

WORKPLAN FOR REMEDIAL INVESTIGATION

**VORELCO SITE NO. 4826
BROADWAY VOLKSWAGEN
2740 BROADWAY
OAKLAND, CALIFORNIA**

(ESE PROJECT #6-93-5093)

PRESENTED TO:

**ALAMEDA COUNTY
HEALTH CARE SERVICES AGENCY
1131 HARBOR BAY PARKWAY
ALAMEDA, CALIFORNIA 94502**

PREPARED BY:

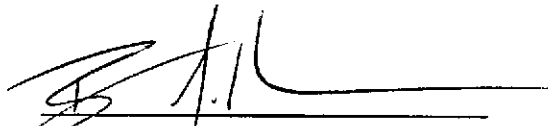
**ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
4090 NELSON AVENUE, SUITE J
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AUGUST 1, 1994



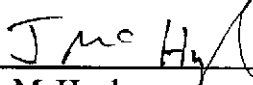
This workplan has been prepared by Environmental Science & Engineering, Inc. (ESE) for the exclusive use of Vorelco, Inc. as it pertains to their site located at 2740 Broadway, Oakland, California. This workplan was prepared with that degree of care and skill ordinarily exercised by other geologists and engineers practicing in this field. No other warranty, either express or implied, is made regarding to the professional advice provided in this workplan.

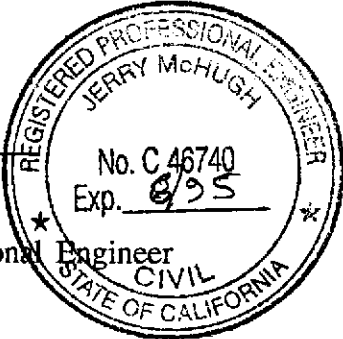
WORKPLAN PREPARED BY:


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Project Geologist

AUGUST 1, 1994
Date

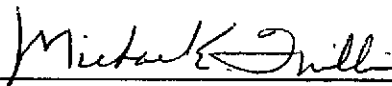
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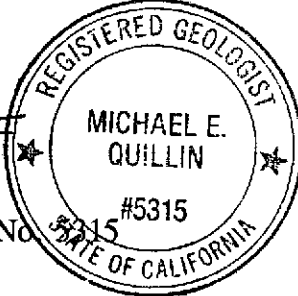

Jerry McHugh
Senior Engineer
California Registered Professional Engineer



8/1/94
Date

UNDER THE PROFESSIONAL SUPERVISION OF:


Michael E. Quillin
Senior Hydrogeologist
California Registered Geologist No. #5315



AUGUST 1, 1994
Date

August 1, 1994

ESE Project #6-93-5093

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**WORKPLAN FOR REMEDIAL INVESTIGATION
VORELCO PROPERTY NO. 4826
BROADWAY VOLKSWAGEN
2740 BROADWAY
OAKLAND, CALIFORNIA**

1.0 INTRODUCTION

This workplan for remedial investigation (RI) has been prepared by Environmental Science & Engineering, Inc. (ESE) for the Alameda County Health Care Services Agency (HCSA) on behalf of Vorelco, Inc. (Vorelco) as it pertains to a former underground storage tank (UST) area located at Vorelco Property No. 4826, 2740 Broadway, Oakland, California (Figure 1 - Vicinity Map). The following workplan presents the procedures and methods to be used during this RI. The objective of the work described in this workplan is to determine whether vapor extraction is a viable remedial technology for the removal of gasoline constituents from impacted backfill material and native sediments at the site. The results of this investigation will be used to prepare a Remedial Action Plan (RAP). Vapor extraction is expected to be the foundation of the preliminary remedial system specifications and design to be included in the RAP, should vapor extraction prove to be a viable remediation technology.

2.0 SITE HISTORY

During August 1988, two USTs referred to as "USTs C and D" were removed by SEMCO, Inc. of Modesto, California at the site. The site is located within a commercially zoned area and is surrounded by numerous automobile maintenance facilities.

