

ENVIRONMENTAL
PROTECTION
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REMEDIAL ACTION PLAN
FOR
CREDIT WORLD AUTO SALES
2345 E. 14TH STREET
OAKLAND, CA 94601

#2116

10-20-97

Prepared For:
MESSRS. AARON AND STANLEY WONG
2200 E. 12TH STREET
OAKLAND, CA 94606

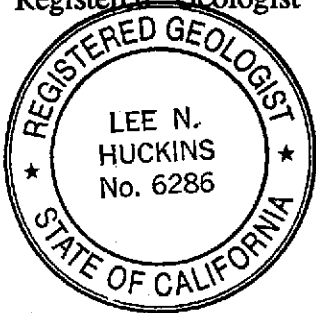
Submitted By:
TANK PROTECT ENGINEERING
Of Northern California, Inc.
2821 WHIPPLE ROAD
UNION CITY, CA 94587
(510) 429-8088

October 20, 1997

Project Number 267

Lee Huckins

Lee N. Huckins
Registered Geologist



Expiration Date 5/31/99

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Frederick G. Moss

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Registered Civil Engineer



Jeff J. Farhoomand, M.S.
Principal Engineer

Jeff J. Farhoomand

This report has been prepared by the staff of Tank Protect Engineering of Northern California, Inc. under direction of an Engineer and/or Geologist whose seal(s) and/or signature(s) appear hereon.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. We make no other warranty, either expressed or implied.

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 SITE HISTORY	1
2.1 ACHCSA Correspondence	1
2.2 Quarterly Groundwater Monitoring	3
3.0 SITE STRATIGRAPHY	3
3.1 Regional Setting	3
3.2 Site Geology and Hydrogeology	4
3.3 Groundwater Flow Direction and Gradient	5
4.0 EXTENT OF SOIL CONTAMINATION	5
5.0 EXTENT OF GROUNDWATER CONTAMINATION	6
5.1 TPHG Dissolved Groundwater Plume Map	6
5.2 Benzene Dissolved Groundwater Plume Map	7
6.0 REMEDIAL OBJECTIVES	7
7.0 PROPOSED OPTIONS FOR SITE REMEDIATION	7
7.1 Groundwater Monitoring	7
7.2 Pump and Treat	8
7.3 Remedial Trench	8
7.4 Remedial Well/Bioremediation	9
8.0 RECOMMENDED REMEDIATION STRATEGY	9

FIGURES

1. SITE VICINITY MAP
2. SITE PLAN
3. LOCATION OF GEOLOGIC CROSS SECTIONS A-A' AND B-B'
4. GEOLOGIC CROSS SECTION A-A'
5. GEOLOGIC CROSS SECTION B-B'
6. GROUNDWATER GRADIENT MAP (9/18/97)
7. LOCATION OF FINAL VERIFICATION SOIL SAMPLING
8. GROUNDWATER GASOLINE CONCENTRATION
9. GROUNDWATER BENZENE CONCENTRATION
10. PROPOSED REMEDIAL OPTIONS

TABLES

1. GROUNDWATER ELEVATION
2. GROUNDWATER GRADIENTS, FLOW DIRECTIONS, AND ELEVATION DATA
3. SUMMARY OF FLOATING PRODUCT THICKNESS
4. SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS

APPENDICES

- A. ALAMEDA COUNTY HEALTH CARE SERVICES, LETTER DATED JUNE 12, 1997

1.0 INTRODUCTION

The subject site is located at 2345 E. 14th Street in the city of Oakland in Alameda County, California (see Figure 1) and is owned by Messrs. Aaron and Stanley Wong [(Wong), telephone number (510) 532-1672]. The site is occupied by a used car dealership known as Credit World Auto Sales. Previous work by others and Tank Protect Engineering of Northern California, Inc. (TPE) has documented soil and groundwater contamination apparently due to leaks or spills associated with a former underground gasoline tank complex.

Figure 2 shows a site plan presenting the locations of an onsite building which includes an office and automotive service bay, the former underground fuel tanks, soil borings and groundwater monitoring wells.

The purpose of this Remedial Action Plan (RAP) is to present several options for groundwater remediation at the site to lower the levels of hydrocarbon contamination. There are presently five monitoring wells installed on the site. To date, free product has been detected in two of these monitoring wells. Recent well sampling indicates that a plume of dissolved fuel hydrocarbons is present.

In order to reduce the impact of contaminated groundwater beneath the site, to protect the beneficial uses of the groundwater and to remediate the site, TPE has evaluated several methods of groundwater remediation. Each method or option is evaluated in this report with respect to the achievement of site remediation goals, cost and reliability. The option selected as most effective is the installation of a remedial well.

2.0 SITE HISTORY

2.1 ACHCSA Correspondence

In a February 1, 1994 letter to Wong, Request for Technical Reports for 2345 E. 14th St., Oakland, CA 94601. Former Taxi Taxi Site, the ACHCSA requested technical information detailing the installation of wells, installation of free product removal systems, and quarterly monitoring data.

In a February 18, 1994 letter to Wong, Comment on November 4, 1993 Preliminary Site Assessment Report for 2345 E. 14th St., Oakland, CA 94601, Credit World Auto Sales, the ACHCSA recommended initiating quarterly groundwater monitoring and a phased approach to further site investigation and remediation. The ACHCSA suggested the initial phase of remediation begin with excavation of contaminated soil in the former tank locations.

Details on soil excavation and remediation are presented in TPE's January 10, 1997 SITE ASSESSMENT REPORT, CREDIT WORLD AUTO SALES, 2345 E. 14TH STREET, OAKLAND CA 94601.

The Alameda County Health Care Services Agency (ACHCSA) requested an additional groundwater investigation in a May 17, 1995 letter to Wong titled Status of Subsurface Investigation at 2345 E. 14th St., Oakland CA 94601, Former Taxi Taxi. TPE responded to ACHCSA request with a August 4, 1995 WORKPLAN FOR GROUNDWATER INVESTIGATION, 2345 E. 14TH ST., OAKLAND CA 94601 (WP). In an October 26, 1995 letter titled Comment on August 4, 1995 Workplan for Soil and Groundwater Investigation at 2345 E. 14th St., Oakland CA 94601 ACHCSA approved TPE's WP. Due to the delay in soil excavation activities, ACHCSA issued a letter October 3, 1996 titled Status of Subsurface Investigation at 2345 E. 14th St., Oakland CA 94601, Former Taxi Taxi requesting that the offsite groundwater investigation be conducted and encouraged the use of rapid site assessment techniques (ie "Geoprobe", Hydropunch").

TPE responded with a February 7, 1997 ADDENDUM TO AUGUST 4, 1995 WORKPLAN, CREDIT WORLD AUTO SALES, 2345 E. 14TH STREET, OAKLAND CA 94601 (AWP) at the request of the client and the Underground Storage Tank Fund (State Fund). The addendum changed the number and location of the soil borings and described using a rapid site assessment technique ("Geoprobe") in which to conduct the work. On February 10, 1997 ACHCSA issued a letter titled Addendum to August 4, 1995 Workplan, Credit World Auto Sales, 2345 E. 14Th Street, Oakland CA 94601 approving the AWP and relocating boring SB-2.

On April 21 and May 2, 1997 TPE pushed 5 soil holes using the "Geoprobe" method. Details on the soil borings, analytical results of the soil and groundwater sampling and

soil and groundwater isoconcentration maps for TPHG and benzene are presented in TPE's June 3, 1997 SITE ASSESSMENT REPORT, CREDIT WORLD AUTO SALES, 2345 E. 14TH STREET, OAKLAND CA 94601.

On June 12, 1997 ACHCSA responded with a letter titled Site Assessment Report for former Credit World Auto Sales, 2345 E. 14th St., Oakland CA 94601 requesting that natural biodegradation parameters be analyzed from groundwater samples collected during quarterly monitoring events and that a RAP to enhance bioremediation at the subject site be submitted (see Appendix A).

2.2 Quarterly Groundwater Monitoring

On September 18, 1997 TPE conducted quarterly groundwater monitoring in response to ACHCSA letter. Results of the monitoring for the biodegradation parameters are presented in TPE's October 6, 1997 THIRD QUARTER REPORT, 1997, CREDIT WORLD AUTO SALES, 2345 E. 14TH STREET, OAKLAND CA 94601. TPE has conducted quarterly groundwater monitoring since March 31, 1994. The reader is referred to the above quarterly report for documentation of recent quarterly groundwater monitoring events.

3.0 SITE STRATIGRAPHY

3.1 Regional Setting

The site is located in the East Bay Plain of the Coast Range physiographic province. The surface of the Bay Plain in the general area of the site is gently sloping to the southwest and the site is at an elevation of about 27 feet above MSL. The East Bay Plain is an area comprised of flat alluvial lowlands and bay and tidal marshes lying between the bedrock hills of the Diablo Range to the east and San Francisco Bay to the west. Geologic materials underlying the plain are classified as consolidated and unconsolidated. The consolidated materials beneath the East Bay Plain are estimated to be present at a depth of about 1,000 feet below the ground surface and are not considered to be aquifers. The unconsolidated materials, occurring from ground surface

to a depth of about 1,000 feet, contain the groundwater aquifers of the East Bay Plain. These materials consist of a heterogeneous mixture of clay, silt, sand, and gravel mainly derived by erosion of the Diablo Range. According to USGS Professional Paper 943, the subject site is located on Quaternary age alluvial deposits consisting of medium-grained, unconsolidated, moderately sorted, permeable fine sand, silt, and clayey silt with a few thin beds of coarse sand.

Major groundwater-bearing materials beneath the East Bay Plain occur at depths ranging from 50 feet to 1,000 feet below ground surface. Groundwater from these aquifers is presently used mostly for irrigation and industrial purposes. Groundwater flow is generally in a direction from the Diablo Range toward San Francisco Bay.

The nearest body of surface water to the site is Brooklyn Basin Tidal Canal located about .50 miles west of the site.

3.2 Site Geology and Hydrogeology

The site hydrogeology has been interpreted from soil boring logs constructed by TPE and others and evaluation of the stabilized groundwater elevations in the 5 on-site groundwater monitoring wells (see Section 3.3 Groundwater Flow Direction and Gradient). The locations of the cross sections are shown in Figure 3. Geologic cross sections A-A' and B-B' (Figures 4 and 5) have been constructed from the soil boring logs and stabilized groundwater elevations to illustrate the site's stratigraphy and hydrogeologic characteristics.

