P & D ENVIRONMENTAL

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ENVIRONMENTAL
PROTECTION

October 16, 1997
Report 0047.RBCA TR2

97 OCT 22 PM 3:59

Mr. L.B. Patel
Mr. P. Gupta
VIP Service
385 Century Circle
Danville, CA 94526

SUBJECT: **RISK-BASED CORRECTIVE ACTION EVALUATION TIER 2**
VIP Service
3889 Castro Valley Blvd.
Castro Valley, CA

Gentlemen:

P&D Environmental, a division of Paul H. King, Inc. (P&D), is pleased to present this report documenting the **Tier 2 evaluation** of the Risk-Based Corrective Action (RBCA) described in ASTM 1739 (a revision of ES 38-94) Guide for Risk-Based Corrective Action Applied at Petroleum Release Site. This work was performed in accordance with a letter from Mr. Scott Seery of the Alameda County Department of Environmental Health dated November 8, 1996, and P&D's proposal 112596.P1 dated November 25, 1996. A Site Location Map (Figure 1) and Site Vicinity Map (Figure 2) are attached with this report in Appendix A.

The Tier 2 RBCA was performed using the computer program Tier 2 RBCA Software by Groundwater Services, Inc. of Houston, Texas. In addition, the results of an underground utility survey are provided for the site and adjacent downgradient sites. **The underground utility survey was performed to identify utility trenches which could act as preferential conduit to transmit petroleum hydrocarbons into homes in the study area.**

A conservative computer model was used to perfrom the RBCA. **The RBCA results indicate that Baseline Risk values for inhalation of Volatile Organic Compounds (VOCs) within indoor air exceeded the Target Risk value for each region.** However, field observations do not support the model results. Evidence of petroleum hydrocrabons in soil was generally absent in the offsite evaluations with the exception of soil at the water table. **P&D recommends that soil gas samples be collected to evaluate the potential for risk of exposure to petroleum hydrocrabon soil gas vapors.**

BACKGROUND

It is P&D's understanding that the subject site was purchased by VIP Service in December, 1984. Prior to purchase of the property by VIP Service, the site was operated as a retail gasoline station for an undetermined period of time. The site was operated as a retail gasoline station from the time of purchase by VIP Service until the tanks were removed by Accutite on April 26, 1993. The site is presently operated as an automotive repair facility.

The subject site is currently paved, with one slab-on-grade structure which is used for automotive repair. The adjacent trailer park is predominantly paved, with the exception of several planters and trailer parking locations. One slab-on-grade structure is located on the adjacent trailer park, immediately adjacent to Castro Valley Boulevard.

The underground tank system at the subject site consisted of three 10,000 gallon capacity gasoline tanks, two dispenser islands, and one 550 gallon waste oil tank. It is P&D's understanding that the fuel tanks contained leaded and unleaded gasoline while in use by VIP Service. In addition, VIP Service reported that diesel fuel was not stored at the site at any time.

It is P&D's understanding that at the time of tank removal, eight soil samples were collected from the sidewalls of the fuel tank pit, and one soil sample was collected from the waste oil tank pit. Groundwater was reported to have been encountered in the fuel tank pit at a depth of approximately 11 feet. One water sample was collected from the water in the fuel tank pit. On April 28, 1993 Accutite returned to the site and collected seven soil samples from beneath the dispenser islands.

All of the samples were analyzed at Sequoia Analytical in Redwood City, California for Total Petroleum Hydrocarbons as Gasoline (TPH-G); Benzene, Toluene, Ethylbenzene and Xylenes (BTEX); and for Total Lead. In addition, the samples from the waste oil tank were analyzed for Total Petroleum Hydrocarbons as Diesel (TPH-D); Total Oil and Grease (TOG); Halogenated Volatile Organic Compounds using EPA Method 8010; Semi-Volatile Organic Compounds using EPA Method 8270; and for the metals cadmium, chromium, lead, nickel and zinc.

The results of the soil samples collected from the fuel tank pit showed TPH-G concentrations ranging from 120 to 6,200 parts per million (ppm), and total lead results ranging from not detected to 13 ppm. The results of the water sample from the fuel tank pit showed 140 ppm TPH-G, and 0.095 ppm total lead.

The results of the soil samples collected from beneath the fuel dispensers showed TPH-G values ranging from not detected to 4.7 ppm, and total lead values ranging from not detected to 7.6 ppm.

The results of the sample collected from the waste oil tank pit showed 670 ppm TPH-G; 410 ppm TPH-D; 1,300 ppm TOG; 0.023 ppm 1,2-Dichloroethane and 0.0094 ppm Tetrachloroethene in the EPA Method 8010 analysis; 2.7 ppm 2-Methylnapthalene and 3.8 ppm Naphthalene in the EPA Method 8270 analysis; and various metals concentrations, none of which exceeded ten times their respective STLC values. The laboratory identified the TPH-D results as being a "non-diesel mix," and indicated that the compounds reported as diesel were diesel-range gasoline and diesel-range oil compounds.

Between August 27 and November 1, 1993 P&D personnel collected stockpiled soil samples for stockpiled soil disposal characterization and oversaw the excavation of approximately 680 cubic yards of soil from the vicinity of the fuel tank pit in an effort to remove petroleum hydrocarbon-impacted soil. In addition, during this time the soil which was stockpiled by Accutite during the tank removal activities and during the subsequent soil excavation activities was disposed of at an appropriate disposal facility, and the tank pit backfilled and compacted. A total of eight confirmation soil samples were collected from the sidewalls of the tank pit on November 19, 1993 at a depth of 10 feet after over-excavation and prior to backfilling. The analytical results of the samples ranged from 33 to 3,200 ppm TPH-G. The sample collection locations are shown on the attached Site Vicinity Map, Figure 3. Documentation of excavation, stockpiled soil characterization and disposal, and backfilling of the pit are provided in P&D's report 0047.R1 dated January 24, 1994. The sample results associated with the removal of the tanks by Accutite are also summarized in P&D's report 0047.R1.

On November 10, 1993 P&D personnel oversaw the installation of three groundwater monitoring wells, designated as MW1 through MW3, and one exploratory soil boring, designated as B1, at the subject site. The wells were developed on November 12 and sampled on November 16, 1993. The results of the water samples showed that TPH-G was not detected in wells MW1 and MW2, and that BTEX was not detected in MW2. In well MW1, 0.0022 ppm of benzene was detected. In well MW3, TPH-G was detected at 12 ppm; benzene was detected at 3.3 ppm; TRPH was not detected; EPA Method 8010 compounds were not detected except for 0.027 ppm 1,2-Dichloroethane; and EPA Method 8270 compounds were not detected except for 0.009

ppm Phenol, 0.006 ppm Benzyl Alcohol, 0.006 2-Methylphenol, 0.007 ppm 2,4-Dimethylphenol, 0.088 ppm Benzoic Acid, 0.042 ppm Naphthalene, and 0.015 2-Methylnapthalene.

Documentation of the monitoring well and soil boring installation and associated sample results are presented in P&D's report 0047.R2 dated January 24, 1994. The locations of the monitoring wells are shown in Figure 2.

In response to a letter dated March 18, 1994 from Mr. Scott Seery of the ACDEH addressed to VIP Service which commented upon the results of the initial groundwater sampling associated with the installation of the monitoring wells, a quarterly groundwater monitoring and sampling program was initiated.

On June 9, 1995, P&D personnel hand augered 5 offsite exploratory boreholes designated as boreholes P1 through P5 in the downgradient direction from the subject site. The locations of the soil borings are shown in Figure 2. The results of the groundwater grab samples showed that no gasoline or BTEX were detected in borehole P4. Gasoline and BTEX were detected in boreholes P1, P2, P3 and P5. Documentation of the soil boring installation and associated sample results are presented in P&D's report 0047.R8 dated July 14, 1995. Based upon the sample results, Mr. Scott Seery of the ACDEH requested that further investigation be performed.

On November 17, 1995, P&D personnel hand augered 5 offsite exploratory boreholes designated as boreholes P6 through P10 for the collection of groundwater grab samples. The locations of the soil borings are shown in Figure 2. The results of the groundwater grab samples showed that no gasoline or BTEX were detected in boreholes P6, P8, and P10. Gasoline and BTEX were detected in boreholes P7, and P9. Documentation of the soil boring installation and associated sample results are presented in P&D's report 0047.R11 dated December 27, 1995. Based upon the sample results, Mr. Scott Seery of the ACDEH requested in a letter dated January 10, 1996 that further investigation be performed.

On August 8 and 9, 1996, P&D personnel hand augered 5 offsite exploratory boreholes designated as boreholes P11 through P15 for the collection of groundwater grab samples. The locations of the soil borings are shown in Figure 2. The results of the groundwater grab samples showed that no gasoline or BTEX were detected in boreholes P11, P13, P14, and P15. Gasoline was detected in borehole P12. Documentation of the soil boring installation and associated sample results are presented in P&D's report 0047.R15 dated October 9, 1996.

Based upon the sample results, Mr. Scott Seery of the ACDEH met with Mr. Patel of VIP Service and Paul king of P&D Environmental on November 8, 1996 to discuss corrective actions. In a letter dated November 8, 1996 Mr. Seery requested that a risk-based corrective action evaluation to be performed and that an underground utility survey be performed to identify utility trenches which could be potential conduits for petroleum hydrocarbon vapors.

FIELD ACTIVITIES

On March 27, 1997 a magnetometer survey was performed to identify underground utilities (electrical, gas, sewer, telephone, and water) at the subject site and adjacent properties affected by petroleum hydrocarbons in groundwater. The area where the magnetometer survey was performed included the entire subject site and the adjacent properties to the northwest, west, and southwest of the subject site. Underground utility location maps (Figure 5, 6, 7, 8, and 9) are attached with this report as Appendix A. Mr. Paul McMahon from California Utility Surveys (CUS) performed the magnetometer surveying.

HYDROGEOLOGY

Based on review of regional geologic maps from U.S. Geological Survey Professional Paper 943, "Flatland Deposits - Their Geology and Engineering Properties and Their Importance to Comprehensive Planning," by E.J. Helley and K.R. Lajoie, 1979 the subject site is underlain by Late Pleistocene alluvium (Qpa). The alluvium is described as typically consisting of weakly consolidated slightly weathered poorly sorted irregularly interbedded clay, silt, sand and gravel. Based on review of the regional geologic maps provided in U.S. Geological Survey Open File Report 80-540, "Preliminary Geologic Map of the Hayward Quadrangle, Alameda and Contra Costa Counties, California " by Thomas Dibblee, Jr., 1980 the alluvial materials are inferred to be underlain at depth by bedrock materials of the Upper Cretaceous Panoche Formation. Additionally, the site is situated approximately 0.8 miles northeast of the inferred trace of the East Chabot Fault and 1.7 miles northeast of the mapped trace of the active Hayward Fault.

Based upon review of the historical quarterly groundwater monitoring data for the subject site, the groundwater flow direction at the subject site has historically been predominantly westerly, with little change in the flow direction. The most recent quarterly monitoring and sampling of the groundwater monitoring wells at the site was performed on April 25, 1997. The results of the monitoring and sampling showed a TPH-G concentration of 30 ppm in well MW3. TPH-G and BTEX analysis were not performed for wells MW1 and MW2. Sample results from wells MW1 and MW2 have historically not shown detectable concentrations of petroleum hydrocarbons. In well MW3, TPH-G concentrations have historically ranged from 5.5 to 24 ppm. Based upon the measured depth to water in the wells on April 25, 1997, the calculated groundwater flow direction at the site was to the west with a gradient of 0.012.

During the offsite groundwater grab sample subsurface investigation, groundwater was initially encountered in the boreholes at depths [illegible] 8 to 9 feet below grade. Static water levels were not evaluated in the boreholes.

