VAPOR EXTRACTION REMEDIAL DESIGN REPORT AND SPECIFICATIONS

PACIFIC SUPPLY COMPANY
OAKLAND, CALIFORNIA

MAY 24 '93

1735 24TH STREET
OAKLAND, CALIFORNIA 94623

MAY 24, 1993

BACE ENVIRONMENTAL PROJECT NO. 29.9

BACE Environmental
A Division Of
Brunsing Associates, Inc.

May 24, 1993 29.9

Ms. Jennifer Eberle
Alameda County Health Care Services Agency,
Department of Environmental Health, Hazardous Materials Program
80 Swan Way, Room 200
Oakland, California 94621

RE: VAPOR EXTRACTION REMEDIAL DESIGN AND SPECIFICATIONS
PACIFIC SUPPLY COMPANY, STID 3826
OAKLAND, CALIFORNIA

Dear Ms. Eberle:

This document has been prepared by BACE Environmental, a division of Brunsing Associates, Inc. (BAI) to comply with a December 1, 1992 request from the Alameda County Health Care Services Agency (ACHCSA). The agency has requested that a remedial design be prepared to address the removal of petroleum hydrocarbons in the shallow subsurface at the Pacific Supply Company, a division of Pacific Coast Building Products, located at 1735 24th Street, Oakland, California as shown on Figure 1. Additionally, an investigation report of findings also prepared by BAI has been submitted to the ACHCSA under separate cover dated May 24, 1993 which addresses the lateral and vertical distribution of petroleum hydrocarbons in the shallow on-site subsurface soils. The engineering assumptions incorporated into this remedial design have been derived from on-site and off-site data obtained from investigations performed during the period between October 1988 through March 1993 in addition to the on-going quarterly groundwater monitoring.

The component parts of the vapor extraction and treatment system including background, regulatory permitting, sampling plan and schedule are addressed below in the following sections.

1.0 BACKGROUND

In May 1987 the Pacific Supply Company removed a 500-gallon underground storage tank (UST) from the location adjacent to the north gate entrance to the Pacific Supply Company storage yard identified on Figure 2. Gas chromatography analyses of soil and soil vapor samples from exploratory borings at the site indicated that soils in the vicinity of the former UST contained various levels of light petroleum hydrocarbons as gasoline. An initial Phase I investigation was performed in September 1988 to determine the lateral extent of hydrocarbons in the soils and groundwater. As part of the Phase I investigation five on-site monitoring wells (MW-1 through MW-5) were installed at the locations indicated on Figure 2 to an approximate depth of 20 feet below existing grade. Soil and groundwater samples were obtained for analyses of Total Petroleum Hydrocarbons as gasoline (TPHg), Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) and organic lead. A Phase II investigation was performed the following year in December 1989 in which two off-site groundwater monitoring wells (MW-6 and MW-7) were installed at the locations indicated on Figure 2. The results of the Phase I and II investigations indicated that light petroleum had migrated beyond the immediate vicinity of the former UST; however, it was concluded that hydrocarbons in the soil and groundwater had not extended beyond the limits of the property.

The Pacific Supply Company initiated quarterly groundwater monitoring at the request of the ACHCSA in May 1992. Initially, only on-site wells were monitored for TPHg, BTEX and Lead. Presently, the five on-site and the two off-site monitoring wells are being monitored quarterly for these constituents.

A vapor extraction pilot study was performed in June 1992 to determine the feasibility of using vapor extraction technology as an insitu corrective action to remove volatile petroleum hydrocarbons from the shallow subsurface soils. A two-inch diameter vapor extraction well (VEW-1) was installed at the location indicated on Figure 2 to an approximate depth of eight feet below existing grade. Vapor was extracted from this well over the course of the four day pilot study using an extraction and treatment system powered by an internal combustion engine, manufactured by Remediation Services, International (RSI). The results of the pilot study indicated that the lithology of the shallow fill soils at the site permitted the flow of air through the soils at a sufficient rate so as to volatilize hydrocarbon constituents in the soil. The radius of influence was determined in the field by measuring relative pressure at several probe locations positioned at various radial distances away from the extraction well, and verified analytically by solving the absolute pressure distribution equation for pressure as a function of distance from the point of extraction. The results indicated that the estimated radius of influence from a two-inch diameter extraction well was approximately 30 feet at a relatively low pressure of less than 50 inches of water [approximately 134 pounds per square foot (psf)].

B-2, B-3, B-9 } Soil samples taken below gw why?

The most recent investigation was performed on March 5, 1993 in response to the December 1, 1992 request from the ACHCSA for an investigation to delineate the zero line of soil contamination. Ten soil borings were drilled as part of this investigation to an approximate depth of seven to ten feet below existing grade. From each boring one soil sample was retained from a depth of approximately seven to eight feet below existing grade for analytical testing of TPHg, BTEX. The locations of the ten exploratory borings are shown on Figure 2, and the associated analytical results of the TPHg tests are provided on Figure 3. This investigation provided data on the lateral and vertical distribution of hydrocarbons in the shallow subsurface soils.

The data generated from the above investigations and groundwater monitoring have been documented in the following reports:

- Soil Investigation Report, Pacific Supply Company, Oakland, California, prepared by BAI, May 24, 1993.
- Report of Findings - Soil and Groundwater Investigation: Pacific Supply Company, Oakland, California, prepared by BAI, March 23, 1990.
- Report of Findings - Vapor Extraction Pilot Study, Pacific Supply Company, Oakland, California, prepared by BAI, November, 18, 1992.
- Quarterly Groundwater Monitoring Report: May 1992, prepared by BAI, July 19, 1992.
- Quarterly Groundwater Monitoring Report: September 1992, prepared by BAI, November 2, 1992.
- Quarterly Groundwater Monitoring Report: November 1992, prepared by BAI, January 19, 1993.
- Quarterly Groundwater Monitoring Report: March 1993, prepared by BAI, May 12, 1993.

2.0 HYDROCARBON PLUME DELINEATION

Figure 3 shows the lateral distribution of TPHg in the on-site shallow subsurface soils at an approximate depth of six to eight feet below existing grade based on the most recent data obtained from the May 24, 1993 Soil Investigation Report. Previous investigations have shown that the maximum concentration of hydrocarbons in the soil are in the unsaturated zone immediately above groundwater, currently

measured at approximately eight feet below existing grade. The contour lines shown on Figure 3 indicate that the maximum TPHg concentration soils mostly lie to the east and south of the former UST. Concentration contours range from a maximum of 5,000 milligrams per Kilogram (mg/Kg) to the minimum concentration contour of 10 mg/Kg. Analyses of soil samples obtained beyond the 10 mg/Kg concentration contour indicate nondetectable levels of petroleum hydrocarbons as shown on Figure 3.

Within the area confined by the 10 mg/Kg concentration contour, the concentration of light petroleum hydrocarbons in the shallow groundwater varies from a low concentration of nondetect at monitoring well MW-1 to a high concentration of 4.3 milligrams per Liter (mg/L) at MW-2. These results are consistent with previous analytical testing of groundwater samples from monitoring wells MW-1, MW-2, and MW-3 which have shown that the highest TPHg and BTEX concentrations in groundwater samples have been detected at monitoring well MW-2. A summary of all available analytical results of groundwater samples obtained from monitoring wells MW-1 through MW-7 through the most recent analytical groundwater sampling in March 1993 are provided on Table 1.

Groundwater samples from on-site wells outside of the 10 mg/Kg concentration contour were obtained from monitoring wells MW-4 and MW-5. The results from monitoring well MW-4 have shown consistently low TPHg concentrations between 0.5 and 0.2 mg/L since the December 1989 sampling. Groundwater samples from monitoring well MW-5 has indicated nondetectable concentrations of TPHg and BTEX since the December 1989 sampling.