Geologic cross sections A-A' and B-B' illustrate that the stratigraphy, in general, consists of the following sequence from ground surface to depth: (1) a dry, brown, aggregate base material that underlies the asphalt surface to a depth of about 1.0 foot; (2) an underlying dry, grey to black clay (sometimes brown) ranging to depths of about 7.5 to 12.0 feet; (3) an underlying damp light grey to green clay to a depth of about 17.0 feet grading into a green clayey sand; (4) an underlying water bearing light green to grey clayey sand ranging to depths of about 23.0 to 27.0; (5) an underlying, dry to moist, brown, gravelly clay ranging to depths of about 27.0 to 30.5 feet grading into a brown clayey sand; (6) an underlying, light brown, wet sand to a depth of about 32.5

feet; and (7) an underlying damp, brown, gravelly clay ranging to the total depth explored. These layers are interfingered deposits of gravel, sand, silt and clay in various combinations.

3.3 Groundwater Flow Direction and Gradient

On September 18, 1997 depth-to-groundwater was measured from the top of casing (TOC) in all wells to the nearest 0.01 foot using an electronic Keck Instrument, Inc., KIR-89 interface probe. A minimum of 3 repetitive measurements were made for each level determination to ensure accuracy. Depth-to-groundwater was subtracted from the TOC elevation, measured relative to mean sea level, to calculate the elevation of the groundwater level in each well (see attached Table 1). When floating product was present, the groundwater elevation was corrected by multiplying the floating product thickness by a density of .75 and adding the resultant value to the groundwater elevation.

Attached Figure 6 is a groundwater gradient map constructed from the data collected on September 18, 1997. Groundwater flow direction was to the north and northwest with a gradient about .020 to .026 feet per foot, respectively. Average groundwater elevations, changes in average groundwater elevations, groundwater gradients, and groundwater flow directions are tabulated in attached Table 2.

4.0 EXTENT OF SOIL CONTAMINATION

Figure 7 shows names, location, depths, and analytical results of final verification soil samples. Final verification soil samples are those samples collected when the sidewalls were excavated to their furthest horizontal and vertical extent and the floor was excavated to its greatest depths.

Final verification soil samples, depicted in Figure 7, detected TPHG concentrations ranging from nondetectable to 110 ppm TPHG in sidewall samples. Verification soil samples collected from the floor of the excavation detected TPHG and BTEX concentrations ranging from nondetectable to 66 ppm.

TPE believes that low concentrations of TPHG and BTEX remain within the former tank excavation. These concentrations presently have minimal impact upon groundwater contamination.

5.0 EXTENT OF GROUNDWATER CONTAMINATION

TPE has been monitoring groundwater since March, 1994. Floating product has been observed in wells MW-1, MW-2, MW-3, and TMW-5. Attached Table 3 summarizes the thickness of floating product measured in each well. The floating product was easily removed by purging with a bailer at the time of sampling. TPE is currently removing floating product in well MW-1 only by the use of a automated skimming device.

Gasoline and benzene contaminant levels appear to be fluctuating with the changing water table; however, contaminant levels have remained generally consistent since March, 1994. Attached Table 4 presents the groundwater sampling data collected from each well during quarterly groundwater monitoring.

Groundwater contamination has been defined to the west, north and east of the site. Groundwater contamination has not been defined to the south of the site based on the results of soil boring SB-2 and MW-3.

5.1 TPHG Dissolved Groundwater Plume Map

Figure 8 presents the groundwater TPHG concentrations from the Geoprobe program along with the March 7 and 10, 1997 quarterly sampling results. Dissolved concentrations in excess of 50,000 ppb TPHG are present.

5.2 Benzene Dissolved Groundwater Plume Map

Figure 9 presents the groundwater benzene concentrations from the Geoprobe program along with the March 7 and 10 quarterly sampling results. Dissolved concentrations in excess of 5,000 ppb benzene are present.

6.0 REMEDIAL OBJECTIVES

This RAP is designed to meet the following objectives: 1) to continue source removal; 2) to reduce dissolved TPHG and MBTEX concentrations in groundwater beneath the site; and 3) to initiate in-situ bioremediation through the injection of nutrients, oxygen and bacteria.

TPE intends to reduce the hydrocarbon contaminant concentrations below "action levels" in order that a human health risk assessment can be conducted.

7.0 PROPOSED OPTIONS FOR SITE REMEDIATION

7.1 Groundwater Monitoring

Contaminants in groundwater will decrease with time due to processes such as dispersion, volatilization and chemical decomposition. To evaluate the change in distribution and concentration of the contaminants with time, continued sampling of the monitoring wells would be done. Analytical data; however, suggests that for the past three years contaminant concentrations have not decreased. These concentration trends could be due to the continued leaching of the floating free product from soils.

This option is considered a "passive" approach because no direct remedial action is conducted. Typical costs for this option range from \$8,000 to \$12,000 per year. Although this option is the lowest cost of all options evaluated, it does not achieve the goal of reducing groundwater concentrations. This option also does not accomplish the goal of source removal. Based upon past concentration trends and the continued observation of floating product, this option was not selected.

7.2 Pump and Treat

This option involves the pumping of groundwater to remediation equipment, treating the groundwater, and discharging to the sewer or to the subsurface. This option will reduce the amount of floating product at the site by causing a cone of depression to draw the floating product into a well. Groundwater could be treated by remediation equipment or disposed of offsite.

This process; however, is slow and has not been successful due to the fact that soil at the capillary fringe will retain some of the free floating product providing an on-going source for future groundwater contamination. Typical costs for this option range from \$50,000 to \$100,000 per year. Case histories in California show that very few sites have attained closure using this option. ACHCSA also commented that groundwater extraction is not recommended as it has proven not to be cost effective.

- ok for plume control

7.3 Remedial Trench

A remedial trench could be constructed to collect floating product and to add nutrients, oxygen and bacteria to the groundwater (see Figure 10). Two PVC pipes would be placed into a trench at depths of about 15 and 25 feet. The lower pipe would be placed several feet below the capillary zone to slowly collect floating product and contaminated groundwater. At the midpoint within the trench, a sump would be installed to pump the floating product out of the trench system.

The upper pipe would be placed directly above the saturated zone, about 10 feet above the lower pipe. Nutrients, oxygen and bacteria could be added to this pipe for reinjection to enhance bioremediation at the site. Through the addition of nutrients, hydrocarbons within the capillary fringe as well as the groundwater could be remediated. Typical costs for this option range from \$100,000 to \$150,000 per year. Floating product, dissolved TPHG and MBTEX concentrations would be expected to decrease with implementation of this option; however, engineering feasibility and the costs associated with trench excavation, dewatering and construction make this remedial option less desirable.

7.4 Remedial Well/Bioremediation

A six-inch diameter remedial well could be installed in the vicinity of well MW-2, (see Figure 10) at a depth of about 30 feet. The well would be constructed so that the well screen would be a depths of about 25 feet. This depth would correlate to the approximate depth of the lower sand as shown in Figure 5.

The remedial well would be used to remove floating product with an automated skimmer device and/or passive adsorbent socks. The larger diameter well would allow more floating product to collect into the well for the automated skimmer to remove. Once the floating product is removed, this well could be used as a bioremediation well. Dilute solutions of hydrogen peroxide or socks of oxygen release compound (ORC) and /or bacteria could be injected into the formation via the well in order to enhance the remediation of the dissolved hydrocarbons in the groundwater.

To test the effects of this remedial well, wells MW-2 and MW-5 would be monitored for increased dissolved oxygen and a reduction of hydrocarbon concentrations. Based upon the results of the biotreatment and the radius of influence established by injection, an expanded remedial well network could be designed at a future time.

Typical costs for this option range from \$20,000 to \$50,000 per year.

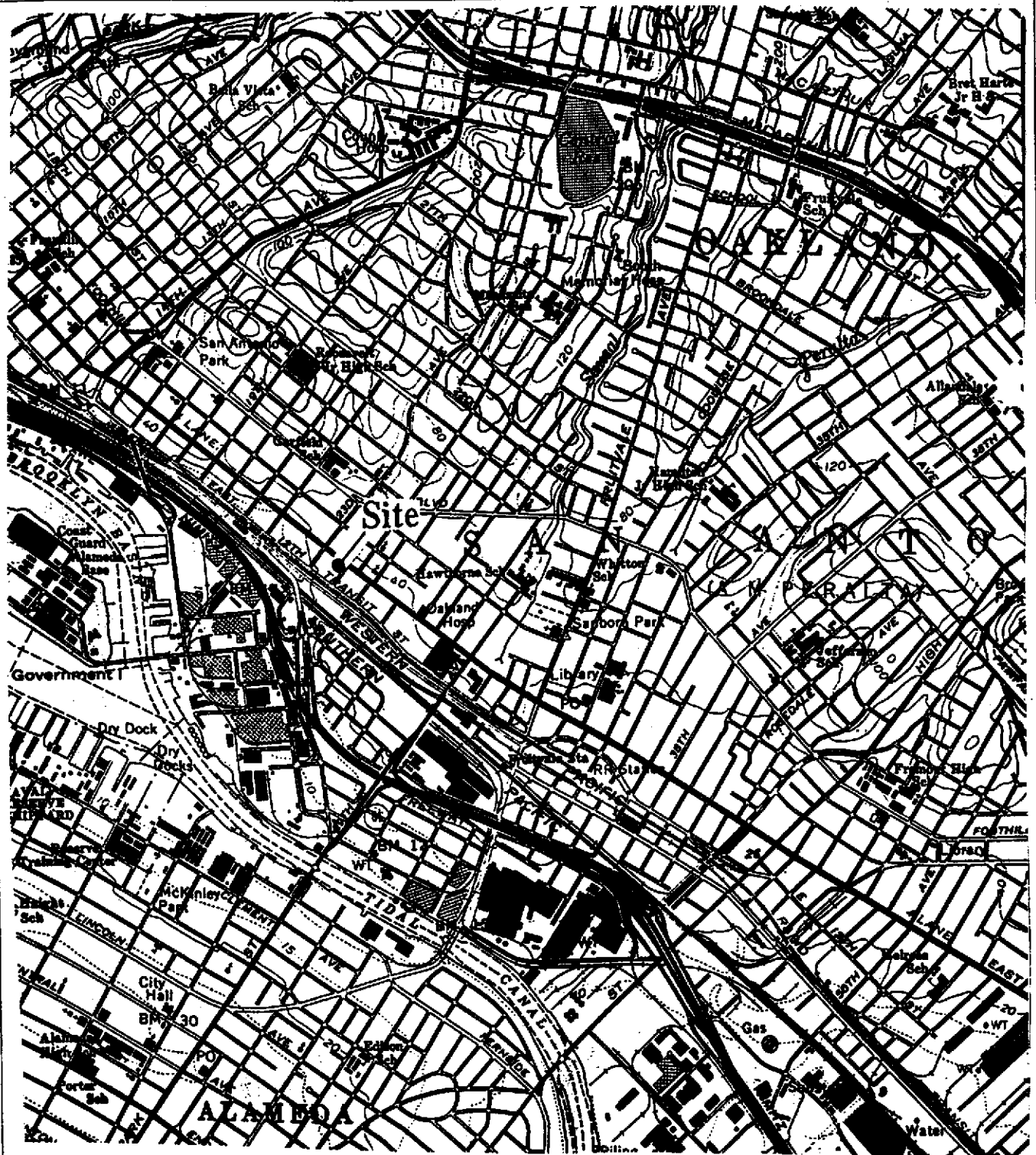
8.0 RECOMMENDED REMEDIATION STRATEGY

Based upon the evaluation of several remediation methods, TPE has determined that (Option 7.4), provides the best solution for remediation of this site. Option 7.4 was selected for the following reasons:

- Minimal site and neighborhood disturbance.
- Lower cost than pump and treat or trenching, based upon one year of operation.