Review of the historical groundwater quality data for the three groundwater monitoring wells at the subject site indicates that TPH-G and BTEX have not been detected in wells MW1 and MW2, with the exception of benzene which was detected in well MW1 on November 16, 1993 and on July 29, 1994 at concentrations of 0.0022 and 0.0012 ppm, respectively.

Review of the subsurface conditions for the subject site and adjacent downgradient sites indicates that these sites are underlain by silty clay to a depth of approximately 19 to 25 feet below grade. Beneath the silty clay layer, a sand layer was encountered in the boreholes for all three of the groundwater monitoring wells (MW1 through MW3) and in ten of the fifteen boreholes for the groundwater grab samples (P1 through P5 and P9 through P13). The depth at which the sand layer is encountered generally appears to become shallower in the westward direction. This sand layer is interpreted to be continuous beneath the subject site and the area of the offsite groundwater quality investigation.

Review of the groundwater flow direction data for the subject site indicates that groundwater flow has remained consistently in a westerly direction since quarterly monitoring and sampling was initiated in November, 1993. Based on the laboratory analytical results of the water samples collected from the groundwater grab sample collection locations, petroleum hydrocarbons appear to be present to the north of the site, as identified in the sample from borehole P12. The presence of petroleum hydrocarbons to the north of the site in borehole P12 is interpreted to be the result of preferential movement of the petroleum hydrocarbons in the silty fine sand layer which is interpreted to be continuous beneath the site.

The comparatively low concentration of petroleum hydrocarbons in sample P2 is interpreted to be associated with the finer grained materials which were encountered in boreholes P2 and P6, resulting in impeded contaminant migration in the vicinity of these two boreholes and a divergent groundwater flow towards locations P3 and P9. Groundwater isoconcentration contours showing the estimated locations of 100, 10 and 1 ppm and not detected (ND) TPH-G contours are shown on Figure 2. BTEX contours were similar to and fully encompassed by the TPH-G contours.

TIER 2 SITE SPECIFIC FIELD DATA

Following over-excavation of the tank pit in 1993, a total of eight soil samples designated as TP1-10.0 through TP8-10.0 were collected from the pit perimeter at a depth of 10 feet below the ground surface to evaluate residual petroleum hydrocarbon concentrations. The results of these confirmation samples are presented in Table 1.

Between November, 1993 and April, 1997 the three groundwater monitoring wells at the site were monitored and sampled on a quarterly basis. Monitoring results for monitoring wells MW1, MW2, and MW3 are presented in Table 2. Sample results are presented in Table 3.

Between June, 1995 and August, 1996 a total of 15 groundwater grab samples designated as P1 through P15 were collected from properties adjacent to or near the subject site to evaluate the extent of petroleum hydrocarbons in groundwater. The sample results are presented in Table 4.

During the collection of groundwater grab samples P11, P13, P14, and P15 from properties adjacent to or near the subject site, soil samples were collected to evaluate Total organic carbon, soil moisture content and dry density in the vicinity of the subject site. The total organic carbon results are presented in Table 5, and the soil moisture content and dry density are presented in Table 6.

All of the tables are attached with this report as Appendix B.

ASSUMPTIONS FOR TIER 2 APPROACH

The following assumptions were used in preparation of the Tier 2 RBCA.

1) Groundwater at or near the subject site is not considered a source of drinking water.

2) The study area encompassed the area defined by the Figure 3 TPH-G ND contour. This study area was divided into three regions as follows.

- o Region #1: The area defined by the subject site property line.
- o Region #2: The residential area between the subject site property line (Region #1) and the 10 ppm TPH-G contour.
- o Region #3: The residential area (outside the property line of the subject site) between the 10 ppm and ND TPH-G contour.

A total of three different exposure scenarios were evaluated. One exposure was paired with each of the three study areas as follows.

- o **Region #1: On-Site Commercial**

The maximum groundwater benzene concentration encountered within the study area (groundwater grab sample P1, with a benzene concentration of 27 ppm; see Figure 3 and Table 4) was used to evaluate this region. The P1 groundwater grab sample location is located immediately adjacent to the subject property, immediately downgradient from the former UST pit (see

Figure 3). Although groundwater sample laboratory analytical results from groundwater monitoring well MW3 have consistently shown benzene concentrations ranging from 2.0 to 7.6 ppm (see Table 3 and Figure 2), the highest groundwater grab sample benzene concentration from groundwater grab sample location P1 was used to provide a conservative evaluation.

The maximum soil benzene concentration encountered within the study area (confirmation soil sample TP7-10.0, with a benzene concentration of 24 ppm, see Figure 4 and Table 1) was used to evaluate this area. The TP7-10.0 confirmation soil sample location is on the east wall of the former tank pit following over-excavation. Sample TP7-10.0 was used to provide a conservative evaluation.

In Region #1, the contaminated soil area was assumed to measure approximately 80 feet in length and 50 feet in width. The thickness of the petroleum-impacted soil was assumed to be 1 foot, at a depth ranging from 7.5 to 8.5 feet below the ground surface. Region #1 is shown on Figure 3.

- **Region #2: Off-Site Residential**

The maximum groundwater benzene concentration encountered within this region (groundwater grab sample P3, with a benzene concentration of 2.6 ppm, see Table 4) was used to evaluate this region. The sample P3 benzene concentration was used to provide a conservative evaluation. The P3 groundwater grab sample location is in the trailer park to the northwest of the subject property (see Figure 3). It should be noted that the P3 groundwater grab sample benzene concentration of 2.6 ppm is within the range of benzene concentrations encountered in groundwater monitoring well MW3 which has historically ranged from 2.0 to 7.6 ppm (see Table 3 and Figure 2).

Why not P1 ?

In Region #2, soil was assumed to not be contaminated. Based upon field observations in the boreholes for the offsite groundwater grab samples, evidence of petroleum hydrocarbons was not encountered in soil in these boreholes except at immediately above the water table. The area of impacted groundwater in Region #2 was assumed to measure approximately 60 feet in length and 60 feet in width. Region #2 is shown on Figure 3.

- **Region #3: Off-Site Residential**

The groundwater benzene concentration used to evaluate this area was 0.033 ppm (the average of P2 and P5, see Table 4). The P2 groundwater grab sample location is on the opposite side of the trailer park from the subject site (northwest, see Figure 3). The P5 groundwater grab sample location is adjacent to the subject site (southwest) in the trailer park (see Figure 3). The average benzene concentration value (0.033 ppm) for the groundwater grab samples P2 and P5 (0.026, and 0.040 ppm, respectively) is below the benzene concentration range of 2.0 to 7.6 ppm which was encountered in well MW3 (see Table 3 and Figure 2).

separation of 150 ' ?

In Region #3, soil was assumed to not be contaminated. Based upon field observations in the boreholes for the offsite groundwater grab samples, evidence of petroleum hydrocarbons was not encountered in soil in these boreholes except at immediately above the water table. The area of impacted groundwater in Region #3 was assumed to measure approximately 60 feet in length and 60 feet in width. Region #3 is shown on Figure 3.

3) The detected chemicals of concern (COCs) used in the RBCA were as follows: benzene, toluene, ethylbenzene, and xylenes (BTEX). These COCs are considered to be the representative COCs at the subject site. Benzene is

considered a carcinogen and the other COCs are not considered carcinogens. Carcinogens are evaluated using Target Risk values and the non-carcinogens are evaluated using Target Hazard Quotients.

4) The highest contaminant concentrations were used in both soil and groundwater for each area evaluated. These concentrations were identified by Mr. Scott Seery of the ACDEH during the November 8, 1996 meeting.

5) Air exposure pathways from surface soil (vapor and dust inhalation), and soil exposure pathways from surface soil (dermal contact and ingestion) are assumed to not be applicable because contaminated soil and groundwater are encountered at a depth greater than 3 feet. Similarly, groundwater exposure pathways from groundwater (ingestion) are not applicable because groundwater at the subject site is not considered a source of drinking water.

OK

On-site commercial workers and off-site residential receptors are assumed to be exposed to subsurface chemicals (at a depth greater than 3 feet) by means of volatilization and inhalation of vapor emissions only. An exposure control flowchart is attached with this report as Appendix C.

OK

6) Exposure of on-site commercial workers to volatile emissions from subsurface soil and groundwater and to off-site residents to volatile emissions from groundwater were conservatively evaluated using maximum detected concentrations for each region, and Default Parameters provided in the Groundwater Services, Inc. (GSI) RBCA Spreadsheet for soil, groundwater, air, and buildings. Copies of Default Parameter Tables are attached with this report as Appendix C. Soil sample total organic carbon, moisture content, and dry density are attached with this report as Tables 5, and 6, respectively, in Appendix B.

defaults or site specific for D, etc. ?

7) The target risk for an excess cancer risk for the on-site commercial assessment (Region #1) was 1 in 100,000 (1×10^{-5}). The target risk for an excess cancer risk for the off-site residential assessments (Regions #2 and #3) were 1 in 1,000,000 (1×10^{-6}). These cancer target risk levels are within the target range of 1×10^{-4} to 1×10^{-6} described in Table X2.1 of ASTM 1739 (a revision of ES 38-94) Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites.

10^{-5} comm. 10^{-6} res.

8) Natural attenuation was not incorporated in this risk assessment.

TIER 2 CALCULATION RESULTS

OK

The air exposure pathway (vapor inhalation) resulting from volatilization of petroleum hydrocarbons from subsurface soil (at a depth greater than 3 feet) or groundwater is the only pathway that applies to the subject site (Region #1) or site vicinity regions (Regions #2 and #3). Air exposure pathways are divided into outdoor and indoor exposures.

The target risk is an assigned value and is defined in the Assumptions section, number 7), above (1.0×10^{-5} for on-site commercial, 1.0×10^{-6} and for off-site residential). The source concentration is the representative subsurface soil or groundwater contaminant concentration in a specific region. The Site Specific Target Level (SSTL) for subsurface soil and groundwater is obtained through RBCA Tier 2 calculations (see Worksheets 9.2 and 9.3 for each Region in Appendix D). The baseline risk is the actual risk based upon the assigned target risk and the actual contaminant concentrations at a given location.

To calculate baseline risk, the following formula is used.

SSTL / Target Risk = Source Concentration / Baseline Risk

By comparing the SSTL and the source concentration, it is possible to determine if an unacceptable level of risk exists for a specific location or region. Similarly, by comparing the Baseline Risk with the Target Risk, it is possible to determine quantitatively the degree to which the Baseline Risk complies with or exceeds the Target Risk. For example, if the source concentration exceeds the corresponding SSTL, the area is identified as having an unacceptable level of risk. By comparing the Target Risk with the Baseline Risk, it is possible to determine the degree to which the Target Risk is similar to the Baseline Risk, or if there is a large difference between the Target Risk and the Baseline Risk.

The calculated SSTL values and associated risk levels for each region are presented below. All of the outdoor air pathway SSTL values exceeded the source concentrations used to evaluate each region. Based on these outdoor air SSTL values from subsurface soil and groundwater, there is no unacceptable risk for any of the outdoor air exposure pathways. For this reason, outdoor air exposure pathways and associated SSTL values are not discussed below.

Similarly, the only COC which presented unacceptable risk values or target hazard quotients was benzene. For this reason, the only COC discussed below is benzene.

o Region #1: On-Site Commercial

The calculated Region #1 benzene SSTL for the complete exposure pathway from groundwater volatilization to indoor air indicates an applicable SSTL of 8.1 x 10^{-1} mg/L. The applicable SSTL had a Constituent Reduction Factor (CRF) which was 33 times lower than the representative concentration used for benzene in groundwater grab sample P1 (27 ppm). This resulted in a Baseline Risk from groundwater volatilization to indoor air equal to 3.33 x 10^{-4}. This Baseline Risk value of 3.33 x 10^{-4} is greater than the Target Risk value of 1.0 x 10^{-5}.

