PRELIMINARY SITE ASSESSMENT
MR. MOHAMMAD MEHDIZADEH
5175 BROADWAY
SAN JOSE, CALIFORNIA

Submitted By:
TANK PROTECT ENGINEERING
Of Northern California
June 13, 1990

PRELIMINARY SITE ASSESSMENT

MR. MOHAMMAD MEHDIZADEH
5175 Broadway
Oakland, CA

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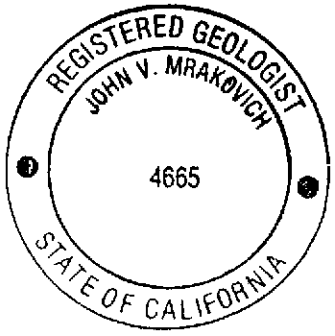
Registered Geologist



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Civil Engineer

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The findings, recommendation, 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 express or implied.

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INTRODUCTION

Location:

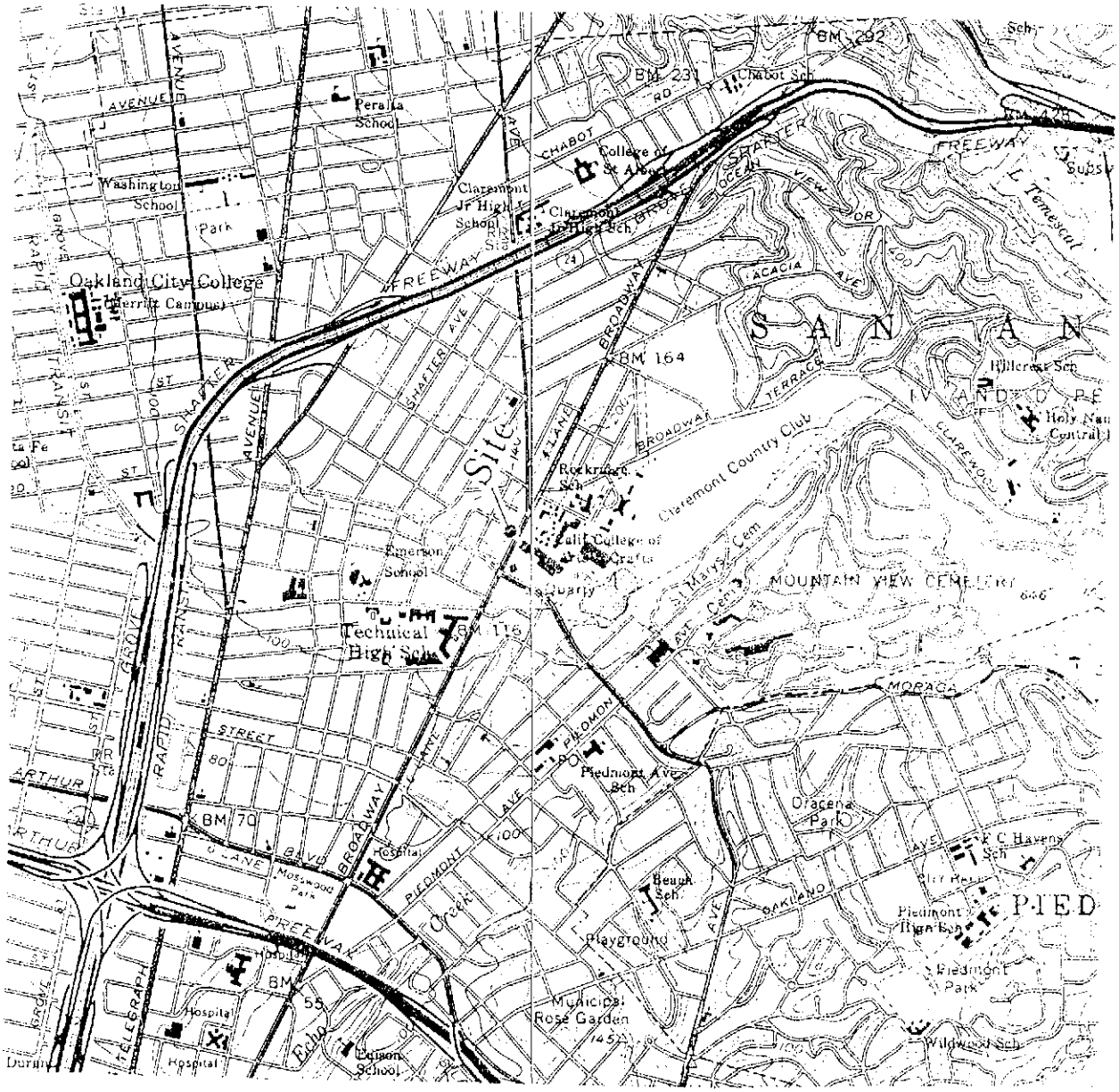
The project site is a former Exxon gasoline station located at 5175 Broadway in the City of Oakland, in Alameda County, California (see Figures 1 and 2). The site was purchased by Mr. Mohammad Mehdizadeh in 1979 at which time the gasoline station was not in operation. It is not known when Exxon ceased operation, however, the site has been inactive since that time.

Background/Site History:

In January 1990, Tank Protect Engineering, Inc. (TPE) conducted two excavations at the subject site. In the first excavation 3-8,000 gallon steel, single-walled, gasoline tanks and associated piping were removed. The excavation was 10 feet to 11 feet deep and encountered groundwater at a depth of about 10.5 feet. During tank removal holes were observed in all three gasoline tanks and the soil was observed to be contaminated based on odor and discoloration. Eight soil samples were collected for chemical analysis. Five samples were collected at depths of about 10 feet from the end-walls and/or sidewalls of each gasoline tank, and three soil samples were collected from beneath the associated piping (see Figure 2). One groundwater sample was collected for chemical analysis.

A 500 gallon steel, single-walled, waste oil tank was removed from the second excavation. One hole was observed in the waste oil tank and no groundwater was encountered in the excavation. No apparent soil contamination was observed. One soil sample was collected for chemical analysis from the floor of the excavation (see Figure 2).

Analytical results of soil sampling for petroleum hydrocarbon compounds are summarized in Table 1. Soil samples collected in the gasoline tank excavation and beneath the associated piping contained total petroleum hydrocarbons as gasoline (TPHG) in all samples except two (SP1 and SP2) collected beneath the piping. TPHG ranged up to 970 parts per million (ppm) in sample S2N. Soil sample S1W, collected in the floor of the waste oil tank, contained no TPHG or benzene, toluene, ethylbenzene, or xylenes



LEGEND

REFERENCE: USGS 7.5 MINUTE QUADRANGLE MAPS OAKLAND WEST AND EAST, CALIFORNIA, EDITED 1980

N

0 2000

SCALE IN FEET

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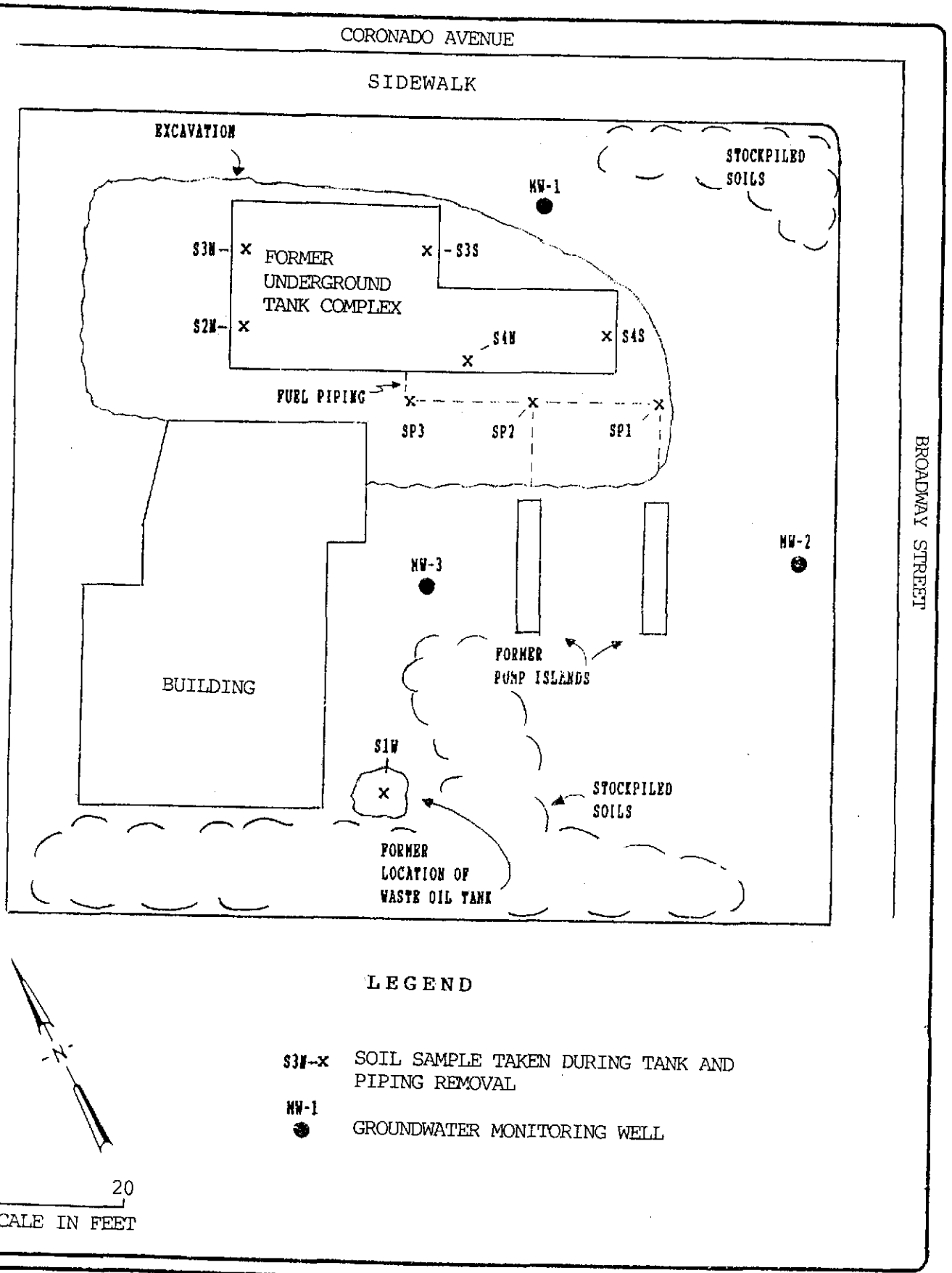
SITE VICINITY MAP
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
1



TANK PROTECT ENGINEERING
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SITE PLAN
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
2

TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS
OBTAINED DURING TANK REMOVAL
(ppm)

Sample Identification	Total Oil & Grease	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes
S1W	<30	<10	<1	<.005	<.005	<.005	<.005
S2N	NA*	NA	970	<5	<5	13	15
S3N	NA	NA	120	<1	<1	<1	<1
S3S	NA	NA	930	<5	<5	<5	14
S4N	NA	NA	12	<.05	<.05	<.05	.130
S4S	NA	NA	55	<.2	<.2	<.2	.8
SP1	NA	NA	<5	<.05	<.05	<.05	<.05
SP2	NA	NA	<5	<.05	<.05	<.05	<.05
SP3	NA	NA	34	<.05	<.05	<.05	<.05

* NA = NOT ANALYZED

(BTEX). Being a waste oil tank, this soil sample was also analyzed for total petroleum hydrocarbons as diesel (TPHD), total oil and grease (TOG), and other volatile organic compounds (United States Environmental Protection Agency [EPA] Method 601/8010). Of these additional tests, only methylene chloride was detected at .0013 ppm.

Analytical results for the groundwater sample collected from the gasoline tank excavation reported the groundwater contained 6900 parts per billion (ppb) TPHG, 53 ppb benzene, and 810 ppb xylenes. See Appendix A for certified analytical results of the above soil and groundwater analyses.

During the week of February 19, 1990, TPE overexcavated contaminated soil from the area of the former underground tank complex and began on-site soil remediation. A total of about 700 tons of contaminated soil, excavated during tank removal and later overexcavation, were remediated. Treatment was begun by spreading the contaminated soil on the ground over a layer of about 8 inches of clean dirt which was underlain by polyethylene plastic. The contaminated soil was then treated by oxidizing the hydrocarbons. Three stockpiles of soil were treated and subsequently sampled on April 4, 1990 for chemical analysis to determine the effectiveness of the remediation. The three stockpiled soils were sampled by compositing discrete soil samples for each stockpile. Certified analytical reports and chain-of-custodies are documented in Appendix A and chemical analyses are summarized in Table 2. Remediation of the three stockpiles resulted in chemical analyses of 5.0 TPHG, 15 TPHG and 17 TPHG. Only trace amounts of BTEX were detected. The remediated soils are currently stockpiled on site.

In response to the above findings Mr. Mehdizadeh contracted with TPE to conduct a preliminary investigation to further assess soil and groundwater contamination, if any, at the subject site.

Objective And Scope Of Work:

TPE's objective in this preliminary investigation was (1) to further investigate the vertical and horizontal extent of soil contamination, if any, (2) to determine whether groundwater beneath the site has been impacted, and (3) to determine hydraulic gradient and direction of groundwater flow. To meet these objectives TPE performed the following scope of work:

- Reviewed files of the California Regional Water Quality

TABLE 2
SUMMARY OF SOIL ANALYTICAL RESULTS
FOR REMEDIATED EXCAVATED SOILS
(ppm)

Sample Identification	TPH as Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes
Composite MS1,MS2,MS3,MS4	5.0	0.0074	0.0050	0.038	0.069
Composite MS5,MS6,MS7	15	0.0074	0.020	0.063	0.12
Composite MS8,MS9,MS10	17	0.0050	0.010	0.041	0.095
Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050

Control Board-San Francisco Region (RWQCB) for documented off-site, ugradient sources of contamination and for regional groundwater flow direction.