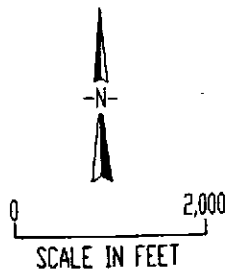
- Effective removal of floating product and a decrease in dissolved hydrocarbon concentrations.
- Bioremediation could be initiated once the removal of floating product has been completed.
- No soil stockpiles generated from trenching.

TPE will proceed with a detailed design, field and system installation schedule following approval of the recommended option. A detailed workplan will be prepared in the future to present well and equipment specifications, injection rates and other details concerning chemical and biological compounds.



LEGEND

REFERENCE: USGS 7.5 MINUTE
 SERIES QUADRANGLE MAP
 OAKLAND EAST, CALIFORNIA
 PHOTOREVISED 1980

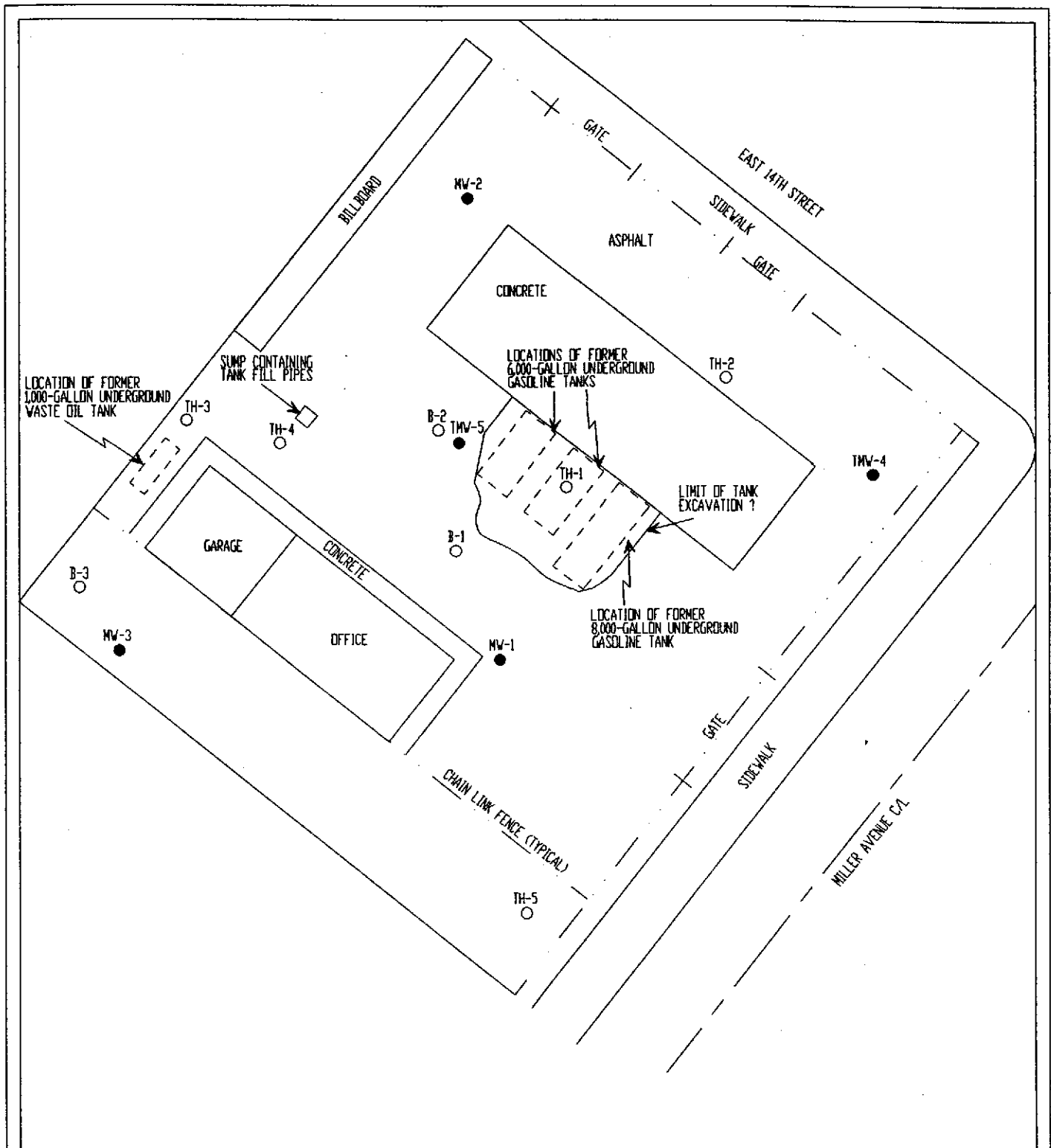


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SITE VICINITY MAP

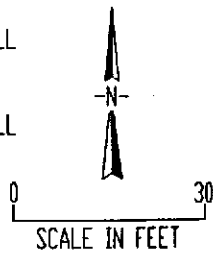
CREDIT WORLD AUTO SALES
 2345 E. 14TH STREET
 OAKLAND, CA 94601

DATE	5/21/97
FIGURE	1
FILE #	267-IN
DRAWN BY	VK
CHECKED BY	LNH



LEGEND

- TMW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
- MW-1 NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
- B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS

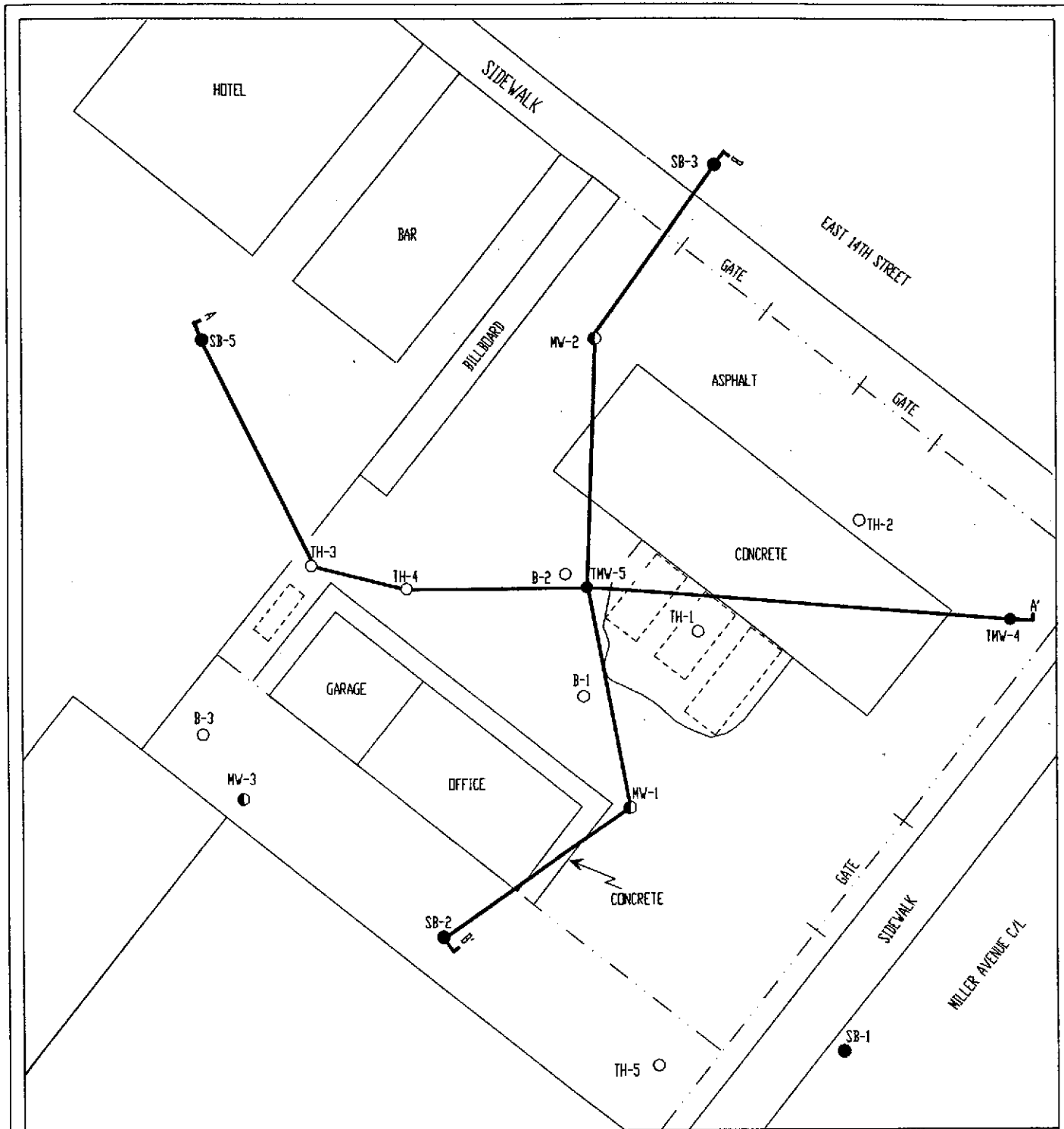


TANK PROTECT ENGINEERING





SITE PLAN

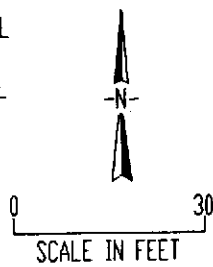
CREDIT WORLD AUTO SALES
 2345 E. 14TH STREET
 OAKLAND, CA 94601

DATE	10/20/97
FIGURE	2
FILE #	267-2N
DRAWN BY	VK
CHECKED BY	LNH



LEGEND

- 
 THW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
- 
 MV-1 NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
- 
 B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS
- 
 A A' LOCATION OF GEOLOGIC CROSS SECTION