The Region #1 benzene SSTL for the complete exposure pathway from subsurface soil volatilization (impacted soil at a depth greater than 3 feet) to indoor air indicates an applicable SSTL of 6.1 mg/kg. This applicable SSTL had a CRF which was 4 times lower than the representative concentration used for benzene in soil sample TP7-10.0 (24 ppm). This resulted in a Baseline Risk from subsurface soil volatilization to indoor air equal to 3.93 x 10^{-5}. This Baseline Risk value of 3.93 x 10^{-5} is greater than the Target Risk value of 1.0 x 10^{-5}.

The total Baseline Risk due to groundwater and subsurface soil volatilization to indoor air is the sum of the Baseline Risk from groundwater and the Baseline Risk from subsurface soil. In Region #1 the Baseline Risk is equal to 3.72 x 10^{-4}. This total Baseline Risk exceeds the Target Risk for this Region. The SSTL spreadsheets showing the results for the complete pathways for petroleum-impacted soil and groundwater in Region #1 are summarized in Appendix D.

It should be noted that use of MW3 groundwater benzene concentrations as an alternative to the P1 benzene concentrations also results in an unacceptable level of risk for Region #1.

o Region #2: Off-Site Residential

The calculated Region #2 benzene SSTL for the complete exposure pathway from groundwater volatilization to indoor air indicates an applicable SSTL of 2.6 x 10^{-2} mg/L. This applicable SSTL had a CRF which was 100 times lower than the

representative concentration used for benzene in groundwater grab sample P3 (2.6 ppm). This resulted in a Baseline Risk from groundwater volatilization to indoor air equal to 1.0×10^{-4}. This Baseline Risk value of 1.0×10^{-4} is greater than the Target Risk value of 1.0×10^{-5}.

The Region #2 benzene SSTL for the complete exposure pathway from subsurface soil volatilization (impacted soil at a depth greater than 3 feet) to indoor air is not considered because evidence of petroleum hydrocarbons was not encountered in groundwater grab sample boreholes in Region #2 other than at the water table.

The total Baseline Risk due to groundwater and subsurface soil volatilization to indoor air in Region #2 is equal to 1.0×10^{-4}, which is greater than the Target Risk value of 1.0×10^{-5}. The SSTL spreadsheets showing the results for the complete pathways for petroleum-impacted soil and groundwater in Region #2 are summarized in Appendix D.

o Region #3: Off-Site Residential

The Region #3 benzene SSTL for the complete exposure pathway from groundwater volatilization to indoor air indicates an applicable SSTL of 2.6×10^{-2} mg/L. The applicable SSTL had a CRF which was 0.007 times lower than the representative concentration value used for benzene (0.033 ppm). This resulted in a Baseline Risk from groundwater volatilization to indoor air equal to 1.27×10^{-6}. This Baseline Risk value of 1.27×10^{-6} is greater than the Target Risk value of 1.0×10^{-6}.

The benzene SSTL for the complete exposure pathway from subsurface soil volatilization (impacted soil at a depth greater than 3 feet) to indoor air is not considered because evidence of petroleum hydrocarbons was not encountered in groundwater grab sample boreholes in Region #3 other than at the water table.

The total Baseline Risk due to groundwater and subsurface soil volatilization to indoor air in Region #3 is equal to 1.27×10^{-6}, which is greater than the Target Risk value of 1.0×10^{-6}. The SSTL spreadsheets showing the results for the complete pathways for petroleum-impacted soil and groundwater in Region #3 are summarized in Appendix D.

DISCUSSION AND RECOMMENDATIONS

The underground utility survey identified the locations of buried utilities for electrical, gas, sewer, telephone, and water. Review of the underground at the trailer park located adjacent to the subject site showed that the trailers are located above the ground, with a breezeway between the floor of the trailers and the ground surface. The underground utilities extend out of the ground, and into the breezeway before entering the trailers. There is one house at the trailer park which is located adjacent to Castro Valley Boulevard which has a slab-on-grade foundation construction. At this location, underground utilities enter directly into the building.

The SSTL is a value which is established using site-specific conditions and which is used to evaluate the presence of an unacceptable health risk resulting from the presence of COC's. SSTLs were evaluated for exposure to COC vapors in buildings resulting from the volatilization of COCs from soil and the water table at the subject site (Region #1), and from the water table for the off-site regions (Regions #2 and #3).

Based on evaluation of the highest COC concentrations for each region, the RBCA Tier 2 results show unacceptable risk in all three regions and for all potential sources evaluated (soil and groundwater). The use of the highest COC

values in each region evaluated, and the assumptions of the model resulted in a conservative evaluation.

Based on the presence of the breezeways beneath the trailer homes in the trailer park adjacent to the subject site, and based on the absence of evidence of petroleum hydrocarbons in the soil from the groundwater grab sample boreholes, P&D recommends that the risk of exposure be further evaluated. P&D recommends that shallow soil gas samples be collected in the underground utility trenches to evaluate the presence of COCs and thereby determine if there is actual risk of exposure to COCs.

DISTRIBUTION

Copies of this report should be forwarded to Mr. Scott Seery at the Alameda County Department of Environmental Health and to the San Francisco Bay Regional Water Quality Control Board.

LIMITATIONS

This report was prepared solely for the use of VIP Service. The content and conclusions provided by P&D in this assessment are based on information collected during our investigation, which may include, but not be limited to, visual site inspections; interviews with site owner, regulatory agencies and other pertinent individuals; review of available public documents; subsurface exploration and our professional judgement based on said information at the time of preparation of this document. Any subsurface sample results and observations presented herein are considered to be representative of the area of investigation; however, geological conditions may vary between borings and may not necessarily apply to the general site as a whole. If future subsurface or other conditions are revealed which vary from these findings, the newly-revealed conditions must be evaluated and may invalidate the findings of this report.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information contained herein is brought to the attention of the appropriate regulatory agencies, where required by law. Additionally, it is the sole responsibility of the owner to properly dispose of any hazardous materials or hazardous wastes left onsite, in accordance with existing laws and regulations.

This report has been prepared in accordance with generally accepted practices using standards of care and diligence normally practiced by recognized consulting firms performing services of a similar nature. P&D is not responsible for the accuracy or completeness of information provided by other individuals or entities which is used in this report. This report presents our professional judgement based upon data and findings identified in this report and interpretation of such data based upon our experience and background, and no warranty, either express or implied, is made. The conclusions presented are based upon the current regulatory climate and may require revision if future regulatory changes occur.

Should you have any questions, please do not hesitate to contact us at (510) 658-6916.

Sincerely,

P&D Environmental

Paul H. King

Paul H. King
Registered Geologist #5901
Expires 12/31/97

PHK
0047RBCA.TR2

Attachments: Appendix A: Figures 1, 2, 3, 4, 5 6, 7, 8, & 9
Appendix B: Tables 1, 2, 3, 4, 5, & 6
Appendix C: Exposure Control Flowchart and Default Parameter Table
Appendix D: SSTL Tier 2 Calculation Spreadsheets

Appendix A

FIGURES

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A Division of Paul H. King, Inc.
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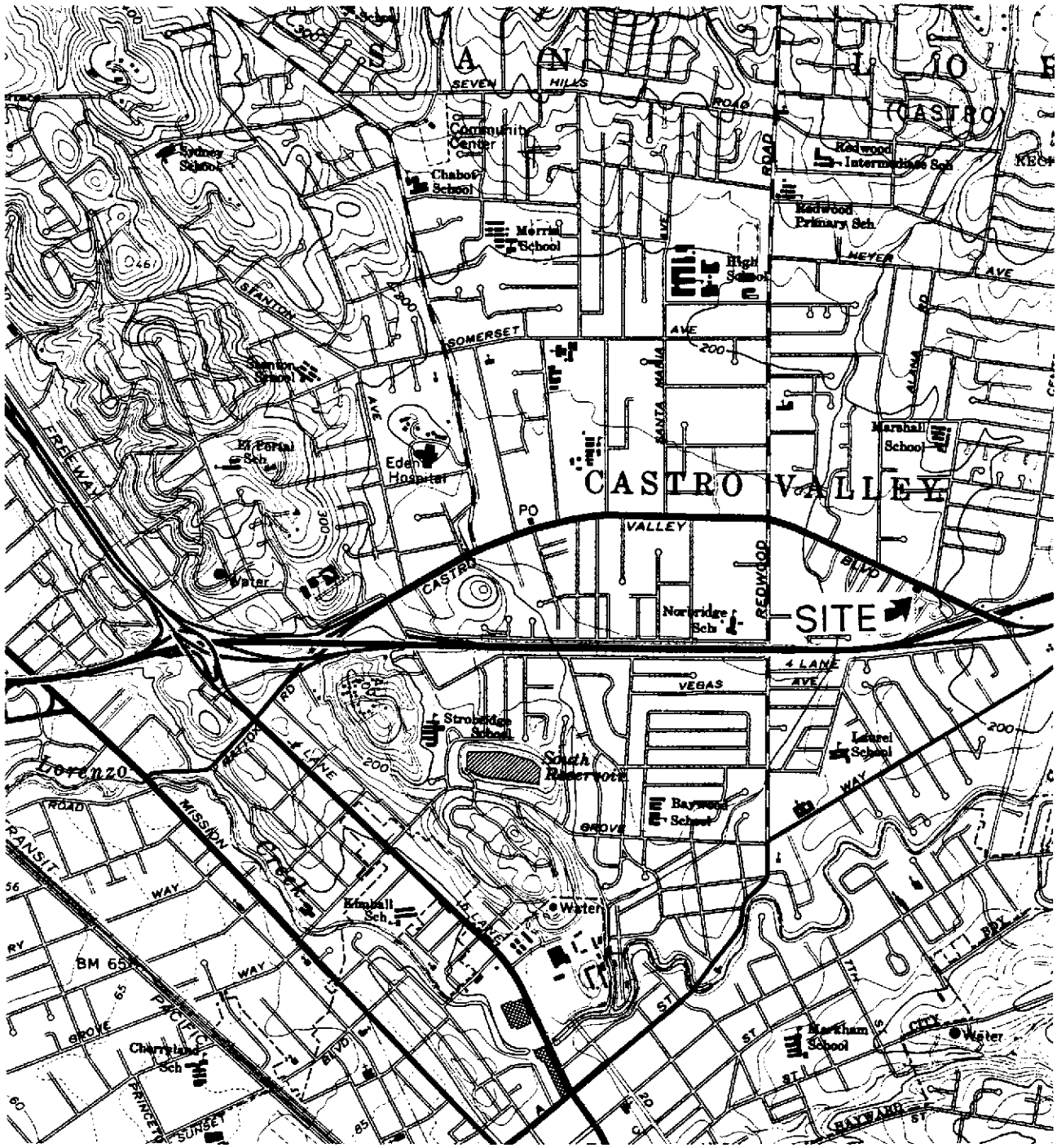

Base Map From
U.S. Geological Survey
Hayward, Calif.
7.5 Minute Quadrangle
Photorevised 1980