- Conducted an on-site subsurface utility survey.
- Drilled three soil borings and converted all three to groundwater monitoring wells.
- Collected soil samples from each boring for chemical analysis.
- Developed, purged, and sampled groundwater from each monitoring well for chemical analysis.
- Analyzed seven soil samples and three groundwater samples for TPHG and BTEX.
- Surveyed top-of-well casings for elevation and determined groundwater flow direction and gradient.

SITE DESCRIPTION

Figure 1 is a site vicinity map showing the location of the site relative to adjacent streets and buildings. The site vicinity maps is taken from the United States Department of the Interior Geological Survey (USGS) Oakland East and West Quadrangles, 7.5 minute series topographic maps.

The site is located on top of a ridge that extends from the base of the East Bay Berkeley Hills into the East Bay Plain. At the location of the site, the ridge has been graded to an elevation of about 155 feet mean sea level (MSL). The topography slopes away from the site in all directions except northeasterly with an average gradient of about 0.03 feet per foot. There are no nearby streams or creeks.

Figure 2 is a detailed site plan showing the existing building, tank excavations, and stockpiled soils. Also shown are the locations of the former underground storage tanks, former pump islands, and locations where soil samples were collected during removal of the tanks and associated piping. The three groundwater monitoring wells that were installed as part of this investigation are shown as MW-1, MW-2, and MW-3.

SUBSURFACE INVESTIGATION

Prefield Activities:

Before starting field activities TPE reviewed files at the RWQCB's office to determine if any documented contaminated sites exist in the area and/or upgradient of the project site. This review was conducted to determine if any upgradient contaminant sources may be contributing to contaminants found beneath the site and to determine depth and direction of groundwater flow in the area of the site to assist TPE in optimally locating the installation of three on-site groundwater monitoring wells. No nearby offsite contaminant sites were found in the RWQCB files.

Drilling And Soil Sampling:

During the period April 17 through April 24, 1990, TPE installed three groundwater monitoring wells (MW-1,2, and 3) at the locations shown in Figure 2 to further investigate the horizontal and vertical extent of soil contamination and to determine groundwater flow direction, gradient, and quality beneath the site. The soil borings in which the wells were constructed are located on site and up and downgradient of potential on-site sources of soil and groundwater contamination. Well MW-1 was located in the farthest estimated upgradient direction from the former underground gasoline tank complex to establish background soil and groundwater chemical levels. Well MW-3 was located within 10 feet and in the estimated downgradient direction of the former tank complex. Well MW-2 was located in the estimated cross-gradient direction from well MW-3 and near the southeast property boundary in an attempt to establish soil and groundwater contaminant plume limits (if any).

Prior to drilling at any of the above locations TPE contracted with subsurface locators and conducted a USA location request to ensure that drilling activities would not encounter any buried utilities or underground objects.

The exploratory borings for the monitoring wells were drilled using 10-inch diameter hollow-stem auger drilling equipment. The

augers and sampling equipment were steam-cleaned before drilling each boring to prevent cross contamination between borings or the introduction of off-site contamination for the initial boring. Representative soil samples were collected at approximately 5 foot depth intervals below the ground surface by advancing a modified California split-spoon sampler, equipped with brass tubes, into the undisturbed soil beyond the tip of the augers. The sampling equipment was cleaned before each sampling event by washing with a tri-sodium phosphate solution and rinsing in distilled water. Samples collected for chemical analysis from above the water table were preserved in the tubes by covering the caps with aluminum foil capped with plastic end caps, and taping the caps with duct tape, and storing on ice while transported to a State-certified laboratory accompanied by chain-of-custody documentation (see Appendices B and C). Soil samples were analyzed for TPHG and BTEX by EPA Methods GCFID (5030/8015), and (5030/8020), respectively.

A detailed boring log has been prepared from auger return material and split-spoon samples (see Appendix D). The soil was logged according to the Unified Soil Classification System by a California registered geologist.

Drill cuttings have been stockpiled on site and covered with plastic sheeting. After the cuttings are characterized, TPE will provide recommendations to the client on their remediation, or disposal, or both in an appropriate manner.

Groundwater Monitoring Well Installation:

Exploratory borings for the three groundwater monitoring wells were drilled to depths ranging from 23 feet to 27 feet. Each boring was converted to a monitoring well by installing 4-inch diameter, flush-threaded, polyvinyl chloride casing and 0.020-inch machine-slotted screen. The exact depth of each boring and screen length was determined by the geologic profile and occurrence of groundwater in the boring at each location. A sand pack was placed in the annular space to a maximum of 2 feet above the top of the screened interval. Approximately 1 foot of bentonite was placed above the sand pack followed by a portland cement surface seal. A traffic rated, locking, vault box was set in concrete to protect the well. A locking well cap with lock was also installed on each well casing. The top of casing was surveyed relative to MSL by a professional civil engineer.

Oakland bench mark number 2557 located at the intersection of Coronado Avenue and Broadway Street at an elevation of 158.39 USGS MSL was used in determining elevations on the project site. See Appendix D for well completion details, and Appendix E for TPE's groundwater monitoring well construction procedures.

Groundwater Sampling:

After the wells were installed, depth to water was measured and recorded. Depth to water was measured from the top of casing to the nearest 0.01 foot using an electronic Solinst water level meter. A minimum of three repetitive measurements were made for each water level determination to ensure accuracy. Each well was checked for floating product using a clear teflon bailer. No floating product was observed in wells MW-2 and 3. The water level in well MW-1 had risen above the top of the perforated screened interval and consequently could not be checked for floating product. Well MW-1 is located upgradient of potential on-site sources of hydrocarbon contamination and would not be expected to contain floating product if present. During well development, the water level in well MW-1 was easily lowered below the top of perforations at which time floating product, if present, would have entered the well; no floating product was observed.

All wells were developed by bailing (see Appendix F). After groundwater in the wells was allowed to stabilize (a minimum of 24 hours), the wells were purged a minimum of four wetted well volumes with a teflon bailer as described in Appendix G. Decontamination between sampling events was accomplished by washing the sampler bailer with a solution of tri-sodium phosphate and rinsing in distilled water. The water samples were collected in sterilized glass vials with teflon lined screw caps, immediately sealed in the vials, and labeled including: date, time, sample location, project number, and sampler. The Samples were immediately stored on ice for transport to a State-certified laboratory accompanied by chain-of-custody documentation. Water samples were analyzed for TPHG, and BTEX by EPA Methods GCFID (5030/8015) and (5030/8020), respectively. See Appendices H and I for waste handling and decontamination procedures, and quality assurance and quality control procedures.

Development and purge water are stored in 55 gallon drums on site. After the groundwater is characterized, TPE will provide recommendations to the client and assist them in remediation, or disposal of the fluids, or both in an appropriate manner.

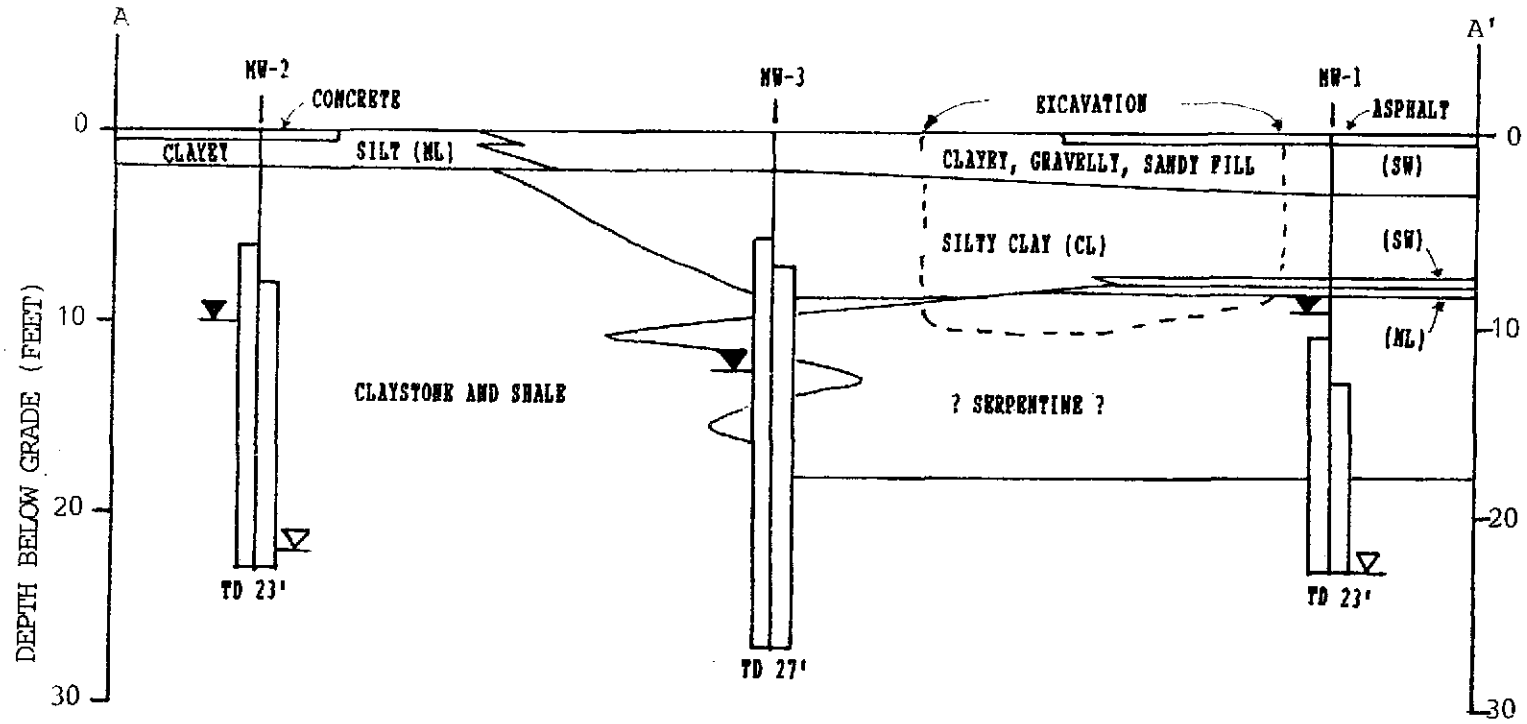
FINDINGS

Hydrogeology:

The hydrogeology of the subject site has been interpreted from the soil boring logs and water levels in groundwater monitoring wells MW-1, MW-2, and MW-3. Boring logs and well completion details are presented in Appendix D.

The site is located on top of a topographic ridge at the base of the East Bay Berkeley Hills and is underlain by the bedrock that comprises the hills. Figure 3 is a geologic cross section constructed from the three soil borings drilled during this investigation. The cross section shows a thin veneer of silty, sandy, clayey soils varying in thickness from about 2 feet to 10 feet, overlying bedrock comprised of intermixed claystone, shale and probable serpentine. The USGS, Areal and Engineering Geology of Oakland West and East Quadrangles, California, dated 1957 and 1969, respectively, show the site to be underlain by the Jurassic and Cretaceous age Franciscan Formation, comprised mainly of sandstone and shale with minor amounts of chert, greenstone, serpentine, and metamorphic rocks. The soil borings drilled by TPE did not encounter sandstones.

The Franciscan Formation, at the location of the site, comprises the foothills of the Diablo Range and is not considered a major water-bearing aquifer. Major aquifers are found beneath the East Bay Plain to the west in the unconsolidated, or poorly consolidated materials ranging from depths of about 50 feet to about 1,000 feet. The water-bearing properties of the Franciscan bedrock is poor because the bedrock is composed of low permeability consolidated rocks. Low yield wells of several gallons per minute are developed for domestic and stock use where sandstones, conglomerates and fracture zones can be located in the bedrock (Hickenbottom, K.,et al, 1988, Geohydrology and Groundwater-Quality Overview, of the East Bay Plain Area, Alameda County, California, 82 p).



LEGEND

SEE FIGURE 4 FOR
LOCATION OF CROSS SECTION

0 20
SCALE IN FEET

VERTICAL EXAGGERATION X 2

STABILIZED WATER
LEVEL 4/30/90

BOREHOLE
SCREENED INTERVAL
SAND PACK INTERVAL
FIRST ENCOUNTERED GROUNDWATER

TD 23' - TOTAL DEPTH OF BOREHOLE

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GEOLOGIC CROSS SECTION
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
3

Groundwater beneath the site was encountered only within the bedrock and not within the thin veneer of soil overlying the bedrock. The initial well, MW-1, was drilled in the estimated upgradient direction from the underground storage tank complex (see Figure 2) and encountered a relatively soft 2-foot thick waterbearing zone at a depth of 23 feet, approximately 14 feet into bedrock. The upper bedrock in well MW-1 is highly weathered and fractured. Drilling became more difficult with depth, indicating the density of the bedrock was increasing and the fracturing decreasing. When water was encountered at the depth of 23 feet, it was believed this water represented an unconfined water table perched on low permeability, relatively unfractured, dense bedrock. Because of the difficult drilling, the boring was terminated at a depth of 23 feet, at first encountered water, and a 10-foot screen was installed. Prior to installing the screen, depth to water was stabilized at about 23 feet. About 2 hours after installation of the well, the water level was found to have significantly risen to a depth of about 10 feet. This rise in water level, from 23 feet to 10 feet in depth, indicates the groundwater is confined within the bedrock.

No waterbearing zones were observed while drilling the second well (MW-3) to a depth of 27 feet. A dry well was constructed in the boring of well MW-3 to determine if any low yielding, low permeability, waterbearing zones may exist within the boring, or to demonstrate that no groundwater exist at this location on the site. A 20-foot screen was installed in the dry boring of well MW-3 to allow water to enter the boring from any low permeability waterbearing zones that may yield water to the well over a long period of time. The top of perforations (at a depth of 7.0 feet) was located above the base of the former tanks to detect all possible waterbearing zones and any potential floating product. After seven days, water was measured in well MW-3 at a depth of 11.95 feet; no floating product was present.

