data to evaluate if/when background concentrations can be attained.

8.7 SCHEDULE

Pending review by the Regional Water Board, it is anticipated that the *Draft RAP* could be made available for public comment in April 2015 with anticipated approval in June 2015. Following approval of the RAP, installation of the ERH system would be conducted during July to August, with operation commencing in September 2015. Groundwater monitoring and reporting would be conducted in accordance with proposed MRP.

9.0 ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter
µV	microvolts
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
BTEX	Benzene, toluene, ethyl benzene and xylenes
CAA	Clean Air Act
CalEPA	California Environmental Protection Agency
CalOSHA	California Occupational Safety and Health Administration
CCR	California Code of Regulations
CCTV	Closed-circuit Television
CDPH	California Department of Public Health
CE	Chloroethene (Vinyl Chloride)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHHSLs	California Human Health Screening Levels
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CL	Clay
cm/sec	centimeters per second
COCs	Chemicals of concern
COPCs	Chemicals of Potential Concern
CPT	Cone penetration test
CRA	Conestoga Rovers & Associates
CSLM	Controlled low strength material
CSM	Conceptual Site Model
CVOCs	Chlorinated Volatile Organic Compounds
CWA	Clean Water Act

DAF	Dilution/attenuation Factor
DCE	cis- and trans-1,2-Dichloroethene
DLM	Designated Level Methodology
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved oxygen
DQOs	Data Quality Objectives
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EC	electrical conductivity
ECP	Electron Capture Detector
ELAP	Environmental Laboratory Accreditation Program
ER	Emergency Response
ERH	Electrical Resistive Heating
ERI	Environmental Resolutions, Inc.
GAC	Granular activated carbon
gm/kg	grams per kilogram
gpm	gallons per minute
GZA	Ground Zero Analysis
HASP	Health and Safety Plan
HDPE	High density polyehtylene
HERD	Human and Ecological Risk Division
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ICs	Institutional Controls
IDW	Investigation-derived waste
ILCR	Incremental lifetime cancer risk
ISCF	*In situ* chemical flushing
ISCO	*In situ* chemical oxidation
kW	kilowatt
m	meters

LUC	Land Use Covenant
MBAS	Methylene blue active substances
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MIP	Membrane Interface Probe
MNA	Monitoring Natural Attenuation
MRP	Monitoring Reporting Program
MSL	Mean Sea Level
mS/m	milliSiemens per minute
NAVD	North American Vertical Datum
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCUAPCD	North Coast Unified Air Pollution Control District
NPDES	National Pollutant Discharge Elimination System
OSHA	United States Occupational Safety and Health Administration
PCE	Tetrachloroethene
PHG	Public Health Goal
PID	Photo-ionization detector
PPE	Personal protection equipment
ppm_v	parts per million by volume
PRG	Preliminary Remediation Goal
psig	pounds per square inch gauge
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
OEHHA	Office of Environmental Human Health Assessment
ORP	Oxidation-reduction potential
PHGs	Public Health Goals
PLC	Programmable Logic Controller
RAO	Remedial Action Objectives
RAP	Remedial Action Plan
RCRA	Resource Conservation and Reclamation Act

RDIP	Remedial Design/Implementation Plan
RfD	Reference dose
RGs	Remedial Goals
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RSLs	Regulatory Screening Levels
SARA	Superfund Amendments and Reauthorization Act
scfm	standard cubic feet per minute
SDWA	Safe Drinking Water Act
SM	Silty sand
SP	Poorly graded sand
SSDS	Subslab depressurization system
SSLs	Soil Screening Levels
STLCs	Soluble Threshold Limit Concentrations
S.U.	Standard Units
SVE	Soil vapor extraction
SWRCB	State Water Resources Control Board
TBCs	To Be Considered
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TSLCP	Toxic Characteristics Leaching Potential
TCM	Trichloromethane
THMs	Trihalomethanes
TMB	Trimethylbenzene
TPHd	Total Petroleum Hydrocarbons as diesel
TPHg	Total Petroleum Hydrocarbons as gasoline
TPHmo	Total Petroleum Hydrocarbons as motor oil
UCL	Upper confidence level
USA	Underground Services Alert
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

USGS	Unites States Geological Survey
UST	Underground Storage Tank
VCP	Vitrified clay pipe
VOCs	Volatile Organic Compounds
WEST	West Environmental Services & Technology, Inc.
WDRs	Water Discharge Requirements
W&K	Winzler & Kelly
WQOs	Water Quality Objectives

10.0 REFERENCES

ASTM, *Standard Guide for Sample Chain-of-Custody Procedures D 4840-99* (ASTM D 4840).

ASTM, *Standard Guide for Soil Gas Monitoring in the Vadose Zone D-5314-92* (ASTM D 5314).

Calibre Systems, Inc., *Technical Memorandum #1, Results of Initial Direct Push Investigation, Norman's Dry Cleaners and Laundry,* January 25, 2007 (Calibre, 2007).

Chu, M., Ktanidis, P., McCarty, P., *Effect of biomass accumulation on microbially enhanced dissolution of a PCE pool: a numerical simulation,* Journal of Contaminant Hydrology, 65, 2003, (Chu et al., 2003).

Ayres Associates, *An Investigation of Groundwater Contamination from an Onsite Sewage Disposal System (OSDS) at a Single Family Home in Florida, Phase 2 Report to Soap and Detergent Association*. April 1993 (Ayres, 1993).

California Code of Regulations, Title 22, Section 64444.

California Department of Water Resources, *California's Groundwater Bulletin 118: Eureka Plain Groundwater Basin, Groundwater Basin Number: 1-9,* February 27, 2004 (DWR, 2004).

California Environmental Protection Agency – Department of Toxic Substances Control, Site Mitigation Program Management Memo, *Response Actions for Sites Where Use May Include Sensitive Uses*, Final Draft, March 26, 2002 (CalEPA, 2002).

California Environmental Protection Agency – Department of Toxic Substances Control, *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air,* Interim Final, February 7, 2005 (CalEPA, 2005).

California Environmental Protection Agency – Department of Toxic Substances Control, *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Vapor Intrusion Guidance), October 2011 (CalEPA, 2011).

California Environmental Protection Agency – Department of Toxic Substances Control, Human and Ecological Risk Division, *Vapor Intrusion Guidance Interim Final, DTSC Indoor Air Guidance Unclassified Soil Screening Model*, December 2004, Last Modified December 6, 2011 (HERD, 2011).

California Environmental Protection Agency – Office of Human and Ecological Risk (HERO), *HERO Human Health Risk Assessment (HHRA) Note Number 3*, July 14, 2014 (HERO, 2014).

California Regional Water Quality Control Board – Central Valley Region, *Designated Level Methodology for Waste Classification and Cleanup Level Determination*, October 1986, Updated June 1989 (Regional Water Board, 1989).

California Regional Water Quality Control Board – Central Valley Region, *Dry Cleaners – A Major Source of PCE in Ground Water*, March 27, 1992 (Regional Water Board, 1992).

California Regional Water Quality Control Board – North Coast Region, *Cleanup and Abatement Order R1-2003-0088 for KFD Enterprises, Incorporated dba Norman's Dry Cleaner and Laundry, 2907 E Street, Eureka, California, Humboldt County*, July 18, 2003 (Regional Water Board, 2003).

California Regional Water Quality Control Board – North Coast Region, *Draft Feasibility Study/Remedial Action Plan, E and Grotto Streets Plume, Eureka, California – Technical Review, Norman's Laundry and Dry Cleaning, 2907 E Street, Eureka, California, RB Case Nos. 1NHU630 and 1THU694*, May 8 2012 (Regional Water Board, 2012).

California Regional Water Quality Control Board – North Coast Region, *Monitoring and Reporting Program (MRP) No. R1-2008-0060, WDID 1B08011RHUM for Normans Dry Cleaners, 2907 E Street, Eureka, California*, May 6, 2008 (Regional Water Board, 2008).

California Regional Water Quality Control Board – North Coast Region, *Monitoring and Reporting (MRP) Program No. R1-2009-0130 for Norman's Dry Cleaners and Laundry, 2907 E Street, Eureka, California*, December 8, 2009 (Regional Water Board, 2009a).

California Regional Water Quality Control Board – North Coast Region, *Technical Memorandum, Norman's Dry Cleaners and Laundry, 2907 E Street, Eureka, California*, June 2, 2009 (Regional Water Board, 2009b)

California Regional Water Quality Control Board – North Coast Region, *Order No. R1-2011-0059 Rescinding Monitoring and Reporting Program Order No. R1-2009-0130 for Norman's Dry Cleaners and Laundry, 2907 E Street, Eureka, California*, May 10, 2011 (Regional Water Board, 2011a).

California Regional Water Quality Control Board – North Coast Region, *Water Quality Control Plan for the North Coast Region*, May 2011 (Regional Water Board, 2011b).

California Senate Bill 1764 – Advisory Committee, *Recommendations Report Regarding California's Underground Storage Tank Program*, May 31, 1996 (Senate Bill 1764 advisory Committee, 1996).

City of Eureka, *2005 City of Eureka Drinking Water Consumer Confidence Report*, May 2006 (City of Eureka, 2006).

Clearwater, *Laboratory Results of Soil and Groundwater Samples, Norman's Dry Cleaners, 2907 E Street, Eureka, California*, December 31, 1998 (Clearwater, 1998).

Conestoga Rovers & Associates (CRA), *First Quarter 2010 Semi-Annual Groundwater Monitoring Report, Union Oil Facility 30-6630 (Former Unocal Station 5357), 2907 E Street, Eureka, California, Case 1THU694*, April 26, 2010 (CRA, 2010).

CRA, *First Semi-Annual 2014 Groundwater Monitoring Report, Union Oil Facility 30-6630 (Former Unocal #5357) 2907 E Street, Eureka, California*, April 30, 2014 (CRA, 2014).

CRA, *In-Situ Chemical Oxidation Treatability Study Report, Union Oil Facility 30-6630 (Former Unocal #5357) 2907 E Street, Eureka, California*, October 7, 2011, (CRA, 2011).

ENSR International, *Installation of Additional Groundwater Monitoring Wells for Further Groundwater Plume Definition and Destruction of Monitoring Wells and Destruction of Monitoring Wells Screened Across Two Aquifers, Former Unocal Station No. 5357, 2907 E Street, Eureka, California, Humboldt County LOP No. 12694*, December 22, 2004 (ENSR, 2004).

ENSR|AECOM, *Quarterly Groundwater Monitoring Results Report, First Quarter 2005, 2907 E Street, Eureka, California, Humboldt County LOP No. 12694, Former Unocal Station No. 5357, Chevron Site Number 306630, ENSR Project No. 06940-292-OM1*, January 22, 2007 (ENSR, 2007).

Feenstra, Ph.D., P. Geo., Stanley, *Expert Report, KFD Enterprises, Inc., v. City of Eureka et al., U.S. District Court, Northern District of California, Case No. CV-08-4571 MMC*, August, 19, 2012 (Feenstra, 2012).

Folkes, D.J. and D. W. Kurz, 2003, *Efficacy of Sub-slab Depressurization for Mitigation of Vapor Intrusion of Chlorinated Organic Compounds, Proceedings of the 2002 Indoor Air Conference, International Academy of Indoor Air Sciences*, Monterey, July 2002 (Folkes and Kurz, 2002).

Gilbert, R. O., *Statistical Methods for Environmental Pollution Monitoring*, John Wiley & Sons, 1987 (Gilbert, 1987).

Ground Zero Analysis (GZA), *Groundwater and Soil Vapor Monitoring Report First Quarter 2014, City of Eureka, E Street*, May 2, 2014 (GZA, 2014).

GZA, *Soil Vapor Survey, City of Eureka, E Street*, December 23, 2013 (GZA, 2013a).

GZA, *Technical Summary Report Investigation of E Street Sewer Line and Manhole, Eureka, California*, February 19, 2013 (GZA, 2013b).

McAlary, *Conceptual Models of Vapor Intrusion*, U.S. Environmental Protection Agency, Office of Research and Development Seminar on Indoor Air Vapor Intrusion, February 25-26, 2003 (McAlary, 2003).

Tchobanoglous, G., *Wastewater Engineering: Treatment, Disposal, Reuse*, Metcalf & Eddy, Inc. 1979 (M&E, 1979).

National Research Council, Alternatives for Groundwater Cleanup, National Academy Press, 1994 (NRC, 1994).

Parker Engineering and Construction Company, *Canopy and Pump Island Addition, Service Station No. 5357, Drawing, No. F-3-5357-4, Grotto & E Streets, Eureka, California, for Union Oil Company of California*, August 8, 1966 (Parker Engineering, 1966).

Shuster Photograph Collection, Humboldt State University, http://vetc.humboldt.edu/humco/holdings/shuster/Access_Jpg/2001010568.jpg, 1947 (Shuster, 1947).

SounPacific Environmental Services, *Results of Well Survey, Norman's Dry Cleaning, 2907 E Street, Eureka, California*, May 17, 2002 (SounPacific, 2002).

State Water Resources Control Board, *Resolution No. 92-49 – Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*, June 18, 1992 – As Amended on April 21, 1994 and October 2, 1996 (SWRCB, 1996).

State Water Resources Control Board, *Order: WQ 98-12 UST*, November 19, 1998 (SWRCB, 1998).

Union Oil Company of California, Div 43 Northern California-Retail Allocation Customer Base, Branch 0196, Retail Unit 5357, Eureka, California, June 20, 1979 (Union Oil, 1979).

United States Environmental Protection Agency (USEPA), *Guidance Document for Effluent Discharges from the Auto and Other Laundries Point Source Category*, February 1982 (USEPA, 1982).

USEPA, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final, USEPA, 540/G-89/004, Office of Remedial and Emergency Response, 1988* (USEPA, 1988).

USEPA, *Risk Assessment Guidance for Superfund, Parts A and B*, December 1989 (USEPA, 1989).

USEPA, *Title 40 CFR Part 300 National Oil and Hazardous Substances Pollution Contingency (NCP)*, April 9, 1990 (NCP, 40CFR300).

USEPA, Office of Research and Development, *Estimating Potential for Occurrence of DNAPL at Superfund Sites*, January 1992 (USEPA, 1992a).

USEPA, *Supplemental Guidance to RAGS: Calculating the Concentration Term, Publication 9285.7-081, Intermittent Bulletin, Volume 1, Number 1*, May 1992 (USEPA, 1992b).

USEPA, Evaluation of the Likelihood of DNAPL Presence at NPL Site, National Results, EPA 540R-93-073, September 1993 (USEPA, 1993).

USEPA, Office of Research and Development, *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*, January 1994 (USEPA, 1994).

USEPA, *User's Guide to the VOCs in Soils Presumptive Remedy*, July 1996 (USEPA, 1996a).

USEPA, *Soil Screening Guidance: User's Guide*, Office of Solid Waste and Emergency Response, 9355.4-23, July 1996 (USEPA, 1996b).

USEPA, *Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures*, EPA/540/S-95/504, Office of Research and Development, Washington D.C., April 1996 (USEPA, 1996c).

USEPA, *Field Applications of In Situ Remediation Technologies: Chemical Oxidation, EPA 542-R-98-008,* Office of Solid Waste and Emergency Response Technology Innovation Office, September 1998 (USEPA, 1998).

USEPA, Office of Solid Waste and Emergency Response, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, Directive 9200.4-17P, April 1999 (USEPA, 1999).

USEPA, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, EPA* 540-R-00-002, OSWER 9355.0-75, July 2000 (USEPA, 2000).

USEPA, *Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups*, EPA 540-F-00-005, September 2005 (USEPA, 2005).

USEPA, *Indoor Air Vapor Intrusion Mitigation Approaches, Engineering Issue*, EPA/600/R-08-115, October 2008 (USEPA, 2008a).

USEPA, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, (USEPA, 2008b).

USEPA, *Engineering Controls on Brownfields Information Guide, Engineering Controls Fact* Sheet, EPA-560-F-10-005, November 2010 (USEPA, 2010).

USGS, Volatile Organic Compounds in the Nation's Ground Water and Drinking-Water Supply Wells, Circular 1292, 2006. (USGS, 2006).

USEPA, *Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model, EPA 542-5-11-011*, July 2011 (USEPA, 2011).

West Environmental Services and Technology, Inc. (WEST), *Draft Remedial Action Plan, OU-1: On-Site Remediation, E and Grotto Streets Plume, Eureka, California*, March 2015 (WEST, 2015).

WEST, *Feasibility Study/Pilot Study Work Plan, E and Grotto Streets PCE Plume, Eureka, California*, June 2007 (WEST, 2007a).

WEST, *Notice of Intent, In Situ Chemical Oxidation Pilot Study, General Waste Discharge Requirements, Order No. R1-2006-0107, E and Grotto Streets Plume, Eureka, California*, November 2007 (WEST, 2007b).

WEST, *ISCO Pilot Study Start-Up and Quarterly Monitoring Report, E and Grotto Streets Plume, Eureka, California*, October 2008 (WEST, 2008a).

WEST, *Interim Data Submittal, E and Grotto Streets PCE Plume, Eureka, California*, July 2008 (WEST, 2008b).

WEST, *Presentation of Updated Conceptual Site Model, E and Grotto Streets PCE Plume, Eureka, California, Regional Water Quality Control Board – North Coast Region Meeting*, August 13, 2008 (WEST, 2008c).

WEST, *In Situ Chemical Flushing Pilot-Scale Report, E and Grotto Streets Plume, Eureka, California*, August 2010 (WEST, 2010).

WEST, *In Situ Chemical Flushing Monitoring Report, First Quarter 2011, E and Grotto Streets Plume, Eureka, California*, April 2011 (WEST, 2011a).

WEST, *ISCO Monitoring Report Fourth Quarter 2011, WDID 1B08011RHUM, Eureka, California*, December 2011 (WEST, 2011b).

WEST, *Revised In Situ Chemical Flushing Bench-Scale Study Report, E and Grotto Streets Plume, Eureka, California, Revision 1*, November 2009 (WEST, 2009).

WEST, *Revised Feasibility Study/Remedial Action Plan, E and Grotto Streets Plume, Eureka, California, Revision 1*, August 2012 (WEST, 2012).

WEST, *Sewer Investigation Work Plan, E and Grotto Streets Plume, Eureka, California*, July 2013 (WEST, 2013).

Wiedemeier, T., M. Swanson, D. Mouton, E. Gordon, W. Wilson, B. Wilson, D. Campbell, P. Haas, R. Miller, J. Hansen, F. Chapelle. 1998. *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water*. EPA/600/R-98/128/ Office of Research and Development Washington DC 20460 (Weidemeier et al., 1998).

Winzler & Kelly (W&K), *Report of Findings from Site Investigations, Norman's Dry Cleaners, 2907 E Street, Eureka, California, LOP #12694,* January 2001 (W&K, 2001).

W&K, *Survey Plat of S.E. Corner of Grotto and E Streets, Eureka, California for Union Oil Company of California,* June 17, 1964 (W&K, 1964).

W&K, Workplan for Initial Site Investigation at Former Site of Underground Storage Tank, Norman's Dry Cleaner, 2907 E Street, Eureka, California, LOP # 12694, September 10, 1999 (W&K, 1999).

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TABLES

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-1	4-25	135.12	12/8/00	11.10	124.02	--	--	--
			3/23/01	7.80	127.32	--	--	--
			6/28/01	8.74	126.38	--	--	--
			9/19/01	9.72	125.40	--	--	--
			12/27/01	6.55	128.57	--	--	--
			3/31/02	6.55	128.57	--	--	--
			6/27/02	8.88	126.24	--	--	--
			9/27/02	9.76	125.36	--	--	--
		134.81	12/31/02	6.52	128.29	--	--	--
			3/26/03	6.04	128.77	--	--	--
			11/6/03	12.05	122.76	--	--	--
			3/22/04	7.00	127.81	--	--	--
			5/18/04	8.30	126.51	--	--	--
			8/9/04	10.95	123.86	--	--	--
			11/9/04	10.86	123.95	--	--	--
MW-2	4-20	136.38	12/8/00	11.70	124.68	--	--	--
			3/23/01	9.40	126.98	--	--	--
			6/28/01	11.57	124.81	--	--	--
			9/19/01	12.97	123.41	--	--	--
			12/27/01	7.56	128.82	--	--	--
			3/31/02	--	--	--	--	--
			6/27/02	9.90	126.48	--	--	--
			9/27/02	12.50	123.88	--	--	--
		136.07	12/31/02	6.70	129.37	--	--	--
			3/26/03	6.58	129.49	--	--	--
			11/6/03	12.69	123.38	--	--	--
			3/22/04	7.08	128.99	--	--	--
			5/18/04	8.40	127.67	--	--	--
			8/9/04	11.43	124.64	--	--	--
			11/9/04	11.67	124.40	--	--	--
			2/7/05	7.51	128.56	--	--	--

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
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Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-3	4-20	136.25	12/8/00	11.85	124.40	--	--	--
			3/23/01	9.79	126.46	--	--	--
			6/28/01	11.59	124.66	--	--	--
			9/19/01	12.87	123.38	--	--	--
			12/27/01	7.91	128.34	--	--	--
			3/31/02	--	--	--	--	--
			6/27/02	9.95	126.30	--	--	--
			9/27/02	12.18	124.07	--	--	--
		135.95	12/31/02	4.84	131.11	--	--	--
			3/26/03	6.64	129.31	--	--	--
			11/6/03	12.41	123.54	--	--	--
			3/22/04	7.15	128.80	--	--	--
			5/18/04	8.62	127.33	--	--	--
			8/9/04	11.32	124.63	--	--	--
			11/9/04	11.65	124.30	--	--	--
			2/7/05	7.74	128.21	--	--	--
MW-4	5.5-20	135.18	12/31/02	6.21	128.97	--	--	--
			3/26/03	6.64	128.54	--	--	--
			11/6/03	12.44	122.74	--	--	--
			3/22/04	6.81	128.37	--	--	--
			5/18/04	8.50	126.68	--	--	--
			8/9/04	9.58	125.60	--	--	--
			11/9/04	11.40	123.78	--	--	--
MW-5	5.5-20	134.68	12/31/02	5.91	128.77	--	--	--
			3/26/03	6.23	128.45	--	--	--
			11/6/03	12.01	122.67	--	--	--
			3/22/04	6.65	128.03	--	--	--
			5/18/04	8.00	126.68	--	--	--
			8/9/04	10.53	124.15	--	--	--
			11/9/04	10.74	123.94	--	--	--
MW-6	5.5-20	138.02	12/31/02	8.21	129.81	--	--	--
			3/26/03	7.04	130.98	--	--	--
			11/6/03	12.75	125.27	--	--	--
			3/22/04	7.30	130.72	--	--	--
			5/18/04	8.70	129.32	--	--	--
			8/9/04	11.35	126.67	--	--	--
			11/9/04	12.18	125.84	--	--	--
MW-7	5.5-25	138.44	12/31/02	8.35	130.09	--	--	--
			3/26/03	8.54	129.90	--	--	--
			11/6/03	14.42	124.02	--	--	--
			3/22/04	9.03	129.41	--	--	--
			5/18/04	10.65	127.79	--	--	--
			8/9/04	13.28	125.16	--	--	--
			11/9/04	13.70	124.74	--	--	--

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-8A	4-9	134.16	11/5/03	6.40	127.76	--	--	0.52
			3/22/04	5.28	128.88	--	--	0.16
			5/18/04	5.75	128.41	--	--	0.24
			8/9/04	6.46	127.70	--	--	0.40
			11/9/04	6.20	127.96	--	--	0.44
			2/7/05	5.56	128.60	--	--	0.17
		134.23	5/18/05	4.74	129.49	--	--	0.29
			8/17/05	5.65	128.58	--	--	0.32
			11/1/05	6.91	127.32	--	--	0.41
			2/20/06	4.48	129.75	--	--	0.16
			5/16/06	4.71	129.52	--	--	0.25
			8/30/06	5.99	128.24	--	--	0.39
			10/24/06	6.22	128.01	--	--	0.50
			1/30/07	5.31	128.92	--	--	0.36
			5/1/07	4.85	129.38	--	--	0.23
			1/29/08	4.48	129.75	--	--	0.17
			4/28/08	5.00	129.23	--	--	0.26
			7/30/08	5.98	128.25	--	--	0.44
			10/28/08	6.31	127.92	--	--	0.54
			1/28/09	5.39	128.84	--	--	0.43
			4/28/09	5.25	128.98	--	--	0.27
			7/28/09	5.92	128.31	0.005	290	0.41
			1/28/10	4.45	129.78	0.011	282	0.23
			12/23/10	4.35	129.88	0.01	274	0.20
			1/27/11	4.61	129.62	0.02	--	0.21
			2/2/11	4.62	129.61	0.069	272	0.23
			7/27/11	5.51	128.72	0.02	--	0.30
			1/25/12	4.72	129.51	0.013	280	0.22
			7/17/12	5.01	129.22	0.014	289	0.29
			1/23/13	4.55	129.68	0.017	283	0.21
			6/20/13	5.35	128.88	0.010	304	0.36
			8/5/13	5.87	128.36	0.008	332	0.43
			1/15/14	5.94	128.29	0.007	354	0.60
			3/23/14	5.22	129.01	0.011	301	0.42
			4/9/14	5.05	129.18	0.012	296	0.37

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-8B	15-20	134.12	11/5/03	12.05	122.07	--	--	0.52
			3/22/04	7.02	127.10	--	--	0.16
			5/18/04	8.40	125.72	--	--	0.24
			8/9/04	10.87	123.25	--	--	0.40
			11/9/04	11.00	123.12	--	--	0.44
			2/7/05	7.41	126.71	--	--	0.20
		134.20	5/18/05	7.94	126.26	--	--	0.29
			8/17/05	9.10	125.10	--	--	0.32
			11/1/05	11.45	122.75	--	--	0.41
			2/20/06	6.18	128.02	--	--	0.16
			5/16/06	7.43	126.77	--	--	0.25
			8/30/06	10.29	123.91	--	--	0.39
			10/24/06	11.73	122.47	--	--	0.50
			1/30/07	9.21	124.99	--	--	0.36
			5/1/07	7.39	126.81	--	--	0.23
			1/29/08	6.33	127.87	--	--	0.17
			4/28/08	7.86	126.34	--	--	0.26
			7/30/08	10.81	123.39	--	--	0.44
			10/28/08	12.29	121.91	--	--	0.54
			1/28/09	10.11	124.09	--	--	0.43
			4/28/09	8.16	126.04	--	--	0.27
			7/28/09	10.43	123.77	--	--	0.41
			1/28/10	6.95	127.25	--	--	0.23
			12/23/10	6.53	127.67	0.01	299	0.20
			1/27/11	6.93	127.27	0.01	--	0.21
			2/2/11	7.16	127.04	0.034	285	0.23
			7/27/11	8.82	125.38	0.01	--	0.30
			1/25/12	7.10	127.10	0.008	309	0.22
			7/17/12	8.20	126.00	0.013	304	0.29
			1/23/13	6.85	127.35	0.009	299	0.21
			6/20/13	9.25	124.95	0.010	292	0.36
			8/5/13	10.53	123.67	0.009	300	0.43
			1/15/14	12.53	121.67	0.006	310	0.60
			3/23/14	9.81	124.39	0.007	304	0.42
			4/9/14	9.08	125.12	0.007	313	0.37

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-9A	5-10	134.63	11/5/03	6.70	127.93	--	--	0.55
			3/22/04	5.67	128.96	--	--	0.15
			5/18/04	6.21	128.42	--	--	0.23
			8/9/04	6.70	127.93	--	--	0.43
			11/9/04	6.56	128.07	--	--	0.46
			2/7/05	5.99	128.64	--	--	0.16
		134.72	5/18/05	5.38	129.34	--	--	0.19
			8/17/05	6.10	128.62	--	--	0.39
			11/1/05	6.51	128.21	--	--	0.52
			2/20/06	4.98	129.74	--	--	0.18
			5/16/06	5.12	129.60	--	--	0.25
			8/30/06	6.56	128.16	--	--	0.45
			10/24/06	6.70	128.02	--	--	0.55
			1/30/07	5.83	128.89	--	--	0.31
			5/1/07	7.53	127.19	--	--	-0.22
			1/29/08	5.09	129.63	--	--	0.15
			4/28/08	5.50	129.22	--	--	0.26
			7/30/08	6.41	128.31	--	--	0.46
			10/28/08	--	--	--	--	--
			1/28/09	6.11	128.61	--	--	0.42
			4/28/09	5.67	129.05	--	--	0.27
			7/28/09	6.31	128.41	0.005	290	0.43
			12/14/09	6.33	128.39	--	--	0.53
			1/28/10	5.30	129.42	0.011	282	0.19
			3/8/10	--	--	--	--	--
			3/15/10	4.98	129.74	--	--	0.15
			4/9/10	4.94	129.78	--	--	0.15
			6/15/10	5.08	129.64	--	--	0.19
			7/28/10	5.80	128.92	0.009	285	0.32
			12/23/10	4.88	129.84	0.01	274	0.19
			1/27/11	5.03	129.69	0.02	--	0.21
			2/2/11	5.06	129.66	0.069	272	0.17
			5/3/11	4.89	129.83	--	--	0.18
			7/27/11	5.19	129.53	0.02	--	0.36
			1/25/12	5.24	129.48	0.013	280	0.21
			7/17/12	5.30	129.42	0.014	289	0.33
			1/23/13	4.91	129.81	0.017	283	0.22
			6/20/13	5.50	129.22	0.010	304	0.41
			8/5/13	5.95	128.77	0.008	332	0.48
			1/15/14	5.94	128.78	0.007	354	0.67
			3/23/14	5.46	129.26	0.011	301	0.46
			4/9/14	5.29	129.43	0.012	296	0.40

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-9B	15-20	134.63	11/5/03	12.15	122.48	--	--	0.55
			3/22/04	7.17	127.46	--	--	0.15
			5/18/04	8.52	126.11	--	--	0.23
			8/9/04	11.00	123.63	--	--	0.43
			11/9/04	11.20	123.43	--	--	0.46
			2/7/05	7.55	127.08	--	--	0.16
		134.59	5/18/05	7.13	127.46	--	--	0.19
			8/17/05	9.94	124.65	--	--	0.39
			11/1/05	11.60	122.99	--	--	0.52
			2/20/06	6.68	127.91	--	--	0.18
			5/16/06	7.51	127.08	--	--	0.25
			8/30/06	11.02	123.57	--	--	0.45
			10/24/06	12.13	122.46	--	--	0.55
			1/30/07	8.80	125.79	--	--	0.31
			5/1/07	5.13	129.46	--	--	-0.22
			1/29/08	6.48	128.11	--	--	0.15
			4/28/08	7.97	126.62	--	--	0.26
			7/30/08	10.94	123.65	--	--	0.46
			10/28/08	12.42	122.17	--	--	--
			1/28/09	10.22	124.37	--	--	0.42
			4/28/09	8.26	126.33	--	--	0.27
			7/28/09	10.55	124.04	0.009	300	0.43
			12/14/09	11.55	123.04	--	--	0.53
			1/28/10	7.08	127.51	0.007	303	0.19
			3/8/10	6.95	127.64	--	--	--
			3/15/10	6.42	128.17	--	--	0.15
			4/9/10	6.34	128.25	--	--	0.15
			6/15/10	6.91	127.68	--	--	0.19
			7/28/10	8.93	125.66	0.011	300	0.32
			12/23/10	6.67	127.92	0.01	299	0.19
			1/27/11	7.05	127.54	0.01	--	0.21
			2/2/11	7.27	127.32	0.034	285	0.23
			5/3/11	6.59	128.00	--	--	0.18
			7/27/11	8.74	125.85	0.01	--	0.36
			1/25/12	7.22	127.37	0.008	309	0.21
			7/17/12	8.48	126.11	0.013	304	0.33
			1/23/13	7.00	127.59	0.009	299	0.22
			6/20/13	9.48	125.11	0.010	292	0.41
			8/5/13	10.68	123.91	0.009	300	0.48
			1/15/14	12.64	121.95	0.006	310	0.67
			3/23/14	9.97	124.62	0.007	304	0.46
			4/9/14	9.22	125.37	0.007	313	0.40