N

Scale in Feet

0 1000 2000 3000

Figure 1
SITE LOCATION MAP
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D Environmental
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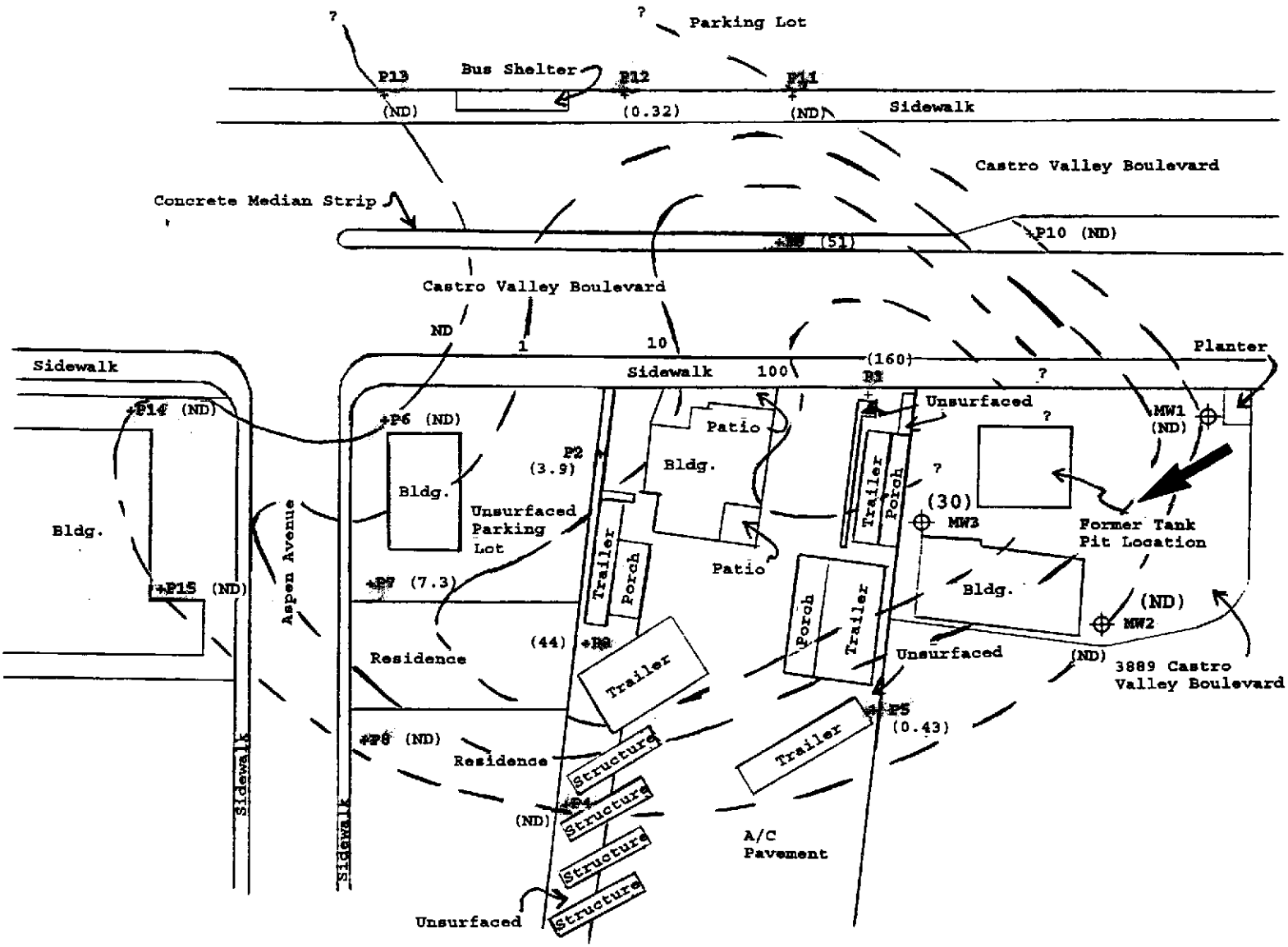
Oakland, CA 94611
(510) 658-6916



LEGEND

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

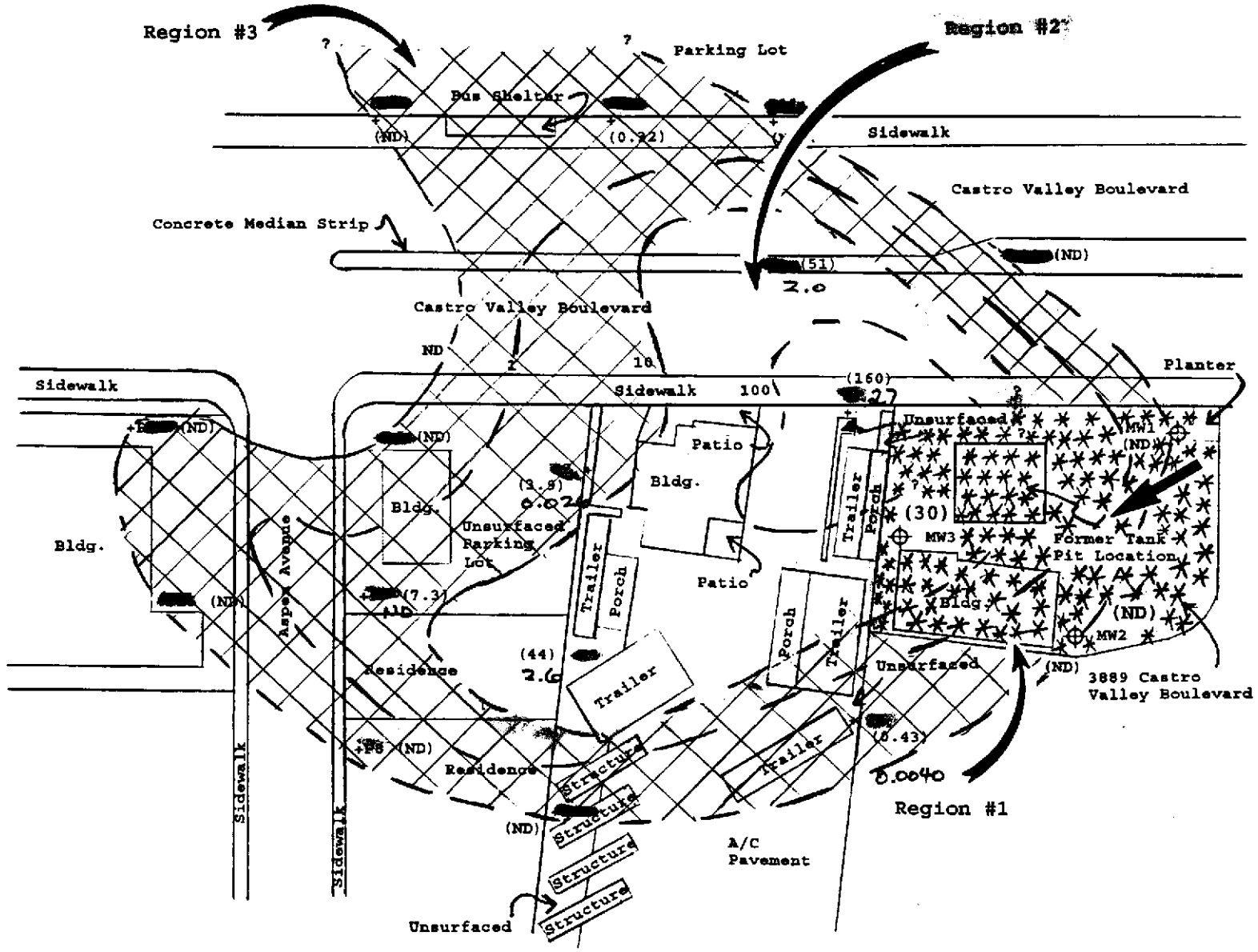
0 30 60

Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 2
SITE VICINITY MAP
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D ENVIRONMENTAL
A Division of Paul H. King, Inc.
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



LEGEND

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

0 30 60

Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 3
SITE VICINITY MAP
Showing the Study Area Regions
(Region #1, #2, #3)
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D ENVIRONMENTAL
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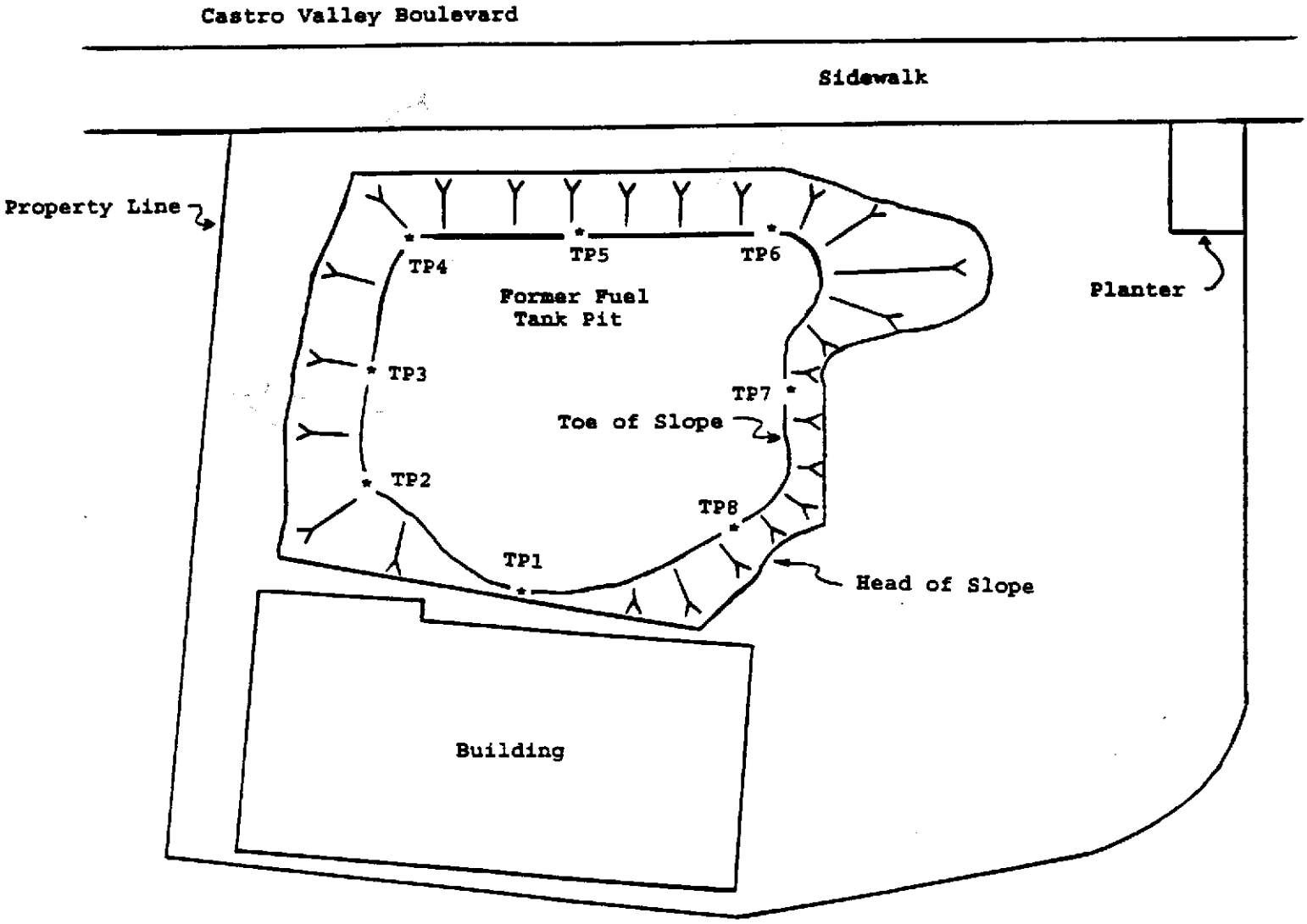
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



Base Map From
P&D Environmental
October, 1993

Figure 4
SITE PLAN
Showing Confirmation Soil Sample
Collection Locations Following
Over-Excavation
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D Environmental