The last well installed, well MW-2, encountered an approximate 1.5-foot thick waterbearing zone at a depth of about 20 feet. Water from this zone immediately rose in elevation within the boring indicating a confined aquifer similar to well MW-1. Since other low yielding, low permeability, waterbearing zones may exist at shallower depths within this boring, as suggested by the response of the initially dry boring of well MW-3, a 20-foot screen was installed for reasons discussed above for well MW-3 and, specifically, to detect the occurrence of any floating product. Six days after well installation well MW-2 was checked for floating product; no product was present.

Groundwater beneath the site is believed to be transmitted through low permeability, thin (1.5-2.0 feet), confined, and possibly unconfined waterbearing zones. It has not been determined if these zones are hydraulically interconnected or isolated from one another. These zones may be waterbearing fractures that have been intersected by the borings. All three wells are low yielding water wells that can manually be bailed dry within minutes using a 4-inch bailer. Wells, MW-2 and MW-3 are significantly lower yielding than MW-1.

Groundwater elevations measured in the three monitoring wells on May 17, 1990 indicate that the direction of groundwater flow is west-southwesterly with a gradient of 0.042 feet per foot (see Figure 4 and Table 3). If the waterbearing zones penetrated by the three wells are not hydraulically interconnected, no groundwater flow may exist or the direction of flow may be unique for each zone.

Soil Analytical Results:

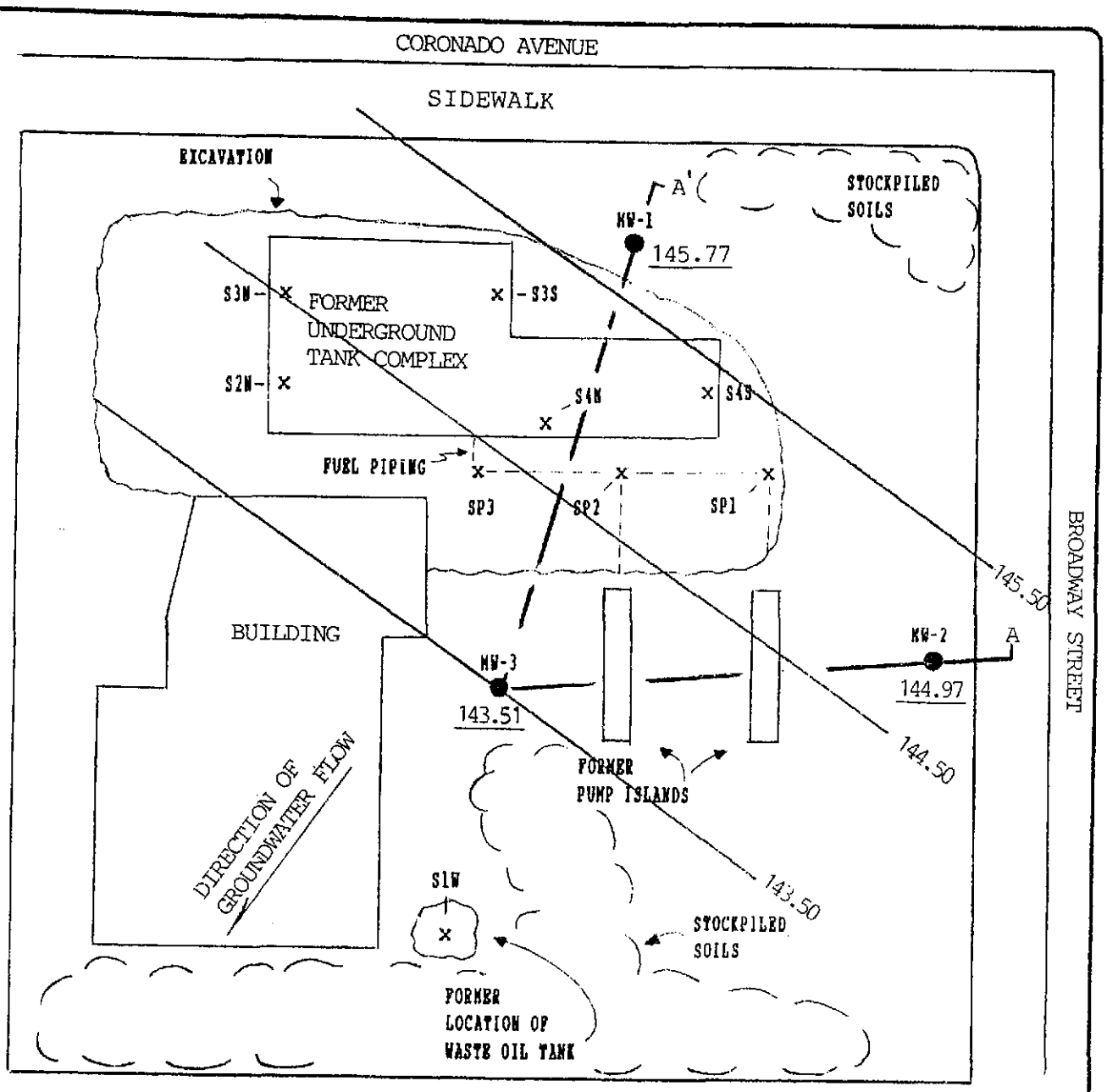
Seven soil samples were analyzed for TPHG and BTEX by Sequoia Analytical located in Redwood City, CA. Certified analytical reports and chain-of-custodies are documented in Appendix A and summarized in Table 4.

Figures 5 through 7 show gasoline concentrations detected in soil for the 4-foot to 5-foot, 8-foot to 10-foot, and 13-foot to 14-foot depths. Because of poor sample recoveries due to the dense bedrock, few soil samples were adequate for chemical analysis. Chemical analysis for soil samples for all three wells at the same depth interval are available only for the 8-foot to 10-foot depth range (see Figure 6). The highest gasoline concentrations, 190 ppm and 180 ppm, were detected in soils for the boring for well MW-1 at the 8-foot to 10-foot and 13.5-foot to 14.0 foot depth ranges, respectively.

Concentrations of the remaining BTEX chemicals in the soils are minor, ranging from non-detectable (<0.0050 ppm) to a high of 6.4 ppm for xylenes in well MW-1.

Groundwater Analytical Results:

Three groundwater samples were analyzed for TPHG and BTEX by Sequoia Analytical located in Redwood City, CA. Certified



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SW3 – x	SOIL SAMPLE TAKEN DURING TANK AND PIPING REMOVAL
MW-1 ●	GROUNDWATER MONITORING WELL
—— 145.50	POTENTIOMETRIC CONTOUR
A —— A'	CROSS SECTION, SEE FIGURE 3

N

0 20

SCALE IN FEET

TANK PROTECT ENGINEERING
Of Northern California

GROUNDWATER GRADIENT
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE 4

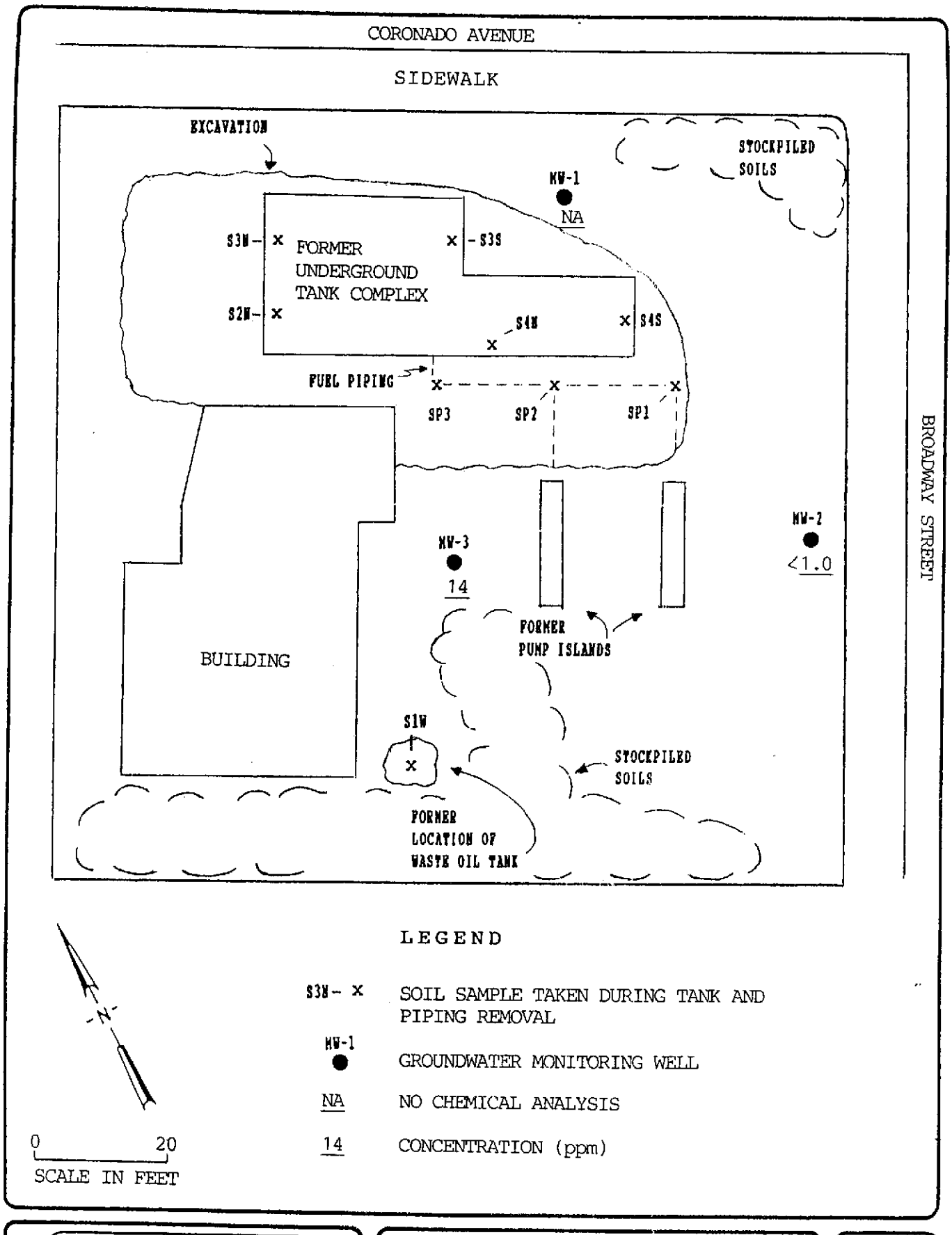
TABLE 3
GROUNDWATER ELEVATIONS
5175 BROADWAY

Well Name	Elevation TOC*(feet MSL)	Date	Depth to Water** (feet)	Groundwater Elevation(feet MSL)
MW-1	155.03	5/17/90	9.26	145.77
MW-2	154.97	5/17/90	10.00	144.97
MW-3	155.93	5/17/90	12.42	143.51

* TOC = TOP-OF-CASING
** MEASURED FROM TOC

TABLE 4
SUMMARY OF PRELIMINARY SITE ASSESSMENT
SOIL ANALYTICAL RESULTS
(ppm)

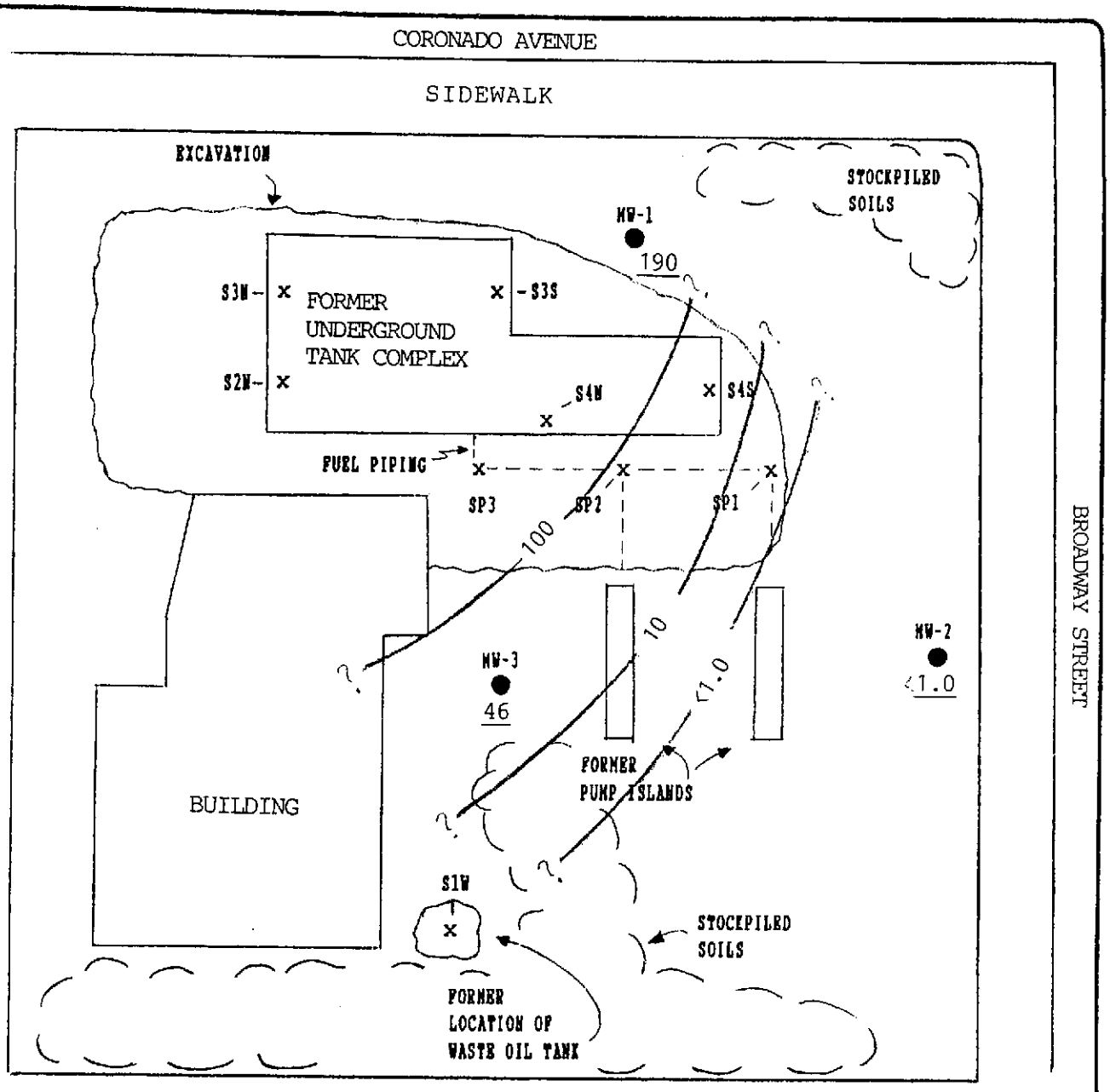
Sample Identification	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes
MW-1	08.0-08.5	190	0.24	0.21	0.92	0.60
MW-1	13.5-14.0	180	1.7	1.4	2.4	6.4
MW-2	04.0-04.5	<1.0	0.0061	0.0050	0.0057	0.026
MW-2	08.5-09.0	<1.0	0.0060	0.0050	0.0089	0.013
MW-3	05.0-05.5	14	<0.0050	<0.0050	<0.0050	0.10
MW-3	10.0-10.5	46	0.050	<0.0050	0.40	0.20
MW-3	14.0-14.5	11	<0.0050	<0.0050	<0.0050	0.10