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-10A	4-9	135.00	11/5/03	7.21	127.79	--	--	0.45
			3/22/04	5.88	129.12	--	--	0.15
			5/18/04	6.60	128.40	--	--	0.20
			8/9/04	7.20	127.80	--	--	0.38
			11/9/04	7.00	128.00	--	--	0.42
			2/7/05	6.25	128.75	--	--	0.15
		135.05	5/18/05	5.33	129.72	--	--	0.15
			8/17/05	6.25	128.80	--	--	0.35
			11/1/05	6.65	128.40	--	--	0.47
			2/20/06	4.81	130.24	--	--	0.19
			5/16/06	4.69	130.36	--	--	0.25
			8/30/06	6.69	128.36	--	--	0.41
			10/24/06	6.96	128.09	--	--	0.47
			1/30/07	5.85	129.20	--	--	0.24
			5/1/07	5.22	129.83	--	--	0.23
			1/29/08	5.02	130.03	--	--	0.16
			4/28/08	5.50	129.55	--	--	0.25
			7/30/08	6.65	128.40	--	--	0.41
			10/28/08	7.06	127.99	--	--	0.50
			1/28/09	6.67	128.38	--	--	0.36
			4/28/09	5.72	129.33	--	--	0.26
			7/28/09	6.56	128.49	0.005	290	0.38
			1/28/10	5.22	129.83	0.011	282	0.20
			7/28/10	5.90	129.15	0.009	285	0.30
			12/23/10	4.77	130.28	0.01	274	0.20
			1/27/11	4.88	130.17	0.02	--	0.22
			7/27/11	5.23	129.82	0.02	--	0.39
			1/25/12	5.32	129.73	0.013	280	0.21
			7/17/12	5.41	129.64	0.014	289	0.32
			1/23/13	4.81	130.24	0.017	283	0.22
			6/20/13	5.82	129.23	0.010	304	0.35
			8/5/13	6.45	128.60	0.008	332	0.40
			1/15/14	6.56	128.49	0.007	354	0.57
			3/23/14	5.72	129.33	0.011	301	0.41
			4/9/14	5.50	129.55	0.012	296	0.36

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-10B	15-20	135.02	11/5/03	12.19	122.83	--	--	0.45
			3/22/04	7.50	127.52	--	--	0.15
			5/18/04	8.86	126.16	--	--	0.20
			8/9/04	11.40	123.62	--	--	0.38
			11/9/04	11.61	123.41	--	--	0.42
			2/7/05	7.91	127.11	--	--	0.15
		135.09	5/18/05	7.11	127.98	--	--	0.15
			8/17/05	10.30	124.79	--	--	0.35
			11/1/05	12.00	123.09	--	--	0.47
			2/20/06	7.03	128.06	--	--	0.19
			5/16/06	7.54	127.55	--	--	0.25
			8/30/06	11.43	123.66	--	--	0.41
			10/24/06	12.33	122.76	--	--	0.47
			1/30/07	8.61	126.48	--	--	0.24
			5/1/07	7.87	127.22	--	--	0.23
			1/29/08	6.94	128.15	--	--	0.16
			4/28/08	8.37	126.72	--	--	0.25
			7/30/08	11.33	123.76	--	--	0.41
			10/28/08	12.85	122.24	--	--	0.50
			1/28/09	10.80	124.29	--	--	0.36
			4/28/09	8.68	126.41	--	--	0.26
			7/28/09	10.98	124.11	0.009	300	0.38
			1/28/10	7.56	127.53	0.007	303	0.20
			7/28/10	9.42	125.67	0.011	300	0.30
			12/23/10	7.12	127.97	0.01	299	0.20
			1/27/11	7.44	127.65	0.01	--	0.22
			7/27/11	9.67	125.42	0.01	--	0.39
			1/25/12	7.74	127.35	0.008	309	0.21
			7/17/12	9.15	125.94	0.013	304	0.32
			1/23/13	7.38	127.71	0.009	299	0.22
			6/20/13	9.81	125.28	0.010	292	0.35
			8/5/13	11.08	124.01	0.009	300	0.40
			1/15/14	13.08	122.01	0.006	310	0.57
			3/23/14	10.43	124.66	0.007	304	0.41
			4/9/14	9.67	125.42	0.007	313	0.36

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-11A	4-9	133.66	5/18/05	5.09	128.57	--	--	0.15
			8/17/05	5.31	128.35	--	--	0.33
			11/1/05	5.63	128.03	--	--	0.44
			2/20/06	4.82	128.84	--	--	0.14
			5/16/06	5.12	128.54	--	--	0.18
			8/30/06	5.34	128.32	--	--	0.43
			10/24/06	5.85	127.81	--	--	0.47
			1/30/07	5.18	128.48	--	--	0.23
			5/1/07	5.26	128.40	--	--	0.17
			1/29/08	4.95	128.71	--	--	0.10
			4/28/08	5.30	128.36	--	--	0.20
			7/30/08	5.64	128.02	--	--	0.39
			10/28/08	5.80	127.86	--	--	0.49
			1/28/09	5.45	128.21	--	--	0.35
			4/28/09	5.32	128.34	--	--	0.22
			7/28/09	5.67	127.99	0.005	290	0.36
			1/28/10	5.04	128.62	0.011	282	0.13
			7/28/10	5.46	128.20	0.009	285	0.26
			1/27/11	5.11	128.55	0.02	--	0.14
			7/27/11	5.60	128.06	0.02	--	0.24
			1/25/12	5.10	128.56	0.013	280	0.14
			7/17/12	5.32	128.34	0.014	289	0.26
			1/23/13	5.06	128.60	0.017	283	0.13
			6/20/13	5.32	128.34	0.010	304	0.30
			8/5/13	5.55	128.11	0.008	332	0.38
			1/15/14	5.35	128.31	0.007	354	0.52
			3/23/14	5.15	128.51	0.011	301	0.34
			4/9/14	5.07	128.59	0.012	296	0.30

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-11B	12-22	133.58	5/18/05	6.97	126.61	--	--	0.15
			8/17/05	9.60	123.98	--	--	0.33
			11/1/05	11.36	122.22	--	--	0.44
			2/20/06	6.52	127.06	--	--	0.14
			5/16/06	7.44	126.14	--	--	0.18
			8/30/06	10.82	122.76	--	--	0.43
			10/24/06	11.89	121.69	--	--	0.47
			1/30/07	8.15	125.43	--	--	0.23
			5/1/07	7.38	126.20	--	--	0.17
			1/29/08	6.20	127.38	--	--	0.10
			4/28/08	7.84	125.74	--	--	0.20
			7/30/08	10.72	122.86	--	--	0.39
			10/28/08	12.19	121.39	--	--	0.49
			1/28/09	9.90	123.68	--	--	0.35
			4/28/09	8.08	125.50	--	--	0.22
			7/28/09	10.31	123.27	0.009	300	0.36
			1/28/10	6.65	126.93	0.007	303	0.13
			7/28/10	8.84	124.74	0.011	300	0.26
			1/27/11	6.91	126.67	0.01	--	0.14
			7/27/11	8.69	124.89	0.01	--	0.24
			1/25/12	6.90	126.68	0.008	309	0.14
			7/17/12	8.65	124.93	0.013	304	0.26
			1/23/13	6.68	126.90	0.009	299	0.13
			6/20/13	9.21	124.37	0.010	292	0.30
			8/5/13	10.38	123.20	0.009	300	0.38
			1/15/14	12.05	121.53	0.006	310	0.52
			3/23/14	9.53	124.05	0.007	304	0.34
			4/9/14	8.85	124.73	0.007	313	0.30

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-12B	13-28	127.11	10/11/07	12.42	114.69	--	--	--
			7/22/08	10.05	117.06	--	--	--
			8/27/08	10.69	116.42	--	--	--
			9/25/08	10.86	116.25	--	--	--
			12/9/08	10.84	116.27	--	--	--
			4/15/09	7.66	119.45	--	--	--
			5/13/09	7.61	119.50	--	--	--
			6/11/09	8.75	118.36	--	--	--
			7/17/09	9.54	117.57	--	--	--
			10/22/09	10.68	116.43	--	--	--
			6/15/10	6.71	120.40	--	--	--
			9/27/10	9.33	117.78	--	--	--
			10/13/10	9.95	117.16	--	--	--
			3/2/11	7.08	120.03	--	--	--
			4/4/11	5.4	121.71	--	--	--
			4/5/11	5.9	121.21	--	--	--
			6/14/11	7.4	119.71	--	--	--
			7/21/11	8.98	118.13	--	--	--
			8/11/11	9.73	117.38	--	--	--
			8/31/11	8.99	118.12	--	--	--
			9/1/11	9.66	117.45	--	--	--
			9/15/11	8.80	118.31	--	--	--
			9/16/11	9.99	117.12	--	--	--
			9/28/11	9.09	118.02	--	--	--
			9/29/11	10.11	117.00	--	--	--
			10/12/11	8.71	118.40	--	--	--
			10/25/11	9.45	117.66	--	--	--
MW-13A	5-10	136.54	12/23/10	4.99	131.55	0.01	274	0.23
			2/2/11	5.02	131.52	0.069	272	0.20
			3/23/14	6.05	130.49	--	--	0.30
			4/9/14	5.78	130.76	--	--	0.27
MW-13B	18-28	136.40	3/8/10	8.21	128.19	--	--	--
			12/23/10	8.94	127.46	0.01	299	0.23
			2/2/11	8.42	127.98	0.034	285	0.20
			3/23/14	11.39	125.01	--	--	0.30
			4/9/14	10.58	125.82	--	--	0.27
UMW-13A	4.5-9.5	134.26	1/23/13	4.55	129.71	0.017	283	0.12
			3/10/13	4.55	129.71	--	--	0.17
			6/20/13	5.83	128.43	0.010	304	0.25
			8/5/13	6.06	128.20	0.008	332	0.28
			1/15/14	6.07	128.19	0.007	354	0.41
			3/23/14	5.33	128.93	0.011	301	0.31
			4/9/14	5.13	129.13	0.012	296	0.26

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
UMW-13B	14.5-19.5	134.07	1/23/13	5.62	128.45	0.009	299	0.12
			3/10/13	6.12	127.95	--	--	0.17
			6/20/13	8.17	125.90	0.010	292	0.25
			8/5/13	8.73	125.34	0.009	300	0.28
			1/15/14	10.1	123.97	0.007	354	0.41
			3/23/14	8.30	125.77	0.007	304	0.31
			4/9/14	7.54	126.53	0.007	313	0.26
KMW-14A	5-10	139.10	4/9/14	--	--	--	--	--
KMW-14B	15-20	139.05	4/9/14	10.79	128.26	--	--	--
MW-15A	5-10	--	7/28/10	5.85	--	--	--	--
			3/23/14	7.20	--	--	--	--
			4/9/14	6.70	--	--	--	--
MW-15B	14.5-24.5	--	7/28/10	8.84	--	--	--	--
			3/23/14	9.84	--	--	--	--
			4/9/14	9.04	--	--	--	--
MW-16B	20-30	129.59	7/22/08	10.73	118.86	--	--	--
			8/27/08	11.37	118.22	--	--	--
			9/25/08	11.77	117.82	--	--	--
			12/9/08	11.63	117.96	--	--	--
			4/15/09	8.13	121.46	--	--	--
			5/13/09	8.18	121.41	--	--	--
			6/11/09	9.38	120.21	--	--	--
			3/2/11	7.46	122.13	--	--	--
			6/14/11	8.74	120.85	--	--	--
			8/11/11	9.95	119.64	--	--	--
			10/12/11	9.32	120.27	--	--	--
MW-17B	20-30	120.00	7/22/08	6.30	113.70	--	--	--
			8/27/08	6.71	113.29	--	--	--
			9/25/08	6.99	113.01	--	--	--
			12/9/08	6.60	113.40	--	--	--
			4/15/09	4.14	115.86	--	--	--
			5/13/09	4.18	115.82	--	--	--
			6/11/09	5.24	114.76	--	--	--
			3/2/11	3.50	116.50	--	--	--
			6/14/11	4.96	115.04	--	--	--
			8/11/11	5.99	114.01	--	--	--
			10/12/11	5.01	114.99	--	--	--
MW-18BS	10-15	126.19	6/20/13	7.99	118.20	--	--	--
			8/5/13	8.55	117.64	--	--	--
			1/15/14	10.19	116.00	--	--	--
MW-18BD	20-30	126.31	6/20/13	10.70	115.61	0.010	292	--
			8/5/13	12.10	114.21	0.009	300	--
			1/15/14	12.03	114.28	0.007	354	--
KMW-19B	15-20	134.27	3/23/14	9.81	124.46	0.007	304	--
			4/9/14	9.07	125.20	0.007	313	--

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-19BS	13-19	131.85	6/20/13	8.78	123.07	--	--	--
			8/5/13	10.23	121.62	--	--	--
			1/15/14	11.39	120.46	--	--	--
MW-19BD	25-35	131.84	6/20/13	10.04	121.80	0.010	292	--
			8/5/13	11.10	120.74	0.009	300	--
			1/15/14	12.88	118.96	0.007	354	--
KMW-20A	5-10	134.12	3/23/14	5.69	128.43	0.011	301	--
			4/9/14	5.50	128.62	0.012	296	--
MW-20BS	12-17	132.63	6/20/13	9.33	123.30	--	--	--
			8/5/13	10.50	122.13	--	--	--
			1/15/14	12.19	120.44	--	--	--
MW-20BD	21-31	132.76	6/20/13	10.20	122.56	0.010	292	--
			8/5/13	11.40	121.36	0.009	300	--
			1/15/14	12.93	119.83	0.007	354	--
KMW-21A	5-10	133.63	3/23/14	5.20	128.43	0.011	301	--
			4/9/14	5.18	128.45	0.012	296	--
MW-21BD	20-30	129.23	6/20/13	10.40	118.83	0.010	292	--
			8/5/13	10.90	118.33	0.009	300	--
			1/15/14	11.99	117.24	0.007	354	--
KMW-22B	15-20	133.70	3/23/14	9.54	124.16	0.007	304	--
			4/9/14	8.82	124.88	0.007	313	--
MW-22BS	13.5-18.5	129.02	6/20/13	8.91	120.11	--	--	--
			8/5/13	10.00	119.02	--	--	--
			1/15/14	11.67	117.35	--	--	--
MW-22BD	22-32	129.27	6/20/13	10.39	118.88	0.010	292	--
			8/5/13	11.52	117.75	0.009	300	--
			1/15/14	12.81	116.46	0.007	354	--
KMW-23B	15-20	133.84	3/23/14	9.44	124.40	0.007	304	--
			4/9/14	8.72	125.12	0.007	313	--
MW-23BD	22-32	119.95	6/20/13	6.38	113.57	0.010	292	--
			8/5/13	7.18	112.77	0.009	300	--
			1/15/14	7.79	112.16	0.007	354	--
MW-24BD	20-30	122.40	6/20/13	8.28	114.12	0.010	292	--
			8/5/13	9.00	113.40	0.009	300	--
			1/15/14	9.73	112.67	0.007	354	--
MW-26BD	18-28	121.54	6/20/13	7.58	113.96	0.010	292	--
			8/5/13	8.20	113.34	0.009	300	--
			1/15/14	9.26	112.28	0.007	354	--
MW-27BD	22-32	129.24	6/20/13	11.95	117.29	0.010	292	--
			8/5/13	12.98	116.26	0.009	300	--
			1/15/14	14.31	114.93	0.007	354	--
MW-28BS	12-22	131.47	6/20/13	8.50	122.97	--	--	--
			8/5/13	9.80	121.67	--	--	--
			1/15/14	11.72	119.75	--	--	--

TABLE 2-1
SUMMARY OF GROUNDWATER ELEVATIONS
E and Grotto Streets Plumes
Eureka, California

ID	Screen Interval (feet)	Top of Casing Elevation (ft above MSL)	Date	Depth to Water (ft bgs)	Ground-water Elevation (ft above MSL)	Hydraulic Gradient (ft/ft)	Flow Direction (degrees)	Vertical Hydraulic Gradient (ft/ft)
MW-28BD	27-37	131.84	6/20/13	10.81	121.03	0.010	292	--
			8/5/13	11.70	120.14	0.009	300	--
			1/15/14	13.38	118.46	0.007	354	--
FW-1	5-10	135.64	12/14/09	7.25	128.39	--	--	--
			1/12/10	6.60	129.04	--	--	--
			3/15/10	5.49	130.15	--	--	--
			4/9/10	5.40	130.24	--	--	--
			5/18/10	5.62	130.02	--	--	--
			6/15/10	5.50	130.14	--	--	--
			7/28/10	6.54	129.10	--	--	--
			12/23/10	4.39	131.25	0.01	274	--
			2/2/11	5.49	130.15	0.069	272	--
			4/14/11	4.75	130.89	--	--	--
			5/3/11	4.92	130.72	--	--	--

Notes:
't above MSL: feet above Mean Sea Level
ft bgs: feet below ground surface
ft/ft: feet per foot

TABLE 3-1
SUMMARY OF SOIL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs					Petroleum Hydrocarbons and Related VOCs																Other VOCs	
			PCE	TCE	TCA	DCE	BM	TPHg	TPHd	TPHmo	TPHss	TPHk	Benzene	Toluene	Ethyl benzene	Xylenes	Naph thalene	TMB	sec-Butyl benzene	n-Butyl benzene	n-Propyl benzene	Isopropyl benzene	p-Isopropyl Toluene	Acetone	Carbon disulfide
			(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
2907 E STREET																									
Clearwater - 1998																									
B-1	4/98	5.5	--	--	--	--	--	<1	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
B-2	4/98	5.5	--	--	--	--	--	<1	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
B-3	4/98	5.5	--	--	--	--	--	<1	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
B-4	4/98	5.5	--	--	--	--	--	<1	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
B-5	4/98	5.5	<5	<5	--	<5	<20	--	--	--	--	--	--	--	--	--	--	<5	--	--	--	--	--	--	--
B-6	4/98	5.5	--	--	--	--	--	--	--	<5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-7	4/98	5.5	90	<5	--	<5	<20	--	--	--	--	--	--	--	--	--	--	<5	--	--	--	--	--	--	--
ERI - 2000																									
MW-1	10/00	5	--	--	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
		10	--	--	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
W&K - 2001																									
MW-2	10/00	5.5	<20	<20	--	<20	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	<20	--	--	--	--	--	--	--
		10	<20	<20	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
		15	<20	<20	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
		18	<20	<20	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
MW-3	10/00	5.5	250,000	<400	--	<400	--	<400	--	--	--	--	<1,600	<1,600	<1,600	<1,600	--	<400	--	--	--	--	--	--	--
		10	1,700	43	--	--	--	2.4	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
		15.5	<20	<20	--	<20	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	<20	--	--	--	--	--	--	--
		19	<20	<20	--	--	--	<1.0	--	--	--	--	<5	<5	<5	<5	--	--	--	--	--	--	--	--	--
ERI - 2002/2003																									
MW-4	11/02	10	230	<25	--	<25	<250	<1.0	--	--	--	--	<25	<25	<25	<25	--	<25	--	--	--	--	--	<250	110
MW-5	11/02	10	140	<5	--	<5	<5	<1.0	--	--	--	--	<5	<5	<5	<5	--	<5	--	--	--	--	--	<50	<10
MW-6	11/02	10	<5	<5	--	<5	<5	<1.0	--	--	--	--	<5	<5	<5	<5	--	<5	--	--	--	--	--	<50	<10
MW-7	11/02	10	--	--	--	--	--	<1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-8B	10/03	5	<700	<700	--	<700	<1,400	320	--	--	--	--	<700	<700	<700	<700	--	<700	--	--	--	--	--	<7,000	<1,400
			<5,000	<5,000	--	<5,000	<10,000	--	--	--	--	--	<5,000	<5,000	6,200	35,700	--	28,300	--	--	--	--	--	<50,000	<10,000
		10	<4.3	<4.3	--	<4.3	<8.7	<2.0	--	--	--	--	58	<4.3	<4.3	<4.3	--	<4.3	--	--	--	--	--	59	38
MW-9B	10/03	6	20	<3.8	--	<3.8	<3.8	<5.0	--	--	--	--	<3.8	<3.8	<3.8	4.2	--	<3.8	--	--	--	--	--	<38	<7.6
		10	470	<3.8	--	<3.8	<3.8	<1.7	--	--	--	--	7.4	<3.8	<3.8	<3.8	--	<3.8	--	--	--	--	--	260	39
MW-10B	10/03	5	<19	<19	--	<19	<38	<16	--	--	--	--	<19	<19	<19	<19	--	<19	--	--	--	--	--	<190	<38
		10	<3.4	<3.4	--	<3.4	<6.7	<1.5	--	--	--	--	7.4	<3.4	<3.4	3.4	--	<3.4	--	--	--	--	--	260	39
Calibre - 2006																									
SP-1	11/06	4	190	6.9	--	9.9	<4.4	--	--	--	--	--	<4.4	<4.4	<4.4	<4.4	--	<4.4	--	--	--	--	--	22	<4.4
SP-2	11/06	4	410	19	--	47	<4.4	--	--	--	--	--	<4.4	<4.4	<4.4	<4.4	--	<4.4	--	--	--	--	--	21	<4.4
SP-3	11/06	4	20	<5.2	--	<5.2	<5.2	--	--	--	--	--	<5.2	<5.2	<5.2	<5.2	--	<5.2	--	--	--	--	--	36	<5.2
SP-4	11/06	4	17	<4.6	--	<4.6	<4.6	--	--	--	--	--	<4.6	<4.6	<4.6	<4.6	--	<4.6	--	--	--	--	--	<19	<4.6
SP-5	11/06	4	4.8	<4.4	--	<4.4	<4.4	--	--	--	--	--	<4.4	<4.4	<4.4	<4.4	--	<4.4	--	--	--	--	--	5.8	<4.4
SP-6	11/06	4	96	1.7	--	<4.2	<4.2	--	--	--	--	--	<4.2	<4.2	<4.2	<4.2	--	<4.2	--	--	--	--	--	26	<4.2
SP-7	11/06	4	27	<4.6	--	<4.6	<4.6	--	--	--	--	--	<4.6	<4.6	<4.6	<4.6	--	<4.6	--	--	--	--	--	--	<4.6
WEST - 2008																									
A-1	2/08	9.5	507	3.48	<2.20	13.9	<2.20	--	--	--	--	--	<2.20	<2.20	<2.20	<2.20	--	<2.20	--	--	--	--	--	--	--
A-2	2/08	10	853	<200	<200	<200	355	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
A-3	2/08	10	1,930	<200	<200	<200	293	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
B-1	2/08	8	603	<200	<200	<200	336	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
		10	2,310	<200	<200	<200	288	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--

TABLE 3-1
SUMMARY OF SOIL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs					Petroleum Hydrocarbons and Related VOCs																Other VOCs	
			PCE	TCE	TCA	DCE	BM	TPHg	TPHd	TPHmo	TPHss	TPHk	Benzene	Toluene	Ethyl benzene	Xylenes	Naph thalene	TMB	sec-Butyl benzene	n-Butyl benzene	n-Propyl benzene	Isopropyl benzene	p-Isopropyl Toluene	Acetone	Carbon disulfide
			(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
B-2	2/08	10	2,280	<200	<200	<200	312	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
B-3	2/08	10	440	<200	<200	<200	371	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
C-1	2/08	7.5	206	<200	<200	<200	307	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
		9	583	<200	<200	<200	367	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
C-2	2/08	10	31,600	<200	<200	<200	239	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
C-3	2/08	11	9.31	<1.66	<1.66	<1.66	<1.66	--	--	--	--	--	<1.66	<1.66	<1.66	<1.66	--	<1.66	--	--	--	--	--	--	--
D-1	2/08	4	<3.14	<3.14	<3.14	<3.14	<3.14	--	--	--	--	--	<3.14	<3.14	<3.14	<3.14	--	<3.14	--	--	--	--	--	--	--
D-3	2/08	4	<4.78	<4.78	<4.78	<4.78	<4.78	--	--	--	--	--	<4.78	<4.78	<4.78	<4.78	--	<4.78	--	--	--	--	--	--	--
D-4	2/08	4	218	4.55	<1.90	14.3	<1.90	--	--	--	--	--	<1.90	<1.90	<1.90	<1.90	--	<1.90	--	--	--	--	--	--	--
D-5	2/08	4	<1.51	<1.51	<1.51	<1.51	<1.51	--	--	--	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--
D-6	6/08	5	<1.49	<1.49	<1.49	<1.49	<1.49	--	<10.0	<10.0	--	--	<1.49	<1.49	<1.49	<1.49	--	<1.49	--	--	--	--	--	--	--
		8	<1.51	<1.51	<1.51	<1.51	<1.51	--	<10.0	<10.0	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--
		10	5.71	<1.51	<1.51	<1.51	<1.51	--	<10.0	25.4	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--
		12	<1.50	<1.50	<1.50	<1.50	<1.50	--	<10.0	<10.0	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
		20	<1.52	<1.52	<1.52	<1.52	<1.52	--	<10.0	<10.0	--	--	<1.52	<1.52	<1.52	<1.52	--	<1.52	--	--	--	--	--	--	--
D-7	6/08	5	43.9	<1.50	<1.50	<1.50	<1.50	--	20.0	79.3	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
		8	1.63	<1.50	<1.50	<1.50	<1.50	--	<10.0	<10.0	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
		20	<1.50	<1.50	<1.50	<1.50	<1.50	--	<10.0	<10.0	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
D-8	6/08	5	22,000	<200	<200	<200	372	--	<10.0	40.2	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
		6	223	7.79	<1.50	4.00	<1.50	--	<10.0	<10.0	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
		8	<1.50	<1.50	<1.50	<1.50	<1.50	--	<10.0	<10.0	--	--	<1.50	<1.50	<1.50	<1.50	--	<1.50	--	--	--	--	--	--	--
		10	320	<1.51	<1.51	<1.51	<1.51	--	<10.0	<10.0	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--
		12	6.12	<1.49	<1.49	<1.49	<1.49	--	<10.0	<10.0	--	--	<1.49	<1.49	<1.49	<1.49	--	<1.49	--	--	--	--	--	--	--
		20	<1.51	<1.51	<1.51	<1.51	<1.51	--	<10.0	<10.0	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--
ENSR - 2008																									
GP-1	3/08	10	<5.0	<5.0	<5.0	<5.0	--	11	--	--	--	--	790	520	310	1,300	200	520	17	44	150	49	<5.0	<50	--
		12.5	<5.0	<5.0	<5.0	<5.0	--	4	--	--	--	--	250	52	70	270	240	246	18	44	120	36	<5.0	<50	--
		16	130	<5.0	<5.0	5.6	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-2	3/08	12.5	<250	<250	<250	<250	--	1,300	--	--	--	--	430	1,100	280	56,000	22,000	124,000	3,800	11,000	20,000	5,200	2,100	<2,500	--
		16	340	<5.0	<5.0	7.4	--	1.4	--	--	--	--	<5.0	<5.0	<5.0	10	<5.0	6.4	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	110	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-3	3/08	10	<25	<50	<25	32	--	500	--	--	--	--	46	2,400	4,100	19,000	2,400	27,800	1,000	2,800	3,700	980	540	<250	--
		12.5	<25	<25	<25	44	--	52	--	--	--	--	<25	49	2,200	1,200	1,600	2,630	130	330	1,000	300	46	<250	--
		16	<5.0	<5.0	<5.0	34	--	3	--	--	--	--	19	5.4	340	99	530	428	6.6	<5.0	290	140	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	6.1	<5.0	5.7	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-4	3/08	6	<25	<25	<25	<25	--	47	--	--	--	--	<25	<25	<25	<25	200	<25	83	160	80	39	<25	<250	--
		10	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	22	<5.0	<5.0	<5.0	--	2.9	--	--	--	--	<5.0	<5.0	<5.0	<5.0	28	17	11	19	11	5.2	<5.0	<50	--
		20	7.4	<5.0	<5.0	<5.0	--	1.6	--	--	--	--	<5.0	<5.0	<5.0	<5.0	6.5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-5	3/08	6	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	7.9	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.5	<5.0	<5.0	<5.0	<5.0	--	1.2	--	--	--	--	130	<5.0	46	5.8	100	<5.0	5.0	5.2	63	23	<5.0	<50	--
		16	51	6.8	<5.0	17	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--

TABLE 3-1
SUMMARY OF SOIL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs					Petroleum Hydrocarbons and Related VOCs																Other VOCs	
			PCE	TCE	TCA	DCE	BM	TPHg	TPHd	TPHmo	TPHss	TPHk	Benzene	Toluene	Ethyl benzene	Xylenes	Naph thalene	TMB	sec-Butyl benzene	n-Butyl benzene	n-Propyl benzene	Isopropyl benzene	p-Isopropyl Toluene	Acetone	Carbon disulfide
			(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
GP-6	3/08	6	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	54	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	340	<5.0	6.8	<5.0	13	<5.0	<5.0	<5.0	5.4	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-7	3/08	6	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	230	14	48	56	23	26.1	<5.0	<5.0	16	8.0	<5.0	<50	--
		13	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	81	<5.0	<5.0	<5.0	50	<5.0	<5.0	5.6	29	10	<5.0	<50	--
		16	15	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	110	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-8	3/08	6	<250	<800	<250	<250	--	5,400	--	--	--	--	6,600	140,000	110,000	550,000	27,000	240,000	6,900	18,000	47,000	14,000	3,600	<5,000	--
		10	<5.0	<5.0	<5.0	28	--	12	--	--	--	--	95	75	140	600	78	610	20	62	100	26	10	86	--
		12.5	270	<5.0	<5.0	6.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	6.1	<5.0	<5.0	17	--	<1.0	--	--	--	--	60	17	15	73	6.3	29.7	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	2.8	--	--	--	--	9.4	140	100	470	17	130	<5.0	8.9	19	5.3	<5.0	<50	--
GP-9	4/08	6	130	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	1,400	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12	710	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-10	4/08	6	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		13	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-11	4/08	6	1,300	16	<5.0	12	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.5	5,700	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.7	7,900	<5.0	5.4	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-12	4/08	6	18,000	33	<5.0	56	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.5	24,000	<5.0	8.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12.7	10,000	<25	<25	<25	--	<2.5	--	--	--	--	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	--
		16	<5.0	900	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		17	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-13	4/08	6	27	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		11	<5.0	26	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		11.5	780	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		18	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-14	4/08	6	44	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		13.3	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		13.6	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--

TABLE 3-1
SUMMARY OF SOIL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs					Petroleum Hydrocarbons and Related VOCs																Other VOCs	
			PCE	TCE	TCA	DCE	BM	TPHg	TPHd	TPHmo	TPHss	TPHk	Benzene	Toluene	Ethyl benzene	Xylenes	Naph thalene	TMB	sec-Butyl benzene	n-Butyl benzene	n-Propyl benzene	Isopropyl benzene	p-Isopropyl Toluene	Acetone	Carbon disulfide
			(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
GP-15	4/08	6	2,100	7.9	<5.0	25	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		11	2,600	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	7.8	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		16	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		20	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-16	6/08	5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		8	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	6.0	<5.0	<5.0	<5.0	--	<1.0	--	23	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		19.5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-17	6/08	5	860	43	<5.0	9.5	--	<1.0	--	2,500	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		8	16	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	150	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		19.5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
GP-18	6/08	5	20,000	87	<5.0	20	--	<1.0	--	760	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		8	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	23	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		10	1,300	<5.0	<5.0	5.2	--	<1.0	--	210	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		12	28	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		19.5	<5.0	<5.0	<5.0	<5.0	--	<1.0	--	<10	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
WEST - 2009																									
C-2A	2/09	10.5	66,900	<500	<500	<500	<500	--	--	--	--	--	<500	<500	<500	<500	--	<500	--	--	--	--	--	--	--
C-2B	2/09	11	101,000	<1,000	<1,000	<1,000	<1,000	--	--	--	--	--	<1,000	<1,000	<1,000	<1,000	--	<1,000	--	--	--	--	--	--	--
C-2C	2/09	11	76,200	<500	<500	<500	<500	--	--	--	--	--	<500	<500	<500	<500	--	<500	--	--	--	--	--	--	--
CRA - 2011																									
TSB-1	4/6/11	3	--	--	--	--	--	810	--	--	--	--	350	<190	17,000	4,200	--	--	--	--	--	--	--	--	--
TSB-2	4/5/11	3	--	--	--	--	--	320	--	--	--	--	320	<52	920	2,700	--	--	--	--	--	--	--	--	--
		6	--	--	--	--	--	730	--	--	--	--	77	<94	7,500	190	--	--	--	--	--	--	--	--	--
TSB-3	4/5/11	3	--	--	--	--	--	28	--	--	--	--	81	<50	990	2,100	--	--	--	--	--	--	--	--	--
E STREET/SEWER LINE																									
WEST - 2008																									
15B (E-1)	2/08	10	<1.45	<1.45	<1.45	<1.45	<1.45	--	--	--	--	--	<1.45	<1.45	<1.45	<1.45	--	<1.45	--	--	--	--	--	--	--
E-2	2/08	8	<1.21	<1.21	<1.21	<1.21	<1.21	--	--	--	--	--	<1.21	<1.21	<1.21	<1.21	--	<1.21	--	--	--	--	--	--	--
E-3	2/08	9	8.56	<1.79	<1.79	<1.79	<1.79	--	--	--	--	--	16.6	<1.79	<1.79	2.40	--	<1.79	--	--	--	--	--	--	--
E-4	2/08	9.5	<200	<200	<200	<200	320	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
E-5	2/08	9	823	<200	<200	<200	305	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
E-6	2/08	9	257	<200	<200	<200	<200	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
E-7	2/08	9	<8.05	<8.05	<8.05	<8.05	<8.05	--	--	--	--	--	<8.05	<8.05	<8.05	<8.05	--	<8.05	--	--	--	--	--	--	--
E-9	2/08	9.5	5,040	<200	<200	<200	296	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
E-10	2/08	9.5	4,050	<200	<200	<200	<200	--	--	--	--	--	<200	<200	<200	<200	--	<200	--	--	--	--	--	--	--
G-1	2/08	9.5	7.15	<1.69	<1.69	<1.69	<1.69	--	--	--	--	--	<1.69	<1.69	<1.69	<1.69	--	<1.69	--	--	--	--	--	--	--
G-2	2/08	9.5	127	<1.45	<1.45	<1.45	<1.45	--	--	--	--	--	<1.45	<1.45	<1.45	<1.45	--	<1.45	--	--	--	--	--	--	--
G-3	2/08	11	10.5	<1.55	<1.55	<1.55	<1.55	--	--	--	--	--	<1.55	<1.55	<1.55	<1.55	--	<1.55	--	--	--	--	--	--	--
G-4	2/08	10	225	1.52	<1.51	<1.51	<1.51	--	--	--	--	--	<1.51	<1.51	<1.51	<1.51	--	<1.51	--	--	--	--	--	--	--