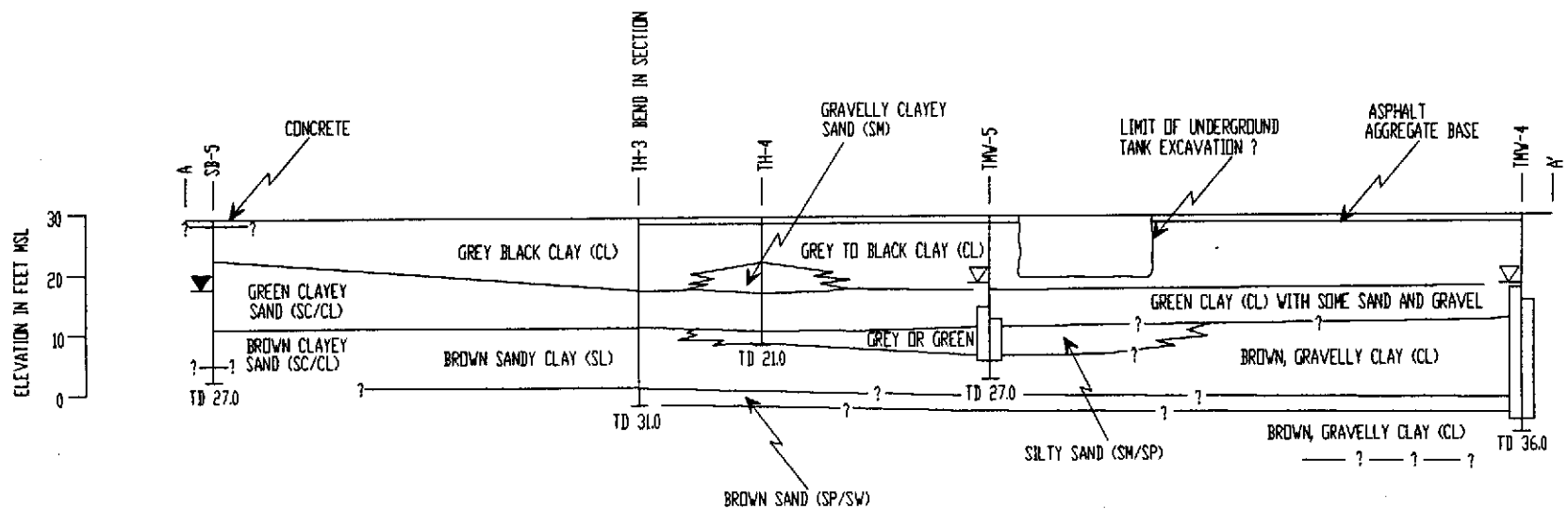


TANK PROTECT ENGINEERING

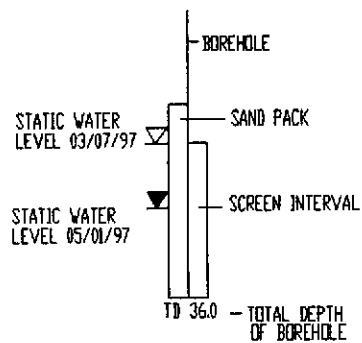
SITE PLAN
LOCATION OF GEOLOGIC CROSS SECTIONS A-A' AND B-B'

CREDIT WORLD AUTO SALES
2345 E. 14TH STREET
OAKLAND, CA 94601

DATE	10/20/97
FIGURE	3
FILE #	267-31N
DRAWN BY	VK
CHECKED BY	LNH

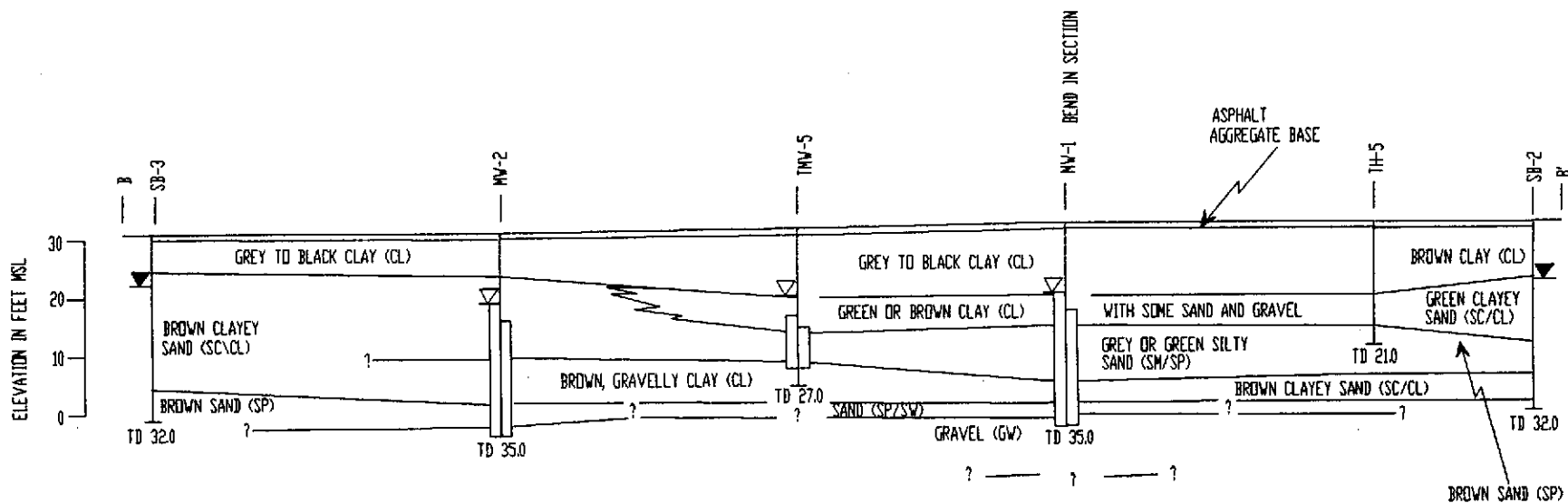


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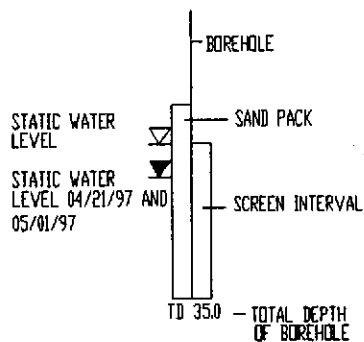


NO VERTICAL EXAGGERATION
 NOTE: SEE FIGURE 4 FOR LOCATION OF CROSS SECTION

TANK PROTECT ENGINEERING		
GEOLOGIC CROSS SECTION A-A'		
CREDIT WORLD AUTO SALES 2345 E. 14TH STREET OAKLAND, CA 94601	DATE	10/20/97
	FIGURE	4
	FILE #	267-32
	DRAWN BY	VK
	CHECKED BY	LNH

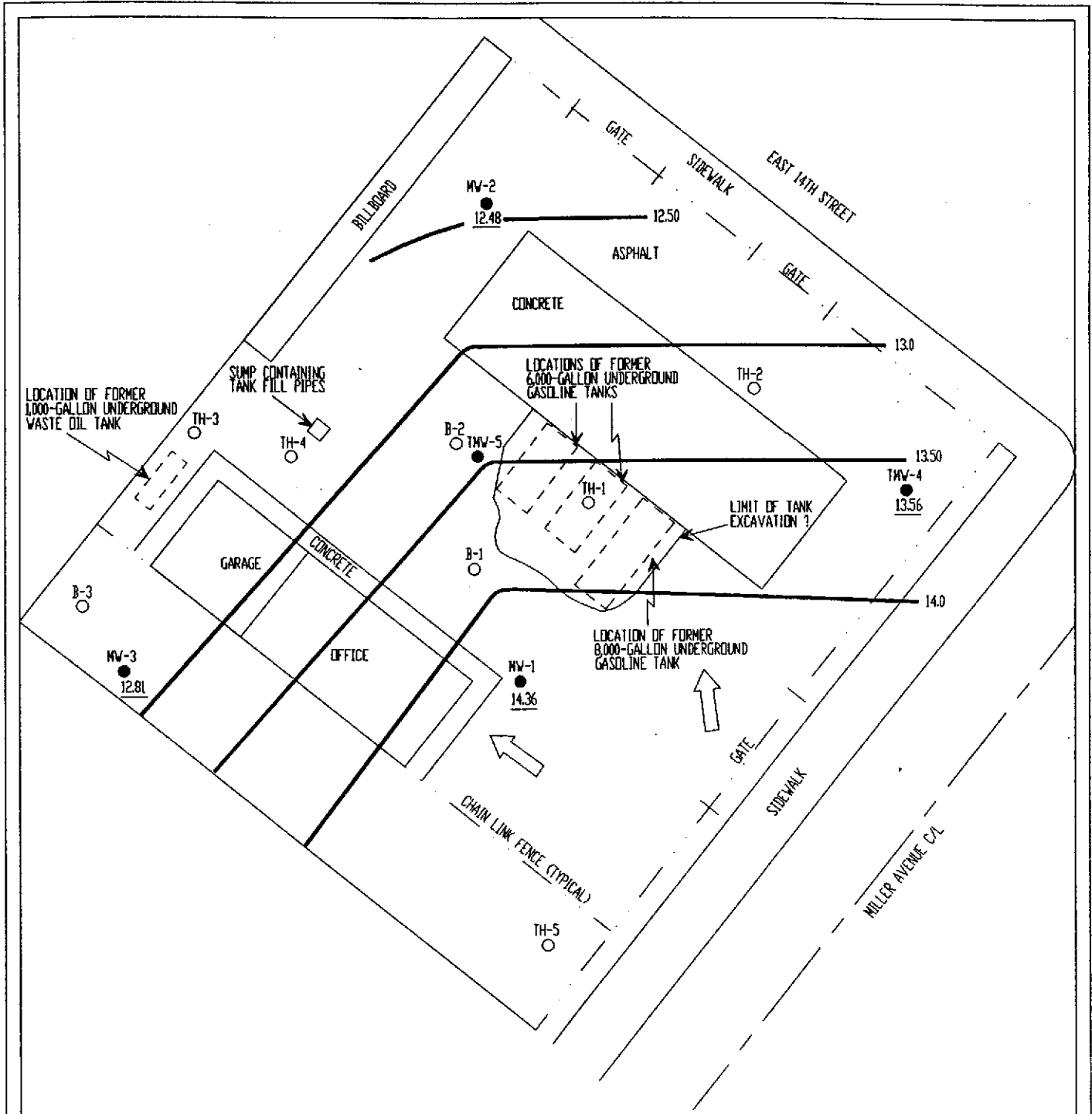


LEGEND



NO VERTICAL EXAGGERATION
 NOTE: SEE FIGURE 4 FOR LOCATION OF CROSS SECTION

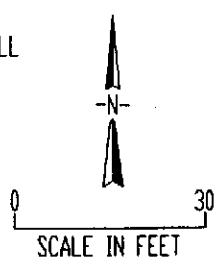
TANK PROTECT ENGINEERING		
GEOLOGIC CROSS SECTION B-B'		
CREDIT WORLD AUTO SALES 2345 E. 14TH STREET OAKLAND, CA 94601	DATE	10/20/97
	FIGURE	5
	FILE #	267-33
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	CHECKED BY	LNH