TANK PROTECT ENGINEERING
Of Northern California

GASOLINE CONCENTRATIONS
4 FOOT TO 5 FOOT DEPTH
5175 BROADWAY
OAKLAND, CALIFORNIA

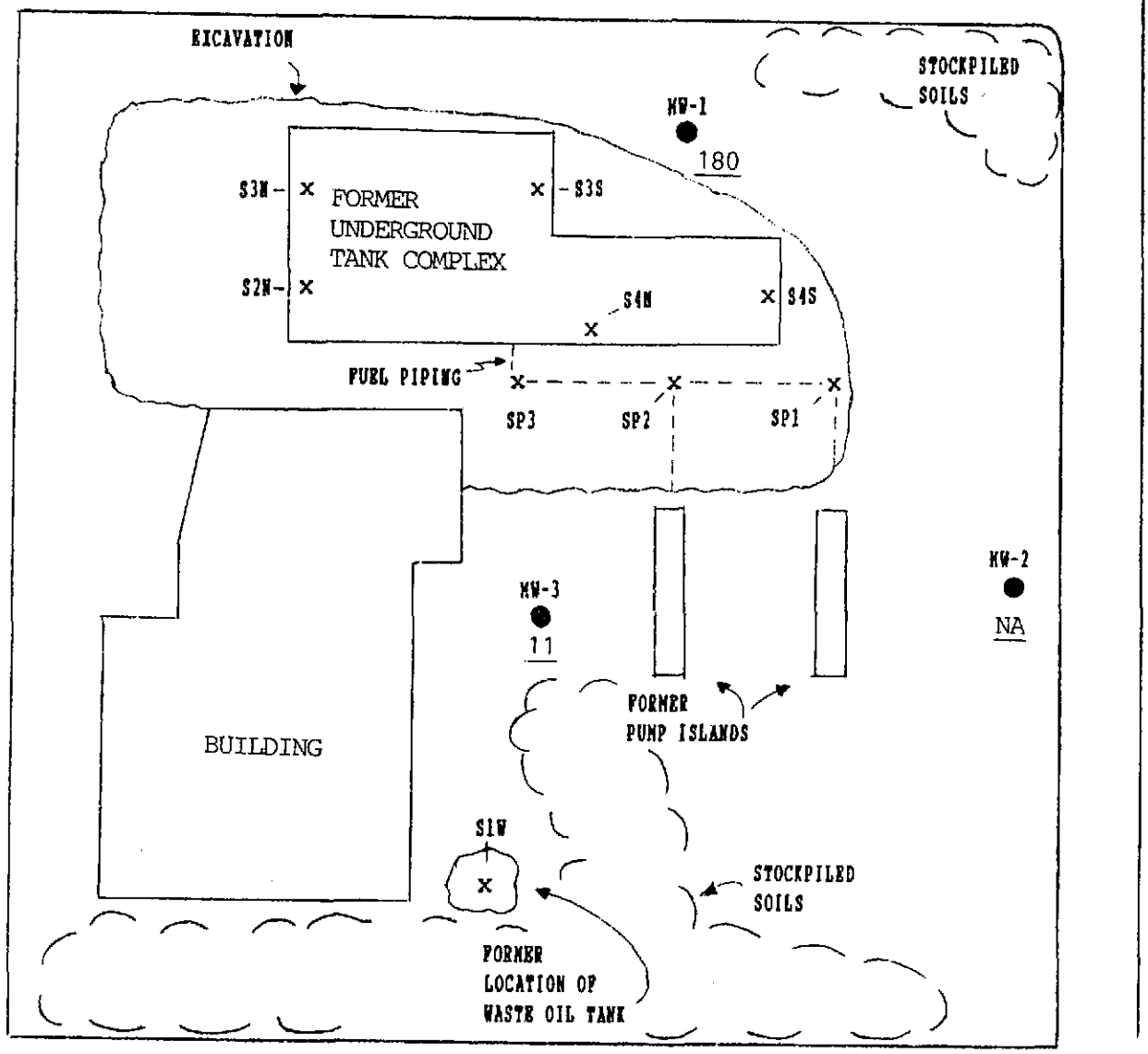
FIGURE
5



TANK PROTECT ENGINEERING
Of Northern California

GASOLINE CONCENTRATIONS
8 FOOT TO 10 FOOT DEPTH
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
6



LEGEND

S3N- ×	SOIL SAMPLE TAKEN DURING TANK AND PIPING REMOVAL
MW-1 ●	GROUNDWATER MONITORING WELL
NA	NO CHEMICAL ANALYSIS
180	CONCENTRATION (ppm)

N

0 20
SCALE IN FEET

TANK PROTECT ENGINEERING
Of Northern California

GASOLINE CONCENTRATIONS
13 FOOT TO 14 FOOT DEPTH
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
7

TABLE 5
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
(ppb)

Sample Identification	Date Sampled	TPH as Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes
MW-1	4/30/90	200	18	5	2	12
MW-2	4/30/90	230	39	18	5	23
MW-3	4/30/90	56000	3600	8600	1300	7200
Detection Limits:		50	0.3	0.3	0.3	0.3

analytical reports and chain-of -custodies are presented in Appendix A and Table 5.

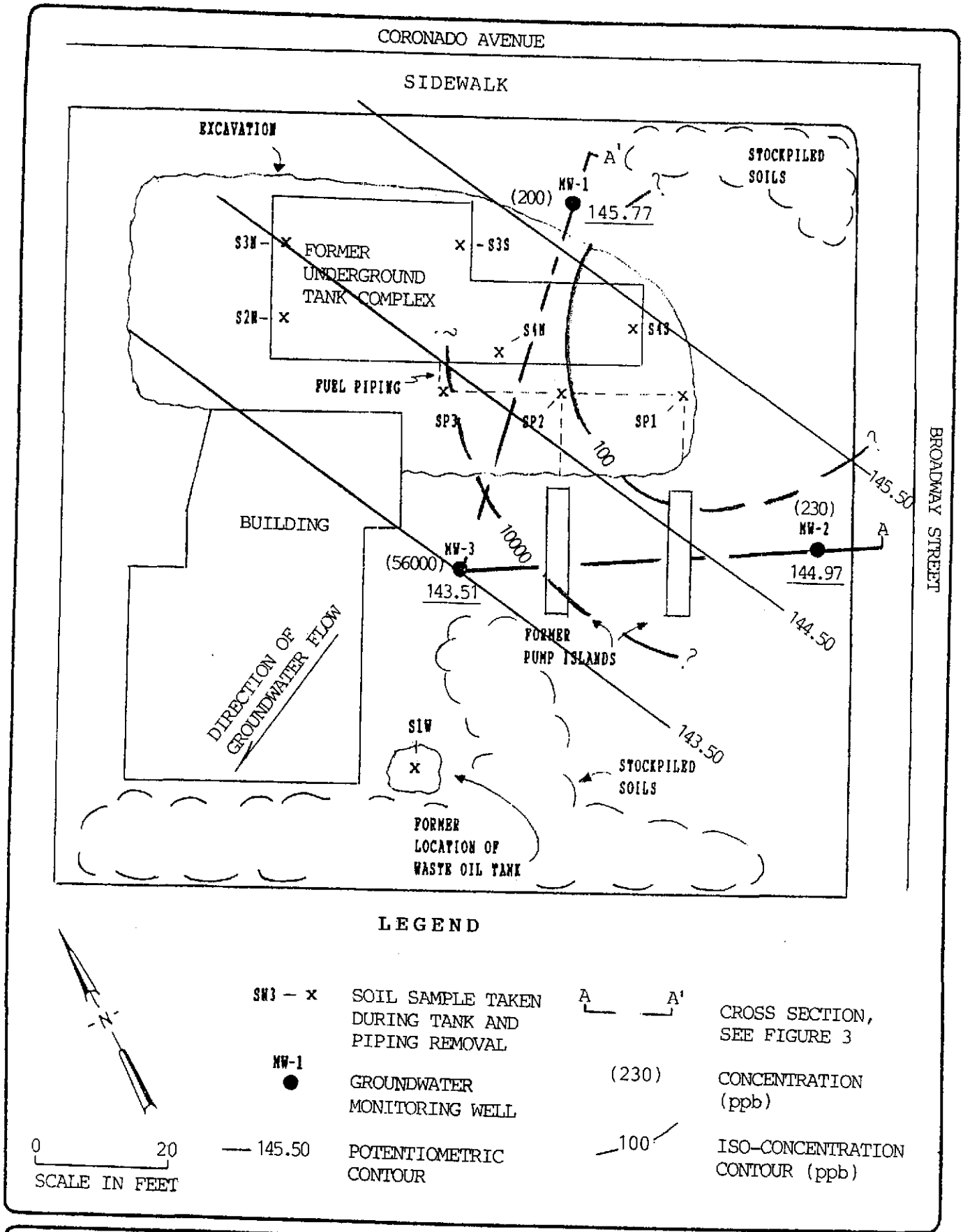
Figures 8 and 9 graphically display the analytical results as iso-concentration contours for gasoline and benzene concentrations, respectively, detected in the groundwater. The chemical analyses detected high concentrations of gasoline and benzene in well MW-3 (56000 ppb and 3600 ppb, respectively) and lower concentrations in wells MW-1 (200 ppb and 18 ppb, respectively) and MW-2 (230 ppb and 39 ppb respectively). The occurrence of hydrocarbons in the water samples from upgradient well MW-1 and cross gradient well MW-2 suggest that direction of groundwater flow may be variable due to seasonal gradient changes or perhaps due to tortuous flow through fracture systems. The plume patterns, as mapped, also suggest a potential offsite, upgradient contaminant source, however, no potential sources of contamination could be found in reviewing available RWQCB files.

Water samples from wells MW-1 and MW-2 may contain desorbed hydrocarbons from contact with contaminated rock and soil due to groundwater rising up the well screens from their initially confined state. Groundwater in these wells may be uncontaminated within the confined aquifer. Specific water depth sampling should be conducted in a future sampling event to analyze water purged directly from the confined aquifers. The absence of contaminated soils, as determined by chemical analyses, in the boring of well MW-2 suggests actual aquifer contamination in this well.

The exact stratigraphic source of groundwater in well MW-3 is unknown. The high concentrations of TPHG and BTEX in this well indicates the aquifer is contaminated.

Summary Of Findings:

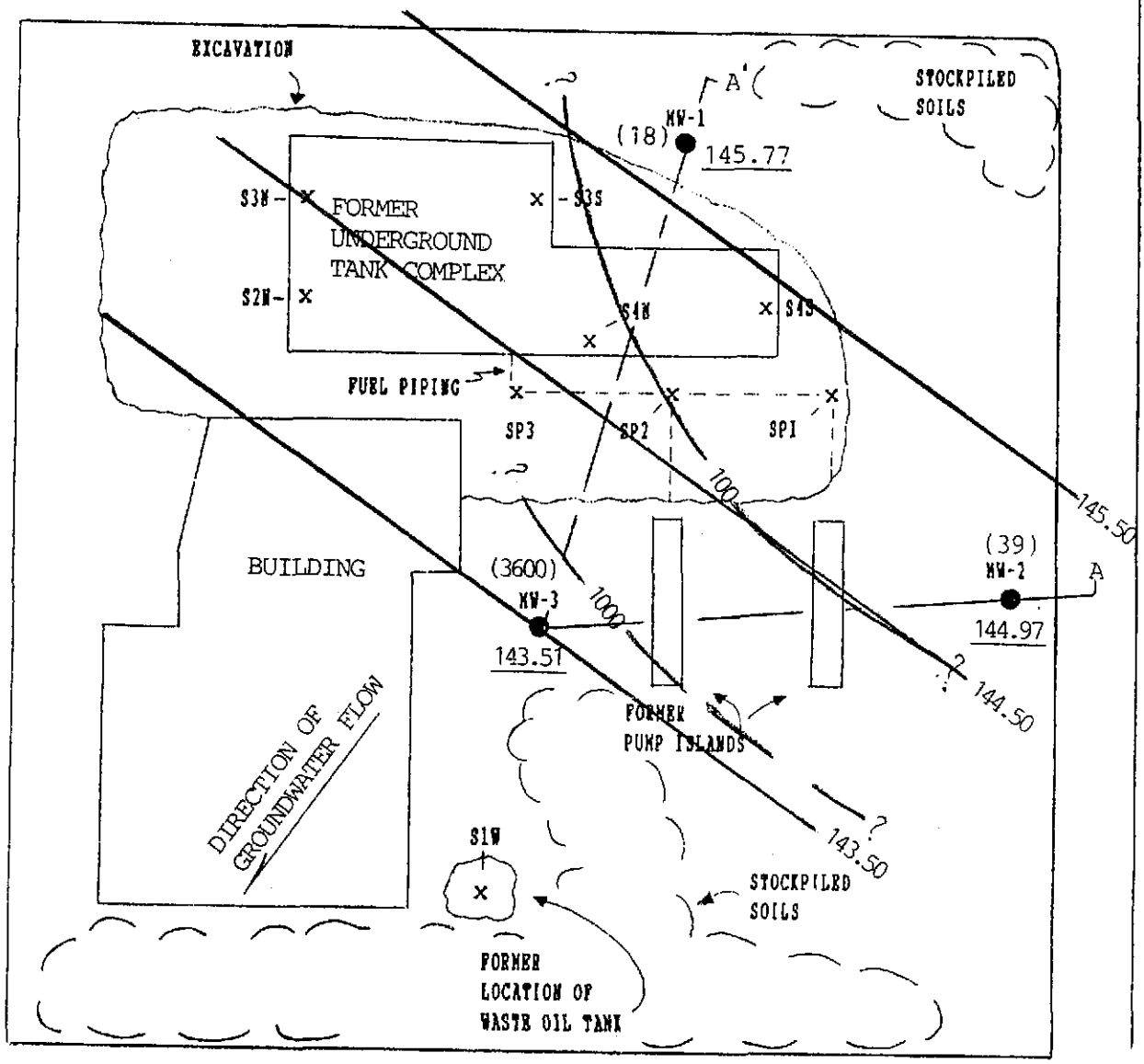
- No upgradient, offsite, potential sources of contamination could be found during a review of available RWQCB files.
- The site is located on bedrock composed of the Franciscan Formation.
- Low to Moderate levels (11 ppm to 190 ppm TPHG) of soil contamination were detected in soil borings for wells MW-1 and MW-3, respectively.
- No floating product was observed.