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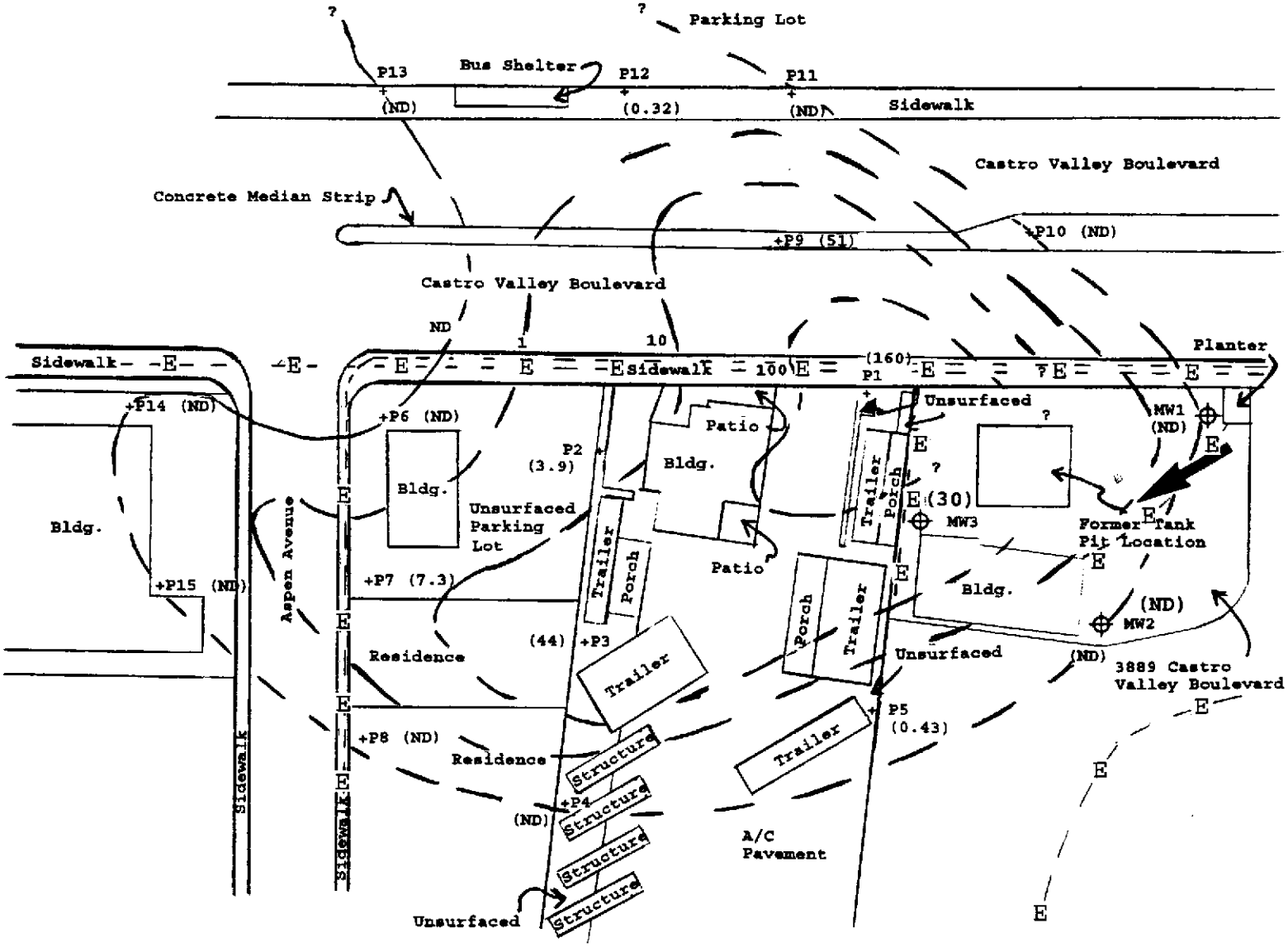
Oakland, CA 94611
(510) 658-6916



LEGEND

--E-- Electrical Lines

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

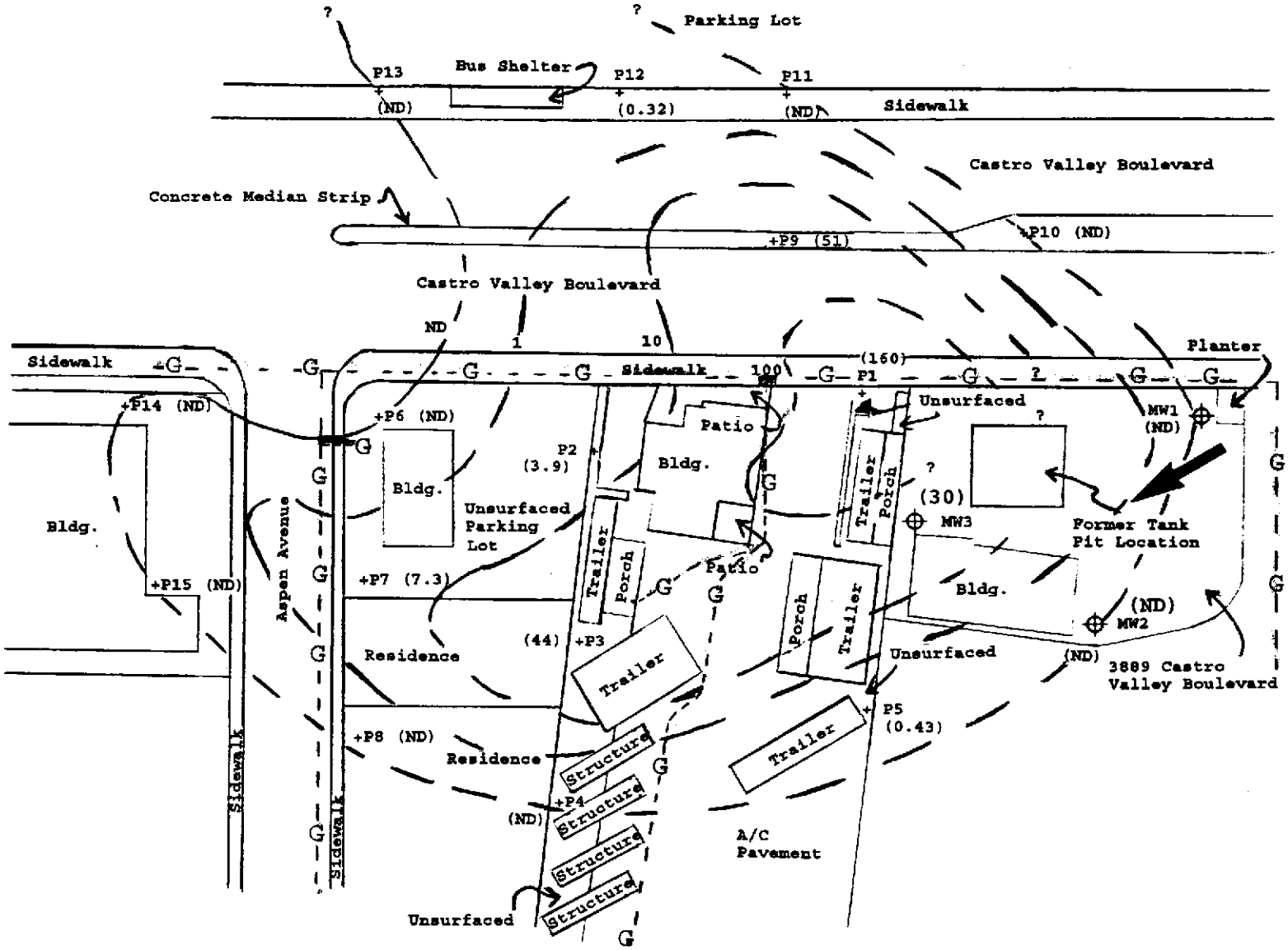
0 30 60

Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 5
SITE VICINITY MAP
Showing Underground Utility
Trenches for Electrical Lines
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D ENVIRONMENTAL
A Division of Paul H. King, Inc.
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



LEGEND

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

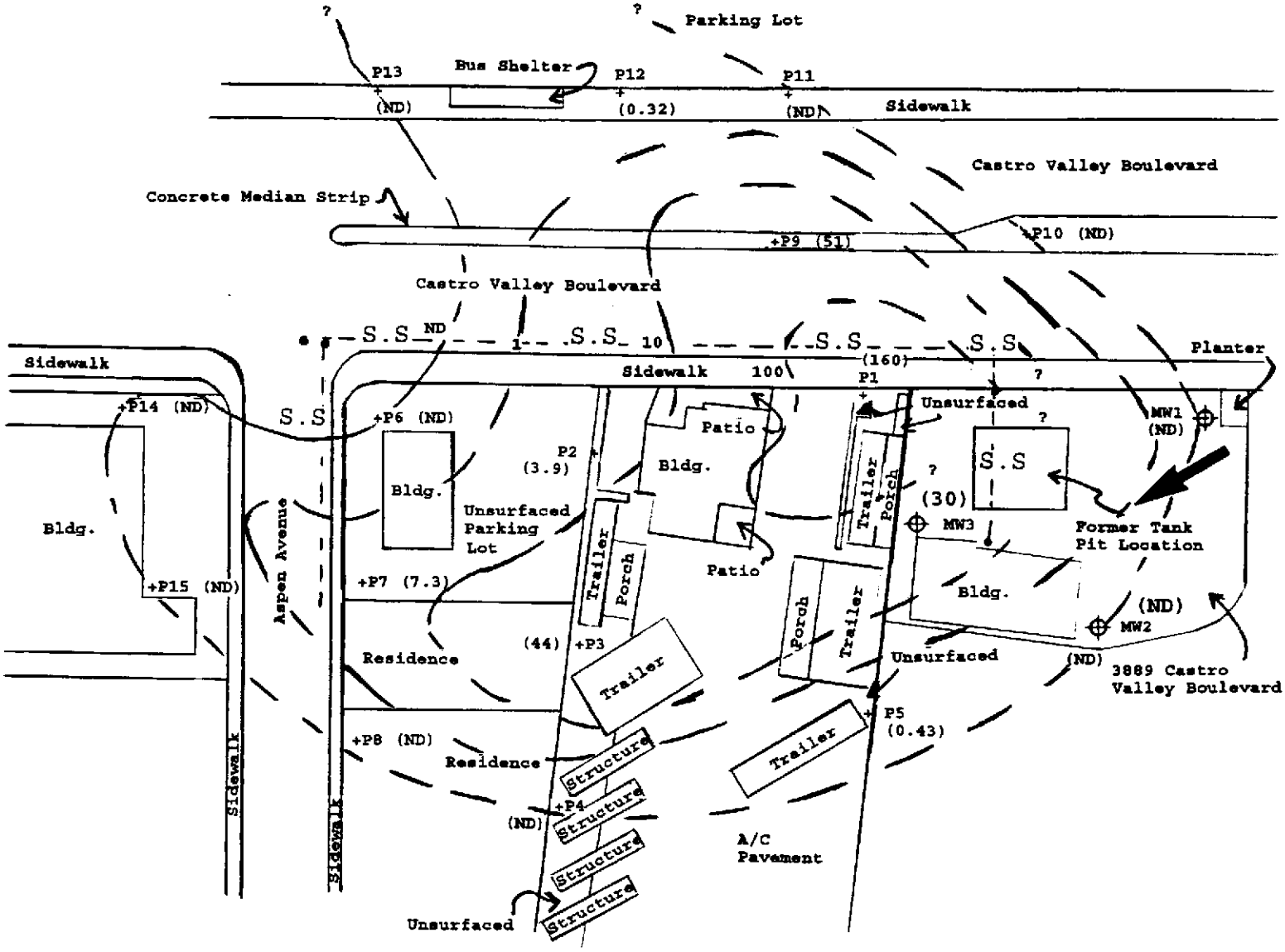
0 30 60

Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 6
SITE VICINITY MAP
Showing Underground Utility
Trenches for Gas Lines
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D ENVIRONMENTAL
A Division of Paul H. King, Inc.
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