NOTE: REVISED SEPTEMBER 10, 1997

LEGEND

- TMW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
- MW-1 NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
- B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS
- 14.36 POTENTIOMETRIC ELEVATION
- 14.0 POTENTIOMETRIC CONTOUR
- ← 14.0 GROUNDWATER FLOW DIRECTION

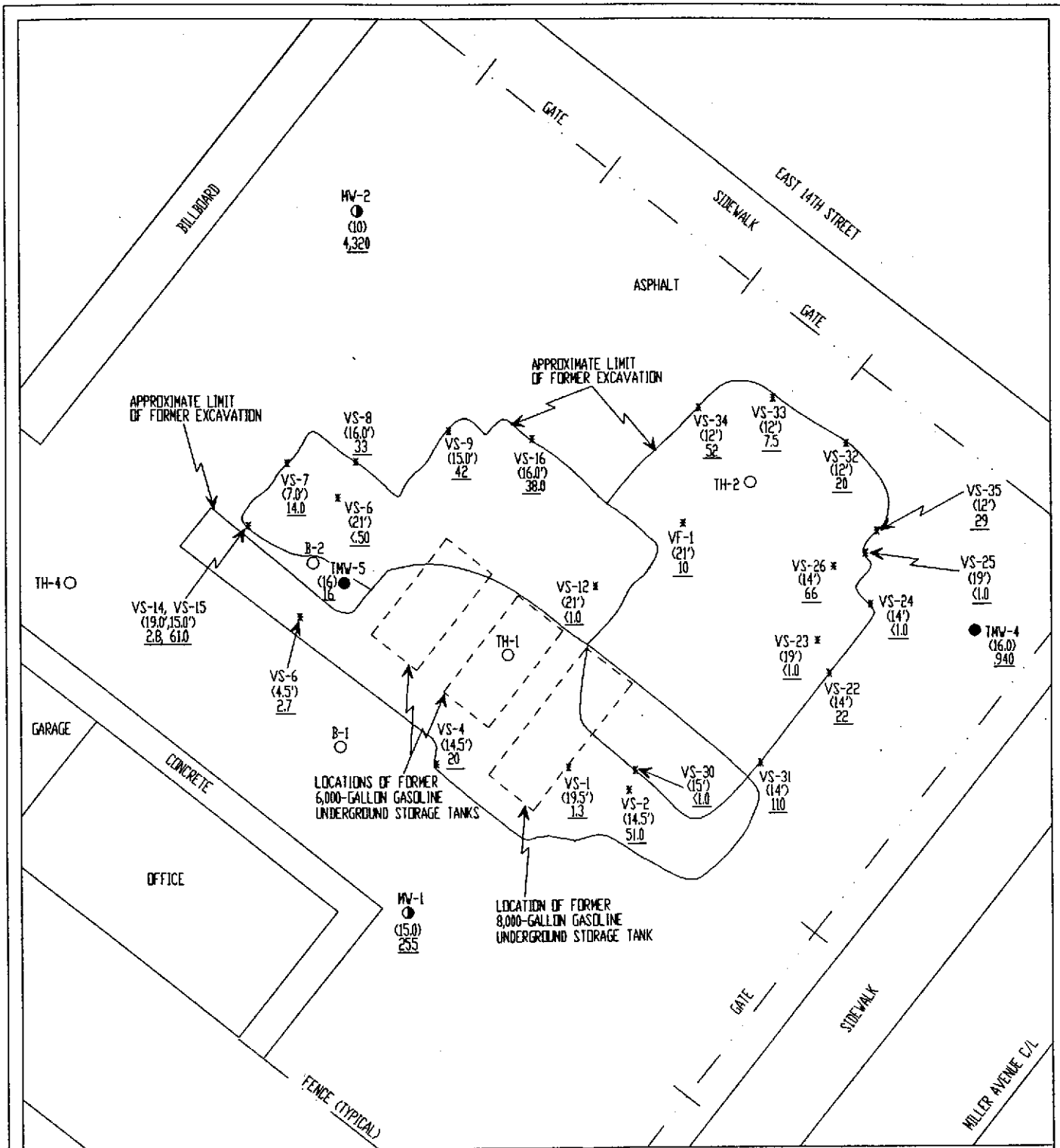


TANK PROTECT ENGINEERING

SITE PLAN:
GROUNDWATER GRADIENT MAP (09/18/97)

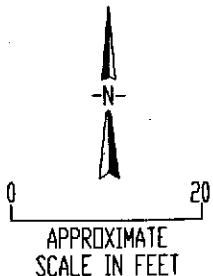
CREDIT WORLD AUTO SALES
2345 E. 14TH STREET
OAKLAND, CA 94601

DATE	10/20/97
FIGURE	6
FILE #	267-4-N
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CHECKED BY	LNH



LEGEND

- NAME LOCATION OF MONITORING WELL (DEPTH OF SAMPLE COLLECTED DURING INSTALLATION)
- 100 CONCENTRATION TPHG (ppm)
- VS-27 (18') * NAME, DEPTH, AND LOCATION OF SOIL SAMPLE