TABLE 3-1
SUMMARY OF SOIL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs					Petroleum Hydrocarbons and Related VOCs																Other VOCs	
			PCE	TCE	TCA	DCE	BM	TPHg	TPHd	TPHmo	TPHss	TPHk	Benzene	Toluene	Ethyl benzene	Xylenes	Naph thalene	TMB	sec-Butyl benzene	n-Butyl benzene	n-Propyl benzene	Isopropyl benzene	p-Isopropyl Toluene	Acetone	Carbon disulfide
			(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
GZA - 2011																									
HP-7	10/27/11	9.5	4,100	55	<20	<20	<20	6.0	1.2	<10	4.1	<1.0	<5.0	<5.0	<5.0	<5.0	<40	<20	<20	<20	<20	<20	<20	<20	--
HP-8	10/26/11	9.5	1,700	120	<28	130	<28	7.1	2.3	14	2.1	<1.0	140	12	110	8.5	<56	<28	<28	<28	<28	<28	<28	<28	--
HP-9	10/26/11	9.5	70	<18	<18	<18	<18	4.8	4.6	48	1.7	2.1	290	<4.4	87	13	<35	<18	<18	20	110	67	<18	<18	--
HP-12	10/27/11	33	<17	<17	<17	<17	<17	--	--	--	--	--	<4.3	<4.3	<4.3	<4.3	<34	<17	<17	<17	<17	<17	<17	48	--

Notes:
CVOCs: Chlorinated Volatile Organic Compounds
PCE: Tetrachloroethene
TCE: Trichloroethene
TCA: Trichloroethane
DCE: cis 1,2-Dichloroethene
BM: Bromomethane
TPHg: Total petroleum hydrocarbons as gasoline
TPHd: Total petroleum hydrocarbons as diesel
TPHmo: Total petroleum hydrocarbons as motor oil
TPHss: Total petroleum hydrocarbons as stodard solvent
TPHk: Total petroleum hydrocarbons as kerosene
TMB: Trimethylbenzene
µg/kg: Micrograms per kilogram
mg/kg: Milligrams per kilogram
<1.0: Less than the laboratory-reporting limit of 1.0
--: Not analyzed/not sampled

TABLE 3-2
SUMMARY OF SOIL ANALYTICAL RESULTS - PHYSICAL PARAMETERS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	USCS	Flexible Wall Hydraulic Conductivity	Bulk Density	f_{oc}	Soil Moisture
				(cm/s)	(lb/ft^3)	(mg/kg)	(percent)
ERI - 2003							
S-10-MW-9B	10/21/03	10	--	--	91.76	--	27.7
WEST - 2007							
W-9	4/10/07	6.5-7	--	--	--	1,140	29.7
ENSR - 2008							
GT-1	3/31/08	6-8.5	SM	3.40E-05	102.2	--	20.8
		10-12.5	CL	4.57E-09	98.0	--	28.9
		12.5-15	MH/OH	4.55E-09	93.7	--	29.6
			CL	4.83E-09	58.3	--	66.6
		15-17.5	SM	3.41E-06	120.1	--	16.8
GT-2	3/31/08	6-8.5	SP	1.09E-04	105.7	--	22.1
		12-12.5	SC	1.11E-07	92.8	--	23.7
		12.5-15	CL	5.32E-09	102.1	--	25.9
		15-17.5	SM	5.33E-06	106.7	--	20.8
GT-3	4/2/08	6-8.5	SP	1.49E-03	101.2	--	19.3
		10-12.5	CL	2.84E-08	111.9	--	23.2
		12.5-15	CL	3.36E-08	92.6	--	26.2
		15-17.5	SM	3.03E-04	105.7	--	18.3

Notes:

USCS: Unified Soil Classification System soil type by ASTM D2487-06
cm/s: centimeter per second
f_{oc}: Fraction Organic Carbon
lb/ft^3: Pounds per cubic foot
mg/kg: Milligrams per kilogram
SM: Silty Sand
CL: Clay
MH: Silt of high plasticity, elastic silt
OH: Organic clay, organic silt
SP: Poorly graded sand
SC: Clayey sand

TABLE 3-3
SUMMARY OF SOIL GAS ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Depth (feet)	Date	Chlorinated VOCs						Petroleum Related VOCs						Other VOCs
			PCE	TCE	DCE	TCTFA	TCM	CM	Benzene	Toluene	Ethyl benzene	Xylenes	1,3,5-TMB	1,2,4-TMB	Styrene
			(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
2907 E STREET															
W-1	3	4/19/07	229,000	16,400	8,800	<3,070	--	<826	<1,280	<1,510	<1,740	<1,740	<1,970	<1,970	<1,700
W-2	3	4/19/07	2,020	<537	<397	<766	--	<207	<319	<377	<434	<434	<492	<492	<426
W-3	3	4/19/07	408	<5.37	<3.97	<7.66	--	2.6	13.6	20.8	12.6	45.4	5.11	19.3	4.51
W-4	3	4/19/07	10,200	<107	<79.3	<153	--	<41.3	<63.9	<75.4	<86.8	<86.8	<98.3	<98.3	<85.2
W-5	3	4/19/07	608	7.63	<3.97	10.5	--	<2.07	9.17	12.4	6.99	14.4	<4.92	<4.92	<4.26
W-10	3	4/19/07	97,400	2,390	<793	<1,530	--	<413	<639	<754	<868	<868	<983	<983	<852
			98,100	2,330	<793	<1,530	--	<413	<639	<754	<868	<868	<983	<983	<852
W-11	3	4/19/07	3,400	<53.7	<39.7	<76.6	--	<20.7	<31.9	<37.7	<43.4	<43.4	<49.2	<49.2	<42.6
A-1	3	2/6/08	2,910	<26.9	<19.8	<28.1	<24.4	<10.3	<16.0	<18.8	<21.7	<21.7	<24.6	<24.6	<21.3
W-1A	3	2/7/08	1,980,000	<13,400	33,400	<14,000	<12,200	<5160	<7,990	<9,420	<10,900	<10,900	<12,300	<12,300	<10,600
W-2A	3	2/6/08	245	<26.9	<19.8	<28.1	<24.4	<10.3	<16.0	19.6	<21.7	<21.7	<24.6	<24.6	<21.3
SG-1	5	10/22/09	<10.2	<8.06	<5.95	<11.5	<7.32	<3.10	5.14	<5.65	<6.51	<6.51	<7.37	<7.37	<6.39
VP-1	4	12/14/09	1,340,000	30,900	28,200	<5,620	<4,880	<2,070	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	3/15/10	753,000	23,800	18,000	<5,620	<4,880	<2,070	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	4/9/10	1,660	53.4	41.0	<28.1	<24.4	<10.6	<16.0	<18.8	<21.7	<21.7	<24.6	<24.6	<21.3
	4	5/18/10	903,000	27,200	17,100	<7,660	<3,190	<2,070	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	6/15/10	1,160,000	27,500	15,400	<7,660	<3,190	<2,070	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	7/28/10	1,060,000	36,100	21,600	<7,660	<4,880	<2,070	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	10/13/10	1,310,000	33,700	21,200	<7,660	<4,880	<2,560	<3,190	<3,770	<4,340	<4,340	<4,920	<4,920	<4,260
	4	2/2/11	710,000	20,800	12,300	<6,130	<3,910	<1,650	<2,560	<3,010	<3,470	<3,470	<3,930	<3,930	<3,410
VP-2	4	12/14/09	35,600	<269	<198	<281	<244	<103	<160	<188	<217	<217	<246	<246	<213
	4	3/15/10	26,300	<269	<198	<281	<244	<103	<160	<188	<217	<217	<246	<246	<213
	4	4/9/10	35,600	<269	<198	<281	<244	<103	<160	<188	<217	<217	<246	<246	<213
	4	5/18/10	38,700	539	<397	<766	<488	<207	<319	<377	<434	<434	<492	<492	<426
	4	6/15/10	43,800	<537	<397	<766	<488	<207	<319	<377	<434	<434	<492	<492	<426
	4	7/28/10	114,000	1,450	<793	<1,530	<977	<413	<639	<754	<868	<868	<983	<983	<852
	4	10/13/10	92,400	929	<397	<1,530	<488	<511	<639	<764	<868	<868	<983	<983	<852
	4	2/2/11	74,200	<537	<397	<766	<488	<207	<319	<377	<434	<434	<492	<492	<426
	4	5/3/11	104,000	<537	<397	<766	<488	<207	<319	<377	<434	<434	<492	<492	<426

TABLE 3-3
SUMMARY OF SOIL GAS ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Depth (feet)	Date	Chlorinated VOCs						Petroleum Related VOCs						Other VOCs
			PCE	TCE	DCE	TCTFA	TCM	CM	Benzene	Toluene	Ethyl benzene	Xylenes	1,3,5-TMB	1,2,4-TMB	Styrene
			(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
E STREET															
WEST															
W-12	3.5	12/9/08	127	<26.9	<19.8	<28.1	<24.4	<10.3	<16.0	<18.8	<21.7	<21.7	<24.6	<24.6	<21.3
W-13	3.5	12/9/08	91.5	<26.9	<19.8	<28.1	<24.4	<10.3	21.1	24.7	<21.7	<21.7	<24.6	<24.6	<21.3
W-14	3.5	12/9/08	<33.9	<26.9	<19.8	<28.1	60.0	<10.3	<16.0	<18.8	<21.7	<21.7	<24.6	<24.6	<21.3
W-15	3.5	10/3/13	<7.8	<6.2	<4.5	<8.8	6.9	<24	<3.6	<4.3	<5.0	<5.0	<5.6	<5.6	<4.9
W-16	4	10/3/13	460	<6.1	<4.5	<8.7	<5.5	<23	<3.6	<4.3	<4.9	<4.9	<5.6	<5.6	<4.8
			480	<6.2	<4.6	<8.8	<5.6	<24	<3.7	<4.4	<5.0	<5.0	<5.7	<5.7	<4.9
		2/5/14	180	<5.8	<4.3	<8.2	<5.2	<22	<3.4	<4.0	<4.7	<4.7	<5.3	<5.3	<4.6
W-17	3.5	10/3/13	<7.6	<6.0	<4.4	<8.6	200	<23	4	13	<4.9	13	<5.5	<5.5	<4.8
ALLEY BETWEEN D & E STREETS															
W-18	4.5	10/2/13	<7.2	<5.8	<4.2	<8.2	23	<22	<3.4	<4.0	<4.6	<4.6	7.1	14	<4.6
W-19	4.5	10/2/13	32	<6.5	<4.8	<9.2	<5.9	<25	<3.8	<4.5	<5.2	<5.2	<5.9	<5.9	<5.1
		2/5/14	14	<6.0	<4.4	<8.6	<5.5	<23	<3.6	<4.2	<4.9	15.2	<5.5	<5.5	<4.8
			15	<6.1	<4.5	<8.7	<5.5	<23	<3.6	<4.2	<4.9	17.0	<5.6	<5.6	<4.8
W-20	4.5	10/2/13	<8.1	<6.4	<4.7	<9.1	<5.8	<24	<3.8	<4.5	<5.2	<5.2	<5.8	<5.8	<5.1
D STREET															
W-21	4.5	10/3/13	<8.2	<6.5	<4.8	<9.3	<5.9	<25	<3.9	12	<5.2	20.7	<5.9	11	<5.2
W-22	4.5	10/2/13	<7.4	<5.8	<4.3	<8.4	<5.3	<22	<3.5	<4.1	<4.7	<4.7	<5.4	<5.4	<4.6
		2/5/14	<7.9	<6.3	<4.6	<9.0	<5.7	<24	<3.7	<4.4	<5.1	<5.1	<5.8	<5.8	<5.0
W-23	4.5	10/2/13	<7.0	<5.6	<4.1	<7.9	<5.0	<21	<3.3	<3.9	<4.5	<4.5	<5.1	<5.1	<4.4
ALLEY BETWEEN D & WILLIAMS STREETS															
W-24	4.5	10/1/13	<7.6	<6.0	<4.4	<8.6	<5.5	<23	<3.6	<4.2	<4.9	<4.9	<5.5	<5.5	<4.8
W-25	4.5	10/3/13	<7.9	<6.2	<4.6	<8.9	<5.7	<24	<3.7	<4.4	<5.0	<5.0	<5.7	<5.7	<4.9
		2/5/14	<8.1	<6.4	<4.8	<9.2	<5.8	<25	<3.8	<4.5	<5.2	<5.2	<5.9	<5.9	<5.1
W-26	4.5	10/1/13	<7.7	<6.1	<4.5	<8.7	<5.6	<24	<3.6	<4.3	<4.9	<5.0	<5.6	<5.6	<4.8

TABLE 3-3
SUMMARY OF SOIL GAS ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Depth (feet)	Date	Chlorinated VOCs						Petroleum Related VOCs						Other VOCs
			PCE	TCE	DCE	TCTFA	TCM	CM	Benzene	Toluene	Ethyl benzene	Xylenes	1,3,5-TMB	1,2,4-TMB	Styrene
			($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
HENDERSON STREET															
W-27	4.5	10/2/13	100	<5.7	<4.2	<8.1	<5.2	<22	<3.4	<4.0	<4.6	<4.6	<5.2	<5.2	<4.5
		2/4/14	69	<6.2	<4.6	<8.8	<5.6	<24	<3.7	<4.4	<5.0	13.8	<5.7	<5.7	<4.9

Notes:

VOCs: Volatile Organic Compounds
PCE: Tetrachloroethene
TCE: Trichloroethene
DCE: Dichloroethene
TCTFA: Trichlorotrifluoroethane
TCM: Trichloromethane
CM: Chloromethane
TMB: Trimethylbenzene
$\mu g/m^3$: micrograms per cubic meter
<1.0: Less than the laboratory-reporting limit of 1.0
--: Not analyzed/ not sampled

TABLE 3-4
SUMMARY OF DEPTH DISCRETE GROUNDWATER ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs						Petroleum Hydrocarbons & Related VOCs														Acetone	MBAS
			PCE	TCE	DCE	CE	TCM	BDCM	TPHg	TPHd	TPHmo	TPHss	Kerosene	Benzene	Toluene	Ethyl benzene	Xylenes	Naph-thalene	TMB	Butyl-benzene	n-Propyl-benzene	Isopropyl-benzene		
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
2907 E STREET																								
B-1	4/23/98	5	--	--	--	--	--	--	9,400	--	--	--	--	75	45	590	1,300	--	--	--	--	--	--	--
B-2	4/23/98	5	--	--	--	--	--	--	<0.05	--	--	--	--	<0.5	<0.5	<0.5	<2	--	--	--	--	--	--	--
B-3	4/23/98	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-4	4/23/98	5	--	--	--	--	--	--	<0.05	--	--	--	--	<0.5	<0.5	<0.5	<2	--	--	--	--	--	--	--
B-5	4/23/98	5	240	<3	<3	<10	<3	<3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-6	4/23/98	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-7	4/23/98	5	880	30	30	<40	<10	<10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SP-1	11/06	4	43	2.1	4.83	<2.0	0.32J	<2.0	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	5.0J	--
SP-2	11/06	4	110	4.9	10.3	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
SP-3	11/06	4	720	<50	<50	<50	<50	<50	--	--	--	--	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<500	--
SP-4	11/06	4	10,000	<250	96	<250	<250	<250	--	--	--	--	--	<250	<250	<250	<250	<250	<250	<250	<250	<250	<2,500	--
SP-5	11/06	4	2.0	<2.0	<2.0	<2.0	1.2J	<2.0	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	7.9J	--
SP-6	11/06	4	1.6	<2.0	<2.0	<2.0	1.4J	0.42J	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.2J	--
SP-7	11/06	4	610	<10	2.2J	<10	<10	<10	--	--	--	--	--	<10	<10	<10	<10	<10	<10	<10	<10	<10	12J	--
SP-14	11/06	4	2,400	<20	17	<20	<20	<20	--	--	--	--	--	<20	<20	<20	<20	<20	<20	<20	<20	<20	<200	--
		14	6,100	11J	7.5J	<20	<20	<20	--	--	--	--	--	<20	<20	<20	<20	<20	<20	<20	<20	<20	<200	--
A-1	2/08	10	5,430	<50.0	54.6	<50.0	<50.0	<50.0	--	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	--
A-2	2/08	10	3,980	49.6	31.5	<25.0	<25.0	<25.0	--	--	--	--	--	<25.0	<25.0	<25.0	<25.0	<50.0	<25.0	<25.0	<25.0	<25.0	--	--
A-3	2/08	10	2,000	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	<10.0	<10.0	<10.0	<10.0	<20.0	<10.0	<10.0	<10.0	<10.0	--	--
B-1	2/08	10	20,600	<100	<100	<100	<100	<100	--	--	--	--	--	<100	<100	<100	<100	<200	<100	<100	<100	<100	--	--
B-2	2/08	10	8,800	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	--
B-3	2/08	10	2,660	20.1	<20.0	<20.0	<20.0	<20.0	--	--	--	--	--	<20.0	<20.0	<20.0	<20.0	<40.0	<20.0	<20.0	<20.0	<20.0	--	--
C-1	2/08	8	7,920	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	--
C-2	2/08	10	7,960	<40.0	<40.0	<40.0	<40.0	<40.0	--	--	--	--	--	<40.0	<40.0	<40.0	<40.0	<80.0	<40.0	<40.0	<40.0	<40.0	--	--
C-3	2/08	11	1,890	15.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	<10.0	<10.0	<10.0	<10.0	<20.0	<10.0	<10.0	<10.0	<10.0	--	--
D-6	6/08	20	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-2	2/08	8	<0.500	<0.500	<0.500	<0.500	2.15	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-3	2/08	9	0.970	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-4	2/08	9.5	7.32	<0.500	<0.500	<0.500	0.990	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-5	2/08	9	20.5	<0.500	<0.500	<0.500	2.54	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-6	2/08	9	1.58	<0.500	<0.500	<0.500	8.69	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-11	2/08	9.5	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	1,520	4,510	2,720	7,660	458	1,755	<50.0	358	151	--	--
E-12	2/08	10.5	2.52	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		15	<5.00	<5.00	26.1	<5.00	<5.00	<5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		22	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		30	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-22	6/08	10	<20.0	<20.0	200	<20.0	<20.0	<20.0	16,700	--	--	--	--	470	168	1,710	697.6	429	199.8	21.8	236	93.7	--	--
		15	2.36	<0.500	<0.500	<0.500	<0.500	<0.500	85	--	--	--	--	<0.500	4.54	2.73	12.79	1.15	3.460	<0.500	0.750	<0.500	--	--
		25	<0.500	<0.050	<0.050	<0.050	<0.050	<0.500	<50	--	--	--	--	<0.500	2.18	1.19	6.37	<1.00	0.860	<0.500	<0.500	<0.500	--	--

TABLE 3-4
SUMMARY OF DEPTH DISCRETE GROUNDWATER ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs						Petroleum Hydrocarbons & Related VOCs														Acetone	MBAS
			PCE	TCE	DCE	CE	TCM	BDCM	TPHg	TPHd	TPHmo	TPHss	Kerosene	Benzene	Toluene	Ethyl benzene	Xylenes	Naph-thalene	TMB	Butyl-benzene	n-Propyl-benzene	Isopropyl-benzene		
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
G-5	2/08	11	0.810	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		15	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		22	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50
		30	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-6	2/08	10.5	0.760	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--
E STREET																								
SP-12	11/06	4	2.4J	<5.0	<5.0	<5.0	9.9	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	2.9J	<5.0	<5.0	<5.0	1.0J	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
SP-13	11/06	4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	<5.0	<5.0	<5.0	<5.0	0.82J	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	11J	--
SP-15	11/06	4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.1J	--
		14	<5.0	<5.0	<5.0	<5.0	1.1J	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.8J	--
SP-9	11/06	4	<5.0	<5.0	<5.0	<5.0	3.4 J	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	83	<5.0	0.89J	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	6.9J	--
W-6	4/07	15	10,300	<100	<100	<100	<100	<100	--	--	--	--	--	<100	<100	<100	<100	<200	<100	<100	<100	<100	--	--
		15	8,590	<100	<100	<100	<100	<100	--	--	--	--	--	<100	<100	<100	<100	<200	<100	<100	<100	<100	--	--
		30	533	<4.00	<4.00	<4.00	<4.00	<4.00	--	--	--	--	--	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<4.00	<4.00	<4.00	--	--
		52	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-7	2/08	10	0.500	<0.500	<0.500	<0.500	6.16	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-8	4/08	11	1.40	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-9	2/08	9.5	911	58.3	610.8	16.0	<5.00	<5.00	--	--	--	--	--	399	11.2	658	7.01	<10.0	<5.00	40.2	137	127	--	--
E-10	2/08	9.5	4,290	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	--
E-13	4/08	11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-14	4/08	11	0.980	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-15	4/08	12	2,300	<20.0	<20.0	<20.0	<20.0	<20.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-16	4/08	13	2,210	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
E-17	6/08	10	1.25	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		15	1.79	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		25	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-18	6/08	10	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	<50
		15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		25	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-19	6/08	10	125	47.8	233	49.7	<20.0	<20.0	7,340	--	--	--	--	518	77.6	1,690	71.4	<40.0	<20.0	21.2	186	100	--	95
		16	4,690	<50.0	<50.0	<50.0	<50.0	<50.0	961	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	180
		25	0.570	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	1.14	<0.500	0.730	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
E-20	6/08	10	8.91	<0.500	<0.500	<0.500	3.57	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	<50
		15	3.60	<0.500	<0.500	<0.500	0.650	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	<50
		25	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
G-1	2/08	9.5	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		13	313	5.27	24.7	<2.00	<2.00	<2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G-2	2/08	9.5	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
G-3	2/08	11	11	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--

TABLE 3-4
SUMMARY OF DEPTH DISCRETE GROUNDWATER ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs						Petroleum Hydrocarbons & Related VOCs														Acetone	MBAS
			PCE	TCE	DCE	CE	TCM	BDCM	TPHg	TPHd	TPHmo	TPHss	Kerosene	Benzene	Toluene	Ethyl benzene	Xylenes	Naph-thalene	TMB	Butyl-benzene	n-Propyl-benzene	Isopropyl-benzene		
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
G-4	2/08	10	0.630	<0.500	<0.500	<0.500	0.620	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
15A	2/08	11.5	5,610	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15B	2/08	10	<0.500	<0.500	<0.500	<0.500	2.50	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		15	10.3	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	39.8	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		30	<0.500	<0.500	0.670	<0.500	0.720	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
HP-7	10/27/11	9.5	530	1,600	149	1.5	<0.5	<0.5	3,300	310	3,000	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	23	<50
		13	9,500	100	28.8	<0.5	1.6	<0.5	12,000	<50	<170	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<50
		20	10	1.4	<1.0	<0.5	<0.5	<0.5	<50	99	1,400	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	6	--
HP-8	10/26/11	7.5	55	50	541.5	17	<0.5	<0.5	8,200	--	--	8,100	7,300	460	110	1,300	1,250	250	560	350	170	71	24	<50
		15	900	410	7.9	<0.5	<0.5	<0.5	1,400	140	1,600	90	<50	4.8	1.9	15	13.9	2.1	5.4	<1.0	1.7	<1.0	7.1	<50
		20	19	16	1.3	<0.5	<0.5	<0.5	<50	82	500	<50	<50	1.4	1.1	1.7	2.39	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<50
HP-9	10/26/11	7.5	11	<1.0	12	0.97	<1.0	<1.0	110,000	2,700	270	22,000	22,000	3,900	7,800	4,700	16,400	1,100	8,700	<1.0	1,400	450	<1,000	--
		15	470	10	29	<0.5	<0.5	<0.5	1,400	130	390	620	660	47	170	33	134	4.3	29.8	8.6	6	2.6	13	<50
		20	1,800	5.6	9.3	<0.5	0.60	<0.5	2,000	140	<170	410	310	6.7	41	22	75	3.4	24.9	10.2	6.4	2.4	5.2	<50
HP-11	10/28/11	7	1.1	<1.0	<1.0	<0.5	<0.5	<0.5	<50	<50	<170	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<50
		13	7,000	17	17	<0.5	1.6	<0.5	8,400	180	2,300	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<50
		25	46	<1.0	<1.0	<0.5	<0.5	<0.5	65	<50	500	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	--
		29	9.4	<1.0	<1.0	<0.5	<0.5	<0.5	<50	<50	<170	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	<50
HPW-15	10/2/13	11-14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
HPW-17	10/2/13	11-14	680	<0.50	<0.50	<0.50	3.5	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
ALLEY BETWEEN D AND E STREETS																								
SP-10	11/06	4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	1,100	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
SP-11	11/06	4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
		14	<5.0	<5.0	<5.0	<5.0	0.64J	<5.0	--	--	--	--	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<50	--
E-21	6/08	10	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		15	1,150	<10.0	<10.0	<10.0	<10.0	<10.0	189	--	--	--	--	<10.0	<10.0	<10.0	<10.0	<20.0	<10.0	<10.0	<10.0	<10.0	--	--
		21	1.69	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		30	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
HPW-18	9/30/13	15-16	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
HPW-20	10/1/13	13.5-15	<0.50	<0.50	<0.50	<0.50	11	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
D STREET																								
HP-12	10/27/11	20	230	<1.0	<1.0	<0.5	<0.5	<0.5	330	--	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	--
		30	21	<1.0	<1.0	<0.5	<0.5	<0.5	<50	--	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	7.2	--
		34	89	<1.0	<1.0	<0.5	<0.5	<0.5	130	--	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0	<1.0	<1.0	<1.0	<1.0	<5.0	--
W-7	4/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	14,300	<100	<100	<100	<100	<100	--	--	--	--	--	<100	<100	<100	<100	<200	<100	<100	<100	<100	--	--
		30	4,830	<50.0	<50.0	<50.0	<50.0	<50.0	--	--	--	--	--	<50.0	<50.0	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	--	--
HPW-21	10/3/13	8-12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
HPW-22	10/1/13	8-12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
HPW-23	10/1/13	8-12	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--

TABLE 3-4
SUMMARY OF DEPTH DISCRETE GROUNDWATER ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Date	Depth (feet)	CVOCs						Petroleum Hydrocarbons & Related VOCs														Acetone	MBAS
			PCE	TCE	DCE	CE	TCM	BDCM	TPHg	TPHd	TPHmo	TPHss	Kerosene	Benzene	Toluene	Ethyl benzene	Xylenes	Naph-thalene	TMB	Butyl-benzene	n-Propyl-benzene	Isopropyl-benzene		
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
ALLEY BETWEEN D AND WILLIAM STREETS																								
HPW-25	9/30/13	12-17	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
WILLIAM STREET																								
W-8	4/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	831	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	<10.0	<10.0	<10.0	<10.0	<20.0	<10.0	<10.0	<10.0	<10.0	--	--
		30	195	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	--	--
W-12	10/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	59.8	<0.500	<0.500	<0.500	0.960	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		30	50.3	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
W-14	10/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	138	<1.00	<1.00	<1.00	<1.00	<1.00	--	--	--	--	--	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00	<1.00	--	--
		30	43.7	<0.500	<0.500	<0.500	0.690	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
LOWELL STREET																								
W-9	4/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		30	136	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	--	--
B STREET																								
W-13	10/07	15	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		22	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--
		30	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	--	--	--	<0.500	<0.500	<0.500	<0.500	<1.00	<0.500	<0.500	<0.500	<0.500	--	--

Notes:

CVOCs: Chlorinated Volatile Organic Compounds
PCE: Tetrachloroethene
TCE: Trichloroethene
DCE: Dichloroethene (sum of cis 1,2-DCE and trans 1,2-DCE)
CE: Chloroethene
TCM: Trichloromethane
TPHg: Total petroleum hydrocarbons as gasoline
TPHd: Total petroleum hydrocarbons as diesel
TPHmo: Total petroleum hydrocarbons as motor oil
TPHss: Total petroleum hydrocarbons as stodard solvent
TMB: Sum of 1,2,4 - Trimethylbenzene and 1,3,5 - Trimethylbenzene
MBAS: Methylene blue active substances
µg/l: micrograms per liter
<1.0: Less than the laboratory-reporting limit of 1.0
--: Not analyzed/ not sampled
J: estimated value below laboratory-reporting limit, but above method-detection limit

TABLE 3-5
SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
E and Grotto Streets Plumes
Eureka, California