Groundwater samples obtained from off-site monitoring well MW-6 during two monitoring episodes in December 1989 and March 1993 indicate relatively low concentrations of TPHg (1.1 and 2.3 mg/L, respectively) and BTEX [nondetect to 5.4 micrograms per Liter (µg/L)]. It is believed that the presence of petroleum hydrocarbons in groundwater samples from monitoring well MW-6 is the result of an off-site source not related to the UST removed from the Pacific Supply Company site. Similarly, groundwater samples obtained from off-site monitoring well MW-7 during the same two monitoring episodes of December 1989 and March 1993 indicate nondetectable concentrations of TPHg and BTEX.

The area delineated by the 10 mg/Kg concentration line on Figure 3 is the area targeted for soil vapor extraction. As presented above, this area contains the highest concentrations of petroleum hydrocarbons in both the shallow soil and groundwater.

3.0 VAPOR EXTRACTION SYSTEM LAYOUT

The vapor extraction system layout consists of a series of vapor recovery wells and a

subsurface collection system connecting the recovery wells to the treatment system.

3.1 VAPOR RECOVERY WELL DESIGN

The generalized vapor recovery well completion details are provided on Figure 4. Each of the nine proposed vapor recovery wells will be constructed of four-inch diameter PVC pipe to maximize vapor and groundwater recovery. Construction of each vapor recovery well will require drilling a 10-inch (nominal) diameter auger hole to an approximate depth of 15 feet below existing grade. From each vapor recovery well boring a minimum of one soil sample (obtained at a depth of approximately eight feet) and one groundwater sample will be retained for the baseline analyses of TPHg (EPA Method 5030/8015) and BTEX (EPA Method 8020). Each vapor recovery well will be developed and sampled prior to the construction of the collection system. Recovery well development will consist of bailing four to ten casing volumes of water from each well until temperature, pH and electrical conductivity have stabilized. All purge water will be contained in 55-gallon drums for either off-site disposal or on-site treatment and discharge.

The vapor recovery wells will be placed so as to provide a minimum of four feet of well screen above the saturated zone. The depth of each recovery well will vary, however is estimated that the depth of each well will be approximately 19 feet below grade based on a measurement of groundwater levels made in March 1993. The recovery wells will be used for both vapor and groundwater recovery based on the results on the 1992 vapor extraction pilot study. Groundwater can be extracted under the anticipated range of negative pressures generated from the vacuum pump at the treatment system. Each recovery well will be constructed to the specifications indicated on Figure 4. Each well will be secured by a flush mounted, traffic rated Christy box.

Each well will be fitted for a magnahelic pressure gauge which will measure relative pressure in inches of water.

3.2 COLLECTION SYSTEM

The layout of the vapor extraction and collection system is shown on Figure 5. There is a total nine vapor recovery wells (VRW-1 through VRW-9). The locations of these wells have been positioned based of the delineation of the hydrocarbon plume presented in Section 2.0 of this Report. An overlap redundancy of approximately 20 percent relative to the placement of each recovery well and its estimated 30-foot radius of influence is anticipated as shown on Figure 5.

A series of trenches will be excavated which will contain the collection pipes shown on Figure 5. Trenches will be sized in the field by the contractor prior to trench excavation to maximize the number of collection pipes possible and minimize the lineal feet of trench. Each trench shall be saw cut to achieve a clean straight line.

Trench width will be restricted to a maximum of two feet to reduce the load on the pipe. Spoils from the excavation will temporarily be placed adjacent to the trench to accommodate backfilling.

A two-inch diameter PVC collection pipe will connect each vapor recovery well to the central manifold within the treatment pad. Joints connecting sections of PVC pipe will be glued with PVC cement to create an air/water tight seal. Each run of collection pipe will be buried approximately two to three feet below existing grade. The design will allow each vapor recovery well to be operated independently of the other recovery wells, and allow for control at a centralized location. The collection pipe will be laid at the bottom of the trench in a fine grain granular subbase of no less than two inches below the pipe, extending to approximately six inches (minimum) above the pipe, with a minimum one percent grade sloping back towards the well. The granular soils shall fill all spaces under and adjacent to the pipe and shall be carefully tamped firm in thin layers prior to placing the compacted backfill. Above the collection pipe, excavation spoils will be compacted to a minimum of 90 percent relative compaction (ASTM D 1557 - 78) to within two inches of existing grade. New asphalt will be placed over the backfill to match existing.

Asphalt removed prior to trench excavation and excess soils remaining after trench compaction shall be removed from the site and disposed in an appropriate fashion.

4.0 TREATMENT SYSTEM DESIGN

4.1 TREATMENT PAD DESIGN

The vapor extraction treatment system and all the associated components will be secured by a contained treatment pad which measures approximately 20 feet by 20 feet as shown on Figure 6. The pad will be surrounded by a six-inch high asphalt containment berm and a six-foot high chain link fence. One double gate will open out into the storage yard and a second (single) gate will open on the east side to allow access to the trailer mounted treatment system. The pad will be wired for 110 volt power (minimum) to provide electrical power for the water level sensor, pumps, and any other electrical controls that may be added to the system in the future. A connection between the sanitary sewer collection system and the treatment system disharge line will be joined in the treatment pad. As a means to provide a supplemental fuel source after the initial high concentration of hydrocarbons in the soil vapor are vented, a connection to the Pacific Gas and Electric natural gas line or an existing propane gas holding tank will be required.

A small sump will be installed at the low point in the treatment pad to discharge stormwater runoff into the POTW.

4.2 VAPOR EXTRACTION TREATMENT SYSTEM DESIGN

A schematic flow diagram of the vapor recovery treatment system is provided on Figure 7. Taken from the central manifold where each of the nine vapor recovery wells are connected, a two-inch diameter PVC pipe connects the manifold to a 60 - gallon water knock out tank intended to separate vapor and groundwater. Groundwater will be pumped to a 1,000 gallon holding tank (volume approximate). Soil vapor will be routed from the water knock out tank to the RSI Spray Aeration Vacuum Extraction (SAVE) treatment system where it will initially provide 100 percent of the fuel requirement for the internal combustion engine where it will be burned as part of the normal combustion process as shown on Figure 7. Emissions from the engine are passed through a standard catalytic converter to further enhance hydrocarbon destruction prior to discharge to the atmosphere.

The fundamental groundwater treatment process incorporated into this phase of the remedial design involves the use of a the spray aeration and sparging tank which is part of the SAVE treatment system. As shown on Figure 7, groundwater stored in the holding tank will be pumped into the spray aeration and sparging tank which will separate hydrocarbons from the groundwater by sparging water at elevated temperatures. Groundwater leaving the spray aeration tank will then be routed to two 55-gallon activated carbon vessels arranged in parallel for a final polish before being discharged to the City of Oakland sewer collection system located along 24th Street. Limitations on the affluent waste stream will be regulated by the Public Owned Treatment Works (POTW) owned and operated by the East Bay Municipal Utility District (District).

The SAVE treatment system is designed to operate continuously around the clock. It is equipped with a water level sensor in the holding tank which will automatically shut the system down when the water in the holding tank reaches a specified level. When groundwater reaches a specified high water mark in the holding tank it will be routed into the spray aeration tank, treated and routed to the carbon vessels for polishing prior to discharge. Initially, the process of switching from the vapor phase to the liquid phase of treatment will be performed manually until it is determined what the rate of groundwater recovery will be. At that time this process can be modified to be automatic or remain manual. If it is determined that hydrocarbon concentrations in the groundwater are sufficiently low to eliminate the spray aeration process, groundwater can be routed directly to the activated carbon vessels for filtration and discharge.

