WORKPLAN
FOR
CONSTRUCTION OF GROUNDWATER MONITORING WELLS

6/18/93

2345 E. 14TH STREET
OAKLAND, CA 94601

6-18-93

Submitted By:
TANK PROTECT ENGINEERING
Of Northern California, Inc.
June 18, 1993

John V. Mrakovich, Ph.D.
Registered Geologist

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OAKLAND, CA 94601

June 18, 1993

This Workplan/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.

Jeff J. Farhoomand, M.S.
Civil Engineer

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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). A used car dealership known as Credit World Auto Sales currently occupies the site. An on-site building which includes an automotive service bay is used as an office and for light automobile maintenance.

Tank Protect Engineering of Northern California, Inc. (TPE) has been contracted by Messrs. Aaron and Stanley Wong [(Wong), telephone number (510) 532-1672] to construct two 2-inch groundwater monitoring wells (TMW-4 and TMW-5) at locations approved by the Alameda County Health Care Services Agency (ACHCSA) in their October 30, 1992 letter (see Appendix A) and to install free product removal systems in up to 2 wells if free product is present.

This workplan proposes a change in location for 1 of the wells due to a change in groundwater gradient based on depth-to-groundwater measurements made by NKJ Environmental Monitoring (NKJ) on April 16, 1992 and by TPE on June 11, 1993; details of the proposed change are discussed below in section 3.2.1 Monitoring Well Locations.

2.0 BACKGROUND

The following background is summarized from documents provided to TPE by Wong.

2.1 Tank Removal

On August 5, 1988, one 8,000-gallon underground gasoline storage tank, two 6,000-gallon underground gasoline storage tanks, one 1,000-gallon underground waste oil storage tank, 2 dispenser islands, and associated piping were removed from the site by West Coast Tank Company of Campbell, California. Subsequent soil sampling was conducted by SCS Engineers (SCS) of Dublin, California.

2.2 Tank Removal Soil Sampling

On August 25, 1988, two soil samples were collected from beneath each gasoline tank and submitted for analysis for total petroleum hydrocarbons as gasoline (TPHG) by United States Environmental Protection Agency (EPA) Method 8015; for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020; and for lead by EPA Method 7420. Samples collected from beneath the waste oil storage tank were analyzed for total petroleum hydrocarbons as diesel (TPHD) by EPA Method 8015, for total oil & grease (TOG) by Standard Method 503E, and for volatile organics by EPA Method 624.

2.2.1 Results of Chemical Analyses

All samples analyzed for TPHG, BTEX, and lead contained concentrations of all constituents. TPHG ranged in concentration from 130 parts per million (ppm) to 1,500 ppm. BTEX chemicals ranged in concentration from a low of .17 ppm for benzene to a high of 160 ppm for xylenes. Lead ranged in concentration from 4.6 ppm to 316 ppm.

TOG and TPHD were detected in both soil samples collected beneath the waste oil tank. TOG was detected at concentrations of 570 ppm and 780 ppm. TPHD was detected at concentrations of 65 ppm and 110 ppm.

EPA Method 624 detected only ethylbenzene and total xylenes in soil beneath the waste oil tank.

The reader is referred to SCS's September 19, 1988 letter report to Mr. Dino Gonis for documentation of the above work and analytical results.

2.3 Soil Boring and Groundwater Investigation-October 3, 1988

On October 3, 1988, California Environmental Consultants (CEC) drilled 3 soil borings (see Figure 2) to characterize the soil in the vicinity of the tanks. Borings B-1 and

B-2 were drilled in the area of the former underground gasoline tanks and boring B-3 was drilled in the area of the former waste oil tank. One sample was collected at a depth of 15 feet in each boring.

2.3.1 Results of Chemical Analyses

2.3.1.1 Soil Samples

Soil samples from borings B-1 and B-2 were analyzed for TPHG and BTEX by EPA Method 5030 or 3810/8015/8020; TPHG was detected at concentrations of 3.4 ppm and 83 ppm, respectively. Low concentrations of some or all BTEX chemicals were detected in both samples.

The soil sample from boring B-3 was analyzed for BTEX, TOG, and halogenated volatile organics by EPA Methods 5030/8020, 3550, and 5030/8010, respectively. All BTEX chemicals were detected and ranged in concentration from a low of .360 ppm for benzene to a high of .850 ppm for xylenes. TOG was detected at a concentration of 88 ppm and no chemicals were detected by EPA Method 5030/8010. Cl-Hc

2.3.1.2 Grab Groundwater Samples

One grab groundwater sample was collected from each boring and analyzed as discussed above under section 2.3.1.1 Soil Samples.

TPHG was detected in water samples from borings B-1 and B-2 at concentrations of 67,000 parts per billion (ppb) and 110,000 ppb, respectively; all BTEX chemicals were detected in both samples with concentrations ranging from a low of 2,400 ppb for toluene to a high of 17,000 ppb for benzene.

The water sample from boring B-3 detected all BTEX chemicals ranging in concentration from a low of 160 ppb for toluene to a high of 1,300 ppb for xylenes. TOG was detected at a concentration of 290,000 ppb and no chemicals were detected by EPA Method 5030/8010.

The reader is referred to CEC's November 21, 1988 letter report to Mr. Dino Gonis for documentation of the above scope of work and analytical results.

2.4 Soil Boring and Groundwater Investigation-August 21 and 22, 1991

On May 22, 1991, Earth Systems Environmental, Inc. (ESE), under subcontract to Mobile Labs, installed 1 groundwater monitoring well and on August 21 and 22, 1991, drilled 5 soil borings and installed 2 groundwater monitoring wells (see Figure 2) as a further characterization of contamination in the soil and groundwater.

The soil borings were located, generally, along an east-west treading line that runs through the center of the location of the former gasoline tank complex and generally in the direction of the anticipated groundwater gradient. Boring TH-2 is located at the easterly end of the line; boring TH-1 is located in the center of the former complex; boring TH-3 is located at the westerly end of the line near the waste oil tank; and boring TH-4 is located about a third the distance from TH-3 to TH-1. Boring TH-5 was not located in line with the other borings, but was located in the southerly corner of the site (see Figure 2).

Monitoring well MW-1 is located south of the former tank complex; wells MW-2 and MW-3 are located near the northerly and westerly corners of the site, respectively (see Figure 2).

Two soil samples were chemically analyzed from each boring and monitoring well with the exception of boring TH-1 in which only 1 sample was collected. All samples were collected at depths of about 10 or 18 feet, with the exception of the deeper sample in boring TH-2 which was collected at a depth of 29.5 feet.

2.4.1 Results of Chemical analyses

2.4.1.1 Soil Samples

All soil samples from borings and monitoring wells located in the area of the former gasoline tank complex were analyzed for TPHG by EPA Method 8015 Modified and BTEX by EPA Method 8020. All soil samples from borings and monitoring wells located in the area of the former waste oil tank were analyzed for total recoverable hydrocarbons (TRH) by EPA Method 418.1, TPHG, and BTEX. Soil samples from boring TH-5, located furthest from either former tank area, was analyzed for TPHG and BTEX.

All soil samples in all borings, with the exception of 1 sample in boring TH-5, detected TPHG with concentrations ranging from 10 ppm to 4,320 ppm. Chemical analyses of the deeper sample in boring TH-5 were nondetectable. All soil samples analyzed for TRH detected concentrations ranging from 20 ppm to 1,600 ppm. BTEX chemicals were detected almost exclusively in samples collected only in the area of the former gasoline tank complex.