USTs C and D (one 500-gallon waste oil UST and one 3,000-gallon gasoline UST, respectively) were formerly located adjacent to each other at the north side of the site along 28th Street (Figure 2 - Site Map). Soil samples collected from the excavation during removal of the USTs were reported to contain detectable concentrations of total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene, and total xylenes (BTEX) (SEMCO, 1989). Two soil borings, SB-3 and SB-4, were drilled under the supervision of ESE during May 1991 at the UST C and D area (ESE, 1991a). Three soil samples collected from boring SB-3 (5, 10, and 15-foot depth) were reported to contain detectable concentrations of TPH-G and BTEX. Boring SB-4 intersected gravel fill in the former UST excavation. One soil sample collected at the base of the fill at a depth of 15 feet below grade was reported to contain detectable concentrations of TPH-G and BTEX.

Boring logs for five ground water monitoring wells (MW-1, MW-3, MW-4, MW-5, and MW-6) installed under ESE's supervision indicated the presence of clay sediments with a perched, moist to wet sand bed at a depth ranging between 11 to 17 feet below grade across the site (ESE, 1991a; ESE, 1991b). ESE installed wells MW-1 and MW-3 to a depth of approximately 20 feet below grade and screened across the interval of the perched sand bed. ESE identified the sand bed in wells MW-5 and MW-6 at depths of 17 and 11 feet, respectively (ESE, 1991b). The sand bed at these locations was observed to be approximately two feet in thickness and to have an apparent dip toward the west. Clay sediments above and immediately below the sand bed were observed to be dry.

Soil samples collected from the sand bed in borings MW-5 and MW-6 were noted to have a fuel odor and detectable concentrations of volatile organic compounds (VOCs) based on

photoionization detector (PID) readings. However, ESE did not observe a fuel odor or detect VOCs with a PID in samples of clay collected above and below the sand bed in these borings. No detectable concentrations of halogenated volatile organic compounds (HVOCs) have been reported in soil samples collected from either the sand or clay sediments at the site.

A sandy clay aquifer was found at a depth of approximately 22 to 23 feet below grade, beneath the clay unit containing the perched sand bed, in wells MW-4, MW-5, and MW-6 (Figure 3 - North-South Oriented Cross Section). Monitoring well MW-4 was installed to a depth of 25 feet below grade and wells MW-5 and MW-6 were installed to a depth of 30 feet below grade. Water levels in these wells were observed to rise approximately 12 to 14 feet when the sandy clay aquifer was penetrated, suggesting some confining pressure.

Detectable concentrations of TPH-G and BTEX have been reported in some ground water samples collected from various site wells since January 21, 1989 (ESE, 1989; ESE, 1991a; ESE, 1991b; ESE, 1992; ESE, 1993). A summary of the TPH-G and BTEX analytical results for ground water samples collected at the site is presented in Table 1 - TPH-G and BTEX Concentrations in Ground Water.

Historically, the highest concentrations of TPH-G and BTEX have been reported in ground water samples collected from well MW-3, located west and hydraulically downgradient of the former UST area (Figure 2). Well MW-3 is selectively screened to recharge with water from the perched sand bed.

In addition to petroleum hydrocarbons, detectable concentrations of HVOCs such as trichloroethylene (TCE) and 1,2-Dichloroethane (DCA) have been reported in some ground water samples collected at the site (ESE, 1991a; ESE, 1991b; ESE, 1992; ESE, 1993). A summary of the TCE and DCA analytical results for ground water samples collected at the site is presented in Table 2 - TCE and DCA Concentrations in Ground Water.

Historically, the highest concentrations of HVOCs have been reported in ground water samples collected from wells screened into the deeper, semi-confined sandy clay aquifer (MW-4, MW-5, and MW-6). Contours of TCE concentration in ground water suggest an off-site source to the north of the former UST area. ESE concluded that ground water in the semi-confined sandy clay aquifer containing TCE was cross-contaminating the upper perched sand bed at the site by upward migration through the screened monitoring well casings.