LEGEND

--S.S-- Sanitary Sewer Lines

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

0 30 60

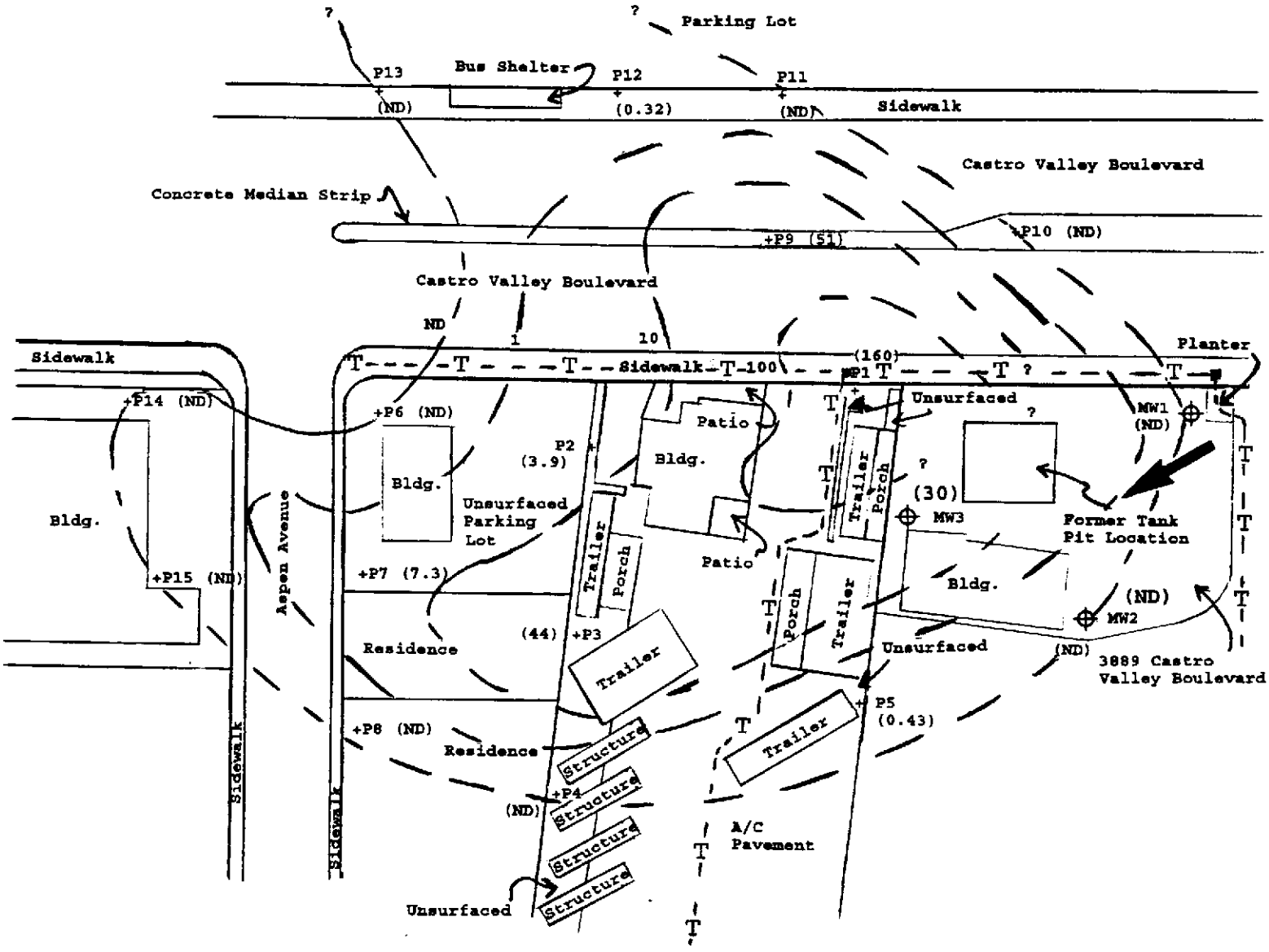
Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 7
SITE VICINITY MAP
Showing Underground Utility Trenches for Sanitary Sewer Lines
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

Depth?

P & D ENVIRONMENTAL
A Division of Paul H. King, Inc.
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



LEGEND

--T-- Telephone Lines

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

0 30 60

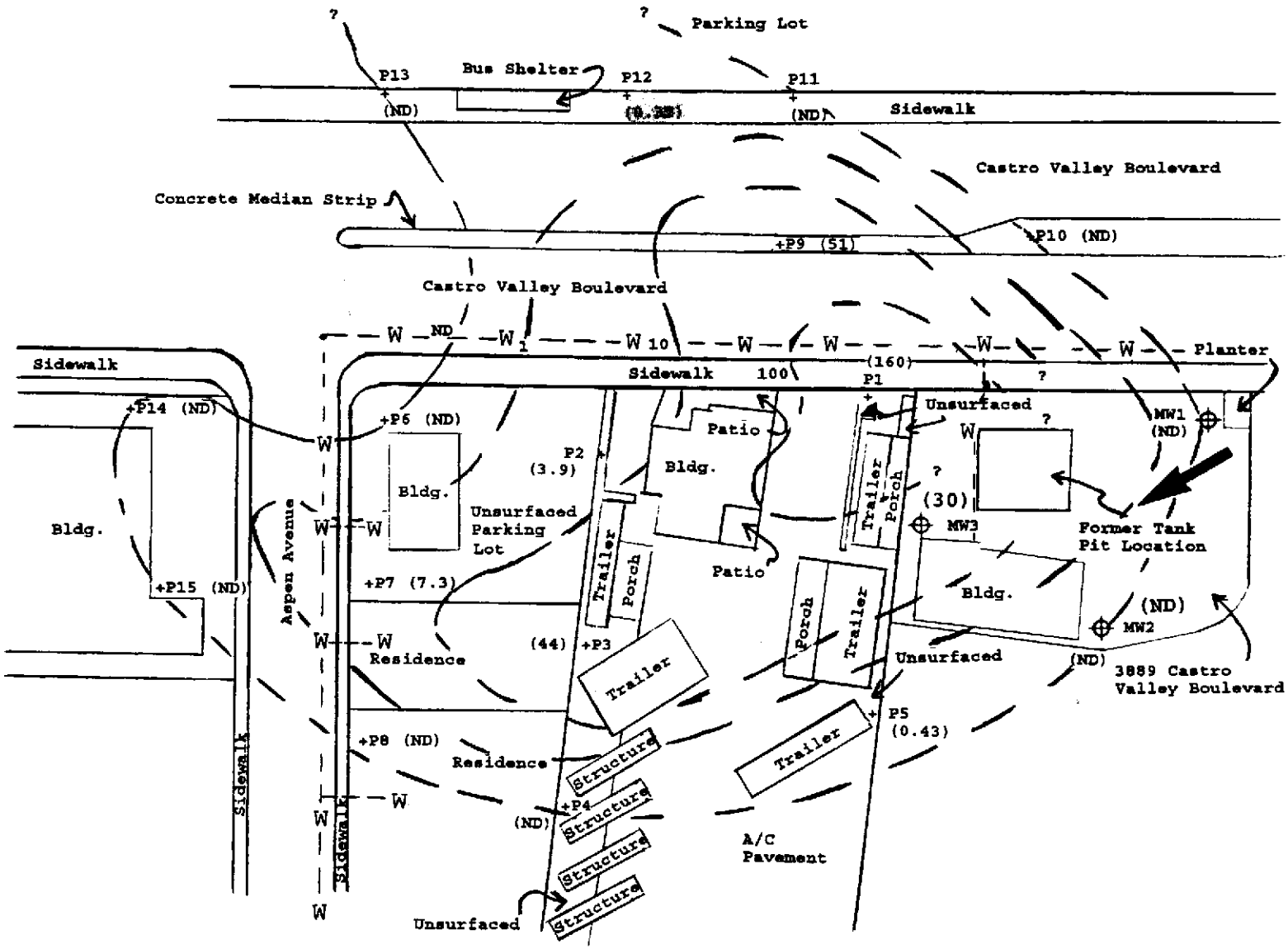
Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 8
SITE VICINITY MAP
Showing Underground Utility Trenches for [redacted] VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

P & D Environmental

A Division of Paul H. King, Inc.
4020 Panama Court
Oakland, CA 94611
(510) 658-6916



LEGEND

--W-- Water Lines

(30) ⊕ Existing Groundwater Monitoring Well and TPH-Gasoline Concentration in ppm on April 25, 1997.

(160) + Groundwater Grab Sample Collection Location and TPH-Gasoline Concentration on June 9, 1995 (P1-P5), November 17, 1995 (P6-P10), and August 8 and 9, 1996 (P11-P15)

Groundwater Isoconcentration Contour for TPH-Gasoline in ppm

Groundwater Flow Direction on April 25, 1997

North

0 30 60

Scale in Feet

Base Map From
P&D Environmental
October, 1993
January, 1995
June, 1995
Prepared Using a
Rolatape

Figure 9
SITE VICINITY MAP
Showing Underground Utility Trenches for Water Lines
VIP Service
3889 Castro Valley Blvd.
Castro Valley, California

Appendix B

TABLES

TABLE 1

SUMMARY OF LABORATORY ANALYTICAL RESULTS
FUEL TANK PIT SOIL SAMPLES FOLLOWING OVER-EXCAVATION
(Samples Collected on October 19, 1993)

Sample No.	TPH-G	Benzene	Toluene	Ethyl-benzene	Total Xylenes
TP1-10.0	120	4.6	3.0	1.6	8.9
TP2-10.0	210	1.8	1.7	27	15
TP3-10.0	1,800	23	68	27	160
TP4-10.0	750	13	46	15	87
TP5-10.0	1,300	13	63	17	110
TP6-10.0	980	6.7	22	18	109
TP7-10.0	3,200	24	220	80	430
TP8-10.0	33	0.064	0.090	0.13	0.24

NOTE:

TPH-G = Total Petroleum Hydrocarbons as Gasoline.
Results are in parts per million (ppm), unless otherwise indicated.

TABLE 2

WELL MONITORING DATA

Well No.	Date Monitored	Top of Casing Elev. (ft.)	Depth to Water (ft.)	Water Table Elev. (ft.)
MW1	04/25/97	180.83	8.37	172.46
	01/31/97		7.62	173.21
	07/19/96		8.81	172.02
	04/23/96		8.17	172.66
	01/17/96		9.66	171.17
	10/26/95		10.00	170.83
	08/15/95		9.23	171.60
	05/02/95		8.56	172.27
	01/30/95		9.50	171.33
	10/31/94		11.55	169.28
	07/29/94		10.86	169.97
	04/25/94		10.70	170.13
	11/16/93		11.63	169.20
	11/12/93*		11.53	169.30
MW2	04/25/97	179.70	8.10	171.60
	01/31/97		7.22	172.48
	07/19/96		8.57	171.13
	04/23/96		7.85	171.85
	01/17/96		8.94	170.76
	10/26/95		9.68	170.02
	08/15/95		8.91	170.79
	05/02/95		8.17	171.53
	01/30/95		8.68	171.02
	10/31/94		10.99	168.71
	07/29/94		10.34	169.36
	04/25/94		10.04	169.66
	11/16/93		11.10	168.60
	11/12/93*		10.95	168.75
MW3	04/25/97	178.98	7.99	170.99
	01/31/97		7.30	171.68
	07/19/96		8.42	170.56
	04/23/96		7.76	171.22
	01/17/96		8.61	170.37
	10/26/95		9.39	169.59
	08/15/95		8.62	170.36
	05/02/95		8.04	170.94
	01/30/95		8.46	170.52
	10/31/94		10.58	168.40
	07/29/94		10.03	168.95
	04/25/94		9.64	169.34
	11/16/93		10.63	168.35
	11/12/93*		10.66	168.32

NOTES:

Elevations are in feet Mean Sea Level.
ft. = Feet.
* = Depth to water measurements prior to groundwater monitoring well development.