2.4.1.2 Groundwater Samples

Groundwater samples were collected from the monitoring wells on August 23, 1991, one day after their construction and development, and analyzed for TPHG by EPA Method 8015 Modified and BTEX by EPA Method 602. No TPHG or BTEX were detected in well MW-3. TPHG was detected in wells MW-1 and MW-2 at concentrations of 2,090,000 ppb and 10,000 ppb, respectively. BTEX chemicals were detected only in well MW-1 and ranged in concentration from 2,145 ppb for ethylbenzene to 23,150 ppb for xylenes.

The reader is referred to ESE's December 23, 1991 Phase I Soil and Ground Water Assessment report for documentation of the above scope of work and analytical results.

2.5 Groundwater Monitoring-April 16, 1992

On April 16, 1992, NKJ measured the depth-to-groundwater in each well and found floating product present in all 3 wells. The thickness of product ranged from 0.16 feet to 5.12 feet.

The reader is referred to NKJ's May 1, 1992 letter report to Mobile Labs, Inc. for documentation of the above scope of work.

3.0 PROPOSED SCOPE OF WORK

This scope of work is submitted for the review and approval of Wong, the ACHCSA, and the California Regional Water Quality Control Board-San Francisco Bay Region (CRWQCB).

TPE proposes to install 2 groundwater monitoring wells as a further investigation of the vertical and lateral extent of vadose zone soil contamination and the lateral extent of groundwater contamination by TPHG and BTEX.

If significant free floating product is found in any on-site well after installation of the proposed wells, this workplan will be amended to include installation of up to 2 free product removal systems.

TPE proposes the following scope of work:

- Conduct a subsurface utility survey, if necessary, to minimize the potential of encountering unexpected utilities, and to assist in selecting locations for 2 soil borings.

- Drill 2 soil borings to investigate the horizontal and vertical extent of vadose zone soil contamination.

- Collect soil samples from each soil boring at approximately 5-foot depth intervals for construction of a boring log and for chemical analyses.

- Analyze vadose zone soil samples from the borings for TPHG and BTEX.
- Convert the borings into groundwater monitoring wells.
- Develop the newly installed groundwater monitoring wells.
- Purge and sample all on-site monitoring wells (5) for chemical analysis. Wells containing free floating product that cannot be removed by bailing will not be sampled.
- If free floating petroleum product is present in any wells to the extent that removal by bailing is estimated not to be cost effective, install up to 2 automated free product removal systems.
- Analyze up to 5 groundwater monitoring well samples and 1 trip blank sample for TPHG and BTEX.
- Survey top-of-casings (TOC) of all 5 on-site wells to the nearest .01 foot relative to Mean Sea Level (MSL).
- Interpret direction and gradient of groundwater flow.
- Prepare a Site Assessment Report (SAR).

Details of the proposed scope of work are presented below.

3.1 Prefield Activities

Prior to beginning drilling activities TPE will contract with subsurface locators, if necessary, and conduct an Underground Service Alert location request to minimize the potential for encountering any buried utilities or underground objects.

TPE will obtain well installation permits from the Alameda County Flood Control and Water Conservation District, Water Resources Management Zone 7 and visit the site to select the proposed soil boring locations.

A representative of TPE visited the site on June 11, 1993 to measure depth-to-groundwater in each well (for evaluation of gradient and flow direction) and free product thickness, if any. Depth-to-groundwater and top of free product were measured by using a KECK Model KIR-89 interface meter. Results are documented in Table 1. Based on groundwater elevations calculated from TOC information provided by ESE in their December 23, 1991 Phase I Soil and Ground water Assessment report, groundwater gradient was determined to be .0357 feet per foot in a northwesterly direction (see Table 1 and Figure 3).

TPE observed that all wells were constructed with vault boxes approximately at grade and the boxes were filled with water to the TOC. Also, all casings were observed to have loose locking well caps. It was apparent that water entering the vault boxes from rain, car or parking lot washing, etc., could freely enter each well. The effect of potential artificial recharge on the accuracy of the above gradient determination is unknown. Potentially, the gradient determined on June 11, 1993 may not reflect natural conditions.

Free product was detected only in well MW-1 which contained an apparent .12-inch column of gasoline.

3.2 Soil Boring and Sampling Procedures

The vertical and horizontal limits of vadose zone soil contamination will be investigated while drilling 2 soil borings for construction of groundwater monitoring wells.

See Appendices B and C for TPE's protocols relative to hollow-stem auger drilling and soil sampling procedures, and waste handling and decontamination procedures.

3.2.1 Monitoring Well Locations

The locations of the 2 proposed monitoring wells are shown in Figure 3 and are based on the groundwater gradient determination made by TPE on June 11, 1993. Well TMW-4 is proposed to be located near the eastern corner of the site since this location is estimated to be upgradient of the 2 on-site source areas and is expected to evaluate the potential of off-site sources impacting the site. Well TMW-5 is proposed to be located downgradient and within 10 feet of the former location of the underground gasoline tank complex according to recommendations in the CRWQCB's "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites", dated August 10, 1990.

3.2.2 Drilling Method

The exploratory borings for the 2 proposed monitoring wells will be drilled by a State of California licensed water well driller (C-57 Water Well Driller contractor's license) using 8-inch diameter, hollow-stem, auger drilling equipment. The augers will be steam-cleaned before drilling each boring to prevent cross contamination between borings or the introduction of off-site contamination for the initial boring.

3.2.3 Sampling Procedures

Representative soil samples will be collected for chemical analyses in the vadose zone at approximately 5-foot depth intervals below the ground surface by advancing a split-spoon sampler, equipped with three 2-inch diameter by 6-inch long brass tubes, into the undisturbed soil beyond the tip of the augers. The lead tube will be selected for chemical analysis; if the lead tube is not full, the middle tube will be selected. If neither the lead nor the middle tube is full, the sample will be retaken. The sampling equipment will be cleaned before each sampling event by washing with a trisodium phosphate solution and rinsing in potable or distilled water. Samples collected for chemical analysis from the vadose zone will be preserved in the tubes by quickly covering the open ends with teflon tape and capping the ends with plastic end caps. The tubes will be labeled to show site name, project number, date, time, sample name,

depth collected, and sampler and placed in an iced cooler for transport to a California State Department of Health Services (DHS) certified laboratory accompanied by chain-of-custody documentation.

A detailed boring log will be prepared from auger return material and split-spoon samples. The soil will be logged according to the Unified Soil Classification System by a California Registered Geologist.

Drill cuttings will be stored on site, contained in 55-gallon steel drums or in visqueen. The stored cuttings will be labeled to show contents, date stored, suspected contamination, expected date of removal, company name, contact, and telephone number. Disposal of the cuttings and drums is the responsibility of the client. After the cuttings are characterized by chemical analysis, TPE will provide recommendations to the client and, at their request, assist them in remediation, or disposal of the cuttings, or both in an appropriate manner as an additional work item.

3.2.4 Chemical Analyses

Soil samples collected from soil borings for chemical analysis are proposed to be analyzed for TPHG and BTEX by EPA Methods 5030/8015 and 5030/8020, respectively.

3.3 Groundwater Investigation

The following discussion proposes groundwater monitoring well construction, development, and sampling procedures; and chemical analyses. Appendices D, E, and F document TPE's protocols relative to groundwater monitoring well construction, development, and sampling procedures.