Research by ESE indicates that several sites surrounding the Vorelco property handle petroleum hydrocarbons and solvents containing HVOCs and that numerous unauthorized releases at other properties have been documented by the HCSA and the Regional Water Quality Control Board (RWQCB) - San Francisco Bay Region (ESE, 1991a). The existence of an off-site source of HVOCs was documented in a report submitted to the HCSA (ESE, 1992). Representatives of Vorelco and ESE also reported the existence of this off-site HVOC source during a meeting with Mr. Thomas Peacock of the HCSA in December, 1992.

ESE recommended that no ground water extraction from the deeper semi-confined sandy clay aquifer be performed at the site, that monitoring wells MW-4, MW-5, and MW-6 be properly abandoned to prevent HVOC cross-contamination of the shallow sediments, and that three selectively screened vadose wells be installed for the purpose of conducting vapor extraction performance testing to determine whether it is feasible for the recovery of gasoline constituents from the UST excavation backfill and the perched sand bed at the site (ESE, 1993). The HCSA concurred with these recommendations and, in addition, recommended that one additional well be installed further west of MW-3 to try and define the TPH-G plume in the downgradient direction (HCSA, 1993). The HCSA has stated that the cleanup of contamination from an off-site source will not be required (HCSA, 1994).

3.0 RECENT SITE ACTIVITIES

On March 16, 1994, ESE supervised the abandonment of wells MW-4, MW-5, and MW-6; the installation of three vadose wells (VW-1, VW-2, and VW-3) selectively screened through the perched sand bed; and the installation of one monitoring well (MW-7) at a location west of well MW-3 in the downgradient direction (ESE, 1994). Standing water with dissolved gasoline constituents was noted in the UST backfill material at boring VW-3. The subsurface sedimentary stratigraphy observed in borings VW1, VW2, VW3, and MW7 are consistent with past findings which suggests continuity of the apparently westward- dipping, perched sand bed across the site from the former UST area (Figure 4 - East-West Oriented Schematic Cross Section). Based on these findings, ESE recommended that the extraction of standing water in the backfill materials from well VW-3 to assess whether vapor extraction performance testing at well VW-3 was feasible and to provide interim remediation (ESE, 1994).

On July 1, 1994, approximately 900 gallons of ground water was extracted from the UST backfill at well VW-3. In addition, ESE supervised the extraction of 35 gallons of ground water from well VW-1 and 31 gallons of ground water from well VW-2, both of which are installed in native sediments. Due to the slow ground water recharge observed in each of the three wells, ESE has concluded that the extraction of a small volume of ground water from each well may be necessary immediately prior to vapor extraction performance testing.

4.0 SOIL VAPOR EXTRACTION TESTING AND ANALYSIS

ESE will conduct three (3) soil vapor extraction performance tests to evaluate the properties of the gasoline-impacted UST backfill material and the surrounding native sediments beneath the site. The tests will be performed using ESE's mobile vapor extraction test unit, which consists of a positive-displacement blower with silencers and filter, an internal combustion engine which provides a variable speed drive for the blower, a condensate knock-out chamber, air flowmeters, temperature gauges, pressure/vacuum gauges, and granular activated carbon vessels (GAC) for offgas treatment.

ESE will, if necessary, purge all standing ground water from wells VW1, VW2, and VW3 using a vacuum truck immediately prior to conducting a vapor extraction performance test at each of the three wells. Ground water collected by the vacuum truck will be transported to a licensed facility for disposal by recycling. At the start of each test, a vacuum will be applied to the appropriate extraction well (VW1, VW2, or VW3). The resulting air flow will be noted and peripheral wells fitted with a magnehelic gauge will be monitored. After approximately 20 minutes, the extraction well vacuum will be increased incrementally and the resultant influence on the peripheral wells will be noted. This procedure will be continued until the limits of the blower are realized (approximately 100 cubic feet per minute flowrate up to ten inches mercury vacuum). The vapor stream from the extraction well will be monitored at five-minute intervals with both a portable flame ionization detector (FID) equipped with a dilution probe and an oxygen (O₂)/lower explosivity limit (LEL) meter. The FID and LEL meters will provide usable data and act as a safety check by monitoring variances in VOC concentrations during the tests. In addition, one air sample will be collected at both the beginning and at the end of each test in a Tedlar® bag and placed in a container capable of preventing exposure to ultraviolet light. The air samples will be transported to a State-certified laboratory under chain of custody documentation and analyzed for TPH-G and VOCs, including the BTEX constituents, using analytical methods EPA 8015 (modified per CA LUFT) and EPA 8240, respectively.