Well ID	Date Installed	Monitoring Well Construction Details								
		Well Diameter (inches)	Casing Material	Total Depth (ft bgs)	Screen Interval (ft bgs)	Screen Slot Size (inches)	Sand Pack Interval (ft bgs)	Sand Pack Type	Bentonite Seal (ft bgs)	Grout Seal (ft bgs)
MW-1	10/17/00	2	Sch. 40 PVC	25	4 to 25	0.020	3 to 25	#3	2 to 3	0 to 2
MW-2	10/20/00	2	Sch. 40 PVC	20	4 to 20	0.20	3 to 20	#3	2 to 3	0 to 2
MW-3	10/20/00	2	Sch. 40 PVC	20	4 to 20	0.20	3 to 20	#3	2 to 3	0 to 2
MW-4	11/20/02	2	Sch. 40 PVC	20	6 to 20	0.020	4 to 20	#3	3.5 to 4	0 to 3.5
MW-5	11/20/02	2	Sch. 40 PVC	20	6 to 20	0.020	4 to 20	#3	3.5 to 4	0 to 3.5
MW-6	11/20/02	3	Sch. 40 PVC	20	6 to 20	0.020	4 to 20	#3	3.5 to 4	0 to 3.5
MW-7	11/20/02	2	Sch. 40 PVC	25	6 to 20	0.020	4 to 20	#3	3.5 to 4	0 to 3.5
MW-8A	10/21/03	2	Sch. 40 PVC	9	4 to 9	0.020	3 to 9	#3	2 to 3	0 to 2
MW-8B	10/21/03	2	Sch. 40 PVC	20	15 to 20	0.020	14 to 20	#3	9 to 14	0 to 9
MW-9A	10/21/03	2	Sch. 40 PVC	10	5 to 10	0.020	4 to 10	#3	2.5 to 4	0 to 2.5
MW-9B	10/21/03	2	Sch. 40 PVC	20	15 to 20	0.020	14 to 20	#3	9 to 14	0 to 9
MW-10A	10/22/03	2	Sch. 40 PVC	9	4 to 9	0.020	3 to 9	#3	2 to 3	0 to 2
MW-10B	10/22/03	2	Sch. 40 PVC	20	15 to 20	0.020	14 to 20	#3	9 to 14	0 to 9
MW-11A	5/11/05	2	Sch. 40 PVC	9	4 to 9	0.020	3 to 9	#2/12	2 to 3	0 to 2
MW-11B	5/11/05	2	Sch. 40 PVC	22	12 to 22	0.020	11 to 22	#2/12	8 to 11	0 to 8
MW-12B	2/12/09	6	Sch. 40 PVC	30	15 to 30	0.010	11 to 30	#2/16	8 to 11	0 to 8
MW-13A	2/21/08	2	Sch. 40 PVC	10	5 to 10	0.010	4.5 to 10	#2/16	3 to 4.5	0 to 3
MW-13B	2/21/08	2	Sch. 40 PVC	28	18 to 28	0.010	15 to 28	#2/16	12 to 15	0 to 12
UMW-13A	11/8/12	2	Sch. 40 PVC	9.5	4.5 to 9.5	0.020	4 to 9.5	#2/12	3 to 4	0.3 to 3
UMW-13B	1/18/13	2	Sch. 40 PVC	19.5	14.5 to 19.5	0.020	13.5 to 19.5	#2/12	12 to 13.5	0.3 to 12
KMW-14A	3/23/14	2	Sch. 40 PVC	10	5 to 10	0.010	4 to 10	#2/16	3 to 4	0 to 3
KMW-14B	3/23/14	2	Sch. 40 PVC	20	15 to 20	0.010	13 to 20	#2/16	10 to 13	0 to 10
MW-15A	10/22/09	2	Sch. 40 PVC	10	5 to 10	--	--	--	--	--
MW-15B	10/22/09	2	Sch. 40 PVC	24.5	14.5 to 24.5	--	13.5-24.5	--	--	--
MW-16B	4/8/08	2	Sch. 40 PVC	30	20 to 30	0.010	18 to 30	#2/16	16 to 18	0 to 16
MW-17B	4/15/08	2	Sch. 40 PVC	30	20 to 30	0.010	18 to 30	#2/16	16 to 18	0 to 16
MW-18BS	6/2/13	2	Sch. 40 PVC	15	10 to 15	0.010	9 to 15	#2/12	6 to 9	0 to 6
MW-18BD	6/1/13	2	Sch. 40 PVC	30	20 to 30	0.010	19 to 30	#2/12	16 to 19	0 to 16
KMW-19B	2/19/17	2	Sch. 40 PVC	20	15 to 20	0.010	13 to 20	#2/16	9 to 13	0 to 9
MW-19BS	5/30/13	2	Sch. 40 PVC	19	13 to 19	0.010	12 to 19	#2/12	9 to 12	0 to 9
MW-19BD	5/30/13	2	Sch. 40 PVC	35	25 to 35	0.010	24 to 35	#2/12	21 to 24	0 to 21
KMW-20A	3/23/14	2	Sch. 40 PVC	10	5 to 10	0.010	4 to 10	#2/16	3 to 4	0 to 3
MW-20BS	6/2/13	2	Sch. 40 PVC	17	12 to 17	0.010	10 to 17	#2/12	7 to 10	0 to 7
MW-20BD	6/2/13	2	Sch. 40 PVC	31	21 to 31	0.010	20 to 32	#2/12	17 to 20	0 to 17
KMW-21A	3/4/14	2	Sch. 40 PVC	10	5 to 10	0.010	4 to 10	#2/16	3 to 4	0 to 3
MW-21BD	6/1/13	2	Sch. 40 PVC	30	20 to 30	0.010	19 to 32	#2/12	13 to 19	0 to 13
KMW-22B	3/4/14	2	Sch. 40 PVC	20	15 to 20	0.010	13 to 20	#2/16	8.5 to 13	0 to 8.5

TABLE 3-5
SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS
E and Grotto Streets Plumes
Eureka, California

Well ID	Date Installed	Monitoring Well Construction Details								
		Well Diameter (inches)	Casing Material	Total Depth (ft bgs)	Screen Interval (ft bgs)	Screen Slot Size (inches)	Sand Pack Interval (ft bgs)	Sand Pack Type	Bentonite Seal (ft bgs)	Grout Seal (ft bgs)
MW-22BS	5/31/13	2	Sch. 40 PVC	18.5	13.5 to 18.5	0.010	11.5 to 18.5	#2/12	9 to 11.5	0 to 9
MW-22BD	5/31/13	2	Sch. 40 PVC	32	22 to 32	0.010	21 to 32	#2/12	18 to 21	0 to 18
KMW-23B	3/5/14	2	Sch. 40 PVC	20	15 to 20	0.010	13 to 20	#2/16	7 to 13	0 to 7
MW-23BD	5/29/13	2	Sch. 40 PVC	32	22 to 32	0.010	20 to 32	#2/12	17 to 20	0 to 17
MW-24BD	5/31/13	2	Sch. 40 PVC	30	20 to 30	0.010	19 to 30	#2/12	15 to 19	0 to 15
MW-26BD	5/29/13	2	Sch. 40 PVC	28	18 to 28	0.010	16.5 to 28	#2/12	14 to 16.5	0 to 14
MW-27BD	5/31/13	2	Sch. 40 PVC	30	22 to 32	0.010	20 to 32	#2/12	17 to 20	0 to 17
MW-28BS	5/29/13	2	Sch. 40 PVC	22	12 to 22	0.010	11 to 22	#2/12	8 to 11	0 to 11
MW-28BD	5/30/13	2	Sch. 40 PVC	37	27 to 37	0.010	25.5 to 37	#2/12	21.5 to 25.5	0 to 21.5
FW-1	4/8/08	4	Stainless Steel	10	5 to 10	--	4 to 10	#2/16	4 to 4.5	0 to 4
VP-1	4/15/08	0.625	Stainless Steel	4	3.75 to 4	mesh	3 to 4	#2/16	0.5 to 3	0 to 0.5
VP-2	4/15/08	0.625	Stainless Steel	4	3.75 to 4	mesh	3 to 4	#2/16	0.5 to 3	0 to 0.5
SV-1	10/27/08	2	Sch. 40 PVC	5	2 to 5	0.02	1.5 to 5	#2/12	1 to 1.5	0 to 1
SV-2	10/27/08	2	Sch. 40 PVC	5	2 to 5	0.02	1.5 to 5	#2/12	1 to 1.5	0 to 1
W-16	10/2/13	0.75	--	4	3.2 to 3.8	--	3 to 4	#2/12	0.6 to 3	--
W-19	9/30/13	0.75	--	4.5	3.7 to 4.3	--	3.5 to 4.5	#2/12	0.6 to 3.5	--
W-22	10/1/13	0.75	--	4.5	3.7 to 4.3	--	3.5 to 4.5	#2/12	0.6 to 3.5	--
W-25	9/30/13	0.75	--	4.5	3.7 to 4.3	--	3.5 to 4.5	#2/12	0.6 to 3.5	--
W-27	10/1/13	0.75	--	4.5	3.7 to 4.3	--	3.5 to 4.5	#2/12	0.6 to 3.5	--

Notes:

ft bgs: feet below ground surface
PVC: poly vinyl chloride

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
OU-1 A-ZONE GROUNDWATER																								
2907 E STREET A-ZONE GROUNDWATER																								
MW-1	4-25	12/8/00	--	--	--	--	--	--	--	--	--	95	0.63	<0.5	<0.5	0.93	<3.0	--	--	--	--	--	--	--
		3/28/01	--	--	--	--	--	--	--	--	--	560	15	<3.0	11	12.4	<7.0	--	--	--	--	--	--	--
		6/28/01	--	--	--	--	--	--	--	--	--	690	29	0.51	3.8	13.82	<1.0	--	--	--	--	--	--	--
		9/19/01	--	--	--	--	--	--	--	--	--	810	63	<2.0	2.4	8.55	<30	--	--	--	--	--	--	--
		12/27/01	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<3.0	--	--	--	--	--	--	--
		3/31/02	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<3.0	--	--	--	--	--	--	--
		6/27/02	--	--	--	--	--	--	--	--	--	250	2.9	<0.50	1.9	7.5	<7.0	--	--	--	--	--	--	--
		9/27/02	--	--	--	--	--	--	--	--	--	730	27	<2.0	3	11	<15	--	--	--	--	--	--	--
		12/31/02	--	--	--	--	--	--	--	--	--	89	0.62	<0.50	<0.50	1.25	<3.0	--	--	--	--	--	--	--
		3/27/03	3.2	<0.5	<0.5	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--
		11/6/03	--	--	--	--	--	--	--	--	--	190	34	<0.50	0.83	0.86	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	160	23	2.2	7	11	0.67	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	85	9.1	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	2.2	<0.50	<0.50	1.2	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	91	19	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
MW-2	4-20	12/8/00	1.3	<1.0	<1.0	--	<1.0	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/28/01	34	<1.0	<1.0	--	<1.0	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		9/19/01	18	<1.0	<1.0	--	<1.0	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		12/27/01	<1.0	<1.0	<1.0	--	<1.0	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		6/27/02	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<3.0	--	--	--	--	--	--	--
		9/27/02	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<3.0	--	--	--	--	--	--	--
		12/31/02	--	--	--	--	--	--	--	--	--	60	<0.50	<0.50	<0.50	0.64	<3.0	--	--	--	--	--	--	--
		3/27/03	1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	<0.5	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		11/6/03	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	1.2	2.5	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	<50	<0.50	0.94	0.7	3.1	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
MW-3	4-20	11/10/00	6,600	<50	150	--		--	--	--	--	9,600	<20	<20	<20	<20	<20	--	--	--	--	--	--	--
		3/28/01	6,900	<130	<130	--	<130	--	--	--	--	<13,000	<50	<50	<50	<50	--	--	--	--	--	--	--	--
		9/19/01	6,700	<50	<50	--	<50	--	--	--	--	11,000	<25	<25	<25	<25	--	--	--	--	--	--	--	--
		12/27/01	14,000	<100	<100	--	<100	--	--	--	--	21,000	<50	<50	<50	<50	--	--	--	--	--	--	--	--
		6/27/02	--	--	--	--	--	--	--	--	--	4,600	<0.50	<0.50	<0.50	<0.50	<12	--	--	--	--	--	--	--
		9/27/02	--	--	--	--	--	--	--	--	--	1,900	<0.50	<0.50	<0.50	<0.50	<3.0	--	--	--	--	--	--	--
		12/31/02	--	--	--	--	--	--	--	--	--	60	<0.50	<0.50	<0.50	1.86	<3.0	--	--	--	--	--	--	--
		3/27/03	9,200	22	53	1.0	--	--	--	--	--	3,000	<0.50	<0.50	<0.50	<0.50	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--
		11/6/03	--	--	--	--	--	--	--	--	--	1,400	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	0.69	1.1	2.2	4.9	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	63	2.0	3.6	2.7	12	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-4	5.5-20	12/31/02	--	--	--	--	--	--	--	--	--	1,200	2.4	<0.50	1.2	5.2	<3.0	--	--	--	--	--	--	--
		3/27/03	4,900	27	86	<0.5	<0.5	<0.5	<0.5	3.6	--	2,100	17	4.8	10	87	--	50	9	6.2	4.1	3.2	5.0	<0.5
		11/6/03	--	--	--	--	--	--	--	--	--	1,900	2.8	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	10.0	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	71	16.0	0.51	<0.50	1.9	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	4.6	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	8.9	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
MW-5	5.5-20	12/31/02	--	--	--	--	--	--	--	--	--	3,900	<0.50	<0.50	<2.0	1	<6.0	--	--	--	--	--	--	--
		3/27/03	9,900	38	32	<0.5	<0.5	2.7	1.0	5.0	--	1,900	<0.5	<0.5	<0.5	0.99	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		11/6/03	--	--	--	--	--	--	--	--	--	2,000	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	1.1	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	<50	0.51	1.10	0.82	3.5	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
MW-6	5.5-20	12/31/02	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	0.64	<3.0	--	--	--	--	--	--	--
		3/26/03	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<2.5	--	--	--	--	--	--	--
		11/6/03	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	0.74	1.6	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	<50	0.82	1.6	1.1	5.1	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
MW-7	5.5-25	12/31/02	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	0.73	<3.0	--	--	--	--	--	--	--
		3/26/03	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<2.5	--	--	--	--	--	--	--
		11/6/03	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		3/22/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	<50	0.75	1.4	0.9	3.9	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	2.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-8A	4-9	11/6/03	<100	<100	<100	<100	<100	<100	<100	<100	<100	42,000	2,400	3,800	3,400	12,200	<100	3,740	150	490	170	<100	740	<1.,000
		3/22/04	--	--	--	--	--	--	--	--	--	17,000	1,600	820	2,300	3,300	<25	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	16,000	2,500	350	2,300	1,900	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	21,000	3,500	350	2,400	1,200	<5.0	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	18,000	5,400	310	4,000	520	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	27,000	3,300	830	2,200	2,400	<0.50	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	13,000	1,300	590	3,000	4,700	<25	--	--	--	--	--	--	--
		8/17/05	42	<20	<20	<20	<40	<20	<20	<20	<20	9,600	630	80	1,400	1,500	<20	640	32	<20	88	<20	270	<400
		11/1/05	--	--	--	--	--	--	--	--	--	5,200	290	42	840	480	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	1,600	700	510	1,900	4,000	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	1,500	690	370	1,800	3,900	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	24,000	400	230	2,500	4,200	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	22,000	480	240	2,700	4,300	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	6,000	150	32	790	680	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	7,100	170	40	910	920	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	7,000	120	28	720	460	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	10,000	180	130	880	1,200	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	17,000	340	400	1,200	2,700	--	--	--	--	--	--	--	--
		1/29/08	<2	<2.0	8.3	<2.0	--	<2.0	<2.0	<2.0	<2.0	14,000	260	200	1,000	1,300	<2.0	770	55	240	86	9.0	250	<2.0
			0.91	0.61	9.3	<0.50	--	<0.50	<0.50	<0.50	<2.5	14,000	290	220	1,100	1,300	<0.50	830	72	240	110	12	260	8.5
		4/28/08	<4.0	<4.0	10	<4.0	<4.0	<4.0	<4.0	<4.0	<5	16,000	380	210	1,500	2,500	<4.0	1,120	59	260	100	9.0	370	<40
		7/23/08	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	4,050	211	<25.0	751	119	<20.0	40.8	<25.0	88.6	44.5	<25.0	105	--
		7/30/08	<0.50	0.72	3.6	<0.50	--	<0.50	<0.50	<0.50	<0.50	4,600	180	19	550	168.1	<0.50	160	27	130	56	2.3	180	2.9
			<0.50	0.64	3.4	<0.50	--	<0.50	<0.50	<0.50	<0.5	4,400	180	19	540	178.5	<0.50	158	26	120	54	2.2	180	3.4
		10/28/08	<0.50	0.89	3.8	<0.50	--	<0.50	<0.50	<0.50	<0.50	5,300	220	19	680	140	<0.50	202	30	200	79	2.9	200	7.1
		1/28/09	<1.5	1.7	6.3	<1.5	--	<1.5	<1.5	<1.5	<1.5	5,000	160	15	710	120	<1.5	297	25	150	59	4.0	180	<2.0
		4/28/09	<1.5	1.7	6.9	<1.5	--	<1.5	<1.5	<1.5	<1.5	11,000	290	74	1,200	1,500	<1.5	760	44	200	80	6.1	270	<2.0
		7/28/09	<0.90	<0.90	1.6	<0.90	--	<0.90	<0.90	<0.90	<0.90	5,000	240	10	580	37	<0.90	48	33	160	71	1.4	220	7.4
		1/28/10	<0.90	<0.90	11	<0.90	--	<0.90	<0.90	<0.91	<0.90	12,000	400	89	1,600	600	<0.90	465	87	340	130	12	270	<8.0
			<3.0	<2.5	11	<3.0	--	<3.0	<3.0	<3.0	<3.0	13,000	440	100	1,600	700	<1.5	466	77	330	120	11	280	<10
		7/28/10	<2.5	<2.5	3.6	<2.5	--	<2.5	<2.5	<2.5	<2.5	7,700	270	17	1,100	400	<2.5	230	44	250	98	--	--	11
		1/27/11	<2.5	<2.5	13	<2.5	--	<2.5	<2.5	<2.5	<2.5	13,000	350	85	1,400	1,000	<2.5	710	67	340	140	7.9	--	<2.5
		7/27/11	<2.5	<2.5	12	<2.5	--	<2.5	<2.5	<2.5	<2.5	14,000	300	34	1,400	380	<2.5	610	65	370	140	9.0	460	<25
		1/25/12	<2.5	<2.5	10	<2.5	--	<2.5	<2.5	<2.5	<2.5	15,000	340	85	1,400	860	<2.5	425	53	290	110	6.7	430	<7.0
		7/17/12	<2.5	<2.5	12	<2.5	--	<2.5	<2.5	<2.5	<2.5	15,000	300	52	1,100	550	<2.5	370	64	340	140	11.0	530	<7.0
		1/23/13	<1.5	<1.5	8.9	<1.5	--	<1.5	<1.5	<1.5	<1.5	8,200	260	120	710	1,000	<1.5	299	14.1	99	59	1.7	110	4.1
		8/5/13	<2.5	<2.5	5.0	<2.5	--	<2.5	<2.5	<2.5	<2.5	17,000	1,500	200	1,800	370	<2.5	139	68	340	140	7.4	630	11
		1/15/14	<2.5	<2.5	4.2	<2.5	--	<2.5	<2.5	<2.5	<2.5	22,000	1,500	130	1,600	580	<2.5	182	67	320	130	6.1	530	24

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-9A	5-10	11/6/03	2,100	<50	<50	<50	<50	<50	<50	<50	<50	680	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<500
		3/22/04	--	--	--	--	--	--	--	--	--	<50	1.6	2.6	3.0	12	0.67	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	130	8.5	13	9.8	41	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	0.78	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		8/17/05	2,500	15	<0.50	<0.50	<1.0	1.3	<0.50	1.0	5.4	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10
		11/1/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	2.3	1.9	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	2,900	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	<22	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/29/08	1,600	5.0	2.3	<0.50	--	<0.50	<0.50	0.71	<5.0	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		2/21/08	1,490	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	--	--	--	--	--	--	--	--	--	--	--	--
		4/28/08	1,900	17	4.7	<0.50	<0.50	0.59	<0.50	0.62	<5	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		7/23/08	1,620	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	367	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<40.0	--
		7/30/08	1,700	7.6	1.5	<0.50	--	<0.50	<0.50	0.53	0.6	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<2.0
		10/28/08	1,600	2.4	1.2	<0.50	--	<0.50	<0.50	<0.50	2.5	--	--	--	--	--	--	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
			1,800	2.5	1.2	<0.50	--	<0.50	<0.50	<0.50	2.7	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/28/09	1,400	<5.0	<5.0	<5.0	--	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<15
		4/28/09	1,000	<5.0	<5.0	<5.0	--	<5.0	<5.0	<5.0	<4.0	<500	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<15
		7/28/09	750	5.5	<0.50	<0.50	--	<0.50	<0.50	<0.50	<5.0	<50	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		12/14/09	2,610	<40.0	<40.0	<40.0	<40.0	--	<40.0	--	<40.0	677	--	--	--	--	--	--	--	--	--	--	--	--
		1/28/10	2,000	2.7	2.5	<0.50	--	0.5	<0.50	<0.50	2.5	<50	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		3/15/10	1,990	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	345	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<10.0	--
		6/15/10	2,040	18.3	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		7/28/10	1,810	17.9	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	485	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		10/13/10	1,040	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	220	<10.0	<10.0	<10.0	<10.0	--	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		1/27/11	780	7.9	<2.5	<2.5	--	<2.5	<2.5	<2.5	<2.5	<250	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	--	<7.0
		2/2/11	1,230	13.8	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	259	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		7/27/11	1,000	17	8.5	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		1/25/12	430	5.5	<2.0	<2.0	--	<2.0	<2.0	<2.0	<2.0	<200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
		7/17/12	500	10	4.2	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/23/13	560	5.4	<2.0	<2.0	--	<2.0	<2.0	<2.0	<2.0	<200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
		8/5/13	590	5.9	<2.0	<2.0	--	<2.0	<2.0	<2.0	<2.0	<200	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
		1/15/14	180	<0.50	<0.50	<0.50	--	<0.50	<0.50	1.4	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-10A	4-9	11/5/03	220	<50	<50	<50	<50	<50	<50	<50	<50	11,000	<50	160	<0.93	2,190	<50	1,690	110	200	64	<50	200	<500
		3/22/04	--	--	--	--	--	--	--	--	--	930	6.6	9.2	<0.94	72	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	520	14	15	<0.95	69	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	1,500	17	7.8	<0.98	26	<0.50	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	290	2.4	<0.50	<0.99	2.1	<0.50	--	--	--	--	--	--	--
		8/17/05	200	18	<0.50	0.65	<1.0	<0.50	<0.50	<0.50	<0.50	400	5.8	1.1	<0.100	7.5	<0.50	6.1	3.7	1.4	6.0	<0.50	10	<10
		11/1/05	--	--	--	--	--	--	--	--	--	280	6.5	<0.50	<0.101	3	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	85	1.3	<0.50	<0.102	<1.0	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.103	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	240	4.7	1.5	<0.104	3	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	490	7	0.6	<0.105	6	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	140	3	<0.5	<0.106	<0.5	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	<50	0.98	<0.50	<0.107	<0.50	--	--	--	--	--	--	--	--
		1/29/08	7.8	1.4	7.2	<0.50	--	<0.50	<0.50	<0.50	<0.50	300	4.7	<0.50	<0.108	<0.50	<0.50	<0.50	1.3	<0.50	1.8	<0.50	0.58	<5.0
		4/28/08	14	0.71	2.8	<0.50	<0.50	<0.50	<0.50	<0.50	<5	60	1.4	<0.50	<0.109	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	<2.0
		7/22/08	18.7	<0.500	3.62	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	107	2.20	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		7/30/08	14	0.75	8	<0.50	--	<0.50	<0.50	<0.50	<0.50	390	4.5	0.88	14	20	<0.50	14	2.9	4.3	4.3	<1.0	5	<2.0
		10/28/08	18	0.93	10	<0.50	--	<0.50	<0.50	<0.50	<0.50	500	8.6	1.1	24	10	<0.50	10	3.8	7	6.5	<0.50	7	<2.0
		1/28/09	10	<0.50	3.9	<0.50	--	<0.50	<0.50	<0.50	<0.50	230	3.8	<0.50	0.55	<0.50	<0.50	<0.50	0.74	<0.50	1.2	<0.50	<0.50	<2.0
		4/28/09	17	0.52	2	<0.50	--	<0.50	<0.50	<0.50	<0.50	120	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	<2.0
		7/28/09	37	<0.50	1.2	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		1/28/10	13	<0.50	2.2	<0.50	--	<0.50	<0.50	<0.50	<0.50	180	2.5	<0.50	2.8	2.5	<0.50	2.6	0.76	1	1.5	--	1.6	<2.0
		7/28/10	31	1.1	2.5	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	1.8	<0.50	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	1.2	<0.50	1.0	<2.0
		1/27/11	34	4.3	2.5	<0.50	--	<0.50	<0.50	0.57	<0.50	140	2.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	0.65	<0.50	--	<2.0
			35	4.5	2.5	<0.50	--	<0.50	<0.50	0.57	<0.50	150	2.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	0.66	<0.50	--	<2.0
		7/27/11	33	0.97	0.75	<0.50	--	<0.50	<0.50	0.52	<0.50	80	0.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/25/12	30	2.3	3.7	<0.50	--	<0.50	<0.50	<1.0	<0.50	420	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	2.5	<0.50	1.0	2.6
		7/17/12	39	1.6	0.89	<0.50	--	<0.50	<0.50	1.4	<0.50	<50	1.3	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50	1.0	<0.50	1.0	<2.0
		1/23/13	17	2.2	1.9	<0.50	--	<0.50	<0.50	1.2	<0.50	110	1.7	<0.50	<0.50	<0.50	<0.5	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	2.1
		8/5/13	44	4.7	2.0	<0.50	--	<0.50	<0.50	2.5	<0.50	180	3.1	0.97	5.3	5.3	<0.50	5.3	2.3	3.0	4.2	<0.50	6.7	<2.0
		1/15/14	74	1.1	0.70	<0.50	--	<0.50	<0.50	6.1	<0.50	240	0.75	1.4	2.0	7.1	<0.50	6.4	<0.50	0.96	0.73	<0.50	1.4	<2.0
FW-1	5-10	8/7/08	2,820	47.1	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	677	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<80.0	--
		12/14/09	2,240	41.4	22.2	<20.0	<20.0	<20.0	<20.0	--	<20.0	558	--	--	--	--	--	--	--	--	--	--	--	--
		1/12/10	3,370	52.0	40.7	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/15/10	6,590	47.8	47.2	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	1,520	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<80.0	--
		4/9/10	7,190	<50.0	51.2	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	1,540	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<100	--
		5/18/10	2,770	70.0	43.7	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	--	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<40.0	--
		6/15/10	2,340	124	48.9	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	--	<10.0	<10.0	<10.0	<10.0	--	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		7/28/10	2,626	148	42.7	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	913	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<40.0	--
		10/13/10	1,600	601	40.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	507	<10.0	<10.0	<10.0	<10.0	--	<10.0	<10.0	<10.0	<10.0	<10.0	<20.0	--
		2/2/11	6,690	66.6	50.3	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	1,690	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<100	--
		4/14/11	5,860	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	--	<50.0	<50.0	<50.0	<50.0	--	<50.0	<50.0	<50.0	<50.0	<50.0	<100	--
		5/3/11	2,840	38.0	35.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	--	<20.0	<20.0	<20.0	<20.0	--	<20.0	<20.0	<20.0	<20.0	<20.0	<40.0	--
MW-13A	5-10	7/22/08	0.520	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
UMW-13A	4.5-9.5	1/23/13	7.0	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.5
		3/10/13	18	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		8/5/13	14	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/15/14	6.3	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
OU-2 A-ZONE GROUNDWATER																								
E STREET - A-ZONE GROUNDWATER (OU-2)																								
MW-11A	4-9	5/18/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		8/17/05	11	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	0.50	<0.50	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10
		11/1/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	<22	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	<22	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/29/08	5.8	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		4/28/08	3.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		7/23/08	7.43	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		7/30/08	12	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0	<2.0
		10/28/08	2.4	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/28/09	1.7	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		4/28/09	5.2	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		7/28/09	4.5	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		1/28/10	4.4	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		7/28/10	3.0	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<2.0
		1/27/11	2.6	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<2.0
		7/27/11	0.81	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/25/12	0.93	<0.50	<0.50	<0.50	--	<0.50	<0.50	0.63	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		7/17/12	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	0.56	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/23/13	0.89	<0.50	<0.50	<0.50	--	<0.50	<0.50	1.2	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		8/5/13	2.0	<0.50	<0.50	<0.50	--	<0.50	<0.50	2.7	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/15/14	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	3.5	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
MW-15A	5-10	7/28/10	3.14	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
OU-3 B-ZONE GROUNDWATER																								
2907 E STREET B-ZONE GROUNDWATER																								
MW-8B	15-20	11/6/03	<20	<20	42	<20	<20	<20	<20	<20	<20	1,900	460	29	46	74	<20	20	<20	<20	<20	<20	38	<200
		3/22/04	--	--	--	--	--	--	--	--	--	390	100	7.7	17	31	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	540	190	4.7	10	17	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	3,600	790	11	63	7.3	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	2,100	570	<5.0	71	<10	<5.0	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	1,400	210	15	21	25	<0.50	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	510	240	<5.0	32	<10	<5.0	--	--	--	--	--	--	--
		8/17/05	31	12	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	1,200	740	7.7	170	9.6	<1.0	1.2	8.4	43	38	<1.0	35	<10
		11/1/05	--	--	--	--	--	--	--	--	--	630	200	<5.0	37	<10	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	650	310	2.9	37	3.3	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	610	400	3.7	56	2.6	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	660	630	4.8	83	3.3	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	2,200	430	3	83	3	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	1,100	280	2	35	1	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	1,100	270	2	35	0.8	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	1,100	340	2.0	39	1.5	--	--	--	--	--	--	--	--
		1/29/08	36	17	9.7	<0.50	--	<0.50	<0.50	<0.50	<0.50	1,800	330	2.0	37	2.3	<0.50	<0.50	3.4	11	11	1.4	4.8	<2.0
		4/28/08	37	25	14	0.53	2.2	<0.50	<0.50	<0.50	<5	2,700	490	3.2	60	3.6	<0.50	<0.50	6.0	27	24	2.0	9.5	<5.0
		7/23/08	19.8	31.7	13.0	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	2,000	668	<4.00	39.1	<4.00	<4.00	<4.00	<4.00	12.6	19.2	<4.00	<8.00	--
			<20.0	28.5	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	2,660	616	<20.0	27.3	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<40.0	--
		7/30/08	25	24	14	<0.50	--	<0.50	<0.50	<0.50	<0.50	1,900	400	2.2	42	1.8	<0.50	<0.50	5.1	18	21	1.8	5	3
		10/28/08	5.9	15	26	0.67	--	<0.50	<0.50	<0.50	<0.51	2,700	490	2.9	49	2.7	<0.50	<0.50	6.8	30	30	2	7.2	<2.0
		1/28/09	<0.50	0.54	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.52	190	22	<0.50	2	<0.50	<0.50	<0.50	<0.50	1	0.87	--	1.1	<2.0
		4/28/09	990	16	15	0.62	--	0.79	<0.50	<0.50	<0.53	22,000	400	1.9	36	2.1	<0.50	<0.50	4.7	20	18	1.5	9.7	<2.0
		7/28/09	12	20	21	<1.5	--	<1.5	<1.5	<1.5	<1.5	3,000	640	2.9	57	3.1	<1.5	<1.5	6.5	29	25	--	22	3.5
		1/28/10	3,400	48	26	<1.5	--	2.2	<1.5	<1.5	<1.5	1,700	370	1.8	27	<15	<1.5	<1.5	4.8	15	15	--	13	<5.0
		7/28/10	190	21	18	0.75	--	<0.50	<0.50	<0.50	<0.50	2,000	390	1.5	18	1.3	<0.50	<0.50	5.2	13	15	<0.50	8.1	<2.0
		1/27/11	51	43	18	1.1	--	<0.90	<0.90	<0.90	<0.90	2,100	390	1.6	11	2.0	<0.90	<0.90	2.51	4.9	7.9	<0.90	--	3.0
		7/27/11	5.1	4.1	58	0.99	--	<0.90	<0.90	<0.90	<0.90	2,200	370	2.0	20	3.3	<0.90	<0.90	4.3	14	15	<0.90	14	<9.0
		1/25/12	57	45	23	1.5	--	<0.50	<0.50	<0.50	<0.50	2,200	360	1.5	3.3	1.7	<0.50	<0.50	0.73	1.1	2.6	<0.50	17	<2.0
		1/17/12	90	80	28	1.2	--	<0.90	<0.90	<0.90	<0.90	2,500	490	2.0	12	1.8	<0.90	<0.90	4.4	14	13	<0.90	23	<2.5
			92	82	29	1.4	--	<0.50	<0.50	<0.50	<0.50	2,600	380	2.0	12	1.9	<0.50	<0.50	4.8	14	14	<0.50	24	<2.0
		1/23/13	30	21	3.1	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		8/5/13	57	47	14	1.2	--	<0.50	<0.50	<0.50	<0.50	2,900	370	5.0	110	16	<0.50	3.0	6.7	32	23	<0.50	32	5.0
			62	52	13	1.3	--	<0.50	<0.50	<0.50	<0.50	2,900	370	5.3	110	16	<0.50	3.4	6.5	32	25	<0.50	31	8.9
		1/15/14	38	31	7.7	1.2	--	<0.90	<0.90	<0.90	<0.90	5,100	530	10.0	120	27	<0.90	6.3	9.1	59	38	<0.90	92	<2.5