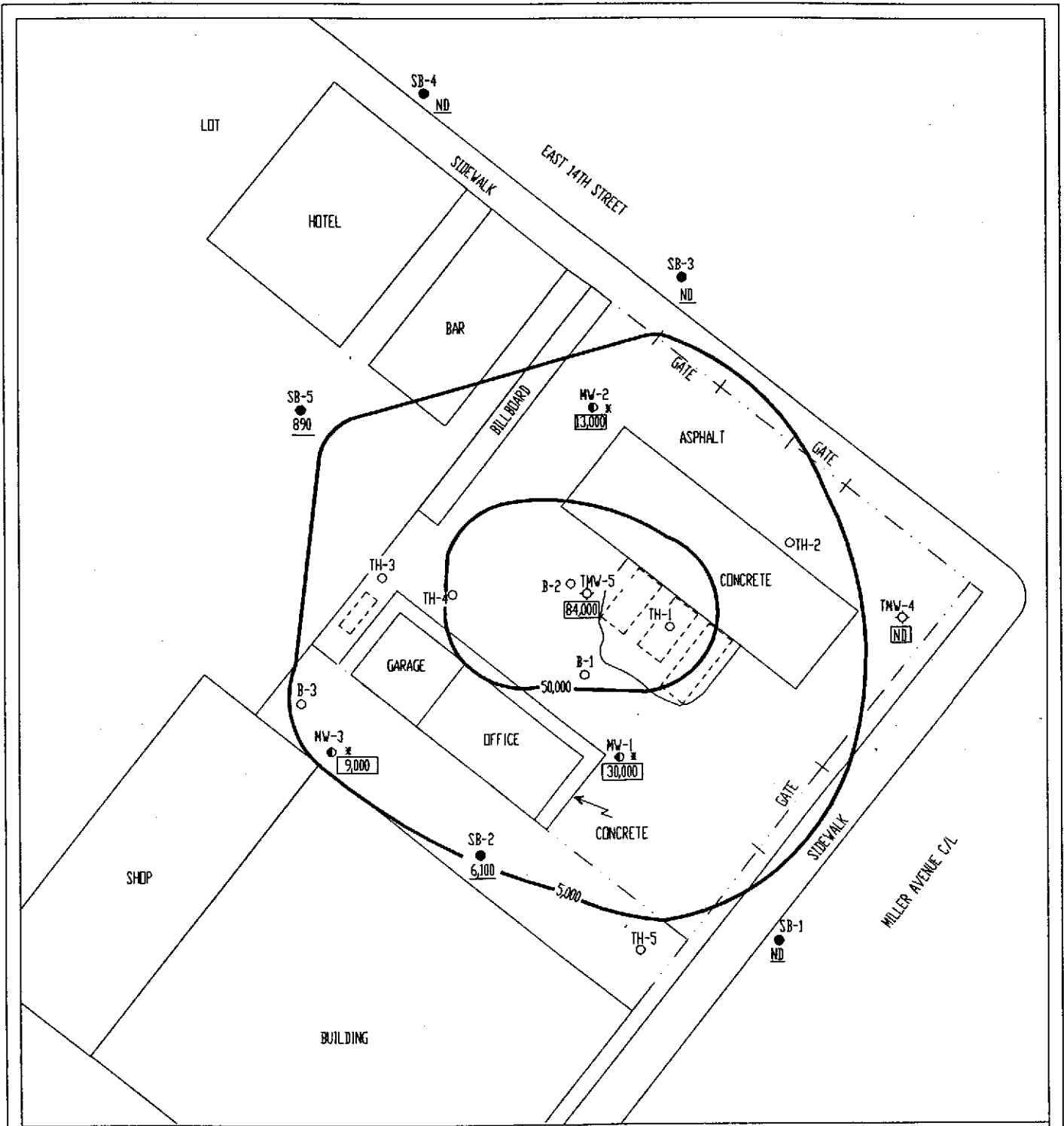


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SITE PLAN:
LOCATION OF FINAL VERIFICATION SOIL SAMPLING

CREDIT WORLD AUTO SALES
2345 E. 14TH STREET
OAKLAND, CA 94601

DATE	10/20/97
FIGURE	7
FILE #	267-16N
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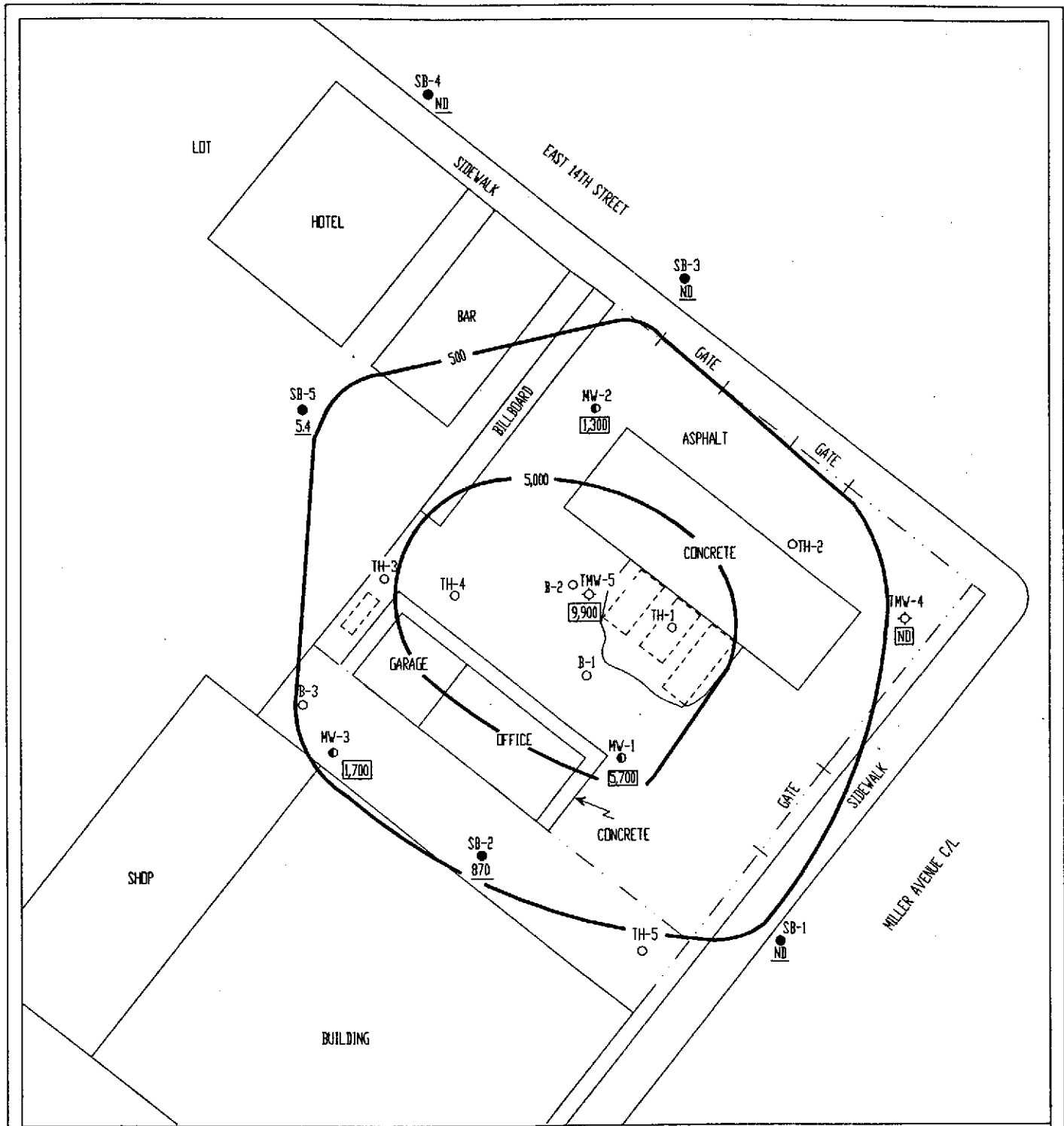
- ◇ THW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
- MW-1 NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
- B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS
- SB-1 LOCATION OF PROPOSED SOIL BORING
- LOCATION OF FORMER UNDERGROUND STORAGE TANK
- 1,700 CONCENTRATION (ppb)
- 5,000 CONCENTRATION CONTOUR
- 30,000 CONCENTRATION 3/7 AND 3/10/97
- ND NON DETECTABLE

0 40
SCALE IN FEET

TANK PROTECT ENGINEERING

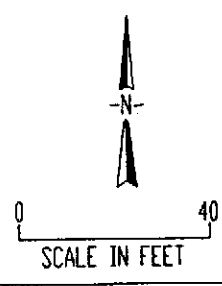
SITE PLAN:
GROUNDWATER GASOLINE CONCENTRATION

CREDIT WORLD AUTO SALES	DATE	10/20/97
2345 E. 14TH STREET	FIGURE	8
OAKLAND, CA 94601	FILE #	267-29N
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- TMW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
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- B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS
- SB-1 LOCATION OF PROPOSED SOIL BORING
- LOCATION OF FORMER UNDERGROUND STORAGE TANK
- 1,700 CONCENTRATION (ppb)
- 5,000 CONCENTRATION CONTOUR
- 5,700 CONCENTRATION 3/7 AND 3/10/97
- ND NON DETECTABLE

LEGEND



TANK PROTECT ENGINEERING

SITE PLAN:
GROUNDWATER BENZENE CONCENTRATION

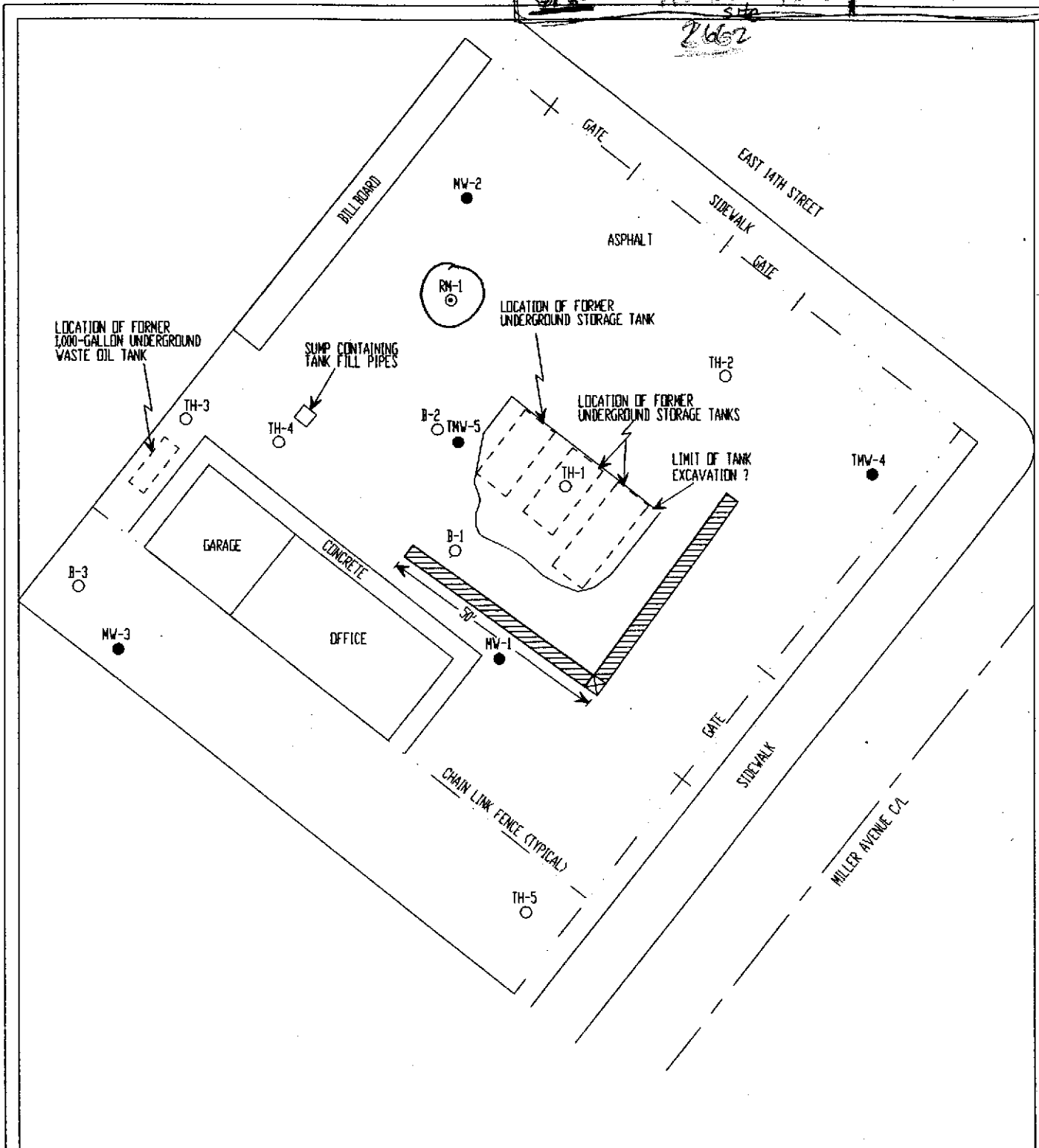
CREDIT WORLD AUTO SALES
2345 E. 14TH STREET
OAKLAND, CA 94601

DATE	10/20/97
FIGURE	9
FILE #	267-30N
DRAWN BY	VK
CHECKED BY	LNH

ORC - Jack Peabody
 Frontgate Ave.
 side

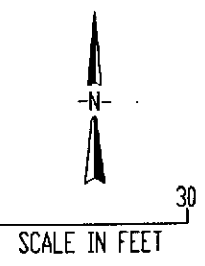
800-850

2/6/97



LEGEND

- PROPOSED SUMP AND INJECTION TRENCH
- RM-1 PROPOSED REMEDIAL WELL
- TMW-4 NAME AND LOCATION OF MONITORING WELL INSTALLED BY TPE
- MW-1 NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
- B-1 NAME AND APPROXIMATE LOCATION OF SOIL BORING DRILLED BY OTHERS