These vapor extraction performance tests will provide site-specific data regarding the radius of influence of the applied extraction vacuum and flow rate in the UST backfill materials and the surrounding upper unsaturated zone of the native sediments. Data regarding achievable extraction flow rates and associated vacuums and baseline analytical data of the vapor streams will also be collected. These data will be presented and summarized in a report following completion of the sitework.

5.0 SCHEDULE

ESE will perform the scope of work described in this workplan according to the following schedule:

- | | |
|----------|--|
| Week 1-2 | HCSA approval of this workplan |
| Week 2-4 | Coordinate, permit, and conduct sitework |
| Week 6 | Receive analytical results for vapor samples |
| Week 7-8 | Finalized report of findings forwarded to HCSA |

ESE considers this schedule tentative and cannot be held responsible for delays caused by factors beyond the control of ESE.

6.0 REFERENCES

County of Alameda Health Care Services Agency (HCSA), 1994. Unpublished Letter Response to Recommendations in April, 1994 Environmental Science & Engineering, Inc. Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; May 31, 1994.

County of Alameda Health Care Services Agency (HCSA), 1993. Unpublished Letter Response to Recommendations in August 3, 1993 Environmental Science & Engineering, Inc. Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; September 23, 1993.

Environmental Science & Engineering, Inc. (ESE), 1989. Unpublished Letter Report of Monitoring Well Installation and Sampling at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; February, 10, 1989.

Environmental Science & Engineering, Inc. (ESE), 1991a. Unpublished Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; July 10, 1991.

Environmental Science & Engineering, Inc. (ESE), 1991b. Unpublished Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; November 12, 1991.

Environmental Science & Engineering, Inc. (ESE), 1992. Unpublished Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; December 3, 1992.

Environmental Science & Engineering, Inc. (ESE), 1993. Unpublished Report of Quarterly Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; August 3, 1993.

Environmental Science & Engineering, Inc. (ESE), 1994. Unpublished Letter Report of Site Activities at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; April 26, 1994.

SEMCO, Inc., 1989. Unpublished Report of Underground Storage Tank Removal at Vorelco Property No. 4826, Broadway Volkswagen, 2740 Broadway, Oakland, California; February 3, 1989.

State of California Department of Water Resources (DWR), 1981. Water Well Standards: State of California. DWR Bull. 74-81; December, 1981.

TABLE 1. TPH-G AND BTEX CONCENTRATIONS IN GROUND WATER

Well No.	Analyte	Concentrations ($\mu\text{g/L}$)				
		1/21/89	5/13/91	10/18/91	10/27/92	7/13/93
MW-1	B	53	ND	ND	ND	ND
	T	13	ND	ND	ND	ND
	E	1.4	ND	ND	ND	ND
	X	8.2	1.1	ND	ND	ND
	TPH-G	ND	130	ND	ND	ND
MW-3	B	9,600	7,800	9,400	7,100	8,100
	T	8,200	12,000	8,600	4,900	6,200
	E	1,800	1,200	750	970	1,400
	X	6,200	4,000	3,300	3,500	4,400
	TPH-G	32,000	81,000	73,000	37,000	41,000
MW-4	B	NA	160	11.0	6.4	36
	T	NA	690	11.0	2.8	4.4
	E	NA	250	ND	1.2	1.8
	X	NA	1,100	15.0	6.2	5.3
	TPH-G	NA	13,000	ND	180	320
MW-5	B	NA	NA	3,500	ND	ND
	T	NA	NA	530	ND	ND
	E	NA	NA	670	ND	ND
	X	NA	NA	1,100	ND	ND
	TPH-G	NA	NA	16,000	87	90
MW-6	B	NA	NA	640	48	5.1
	T	NA	NA	2,700	130	30
	E	NA	NA	1,100	55	30
	X	NA	NA	4,500	230	230
	TPH-G	NA	NA	28,000	1,300	1,100