5.0 PERMITTING

The vapor extraction treatment system intended for the Pacific Supply Company site requires permitting or authorization through the following regulatory agencies and utility companies:

- Alameda County Health Care Services Agency as the Lead Enforcement Agency for the San Francisco Bay Regional Water Quality Control Board: Design approval and well construction permit;
- Bay Area Air Quality Management District in accordance to the Rules and Regulations, Regulation 8, Rule 47: Air Stripping and Soil Vapor Extraction Operations;
- East Bay Municipal Utility District in accordance to Ordince No. 311 - Wastewater Discharge Permit to discharge treated groundwater into POTW;
- City of Oakland, Office of Planning and Building: Encroach permit and sewer hook-up permit;
- Pacific Gas and Electric: Direct connections to natural gas line and electrical service (optional).

The above environmental and construction regulatory agencies and utility companies will require permitting and/or authorization prior to the start-up of construction and the initiation of vapor and/or groundwater treatment and discharge. As of this date no permits have been taken out with any of the above organizations. The Pacific Supply Company anticipates that all permits and approvals will be obtained no later than June 25, 1993.

6.0 MONITORING PLAN

The Monitoring Plan addresses the monitoring of the vapor extraction treatment system and each individual vapor recovery well including the monitoring and sampling of treated affluent water prior to discharge.

6.1 FIELD MONITORING OF VAPOR RECOVERY WELLS AND TREATMENT SYSTEM

Each vapor recovery probe will be monitored daily for relative pressure, percent oxygen and hydrocarbon content (parts per million) of the vapor during the first week of operation, three times per week during weeks two and three , and twice per week thereafter. This data as well as maintenance and operational information will be recorded on a form shown in Appendix A. Additionally, a record of vacuum measurements, fuel flow, air flow, and well flow, and the quantity of the groundwater treated and discharged will be kept on separate forms provided in Appendix B.

A record of the hydrocarbon concentration and the relative pressure at each recovery well and miscellaneous existing on-site wells will be plotted relative to time to monitor system efficiency.

6.2 AFFLUENT MONITORING PLAN

The District regulates discharges of groundwater generated during site remediation. Discharge limits are applied for a specific contaminate based on the average background concentrations observed at the influent of the District's wastewater treatment plant. Typically, allowable afluent concentrations of hydrocarbons and metals associated with the release of gasoline would be approximately:

- Total Petroleum Hydrocarbon: No limit, not a specific contaminate;
- Metals: Varies according to specific metal;
- Benzene: 5 µg/L;
- Toluene: 7 µg/L;
- Ethylbenzene: 5 µg/L;
- Xylene: 8 µg/L.

In accordance with the East Bay Municipal Utility District's Ordinance No. 311, the Wastewater Discharge Permit to be issued to the Pacific Supply Company for the discharge of treated groundwater to the POTW would require the discharge to be monitored by both the District and the discharger. The District will determine the required monitoring frequency based on the following factors:

- Concentration of pollutants in the groundwater;
- Design capacity of treatment system;
- Level of preventative mainentance;
- Frequency of process control samples from the various treatment stages;
- Consistent compliance with discharge limits;
- Treatment systems which rely upon carbon adsorption must collect influent BTEX samples and use that information to continually update the estimated remaining carbon capacity.

It is anticaped that that treated affluent samples will be required the first day of operation, after the second anf fourth weeks of operation, and monthly thereafter. The Appendix B form should be used to track groundwater monitoring and sampling. The results of these tests are to be reported to District officials. Independently, a representative of the District will make an unannounced visit to the site to sample the affluent every quarter of operation.

7.0 SCHEDULE

The schedule for permitting, construction and monitoring are provided as Figure 8. As discussed in Section 5.0 the Pacific Supply Company will work towards obtaining all permits by June 25, 1993. It is the intention of the Pacific Supply Company to proceed with construction of the treatment system as soon as each individual permit is obtained. The schedule reflects the Pacific Supply Company's goal to bring the treatment system on line no later than July 9, 1993.

If you have any questions concerning the design of this system, schedule or permitting concerns, please call either Ms. Normita Callison, Environmental Specialist for Pacific Coast Building Products, at 916-971-2390 or Mike Velzy at 415 - 364-9031.

Respectfully submitted,

Michael E. Velzy
Project Manager

Thomas P. Brunsing
President, Principal Engineer, Ph.D., P.E. (Civil)

Enclosures:

Table 1:	Groundwater Analytical Data Summary
Figure 1:	Vicinity Map
Figure 2:	Site Plan
Figure 3:	Isopleth Map of TPH Gas Concentrations in Soil
Figure 4:	Vapor Recovery Well Details
Figure 5:	Vapor Recovery System Layout
Figure 6:	Treatment Pad Design
Figure 7:	Vapor Recovery Treatment System Flow Diagram
Figure 8:	Treatment System Schedule
Appendix A:	Monitoring and Maintenance Data Form
Appendix B:	Treatment System Monitoring Data Forms

cc: Rich Hiett, San Francisco Bay Regional Water Quality Control Board
Normita Callison, Pacific Coast Building Products
Tony DeJon, Pacific Supply Company

TABLE 1
GROUNDWATER ANALYTICAL DATA SUMMARY
PACIFIC SUPPLY COMPANY

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-1	10/14/88	1.1	1.1	ND	–	ND	–
MW-1	12/29/89	ND	ND	ND	ND	ND	ND (1)
MW-1	5/28/92	ND	ND	ND	ND	ND	0.003(2)
MW-1	9/3/92	ND	ND	ND	ND	ND	0.12 (2)
MW-1	11/24/92	ND	ND	ND	ND	ND	0.017 (2)
MW-1	3/9/93	ND	ND	ND	ND	ND	ND (1)

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-2	10/14/88	11	23	20	–	16	–
MW-2	12/29/89	4	200	6.7	ND	ND	0.22 (1)
MW-2	5/28/92	8.9	550	48	ND	13	ND (2)
MW-2	9/3/92	2.1	760	6.2	1.8	5.1	0.006 (2)
MW-2	11/24/92	4.2	370	15	3.4	9.5	ND (2)
MW-2	3/9/93	4.3	280	14	3.7	7.1	ND (1)

(1) Analysis Completed For Organic Lead
(2) Analysis Completed For Total Lead
ND = not detected
µg/L = micrograms per liter
mg/L = milligrams per liter

TABLE 1
GROUNDWATER ANALYTICAL DATA SUMMARY
PACIFIC SUPPLY COMPANY

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-3	10/14/88	3.4	ND	ND	–	2.8	–
MW-3	12/29/89	ND	ND	ND	ND	ND	.205 (1)
MW-3	5/28/92	ND	0.8	0.5	ND	ND	.016 (2)
MW-3	9/3/92	ND	ND	ND	ND	ND	0.033 (2)
MW-3	11/24/92	ND	ND	ND	ND	ND	0.011 (2)
MW-3	3/9/93	0.1	1.8	ND	ND	ND	ND (1)

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-4	10/14/88	4.6	1.2	ND	–	2.2	–
MW-4	12/29/89	0.5	0.7	ND	ND	ND	ND (1)
MW-4	5/28/92	0.27	8.8	1	ND	3.2	.030 (2)
MW-4	9/3/92	0.20	4.5	4.4	ND	1.9	0.022 (2)
MW-4	11/24/92	0.14	3.2	3.2	ND	1.0	0.005 (2)
MW-4	3/9/93	0.47	10	ND	ND	2.5	ND (1)

(1) Analysis Completed For Organic Lead
(2) Analysis Completed For Total Lead
ND = not detected
µg/L = micrograms per liter
mg/L = milligrams per liter