TANK PROTECT ENGINEERING
Of Northern California

GASOLINE CONCENTRATIONS IN GROUNDWATER
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
8



LEGEND

S#J – x	SOIL SAMPLE TAKEN DURING TANK AND PIPING REMOVAL	A — A'	CROSS SECTION, SEE FIGURE 3
MW-1 ●	GROUNDWATER MONITORING WELL	(3600)	CONCENTRATION (ppb)
— 145.50	POTENTIOMETRIC CONTOUR	100	ISO-CONCENTRATION CONTOUR (ppb)

N

0 20
SCALE IN FEET

TANK PROTECT ENGINEERING
Of Northern California

BENZENE CONCENTRATIONS IN GROUNDWATER
5175 BROADWAY
OAKLAND, CALIFORNIA

FIGURE 9

- Groundwater in wells MW-1 and MW-2 is confined 15 feet to 20 feet below top of bedrock. Other low yield, low permeability waterbearing zones, confined and unconfined may be present.

- Groundwater flow direction is west-southwesterly.

- High levels of TPHG (56,000 ppb) and BTEX were detected in groundwater from well MW-3.

- Low levels of TPHG and BTEX detected in groundwater samples from wells MW-1 and MW-2 may be due to desorption of hydrocarbons from soils above the confining aquifer.

Recommendations:

- Resample and analyze groundwater from wells MW-1, MW-2, and MW-3 using specific water depth sampling techniques in wells MW-1 and MW-2 to confirm the analytical results obtained in this investigation.

- Conduct additional overexcavation of contaminated soils in the northeast corner of the site and in the area of well MW-3 and conduct verification soil sampling and chemical analyses.

- Perform additional characterization of the groundwater contamination (TPE can provide a scope of work upon request from the client).

APPENDIX A

CERTIFIED ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

REPORT SUMMARY
ANAMETRIX, INC. (408) 432-8192

Client : Tank Protect Engineering
Address : 2821 Whipple Road

City : Union City, CA 94587
Attn. : Marc Zomorodi

Anametrix W.O.#: 9001082
Date Received : 01/11/90
Purchase Order#: N/A
Project No. : 0110901
Date Released : 01/22/90

Anametrix I.D.	Sample I.D.	Matrix	Date Sampled	Method	Date Extract	Date Analyzed	Inst I.D.
RESULTS							
9001082-01	L1,2,3,4	WATER	01/10/90	TPH		01/12/90	N/A
9001082-02	S-1-W	SOIL	01/10/90	TPH	01/11/90	01/18/90	N/A
9001082-03	S-2-N	SOIL	01/10/90	TPH		01/12/90	N/A
9001082-04	S-3-N	SOIL	01/10/90	TPH		01/12/90	N/A
9001082-05	S-3-S	SOIL	01/10/90	TPH		01/12/90	N/A
9001082-06	S-4-N	SOIL	01/10/90	TPH		01/12/90	N/A
9001082-07	S-4-S	SOIL	01/10/90	TPH		01/12/90	N/A
9001082-02	S-1-W	SOIL	01/10/90	8010		01/16/90	N/A
						01/17/90	HP15
QUALITY ASSURANCE (QA)							
15B0117H01	METHOD BLANK	SOIL	N/A	8010		01/17/90	HP15
9001082-02	S-1-W	SOIL	01/10/90	SPIKE	01/11/90	01/18/90	N/A

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 L1,2,3,4
Matrix : WATER
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-01
Analyst : CB
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	50	53
108-88-3	Toluene	50	ND
100-41-4	Ethylbenzene	50	ND
1330-20-7	Total Xylenes	100	810
	TPH as Gasoline	2500	6900

ND - Below reporting limit.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-1-W
Matrix : SOIL
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: 01/11/90
Date anl.TPHd: 01/18/90

Anametrix I.D. : 9001082-02
Analyst : CB
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : 01/11/90
Date anl. TOG : 01/11/90

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5	ND
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	ND
1330-20-7	Total Xylenes	5	ND
	TPH as Gasoline	1000	ND
	TPH as Diesel	10000	ND
	Total Oil & Grease	30000	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
TPHd - Total Petroleum Hydrocarbons as diesel is determined by GCFID following either EPA Method 3510 or 3550.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-2-N
Matrix : SOIL
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-03
Analyst : CB
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5000	ND
108-88-3	Toluene	5000	ND
100-41-4	Ethylbenzene	5000	13000
1330-20-7	Total Xylenes	5000	15000
	TPH as Gasoline	100000	970000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-3-N
Matrix : SOIL
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-04
Analyst : CJ
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	1000	ND
108-88-3	Toluene	1000	ND
100-41-4	Ethylbenzene	1000	ND
1330-20-7	Total Xylenes	1000	ND
	TPH as Gasoline	20000	120000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-3-S
Matrix : SOIL
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-05
Analyst : CB
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5000	ND
108-88-3	Toluene	5000	ND
100-41-4	Ethylbenzene	5000	ND
1330-20-7	Total Xylenes	5000	14000
	TPH as Gasoline	100000	930000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-4-N
Matrix : SOIL
Date sampled : 01/10/90
Date anl.TPHg: 01/12/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-06
Analyst : CP
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	50	ND
108-88-3	Toluene	50	ND
100-41-4	Ethylbenzene	50	ND
1330-20-7	Total Xylenes	50	130
	TPH as Gasoline	1000	12000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-4-S
Matrix : SOIL
Date sampled : 01/12/90
Date anl.TPHg: 01/16/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9001082-07
Analyst : mk
Supervisor : TC
Date released : 01/22/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	ND
108-88-3	Toluene	200	ND
100-41-4	Ethylbenzene	200	ND
1330-20-7	Total Xylenes	200	800
	TPH as Gasoline	4000	55000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 601/8010
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-1-W
Matrix : SOIL
Date sampled : 01/10/90
Date analyzed: 01/17/90
Dilution : NONE

Anametrix I.D. : 9001082-02
Analyst : ARL
Supervisor : CF
Date released : 01/22/90
Instrument ID : HP15

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	1	ND
74-83-9	* Bromomethane	0.5	ND
75-71-8	* Dichlorodifluoromethane	1	ND
75-01-4	* Vinyl Chloride	0.5	ND
75-00-3	* Chloroethane	0.5	ND
75-09-2	* Methylene Chloride	0.5	ND
79-69-4	* Trichlorofluoromethane	0.5	ND
75-35-4	* 1,1-Dichloroethene	0.5	ND
75-34-3	* 1,1-Dichloroethane	0.5	ND
156-59-2	# Cis-1,2-Dichloroethene	0.5	ND
156-60-5	* Trans-1,2-Dichloroethene	0.5	ND
67-66-3	* Chloroform	0.5	ND
76-13-1	# Trichlorotrifluoroethane	0.5	ND
107-06-2	* 1,2-Dichloroethane	0.5	ND
71-55-6	* 1,1,1-Trichloroethane	0.5	ND
56-23-5	* Carbon Tetrachloride	0.5	ND
75-27-4	* Bromodichloromethane	0.5	ND
78-87-5	* 1,2-Dichloropropane	0.5	ND
10061-02-6	* Trans-1,3-Dichloropropene	0.5	ND
79-01-6	* Trichloroethene	0.5	ND
124-48-1	* Dibromochloromethane	0.5	ND
79-00-5	* 1,1,2-Trichloroethane	0.5	ND
10061-01-5	* cis-1,3-Dichloropropene	0.5	ND
110-75-8	* 2-Chloroethylvinylether	1	ND
75-25-2	* Bromoform	0.5	ND
127-18-4	* Tetrachloroethene	0.5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	0.5	ND
108-90-7	* Chlorobenzene	0.5	ND
95-50-1	* 1,2-Dichlorobenzene	1	ND
541-73-1	* 1,3-Dichlorobenzene	1	ND
106-46-7	* 1,4-Dichlorobenzene	1	ND
	% Surrogate Recovery	33-134%	62%

ND : Not detected at or above the practical quantitation limit for the method.
* A 601/8010 approved compound (Federal Register, 10/26/84).
\# A compound added by Anametrix, Inc.

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 601/8010
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : METHOD BLANK
Matrix : SOIL
Date sampled : N/A
Date analyzed: 01/17/90
Dilution : NONE

Anametrix I.D. : 15B0117H01
Analyst : ARL
Supervisor : CL
Date released : 01/22/90
Instrument ID : HP15

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	1	ND
74-83-9	* Bromomethane	0.5	ND
75-71-8	* Dichlorodifluoromethane	1	ND
75-01-4	* Vinyl Chloride	0.5	ND
75-00-3	* Chloroethane	0.5	ND
75-09-2	* Methylene Chloride	0.5	1.3
79-69-4	* Trichlorofluoromethane	0.5	ND
75-35-4	* 1,1-Dichloroethene	0.5	ND
75-34-3	* 1,1-Dichloroethane	0.5	ND
156-59-2	# Cis-1,2-Dichloroethene	0.5	ND
156-60-5	* Trans-1,2-Dichloroethene	0.5	ND
67-66-3	* Chloroform	0.5	ND
76-13-1	# Trichlorotrifluoroethane	0.5	ND
107-06-2	* 1,2-Dichloroethane	0.5	ND
71-55-6	* 1,1,1-Trichloroethane	0.5	ND
56-23-5	* Carbon Tetrachloride	0.5	ND
75-27-4	* Bromodichloromethane	0.5	ND
78-87-5	* 1,2-Dichloropropane	0.5	ND
10061-02-6	* Trans-1,3-Dichloropropene	0.5	ND
79-01-6	* Trichloroethene	0.5	ND
124-48-1	* Dibromochloromethane	0.5	ND
79-00-5	* 1,1,2-Trichloroethane	0.5	ND
10061-01-5	* cis-1,3-Dichloropropene	0.5	ND
110-75-8	* 2-Chloroethylvinylether	1	ND
75-25-2	* Bromoform	0.5	ND
127-18-4	* Tetrachloroethene	0.5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	0.5	ND
108-90-7	* Chlorobenzene	0.5	ND
95-50-1	* 1,2-Dichlorobenzene	1	ND
541-73-1	* 1,3-Dichlorobenzene	1	ND
106-46-7	* 1,4-Dichlorobenzene	1	ND
	% Surrogate Recovery	33-134%	90%

ND : Not detected at or above the practical quantitation limit for the method.
* A 601/8010 approved compound (Federal Register, 10/26/84).
\# A compound added by Anametrix, Inc.

TOTAL EXTRACTABLE HYDROCARBON MATRIX SPIKE REPORT
EPA METHOD 3510 WITH GC/FID
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 0110901 S-1-W
Matrix : SOIL
Date sampled : 01/10/90
Date extracted: 01/11/90
Date analyzed : 01/18/90

Anametrix I.D. : 9001082-02
Analyst : CB
Supervisor : TC
Date Released : 01/22/90

COMPOUND	SPIKE AMT. (UG/G)	MS (UG/G)	%REC MS	MSD (UG/G)	%REC MSD	RPD	%REC LIMITS
Diesel	83	73	88%	58	70%	23%	32-93

* Limits established by Anametrix, Inc.