TANK PROTECT ENGINEERING

PROPOSED REMEDIAL OPTIONS

CREDIT WORLD AUTO SALES 2345 E. 14TH STREET OAKLAND, CA 94601	DATE	10/20/97
	FIGURE	10
	FILE #	267-1-2N
	CHECKED BY	FGM

TABLE 1
GROUNDWATER ELEVATION

Well Name	Date	TOC ¹ Elevation (Feet MSL ⁴)	Depth-to-Water From TOC (Feet)	Depth to Product From TOC (Feet)	Corrected ³ Groundwater Elevation (Feet MSL)
MW-1	08/23/91 ⁵	100.00 ²	15.42	NA ⁹	84.58
	04/16/92 ⁶	27.33 ⁷	16.66	11.54	14.51 ⁸
	06/11/93		12.61	12.60	14.73
	08/17/93		14.40	13.63	13.50 ⁷
	03/31/94		12.64	ND	14.69
	06/27/94		14.32	13.16	13.88
	09/16/94		15.86	13.64	13.14
	03/31/95		11.82	9.48	17.27
	06/28/95		13.50	12.60	14.51
	09/28/95		14.27	13.96	13.29
	12/26/95		11.77	11.62	15.67
	03/22/96		10.52	10.44	16.87
	06/20/96		13.38	12.49	14.63
	09/24/96		14.60	13.40	13.63
	12/27/96		9.17	9.08	18.23
	03/06/97		12.35	ND	14.98
	06/28/97		10.93	10.60	16.65
	09/18/97		13.10	12.93	14.36
MW-2	08/23/91 ⁵	98.585 ²	13.77	NA	84.815
	04/16/92 ⁶	25.92 ⁷	15.38	12.57	12.65 ⁸
	06/11/93		13.185	ND ¹⁰	12.74
	08/17/93		14.04	14.03	11.89
	03/31/94		13.61	13.07	12.72 ⁸
	06/27/94		14.24	13.44	12.28
	09/16/94		17.82	13.36	11.45
	03/31/95		16.72	9.28	14.78
	06/28/95		13.50	12.77	12.97
	09/28/95		14.63	14.09	11.70

TABLE 1
GROUNDWATER ELEVATION

Well Name	Date	TOC ¹ Elevation (Feet MSL ⁴)	Depth-to-Water From TOC (Feet)	Depth to Product From TOC (Feet)	Corrected ³ Groundwater Elevation (Feet MSL)
MW-2	12/26/95	25.92 ⁷	12.58	11.68	14.01
	03/22/96		11.46	11.31	14.57
	06/20/96		13.08	12.71	13.12
	09/30/96		16.67	12.92	12.06
	12/27/96		15.74	8.17	15.86
	03/06/97		12.55	ND	13.37
	06/28/97		11.98	11.94	13.97
	09/18/97		13.44	13.44	12.48
MW-3	08/23/91 ⁵	99.25 ²	15.07	NA	84.18
	04/16/92 ⁶	27.57 ⁷	14.14	13.98	13.55 ⁸
	06/11/93		14.275	ND	13.30
	08/17/93		15.77	ND	11.80
	03/31/94		14.35	ND	13.22
	06/27/94		14.77	ND	12.80
	09/16/94		15.42	15.37	12.19
	03/31/95		12.98	12.52	14.94
	06/28/95		14.20	14.15	13.41
	09/28/95		15.17	ND	12.40
	12/26/95		13.33	13.27	14.28
	03/22/96		12.81	12.77	14.79
	06/20/96		13.95	13.88	13.67
	09/24/96		14.86	14.82	12.74
	12/27/96		11.04	10.98	16.58
	03/07/97		13.80	ND	13.77
	06/28/97		13.72	13.66	13.89
	09/18/97		14.76	ND	12.81
TMW-4	08/17/93	26.50 ⁷	13.26	ND	13.24
	03/31/94		12.40	ND	14.10

TABLE 1
GROUNDWATER ELEVATION

Well Name	Date	TOC ¹ Elevation (Feet MSL ⁴)	Depth-to-Water From TOC (Feet)	Depth to Product From TOC (Feet)	Corrected ³ Groundwater Elevation (Feet MSL)
TMW-4	06/27/94	26.50 ⁷	12.84	ND	13.66
	09/16/94		13.58	ND	12.92
	03/31/95		10.23	ND	16.27
	06/28/95		12.21	ND	14.29
	09/28/95		13.38	ND	13.12
	12/26/95		11.32	ND	15.18
	03/22/96		10.54	ND	15.96
	06/20/96		12.14	ND	14.36
	09/24/96		13.01	ND	13.49
	12/27/96		9.51	ND	16.99
	03/07/97		11.92	ND	14.58
	06/28/97		10.70	ND	15.80
	09/18/97		12.94	ND	13.56
	TMW-5	08/17/93	26.51 ⁷	12.98	12.95
03/31/94			11.39	ND	15.12
06/27/94			12.24	ND	14.27
09/16/94			13.02	12.97	13.53
03/31/95			7.38	ND	19.13
06/28/95			11.31	11.25	15.25
09/28/95			14.42	ND	12.09
12/26/95			10.16	10.11	16.38
03/22/96			7.59	7.54	18.96
06/26/96 ¹¹			7.12	ND	NA
09/30/96 ¹¹			7.42	ND ¹⁰	NA ⁹
12/27/96 ¹¹			6.38	ND	NA
03/07/97 ¹¹			11.12	ND	NA
06/28/97 ¹²		NM ¹²	NM ¹²	---	
09/18/97 ¹¹		12	ND	---	

- 1 TOP-OF-CASING.
- 2 RELATIVE TO SITE DATUM ESTABLISHED BY ESE.
- 3 ELEVATION CORRECTED FOR FLOATING PRODUCT USING 0.75 DENSITY FOR GASOLINE.
- 4 MEAN SEA LEVEL.
- 5 WATER LEVEL MEASUREMENTS BY ESE.
- 6 WATER LEVEL MEASUREMENTS BY NKJ.
- 7 TOC SURVEYED 8/10/93 BY PROFESSIONAL ENGINEER.
- 8 CORRECTED GROUNDWATER ELEVATION BY TANK PROTECT ENGINEERING
- 8 CORRECTED GROUNDWATER ELEVATION BY TANK PROTECT ENGINEERING.
- 9 NOT AVAILABLE.
- 10 NOT DETECTED.
- 11 WELL TOP DESTROYED DURING REMEDIATION
- 12 NOT MEASURED - WELL OBSTRUCTED

TABLE 2
GROUNDWATER GRADIENTS, FLOW DIRECTIONS,
AND ELEVATION DATA

Date	Average Groundwater Elevation (Feet-MSL ¹)	Change in Average Groundwater Elevation (Feet)	Groundwater Gradient	Groundwater Flow Direction
04/16/92	13.57	---	.021	NW
06/11/93	13.59	0.02	.026	NW
08/17/93	12.80	-0.79	.029	RADIAL
03/31/94	13.97	+1.17	.050	RADIAL
06/27/94	13.38	-0.59	.020	RADIAL
09/16/94	12.65	-0.73	.0179-.0411	RADIAL
03/31/95	16.48	+3.83	.075	RADIAL
06/28/95	14.09	-2.39	.025-.053	RADIAL
09/28/95	12.52	-1.57	.025	NW
12/26/95	15.09	+2.57	.048	RADIAL
03/22/96	16.23	+1.14	.034-.132	RADIAL
06/20/96 ²	13.95	-2.28	.016	NW
09/30/96 ²	12.98	-0.97	.019	NW
12/27/96 ²	16.41	+3.43	.024-.029	N-NW
03/07/97 ²	14.18	-2.23	.020-.035	N-NW
06/28/97 ²	15.07	+.89	.027-.04	NW
09/18/97	13.30	-1.77	.02-.026	RADIAL

¹ MEAN SEA LEVEL.

² DOES NOT INCLUDE DATA FOR TMW-5; WELL TOP DESTROYED DURING REMEDIATION ACTIVITIES.

TABLE 3
SUMMARY OF FLOATING PRODUCT THICKNESS

Well Name	Date	Depth-to-Water From TOC ¹ (Feet)	Depth-to-Product From TOC (Feet)	Product Thickness (Feet)
MW-1	04/16/92 ²	16.66	11.54	5.12
	06/11/93	12.61	12.60	0.01
	08/17/93	14.40	13.63	0.77
	03/31/94	12.64	ND	---
	06/27/94	14.32	13.16	1.16
	09/16/94	15.86	13.64	2.22
	03/31/95	11.82	9.48	2.34
	06/28/95	13.50	12.60	0.90
	09/28/95	14.27	13.96	0.31
	12/26/95	11.77	11.62	0.15
	03/22/96	10.52	10.44	0.08
	06/20/96	13.38	12.49	0.089
	09/24/96	14.60	13.40	1.20
	12/27/96	9.17	9.08	0.09
	03/06/97	12.35	ND	---
	06/28/97	10.93	10.60	0.33
	09/18/97*	13.10	12.93	.17
MW-2	04/16/92 ²	15.38	12.57	2.81
	06/11/93	13.185	ND ³	---
	08/17/93	14.04	14.03	0.01
	03/31/94	13.61	13.07	0.54
	06/27/94	14.24	13.44	0.80
	09/16/94	17.82	13.36	4.46
	03/31/95	16.72	9.28	7.44
	06/28/95	13.50	12.77	0.73
	09/28/95	14.63	14.09	0.54
	12/26/95	12.58	11.68	0.90
	03/22/96	11.46	11.31	0.15

**TABLE 3
SUMMARY OF FLOATING PRODUCT THICKNESS**

Well Name	Date	Depth-to-Water From TOC ¹ (Feet)	Depth-to-Product From TOC (Feet)	Product Thickness (Feet)
MW-2	06/20/96	13.08	12.71	0.37
	09/30/96	16.67	12.92	3.75
	12/27/96	15.74	8.17	7.57
	03/06/97	12.55	ND	---
	06/28/97	11.98	11.94	0.04
	09/18/97*	13.44	13.44	TRACE
MW-3	04/16/92 ²	14.14	13.98	0.16
	06/11/93	14.275	ND	---
	08/17/93	15.77	ND	---
	03/31/94	14.35	ND	---
	06/27/94	14.77	ND	
	09/16/94	15.42	15.37	
	03/31/95	12.98	12.52	0.46
	06/28/95	14.20	14.15	0.05
	09/28/95	15.7	ND	--
	12/26/95	13.33	13.27	0.06
	03/22/96	12.81	12.77	0.04
	06/20/96	13.95	13.88	0.07
	09/24/96	14.86	14.82	0.04
	12/27/96	11.04	10.98	0.06
	03/07/97	13.80	ND	---
	06/28/97	13.72	13.66	0.06
	09/18/97	14.76	ND	---
TMW-4	08/17/93	13.26	ND	---
	03/31/94	12.40	ND	---
	06/27/94	12.84	ND	---
	09/16/94	13.58	ND	---
	03/31/95	10.23	ND	---