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-9B	15-20	11/6/03	12,000	<250	<250	<250	<250	<250	<250	<250	<250	2,600	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<2,500
		3/22/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	<50	0.63	1	1	3.6	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	0.68	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		8/17/05	2,700	7.2	<0.50	<0.50	<1.0	2.0	<0.50	<0.50	16	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<05.0	<0.50	<0.50	<0.50	<0.50	<0.50	<10
		11/1/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	3,900	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	<110	<3	<3	<3	<3	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/29/08	9,000	15	0.93	<0.50	--	2.9	0.93	0.83	<15	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		4/28/08	12,000	11	0.76	<0.50	<0.50	2.4	0.76	0.66	33	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		7/23/08	9,390	<100	<100	<100	<100	<100	<100	<100	<100	2,090	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
			8,680	<100	<100	<100	<100	<100	<100	<100	<100	1,950	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
		7/30/08	12,000	15	13	<0.50	--	2.2	0.58	0.59	13	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<0.50	<1.0	<2.0
		10/28/08	5,100	17	0.68	<0.50	--	2.4	0.68	0.83	16	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/28/09	8,400	<25	<25	<25	--	<25	<25	<25	<25	<2,500	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<60
		4/28/09	12,000	<25	<25	<25	--	<25	<25	<25	<50	<2,500	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<60
		7/28/09	8,800	16	13	<0.50	--	2.3	0.61	0.66	<25	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		12/14/09	9,300	<100	<100	<100	<100	--	<100	--	<100	2,330	--	--	--	--	--	--	--	--	--	--	--	--
		1/28/10	9,900	15	13	<0.50	--	2	0.71	0.88	11	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		3/15/10	14,900	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	2,270	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<80.0	--
		6/15/10	13,700	<100	<100	<100	<100	<100	<100	<100	<100	--	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
		7/28/10	11,500	<100	<100	<100	<100	<100	<100	<100	<100	3,040	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
		10/13/10	11,700	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	2,160	<50.0	<50.0	<50.0	<50.0	--	<50.0	<50.0	<50.0	<50.0	<50.0	<100	--
		1/27/11	13,000	<50	<50	<50	--	<50	<50	<50	<50	<5,000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	--	<500
		2/2/11	11,500	<100	<100	<100	<100	<100	<100	<100	<100	2,160	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
		7/27/11	4,900	7.3	4.2	<2.5	--	<2.5	<2.5	<2.5	13	<250	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25
		1/25/12	5,600	<25	<25	<25	--	<25	<25	<25	<25	<2,500	<2.5	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<70
		7/17/12	3,800	4.6	2.4	<1.5	--	<1.5	<1.5	<1.5	2.2	<150	<1.5	<1.5	<1.5	<1.5	<10	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<4.0
		1/23/13	9,500	<15	<15	<15	--	<15	<15	<15	<15	<1,500	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<40
		8/5/13	6,200	<25	<25	<25	--	<25	<25	<25	<25	<2,500	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<70
		1/15/14	7,800	<25	<25	<25	--	<25	<25	<25	<25	<2,500	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<70

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-10B	15-20	11/5/03	46	<5.0	14	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	460	10	<5.0	<5.0	8.7	<5.0	<5.0	<5.0	<5.0	5.6	<5.0	<5.0	<5.0
		3/22/04	--	--	--	--	--	--	--	--	--	64	2.3	<0.50	<0.50	1.3	<0.50	--	--	--	--	--	--	--
		5/18/04	--	--	--	--	--	--	--	--	--	110	6.3	3.7	3.8	15	<0.50	--	--	--	--	--	--	--
		8/9/04	--	--	--	--	--	--	--	--	--	390	14	0.85	1.2	1.3	<0.50	--	--	--	--	--	--	--
		11/9/04	--	--	--	--	--	--	--	--	--	150	9.2	<0.50	0.54	<1.0	<0.50	--	--	--	--	--	--	--
		2/7/05	--	--	--	--	--	--	--	--	--	110	4.6	<0.50	0.83	<1.0	<1.0	--	--	--	--	--	--	--
		5/18/05	--	--	--	--	--	--	--	--	--	<50	3.4	<0.50	0.64	<1.0	<0.50	--	--	--	--	--	--	--
		8/17/05	82	<0.50	31	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	150	6.2	<0.50	1.2	<1.0	<0.50	<0.50	0.56	<0.50	11	<0.50	<0.50	<10
		11/1/05	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	90	1.8	3.2	0.98	19	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	60	3.9	<0.50	0.73	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	120	<0.50	<0.50	1.9	<1.0	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	290	6	<0.5	4	<0.5	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	300	6	<0.5	4	<0.5	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	210	6	<0.5	4	<0.5	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	380	15	<0.50	14	<0.50	--	--	--	--	--	--	--	--
			--	--	--	--	--	--	--	--	--	380	16	<0.50	13	<0.50	--	--	--	--	--	--	--	--
		1/29/08	44	0.74	2.3	<0.50	--	<0.50	<0.50	<0.50	<0.50	480	16	0.65	25	<0.50	<0.50	<0.50	<0.50	4.0	5.8	<0.50	0.76	<2.0
		4/28/08	51	0.82	15	<0.50	6.2	<0.50	<0.50	<0.50	<5	900	30	1.0	28	0.66	<0.50	<0.50	0.94	5.3	12	<0.50	2.0	<5.0
		7/22/08	45.9	<1.00	3.22	<1.00	2.07	<1.00	<1.00	<1.00	<1.00	305	13.1	<1.00	12.9	<1.00	<0.50	1.93	<1.00	1.58	5.87	<1.00	<2.00	--
			55.3	<2.00	4.28	<2.00	2.63	<2.00	<2.00	<2.00	<2.00	446	20.1	<2.00	23.1	<2.00	<0.50	2.35	<2.00	2.40	8.63	<2.00	<4.00	--
		7/30/08	50	0.73	5.4	<0.50	--	<0.50	<0.50	<0.50	<0.50	480	17	0.61	14	0.56	<0.50	<0.50	1.1	3.0	13	<1.0	<1.0	3.1
		10/28/08	51	1.3	4.8	<0.50	--	<0.50	<0.50	<0.50	<0.50	890	31	1.5	32	2.1	<0.50	0.59	2	10.0	28	<0.50	2.3	3.9
		1/28/09	32	3.6	2.6	<0.50	--	<0.50	<0.50	<0.50	<0.50	2,000	60	3.1	280	3.8	<0.50	0.98	3.5	59.0	54	<0.50	4.8	<2.0
		4/28/09	18	6.9	1.8	<0.50	--	<0.50	<0.50	<0.50	<0.50	600	14	0.5	42	0.6	<0.50	<0.50	1	8.8	11	<0.50	1.0	<2.0
		7/28/09	93	23	4.8	<0.50	--	<0.50	<0.50	<0.50	<0.50	1,500	31	1	130	2.2	<0.50	<0.50	2.82	26.0	29	--	2.6	<2.0
		1/28/10	47	7.6	1.5	<0.50	--	<0.50	<0.50	<0.50	<0.50	320	4.8	<0.50	24	<0.50	<0.50	<0.50	0.6	5.8	6.7	--	<0.50	2.0
		7/28/10	270	56	7.1	<0.50	--	<0.50	<0.50	<0.50	<0.50	320	8.9	<0.50	24	<0.50	<0.50	<0.50	1.0	5.5	8.0	<0.50	<0.50	<2.0
		1/27/11	180	110	8.7	1.3	--	<0.50	<0.50	<0.50	<0.50	1,400	15	0.65	7.5	1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<2.0
		7/27/11	10	130	14	0.74	--	<0.50	<0.50	<0.50	<0.50	920	21	0.77	54	0.56	<0.50	<0.50	1.5	12	19	<0.50	2.4	10
			12	120	13	0.72	--	<0.50	<0.50	<0.50	<0.50	870	20	0.71	52	0.52	<0.50	<0.50	1.4	11	18	<0.50	2.3	12
		1/25/12	66	100	12	1.6	--	<0.50	<0.50	<0.50	<0.50	710	3.5	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	3.5
		7/17/12	76	110	12	0.55	--	<0.50	<0.50	<0.50	<0.50	1,200	23	0.99	69	1.4	<0.50	<0.50	1.8	17	22	<0.50	3.0	<2.0
		1/23/13	28	36	8.5	0.57	--	<0.50	<0.50	<0.50	<0.50	330	3.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		8/5/13	89	13	4.9	<0.50	--	<0.50	<0.50	<0.50	<0.50	90	3.8	<0.50	3.8	<0.50	<0.50	<0.50	<0.50	1.2	2.3	<0.50	<0.50	<2.0
		1/15/14	130	13	1.5	<0.50	--	<0.50	<0.50	<0.50	<0.50	400	10	0.52	3.7	2.6	<0.50	<0.50	<0.50	1.0	6.5	<0.50	4.3	3.4
			110	12	1.4	<0.50	--	<0.50	<0.50	<0.50	<0.50	350	9.7	<0.50	3.3	1.9	<0.50	<0.50	<0.50	1.0	6.1	<0.50	4.3	4.1
MW-13B	18-28	7/22/08	<.0500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<50	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
UMW-13B	14.5-19.5	1/23/13	2.4	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		3/10/13	4.6	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
			5.3	<0.50	<0.50	<0.50	--	<0.50	<0.50	<0.50	<0.50	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		8/5/13	12	<0.50	0.7	<0.50	--	<0.50	<0.50	<0.50	<0.50	230	2.6	<0.50	8.7	0.63	<0.50	1.27	2.37	5.5	3.0	<0.50	3.5	<2.0
		1/15/14	9.4	<0.50	4.2	<0.50	--	<0.50	<0.50	<0.50	<0.50	2,900	93	18	190	75	<0.50	51	11.5	54	23	1.8	75	5.1

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
E STREET - B-ZONE GROUNDWATER																								
MW-11B	12-22	5/18/05	--	--	--	--	--	--	--	--	--	<50	7.0	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		8/17/05	3,200	17	<0.50	<0.50	<1.0	2.9	2.4	1.6	13	<50	6.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<10
		11/1/05	--	--	--	--	--	--	--	--	--	<50	4.4	<0.50	<0.50	<1.0	<0.50	--	--	--	--	--	--	--
		2/20/06	--	--	--	--	--	--	--	--	--	<50	2.4	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		5/16/06	--	--	--	--	--	--	--	--	--	<50	3.3	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		8/30/06	--	--	--	--	--	--	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	--	--	--	--	--	--	--	--
		10/24/06	--	--	--	--	--	--	--	--	--	4,000	4	<0.5	<0.5	<0.5	--	--	--	--	--	--	--	--
		1/30/07	--	--	--	--	--	--	--	--	--	<110	3	<3	<3	<3	--	--	--	--	--	--	--	--
		5/1/07	--	--	--	--	--	--	--	--	--	<50	4.0	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/29/08	7,600	25	21	<0.50	--	1.2	1.2	1.3	<25	<50	4.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		4/28/08	8,400	26	21	0.96	--	1.3	1.2	1.2	25	<50	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
			8,900	24	22	<0.50	<0.50	1.2	1.1	1.1	30	<50	3.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
		7/23/08	6,090	<100	<100	<100	<100	<100	<100	<100	<100	1,460	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
			6,520	<100	<100	<100	<100	<100	<100	<100	<100	1,600	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
			5,760	<100	<100	<100	<100	<100	<100	<100	<100	1,570	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<200	--
		7/30/08	8,000	17	15	<0.50	--	0.78	0.85	0.86	6	<50	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<2.0
		10/28/08	5,000	18	13	<0.50	--	0.86	1	0..94	6.5	<50	3.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/28/09	4,700	18	13	<0.50	--	1.1	1	0.95	<15	<50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
			4,400	12	10	<7.0	--	<7.0	<7.0	<7.0	<7.0	<700	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<7.0	<40
		4/28/09	6,500	17	12	<0.50	--	0.96	1	0.89	<25	<50	3.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
			18	6.9	2	<0.50	--	<0.50	<0.50	<0.50	<0.50	570	14.0	0.60	46.00	0.73	<0.50	<0.50	<0.50	8.3	11	<0.50	1.1	<2.0
		7/28/09	7,300	15	11	<0.50	--	0.83	0.91	0.99	<0.50	<50	2.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
			7,500	17	12	<0.50	--	0.98	1.2	1	<0.51	--	--	--	--	--	--	--	--	--	--	--	--	--
		1/28/10	9,600	16	11	<0.50	--	0.89	1	1	<0.50	<50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<2.0
		7/28/10	9,700	21	14	<0.50	--	1.1	1.3	1.2	12	<50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/27/11	15,000	22	15	<0.50	--	1.0	1.2	1.3	8.6	<50	3.4	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50	<0.50	--	<2.0
		7/27/11	17,000	84	17	<2.5	--	<2.5	<2.5	<2.5	12	<250	3.2	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25
		1/25/12	16,000	180	17	<0.50	--	1.0	1.4	1.5	8.0	<50	3.0	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
			12,000	150	16	<1.5	--	<1.5	<1.5	<1.5	6.4	<150	2.7	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15
		7/17/12	3,400	39	4.2	<0.50	--	<0.50	<0.50	1.1	1.4	<50	0.8	<0.50	<0.50	<0.50	<15	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
		1/23/13	15,000	130	42	<2.5	--	<2.5	<2.5	<2.5	5.6	<250	2.8	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<7.0
		8/5/13	7,900	120	85	<2.5	--	<2.5	<2.5	2.9	3.4	<250	2.8	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<7.0
		1/15/14	8,600	82	51	<2.5	--	<2.5	<2.5	2.8	3.3	<250	3.6	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<7.0
MW-15B	14.5-24.5	7/28/10	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.700	<0.500	<50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
ALLEY BETWEEN D AND E SREETS - B-ZONE GROUNDWATER																								
MW-19BS	13-19	6/20/13	31	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-19BD	25-35	6/20/13	2,500	8.7	3.1	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			2,300	8.4	3.1	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	170	1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			210	0.94	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	1,800	9.9	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			1,800	9.7	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-20BS	12-17	6/20/13	60	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.78	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.0	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-20BD	21-31	6/20/13	16	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	6.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	26	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-28BS	12-22	6/20/13	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-28BD	27-37	6/20/13	5.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	3.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
ALLEY BETWEEN D AND WILLIAM STREETS - B-ZONE GROUNDWATER																								
MW-16B	20-30	7/23/08	24.0	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		9/25/08	30.0	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		12/9/08	43.6	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		4/15/09	47.5	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		6/11/09	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		3/2/11	14.8	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		6/14/11	92.3	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		8/11/11	2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		10/12/11	0.810	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		12/1/11	147	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	--	<1.00	<1.00	<1.00	<1.00	--	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	--
MW-21BD	20-30	6/20/13	1,100	<0.50	1.6	<0.50	<0.50	<0.50	<0.50	0.55	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	590	<0.50	1.5	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	1,100	3.0	1.8	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			1,300	<0.50	2.0	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-22BS	13.5-18.5	6/20/13	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.56	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-22BD	22-32	6/20/13	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.89	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.85	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-27BD	22-32	6/20/13	0.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	0.51	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
WILLIAMS STREET B-ZONE GROUNDWATER																								
MW-12B	13-28	10/11/07	443	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	97	<2.50	<2.50	<2.50	<2.50	--	<2.50	<2.50	<2.50	<2.50	<2.50	<5.00	--
		8/7/08	362	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	--	--	--	--	--	--	--	--	--	--	--	--
		9/25/08	624	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		12/9/08	501	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		4/15/09	320	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--
			639	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		5/13/09	13.6	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		6/11/09	203	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	--	<1.00	<1.00	<1.00	<1.00	--	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	--
			150	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		7/17/09	1.72	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	--	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		10/22/09	88.3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	--	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.000	--
		6/15/10	5.65	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	--	--	--	--	--	--	--	--	--	--	--	--
		9/27/10	489	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--	<2.50	<2.50	<2.50	<2.50	<2.50	<5.00	--
		10/13/10	402	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<4.00	--
		3/2/11	441	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
			488	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	--	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<5.00	--
		4/4/11	421	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	--	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<4.00	--
		4/5/11	568	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		5/3/11	421	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<10.0	--
		6/14/11	84.3	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		7/21/11	293	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		8/11/11	295	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	--	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<4.00	--
		9/1/11	589	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<10.0	--
		9/16/11	497	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	--	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	--
		9/29/11	764	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<10.0	--
		10/12/11	523	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	--	<5.00	<5.00	<5.00	<5.00	<5.00	<10.0	--
		10/25/11	2.25	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		12/1/11	5.09	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
			5.10	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
MW-18BS	10-15	6/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	0.64	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-18BD	20-30	6/20/13	45	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/6/13	60	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/16/14	12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
LOWELL STREET/ALLEY B-ZONE GROUNDWATER																								
MW-17B	20-30	7/24/08	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
			<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		9/25/08	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		12/9/08	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		4/15/09	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		6/11/09	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		3/2/11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		6/14/11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		8/11/11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		10/12/11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--
		12/1/11	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500	<0.500	<0.500	<0.500	<1.00	--

TABLE 3-6
SUMMARY OF GROUNDWATER MONITORING WELL ANALYTICAL RESULTS
E and Grotto Streets Plumes
Eureka, California

Sample ID	Screen Interval (ft)	Date	CVOCs									Petroleum Hydrocarbons												
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	CE	TCA	1,1-DCE	TCM	TCTFA	TPHg	Benzene	Toluene	Ethyl benzene	Xylenes	MTBE	TMB	Butyl benzene	n-Propyl benzene	Isopropyl-benzene	4-Isopropyl-toluene	Naph-thalene	Acetone
			(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
MW-23BD	22-32	6/20/13	11.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	3.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/15/14	9.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-24BD	20-30	6/20/13	7.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	19	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/15/14	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
MW-26BD	18-28	6/20/13	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		8/5/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.0	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--
		1/15/14	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	--	--	<0.50	<0.50	<0.50	<0.50	--	--	--	--	--	--	--	--

Notes:

CVOCs: Chlorinated Volatile Organic Compounds
PCE: Tetrachloroethene
TCE: Trichloroethene
DCE: Dichloroethene
TCA: 1,1,1-Trichloroethane
TCM: Trichloromethane
TCTFA: Trichlorotrifluoroethane
TPHg: Total petroleum hydrocarbons as gasoline
MTBE: Methyl Tertiary Butyl Ether
TMB: Sum of 1,3,5 - trimethylbenzene and 1,2,4 - trimethylbenzene
Butyl-benzene: Sum of n-Butylbenzene, sec-Butylbenzene, and tert-Butylbenzene
µg/l: micrograms per liter
<1.0: Less than the laboratory-reporting limit of 1.0
--: Not analyzed/ not sampled

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
FEDERAL								
I. Contaminant Specific								
	A.		Clean Air Act (CAA) (42 USC 7401-7642) (40 CFR 50-69)	Remediation of soil or groundwater that would produce a vapor discharge would be required to meet Nat'l Ambient Air Quality Standards (NAAQS)	**X**	**X**	**X**	
	B.		Clean Water Act (CWA) as amended by the Water Quality Act of 1987 (33 USC 1251-1376) (40 CFR 100-149)	Storm run off water, extracted groundwater, or soil remediation process water from the site discharged to a surface water body (including discharge to a storm drain or flood channel) would require attainment of Water Quality Criteria.	**X**	**X**	**X**	
		1	Maximum Contaminant Levels (MCLs)	MCLs may be used to establish water remediation standards.		**X**	**X**	
		2	Maximum Contaminant Levels Goal (MCLGs)	Some COCs present in groundwater may not yet be formally regulated and MCLGs may provide guidance for remediation standards.		**X**		**X**
		3	Secondary Maximum Contaminant Levels (SMCLs) (40 CFR 143.3)	The aquifer is a potential drinking water source, then quality of color or odor of the water source should be considered.				**X**
II. Location Specific								
	A.		Resource Conservation and Recovery Act (RCRA) as amended by Hazardous and Solid Waste Amendments (HSWA) (42 USC 7401-7462) (40 CFR 260-280)	The treatment facility for remediation of soil or groundwater (if the soil or groundwater is considered to be a hazardous waste) may be required to be a certain minimum distance from a fault.	**X**	**X**	**X**	
	B.		Executive Order on Flood Plain Management (Exec. Order No. 11,988) (40CFR 6.302 and Appendix A)	Remedial Actions occurring in a floodplain should avoid adverse effects minimize potential harm, restore and preserve natural and beneficial values. Fed. agencies are directed to ensure that planning programs reflect consideration of floodplain managemen	**X**	**X**	**X**	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
	C.		National Archaeological and Historical Preservation Act (16 USC 469) (36 CFR Part 65)	Requirements to take action to recover and preserve artifacts if removal action threatens significant scientific, prehistoric, historic, archeological data. No known historic artifacts are present.	X	X	X	
	D.		National Historic Preservation Act (NHPA) (16 USC 470 et seq.) (36 CFR Part 800)	see above	X	X	X	
	E.		Endangered Species Act (16 USC 1531 et seq.) (50 CFR Part 17, 200, 402) (40 CFR 6.302(h))	Remedial actions should avoid disturbance of terrain which is habitat for endangered species. No known endangered species are present at this site.	X	X	X	
	F.		Fish and Wildlife Coordination Act (16 USC 661et seq.) (33 CFR Parts 320-330)	Designed to protect waters where fish, plant life, or bird life exist. Water discharge from any potential site soil or groundwater remediation is not expected to enter surface waters.	X	X	X	
	G.		Clean Water Act (CWA) (33 USC 1251-1376) (40 CFR Part 6, Appendix A)	Designed to protect wetlands and the drainage areas which feed wetlands. Water discharge from any potential site soil or groundwater remediation would not be expected to enter any wetlands.	X	X		X
III. Action Specific								
	A.		Resource Conservation and Recovery Act (RCRA) as amended by Hazardous and Solid Waste Amendments (HAWS) (42 USC 7401-7642)(40 CFR 260-280)	Soil which may be considered hazardous waste, may be accumulated, stored, transported, or disposed.	X		X	
	B.		Clean Water Act (CWA) (33 USC 1251-1376)					
		1	National Pollutant Discharge Elimination System (NPDES) (40 CFR 122-125)	Treated groundwater may require on-site or off-site disposal.		X	X	
		2	Water Quality Standards [CWA 402 (a)(1)]	Remediation of groundwater may require treatment to promulgated water quality standards.		X	X	
		3	Discharge to Publicly Owned Treatment Works (POTWs) (CWA 307)	Treated groundwater could potentially be disposed to the sanitary sewer.		X	X	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
		4	Storm Water Discharge Requirements [CWA 402(p)]	Groundwater or soil remedial action should ensure storm water discharge at the site it is in compliance.	**X**	**X**	**X**	
	C.		Clean Air Act (CAA)(42 USC 7401-7642)(40 CFR 60.50-60.54)	Remedial alternatives for soil or groundwater may produce a vapor effluent stream or dusts.	**X**	**X**	**X**	
	D.		Occupational Safety and Health Act (OHSA)(29 USC 651 et seq.) (19 CFR 1910)	Remedial action operations for soil and groundwater remediation are subject to protection of workers.	**X**	**X**	**X**	
	E.		Noise Control Act of 1972 as amended by the Quiet Communities Act of 1978 (CFR 204, 205, 211)	Construction, transportation, and treatment equipment may increase noise levels at property boundaries.	**X**	**X**		**X**
STATE AND LOCAL								
I. Contaminant Specific								
	A.		Hazardous Waste Control Act (HWCA) (Health and Safety Code [H&SC] Section 25100-25395) as administered by the CA Department of Toxic Substance Control (DTSC) under the CA Code of Standards for Management of Hazardous and Extremely Hazardous Wastes.	Groundwater or soil that may be considered to be hazardous waste, may be treated, stored, transported, and/or disposed.	**X**	**X**	**X**	
		1	Criteria for identifying Hazardous Wastes (22 66261.1-66262.7)	Establishes criteria for identifying hazardous wastes.	**X**	**X**	**X**	
		a)	Persistent and Bioaccumulative Toxic Substances (22 **S** 66262.7)	Regulatory levels have been set for compounds of concern identified at the sites.	**X**	**X**	**X**	
	B.		Porter-Cologne Water Quality Control Act, Water Code (WC) (13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) under CCR Title 23, Section 2200 to 2714	Treated groundwater may be discharged to a surface water source or to an injection well.		**X**	**X**	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
	C.		Water Quality Control Plan for the North Coast Region, May 2011	Designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater and implementation of programs achieve water quality objectives.		X	X	
		1	North Coast RWQCB	Cleanup Standards included in Order No. R1-2003-088 and Draft Cleanup Order R1-2009-021	X	X	X	
II. Location Specific								
	A.		Fish and Game Code Division 6, Part 1, Chapter 2, Sections 5650-5656	If treated groundwater or processed water from soil remediation is discharged to a surface water source or a storm drain, the discharged water should contain no deleterious compounds that will affect fish, plant, or bird life.	X	X	X	
	B.		SWRCB Resolution No. 68-16 Statement of Policy with Respect to Maintaining High Quality of Waters in California	Granting permits for inappropriate water disposal of wastes into the waters of the State shall be regulated as to achieve and maintain highest water quality to the extent possible.		X		X
	C.		SWRCB Resolution No. 92-49 (As Amended on April 21, 1994 and October 2, 1996) Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304	The SWRCB and the RWQCBs, principal State agencies with primary responsibility for the coordination and control of water quality, shall conform and implement the policies of the Porter-Cologne Water Quality Control Act and shall coordinate their respectiv		X		X
	D.		State Water Resource Control Board (State Water Board) Policy No. 88-63 Sources of Drinking Water (revised by Resolution No. 2006-0008)	All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Water Boards		X	X	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
III Action Specific								
	A.		Hazardous Waste Control Act (HWCA) (Health and Safety Code Section 25100-25395) as administered by the DTSC under CCR Title 22: Standards for Management of Hazardous Wastes.	Site soil or groundwater with COCs may be considered hazardous waste which would require compliance with regulations for accumulation, transportation, treatment, or disposal.	**X**	**X**	**X**	
		1	Identification and Listing of Hazardous wastes (22 CCR Chapter 11, 22 CCR SS 66261.2-66261.126)	Treated soil or groundwater that is identified as hazardous waste would be identified as "listed" or as "characteristic".	**X**	**X**	**X**	
		2	Standards Applicable to Generators of Hazardous Waste (22CCR Chapter 12, 22 CCR SS 66261.1-66262.7)	Offsite disposal requires characterization of waste	**X**	**X**	**X**	
		3	Deed Restrictions (22 CCR Chapter 39; 22 CCR 67390.2)	The property may be restricted from certain future development, if COCs identified on-site, are not addressed.	**X**	**X**	**X**	
		4	Corrective Action Management Units and Temporary Units. (22CCR S 66264.552-S66264.53)	A temporary treatment unit may be set up at the site. Soils pending treatment may be stockpiled at the site.	**X**		**X**	
	B.		Porter-Cologne Water Quality Control Act, Water Code (WC) (13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) under CCR Title 23, S 2050 to S 2836	The North Coast Regional Water Quality Control Board (RWQCB) may require that treatment technology perform at a level near Best Available Technology (BAT) and the RWQCB may establish waste disposal requirements.	**X**	**X**	**X**	
		1	Waste Discharge to Land Requirements (23 CCR Chapter 15, 23, CCR SS 2260-2597)	Remediation projects are exempt, but regulations should be considered and followed to the extent possible.	**X**	**X**		**X**
		2	State Water Resources Control Board Antidegradation Policy (Resolution 68-16)	If treated groundwater is disposed to a water source of the state, then the quality of the water source is to be protected.	**X**	**X**	**X**	
		3	Discharge to Sanitary Sewer	Treated groundwater may be disposed to a sanitary sewer.	**X**	**X**	**X**	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
	C.		California Safe Drinking Water Act (Cal-SDWA) (H&SC SS 4010-4095) (22 CCR 64401-64475)	Treated groundwater may be disposed of to an injection well. The aquifer that the injection well feeds may be a potential drinking source.		X	X	
		1	Maximum Contaminant Levels (MCLs) (22CCR 64435, 64444.5)	MCLs may be used to established the standard for groundwater remediation.		X	X	
		2	Advisory Drinking Water Action Levels (ALs)	Some COCs present in the site groundwater may not yet be formally regulated. Action Levels would provide a non-binding guidance for allowable concentrations.		X		X
		3	Advisory Applied Action Levels	The risk posed to biological receptors by a potential groundwater remediation system must be evaluated.		X		X
	D.		California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) (Health and Safety Code Section 25249.5 et seq.) as implemented under Title 26 CCR Sections 22-12000 et seq.	Some COCs at the site are identified as carcinogens or reproductive toxins	X	X	X	
	E.		California Clean Air Act (Health and Safety Code Sections 39000-44563) as implemented by the local Air Quality Management Districts and overseen by the Air Resources Board under CCR, Title 17, Division 3	Groundwater or soil treatment process may produce a vapor effluent subject to discharge limitations.	X	X	X	
		1	Air Pollution Control District (APCD) Rules and Regulations	Groundwater or soil treatment process may produce a vapor effluent subject to Rules and Regulations of the APCD.	X	X	X	
	F.		California Occupational Health and Safety Act, Labor Code, Sections 6300 et seq.	Remedial actions require appropriate worker protection.	X	X	X	
	G.		California Environmental Quality Act, CCR Title 14, Ch. 3 Section 15064.5 et seq.	Requirements to take action to recover and preserve artifacts if removal action threatens significant scientific, prehistoric, historic, archeological data. No known historic artifacts are present.	X	X	X	

TABLE 5-1
SUMMARY OF ARARS AND TBCS
E and Grotto Streets Plumes
Eureka, California

REQUIREMENT				REASONS	APPLICABLE MEDIA		REQUIREMENT TYPE	
					Soil	Ground-water	ARAR	TBC
	H.		SWRCB Strategic Plan Update 2008-2012	Protect and restore surface water and groundwater quality, promote sustainable water supplies and water quality planning.		X		X
	I.		SWRCB under CCR, Title 27, Division 2	Where necessary to protect water quality, the RWQCB can cite violation of standards promulgated by the SWRCB or of Waste Discharge Requirements (WDRs) in any ensuing enforcement proceeding.	X	X	X	
	J.		Humboldt County Department of Health and Human Services - Division of Environmental Health Title VI, Division 3, Chapter 1	Requirements to construct, repair, and destruct water wells, cathodic protection wells, and monitoring wells to protect the health, safety, and general welfare of the people of the State of California.		X	X	
	K.		City of Eureka Municipal Code 63 Code, Section 7-1.02	States that it is unlawful for any person to excavate in or construct, install, or maintain any improvements, structure, or encroachment in, on, over, or under any city property, tidelands, street or easement without first obtaining a permit from the Director of Public Works.	X	X	X	
	L.		City of Eureka Municipal Code 63 Code, Section 4-5.02	States that it is unlawful for any person to make or continue, or cause to be made or continued, any loud, unnecessary, or unusual noise or any noise which either annoys, disturbs, injures, or endangers the comfort, repose, health, safety, or peace and quiet of any person.	X	X	X	
	M.		SWRCB Resolution No. 2012-0062 Directing Additional Actions to Improve the Underground Storage Tank Cleanup Program	Approves the plan for implementation of Low-Threat Underground Storage Tank Case Closure Policy and additional program improvements.	X	X		X
	N.		SWRCB Low-Threat Underground Storage Tank Case Closure Policy	Establishes consistent statewide case closure criteria for low-threat pretroleum UST sites	X	X		X

TABLE 5-2
SUMMARY OF PRELIMINARY REMEDIAL GOALS
E and Grotto Streets Plumes
Eureka, California

Chemicals of Concern	PRG			
	Soil	Soil Gas - Residential	Soil Gas - Commercial	Groundwater
TPH	(mg/kg)	(µg/m^3)	(µg/m^3)	(µg/l)
TPHg	45	--	--	5
TPHmo	90	--	--	100
VOCs	(mg/kg)	(µg/m^3)	(µg/m^3)	(µg/l)
PCE	0.054	205	2,080	<0.5
TCE	0.072	--	7,000	0.8
DCE	5.4	--	31,000	6
TCM	0.23	--	530	<0.5
Benzene	0.09	--	420	<0.5
Toluene	0.36	--	1.3.E+06	40

Notes:

mg/kg: milligrams per kilogram
µg/m^3: micrograms per cubic meter
µg/l: micrograms per liter
-- Not available or not applicable
PRG: Lower of Health Based and Groundwater Protection

TABLE 6-1
SUMMARY OF REMEDIAL ALTERNATIVE COMPONENTS
E and Grotto Streets Plumes
Eureka, California