TANK PROTECT ENGINEERING OF NORTHEEN CALIFORNIA
2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088
FAX:#(415) 429-8089

TANK PROTECT ENGINEERING
Of Northern California

CHAIN OF CUSTODY

PROJECT NO.	SITE NAME & ADDRESS
0110791	5175 Broadway Oakland

SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER
Marc Zamorski 2821 Whipple Rd Union City

ID NO.	DATE	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	ANALYTES REQUESTED: TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER	REMARKS
L1	1/10/91	4:15		✓	Boring [illegible]	4 amber			All are				TPH: [illegible] BTXE ★ NOTE
L2	1/10/91	4:16		✓	"	4 amber			All are				" " " "
L3	"	4:13		✓	" " "	1 [illegible]			The same				" " " "
L4	"	4:20		✓	"	1 [illegible]							" " " "
S-1-W	"	4:00	✓		Water [illegible]	VOA							TPH: TPH-D, O&G, BTXE CL HC
S-2-N		5:10	✓		Terrace N								TPH-G & BTXE
S-3-N		5:13	✓		Water Tank S Wall								" "
S-3-S	"	5:16	✓		" " 3 (S)								" "
S-4-N	"	5:20	✓		" 4 (N)								" "
S-4-S	"	5:23	✓		" 4 (S)								" "

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Marc Zamorski	1/11/91 10:34	William Kaufer	William Kaufer	1-11-1990 10:35	Tahi Moini Nilli

Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks

DATE. 1-11-90

ANALYSIS REPORT
FOR

Tank Protect Engineering
2821 Whipple Rd.
Union City, CA 94587

CONTACT: Mr. Marc Zomorodi

DATE: 2/08/90

CHAIN OF CUSTODY ID NO: none

ORDER NO: 8977

P.O. NO: 8977

SITE DESCRIPTION: 5175 Broadway
Oakland, Ca

SAMPLE DESCRIPTION:

Three soil samples labeled S-P-1, S-P-2, S-P-3). These were identified by Carter Analytical Laboratory as L1, L2 and L3 respectively.

REQUESTED ANALYSIS:

The three samples were analyzed for BTX and E (benzene, toluene, xylenes and ethyl benzene) by EPA method 8020 and for total petroleum hydrocarbons as gasoline.

Hazardous Materials Certification No: 304 • Drinking Water Certification No: 953
from the
State of California • Department of Health Services

CARTER ANALYTICAL LABORTORY, INC.

95 LOST LAKE LANE • CAMPBELL, CA 95008 • (408) 866-1600 • FAX (408) 866-0319

The samples were identified as follows:

Carter I.D.	Customer I.D.	Date Sampled	Date Extracted	Date Analyzed	EPA Method
L1	S-P-1	1/31/90	2/05/90	2/06/90	8020,TPH
L2	S-P-2	1/31/90	2/05/90	2/06/90	8020,TPH
L3	S-P-3	1/31/90	2/05/90	2/06/90	8020,TPH

BTEX (EPA 8020) Analysis

Samples S-P-1, S-P-2, and S-P-3 were analyzed for benzene, toluene, ethyl benzene and xylenes (BTEX) following EPA method 8020 using an Nicolet model 9630/GC gas chromatograph (GC) and for total petroleum hydrocarbons as gasoline. A 5.00 gram portion of each sample was placed into a clean, glass vial. After adding 5.00 grams of nanograde methanol to the vials, the vials were shaken for 2 minutes. The resulting mixtures were allowed to settle for 30 minutes at 4 degrees Celsius. The clear, colorless methanol extracts were pipetted out of each vial and into separate 4 ml vials. The vials were labeled and maintained at 4 degrees Celsius until the time of analysis.

A 200 microliter (ul) portion of each extract was purged along with 5 ml of distilled water for 10 minutes at a rate of 25 ml per minute in a Tekmar liquid sample concentrator. The purged gases were trapped, concentrated, and automatically desorbed onto the GC. Separation was achieved on a packed, glass column with a stationary phase of 5% SP-1200/1.75% Bentone-34 on Supelcoport. The eluted components were detected by a photo ionization detector (PID) followed by a flame ionization detector (FID). The results of this analysis are reported in parts per million (ppm) as follows.

Compound	L1 (ppm)	L2 (ppm)	Detection Limit (ppm)
benzene	< 0.05.	< 0.05	0.05.
toluene	< 0.05.	< 0.05	0.05.
ethyl benzene	< 0.05.	< 0.05	0.05.
xylenes	< 0.05.	< 0.05	0.05.
gasoline	< 5.00	< 5.00	5.00.

Compound	L3 (ppm)	Detection Limit (ppm)
benzene	< 0.05.	0.05.
toluene	< 0.05.	0.05.
ethyl benzene	< 0.05.	0.05.
xylenes	< 0.05.	0.05.
gasoline	34.00	5.00

Gasoline was found only in sample L3. Any gasoline present in samples L2 and L3 was below the detection limit. No BTE and X was detected in any of the samples.

TANK PROTECT ENGINEERING
Of Northern California

TANK PROTECT ENGINEERING OF NORTHERN CALIFORNIA
2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088

FAX:#(415)•429-8089

CHAIN OF CUSTODY

PROJECT NO.: 104-0417

SITE NAME & ADDRESS: 5175 BROADWAY, OAKLAND, CA 94611

SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER: TANK PROTECT ENGINEERING 415 429-8088, 2821, WHIPPLE, ROAD, UNION CITY, CA

ID NO.	DATE	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	ANALYSES REQUESTED: TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER	REMARKS
MW1-13.5-14.0	4/17/90	1005	✓		MW-1	BRASS SLEEVE							TPH GASOLINE AND BTEX
MW1-8.0-8.5	"	945	✓		MW-1	"							
MW3-5.0-5.5	"	1320	✓		MW-3	"							
MW3-10.0-10.5	"	1340	✓		MW-3	"							
MW3-14.0-14.5	"	1355	✓		MW-3	"							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
John V. Muscheroni	4/20/90 2:30				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

DATE. 4/20/90

TANK PROTECT ENGINEERING
Of Northern California

NK ECT ..GINE..NG (..ORT..... CA...ORNI..

2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088

FAX #(415) 9..

CHAIN OF CUSTODY

PROJECT NO.	SITE NAME & ADDRESS: 5175 Broadway Oakland, CA.
SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER: Tank Protect Engineering 2821 Whipple Rd. Union City, CA	

ID NO.	DATE 1-31	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER	TPH-G	BTEX	REMARKS
S-P-1	1990	11:30	✓		below the pipeline	Brass sleeve							✓	✓	
S-P-2	1-31	11:36	✓		" "	"							✓	✓	
S-P-3	1-31	11:45	✓		" "	"							✓	✓	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Tank Protect	1990 2-1 12:00		Mark McBride	2/1/90 3:00	Desmond Kerr
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
			Mark McBride	2/2/90 12:30	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
	2/1/90 1:45 P.M.	Mark McBride			

Tank Protect Engineering authorizes Carter Analytical Labratories for designated analysis.

Signature: Tank Protect DATE. 2-1-90

Samples submitted for analyses must be collected within a two week period following the completion of the analyses. Any samples remaining after the designated period of time will be discarded.

Should you have any questions please call. We look forward to serving you again in the near future.

M. R. Pixton, Supervisor 02-08-90
M.R. Pixton Date

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Tank Protect Engineering	Client Project ID:	#104-0417, 5175 Broadway, Oakland	Sampled:	Apr 17, 1990
2821 Whipple Rd.	Matrix Descript:	Soil	Received:	Apr 20, 1990
Union City, CA 9587	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Apr 27, 1990
Attention: Marc Zomorodi	First Sample #:	004-3128	Reported:	May 7, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
004-3128	MW1, 13.5-14.0	180	1.7	1.4	2.4	6.4
004-3129	MW1, 8.0-8.5	190	0.24	0.21	0.92	0.60
004-3130	MW3, 5.0-5.5	14	N.D.	N.D.	N.D.	0.10
004-3131	MW3, 10.0-10.5	46	0.050	N.D.	0.40	0.20
004-3132	MW3, 14.0-14.5	11	N.D.	N.D.	N.D.	0.10
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

TANK PROTECT ENGINEERING OF NORTHERN CALIFORNIA
2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088
FAX:#(415) 429-8089

TANK PROTECT ENGINEERING
Of Northern California

Rush. 48 hrs

CHAIN OF CUSTODY

PROJECT NO.	SITE NAME & ADDRESS
104-4490	5175 Broadway Oakland, CA

SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER
Tank Protect Engineering
2821 Whipple Rd. Union City, CA

ID NO.	DATE 1990	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	ANALYSES REQUESTED: TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER TPH-D	OTHER BTEX	REMARKS
M-S-1	4-4	3:20	✓		spoil pile	Brass sleeve						✓	✓	
M-S-2	"	3:26	✓		"	"						✓	✓	Composite
M-S-3	"	3:32	✓		"	"						✓	✓	
M-S-4	"	3:40	✓		"	"						✓	✓	
M-S-5	"	3:47	✓		"	"						✓	✓	
M-S-6	"	3:52	✓		"	"						✓	✓	Composite
M-S-7	"	4:01	✓		"	"						✓	✓	
M-S-8	"	4:10	✓		"	"						✓	✓	
M-S-9	"	4:16	✓		"	"						✓	✓	Composite
M-S-10	"	4:25	✓		"	"						✓	✓	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jeff Farhoumand	4-6-90 12:10				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
			4/6/90 12:15		

DATE. _____

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Tank Protect Engineering	Client Project ID:	#104-4490, Oakland, CA	Sampled: Apr 4, 1990
2821 Whipple Rd.	Matrix Descript:	Soil	Received: Apr 6, 1990
Union City, CA 94587	Analysis Method:	EPA 5030/8015/8020	Analyzed: Apr 9, 1990
Attention: Marc Zomorodi	First Sample #:	004-1006 A - D	Reported: Apr 10, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
0041006 A-D	M-S-1, M-S-2, M-S-3, M-S-4,	5.0	0.0074	0.0050	0.038	0.069
0041007 A-C	M-S-5, M-S-6, M-S-7	15	0.0074	0.020	0.063	0.12
0041008 A-C	M-S-8, M-S-9, M-S-10	17	0.0050	0.010	0.041	0.095
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Tank Protect Engineering	Client Project ID:	#104-4249, 5175 Broadway	Sampled:	Apr 24, 1990
2821 Whipple Rd.	Matrix Descript:	Soil	Received:	Apr 27, 1990
Union City, CA 94587	Analysis Method:	EPA 5030/8015/8020	Analyzed:	May 4, 1990
Attention: Marc Zomorodi	First Sample #:	004-4082	Reported:	May 7, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
004-4082	MW2: 4.0-4.5	N.D.	0.0061	0.0050	0.0057	0.026
004-4083	MW2: 8.5-9.0	N.D.	0.0060	0.0050	0.0089	0.013
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 52000
CLIENT: TANK PROTECT ENGINEERING
CLIENT JOB NO.: 104

DATE RECEIVED: 05/03/90
DATE REPORTED: 05/14/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (ug/L) Gasoline Range
1	MW-1	200
2	MW-2	230
3	MW-3	56000

ug/L - parts per billion (ppb)

Minimum Detection Limit for Gasoline in Water: 50ug/L

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = <15%
MS/MSD Average Recovery = 119%: Duplicate RPD = 2%

Richard Srna, Ph.D.
Laboratory Director

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 52000
CLIENT: TANK PROTECT ENGINEERING
CLIENT JOB NO.: 104

DATE RECEIVED: 05/03/90
DATE REPORTED: 05/14/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
1	MW-1	18	5	2	12
2	MW-2	39	18	5	23
3	MW-3	3600	8600	1300	7200

ug/L - parts per billion (ppb)

Minimum Detection Limit in Water:0.3ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 100% : Duplicate RPD = 7%

Richard Srna, Ph.D.
Laboratory Director

OUTSTANDING QUALITY AND SERVICE

TANK PROTECT ENGINEERING
Of Northern California

2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088

Mackovich

SA# 52000

CHAIN OF CUSTODY

PROJECT NO.	SITE NAME & ADDRESS
104	5175 BROADWAY, OAKLAND, CA.

SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER
TANK PROTECT ENGINEERING TEL.#(415) 429-8088
2821 WHIPPLE RD. UNION CITY, CA. 94587

ID NO.	DATE	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	ANALYTES REQUESTED: TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER	REMARKS
MW-1	4/30/90	3:56 3:57		✓	MW-1	GLASS 40 ML							TPH GASOLINE, BTEX
MW-2	4/30/90	4:33 4:34		✓	MW-2	GLASS 40 ML							TPH GASOLINE, BTEX
MW-3	4/30/90	4:42 4:43		✓	MW-3	GLASS 40 ML							TPH GASOLINE, BTEX

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
John Mackovich	5/3/90 1242				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Alex Eng	5/3/90 1242				
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
[illegible]	5/7/90 2:30	[illegible]	5/3/90 14:20		

DATE.

TANK PROTECT ENGINEERING
Of Northern California

2821 WHIPPLE ROAD
UNION CITY, CA. 94587
PHONE #(415) 429-8088
(800) 523-8088

Mrakovich

SA# 52000

CHAIN OF CUSTODY

PROJECT NO.	SITE NAME & ADDRESS
104	5175 BROADWAY, OAKLAND, CA.

SAMPLERS--NAME, ADDRESS AND TELEPHONE NUMBER
TANK PROTECT ENGINEERING TEL.#(415) 429-8088
2821 WHIPPLE RD. UNION CITY, CA. 94587

ID NO.	DATE	TIME	SOIL	WATER	SAMPLING LOCATION	(1) TYPE OF CONTAINER	ANALYSES REQUESTED: TOTAL LIGHT HC	AROMATIC HC (BTX)	TOTAL HEAVY HC	OIL & GREASE	VOC SCAN (624's)	OTHER	REMARKS
MW-1	4/30/90	3:56 3:57		✓	MW-1	GLASS 40 ML							TPH GASOLINE, BTEX
MW-2	4/30/90	4:33 4:34		✓	MW-2	GLASS 40ML							TPH GASOLINE, BTEX
MW-3	4/30/90	4:42 4:43		✓	MW3	GLASS 40ML							TPH GASOLINE, BTEX

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
John Mrakovich	5/3/90 1242				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Alex Kwok	5/3/90 1242				
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
[illegible]	5/3/90 2:3[illegible]	[illegible]	5/3/90 14:20		

DATE.

APPENDIX B

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING PROCEDURES

APPENDIX B

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING PROCEDURES

Undisturbed soil samples shall be recovered from soil without introducing liquids into the borings. Soil samples as core or cutting shall be taken continuously from ground surface to termination depth, or through the aquifer zone of interest for lithologic logging.