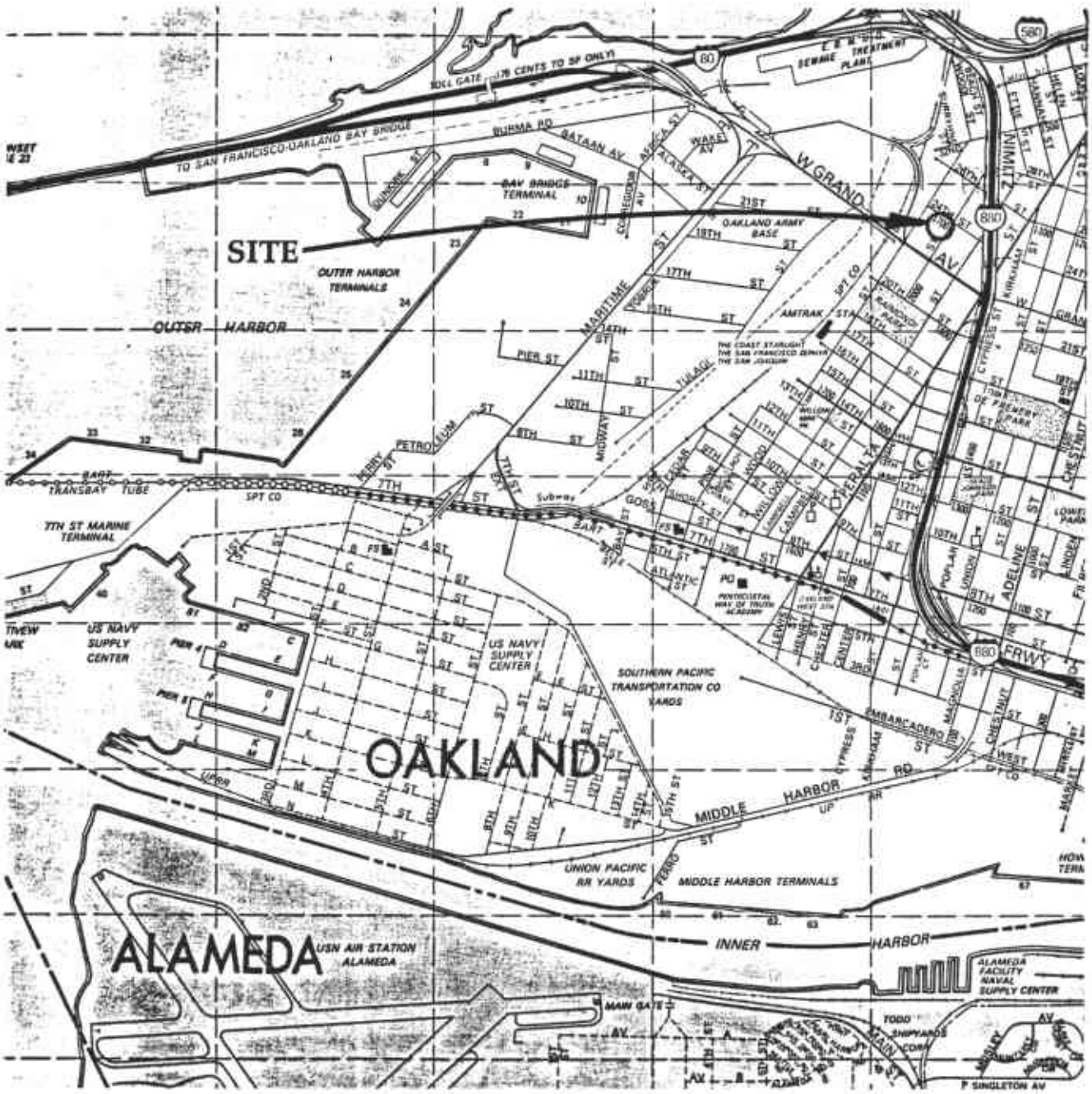
TABLE 1
GROUNDWATER ANALYTICAL DATA SUMMARY
PACIFIC SUPPLY COMPANY

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-5	10/14/88	3.2	ND	ND	–	ND	–
MW-5	12/29/89	ND	ND	ND	ND	ND	ND (1)
MW-5	5/28/92	ND	ND	ND	ND	ND	.008 (2)
MW-5	9/3/92	ND	ND	ND	ND	ND	0.034 (2)
MW-5	11/24/92	ND	ND	ND	ND	ND	0.011 (2)
MW-5	3/9/93	ND	ND	ND	ND	ND	ND (1)

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-6	12/29/89	1.1	5.4	4.5	ND	ND	ND (1)
MW-6	3/9/93	2.3	2.3	2.8	ND	3.1	ND (1)

Well Identification	Sampling Date	TPH (gasoline) mg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L	Lead mg/L
MW-7	12/29/89	ND	ND	ND	ND	ND	0.235 (1)
MW-7	3/9/93	ND	ND	ND	ND	ND	ND (1)

(1) Analysis Completed For Organic Lead
(2) Analysis Completed For Total Lead
ND = not detected
µg/L = micrograms per liter
mg/L = milligrams per liter



PACIFIC SUPPLY COMPANY DRAWING NO.: 29.9-1		
DRAWN BY:	MEV	5/5/93
APPROVED BY:	MEV	5/20/93
REVISION NO.:		

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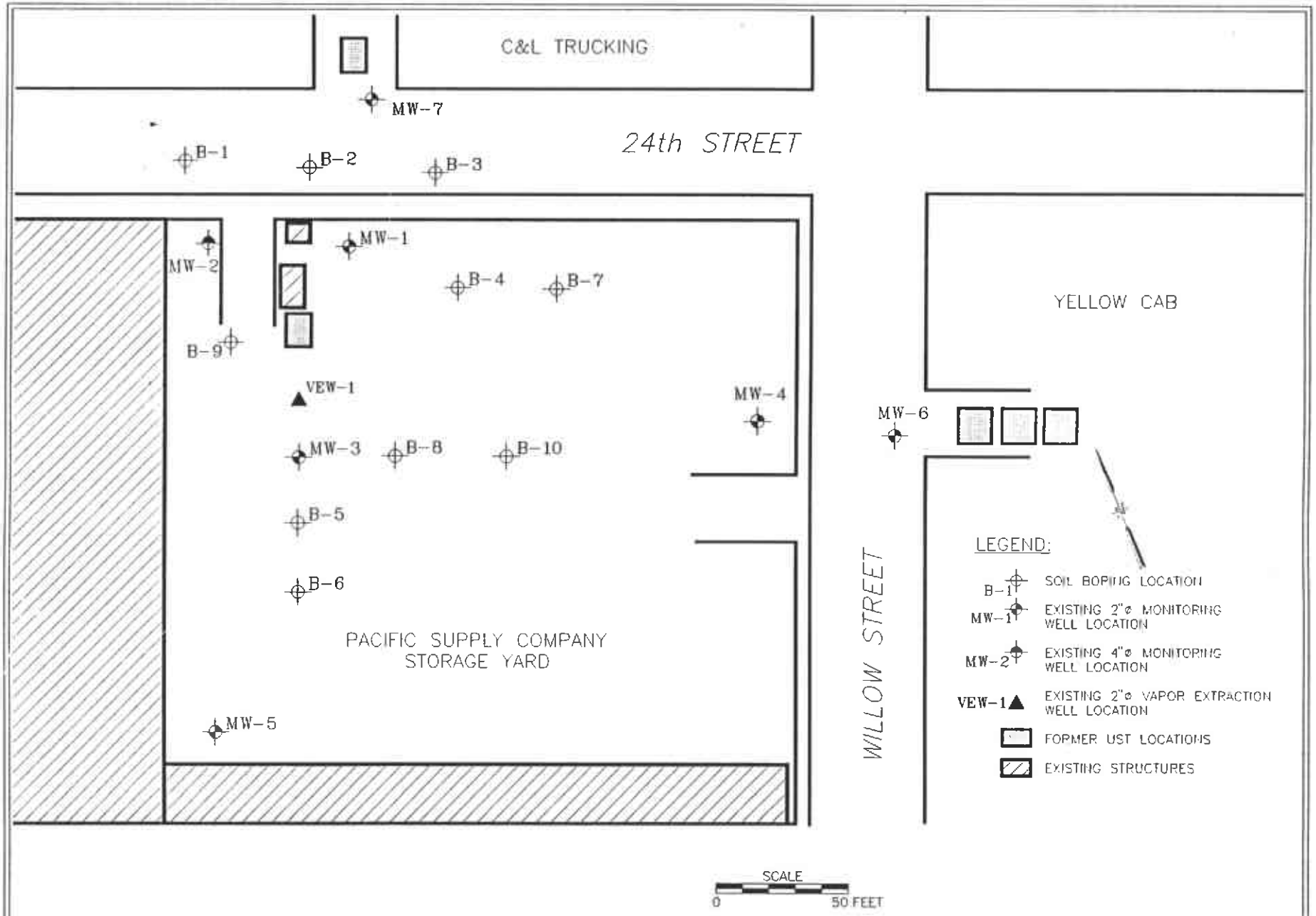
FIGURE 1
VICINITY MAP
PACIFIC SUPPLY COMPANY
OAKLAND, CALIFORNIA