General Response Action			Remedial Action Alternatives				
			1	2	3	4	5
Medium	Technology	Area/Contaminant	No Action	Excavation w/ Off-Site Disposal w/ ICs & MNA w/Sewer Replacement	ISCF w/ ICs & MNA w/Sewer Sliplining	ERH w/ICs & MNA w/Sewer Grouting	GWET w/ ICs & MNA w/Sewer Pipe Bursting
E Street	No Action	Entire property	m				
	Institutional Controls	Entire property		m	m	m	m
A-Zone Groundwater	Excavation - Treat/Dispose	CVOCs		m			
	ISCF	CVOCs			m		
	GWET	CVOCs					m
	ERH	CVOCs				m	
	MNA	CVOCs		m	m	m	m
A/B Aquitard	No Action	DNAPL	m				
	Excavation - Treat/Dispose	DNAPL		m			
	GWET	DNAPL					m
	ERH	DNAPL				m	
	ISCF	DNAPL			m		
Sewer Main	No Action	Joints/defects	m				
	Replacement	Joints/defects		m			
	Sliplining	Joints/defects			m		
	Grouting	Joints/defects				m	
	Pipe Bursting	Joints/defects					m

TABLE 7-1
SUMMARY OF REMEDIAL ACTION ALTERNATIVES EVALUATION
E and Grotto Streets Plumes
Eureka, California

Alternative		Compliance with ARARs	Overall Protection of Human Health & Environment	Long-Term Effectiveness	Reduction in Mobility and Waste Volume	Short-Term Effectiveness	Implementable	Cost
1	No Action	**No** - Cleanup goals in Order not likely to be met within a reasonable time.	**No** - Human health will not be protected until natural attenuation processes eventually improve soil and groundwater quality without the use of institutional controls.	**No** - soil and groundwater quality will improve at the rate of natural attenuation.	**No** - Volume and mobility of COCs will reduce only at the rate of natural attenuation.	**No** - does not protect human health.	**Yes** - No equipment or labor required.	$100,000
2	Excavation with off-Site Disposal with ICs & MNA with Sewer Replacement	**Yes** - Soil cleanup goals will be met through excavation and off-Site disposal, and groundwater cleanup goals met through removal of saturated zone contaminants and MNA; or alternative cleanup goals are allowed.	**Yes** - LUCs will control potential use of shallow groundwater for drinking water until cleanup goals are reached.	**Yes** - Soil and groundwater will improve through source removal in the short-term, and in the long-term through natural attenuation.	**Yes** - Volume and mobility of COCs will be reduced following source removal; and then natural attenuation processes will also reduce volume of contaminants, but at a slower rate.	**Yes** - Source removal effective in short-term; COCs in groundwater should be reduced following source removal and LUCs will control exposure until cleanup goals are met.	**Yes** - Methodology has been employed elsewhere with success.	$3,622,000
3	ISCF with ICs & MNA with Sewer Sliplining	**Yes** - Soil and groundwater clean up goals will be met through ISCF and MNA.	**Yes** -LUCs will control exposure to shallow groundwater for drinking water until cleanup goals are met.	**Yes** - ISCF should be effective in addressing COCs in groundwater.	**Yes** - ISCF will reduce mass of COCs. Mobility of COCs will be reduced following ISCF treatment.	**Yes** - ISCF would remove source material; groundwater quality should improve following ISCF treatment; LUCs would limit exposure to shallow groundwater.	**Yes** - Methodology has been employed at the Site and elsewhere with success.	$3,672,000

TABLE 7-1
SUMMARY OF REMEDIAL ACTION ALTERNATIVES EVALUATION
E and Grotto Streets Plumes
Eureka, California

Alternative		Compliance with ARARs	Overall Protection of Human Health & Environment	Long-Term Effectiveness	Reduction in Mobility and Waste Volume	Short-Term Effectiveness	Implementable	Cost
4	ERH with ICs & MNA with Sewer Grouting	**Yes** - Soil and groundwater cleanup goals will be met through treatment with ERH and MNA.	**Yes** - LUCs control exposure to shallow groundwater for drinking water until cleanup goals are met.	**Yes** - Soil and groundwater will improve in the long-term following ERH treatment.	**Yes** - ERH will remove mass of COCs and hence limit mobility.	**Yes** - Source treatment effective in removing source material; COCs in groundwater should further reduce at the rate of natural attenuation following treatment and LUCs will control exposure until cleanup goals are met.	**Yes** - Methodology has been employed elsewhere with success.	$2,705,000
5	Groundwater extraction and treatment (GWET) w/ ICs & MNA with Sewer Pipe Bursting	**Yes** - LUCs will control exposure to COCs, however, concentrations of COCs in groundwater will likely not reach cleanup goals within a reasonable time.	**Yes** - LUCs will control exposure to shallow groundwater for drinking water	**Partial** - Groundwater quality should improve in the long-term following GWET, but may not achieve cleanup goals.	**Yes** - Volume of COCs will be reduced, but likely not significantly; mobility of COCs in groundwater will be controlled by groundwater extraction and treatment.	**Partial** - Groundwater quality will not improve in the short-term during GWET. LUCs would limit exposure to shallow groundwater.	**Yes** - Methodologies have been employed elsewhere, but with limited success in reaching cleanup goals.	$4,524,000

FIGURES

Figure 1-1	SITE LOCATION MAP	WEST Environmental Services & Technology
March 2015	E and Grotto Streets • Eureka, California	

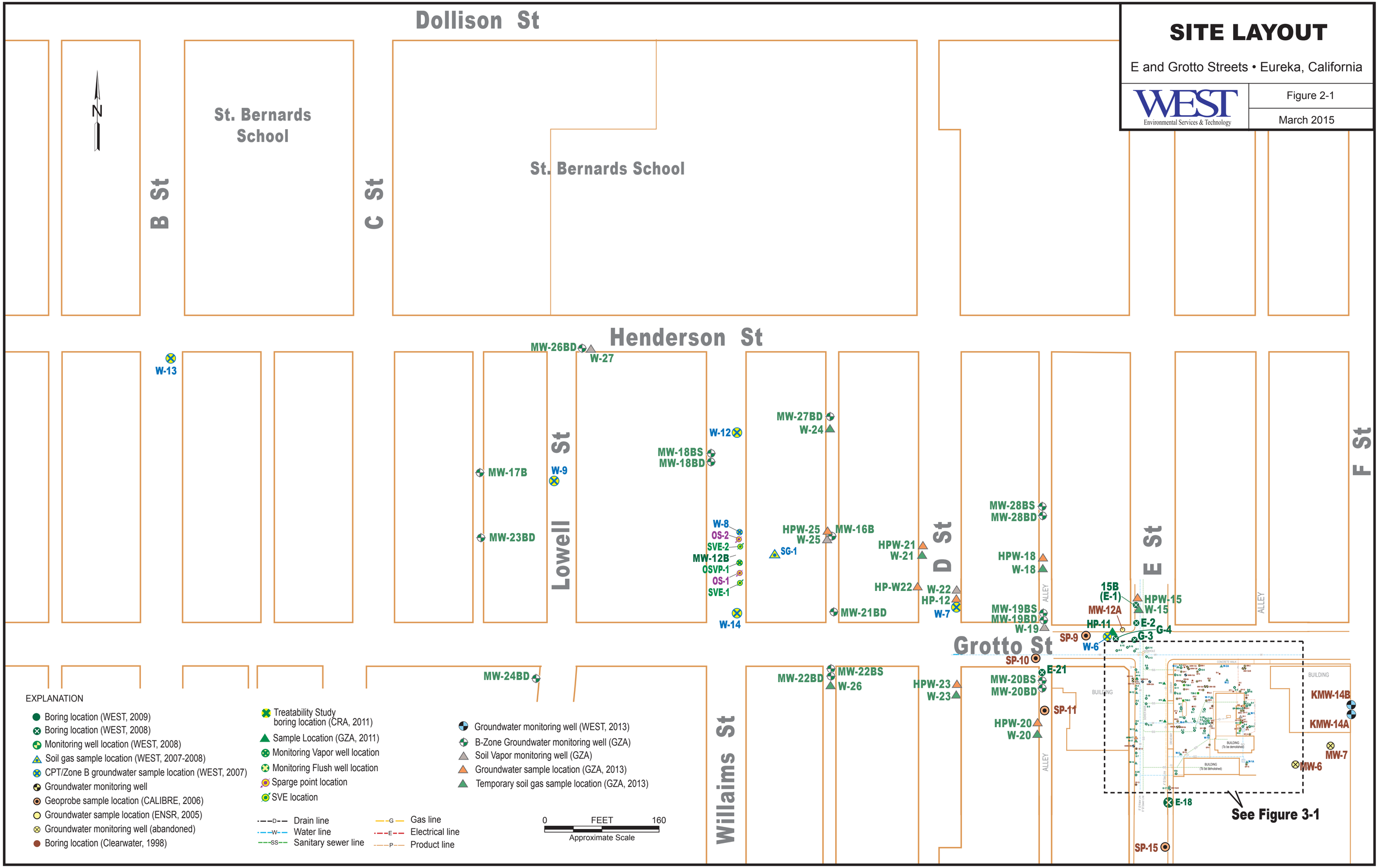
SITE LAYOUT

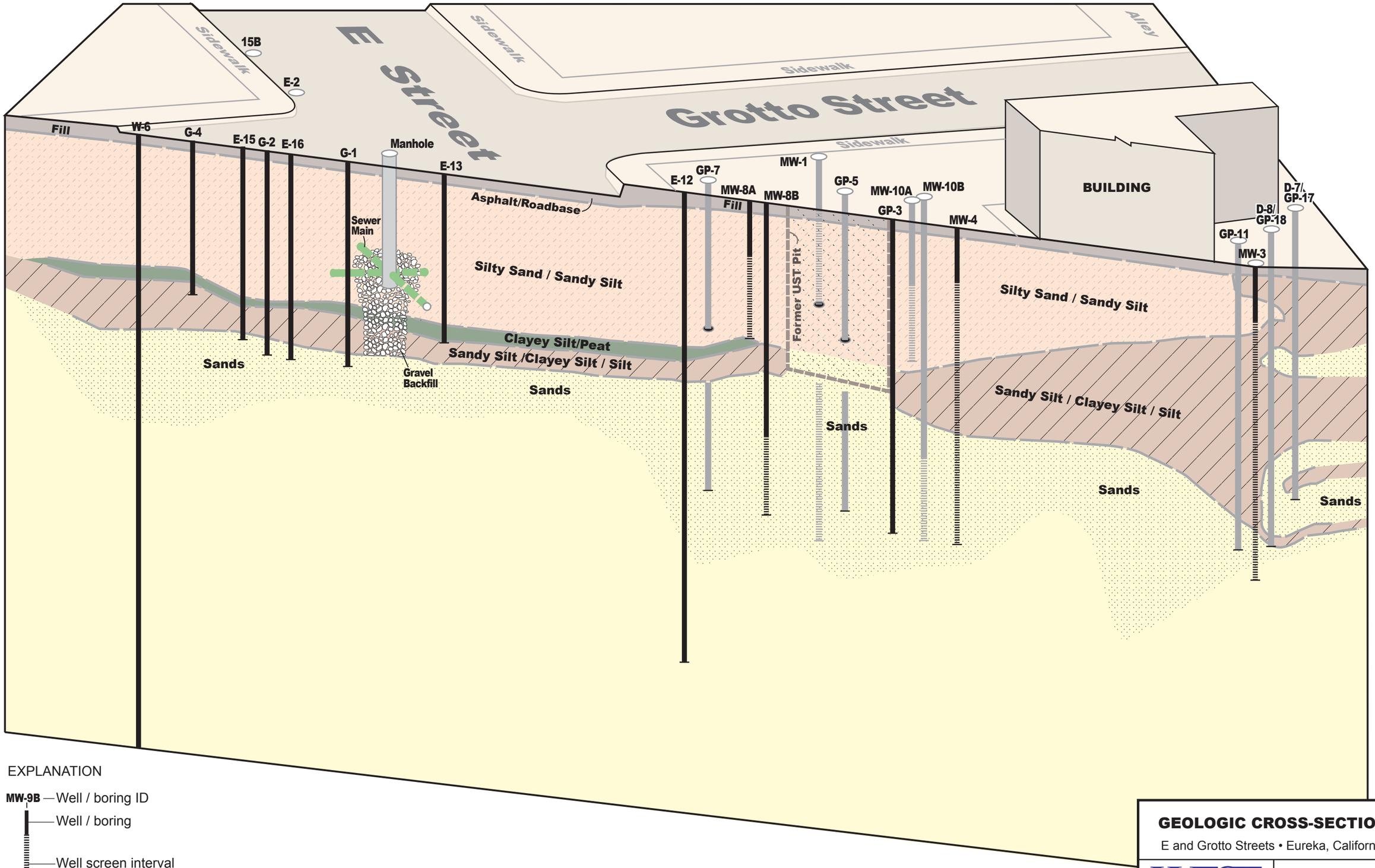
E and Grotto Streets • Eureka, California

WEST Environmental Services & Technology

Figure 2-1

March 2015





GEOLOGIC CROSS-SECTION

E and Grotto Streets • Eureka, California

WEST Environmental Services & Technology

Figure 2-2

March 2015

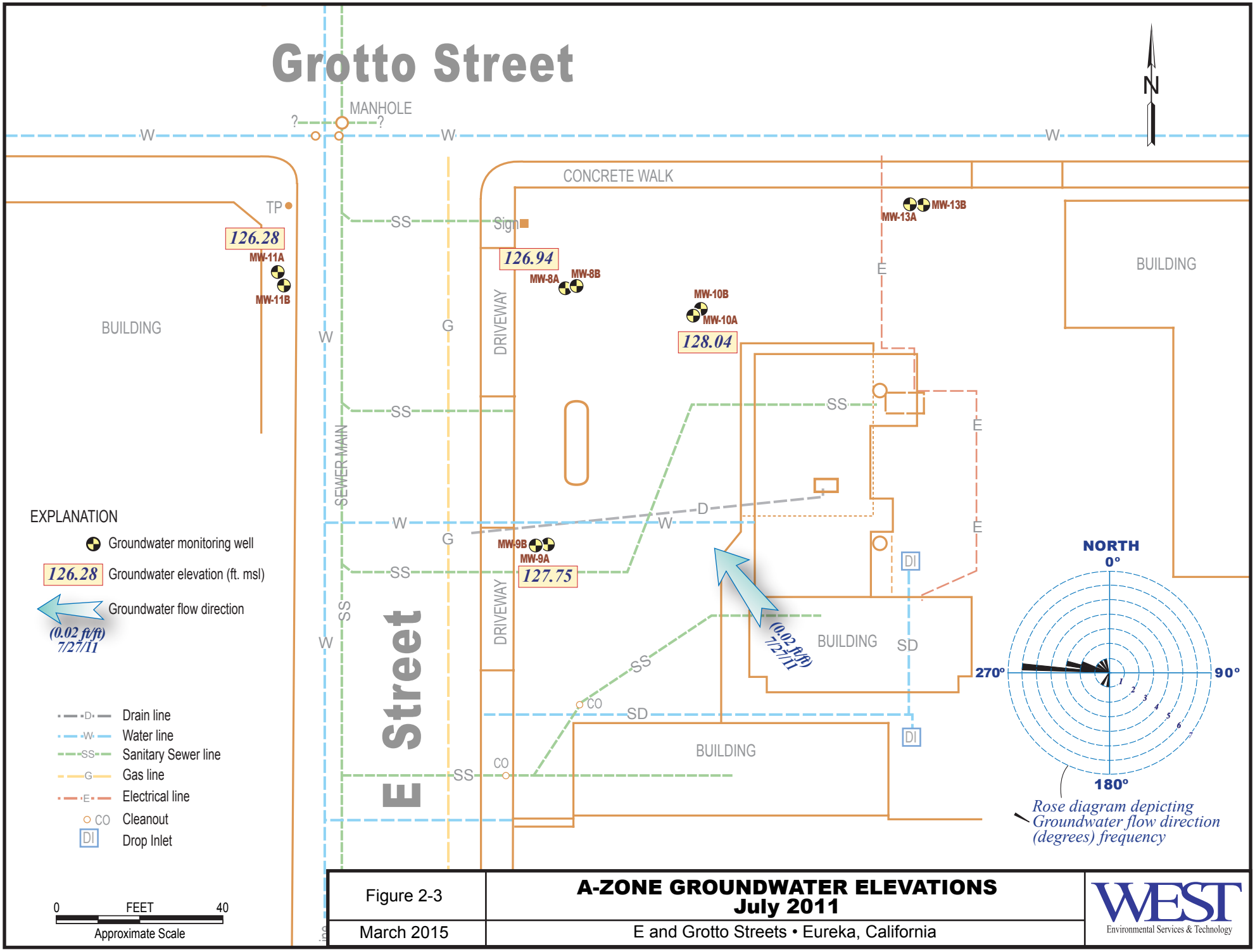


Figure 2-3

March 2015

A-ZONE GROUNDWATER ELEVATIONS
July 2011

E and Grotto Streets • Eureka, California

WEST
Environmental Services & Technology

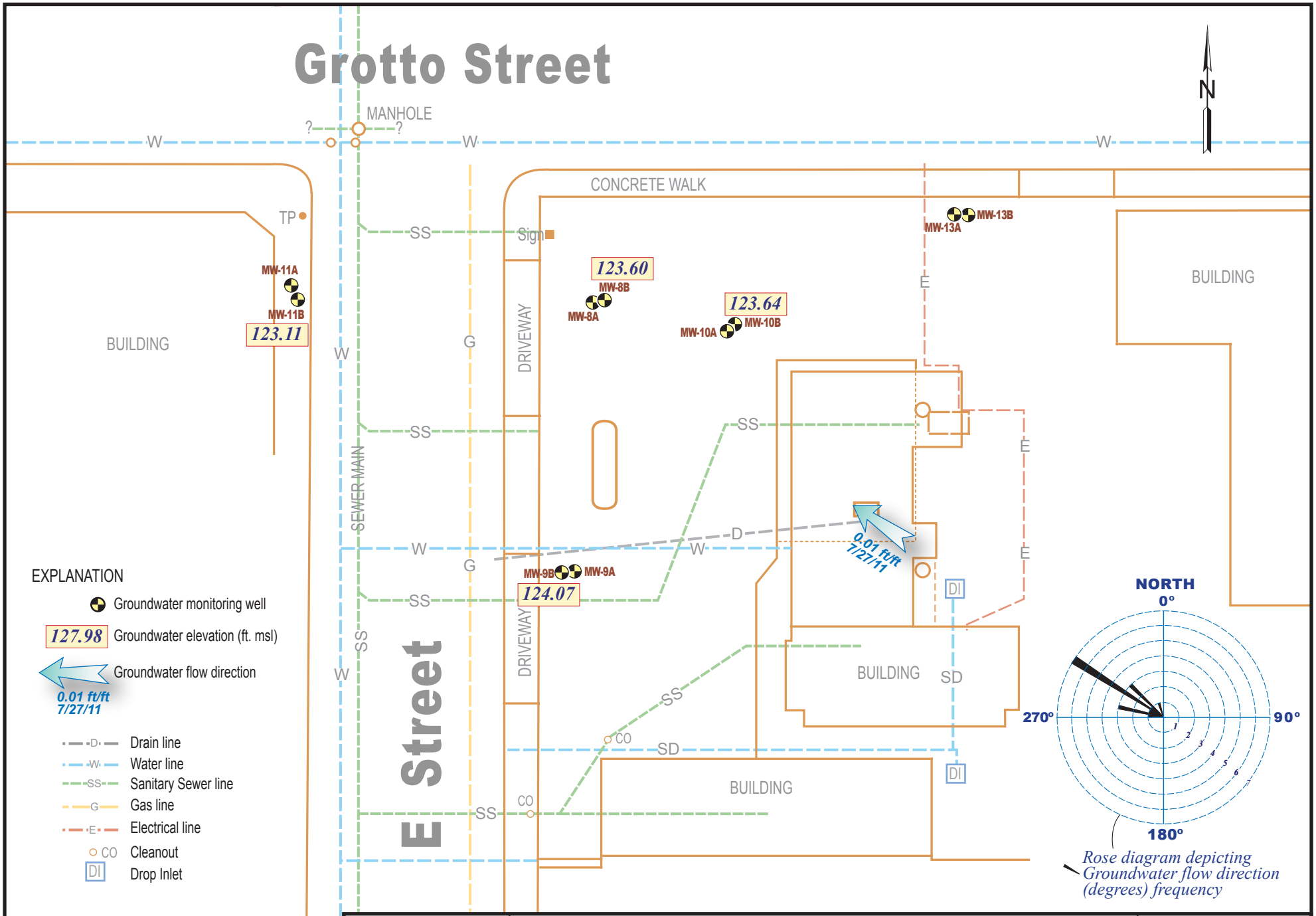


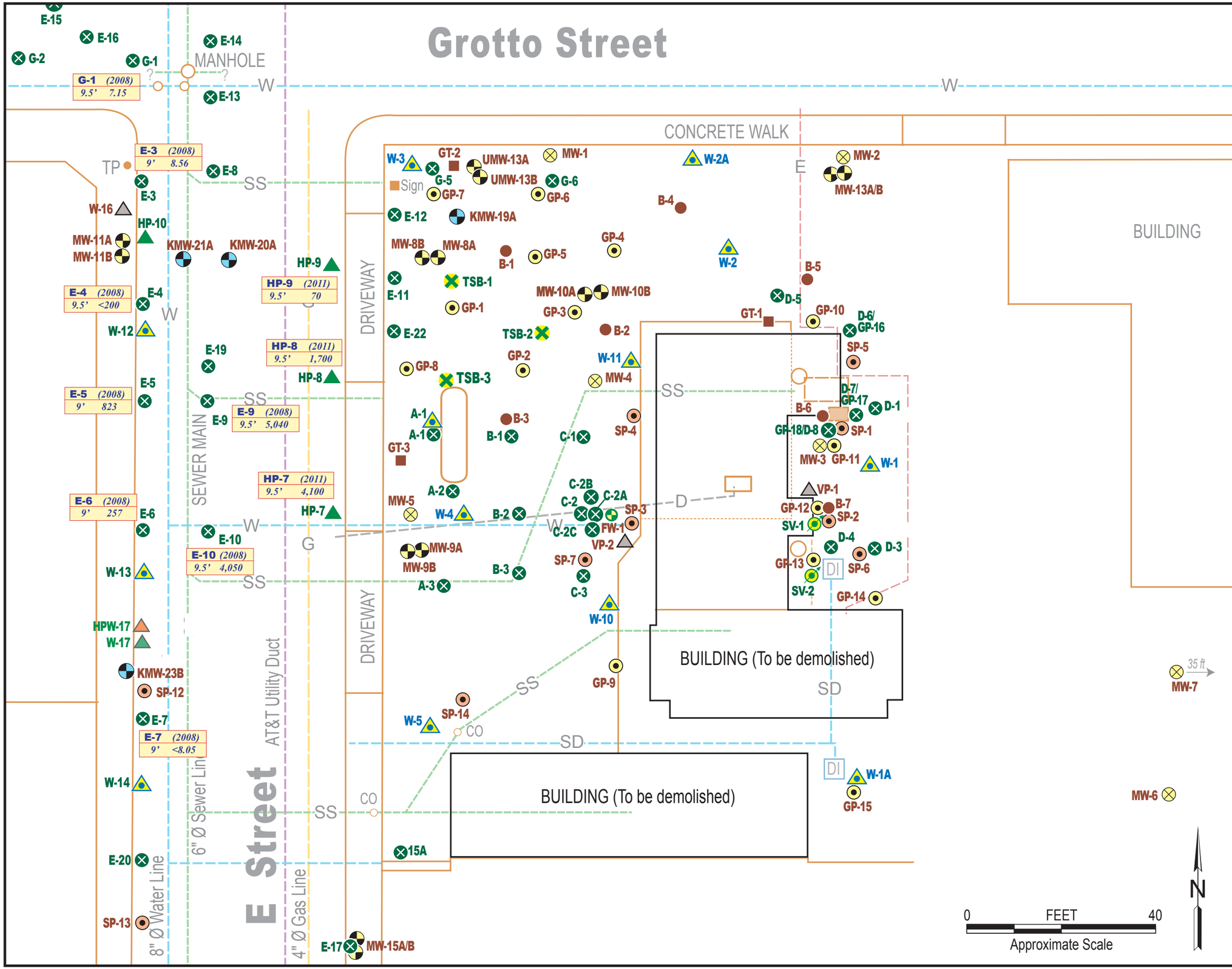
Figure 2-4

March 2015

B-ZONE GROUNDWATER ELEVATIONS
July 2011

E and Grotto Streets • Eureka, California

WEST
Environmental Services & Technology



EXPLANATION

- Groundwater monitoring well (WEST, 2013)
- Groundwater monitoring well
- Soil Vapor monitoring well (GZA)
- Groundwater sample location (GZA, 2013)
- B-Zone Groundwater monitoring well (GZA)
- Temporary soil gas sample location (GZA, 2013)
- Treatability Study boring location (CRA, 2011)
- Sample location (GZA, 2011)
- Boring location (WEST, 2008)
- Monitoring Vapor/Flushing well (WEST, 2008)
- Soil gas sample location (WEST, 2007-2008)
- Geoprobe sample location (CALIBRE, 2006)
- CPT/Zone B groundwater sample location (WEST, 2007)
- Groundwater sample location (ENSR, 2005)
- Groundwater monitoring well (abandoned)
- Boring location (Clearwater, 1998)
- Geotechnical boring location (ENSR, 2008)
- Geoprobe sample location (ENSR, 2008)
- Soil Vapor Extraction well (WEST, 2008)
- Drain line
- Water line
- Sanitary Sewer line
- Gas line
- Electrical line
- AT&T Utility Duct
- CO Cleanout
- DI Drop Inlet

E-9 (2008) 9.5' 5,040 — Tetrachloroethene (PCE) in micrograms per kilograms (µg/kg) detected, sample depth in feet below grade surface, and year sample collected

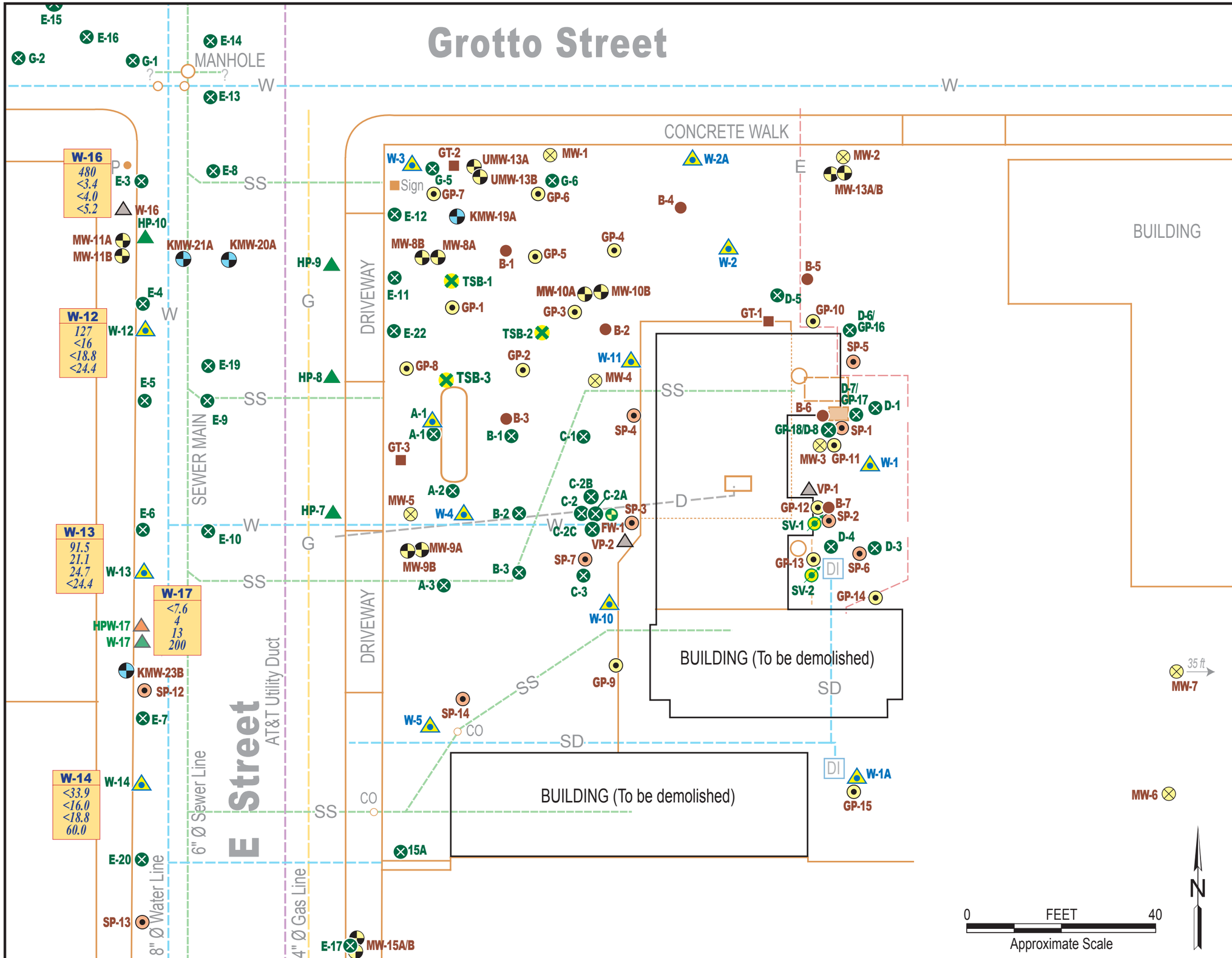
PCE CONCENTRATIONS IN SOIL ALONG E STREET

E Street • Eureka, California

WEST Environmental Services & Technology

Figure 3-1

March 2015



EXPLANATION

- Groundwater monitoring well (WEST, 2013)
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- Soil Vapor monitoring well (GZA)
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- Treatability Study boring location (CRA, 2011)
- Sample location (GZA, 2011)
- Boring location (WEST, 2008)
- Monitoring Vapor/Flushing well (WEST, 2008)
- Soil gas sample location (WEST, 2007-2008)
- Geoprobe sample location (CALIBRE, 2006)
- CPT/Zone B groundwater sample location (WEST, 2007)
- Groundwater sample location (ENSR, 2005)
- Groundwater monitoring well (abandoned)
- Boring location (Clearwater, 1998)
- Geotechnical boring location (ENSR, 2008)
- Geoprobe sample location (ENSR, 2008)
- Soil Vapor Extraction well (WEST, 2008)
- D — Drain line
- W — Water line
- SS — Sanitary Sewer line
- G — Gas line
- E — Electrical line
- AT&T Utility Duct
- CO Cleanout
- DI Drop Inlet

W-17	Sample ID
<7.6	PCE
4	Benzene
13	Toluene
200	TCM

Maximum tetrachloroethene (PCE), Benzene, Toluene and TCM detected.