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

Soil from all borings shall be described in detail using the Unified Soil Classification System and shall 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 shall be noted and accurately logged.

Soil samples will be collected in decontaminated 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 visquene. 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

SAMPLE HANDLING TECHNIQUES

APPENDIX C

SAMPLE HANDLING TECHNIQUES

Soil and groundwater samples will be packaged carefully to avoid breakage or contamination, and will be delivered to the laboratory at proper storage temperatures. The following sample packaging requirements will be followed.

* Sample bottle/sleeve lids will not be mixed. All sample lids will stay with the original containers and have custody seals affixed to them.

* Samples will be secured in coolers to maintain custody, control temperature, and prevent breakage during transporation to the laboratory.

* The original chain-of-custody form and one copy will be placed in a plastic bag and taped to the inside of the cooler lid.

* Ice or blue ice will be used to keep samples at a constant temperature during transport to the laboratory.

* Each sample will be identified by affixing a pressure sensitive, gummed label, or standardized tag on the container(s). This label will contain the sample identification number, date and time of sample collection, and the collector's initials.

All sample containers will be precleaned and will be obtained at 1-Chem Research in Hayward, California, or from a State Department of Health Services certified analytical laboratory.

Sample Control/Chain-of-Custody: All field personnel will refer to this work plan to verify the methods to be employed during sample collection. All sample gathering activities will be recorded in the site logbook; all sample transfers will be documented in the site logbook; samples are to be identified with TPE labels and all sample bottles are to be custody-sealed. All

information is to be recorded in waterproof ink. All TPE field personnel are personally responsible for sample collection and the care and custody of collected samples until the samples are transferred or properly dispatched.

The custody record will be completed by the field technician who has been designated by the TPE project manager as being responsible for sample shipment to the appropriate laboratory. The custody record will include, among other things, the following information: name of person collecting the samples; date samples were collected; type of sampling conducted (composite/grab); location of sampling station; number and type of containers used; and signature of the TPE person relinquishing samples to a non-TPE person with the date and time of transfer noted. The relinquishing individual will also put all the specific shipping data on the custody record.

Site log books will be maintained by a designated TPE field employee to record, for each sample, sampling locations, station numbers, dates, times, sampler's name, designation of the samples as a grab or composite, notation of the type of sample (e.g. groundwater, soil boring, etc.), preservatives used, on-site measurement data, and other observations or remarks.

APPENDIX D

LOGS OF EXPLORATORY BORINGS AND WELL COMPLETION DETAILS

LOG OF EXPLORATORY BORING

PROJECT NUMBER 104

BORING NO. MW-1

PROJECT NAME 5175 Broadway, Oakland, California

BY J. Mrakovich DATE 4/17/90

SURFACE ELEV. 156 ±

Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION
							Asphalt surface
							Fill: Aggregate base of sand and gravel (SP), orange to dark brown, dry.
							Fill: Clayey, gravelly, sand (SW), dark red brown with brick fragments, 5% medium sand, rootlets, damp, no odor.
1.5/1.5		13					Silty clay (CL), brown, stiff, damp, no odor.
				5			@ 6.5' color change to brown-orange.
							Gravelly sand (SW), olive-brown, dry, no odor.
.75/.75		47 for 9 inches					Clayey silt (ML), 30% shale/ claystone fragments, probably weathered bedrock, mottled blue-green/brown, strong gasoline odor, damp, dense.
				10			Serpentine, mottled blue-green/brown, highly fractured, damp, very dense, strong gasoline odor.
							Claystone/shale, brown to black, fractured, moist, very dense, slight odor.
1.0/1.0		52					
				15			
.5/.5		34 for 6 inches					
				20			

REMARKS

Boring drilled with continuous-flight hollow-stem 10-inch O.D. augers (6.625-inch I.D.). Samples collected in a 3-inch O.D. modified California sampler.

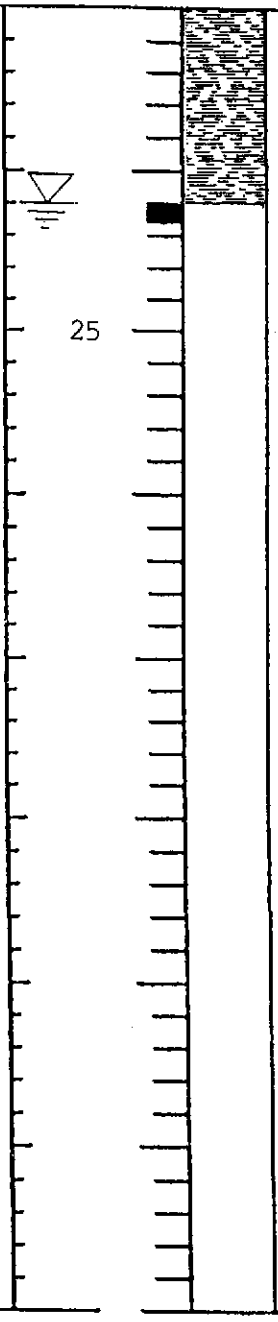
LOG OF EXPLORATORY BORING

PROJECT NUMBER 104 BORING NO. MW-1

PROJECT NAME 5175 Broadway, Oakland, California PAGE 2 Of 2

BY J. Mrakovich DATE 4/17/90 SURFACE ELEV. 156 ±

Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION
							@ 23.0' wet
.17/.17		50 for 2 inches		25			Boring terminated at 23 feet. Sampled to 23.17 feet.

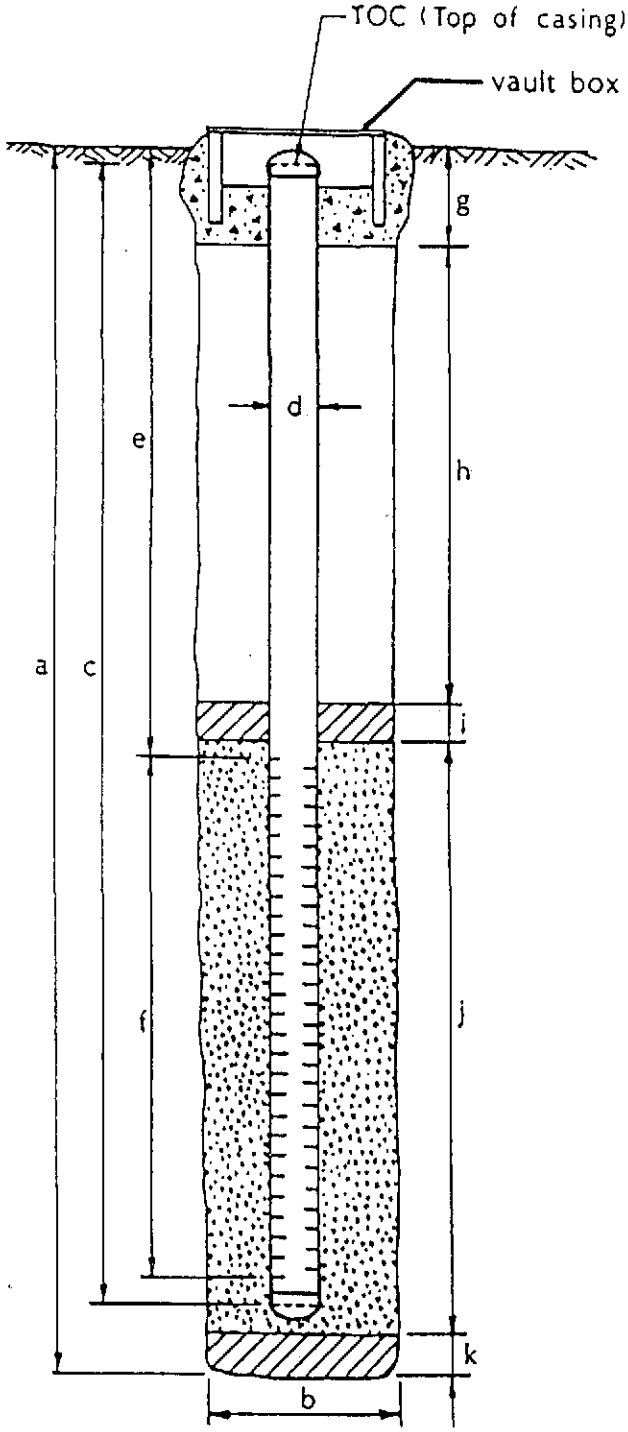


REMARKS

WELL DETAILS

PROJECT NUMBER 104
PROJECT NAME 5175 Broadway
LOCATION Oakland, CA
WELL PERMIT NO. 90222

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 155.03
GROUND SURFACE ELEV. 156 ±
DATUM Mean sea level
INSTALLATION DATE 4/17/90



EXPLORATORY BORING

a. Total depth 23 ft.
b. Diameter 10 in.
Drilling method Hollow-stem auger

WELL CONSTRUCTION

c. Total casing length 23 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 13.0 ft.
f. Perforated length 10.0 ft.
Perforated interval from 23.0 to 13.0 ft.
Perforation type Machine slot
Perforation size .020-inch
g. Surface seal 1.0 ft.
Seal material Concrete
h. Backfill 8.5 ft.
Backfill material Cement
i. Seal 1.0 ft.
Seal material Bentonite
j. Gravel pack 12.5 ft.
Pack material 8x20 filter sand
k. Bottom seal 0.0 ft.
Seal material N/A

LOG OF EXPLORATORY BORING

PROJECT NUMBER 104 BORING NO. MW-2

PROJECT NAME 5175 Broadway, Oakland, California PAGE 1 Of 2

BY J. Mrakovich DATE 4/24/90 SURFACE ELEV. 156 ±

Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	DESCRIPTION
			Concrete
			Clayey silt (ML), mottled yellow-brown and olive brown, damp, slight odor.
			Claystone, mottled yellow-brown with minor blue-green, highly fractured (blocky), upper 9-inches weathered to a clayey consistency, very dense, damp, no odor.
1.25/1.5		97	
			5
1.0/1.0		84	@ 8.0' color change to include more blue-green, slight gasoline odor.
			@ 10.0' hard drilling 10-12 feet, strong gasoline odor while drilling.
			10
.42/.42		80 for 5 inches	@ 13.0-13.4' insufficient sample for analysis, no odor.
.25/.25		50 for 3 inches	@ 18.0-18.25' insufficient sample for analysis, no odor.
			20

REMARKS

Boring drilled with continuous-flight hollow-stem 10-inch O.D. (6.625-inch I.D.). Samples collected in a 3-inch O.D. modified California sampler.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 104

BORING NO. MW-2

PROJECT NAME 5175 Broadway, Oakland, California

BY J. Mrakovich DATE 4/24/90

SURFACE ELEV. 156 ±

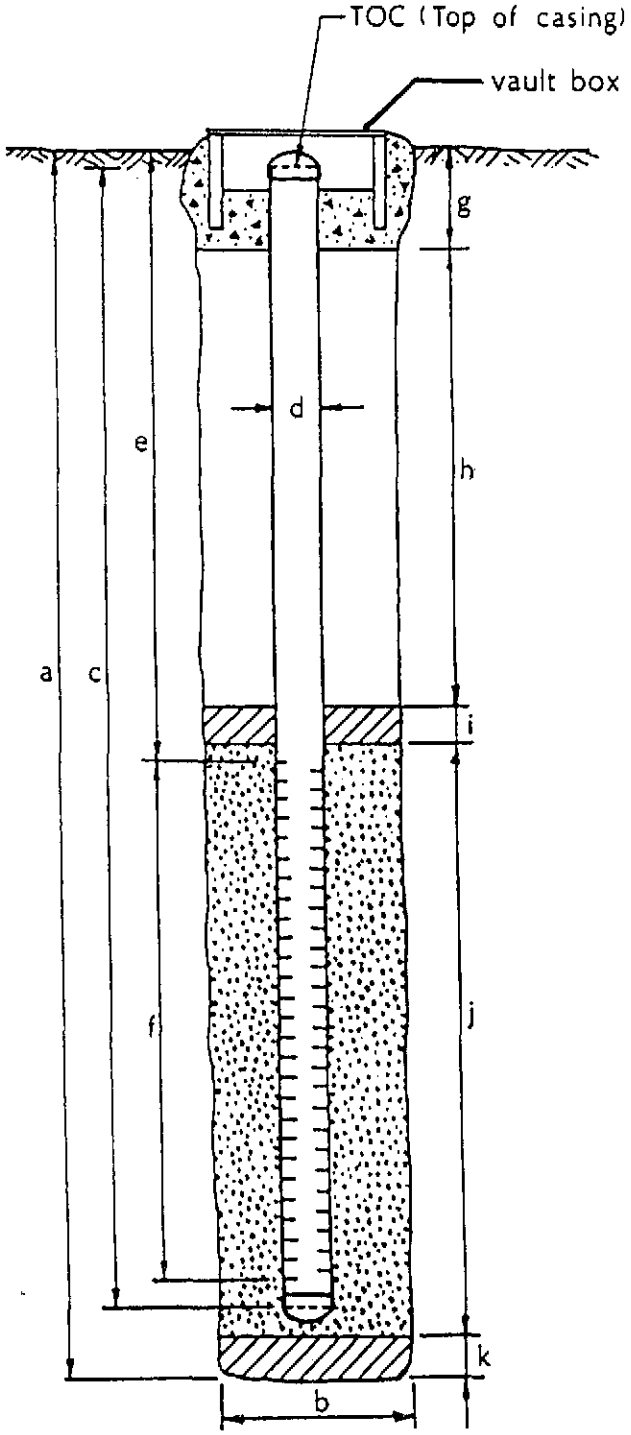
Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION
.17/.17		50 for 2 inches	▽	25			@ 23.0-23.17' insufficient sample for analysis, no odor. Boring terminated at 23 feet. Sampled to 23.17 feet.