3.3.1 Groundwater Monitoring Well Installation

Based on an estimated depth of 13 to 14 feet to groundwater, the exploratory borings are proposed to be drilled to a depth of up to 30 feet. Each boring will be converted into a monitoring well by installing 2-inch diameter, flush-threaded, schedule 40, polyvinyl chloride (PVC) casing and 0.010-inch machine-slotted screen. Slot size is based on the silty sand lithology recorded on the boring logs of the presently constructed 3 on-site wells. The exact depth of each boring and screen length will be determined by the geologic profile and occurrence of groundwater in the boring at each location. The screen is proposed to extend about 5-feet above the water table surface if the aquifer is unconfined. If the aquifer is confined, the screen will extend no more than about .5 feet above the aquifer's upper surface. The length of screen below the water table surface may be up to 20 feet if the aquifer is confined or 15 feet if unconfined. In either case, the screen length may be less if a significant aquiclude is encountered. Based on using a .010-inch screen, a sand pack of #2/16 filter sand will be placed in the annular space from the bottom of the boring to a maximum of 2 feet above the top of the screened interval. If the aquifer is confined, the sand pack will be placed a maximum of 1 foot above the top of the screened interval to prevent the potential for cross contamination. Up to 2 feet of bentonite will be placed above the sand pack followed by a neat cement slurry. A traffic rated, bolt-locked, vault box will be set in concrete to protect the well. A locking well cap with lock will be installed on each well casing and the elevation of the TOC of all on-site wells will be surveyed with respect to MSL datum by a professional civil engineer or licensed land surveyor.

3.3.2 Groundwater Monitoring Well Development

The groundwater monitoring wells will be developed a minimum of 48 hours after well construction is completed. Before development, depth-to-water will be measured from the TOC to the nearest 0.01 foot using a KECK Model KIR-89 interface meter. A minimum of 3 repetitive measurements will be made for each level determination to ensure accuracy. Each well will be checked for floating product using the above interface meter. If floating product is present, the thickness of product will be measured and recorded.

The wells will be developed by using a 1.7", positive displacement, PVC hand pump or by bailing with a PVC bailer until the well is free of sand, silt, and turbidity or no further improvement is apparent.

Development water will be stored on site in 55-gallon steel drums labeled to show contents, date filled, suspected contaminant, company name, contact, and telephone number. Disposal of the drummed water and drums is the responsibility of the client. After the water is characterized by chemical analysis, TPE will provide recommendations to the client and, at their request, assist them in remediation, or disposal of the fluids, or both in an appropriate manner as an additional work item.

3.3.3 Groundwater Sampling

After a minimum of 48 hours after well development, depth to stabilized water will be measured and recorded as discussed above under section 3.3.2 Groundwater Monitoring Well Development and the wells will be sampled.

Prior to sampling, the wells will be purged a minimum of 3 wetted well volumes with dedicated polyethylene bailers. Temperature, pH, and electrical conductivity will be monitored and purging will continue until they are stabilized. Since dedicated bailers will be used for each well sampled, no decontamination will be necessary between sampling events. After purging is completed, turbidity will be measured and the water samples will be collected in sterilized glass vials with teflon lined screw caps, immediately sealed in the vials, and labeled to include: date, time, sample location, project number, and sampler. The samples will be immediately stored in an iced cooler for transport to a DHS certified laboratory accompanied by chain-of-custody documentation. See Appendices C and G for waste handling and decontamination procedures, and quality assurance and quality control procedures (QA/QC).

Purge water will be stored on site in 55-gallon drums. After the drummed water is characterized by chemical analysis, TPE will provide recommendations to the client and, at their request, assist them in remediation or disposal of the fluids, or both in an appropriate manner as an additional work item.

3.3.4 Chemical Analyses

Water samples will be analyzed for TPHG and BTEX by EPA Methods 5030/8015 and 5030/8020.

3.4 Groundwater Gradient Evaluation

The stabilized depth-to-groundwater in all wells, when subtracted from their respective TOC, will provide the groundwater elevations on the dates measured. From this information, the groundwater gradient and flow direction will be evaluated.

3.5 Installation of Free Product Removal System

If free product is encountered in any well(s) while conducting the above scope of work, and it is estimated that manual removal of the free product is not cost effective, TPE will amend this workplan for the review and approval of Wong, the ACHCSA and the CRWQCB for installation of up to 2 free product removal systems. Upon regulator approval and obtaining all required permits, TPE will install the system(s).

3.6 Site Assessment Report

The information collected, analytical results, and TPE's conclusions and recommendations will be summarized in a report. The report will describe the work performed and include: an area map, a detailed site plan showing locations of soil borings and installed monitoring wells, graphic boring logs, graphic monitoring well construction details, geologic cross section(s), a groundwater gradient map, tables summarizing results of chemical analyses, and other documentation to support the conclusions. Copies of all permits required and certified analytical reports with chain-of-custodies will also be included.

Conclusions regarding the extent and type(s) of contamination will be presented within the context of this workplan. Recommendations for feasible remedial alternatives, and/or additional work, supplemental sampling, and analyses will be included.

4.0 SITE SAFETY PLAN

A Site Safety Plan for conducting work under this workplan is included in Appendix H.

5.0 TIME SCHEDULE

The projected time schedule for implementation of the activities described in this workplan is presented below. The schedule reflects a relatively problem-free program. However, delays in the workplan review, permitting, or laboratory analyses could lengthen the project schedule. Access difficulties, adverse weather, and regulator review could also delay the proposed time schedule. TPE will make every effort to adhere to the project schedule.

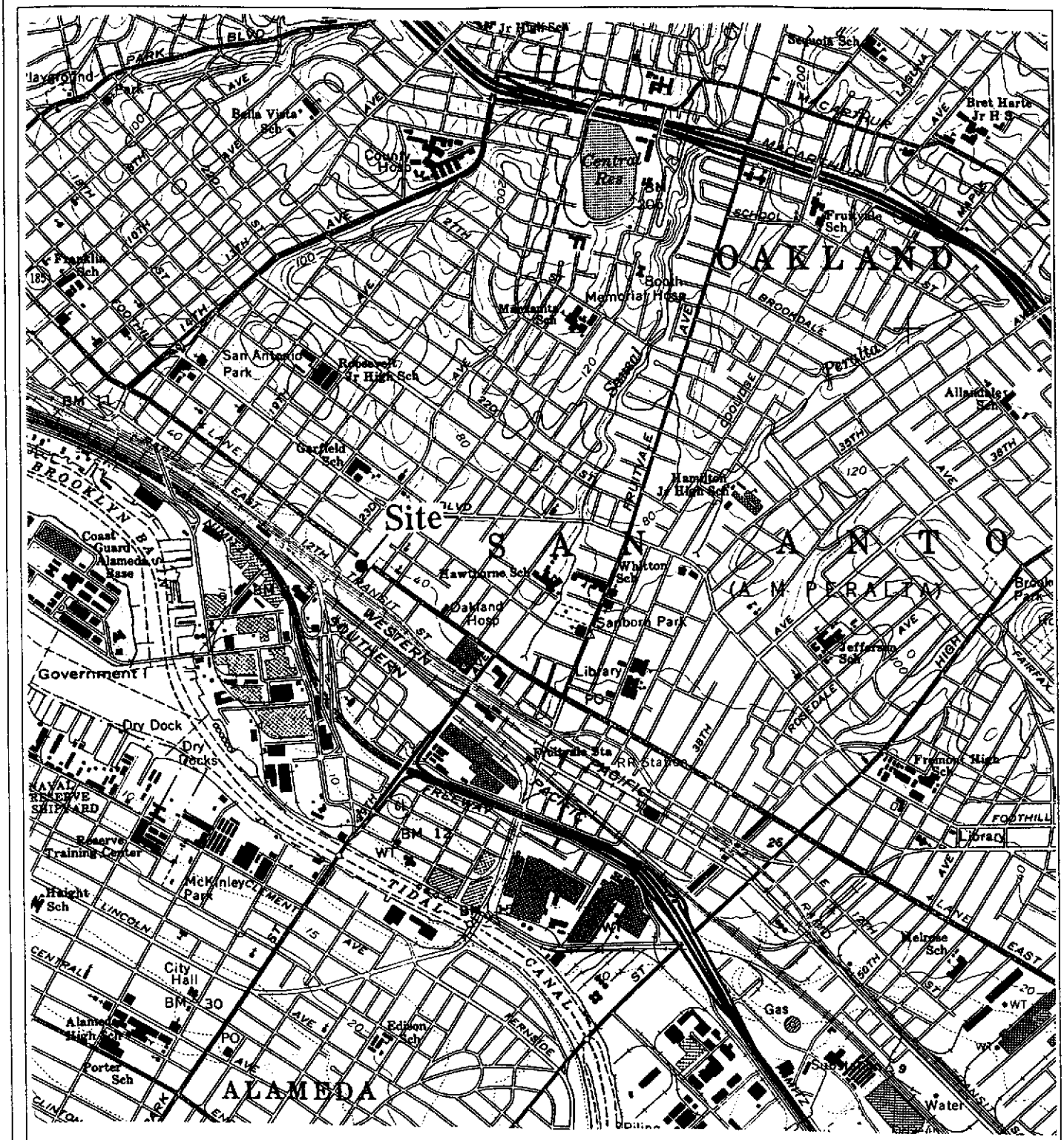
Week 1: Client Submits Workplan for Regulator Approval.