Results in ($\mu g/m^3$)

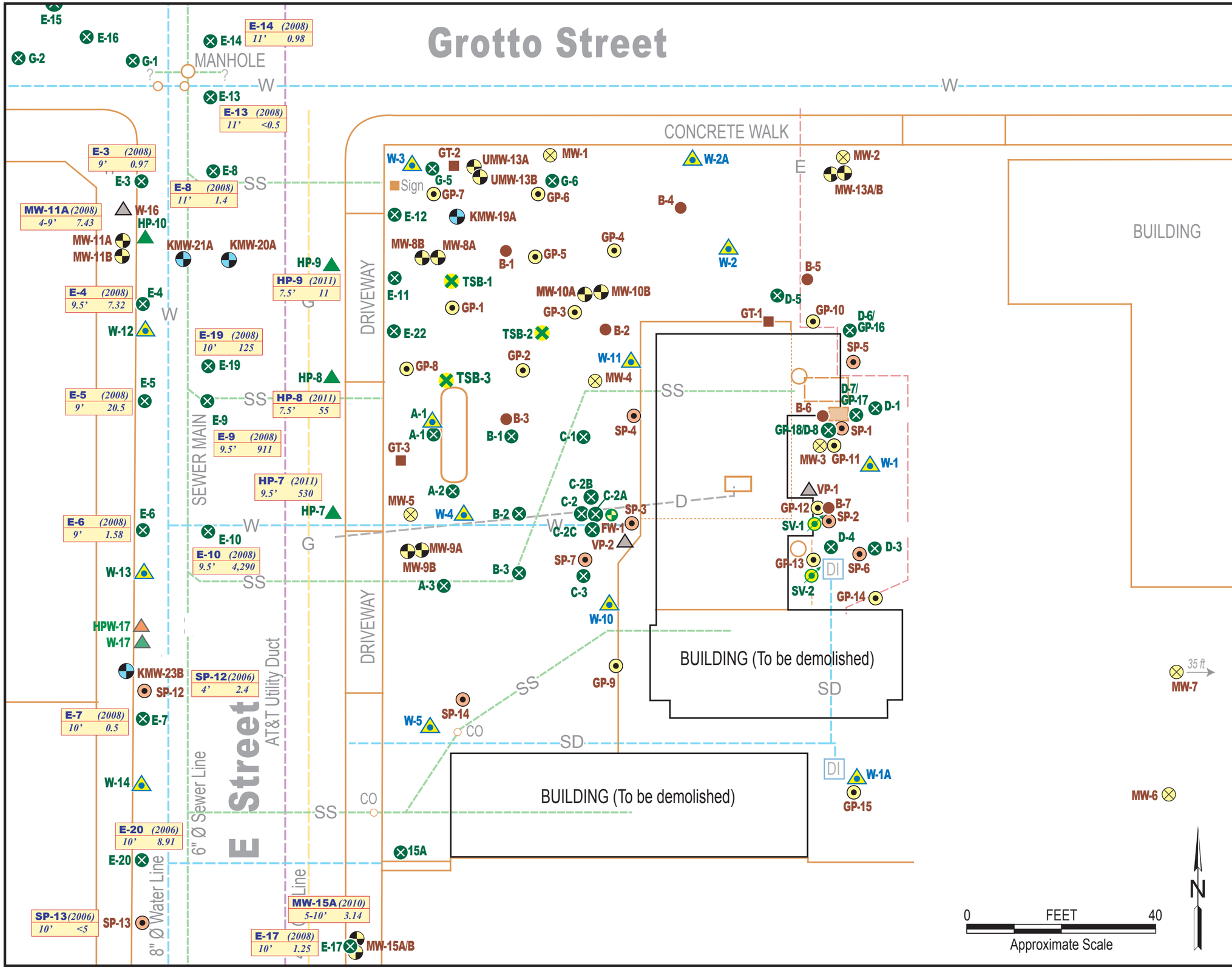
PCE CONCENTRATIONS IN SOIL GAS ALONG E STREET

E Street • Eureka, California

WEST Environmental Services & Technology

Figure 3-2

March 2015



EXPLANATION

- Groundwater monitoring well (WEST, 2013)
- Groundwater monitoring well
- Soil Vapor monitoring well (GZA)
- Groundwater sample location (GZA, 2013)
- B-Zone Groundwater monitoring well (GZA)
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- Geoprobe sample location (CALIBRE, 2006)
- CPT/Zone B groundwater sample location (WEST, 2007)
- Groundwater sample location (ENSR, 2005)
- Groundwater monitoring well (abandoned)
- Boring location (Clearwater, 1998)
- Geotechnical boring location (ENSR, 2008)
- Geoprobe sample location (ENSR, 2008)
- Soil Vapor Extraction well (WEST, 2008)
- D — Drain line
- W — Water line
- SS — Sanitary Sewer line
- G — Gas line
- E — Electrical line
- AT&T Utility Duct
- CO Cleanout
- DI Drop Inlet

E-19 (2008) 10' 125 — Maximum tetrachloroethene (PCE) in micrograms per liter (µg/L) detected, sample depth in feet below grade surface, and year sample collected

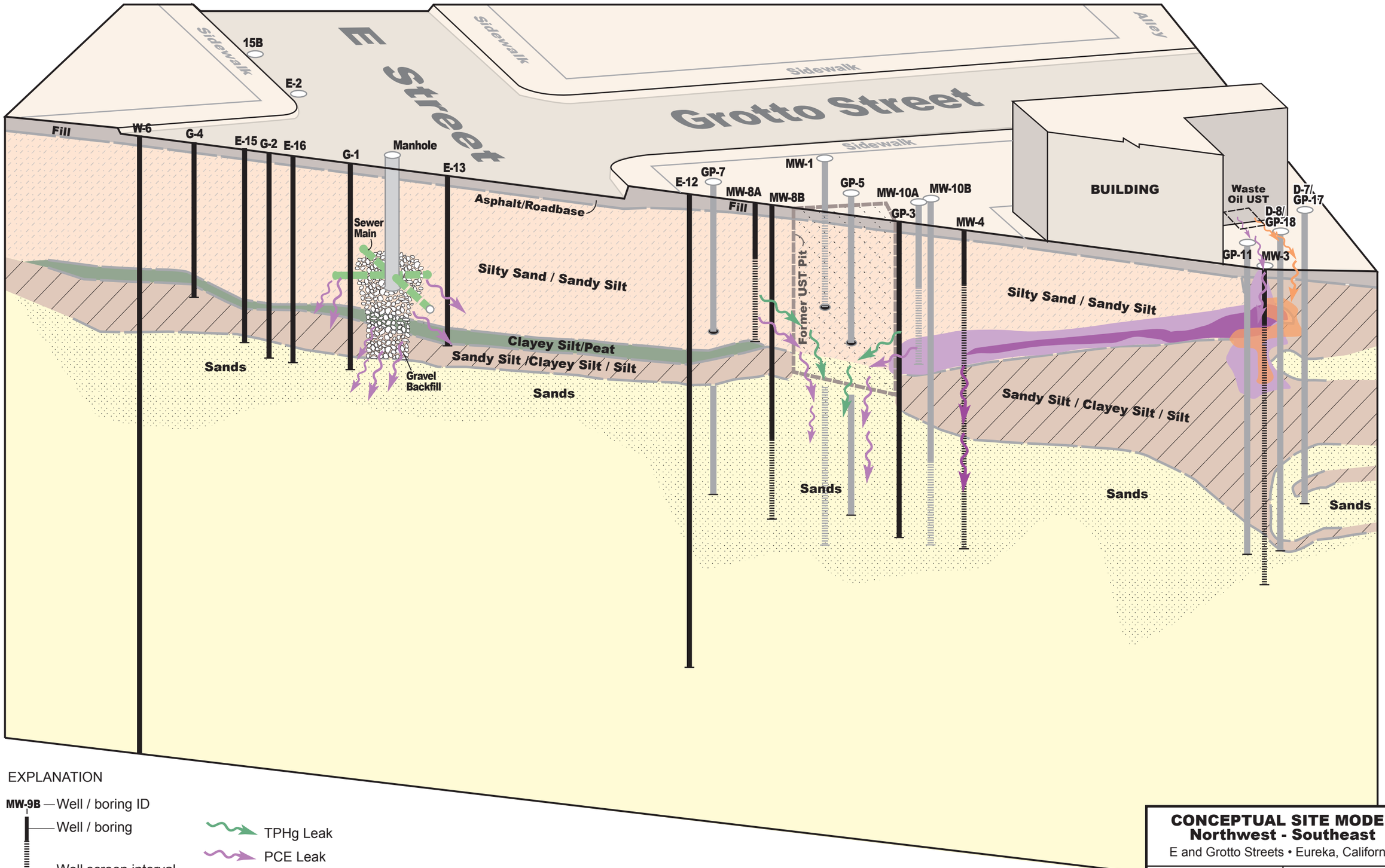
PCE CONCENTRATIONS IN GROUNDWATER ALONG E STREET

E Street • Eureka, California

WEST Environmental Services & Technology

Figure 3-3

March 2015

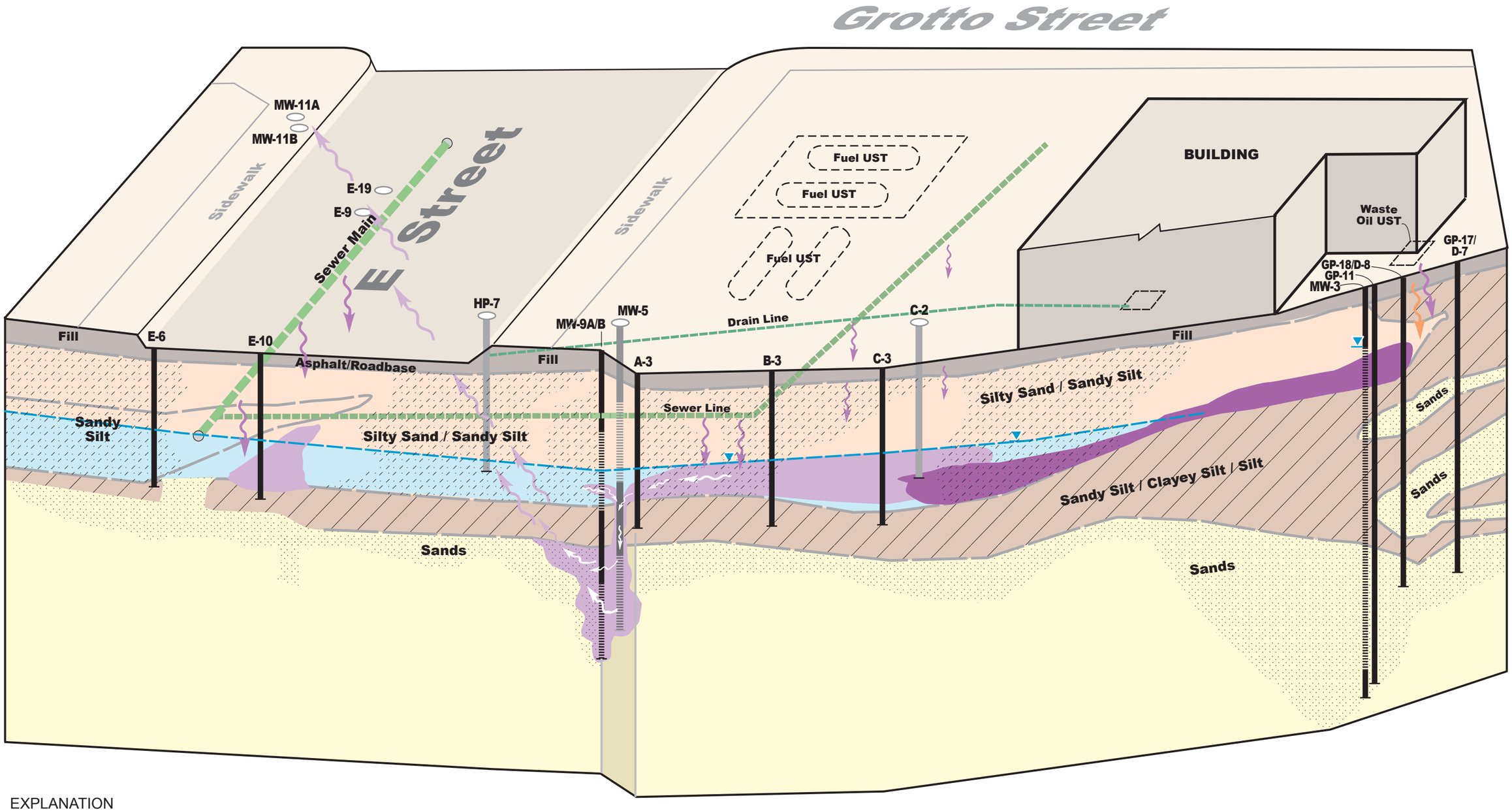


CONCEPTUAL SITE MODEL
Northwest - Southeast
E and Grotto Streets • Eureka, California

WEST Environmental Services & Technology

Figure 4-1

March 2015



EXPLANATION

MW-9B — Well / boring ID

Well / boring

Water level

Well screen interval

Leak from sewer

Leak from waste oil UST

Drawing not to scale

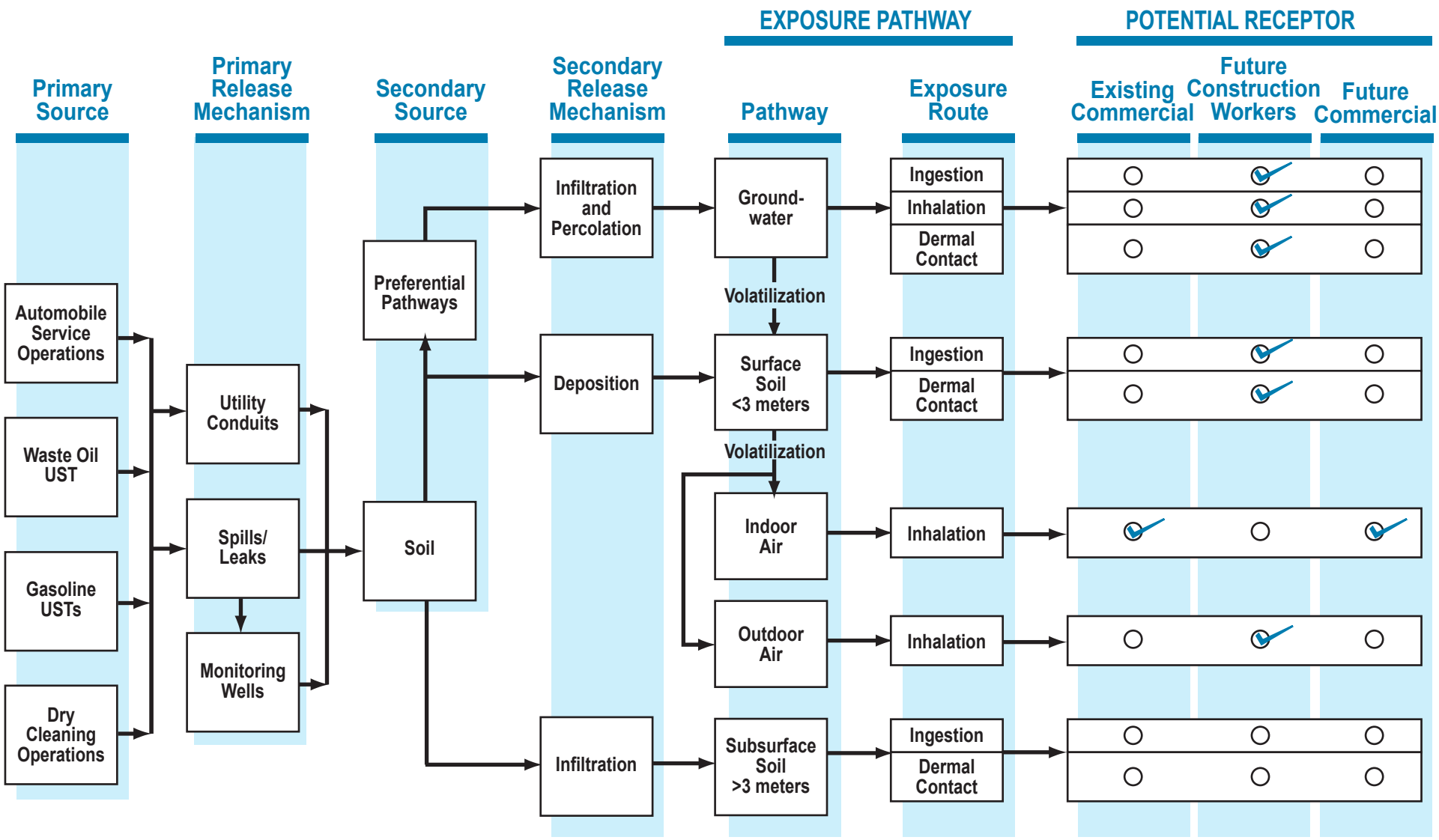
CONCEPTUAL SITE MODEL
East - West

E and Grotto Streets • Eureka, California

WEST Environmental Services & Technology

Figure 4-2

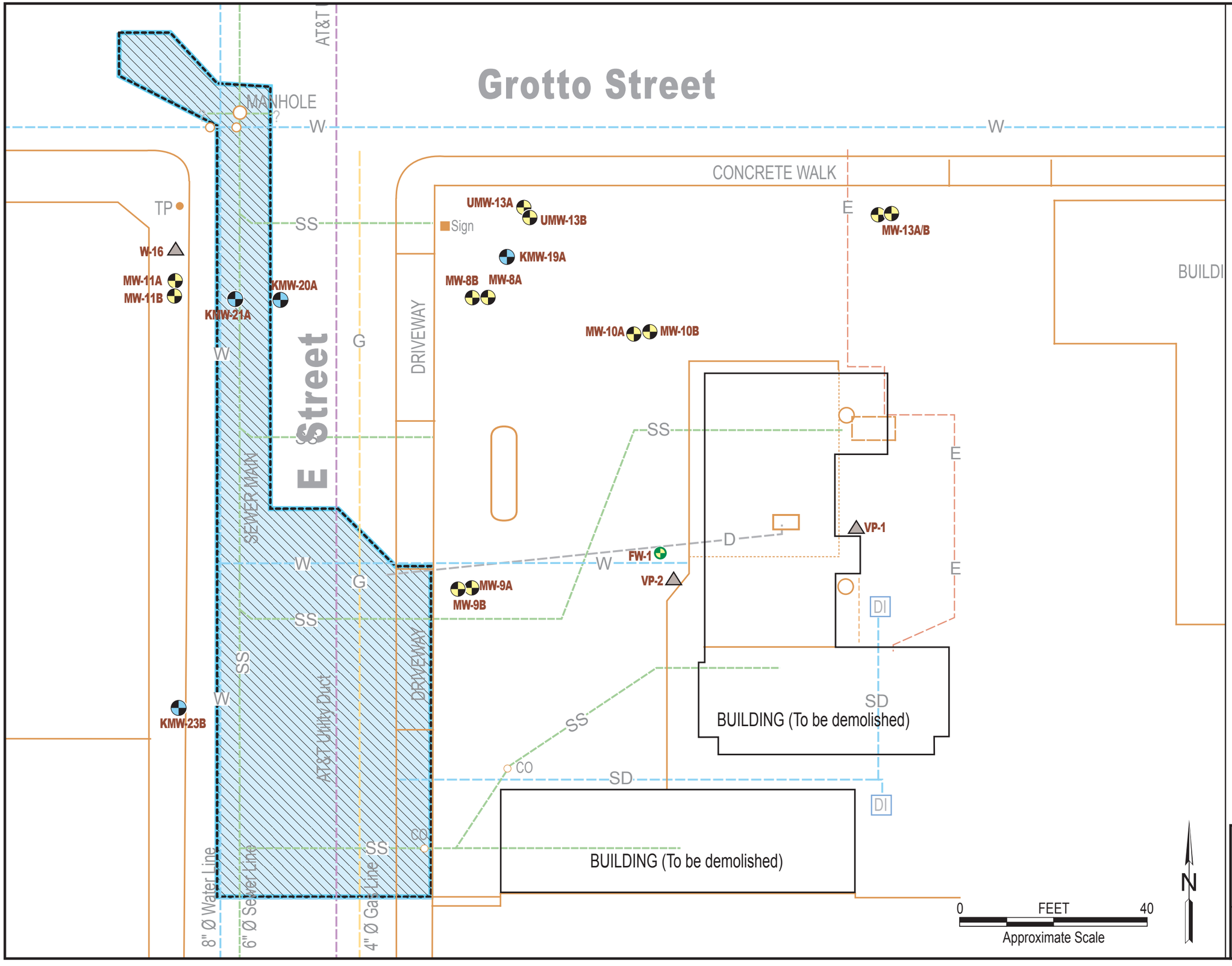
March 2015



Incomplete exposure pathway

Complete exposure pathway

Figure 4-3	EXPOSURE PATHWAY CHART	WEST Environmental Services & Technology
March 2015	E and Grotto Streets • Eureka, California	



EXPLANATION

- Groundwater monitoring well (WEST, 2013)
- Groundwater monitoring well
- Monitoring Vapor/Flushing well (WEST, 2008)
- Soil Vapor monitoring well
- Remediation Area (Alternatives 2, 3, 4 & 5)
- Drain line
- Water line
- Sanitary Sewer line
- Gas line
- Electrical line
- AT&T Utility Duct
- Cleanout
- Drop Inlet

REMEDIATION AREA

E and Grotto Streets • Eureka, California

WEST Environmental Services & Technology

Figure 7-1

March 2015

APPENDIX A

GROUNDWATER ELEVATION FIGURES

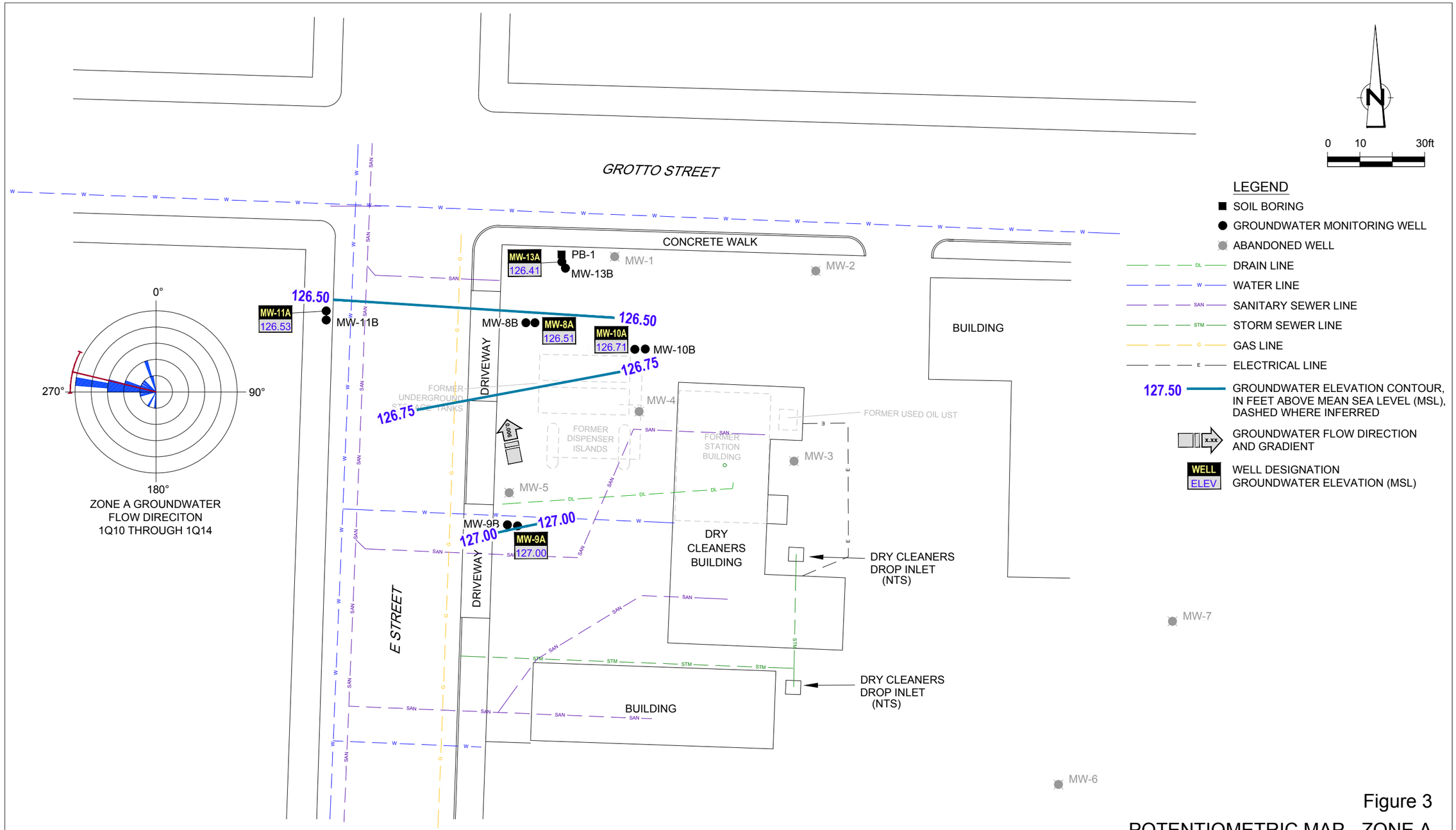


Figure 3

POTENTIOMETRIC MAP - ZONE A
UNION OIL FACILITY 306630 (FORMER UNOCAL #5357)
NCRWQCB CASE #1THU0694
2907 E STREET
Eureka, California
January 15, 2014

BASEMAP PROVIDED BY ENSR CORPORATION

065023-95(020)GN-EM003 MAR 26/2014

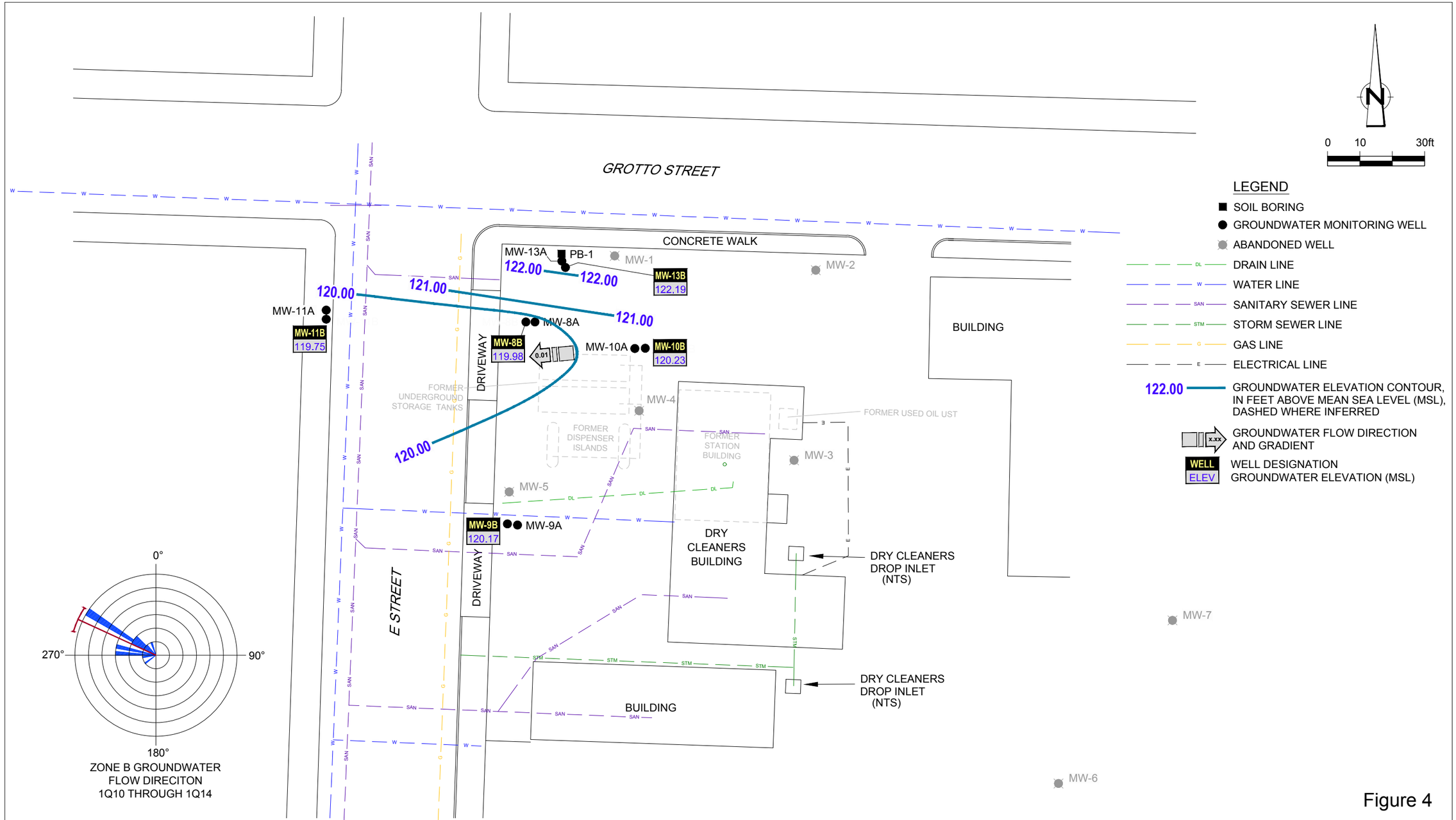
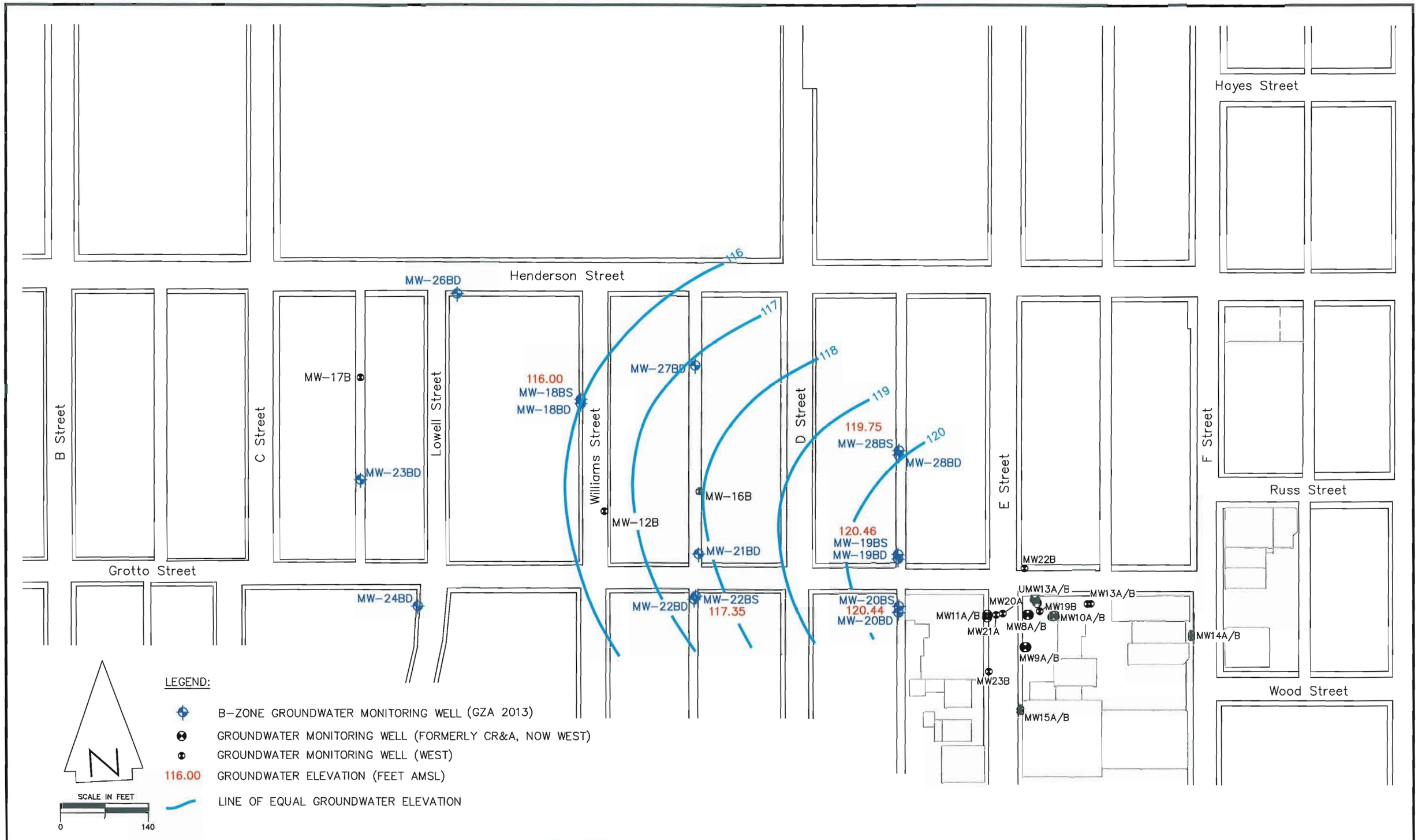


Figure 4

POTENTIOMETRIC MAP - ZONE B
UNION OIL FACILITY 306630 (FORMER UNOCAL #5357)
NCRWQCB CASE #1THU0694
2907 E STREET
Eureka, California
January 15, 2014

BASEMAP PROVIDED BY ENSR CORPORATION

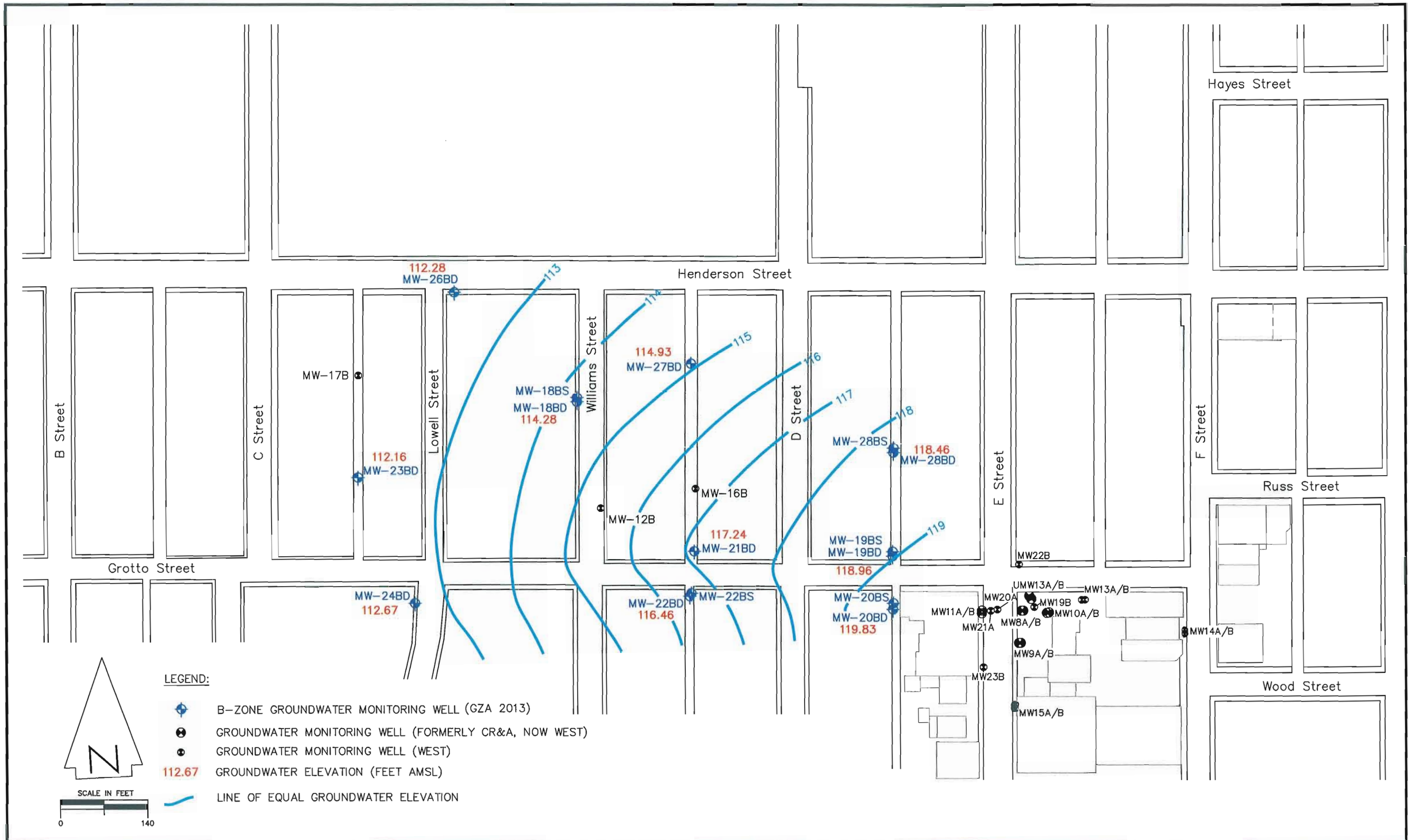
065023-95(020)GN-EM004 APR 28/2014



GROUND ZERO ANALYSIS, INC.