REMARKS

WELL DETAILS

PROJECT NUMBER 104
PROJECT NAME 5175 Broadway
LOCATION Oakland, CA
WELL PERMIT NO. 90222

BORING / WELL NO. MW-2
TOP OF CASING ELEV. 154.97
GROUND SURFACE ELEV. 156 ±
DATUM Mean sea level
INSTALLATION DATE 4/24/90



EXPLORATORY BORING

a. Total depth 23.0 ft.
b. Diameter 10 in.
Drilling method Hollow-stem auger

WELL CONSTRUCTION

c. Total casing length 23.0 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 8.0 ft.
f. Perforated length 15.0 ft.
Perforated interval from 23.0 to 8.0 ft.
Perforation type Machine slot
Perforation size .020-inch
g. Surface seal 1.0 ft.
Seal material Concrete
h. Backfill 4.0 ft.
Backfill material Cement
i. Seal 1.0 ft.
Seal material Bentonite
j. Gravel pack 17.0 ft.
Pack material 8x20 filter sand
k. Bottom seal 0.0 ft.
Seal material N/A

LOG OF EXPLORATORY BORING

PROJECT NUMBER 104 BORING NO. MW-3

PROJECT NAME 5175 Broadway, Oakland, California PAGE 1 OF 2

BY J. Mrakovich DATE 4/17/90 SURFACE ELEV. 156 ±

Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	DEPTH IN FT.	DESCRIPTION
				Fill: Clayey, gravelly, sand (SW), dark brown and black. Hard object encountered at 3 feet, dry, no odor.
				Silty clay (CL), black, slightly damp, firm, slight gasoline odor.
1.5/1.5		7	5	
				@ 7.0' color change to grey, gasoline odor, damp.
1.5/1.5		75	10	Claystone, yellow-brown, weathered to a clayey consistency, damp, strong gasoline odor.
				Claystone/serpentine, mottled green and dark brown, weathered, highly fractured, very dense, damp, strong gasoline odor.
.5/.5		50 for 6 inches	15	@ 14.0'-14.5', slight gasoline odor, damp.
.33/.33		50 for 4 inches	20	@ 19.0'-19.33', slight gasoline odor, insufficient sample for analysis, moist.

REMARKS

Boring drilled with continuous hollow-stem 10-inch O.D. augers (6.625-inch I.D.). Samples collected in a 3-inch O.D. modified California sampler.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 104

PROJECT NAME 5175 Broadway, Oakland, California

BY J. Mrakovich DATE 4/17/90

BORING NO. MW-3

SURFACE ELEV. 156 ±

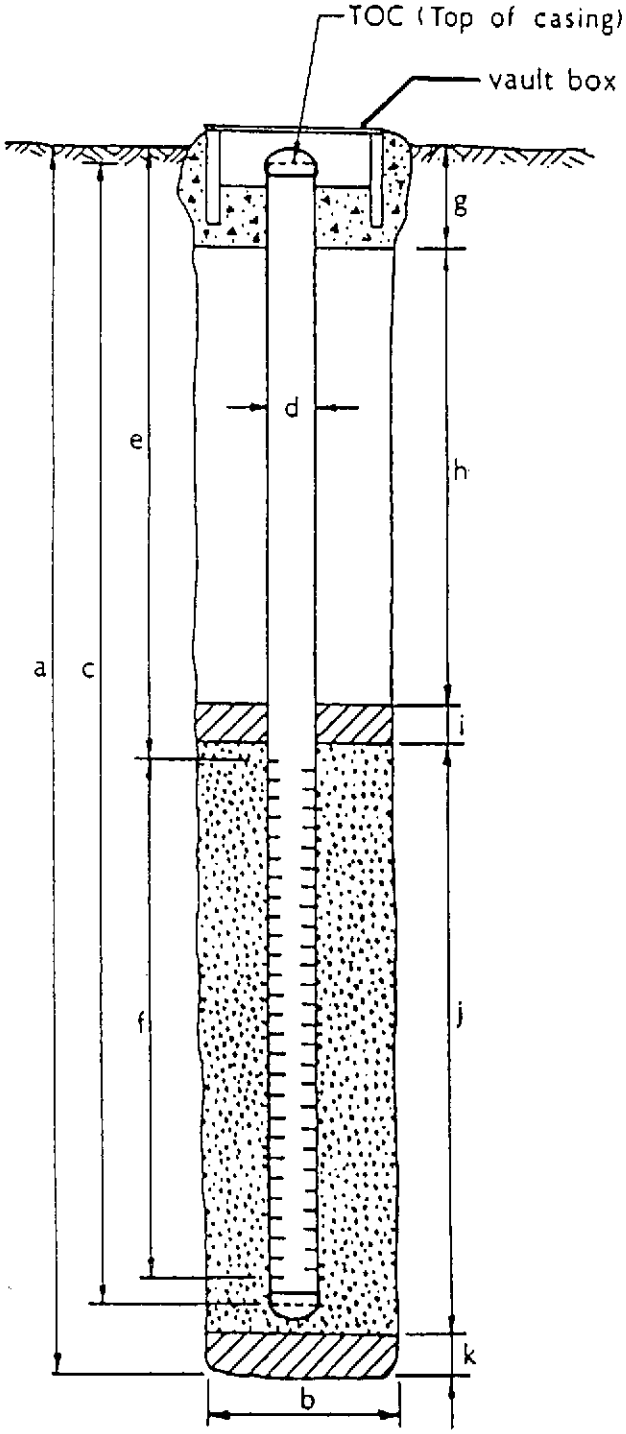
Recovery (ft/ft)	PID (ppm)	Penetration (blws/ft)	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION
				25			Boring terminated at 27 feet.

REMARKS

WELL DETAILS

PROJECT NUMBER 104
PROJECT NAME 5175 Broadway
LOCATION Oakland, CA
WELL PERMIT NO. 90222

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 155.93
GROUND SURFACE ELEV. 156 ±
DATUM Mean sea level
INSTALLATION DATE 4/17/90



EXPLORATORY BORING

a. Total depth 27.0 ft.
b. Diameter 10 in.
Drilling method Hollow-stem auger

WELL CONSTRUCTION

c. Total casing length 27.0 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 7.0 ft.
f. Perforated length 20.0 ft.
Perforated interval from 27.0 to 7.0 ft.
Perforation type Machine slot
Perforation size .020-inch
g. Surface seal 1.0 ft.
Seal material Concrete
h. Backfill 4.0 ft.
Backfill material Cement
i. Seal 1.5 ft.
Seal material Bentonite
j. Gravel pack 21.5 ft.
Pack material 8x20 filter sand
k. Bottom seal 0.0 ft.
Seal material N/A

APPENDIX E

GROUNDWATER MONITORING WELL CONSTRUCTION PROCEDURES

APPENDIX E

GROUNDWATER MONITORING WELL CONSTRUCTION PROCEDURES

BOREHOLE DESIGN

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

Borehole Diameter: The diameter of the borehole shall be a minimum of 4 inches and a maximum of 12 inches greater than the diameter of the well casing

Shallow (Unconfined Zone) Wells: When groundwater is encountered or known to be within 45 feet of the ground surface, the borehole will be advanced through the aquifer to an underlying competent aquitard. The competency of the aquitard may be tested by sampling 5 feet into the underlying aquitard and backfilling the excess hole with either bentonite pellets or neat cement placed by tremie pipe method. An aquitard found to be less than 5 feet thick, is assumed to represent a local lens. The screened interval will begin a minimum of 5 feet above the saturated zone and extend the full thickness of the aquifer or no more than 20 feet into the saturated zone, whichever is reached first. The well screen will not extend into the aquitard, nor shall the screened interval exceed 25 feet in length.

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

The conductor casing shall be installed in the following manner: a large diameter borehole (typically 18 inches) shall be drilled until it is determined that the first competent aquitard has been reached. A low carbon steel conductor casing shall be placed in

the borehole to the depth drilled. Centralizers shall be used to center the casing in the borehole. The annular space between the conductor casing and the formation shall be cement-grouted from bottom to top by tremie pipe method. The grout shall be allowed to set for a minimum of 72 hours.

Drilling may 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 can be repeated with successively smaller diameter conductor casings.

The bottom of the well screen in a confined aquifer shall be determined by presence or lack of a competent (5 foot) 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 shall not cross connect to another aquifer.

CONSTRUCTION MATERIALS

Casing Materials: Well casing shall be constructed of 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 shall be connected by flush threaded couplers. Organic bonding compounds and solvents will not be used on joints.

Well Screen Slots: Well screen shall be factory slotted. The size of the slots shall 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 shall be secured with stainless steel set screws. No organic solvents or cements will be applied.

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

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

Grout Seal Material: Cement grout shall consist of a proper mixture if 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 five minutes. When a washer is not available, components shall be cleaned with water and detergent or tri-sodium phosphate, rinsed in clean water, than 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 to the borehole shall be adequately filtered to remove oil and particulates.

Casing Installation: The casing will be set under tension 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 pack placement. The sand pack shall cover the entire screened interval and rise a minimum of two feet above the highest perforation.

Bentonite Seal Placement: The bentonite seal will be placed 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 should not be less than 1 foot in thickness above the sand pack.

Grout Seal Placement: The cement grout mixture shall 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. Grout will be placed in one continuous lift and will extend to the surface or to the well vault if the wellhead 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 wellhead will be protected from fluid entry, accidental damage, unauthorized access, and vandalism. A watertight cap shall be installed on the well casing. Access to the casing will be controlled by a keyed lock.

Wellheads 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 identified by well number, owner, and type of installation. Construction data, including depth, hole and casing diameter, and screened interval will be noted.

APPENDIX F

GROUNDWATER MONITORING WELL DEVELOPMENT PROCEDURES

APPENDIX F

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, mechanical pumping, air lift pumping, surging, swabbing, or an effective combination of methods. Wells will be developed until the well is free of sand, silt, and turbidity.

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 24 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 five 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 de-watering.

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. All hazardous development water will be transported off site by a licensed transporter to a hazardous waste disposal or treatment facility. No hazardous development water will be released to the environment.

APPENDIX G

GROUNDWATER SAMPLING PROCEDURES

APPENDIX G

GROUNDWATER SAMPLING PROCEDURES

Groundwater samples will be obtained using either a bladder pump or a clear Teflon bailer. Prior to sampling, 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 three to five wetted casing volumes of groundwater have been evacuated and after the TPE sampling team leader determines that water representative of the formation is being obtained. The well will be purged until conductivity has been stabilized (three consecutive conductivity reading within 15% of one another). If the well is emptied before four to ten well volumes are removed, the sample shall be taken when the water level in the well recovers to 80% of its initial water level or better.

TPE will also measure the thickness of any floating product in the monitoring wells using a probe or clear Teflon 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 11) for the type of analysis to be performed.

MEASUREMENTS

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

Parameter	Units of Measurment
PH	Units
Electrical conductivity	Umhos
Temperature	Degrees F or C
Depth to Water	Feet/Tenths
Volume of Water Discharged	Gallons

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

APPENDIX H

WATER HANDLING AND DECONTAMINATION PROCEDURES

APPENDIX H

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 sampling 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 visquene and the appropriate disposal procedure will be determined by the site owner or TPE following receipt of the soil sample analytical results.

APPENDIX I

QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

APPENDIX I

QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

The overall objectives of the field sampling program include generation of reliable data that will support development of a remedial action plan. Sample quality will be checked by the use of proper sampling, handling, and testing methods. Additional sample quality control methods may include the use of background samples, equipment rinsate samples, and trip and field blanks. Chain-of-custody forms, use of a qualified laboratory, acceptable detection limits, and proper sample preservation and holding times also provide assurance of accurate analytical data.

TPE will follow a QA/QC program in the field to ensure that all samples collected and field measurements taken are representative of actual field and environmental conditions and that data obtained are accurate and reproducible. These activities and laboratory QA/QC procedures are described below.

Field Samples: Additional samples taken in the field are used to evaluate both sampling and analytical methods. Three basic categories of QA/QC samples that may be collected are trip samples, field blanks, and duplicate samples.

Trip blanks are a check for cross-contamination during sample collection, shipment, and in the laboratory. Analytically confirmed organic-free water shall be used for organic parameters and deionized water for metal parameters. Blanks will be prepared by the laboratory supplying the sample containers. The blank shall be numbered, packaged, and sealed in the same manner as the other samples. One trip blank will be used for each sample set of less than 20 samples. At least 5% blanks will be used for sets greater than 20 samples. The trip blank is a water sample that remains with the collected samples during transportation and is analyzed along with the field samples to check for residual contamination. The trip blank is not to be opened by either the sample collectors or the handlers.

The field blank is a water sample that is taken into the field and is opened and exposed at the sampling point to detect contamination from air exposure. The water sample is poured into appropriate containers to simulate actual sampling conditions. Contamination for air exposure can vary considerably from site to site.

The laboratory will not be informed about the presence of field and trip blanks and a false identifying number will be put on the label. Full documentation of these collection and decoy procedure will be made in the site logbook.

Duplicate samples are identical sample pairs (collected in the same place and at the same time), placed in identical containers. For soils, adjacent sample liners will be analyzed. For the purpose of data reporting, one is arbitrarily designated the sample, and the other is designated as a duplicate sample. Both sets of results are reported to give an indication of the precision of sampling and analytical methods.

The laboratory's precision will be assessed without the laboratory's knowledge by labeling one of the duplicates with false identifying information. Data quality will be evaluated on the basis of the duplicate results.

Laboratory QA/QC: Execution of a strict QA/QC program is an essential ingredient in high-quality analytical results. By using accredited laboratory techniques and analytical procedures, estimates of the experimental values can be very close to the actual value of the environmental sample. The experimental value is monitored for its precision and accuracy by preforming QC test designed to measure the amount of random and systematic errors and to signal when correction of these errors is needed.

The QA/QC program describes methods for performing QC tests. These methods involve analyzing method blanks, calibration standards, check standards (both independent and EPA-certified standards), duplicates, replicates, and sample spikes. Internal QC also requires adherence to written methods, procedural documentation, and record keeping, and the observance of good laboratory practices.