Week 2: Regulator Approval Received.

Week 4: Subcontracting, Conduct Underground Utility Survey, Drill Soil Borings, Install 2 Groundwater Monitoring Wells, and Submit Soil and Groundwater Samples for Chemical Analyses.

Week 6: Receive Chemical Analyses, Interpret Data, and Write SAR.

Week 9: Submit SAR to Client.



LEGEND

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

-N-

0 2,000

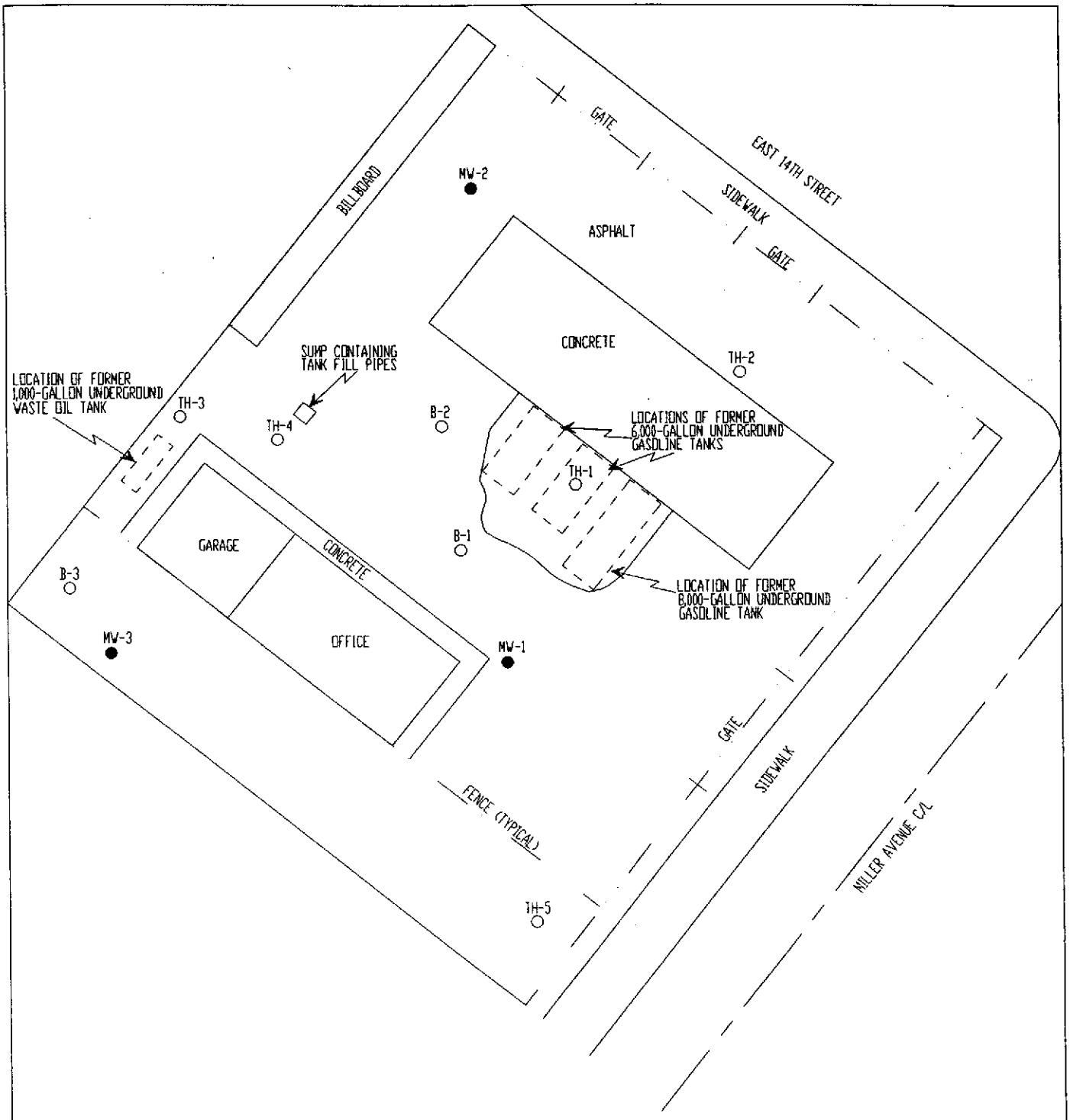
SCALE IN FEET

TANK PROTECT ENGINEERING

SITE VICINITY MAP

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

DATE	6/14/93
FIGURE	1
FILE #	267-1
DRAWN BY	AK
CHECKED BY	JVM



LEGEND

MW-1 ● NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS

B-1 ○ NAME AND APPROXIMATE LOCATION OF SOIL BORING INSTALLED BY OTHERS

-N-

0 30

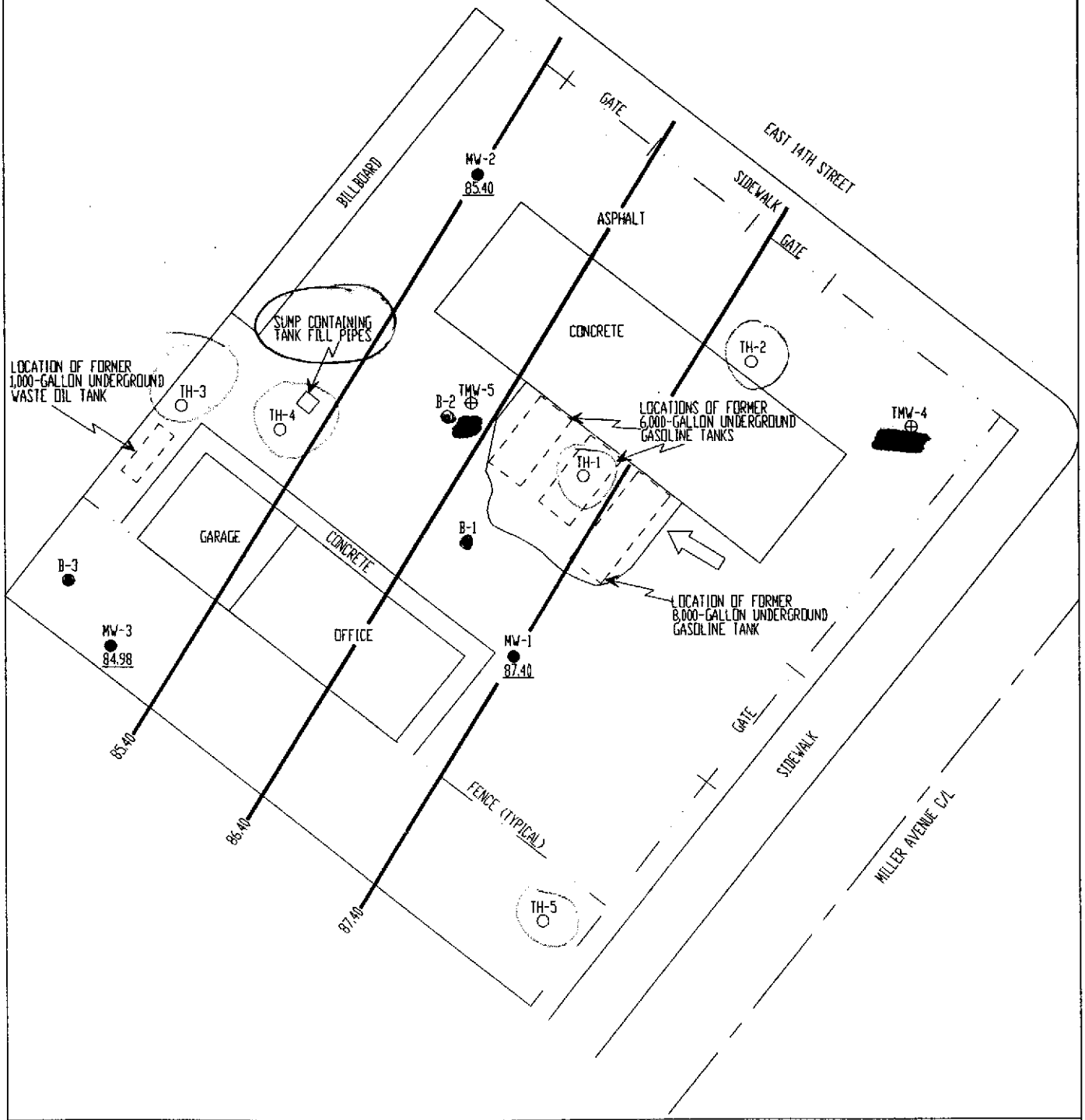
SCALE IN FEET

TANK PROTECT ENGINEERING

SITE PLAN

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

DATE	6/14/93
FIGURE	2
FILE #	267-2
DRAWN BY	AK
CHECKED BY	JVM



LEGEND

MW-1 ●	NAME AND LOCATION OF MONITORING WELL INSTALLED BY OTHERS
B-1 ○	NAME AND APPROXIMATE LOCATION OF SOIL BORING INSTALLED BY OTHERS
TMW-4 ⊕	NAME AND LOCATION OF PROPOSED MONITORING WELL
87.40	RELATIVE GROUNDWATER ELEVATION
85.40	POTENTIOMETRIC CONTOUR
	DIRECTION OF GROUNDWATER FLOW

-N-

0 30

SCALE IN FEET

TANK PROTECT ENGINEERING

SITE PLAN
GROUNDWATER GRADIENT (6/11/93)

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

DATE	6/15/93
FIGURE	3
FILE #	267-3
DRAWN BY	AK
CHECKED BY	JVM

TABLE 1
GROUNDWATER ELEVATION

Well Name	Date	TOC[1] Elevation (Feet SD[2])	Depth-to-Water from TOC (Feet)	Depth to Product From TOC (Feet)	Corrected[3] Groundwater Elevation (Feet MSL[4])
MW-1	6/11/93	100.000	12.610	12.60	87.40
MW-2	6/11/93	98.585	13.185	---	85.40
MW-3	6/11/93	99.250	14.275	---	84.98

1 TOP-OF-CASING

2 SITE DATUM ESTABLISHED BY ESE

3 ELEVATION CORRECTED FOR FLOATING PRODUCT USING .75 DENSITY OF GASOLINE

4 MEAN SEA LEVEL

APPENDIX A

ALAMEDA COUNTY HEALTH CARE SERVICES AGENCY,
OCTOBER 30, 1992 LETTER

8B1+ Fld

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

RAFAT A. SHAHID, ASST. AGENCY DIRECTOR

DEPARTMENT OF ENVIRONMENTAL HEALTH
State Water Resources Control Board
Division of Clean Water Programs
UST Local Oversight Program
80 Swan Way, Rm 200
Oakland, CA 94621
(510) 271-4530

October 30, 1992
STID # 2116

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To J. Mirakovich	From B Chan
Co. TPE	Co. AlaCty LOP
Dept.	Phone # 271-4530
Fax # 429-8089	Fax #

Mr. Stanley Wong
2200 E. 12th St.