DATE: 5-6-93	PROJECT NO.	29.9
CHECKED BY	MEV	5-7-93
APPROVED BY	MEV	5-7-93
DRAWN BY	-NG-	5-6-93
REV. △		

PACIFIC SUPPLY CO.
1735 24TH STREET
OAKLAND, CALIFORNIA

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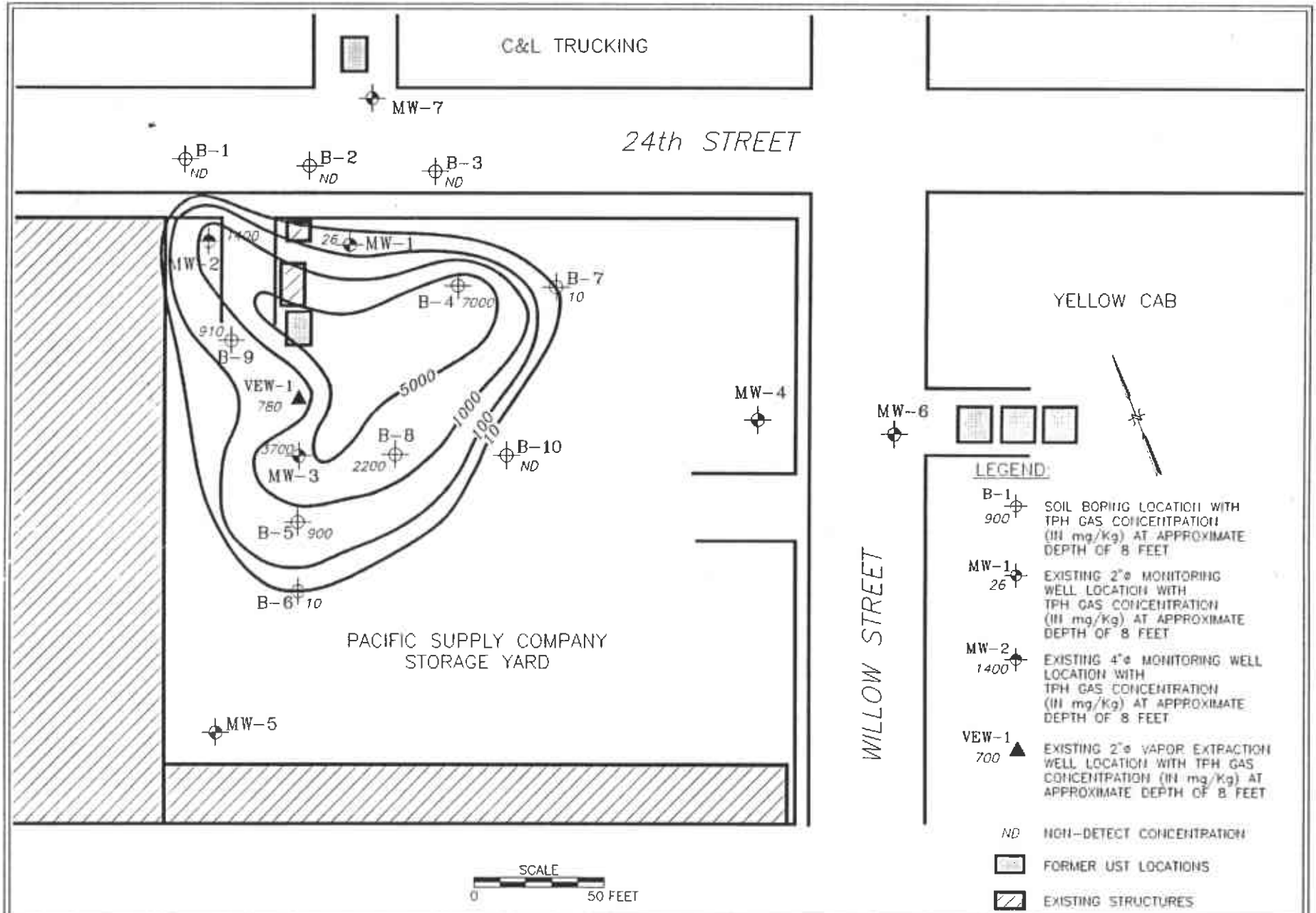
FIGURE 2
SITE PLAN