TABLE 3

GROUNDWATER
LABORATORY ANALYTICAL RESULTS

Sample Location	TPH-D	TPH-G	Benzene	Toluene	Ethyl-benzene	Xylenes
			Samples Collected on April 25, 1997			
MW1	NA	NA	NA	NA	NA	NA
MW2	NA	NA	NA	NA	NA	NA
MW3+	NA	30	5.3	0.52	0.95	3.0
			Samples Collected on January 31, 1997			
MW1	NA	ND	ND	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3++	NA	5.5	1.6	0.10	0.19	0.41
			Samples Collected on July 19, 1996			
MW1	NA	NA	NA	NA	NA	NA
MW2	NA	NA	NA	NA	NA	NA
MW3+++	NA	18	4.8	0.61	0.76	2.8

NOTES:

TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
ND = Not Detected.
NA = Not Analyzed.
+ = In MW3, MTBE was not detected; EPA Method 8010 compounds were not detected except for 0.012 ppm 1,2 Dichloroethane; and EPA Method 8270 compounds were not detected except for Phenol, 4-Methylphenol, 2,4-Dimethylphenol, Naphthalene, and 2-Methylnaphthalene which were detected at concentrations of 0.0028, 0.0024, 0.0028, 0.066 ppm, and 0.015 ppm, respectively.
++ = In MW3, MTBE was detected at a concentration of 0.063 ppm; EPA Method 8010 compounds were not detected except for 0.014 ppm 1,2 Dichloroethane; and EPA Method 8270 compounds were not detected except for Phenol, 2,4-Dimethylphenol, Naphthalene, and 2-Methylnaphthalene which were detected at concentrations of 0.0094, 0.0028, 0.031, and 0.0048 ppm, respectively.
+++ = In MW3, EPA Method 8010 compounds were not detected; EPA Method 8270 compounds were not detected except for 0.0022 ppm 2,4-Dimethylphenol, 0.1 ppm Naphthalene, and 0.022 ppm 2-Methylnaphthalene. The EPA Method 8020 showed that MTBE was detected in MW3 at a concentration of 0.21 ppm.
Results are in parts per million (ppm), unless otherwise specified.

TABLE 3

GROUNDWATER
LABORATORY ANALYTICAL RESULTS
(Continued)

Sample Location	TPH-D	TPH-G	Benzene	Toluene	Ethyl-benzene	Xylenes
			Samples Collected on April 23, 1996			
MW1	NA	ND	ND	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3++++	NA	9.7	2.9	0.17	0.38	0.68
			Samples Collected on January 17, 1996			
MW1	NA	NA	NA	NA	NA	NA
MW2	NA	NA	NA	NA	NA	NA
MW3+++++	NA	21	4.1	0.37	0.52	1.5
			Samples Collected on October 26, 1995			
MW1@	NA	ND	ND	ND	ND	ND
MW2@	NA	ND	ND	ND	ND	ND
MW3@	NA	19	4.0	0.48	0.64	1.8

NOTES:

TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
ND = Not Detected.
NA = Not Analyzed.
++++ = In MW3, EPA 8010 compounds were not detected except for 0.0051 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for Naphthalene and Phenol which were detected at concentrations of 0.056 and 0.025 ppm, respectively. The EPA Method 8020 results showed that MTBE was not detected in MW1 or MW2, and was detected in MW3 at a concentration of 0.15 ppm.
+++++ = In MW3, EPA 8010 compounds were not detected except for 0.011 ppm 1,2 Dichloroethane; EPA 8270 compounds were not detected except for 0.0022 ppm Phenol, 0.0051 ppm 4-Methylphenol, 0.0029 ppm 2,4-Dimethylphenol, 0.032 ppm Naphthalene, and 0.010 ppm 2-Methylnaphthalene.
@ = In MW3, EPA 8010 compounds were not detected except for 0.011 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for 0.043 ppm Naphthalene. The EPA Method 8020 results showed that MTBE was not detected in MW1 or MW2, and was detected in MW3 at a concentration of 0.24 ppm.
Results are in parts per million (ppm), unless otherwise specified.

TABLE 3

GROUNDWATER
LABORATORY ANALYTICAL RESULTS
(Continued)

Sample Location	TPH-D	TPH-G	Benzene	Toluene	Ethyl-benzene	Xylenes
			Samples Collected on August 15, 1995			
MW1	NA	NA	NA	NA	NA	NA
MW2	NA	NA	NA	NA	NA	NA
MW3@@	NA	7.0	2.4	0.23	0.26	0.73
			Samples Collected on May 2, 1995			
MW1	NA	ND	ND	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3@@@	0.84	18	5.4	0.39	0.65	1.7
			Samples Collected on January 30, 1995			
MW1	NA	ND	ND	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3@@@@	0.70	24	7.6	0.35	0.90	2.2

NOTES:
TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
ND = Not Detected.
NA = Not Analyzed.
@@ = EPA 8010 compounds were not detected except for 0.0091 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for 0.003 ppm 4-Methylphenol, 0.005 ppm 2,4-Dimethyl Phenol, 0.019 ppm Naphthalene, and 0.003 ppm 2-Methylnaphthalene.
@@@ = Review of the laboratory report and discussions with the laboratory indicate that the results reported as TPH-D are gasoline-range compounds. EPA 8010 compounds not detected except for 0.014 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for 0.010 ppm 2-Methyl naphthalene and 0.062 ppm Naphthalene.
@@@@= Review of the laboratory report and discussions with the laboratory indicate that the results reported as TPH-D are gasoline-range compounds. EPA 8010 compounds not detected except for 0.018 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for 0.014 ppm 2-Methyl naphthalene and 0.11 ppm Naphthalene.
Results are in parts per million (ppm), unless otherwise specified.

TABLE 3

GROUNDWATER
LABORATORY ANALYTICAL RESULTS
(Continued)

Sample Location	TPH-D	TPH-G	Benzene	Toluene	Ethyl-benzene	Xylenes
			Samples Collected on October 31, 1994			
MW1	NA	ND	ND	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3@@@@@	0.60	8.7	2.6	0.26	0.32	0.92
			Samples Collected on July 29, 1994			
MW1	NA	ND	0.0012	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3#	0.67	6.3	2.0	0.13	0.22	0.52
			Samples Collected on April 25, 1994			
MW1	ND	ND	ND	ND	ND	ND
MW2	ND	ND	ND	ND	ND	ND
MW3##	2.1	17	4.8	0.47	0.29	1.6

NOTES:

TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
ND = Not Detected.
NA = Not Analyzed.
@@@@@= Review of the laboratory report and discussions with the laboratory indicate that the results reported as TPH-D are gasoline-range compounds. EPA 8010 compounds not detected except for 0.019 ppm 1,2-Dichloroethane; EPA 8270 compounds were not detected except for 0.008 ppm 2-Methyl naphthalene, 0.047 ppm Naphthalene, and 0.002 ppm Bis(2-Ethylhexyl) Pthalate.
= Review of the laboratory report and discussions with the laboratory indicate that the results reported as TPH-D are gasoline-range compounds. EPA 8010 compounds not detected except for 0.0077 ppm 1,2-Dichloroethane; EPA 8270 compounds not detected except for 0.008 ppm 2-Methylnaphthalene and 0.044 ppm Naphthalene.
= Review of the laboratory report and discussions with the laboratory indicate that the results reported as TPH-D are gasoline-range compounds. EPA 8010 compounds not detected except for 0.28 ppm 1,2-Dichloroethane; EPA 8270 compounds not detected except for 0.013 ppm 2-Methylnapthalene and 0.084 ppm Naphthalene.
Results are in parts per million (ppm), unless otherwise specified.

TABLE 3

GROUNDWATER
LABORATORY ANALYTICAL RESULTS
(Continued)

Sample Location	TPH-D	TPH-G	Benzene	Toluene	Ethyl-benzene	Xylenes
			Samples Collected on November 16, 1993			
MW1	NA	ND	0.0022	ND	ND	ND
MW2	NA	ND	ND	ND	ND	ND
MW3###	NA	12	3.3	0.66	0.24	1.6

NOTES:

TPH-D = Total Petroleum Hydrocarbons as Diesel.
TPH-G = Total Petroleum Hydrocarbons as Gasoline.
ND = Not Detected.
NA = Not Analyzed.
= TRPH not detected; EPA 8010 compounds not detected except for 0.027 ppm 1,2-Dichloroethane; EPA 8270 compounds not detected except for 0.009 ppm Phenol, 0.006 ppm Benzyl Alcohol, 0.006 2-Methylphenol, 0.007 ppm 2,4-Dimethylphenol, 0.088 ppm Benzoic Acid, 0.042 ppm Naphthalene, and 0.015 ppm 2-Methylnapthalene.
Results are in parts per million (ppm), unless otherwise specified.

TABLE 4

GROUNDWATER GRAB SAMPLE
SUMMARY OF LABORATORY ANALYTICAL RESULTS

Location No.	TPH-G	MTBE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
			Samples Collected on June 9, 1995			
P1	160	NA	27	27	3.5	18
P2	3.9	NA	0.026	0.0054	0.034	0.029
P3	44	NA	2.6	2.9	2.2	7.5
P4	ND	NA	ND	ND	ND	ND
P5	0.43	NA	0.040	0.0012	0.0081	0.0028
			Samples Collected on November 17, 1995			
P6	ND	0.017	ND	ND	ND	ND
P7	7.3	0.067	ND	0.0077	0.010	0.0069
P8	ND	ND	ND	ND	ND	ND
P9	51	0.25	2.0	1.5	1.9	8.8
P10	ND	ND	ND	ND	ND	ND

NOTE:

TPH-G = Total Petroleum Hydrocarbons as Gasoline.
TPH-D = Total Petroleum Hydrocarbons as Diesel.
ND = Not Detected.
NA = Not Analyzed.
Results in parts per million (ppm), unless otherwise indicated.

TABLE 4

GROUNDWATER GRAB SAMPLE
SUMMARY OF LABORATORY ANALYTICAL RESULTS
(Continued)

Location No.	TPH-G	MTBE	Benzene	Toluene	Ethyl-benzene	Total Xylenes
			Samples Collected on August 8 and 9, 1996			
P11	ND	ND	ND	ND	ND	ND
P12	0.32	0.03	ND	ND	ND	ND
P13	ND	ND	ND	ND	ND	ND
P14	ND	ND	ND	ND	ND	ND
P15	ND	ND	ND	ND	ND	ND

NOTE:

TPH-G = Total Petroleum Hydrocarbons as Gasoline.
TPH-D = Total Petroleum Hydrocarbons as Diesel.
ND = Not Detected.
NA = Not Analyzed.
Results in parts per million (ppm), unless otherwise indicated.

TABLE 5

SOIL SAMPLE TOTAL ORGANIC CARBON
SUMMARY OF LABORATORY ANALYTICAL RESULTS
(Samples Collected on August 8, and 9, 1996)

Location No.	TOC
P11-7.0	7,600
P13-7.0	3,800
P14-7.0	3,300
P15-7.0	4,200
P11-11.0	5,000
P13-11.0	4,500
P14-11.0	4,400
P15-11.0	4,800

0.76 %

NOTE:

TOC = Total Organic Carbon.
Results in parts per million (ppm), unless otherwise indicated.