NOTE :
 NA = Not Applicable (wells constructed after date indicated).
 ND = Not Detected Using Analytical Methods EPA 8015 or 8020.
 B = Benzene, T = Toluene, E = Ethylbenzene, X = Xylenes.
 TPH-G = Total Petroleum Hydrocarbons as gasoline
 • all results reported in micrograms per Liter ($\mu\text{g/L}$).

TABLE 2. TCE AND DCA CONCENTRATION IN GROUND WATER					
Well No.	Analyte	Concentrations ($\mu\text{g/L}$)			
		5/13/91	10/18/91	10/27/92	7/13/93
MW-1	TCE	58	120	11	6.4
	DCA	ND	ND	ND	ND
MW-3	TCE	14	14	ND	14
	DCA	380	8.3	170	150
MW-4	TCE	490	450	520	550
	DCA	ND	3.9	ND	ND
MW-5	TCE	NA	120	410	530
	DCA	NA	32	ND	ND
MW-6	TCE	NA	230	2,000	2,100
	DCA	NA	60	ND	ND

NOTE :
 TCE = Trichloroethylene.
 DCA = 1,2 Dichloroethane.
 ND = Not Detected Using Analytical Methods EPA 8010 or 8240.
 NA = Not Applicable (wells constructed after date indicated).
 • all results reported in micrograms per Liter ($\mu\text{g/L}$).



BROADWAY AVENUE

AUTOMOBILE INTERIOR SERVICE

AUTOMOBILE EXCHANGE SERVICE (AES)

28th STREET

MW-5

MW-6

MW-7
B

VW-1

MW-3

VW-2

SB-3

SB-4

VW-3

MW-1
B'

ENTRANCE

MW-4
A'