• Drawn By: ORTH GRAPHICS • San Mateo, California • (415) 572-8680 •



DATE: 5-6-93	PROJECT NO.	29.9
CHECKED BY	MEV	5-7-93
APPROVED BY	MEV	5-7-93
DRAWN BY	-NG-	5-6-93
REV. △		

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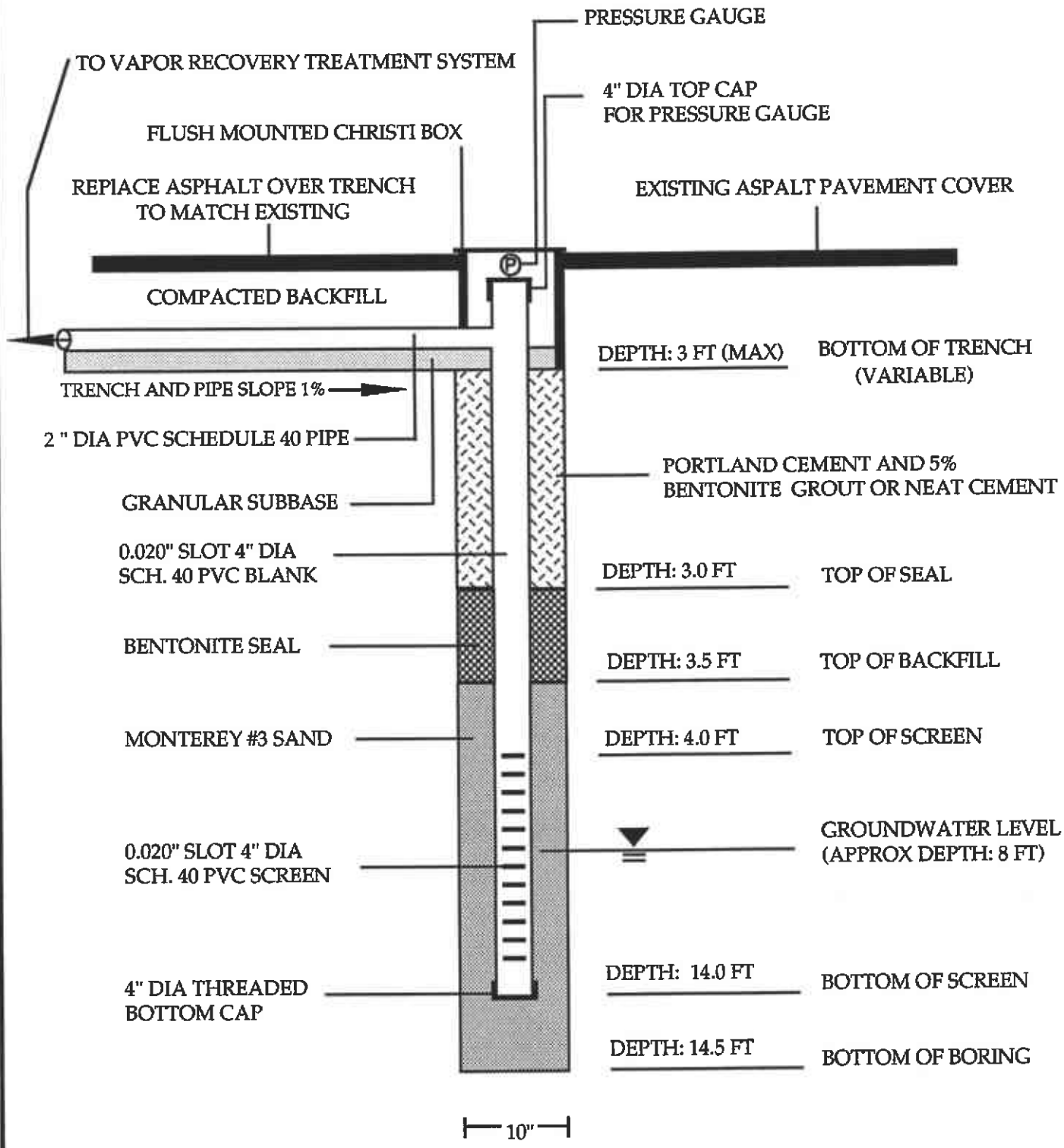
FIGURE 3

ISOPLETH MAP OF TPH GAS CONCENTRATIONS IN SOIL

• Drawn By: NORTH GRAPHICS • San Mateo, California • (415) 572-8690 •



PACIFIC SUPPLY COMPANY DRAWING NO. 29.9-2		
DRAWN BY:	JBB	5-05-93
APPROVED BY:	MEV	5-21-93
REVISION NO.:		

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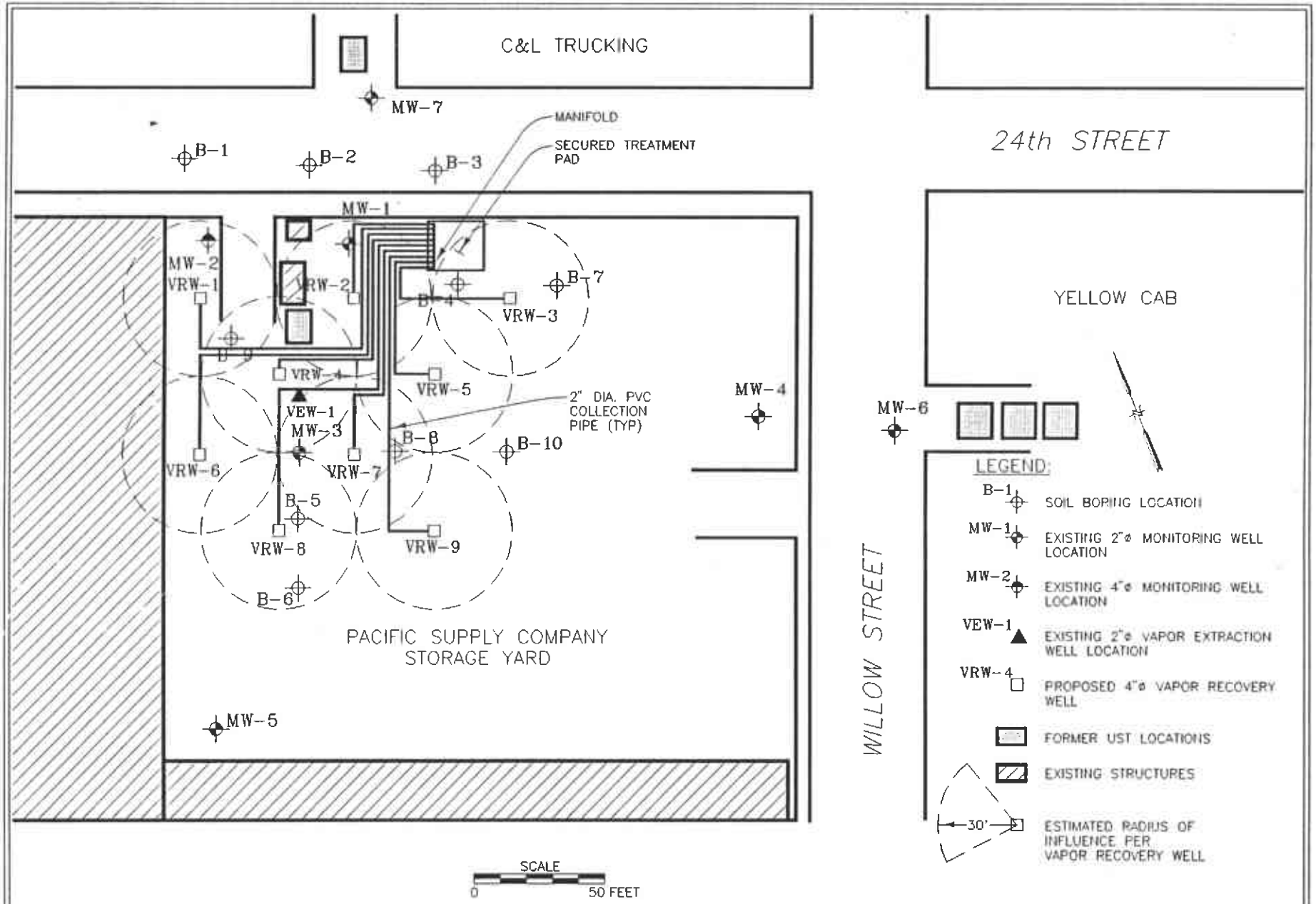
FIGURE 4
VAPOR RECOVERY WELL DETAILS
PACIFIC SUPPLY COMPANY
OAKLAND, CALIFORNIA



DATE: 5-6-93	PROJECT NO.	29.9
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APPROVED BY	MEV	5-7-93
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REV. △		