TABLE 6

SOIL SAMPLE MOISTURE CONTENT AND DRY DENSITY
SUMMARY OF LABORATORY ANALYTICAL RESULTS
(Samples Collected on August 8, and 9, 1996)

Location No.	Percent Moisture	Dry Density
P11-7.0	22.6	82.5
P12-7.0	18.0	97.5
P13-7.0	18.4	85.2
P14-7.0	17.8	89.1
P15-7.0	17.9	102.0

NOTE:

Dry density results are in pounds per cubic foot.

Appendix C

Exposure Control Flowchart

Default Parameter Tables

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: VIP Service | Job Identification: 47 | Software: GSI RBCA Spreadsheet
Site Location: 3889 Castro Valley Boulevard | Date Completed: 11/27/96 | Version: v 1.0
Completed By: PAUL H. KING

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2*yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	TRUE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
GW.v	Volatilization to Outdoor Air	FALSE	TRUE	
GW.b	Vapor Intrusion to Buildings	FALSE	TRUE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	FALSE	TRUE	
SS.v	Volatiles and Particulate Inhalation	FALSE	FALSE	FALSE
SS.d	Direct Ingestion and Dermal Contact	FALSE	FALSE	FALSE
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	
S.b	Intrusion to Buildings - Subsurface Soils	FALSE	TRUE	

Matrix of Receptor Distance and Location on- or off-site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	***1.0E-05***	
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	1	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm^2)	***3.7E+06***		
W	Length of affected soil parallel to wind (cm)	***1.4E+03***		
W.gw	Length of affected soil parallel to groundwater (c	***1.4E+03***		
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02		
delta	Air mixing zone height (cm)	2.0E+02		
Lss	Definition of surficial soils (cm)	1.0E+02		
Pe	Particulate areal emission rate (g/cm^2/s)	2.2E-10		

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	2.5E+03
Ugw.tr	Groundwater Transport velocity (cm/yr)	6.6E+03
Ks	Saturated Hydraulic Conductivity(cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***6.1E+00***		
hv	Vadose zone thickness (cm)	***2.6E+02***		
rhb	Soil density (g/cm^3)	***1.45***		
foc	Fraction of organic carbon in vadose zone	0.01		
phi	Soil porosity in vadose zone	0.38		
Lgw	Depth to groundwater (cm)	***2.6E+02***		
Ls	Depth to top of affected soil (cm)	***2.3E+02***		
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+01***		
pH	Soil/groundwater pH	***7.3***		
		capillary	vadose	foundation
phi.w	Volumetric water content	0.342	0.12	0.12
phi.a	Volumetric air content	0.038	0.26	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

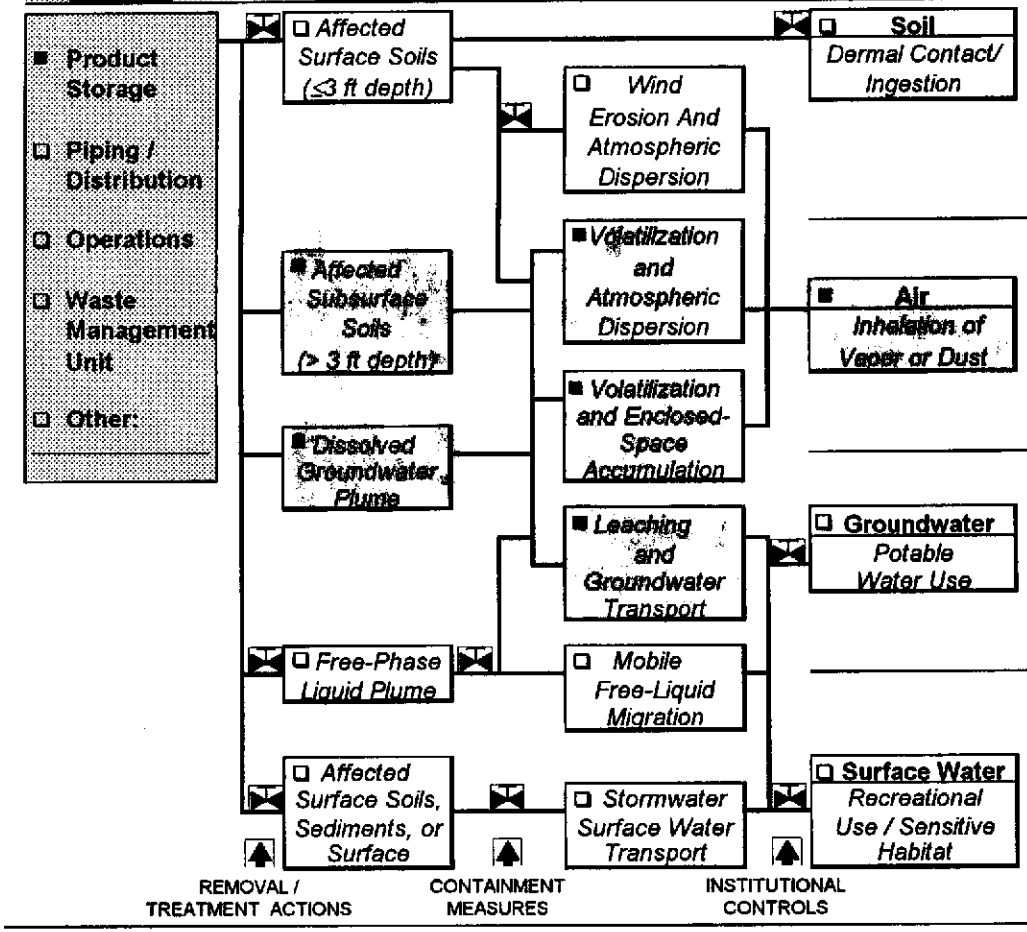
Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)		
ay	Transverse dispersion coefficient (cm)		
az	Vertical dispersion coefficient (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

Site Name: Date Completed:

Site Location: Completed By:

EXPOSURE CONTROL FLOWCHART

Instructions: *Identify remedial measures to be implemented to prevent exposure, as follows:* • Step 1 – *Baseline Exposure: Identify applicable sources, transport mechanisms, and receptors as shown on Worksheet 4.2 (■ = applicable to site).* • Step 2 – *Remedial Measures: Fill in shut-off valves (⋈) to indicate removal / treatment action, containment measure, or institutional controls to be used to "shut off" exposure pathway.* • Step 3 – *Remedial Technology Options: For each complete pathway, identify category of corrective measure to be applied and list possible technology options in space provided (see options list in RBCA Guidance Manual).*



POTENTIAL RECEPTORS

Exposed Receptors

On-Site: □ Residential □ Non-Resid. □ N/A □ Sensitive □ Recreation Habitat

Off-Site: □ Residential □ Non-Resid. □ N/A □ Sensitive □ Recreation Habitat

Exposed Persons

On-Site: ■ Residential ■ Non-Resid. □ N/A

ff-ite: ■ Residential □ Non-Resid. □ N/A

Groundwater Users

On-ite: □Residential □ Non-Resid. □ N/A

ff-ite: □Residential □ Non-Resid. □ N/A

Surface Water Users

n-Site: □ Residential □ Non-Resid. □ N/A □ Sensitive □ Recreation Habitat

ff-Site: □ Residential □ Non-Resid. □ N/A □ Sensitive □ Recreation Habitat

REMEDIAL ACTION TECHNOLOGY OPTIONS

□ Complete Pathway: ○ *Current* ○ *Potential*

⋈ Action Required: □Yes □

If yes, list technology options for ⋈

Complete Pathway: ○ *Current* [redacted]

⋈ Action Required: □Yes □

If yes, list technology options for ⋈

□ Complete Pathway: ○ *Current* ○ *Potential*

⋈ Action Required: □Yes □

If yes, list technology options for ⋈

□ Complete Pathway: ○ *Current* ○ *Potential*

⋈ Action Required: □Yes □

If yes, list technology options for ⋈

(■ OR ● OR ⋈ TO SELECT)

Appendix D

SSTL Results From Tier 2 Calculations

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results for Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" if yes	Only if "yes" left
71-43-2	Benzene	2.7E+1	NA	NA	NA		NA	8.1E-1		NA	2.3E+2	8.1E-1	■	3.3E+01
100-41-4	Ethylbenzene	3.5E+0	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1
108-88-3	Toluene	2.7E+0	NA	NA	NA		NA	9.3E+1		NA	>Sol	9.3E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	1.8E+0	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-395-JOX-552

Region # 1

CRF = Cumulative Risk Factor
i.e., additive pathways

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 9.2**

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

Target Risk (Class A & B) 1.0E-5
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: 0 feet	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.4E+1		NA	NA	NA		NA	[redacted]		>Res	>Res	6.1E+0	■	[redacted]
100-41-4	Ethylbenzene	8.0E+1		NA	NA	NA		NA	>Res		>Res	>Res	>Res	☐	<1
108-88-3	Toluene	2.2E+2		NA	NA	NA		NA	7.2E+2		>Res	>Res	7.2E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	4.3E+2		NA	NA	NA		NA	>Res		>Res	>Res	>Res	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-395-JOX-552

Region #1

RBCA SITE ASSESSMENT | Tier 2 Worksheet 9.3

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-6
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.6E+0	NA	NA	NA		2.6E-2	NA		2.1E+1	NA	2.6E-2	■	1.0E+02
100-41-4	Ethylbenzene	2.2E+0	NA	NA	NA		8.5E+1	NA		>Sol	NA	8.5E+1	☐	<1
108-88-3	Toluene	2.9E+0	NA	NA	NA		3.6E+1	NA		>Sol	NA	3.6E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	7.5E+0	NA	NA	NA		>Sol	NA		>Sol	NA	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-395-JOX-552

Region #2

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 9.2**

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-6
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0	NA	NA	NA		1.2E-1	NA		1.5E+2	NA	1.2E-1	☐	<1
100-41-4	Ethylbenzene	0.0E+0	NA	NA	NA		>Res	NA		>Res	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0	NA	NA	NA		1.7E+2	NA		>Res	NA	1.7E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	NA	NA		>Res	NA		>Res	NA	>Res	☐	<1

Software: GSI RBCA Spreadsheet Serial: G-395-JOX-552
Version: v 1.0

Region #2

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-6
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	3.3E-2	NA	NA	NA		2.6E-2	NA		2.0E+1	NA	2.6E-2	■	1.0E+00
100-41-4	Ethylbenzene	2.1E-2	NA	NA	NA		8.4E+1	NA		>Sol	NA	8.4E+1	☐	<1
108-88-3	Toluene	3.3E-3	NA	NA	NA		3.5E+1	NA		>Sol	NA	3.5E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	1.5E-2	NA	NA	NA		>Sol	NA		>Sol	NA	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-395-JOX-552

Region #3

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 9.2**

Site Name: VIP Service
Site Location: 3889 Castro Valley Boulevard

Completed By: PAUL H. KING
Date Completed: 11/27/1996

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-6
Target Hazard Quotient 1.0E+0

■ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option:

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0	NA	NA	NA		2.3E-1	NA		3.1E+2	NA	2.3E-1	☐	<1
100-41-4	Ethylbenzene	0.0E+0	NA	NA	NA		>Res	NA		>Res	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0	NA	NA	NA		3.3E+2	NA		>Res	NA	3.3E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	NA	NA		>Res	NA		>Res	NA	>Res	☐	<1

Software: GSI RBCA Spreadsheet Serial: G-395-JOX-552
Version: v 1.0

Region #3