Oakland CA 94606

Re: Subsurface Investigation at Former Taxi Taxi at 2345 E. 14th St., Oakland CA 94601

Dear Mr. Wong:

Thank you for the submission of the two reports regarding the above site which you delivered to our office on October 28th. These reports include the **Phase I Soil and Ground Water Assessment** by Earth Systems Environmental, Inc. and the **Groundwater Monitoring Report** dated May 1, 1992 performed by NKJ Environmental Monitoring in behalf of Mr. Jeff Johnson. Our office has completed the review of these reports. As you are aware through our office meeting, more work will be required to determine the extent of and remediate the soil and groundwater contamination.

After reviewing the reports, the first observation reached is that the groundwater contamination appears to be severe. When the wells were initially installed in August 1991 there was high concentrations of Total Petroleum Hydrocarbons as gasoline (TPHg) and high concentrations of Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) in MW-1 only. The next monitoring event in April of 1992 showed floating product on all three wells and as much as 5.12 feet in MW1. Our office agrees with what is recommended in this report. Some type of product removal is necessary immediately. Manual removal may be done only as an interim measure while the extent of the groundwater contamination is being determined and while a remediation system is being developed.

Earth Systems Environmental recommends the installation of two additional monitoring wells, one up-gradient and one down-gradient to help define the extent of the groundwater plume. These locations are acceptable but it will be necessary to perform additional site assessment to identify all additional location(s) requiring monitoring wells.

Be aware that the items 1-5 requested in my October 19, 1992 letter must still be provided by **December 3, 1992.** Your consultant will be able to provide the requested information and adequately reply to my questions.

Because of the results of the recent reports provided, your response should also identify the method by which free product in the wells will be removed and provide a workplan which will define the extent of soil and groundwater contamination. Please also provide a description of the groundwater remediation systems which you are considering for treating the contaminated groundwater. You should also provide a time schedule for the design, permitting and construction of the proposed remedial system.