SHOWROOM

OFFICES

HALLWAY

OFFICES

GARAGE

RAMP TO SECOND FLOOR


PARKING LOT

PARKING LOT

LEGEND

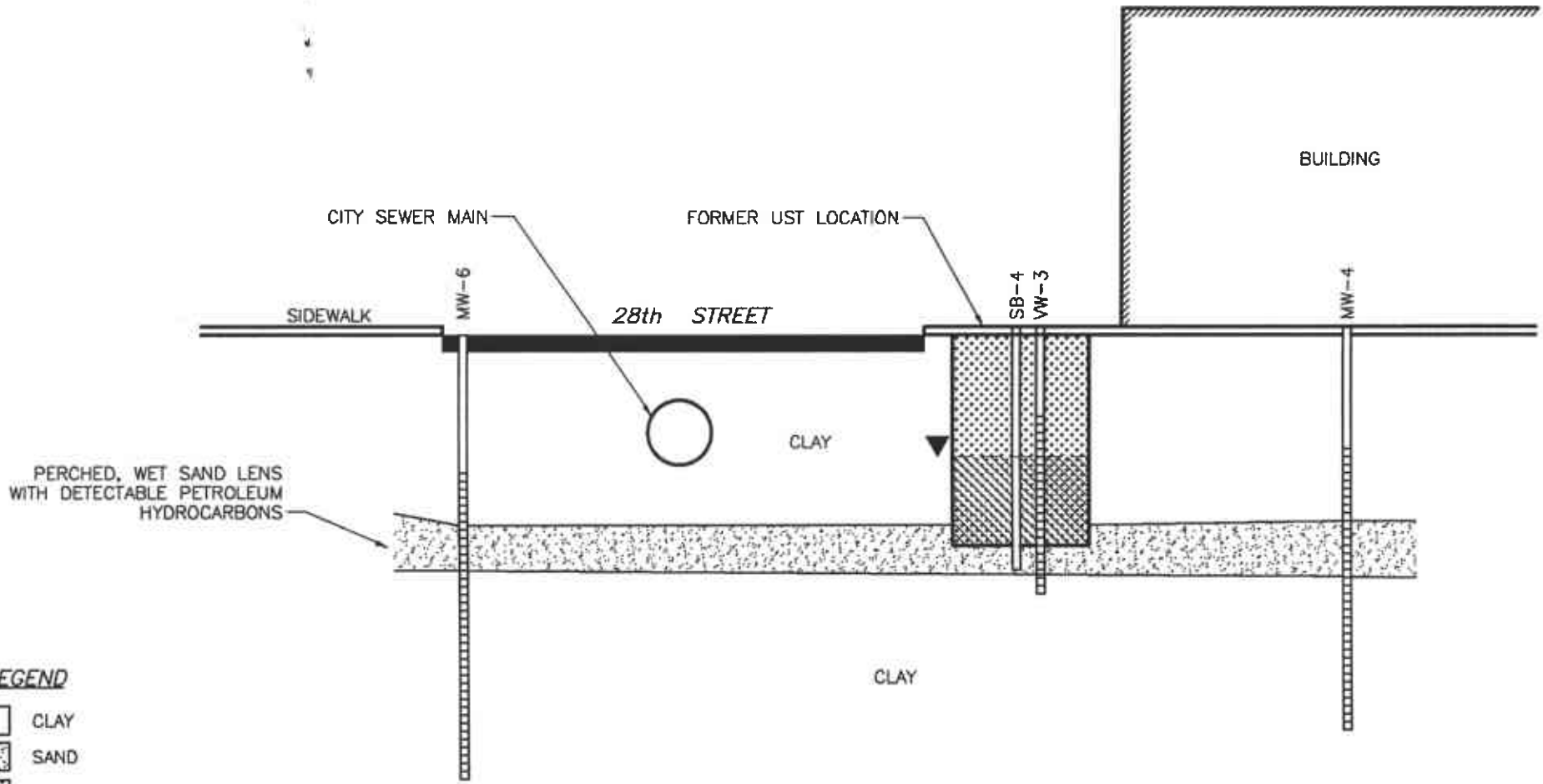
- ⊕ MW-3 MONITORING WELL
- ⊙ MW-5 ABANDONED MONITORING WELL
- VW-1 VADOSE MONITORING WELL
- ⊕ SB-3 SOIL BORING
- A—A' LINE OF GEOLOGIC CROSS-SECTION
- FORMER UNDERGROUND TANK AREA










 Environmental Science & Engineering, Inc. 4090 NELSON AVENUE, SUITE J CONCORD, CA 94520	DATE 3/94	SITE MAP VORELCO PROPERTY NO. 4286 2740 BROADWAY OAKLAND, CALIFORNIA	FIGURE NO. 2
	REVISED 7/21/94		PROJ. NO. 6-93-5093
	CAD FILE 50932006		

NORTH
A

SOUTH
A'



LEGEND

-  CLAY
-  SAND
-  PEA GRAVEL BACKFILL
-  GROUND WATER WITH DETECTED HIGH CONCENTRATIONS OF PETROLEUM HYDROCARBONS
-  MEASURED WATER LEVEL (7/1/94)
-  MONITORING WELL BLACK CASING OR SOIL BORING
-  MONITORING WELL SCREENED INTERVAL