TABLE 3
SUMMARY OF FLOATING PRODUCT THICKNESS

Well Name	Date	Depth-to-Water From TOC ¹ (Feet)	Depth-to-Product From TOC (Feet)	Product Thickness (Feet)	
TMW-4	06/28/95	12.21	ND	---	
	09/28/95	13.38	ND	---	
	12/26/95	11.32	ND	---	
	03/22/96	10.54	ND	---	
	06/20/96	12.14	ND	---	
	09/24/96	13.01	ND	---	
	12/27/96	9.51	ND	---	
	03/07/97	11.92	ND	---	
	06/28/97	10.70	ND	---	
	09/18/97*	12.94	ND	---	
	TMW-5	08/17/93	12.98	12.95	0.03
		03/31/94	11.39	ND	---
06/27/94		12.24	ND	---	
09/16/94		13.02	12.97	0.05	
03/31/95		7.38	ND	---	
06/28/95		11.31	11.25	0.06	
09/28/95		14.42	ND	---	
12/26/95		10.16	10.11	0.05	
03/22/96		7.59	7.54	0.05	
06/20/96 ¹¹		7.12	ND	---	
09/30/96 ¹¹		7.42	ND	---	
12/27/96 ¹¹		6.38	ND	---	
03/07/97 ¹¹		11.12	ND	---	
06/28/97 ¹²		NM ¹²	NM ¹²	---	
09/18/97*	12.00	ND	---		

- ¹ TOP-OF-CASING.
- ² RELATIVE TO SITE DATUM ESTABLISHED BY ESE.
- ³ ELEVATION CORRECTED FOR FLOATING PRODUCT USING 0.75 DENSITY FOR GASOLINE.
- ⁴ MEAN SEA LEVEL
- ⁵ WATER LEVEL MEASUREMENTS BY ESE.
- ⁶ WATER LEVEL MEASUREMENTS BY NKJ.
- ⁷ TOC SURVEYED 8/10/93 BY PROFESSIONAL ENGINEER.
- ⁸ CORRECTED GROUNDWATER ELEVATION BY TANK PROTECT ENGINEERING.
- ⁹ NOT AVAILABLE.
- ¹⁰ NOT DETECTED.
- ¹¹ WELL TOP DESTROYED DURING REMEDIATION
- ¹² NOT MEASURED - WELL OBSTRUCTED
- * VISUAL MEASUREMENTS FROM BAILER

TABLE 4
SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
(ppb¹)

Sample ID Name	Date	TPHG	Methyl t-Butyl Ether	Benzene	Toluene	Ethylbenzene	Xylenes
MW-1	08/17/93	110,000	NA ²	270	690	730	3,100
	03/28/94	34,000	NA	4,900	1,800	1,200	4,000
	06/27/94	21,000	NA	12,000	810	760	2,500
	09/16/94	37,000	NA	7,900	2,400	1,300	3,300
	03/31/95	43,000	NA	8,100	1,900	1,000	4,200
	06/28/95	80,000	NA	7,900	3,200	1,800	7,300
	09/28/95	24,000	<1,200	4,900	470	470	1,700
	12/26/95	61,000	<1,200	12,000	4,200	1,500	5,500
	03/22/96	19,000	<2,500	6,000	47	260	<750
	06/20/96	15,000	910	2,900	100	240	98
	09/24/96	20,000	340	4,800	220	300	770
	12/27/96	24,000	<5.0	5,900	440	310	740
	03/07/97	30,000	<5.0	5,700	370	290	780
	06/28/97	54,000	<5.0	5,200	1,300	1,000	4,900
	09/18/97	54,000	<5.0	5,300	1,200	1,100	4,600
MW-2	08/17/93	49,000	NA	94	240	250	980
	03/28/94	14,000	NA	4,200	<250	910	1,400
	06/27/94	24,000	NA	4,400	72	1,100	1,700
	09/16/94	40,000	NA	2,300	250	2,000	4,100
	03/31/95	28,000	NA	4,000	<120	1,100	1,400
	06/28/95	40,000	NA	2,700	130	1,700	2,900
	09/28/95	7,500	<62	420	14	250	190
	12/26/95	22,000	<250	1,300	88	950	1,800
	03/22/96	9,800	<1,200	2,200	<120	400	<380
	06/20/96	35,000	550	770	<0.50	240	<0.50
	09/30/96	58,000	<5.0	1,600	230	2,200	4,000
	12/27/96	29,000	<5.0	2,100	<0.50	1,200	1,800
	03/07/97	13,000	<5.0	1,300	37	290	180

TABLE 4
SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
(ppb¹)

Sample ID Name	Date	TPHG	Methyl t-butyl ether	Benzene	Toluene	Ethyl-benzene	Xylenes
MW-2	06/28/97	12,000	<5.0	840	<0.50	640	360
	09/18/97	12,000	<5.0	680	<0.50	320	84
MW-3	08/17/93	9,600	NA	4.1	17	28	54
	03/28/94	8,400	NA	2,400	56	67	200
	06/27/94	9,900	NA	3,300	<22	<25	73
	09/16/94	16,000	NA	2,300	80	620	240
	03/31/95	16,000	NA	2,800	70	<25	920
	06/28/95	11,000	NA	2,300	32	81	240
	09/28/95	6,300	<420	1,900	<42	200	<120
	12/26/95	25,000	<250	3,800	97	94	1,600
	03/22/96	16,000	250	3,100	75	69	350
	06/20/96	8,500	220	1,400	28	140	15
	09/24/96	12,000	<5.0	2,400	87	340	110
	12/27/96	5,800	240	1,700	28	<0.50	42
	03/10/97	9,000	<5.0	1,700	<0.5	110	<0.5
	06/28/97	15,000	<5.0	2,200	<0.50	160	190
	09/18/97	28,000	<5.0	3,800	<0.5	100	<0.5
TMW-4	08/17/93	150	NA	<0.50	0.8	1.4	3.7
	03/28/94	<50	NA	<0.50	<0.50	<0.50	<1.5
	06/27/94	<50	NA	<0.50	<0.50	<0.50	<1.5
	09/16/94	<50	NA	<0.50	<0.50	<0.50	<1.5
	03/31/95	<50	NA	<0.50	<0.50	<0.50	<1.5
	06/28/95	<50	NA	<0.50	<0.50	<0.50	<1.5
	09/28/95	<50	<5.0	<0.50	<0.50	<0.50	<1.5
	12/26/95	<50	<5.0	<0.50	<0.50	<0.50	<1.5
	03/22/96	<50	<5.0	<0.50	<0.50	<0.50	<1.5
	06/20/96	<50	<5.0	<0.50	<0.50	<0.50	<0.50
	09/24/96	<50	<5.0	<0.50	<0.50	<0.50	<0.50
	12/27/96	<50	<5.0	<0.50	<0.50	<0.50	<0.50
	03/10/97	<50	<5.0	<0.50	<0.50	<0.50	<0.50

TABLE 4
SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
(ppb¹)

Sample ID Name	Date	TPHG	Methyl t-butyl ether	Benzene	Toluene	Ethyl-benzene	Xylenes
TMW-4	06/27/97	<50	<5.0	<0.50	<0.50	<0.50	<0.50
	09/18/97	<50	<5.0	<0.5	<0.5	<0.5	<0.5
TMW-5	08/17/93	120,000	NA	640	730	790	3,600
	03/28/94	70,000	NA	23,000	1,500	4,100	15,000
	06/28/94	56,000	NA	26,000	940	5,500	26,000
	09/16/94	96,000	NA	17,000	720	3,500	12,000
	03/31/95	64,000	NA	13,000	470	3,500	6,100
	06/28/95	65,000	NA	9,000	240	2,600	5,300
	09/28/95	79,000	<1,200	17,000	1,800	2,700	7,000
	12/26/95	110,000	<1,200	11,000	800	2,300	4,500
	06/26/96	30,000	830	4,000	180	1,500	2,500
	09/30/96	6,900	<5.0	1,600	79	130	370
	12/27/96	78,000	<5.0	12,000	1,900	2,900	9,700
	03/10/97	84,000	<5.0	9,900	1,100	2,600	8,800
	06/28/97	NA	NA	NA	NA	NA	NA
	09/18/97	65,000	<5.0	8,000	<0.5	2,000	4,700
TMW-6	09/18/97	<50.0	<5.0	<0.5	<0.5	<0.5	<0.5

¹ PARTS PER BILLION.

² NOT ANALYZED.

APPENDIX A

ALAMEDA COUNTY HEALTH CARE SERVICES, LETTER DATED JUNE
12, 1997

ALAMEDA COUNTY
HEALTH CARE SERVICES

AGENCY

DAVID J. KEARS, Agency Director



Post-It™ brand fax transmittal memo 7671		# of pages 2
To	L. Huelman	From BChen
Co.	TPE	Co. AC&H
Dept.		Phone # 5676765
Fax #	429-8089	Fax #

June 12, 1997
StID# 2116Mr. Stanley Wong
2200 E. 12th St.
Oakland CA 946061131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-8700
FAX (510) 337-9335Re: Site Assessment Report for former Credit World Auto Sales
2345 E. 14th St., Oakland CA 94601

Dear Mr. Wong:

Our office has received and reviewed that June 3, 1997 Site Assessment Report for the above site. This report gives the soil and groundwater results of the recent borings (SB-1 through SB-5). The results of this investigation indicate that the extent of soil and groundwater contamination is limited to the general area within and around the former underground tanks. It appears, as is believed in typical fuel release cases, that the extent of the release to soil and groundwater is limited and has not traveled beyond 160 feet downgradient of the release.

The report also provides the groundwater monitoring results for the March 1997 sampling event. Free product was not detected in any of the wells, perhaps reflecting the effect of the considerable removal and remediation of gasoline contaminated soil.

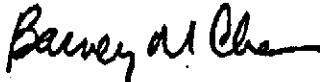
Consistent with the recommendations of the Lawrence Livermore National Lab (LLNL) study, the preferred remedial approach at the typical site is to verify and enhance, if necessary, conditions conducive to natural bioremediation. You should, therefore, include in all future monitoring events, results for the analysis of the following natural biodegradation parameters: dissolved oxygen, oxygen-reduction potential, alkalinity, nitrate, sulfate and ferrous iron (Fe +2). I agree that quarterly monitoring should continue.

Please provide a work plan which recommends the introduction of appropriate supplements to enhance bioremediation. This can be done through the advancement of additional vertical probes or wells or casings etc. within the contaminant plume. Based upon the existing chemicals detected, you can determine which ones to add to enhance biodegradation. At this point, groundwater extraction is not recommended as it has proven not to be cost effective.

Mr. Stanley Wong
2345 E. 14th St.
StID # 2116
June 12, 1997
Page 2.

You may contact me at (510) 567-6765 if you have any questions.

Sincerely,



Barney M. Chan
Hazardous Materials Specialist

c: ~~B. Chan, Files~~

Mr. L. Huckins, TPE, 2821 Whipple Rd., Union City, CA 94587
Mr. A. Rambach, SWRCB Cleanup Fund, P.O. Box 944212,
Sacramento, CA 95814

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