Your subsequent quarterly monitoring reports should include the following information:

* detail the work which has been performed the preceding quarter and that which is proposed for the next quarter
* a site map delineating contamination contours for soil and groundwater based on the most recent data
* historical records of groundwater elevations in all wells
* a tabulation of the analytical results from all previous monitoring events

You may contact me at (510) 271-4350 should you have any questions regarding this letter.

Sincerely,

Barney M. Chan
Hazardous Materials Specialist

cc: G. Jensen, Alameda County District Attorney Office
R. Hiett, RWQCB
E. Howell, files

2add2345

APPENDIX B

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING PROCEDURES

APPENDIX B

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING PROCEDURES

Undisturbed soil samples will be recovered from soil without introducing liquids into the borings. Soil samples as core will be taken at 5-foot depth intervals and changes in lithology from ground surface to termination depth, or through the aquifer zone of interest for lithologic logging.

Borings will be drilled with a hollow-stem auger and sampled with a California or modified California-type split-spoon sampler. Soil samples will be of sufficient volume to perform the analyses which may be required, including replicate analyses.

Soil from all borings will be described in detail using the Unified Soil Classification System and will be logged by a geologist, civil engineer, or engineering geologist who is registered or certified by the State of California and is experienced in the use of the Unified Soil Classification System.

All wet zones above the free water zone will be noted and accurately logged.

Soil samples will be collected in clean brass or stainless steel sampling tubes in the split-spoon. Sediment traps will be used when unconsolidated sands and gravels fall from the sampler during retrieval. The brass tubes will be cut apart using a clean knife. The ends of the tubes will be covered with a thin sheet of Teflon tape or aluminum foil beneath plastic end caps and sealed with electrical or duct tape and properly labeled. The samples will be stored on ice at a temperature of 4 degrees Celsius.

Drill cuttings will be stored on site in 55-gallon drums or covered with plastic sheeting. Analytical results will be submitted immediately to the site owner for determination of appropriate disposal procedures. The soil borings not completed as wells will be backfilled with a cement grout.

APPENDIX C

WASTE HANDLING AND DECONTAMINATION PROCEDURES

APPENDIX C

WASTE HANDLING AND DECONTAMINATION PROCEDURES

Decontamination: Any drilling, sampling or field measurement equipment that comes into contact with soils or groundwater will be properly decontaminated prior to its use at the site and after each incident of contact with the soils or groundwater being investigated. Proper decontamination is essential to obtain samples that are representative of environmental conditions and to accurately characterize the extent of soil and groundwater contamination. Hollow-stem auger flights and the drill bit will be steam-cleaned between the drilling of each well.

All sample equipment, including the split-tube sampler and brass tubes, will be cleaned by washing with tri-sodium phosphate detergent, followed by sequential rinsing with tap water, and deionized water.

Waste Handling: Waste materials generated during site characterization activities will be handled and stored as hazardous waste and will be stored on site in appropriately labeled containers. Waste materials anticipated include drill cuttings, development and purge water, water generated during aquifer testing, water generated during decontamination, and used personnel protection equipment such as gloves and Tyvek. The site owner will be responsible for providing the storage containers and will be responsible for the disposal of the waste materials. Drill cuttings from individual borings will be stored separately in drums or covered by plastic sheeting and the appropriate disposal procedure will be determined by the site owner or TPE following receipt of the soil sample analytical results. Drums or plastic sheeting will be labeled to show material stored, known or suggested contaminant, date stored, expected removal date, company name, contact, and telephone number.

APPENDIX D

GROUNDWATER MONITORING WELL CONSTRUCTION PROCEDURES

APPENDIX D

GROUNDWATER MONITORING WELL CONSTRUCTION PROCEDURES

BOREHOLE DESIGN

Casing Diameter: The minimum diameter of well casings will be 2 inches (nominal).

Borehole Diameter: The diameter of the borehole will be a minimum of 4 inches and a maximum of 12 inches greater than the diameter of the well casing. The minimum annular space will be 2.5 inches as measured from the outside diameter of the casing to the drill hole wall.

Shallow (Unconfined Zone) Wells: When unconfined groundwater is encountered the borehole will be advanced through the aquifer to an underlying clay layer or aquitard. The screened interval will begin a minimum of 5 feet above the saturated zone or above the anticipated seasonal high level of groundwater. The screen will extend the full thickness of the aquifer or no more than 15 feet into the saturated zone, whichever is reached first. The well screen will not extend into the aquitard, nor will the screened interval exceed 20 feet in length.

Deep (Confined Zone) Wells: Any monitoring well to be screened below the upper aquifer will be installed as a double-cased well. A steel conductor casing will be placed through the upper water-bearing zone to prevent aquifer cross-contamination.

The conductor casing will be installed in the following manner: a large diameter borehole (typically 18 inches) will be drilled until it is determined that the first competent aquitard has been reached. A low carbon steel conductor casing will be placed in the borehole to the depth drilled. Centralizers will be used to center the casing in the borehole. The annular space between the conductor casing and the formation will be cement-grouted from bottom to top by tremie pipe method. The grout will be allowed to set for a minimum of 72 hours.

Drilling will continue inside the conductor casing, with a drill bit of smaller diameter than the conductor casing. If additional known aquifers are to be fully penetrated, the procedure will be repeated with successively smaller diameter conductor casings.

The bottom of the well screen in a confined aquifer will be determined by presence or lack of a clay layer or aquitard as described above. The screened interval in a confined zone shall extend across the entire saturated zone of the aquifer or up to a length of 20 feet, which ever is less. The screened zone and filter pack will not cross-connect to another aquifer.

CONSTRUCTION MATERIALS

Casing and Screen Materials: Well casing and screen will be constructed of clean materials that have the least potential for affecting the quality of the sample. The most suitable material for a particular installation will depend upon the parameters to be monitored. Acceptable materials include PVC, stainless steel, or low carbon steel.

Casing Joints: Joints will be connected by flush threaded couplers. Organic bonding compounds and solvents will not be used on joints.

Well Screen Slots: Well screen will be factory slotted. The size of the slots will be selected to allow sufficient groundwater flow to the well for sampling, minimize the passage of formation materials into the well, and ensure sufficient structural integrity to prevent the collapse of the intake structure.

Casing Bottom Plug: The bottom of the well casing will be permanently plugged, either by flush threaded screw-on or friction cap. Friction caps will be secured with stainless steel set screws. No organic solvents or cements will be applied.

Filter Pack Material: Filter envelope materials will be durable, water worn, and washed clean of silt, dirt, and foreign matter. Sand size particles will be screened silica sand. Particles will be well rounded and graded to an appropriate size for retention of aquifer materials.

Bentonite Seal Material: Bentonite will be pure and free of additives that may affect groundwater quality. Bentonite will be hydrated with clean water.

Grout Seal Material: Cement grout will consist of a proper mixture of Type 1/11 Portland cement, hydrated with clean water. Up to 3% bentonite may be added to the mixture to control shrinkage.

CONSTRUCTION PROCEDURES

Decontamination: All downhole tools, well casings, casing fittings, screens, and all other components that are installed in the well shall be thoroughly cleaned immediately before starting each well installation. When available, each component shall be cleaned with a high temperature, high pressure washer for a minimum of 5 minutes. When a washer is not available, components shall be cleaned with water and detergent or trisodium phosphate, rinsed in clean water, then rinsed in distilled water.

Soil and water sampling equipment and material used to construct the wells shall not donate to, capture, mask, nor alter the chemical composition of the soil and groundwater.