PACIFIC SUPPLY CO.
1735 24TH STREET
OAKLAND, CALIFORNIA

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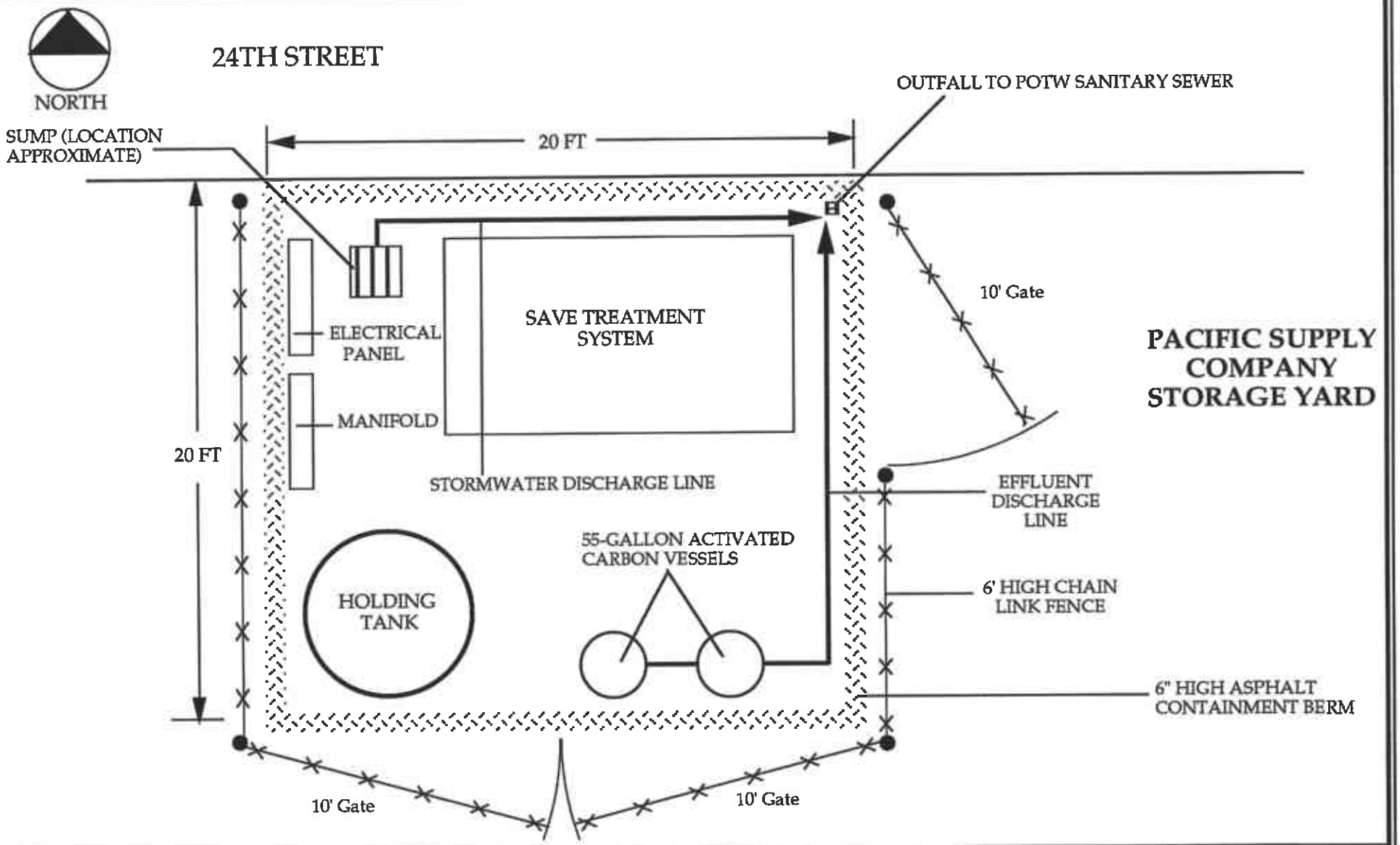
FIGURE 5
VAPOR RECOVERY SYSTEM LAYOUT

• Drawn By: NORTH GRAPHICS • San Mateo, California • (415) 572-8690 •



PACIFIC SUPPLY COMPANY OAKLAND, CALIFORNIA		
DRAWING NUMBER: 29.9-3		
DRAWN BY:	JBB	5/10/93
APPROVED BY:	MEV	5/10/93
SCALE: Not To Scale		

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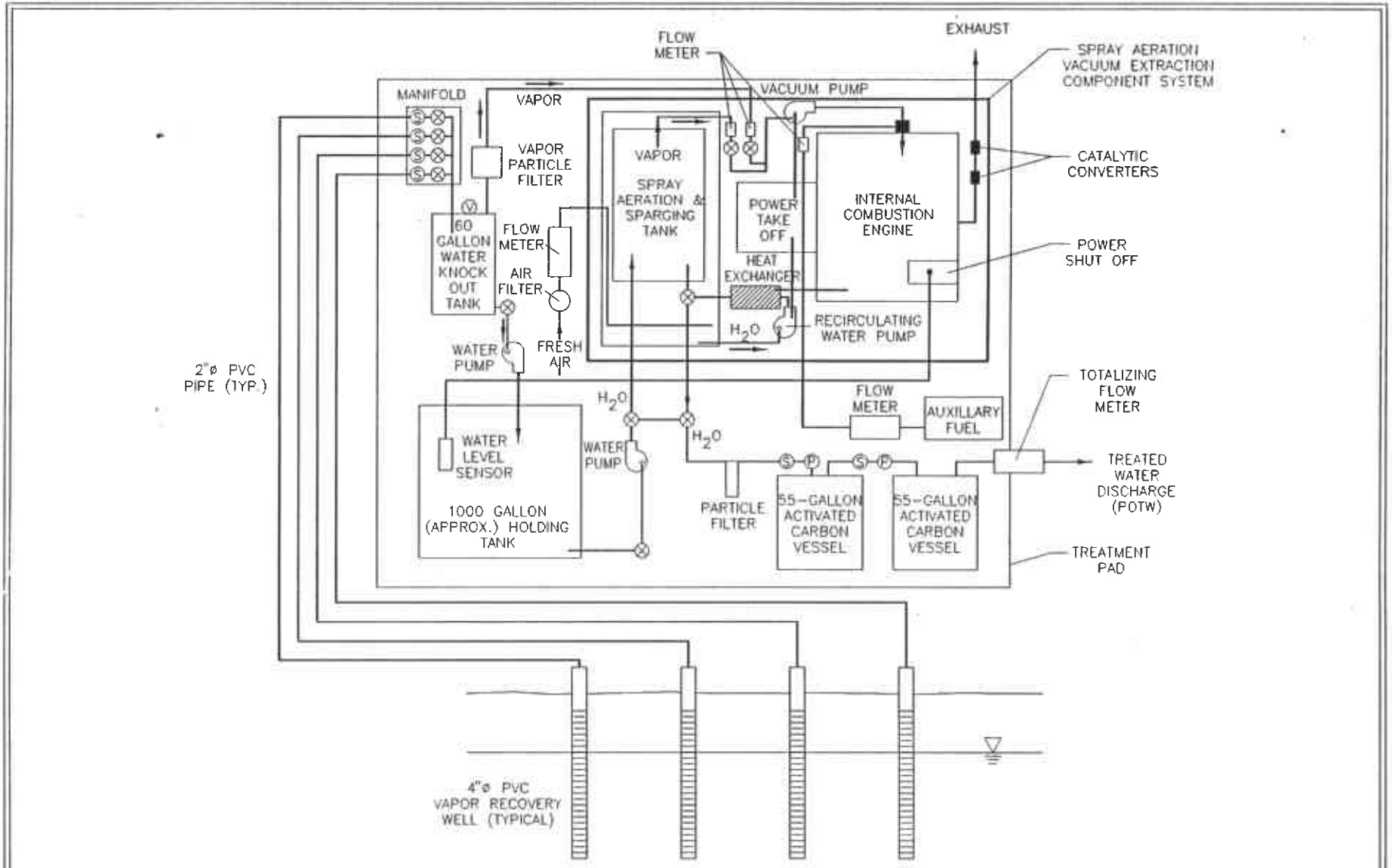
FIGURE 6
TREATMENT PAD DESIGN
PACIFIC SUPPLY COMPANY
OAKLAND, CALIFORNIA



LEGEND:

Ⓢ SAMPLING PORT ⊗ VALVE

NOT TO SCALE Ⓥ VACUUM GAUGE Ⓟ PRESSURE GAUGE

DATE: 5-6-93	PROJECT NO.	29.9
CHECKED BY	MEV	5-7-93
APPROVED BY	MEV	5-7-93
DRAWN BY	-NG-	5-6-93
REV. △		

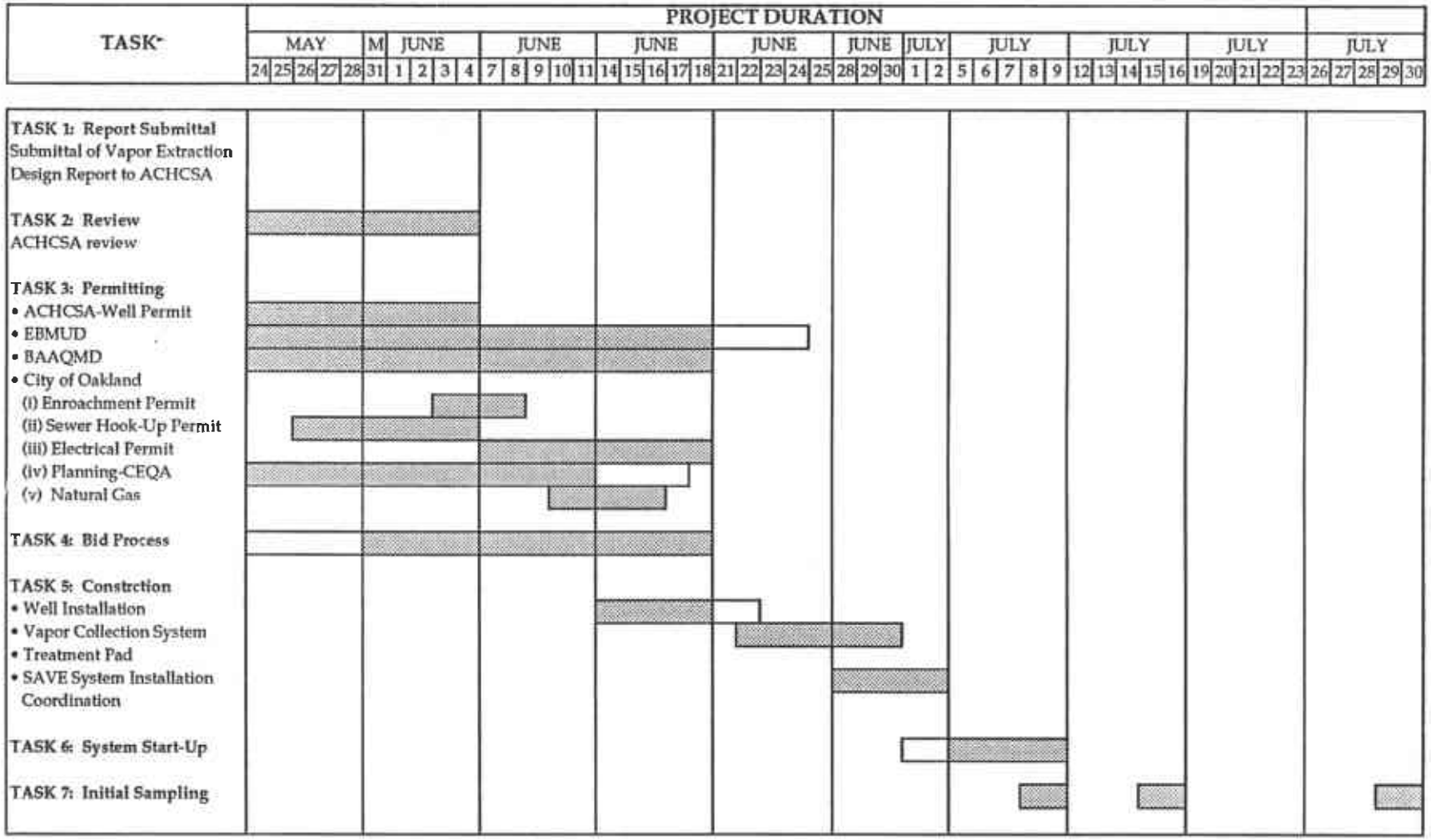
PACIFIC SUPPLY CO.
1735 24TH STREET
OAKLAND, CALIFORNIA

BACE ENVIRONMENTAL

FIGURE 7
VAPOR RECOVERY TREATMENT SYSTEM FLOW DIAGRAM

• Drawn By: NORTH GRAPHICS • San Mateo, California • (415) 572-8690 •

ESTIMATED SCHEDULE OF PROJECT START UP



Notes: 1. Shaded areas represent estimated time to complete project task.
2. Unshade areas represent uncertainity with respect to possible time overrun.

PACIFIC SUPPLY COMPANY DRAWING NO. 29.9-4		
DRAWING:	JBB	5/10/93
APPROVED BY:	MEV	5/21/93
SCALE: Not To Scale		

BACE ENVIRONMENTAL

FIGURE 8
ESTIMATED SCHEDULE OF PROJECT START-UP
PACIFIC SUPPLY COMPANY
OAKLAND, CALIFORNIA

ARRIVAL	DEPARTURE
TIME:	TIME:
SYSTEM ON / OFF	SYSTEM ON / OFF
HOUR METER:	HOUR METER:
H20 DISCHARGE METER:	H20 DISCHARGE METER:
VAPOR WELLS OPEN:	VAPOR WELLS OPEN:
WATER WELLS OPEN:	WATER WELLS OPEN:

VAPOR SAMPLES COLLECTED FROM:
WATER SAMPLES COLLECTED FROM:

OPERATING DATA

		ARRIVAL	DEPARTURE			ARRIVAL	DEPARTURE
ENGINE	R.P.M.			TANK	Tank Vac. "Hg		
	Oil Pres. P.S.I.				Recirc. Pres. P.S.I.		
	Water Temp. °F				Recirc. Temp °F		
	Volts			CAT.	Inlet Temp. °F		
	Intake Vac. "Hg				Outlet Temp. °F		
FUEL	Fuel Flow cfh				Well Vac. "H20		
	Air Flow cfm				Gas Meter		
	Well Flow cfm				Ambient Air Temp.		

MAINTENANCE RECORD

Engine Oil, check level		Radiator, check	
Coolant, check level		Distributor, check	
Fuel, Oil, Coolant, check for leaks		Ignition timing, check	
Engine Oil, change		PCV Valve, check	
Oil Filter, change		Spark Plugs, check	
Battery, check charge and fluid		Spark Plug Wires, check	
Battery, clean terminals and lines		Water Knock Out, drain	
P.T.O. Bearings, check and lubricate		Air Filter, check	
Belts, check		Water Filter, check	

FIELD MEASUREMENTS

INLET, MANIFOLD OR WELLHEAD

HC ppm								
C0 %								
C02 %								
02 %								
Well Vac.								
Depth to Product								
Depth to Water								

EXHAUST

HC ppm		
C0 ppm		
C02 %		
02 %		
NOX ppm		

COMMENTS:

LOCATION:	DATE:	NAME:
PURPOSE OF VISIT:		

ORIGINAL / BOOK COPY

VAPOR EXTRACTION MONITORING DATA

PART 1: *VAPOR EXTRACTION SYSTEM MONITORING*

PROJECT NAME: ______________________________

MONITORING BY: ____________________________

PROJECT NO: __________

DATE: ________________

TIME	RPM	FUEL FLOW (CFH)	AIR FLOW (CFH)	WELL FLOW (CFH)	VACUUM MEASUREMENTS AT RECOVERY WELLS (INCHES H20)								
					VRW-1	VRW-2	VRW-3	VRW-4	VRW-5	VRW-6	VRW-7	VRW-8	VRW-9

VAPOR EXTRACTION MONITORING DATA

PART 2: *GROUNDWATER TREATMENT SYSTEM MONITORING*

PROJECT NAME: ____________________________

PROJECT NO: ____________

DATE: ______________

TIME	TOTALIZER READING	AFFLUENT SAMPLE OBTAINED AT PORT NO.							COMMENTS
		S1	S2	S3	S4	S5	S6	S7	