0 10
SCALE IN FEET
1X VERTICAL EXAGGERATION

ESE Environmental Science & Engineering, Inc.
A GOLDER Company

4090 NELSON AVENUE, SUITE J
CONCORD, CA 94520

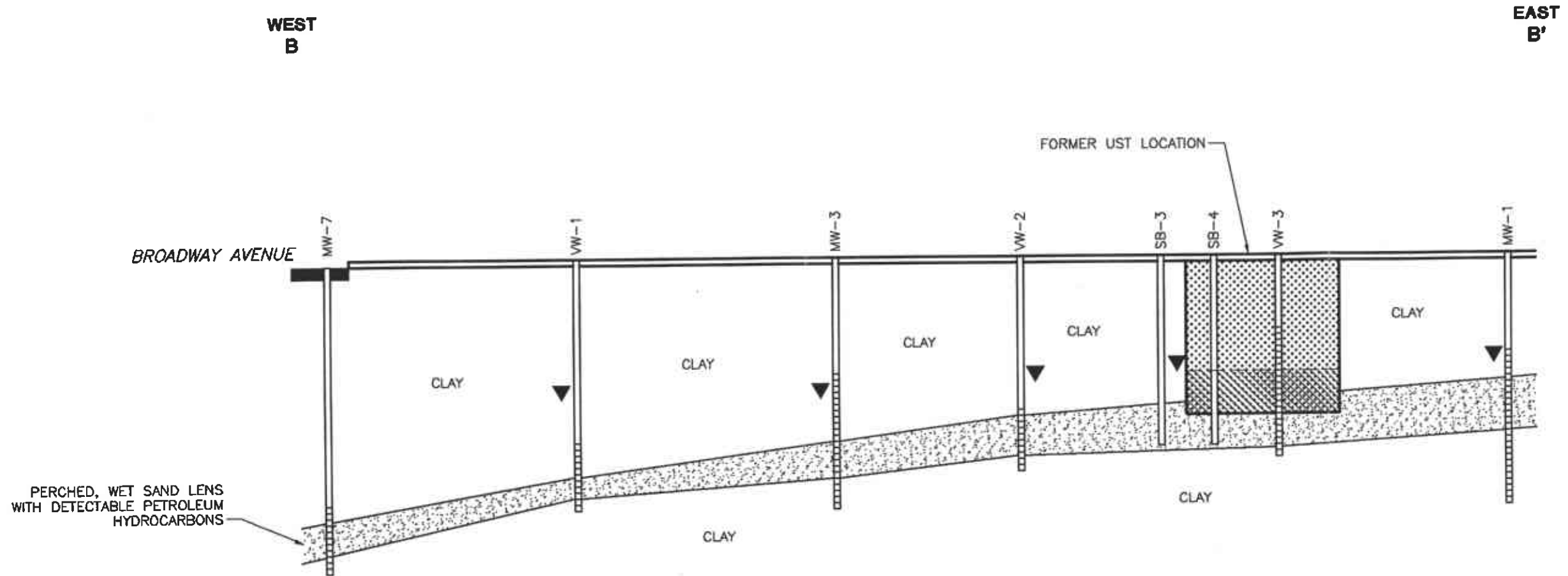
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**NORTH-SOUTH ORIENTED
SCHEMATIC CROSS-SECTION**

VORELCO PROPERTY NO. 4286
2740 BROADWAY
OAKLAND, CALIFORNIA

FIGURE NO.
3

PRD. NO.
6-93-5093



LEGEND

- CLAY
- SAND
- PEA GRAVEL BACKFILL
- GROUND WATER WITH DETECTED HIGH CONCENTRATIONS OF PETROLEUM HYDROCARBONS
- MEASURED WATER LEVEL (7/1/94)
- MONITORING WELL BLACK CASING OR SOIL BORING
- MONITORING WELL SCREENED INTERVAL

0 10 20
 SCALE IN FEET
 2X VERTICAL EXAGGERATION

 Environmental Science & Engineering, Inc. <small>A CLDFP Company</small>	DATE 7/21/94	EAST-WEST ORIENTED SCHEMATIC CROSS-SECTION VORELCO PROPERTY NO. 4286 2740 BROADWAY OAKLAND, CALIFORNIA	FIGURE NO. 4
	REVISED		PROJ. NO. 6-93-5093
4090 NELSON AVENUE, SUITE J CONCORD, CA 94520		CAD FILE 50931008	