Drilling Methods: Acceptable drilling methods include solid and hollow-stem auger, percussion, direct circulation mud and air rotary, and reverse rotary. The best alternative is that which minimizes the introduction of foreign materials or fluids. If drilling fluid is employed, drilling fluid additives shall be limited to inorganic and non-hazardous compounds. Compressed air introduced into the borehole shall be adequately filtered to remove oil and particulates.

Casing Installation: The casing will be set under tension, when necessary, to ensure straightness. Centralizers will be used where necessary to prevent curvature or stress to the casing.

Sand Pack Installation: The sand pack will be installed so as to avoid bridging and the creation of void spaces. The tremie pipe method will be used where installation

conditions or local regulations require. Drilling mud, when used, will be thinned prior to packplacement. The sand pack shall cover the entire screened interval and rise a minimum of 2 feet above the highest perforation.

Bentonite Seal Placement: A bentonite seal will be placed above the sand pack by a method that prevents bridging. Bentonite pellets can be placed by free fall if proper sinking through annular water can be assured. Bentonite slurry will be placed by the tremie pipe method from the bottom upward. The bentonite seal will not be less than 1 foot in thickness.

Grout Seal Placement: The cement grout mixture will be hydrated with clean water and thoroughly mixed prior to placement. If substantial groundwater exists in the bore hole, the grout shall be placed by tremie pipe method from the bottom upward. In a dry borehole, the grout may be surface poured to a depth of 30 feet. Below a depth of 30 feet grout will be placed by tremie pipe. Grout will be placed in 1 continuous lift and will extend to the surface or to the well vault if the well head is completed below grade. A minimum of 5 feet of grout seal will be installed, unless impractical due to the shallow nature of the well.

Surface Completion: The well head will be protected from fluid entry, accidental damage, unauthorized access, and vandalism. A watertight, locking cap will be installed on the well casing. Access to the casing will be controlled by a keyed lock.

Well heads completed below grade will be completed in a concrete and/or steel vault, installed to drain surface runoff away from the vault.

Well Identification: Each well will be labeled to show well number, depth, hole and casing diameter, and screened interval.

APPENDIX E

GROUNDWATER MONITORING WELL DEVELOPMENT PROCEDURES

APPENDIX E

GROUNDWATER MONITORING WELL DEVELOPMENT PROCEDURES

INTRODUCTION

Newly installed groundwater monitoring wells will be developed to restore natural hydraulic conductivity of the formation, remove sediments from well casing and filter pack, stabilize the filter pack and aquifer material, and promote turbidity-free groundwater samples.

Wells may be developed by bailing, hand pumping, mechanical pumping, air lift pumping, surging, swabbing, or an effective combination of methods. Wells will be developed until the water is free of sand, silt, and minimum turbidity has stabilized.

In some cases where low permeability formations are involved or the drilling mud used fails to respond to cleanup, initial development pumping may immediately dewater the well casing and thereby inhibit development. When this occurs, clean, potable grade water may be introduced into the well, followed by surging of the introduced waters with a surge block. This operation will be followed by pumping. The procedure may be repeated as required to establish full development.

METHODOLOGY

Seal Stabilization: Cement and bentonite annular seals shall set and cure not less then 72 hours prior to well development.

Decontamination: All well development tools and equipment shall be thoroughly cleaned immediately before starting each well installation. When available, each component shall be cleaned with a high temperature, high pressure washer for a minimum of 5 minutes. When a washer is not available, components shall be cleaned with clean water, then rinsed with distilled water.

Development equipment shall not donate to, capture, mask, nor alter the chemical composition of the soils and groundwater.

Introduction of Water: Initial development of wells in low permeability formations may dewater the casing and filter pack. When this occurs, clean, potable water will be introduced into the well to enhance development.

Bailing: Development will begin by bailing to remove heavy sediments from the well casing. Care will be taken to not damage the well bottom cap during lowering of the bailer.

Surging: Care will be exercised when using a surge block to avoid damaging the well screen and casing. When surging wells screened in coarse (sand/gravelly) aquifers, the rate of surge block lifting shall be slow and constant. When surging wells screened in fine (silty) aquifers, more vigorous lifting may be required. Between surging episodes, wells will be bailed to remove accumulated sediments.

Pumping: Development pumping rates shall be less than the recharge rate of the well in order to avoid dewatering.

Discharged Water Containment and Disposal: All water and sediment generated by well development shall be collected in 55-gallon steel drums. Development water will be temporarily contained on site, pending sampling and laboratory analysis. No hazardous development water will be released to the environment. Disposal of development water will be the responsibility of the client

APPENDIX F

GROUNDWATER SAMPLING PROCEDURES

APPENDIX F

GROUNDWATER SAMPLING PROCEDURES

Groundwater monitoring wells will not be sampled until at least 72 hours after well development. Groundwater samples will be obtained using either a bladder pump, clear Teflon bailer, or dedicated polyethylene bailer. Prior to collecting samples, the sampling equipment will be thoroughly decontaminated to prevent introduction of contaminants into the well and to avoid cross-contamination. Monitoring wells will be sampled after 3 to 10 wetted casing volumes of groundwater have been evacuated and pH, electrical conductivity, and temperature have stabilized as measured with a Hydac Digital Tester. If the well is emptied before 3 to 10 well volumes are removed, the sample will be taken when the water level in the well recovers to 80% of its initial water level or more.

When a water sample is collected, turbidity of the water will be measured and recorded with a digital turbidimeter. Degree of turbidity will be measured and recorded in nephelometric turbidity units (NTU).

TPE will also measure the thickness of any floating product in the monitoring wells using a probe, clear Teflon, or polyethylene bailer. The floating product will be measured after well development but prior to the collection of groundwater samples. If floating product is present in the well, TPE will recommend to the client that product removal be commenced immediately and reported to the appropriate regulatory agency.

Unless specifically waived or changed by the local, prevailing regulatory agency, water samples shall be handled and preserved according to the latest EPA methods as described in the Federal Register (Volume 44, No.233, Page 69544, Table ll) for the type of analysis to be performed.

Development and/or purge water will be stored on site in labeled containers. The disposal of the containers and development and/or purge water is the responsibility of the client.

MEASUREMENTS

Purged Water Parameter: During purging, discharged water will be measured for the following parameters.

Parameter	Units of Measurement
pH	None
Electrical Conductivity	Micromhos
Temperature	Degrees F or C
Depth to Water	Feet/Tenths
Volume of Water Discharged	Gallons
Turbidity	NTU

Documentation: All parameter measurements shall be documented in writing on TPE development logs.

APPENDIX G

QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

SITE SAFETY PLAN
TANK PROTECT ENGINEERING OF NORTHERN CALIFORNIA, INC.

Site **2345 E. 14th Street**
Oakland, CA 94601

Project Number **267**

Original Site Safety Plan: Yes (X) No ( )
Revision Number

Plan Prepared by **John Mrakovich** Date **6/16/93**

Plan Approved by **Lee Huckins** Date **6/16/93**

Please respond to each item as completely as possible. Where an item is not applicable, please mark "N/A".