GROUNDWATER GRADIENT MAP – UPPER B-ZONE (WELLS SCREENED 10-22 FEET BELOW GRADE)
JANUARY 15, 2014
CITY OF EUREKA
1NHU983
EUREKA, CALIFORNIA

FIGURE
2-2
0414/SITE PLAN



GROUND ZERO ANALYSIS, INC.

GROUNDWATER GRADIENT MAP – LOWER B-ZONE (WELLS SCREENED 18-37 FEET BELOW GRADE)
JANUARY 15, 2014
CITY OF EUREKA
1NHU983
EUREKA, CALIFORNIA

FIGURE
2-3
0414/SITE PLAN

APPENDIX B

IDENTIFICATION AND SCREENING

OF REMEDIAL TECHNOLOGIES

TABLE B-1
SCREENING OF POTENTIAL GROUNDWATER REMEDIAL TECHNOLOGIES
E and Grotto Streets Plume
Eureka, California

GENERAL RESPONSE ACTION	PROCESS OPTION / COMPONENT	DESCRIPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	RETAINED
No Action	None	No action taken at the site	Required by guidance to provide baseline for comparison	Yes	Low	Yes
Institutional Controls	Land use controls	No remedial action for groundwater.	Reduces exposure to groundwater through limitations on use of shallow groundwater as drinking water source.	Yes	Low	Yes
In-Situ	Chemical Oxidation	Inject oxidant, i.e., ozone, persulfate, etc., to chemically treat COCs	Proven technology. Ozone sparge pilot study effective in reducing COCs. Bench-scale testing using persulfate indicated significant adverse impacts to groundwater conditions.	Yes for ozone; No for persulfate due to potential inability to comply with Regional Water Board WDRs and high dosage requirements (~10% w/w).	Low/High	No
	ISCF	Chemical flushing to remove residual PCE from A-Zone/B-Zone aquitard	Pilot study results from 2907 E Street indicated ISCF effective in removing PCE	Yes	Medium	Yes
	MNA	No removal action for groundwater. Periodic monitoring of groundwater	Reduces toxicity at the rate of natural attenuation	Yes	Low	Yes
	Electric Resistive Heating	Electrical Resistance Heating (ERH) – use of electrical current to heat soil and groundwater so contaminants are vaporized and collected for ex situ treatment.	ERH has proved effective at sites with DNAPL within similar type aquifer materials. ERH has also been combined with steam injection. ERH is a newer technology that very few companies provide.	Yes	High	Yes
	Enhanced Biodegradation	Injection of reducing agents to stimulate anaerobic biodegradation of chlorinated solvents	Proven technology for dissolved phase PCE, but effectiveness limited in DNAPL/higher concentration areas due to bioclogging.	Difficult to implement due to low hydraulic conductivity. Difficult to implement in DNAPL/aquitard area due to limitations on injection and resulting distribution.	Medium	No
	Adsorption	Groundwater passes through in-situ treatment cell	Reduction in mobility and toxicity	May be difficult to implement due to subsurface utilities	High	No

TABLE B-1
SCREENING OF POTENTIAL GROUNDWATER REMEDIAL TECHNOLOGIES
E and Grotto Streets Plume
Eureka, California

GENERAL RESPONSE ACTION	PROCESS OPTION / COMPONENT	DESCRIPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	RETAINED
Ex-Situ	Groundwater Extraction	Extraction and treatment of groundwater impacted by COCs.	May not remove adequate mass to achieve cleanup standards, but effective for containment	Yes	High	No
	Excavation	Removal of saturated zone, contaminated soil and backfilling with clean soil	Immediate reduction in mass	Difficult to implement to due to existing buildings and structures and depth of contamination	High	Yes

APPENDIX C

COST ESTIMATES

TABLE C-1
ESTIMATED COST - ALTERNATIVE 2
E and Grotto Streets Plumes
Eureka, California

TASK	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1.0	**CAPITAL COST**				
	Remove Asphalt and Concrete	11,200	SF	$6	$61,600
	Soil Excavation	1,605	CY	$83	$132,413
	Sewer Line / Manhole Replacement	180	LF	$380	$68,310
	Restore Utilities to Tenants	1	LS	$67,000	$67,000
	Dewatering	1	MO	$49,500	$49,500
	Water Treatment	1	MO	$65,000	$65,000
	Utility Protection	1	LS	$22,275	$22,275
	Load, Haul Dispose of Class I	2,568	TN	$380	$974,556
	Generator Fees	1	LS	$83,460	$83,460
	Furnish and Place CDF	803	CY	$182	$145,654
	Furnish and Place Clean Backfill	803	CY	$63	$50,317
	Shore Along Sewer	4,700	SF	$10	$46,530
	ByPass Pumping	1	LS	$18,700	$18,700
	Asphalt/Concrete Restoration	11,200	SF	$30	$332,640
	Permitting	1	LS	$25,000	$25,000
	Traffic Control	1	LS	$75,000	$75,000
	Mobilization	1	LS	$95,000	$95,000
	City of Eureka Engineering fee	1	LS	$15,000	$15,000
	City of Eureka Sewer discharge fee	1	LS	$5,500	$5,500
	Oversight	1	LS	$474,500	$474,500
	Permiting	1	LS	$170,000	$170,000
	Subtotal				$2,980,000
2.0	**INDIRECT COSTS**				
	Storm Water Controls	1	LS	$25,000	$25,000
	Health and Safety/Remedial Monitoring	1	LS	$75,000	$75,000
	Completion Report	1	LS	$45,000	$45,000
	Land Use Covenant	1	LS	$25,000	$25,000
	Subtotal				$170,000
3.0	**OPERATIONS AND MAINTENANCE**				
	Groundwater Monitoring and Reporting	20	Events	$12,850	$257,000
	Regulatory Oversight/Project Meetings	10	Years	$15,000	$150,000
	5-Year Review Reports	5	Each	$7,500	$37,500
	Closure Report	1	LS	$30,000	$30,000
	Subtotal				$474,500
	TOTAL ESTIMATED COST (Alternative 2)				**$3,622,000**

TABLE C-2
ESTIMATED COST - ALTERNATIVE 3
E and Grotto Streets Plumes
Eureka, California

TASK	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1.0	**CAPITAL COST**				
	Sliplining pits	2	EA	$75,000	$150,000
	Sewer sliplining	200	LF	$200	$40,000
	Manhole repair	1	LS	$35,000	$35,000
	Flushing well installation	40	EA	$3,800	$152,000
	Extraction Well	40	EA	$3,800	$152,000
	ISCF System Installation	1	Lump Sum	$390,000	$390,000
	ISCF Flushes	4	EA	$388,400	$1,553,600
	ISCF Monitoring and Reporting	1	EA	$357,600	$357,600
	Subtotal				$2,830,200
1.1	**Permitting**				
1.1.1	**Notice of Intent**				
	Principal Engineer	8	Hours	$215	$1,720
	Senior Geologist	16	Hours	$165	$2,640
	Project Geologist	24	Hours	$120	$2,880
	NOI Annual fee	1	Lump sum	$4,500	$4,500
	Subtotal (rounded)				$11,740
1.1.2	**Assist with Public Notice**				
	Principal Engineer	4	Hours	$215	$860
	Senior Geologist	12	Hours	$165	$1,980
	Senior Staff	24	Hours	$95	$2,280
	Expenses (copying, mailing, etc.)	1	Lump sum	$3,500	$3,500
	Subtotal (rounded)				$8,620
1.1.3	**Well Permitting**				
	Principal Engineer	12	Hours	$215	$2,580
	Senior Geologist	16	Hours	$165	$2,640
	Project Geologist	40	Hours	$120	$4,800
	Permit fee	1	Each	$12,224	$12,224
	Encroachment Permit fee-City of Eureka	10	Each	$250	$2,500
	Well deposit-City of Eureka	40	Each	$1,250	$50,000
	Traffic control plans	5	Each	$1,500	$7,500
	Traffic control	30	Days	$1,500	$45,000
	Subtotal (rounded)				$127,244
	Task 1 Subtotal				***$2,978,000***

TABLE C-2
ESTIMATED COST - ALTERNATIVE 3
E and Grotto Streets Plumes
Eureka, California

TASK	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
2.0	**INDIRECT COSTS**				
	Storm Water Controls	1	LS	$20,000	$20,000
	Destroy and replace monitoring wells	7	Each	$5,000	$35,000
	Permitting Fees	1	LS	$20,000	$20,000
	Health and Safety/Remedial Monitoring	1	Each	$75,000	$75,000
	Completion Report	1	Each	$45,000	$45,000
	Land Use Covenant	1	Each	$25,000	$25,000
	Subtotal (Rounded)				**$220,000**
3.0	**OPERATION AND MAINTENANCE**				
	Groundwater Monitoring and Reporting	20	Events	$12,850	$257,000
	Regulatory Oversight/Project Meetings	10	Years	$15,000	$150,000
	5-Year Review of Reports	5	Each	$7,500	$37,500
	Closure Report	1	Each	$30,000	$30,000
	Subtotal (Rounded)				**$474,500**
	TOTAL ESTIMATED COST (Alternative 3)				**$3,672,000**

TABLE C-3
ESTIMATED COST - ALTERNATIVE 4
E and Grotto Streets Plumes
Eureka, California

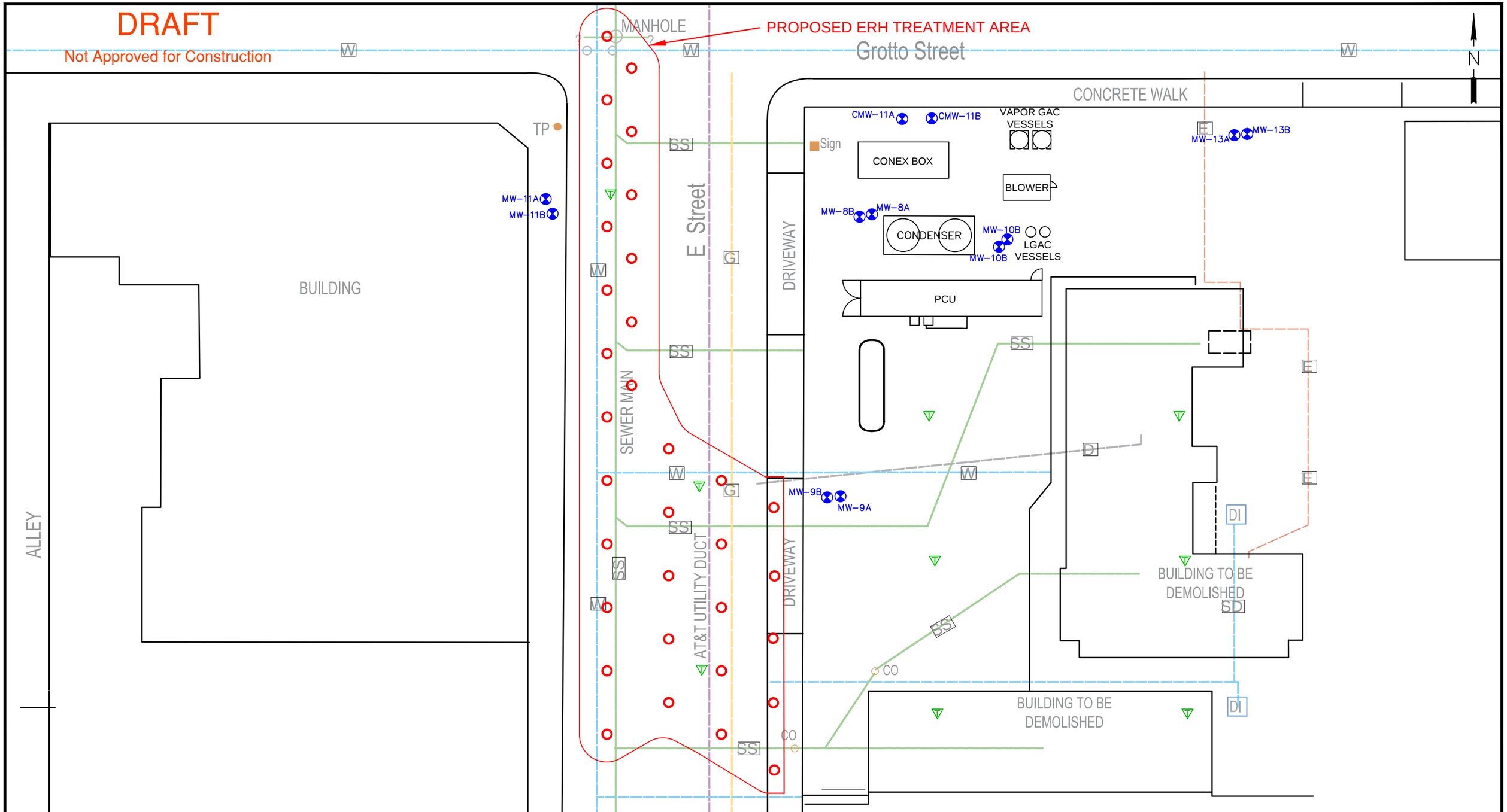
TASK	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1.0	**CAPITAL COST**				
	Traffic control	1	LS	$75,000	$75,000
	Destroy monitoring wells (4)	4	EA	$2,500	$10,000
	Grouting sewer line	100	Joints	$2,500	$250,000
	Borings for electrodes	40	EA	$3,500	$140,000
	Trenching	150	FT	$250	$37,500
	Night work premium		50%	$512,500	$256,250
	Electrical permit and utility connection	1	LS	$100,000	$100,000
	Design	1	LS	$50,000	$50,000
	Materials mobilization	1	LS	$95,000	$95,000
	Installation and start-up	1	LS	$275,000	$275,000
	System Operation	1	LS	$350,000	$350,000
	Electrical use	1	LS	$116,000	$116,000
	Waste disposal	300	Tons	$250	$75,000
	Air sampling, carbon replacement, etc.	1	LS	$30,000	$30,000
	Contingency	1	LS	$75,000	$75,000
	Subtotal (Rounded)				$1,930,000
2.0	**INDIRECT COSTS**				
	Storm Water Controls	1	LS	$20,000	$20,000
	Air permitting	1	LS	$25,000	$25,000
	Destroy probes	40	Each	$3,750	$150,000
	Permitting Fees	1	LS	$20,000	$20,000
	Health and Safety/Remedial Monitoring	1	Each	$75,000	$75,000
	Completion Report	1	Each	$45,000	$45,000
	Land Use Covenant	1	Each	$25,000	$25,000
	Subtotal (Rounded)				**$360,000**
3.0	**OPERATION AND MAINTENANCE**				
	Groundwater Monitoring and Reporting	15	Events	$12,850	$192,750
	Regulatory Oversight/Project Meetings	10	Years	$15,000	$150,000
	5-Year Review of Reports	5	Each	$7,500	$37,500
	Closure Report	1	Each	$30,000	$30,000
	Subtotal (Rounded)				**$410,250**
	TOTAL ESTIMATED COST (Alternative 4)				**$2,705,000**

APPENDIX D

ERH ELECTRODE LAYOUT AND DETAILS

DRAFT

Not Approved for Construction



LEGEND

- MONITORING WELL
- SHEETPILE ELECTRODE
- BORED ELECTRODE
- TEMPERATURE MONITORING POINT

0 10 20 40

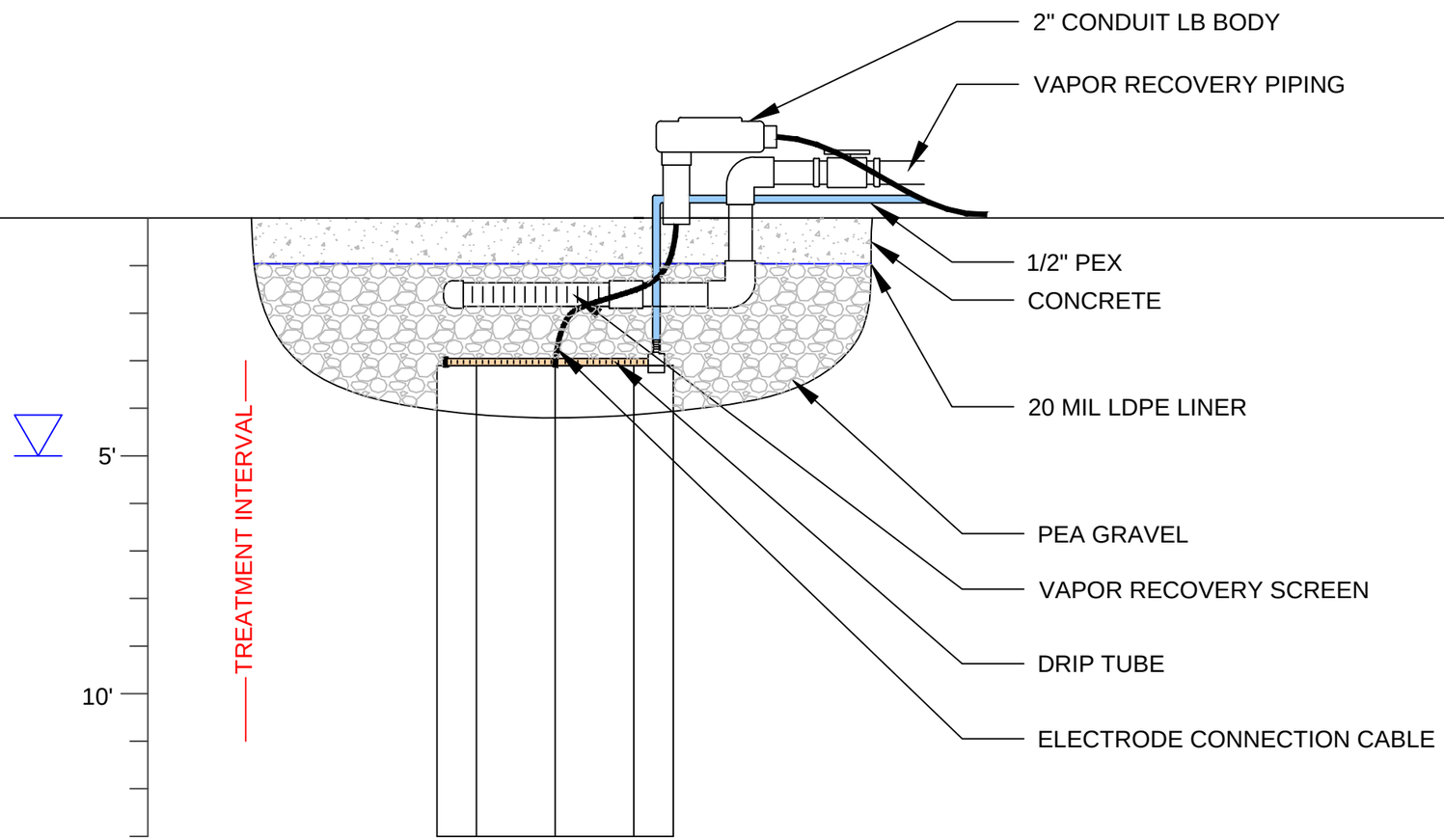
SCALE IN FEET

DESIGNED BY	FOR E AND GROTTO STREET PLUMES AREAS 1, 2 AND 3 EUREKA, CALIFORNIA
DRAWN BY	
CHECKED BY	SITE PLAN WITH ELECTRODE LAYOUT
PROJECT MANAGER	
APPROVED FOR CONSTRUCTION BY ____ DATE ____	DATE / PROJECT / SHEET

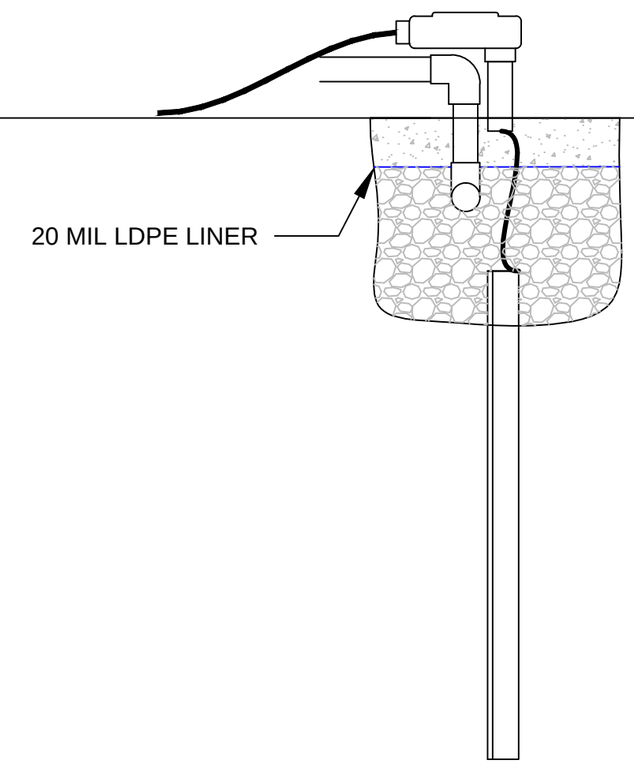
DRAFT

Not Approved for Construction

SHEET PILE ELECTRODE AND VAPOR RECOVERY WELL (TYPICAL OF XX)



SHEET PILE SIDE VIEW

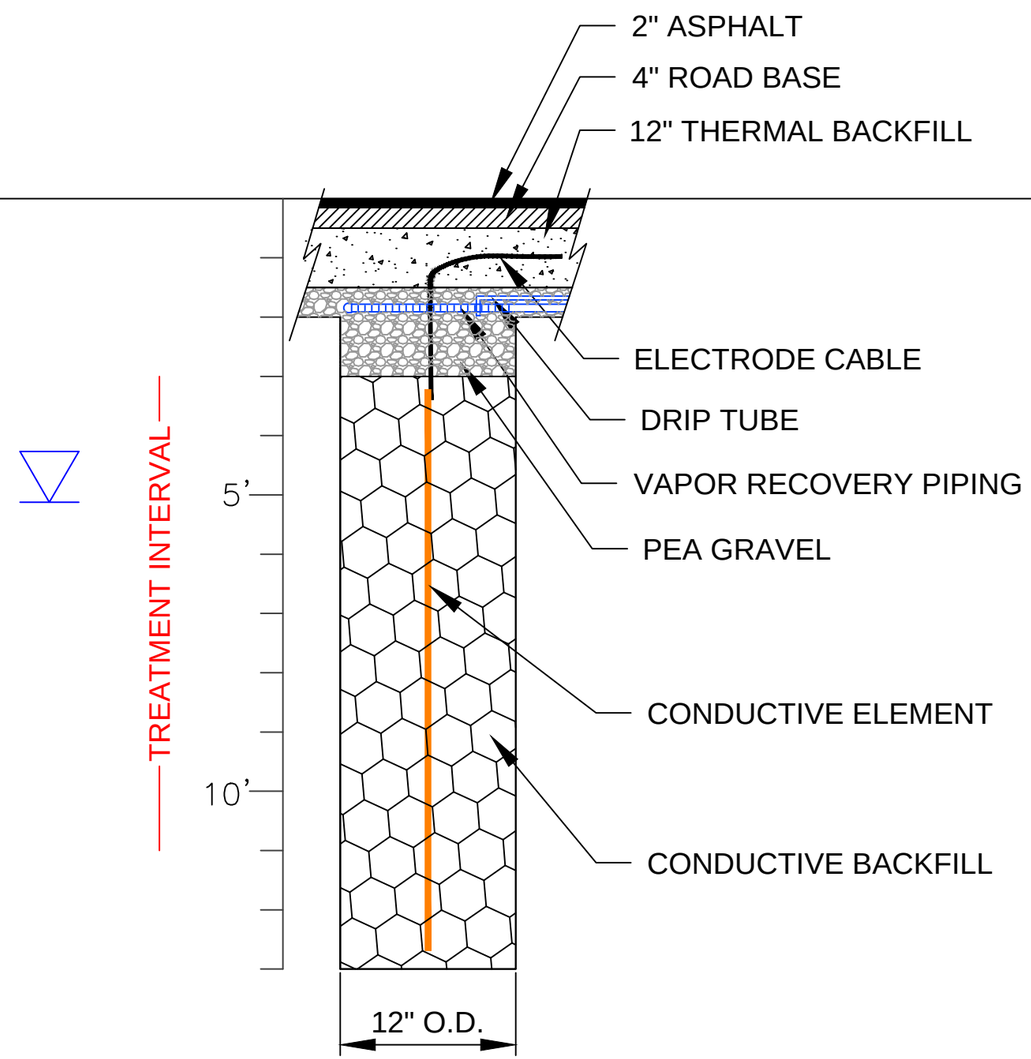


DESIGNED BY	FOR	E AND GROTTO STREET PLUMES AREA 1 EUREKA, CALIFORNIA	
DRAWN BY			
CHECKED BY	SHEETPILE ELECTRODE DETAIL		
PROJECT MANAGER			
APPROVED FOR CONSTRUCTION BY DATE		DATE	PROJECT
		SHEET	

DRAFT

Not Approved for Construction

ELECTRODE BELOW GRADE (TYPICAL OF XX)



NOTES

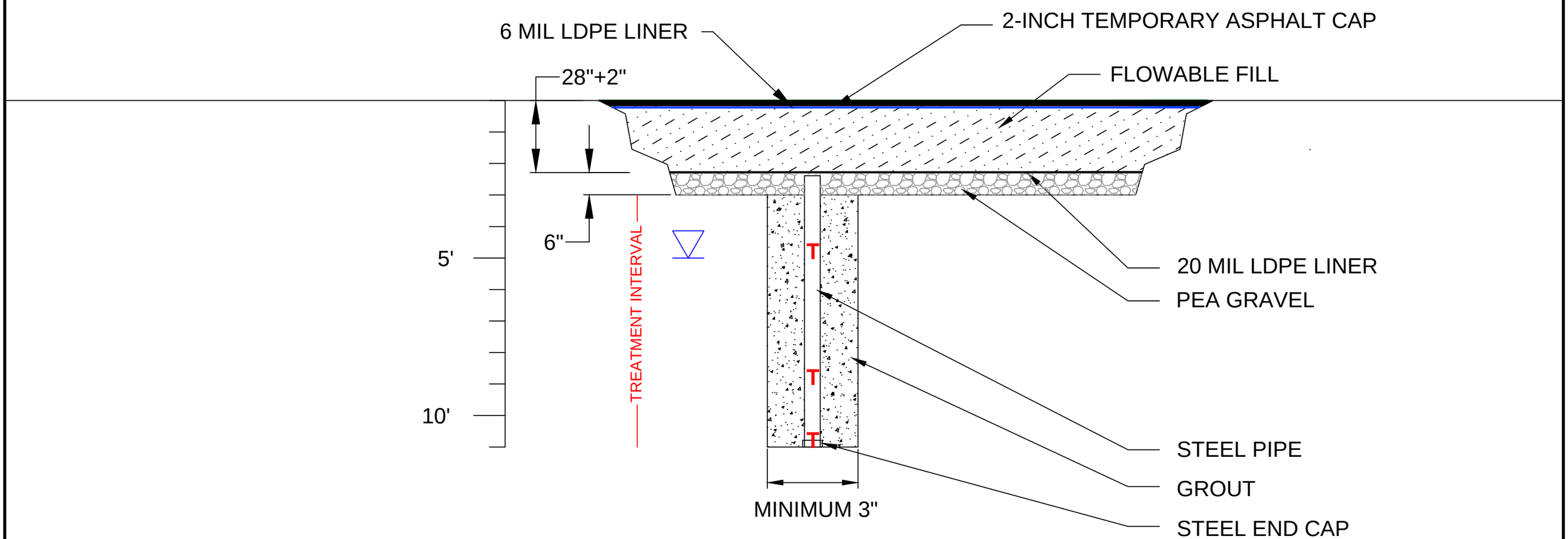
FOR ELECTRODES ADJACENT TO THE NATURAL GAS LINE AND THE AT&T UTILITY LINE, THE TREATMENT INTERVAL WILL BE ADJUSTED SO TREATMENT STARTS AT 5 FT BGS INSTEAD OF 3 FT BGS.

DESIGNED BY	FOR E AND GROTTO STREET PLUMES AREA 1 EUREKA, CALIFORNIA
DRAWN BY	
CHECKED BY NOT APPROVED	BELOW GRADE ELECTRODE DETAIL
PROJECT MANAGER	
APPROVED FOR CONSTRUCTION BY _____ DATE _____	DATE / PROJECT / SHEET

DRAFT

Not Approved for Construction

BELOW GRADE TEMPERATURE MONITORING POINT



T = THERMOCOUPLE

DESIGNED BY	FOR E AND GROTTO STREET PLUMES AREA 1 EUREKA, CALIFORNIA
DRAWN BY	
CHECKED BY NOT APPROVED	BELOW GRADE TEMPERATURE MONITORING POINT DETAIL
PROJECT MANAGER	
APPROVED FOR CONSTRUCTION BY ____ DATE ____	DATE / PROJECT / SHEET