1. KEY PERSONNEL AND RESPONSIBILITIES

Project Manager	**Lee Huckins (510) 429-8088**
Site Safety Manager	**Lee Huckins (510) 429-8088**
Alternate Site Safety Manager	**N/A**
Field Team Members	**N/A**

Agency Reps: [Please specify by one of the following symbols: Federal: (F), State: (S), Local: (L), Contractor(s): (C)

(L) Alameda County Department of Health Service (510) 271-4320

2. JOB HAZARD ANALYSIS

2.1 OVERALL HAZARD EVALUATION

Hazard Level:	High ( )	Moderate ( )	Low (X)	Unknown ( )
Hazard Type:	Liquid (X)	Solid ( )	Sludge ( )	Vapor/Gas (X)

Known or suspected hazardous materials present on site

Benzene, Toluene, Ethyl-Benzene, Xylenes, (BTEX)

Characteristics of hazardous materials included above (complete for each chemical presents):

MATERIAL #1

Corrosive ( )	Ignitable (X)	Toxic (X)	Reactive ( )
Volatile (X)	Radioactive ( )	Biological Agent ( )	
Exposure Routes:	Inhalation (X)	Ingestion (X)	Contact (X)

MATERIAL #2

Corrosive ( )	Ignitable ( )	Toxic ( )	Reactive ( )
Volatile ( )	Radioactive ( )	Biological Agent ( )	
Exposure Routes:	Inhalation ( )	Ingestion ( )	Contact ( )

MATERIAL #3

Corrosive ( )	Ignitable ( )	Toxic ( )	Reactive ( )
Volatile ( )	Radioactive ( )	Biological Agent ( )	
Exposure Routes:	Inhalation ( )	Ingestion ( )	Contact ( )

MATERIAL #4

Corrosive ( )	Ignitable ( )	Toxic ( )	Reactive ( )
Volatile ( )	Radioactive ( )	Biological Agent ( )	
Exposure Routes:	Inhalation ( )	Ingestion ( )	Contact ( )

2.2 JOB-SPECIFIC HAZARDS

For each labor category specify the possible hazards based on information available (i.e., Task-driller, Hazards-trauma from drill rig accidents, etc.) For each hazard, indicate steps to be taken to minimize the hazard.

Driller/Helper/Geologist-Trauma from drilling rig accidents-wear hard hat, gloves, steel-toed boots.

The following additional hazards are expected on site (i.e., snake infested area, extreme heat, etc.):

Temporary open boreholes

Measures to minimize the effects of the additional hazards are:

Protect with barricades, caution tape, or traffic cones when unattended.

3. MONITORING PLAN

3.1 (a) Air Monitoring Plan

Action levels for implementation of air monitoring. Action levels should be based on published data available on contaminants of concern. Action levels should be set by persons experienced in industrial hygiene.

Level (i.e.,.5 ppm)	Action Taken (i.e., commence perimeter monitoring)
5 ppm	**Cease work and commence perimeter monitoring until contamination disperses.**

(b) Air Monitoring Equipment

Outline the specific equipment to be used, calibration method, frequency of monitoring, locations to be monitored, and analysis of samples (if applicable).

Gastech, Inc. Trace-Techtor, hexane calibration. Monitor at borehole during each sampling event if vapors detected.

If air monitoring is not to be implemented for this site, explain why:

N/A

3.2 Personnel Monitoring

(Include hierarchy of responsibilities decision making on the site)

Site safety manager to make decision.

3.3 Sampling Monitoring

(a) Techniques used for sampling: **Sample air at borehole with Gastech, Inc., Trace-Techtor**

(b) Equipments used for sampling: **Gastech, Inc., Trace-Techtor**

(c) Maintenance and calibration of equipments: **Calibrate to hexane prior to operation.**

4. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Equipment used by employees for the site tasks and operations being conducted. Be Specific (i.e., hard hat, impact resistance goggles, other protective glove, etc.).

Hard hat, protective gloves (when necessary), steel-toed boots

5. SITE CONTROL AND SECURITY MEASURES

The following general work zone security guidelines should be implemented:

- Work zone will be restricted by traffic cones.
- Boreholes will be protected when drilling and sampling activities are not actually taking place.
- Excavations will be protected when unattended. Visitors will not be allowed to enter the work zone unless they have attended a project safety briefing.

6. DECONTAMINATION PROCEDURE

List the procedures and specific steps to be taken to decontaminate equipment and PPE.

Wash with trisodium phosphate solution and rinse with clean potable water.

7. TRAINING REQUIREMENTS

Prior to mobilization at the job site, employees will attend a safety briefing. The briefing will include the nature of the wastes and the site, donning personal protection equipment, decontamination procedures and emergency procedures.

8. MEDICAL SURVEILLANCE REQUIREMENTS

If any task requires a very high personnel protection level (OSHA Level A or B), personnel shall provide assurances that they have received a physical examination and they are fit to do the task. Also personnel will be instructed to look for any symptom of heat stress, heat stroke, heat exhaustion or any

other unusual symptom. If there is any report of that kind it will be immediately followed through, and appropriate action will be taken.

9. STANDARD OPERATION PROCEDURES

Tank Protect Engineering of Northern California, Inc. (TPE) is responsible for the safety of all TPE employees on site. Each contractor shall provide all the equipment necessary to meet safe operation practices and procedures for their personnel on site and be responsible for the safety of their workers.

A "Three Warning" system is utilized to enforce compliance with Health and Safety procedures practices which will be implemented at the site for worker safety:

* Eating, drinking, chewing gum or tobacco, and smoking will be allowed only in designated areas.
* Wash facilities will be utilized by workers in the work areas before eating, drinking, or use of the toilet facilities.
* Containers will be labeled identifying them as waste, debris or contaminated clothing.
* All excavation/drilling work will comply with regulatory agency requirements.
* All site personnel will be required to wear hard hats and advised to take adequate measures for self protection.
* Any other action which is determined to be unsafe by the site safety officer.

10. CONFINED SPACE ENTRY PROCEDURES

No one is allowed to enter any confined space operation without proper safety measures. Specifically in case of an excavated Tank Pit no one should enter at any time.

11. EMERGENCY RESPONSE PLAN

Fire extinguisher(s) will be on site prior to excavation. Relevant phone numbers:

Person	Title	Phone No.
John Mrakovich	Project Manager	(510) 429-8088
_____	Fire	911 or_____
_____	Police	911 or_____
_____	Ambulance	911 or_____
_____	Poison Control Center	(800) 523-2222
_____	Site Phone	(510) 000-0000
_____	Nearest off-site no.	_____
Alameda Hospital	Medical Advisor	(510) 523-4357
Aaron & Stanley Wong	Client Contact	(510) 537-1672

U.S EPA - ERT _____ (201) 321-6660
Chemtrec _____ (800) 424-9300
Centers for Disease Control _____ Day (404) 329-3311
Night (404) 329-2888
National Response Center _____ (800) 424-8802
Superfund/RCRA Hotline _____ (800) 424-8802
TSCA Hotline _____ (800) 424-9065
National Pesticide Information Services _____ (800) 845-7633
Bureau of Alcohol, Tobacco, and Firearms _____ (800) 424-9555

HEALTH AND SAFETY COMPLIANCE STATEMENT

I, _____, have received and read a copy of the project Health and Safety Plan.

I understand that I am required to have read the aforementioned document and have received proper training under the occupational Safety and Health Act (29 CFR, Part 1910.120) prior to conducting site activities at the site.

_____ _____

Signature Date

_____ _____

Signature Date

Alameda Hospital
2070 Clinton Avenue
Oakland, CA
Emergency # (510) 523-4357
Gen. Info # (510) 522-3700

Drive southeast on East 14th Street to 29th Avenue. Turn right (southwest) on 29th Avenue. Proceed on 29th Avenue, it will become Park Street. Proceed on Park Street to Clinton Avenue. Turn right (northwest) on Clinton Avenue. Look for the hospital on the left side.