HAGEMAN-AGUIAR, INC.

Underground Contamination Investigations
Groundwater Consultants, Environmental Engineering

3732 Mt. Diablo Blvd. Suite 372
Lafayette, California 94549
(415) 284-1661
FAX (415) 284-1664

April 12, 1991

PROPOSAL FOR SUBSURFACE INVESTIGATION

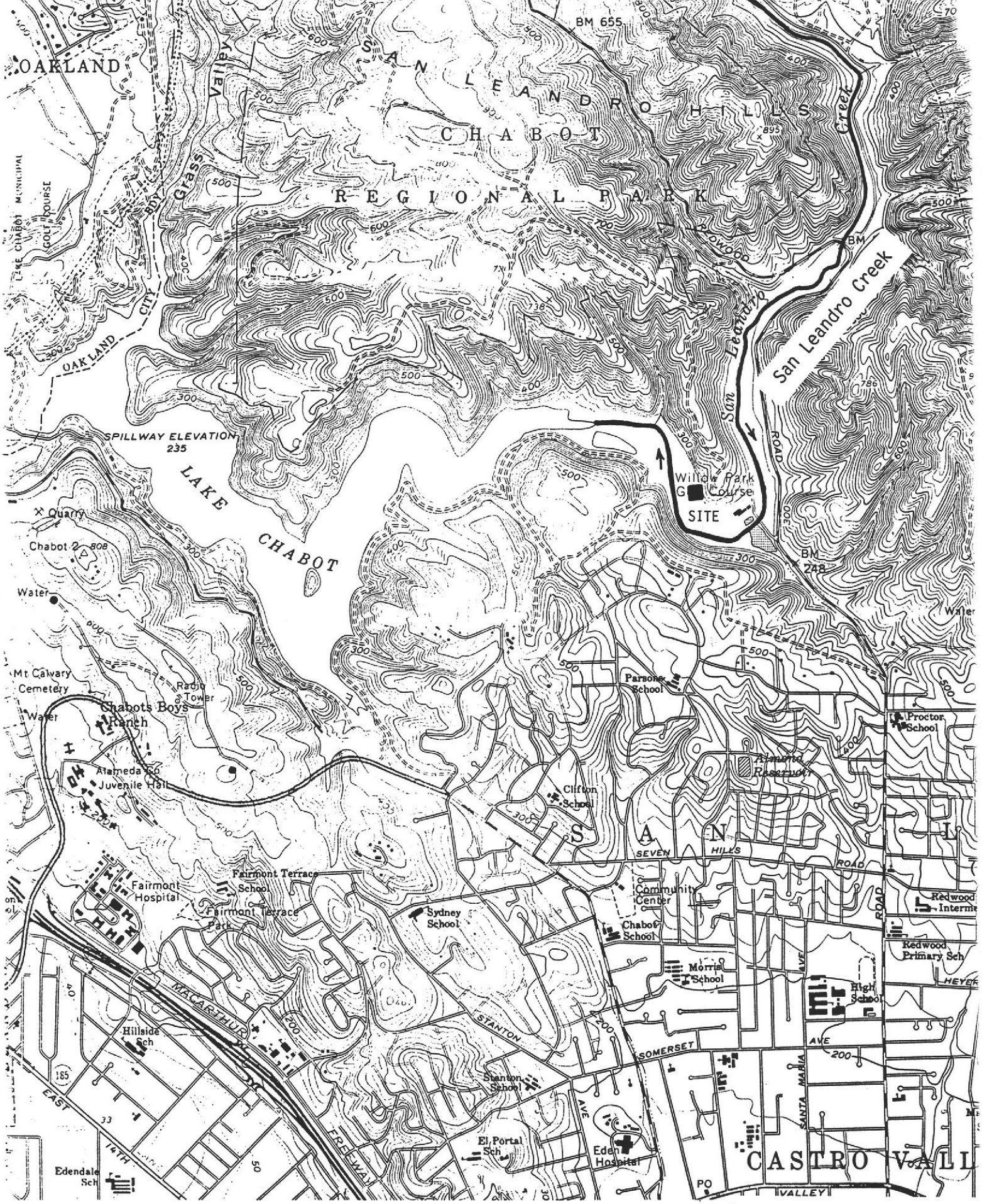
Willow Park Golf Course
17007 Redwood Road
Castro Valley, CA

I. INTRODUCTION

The site location is the maintenance area at the Willow Park Golf Course in Castro Valley, California. The location of the site is shown in Figure 1. In conjunction with this operation, the site has historically operated one underground 1,000-gallon Gasoline storage tank for a number of years.

On August 28, 1990, the underground storage tank was removed. The tank removal was conducted by K.T.W. & Associates, Fremont, California, under permit from the Alameda County Environmental Health Department and the City of Castro Valley Fire Department.

The tank closure report by K.T.W. & Associates is included in Attachment A. The closure report documents the fact that upon removal, the structural integrity of the tank was found to be sound. The tank was wrapped, and was observed to contain no corrosion holes. Very slight hydrocarbon odor was observed while removing the overburden surrounding the fill



SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

FIGURE 1.
Site Location Map.

pipe, and the overburden material contained some discoloration. The backfill material consisted of native soil with large quantities of shale.

The proposed scope of work involves the installation of one groundwater monitoring well as the result of very minor subsurface Gasoline contamination (up to 35 ppm) found at the time the one underground storage tank was removed from this site.

Following the closure of the underground storage tank, representatives from the Alameda County Health Department, the East Bay Municipal Utilities District, and the Regional Water Quality Control Board met on February 20, 1991, in order to reach an agreement as to the scope of the subsurface investigation at the site. Included in Attachment A is the letter from the law offices of Randick and O'Dea, dated February 22, 1991, which summarizes the agreed upon plan. The plan is as follows:

> Willow Park's management will engage the service of an environmental consulting firm which will determine the optimal location for the installation of one groundwater monitoring well in the assumed down-gradient location from the previous underground storage tank location. The well is to be sited where its installation will be the least impeded by the bedrock formations that underlie the area. The well will be drilled to whatever depth is necessary to reach groundwater or to a maximum of fifty (50) feet if no groundwater is encountered. Soil samples will be taken every 5 feet, if possible. If groundwater is not encountered and the soil samples are either totally devoid of petroleum hydrocarbons or contain such low levels as to make migration to groundwater implausible, it will be assumed that, due to the low level of source contamination initially discovered

and the fact that the alleged source has been removed, groundwater contamination is extremely unlikely and no further work will be required at the site by Alameda County or the Board.

If groundwater is encountered within fifty (50) feet of ground surface, the well will be developed and sampled. Regardless of the result of the initial analysis, the well will be retested in ninety (90) days.

If the results of the two groundwater analyses reveal no actionable levels of petroleum hydrocarbons and no potential source of later contamination is suggested by the soil samples taken during the well installation, no further work will be required and the well will be destroyed in the prescribed manner.

A map of the site is shown in Figure 2. This map shows the layout of the facility, along with the location of the previous tank excavation.

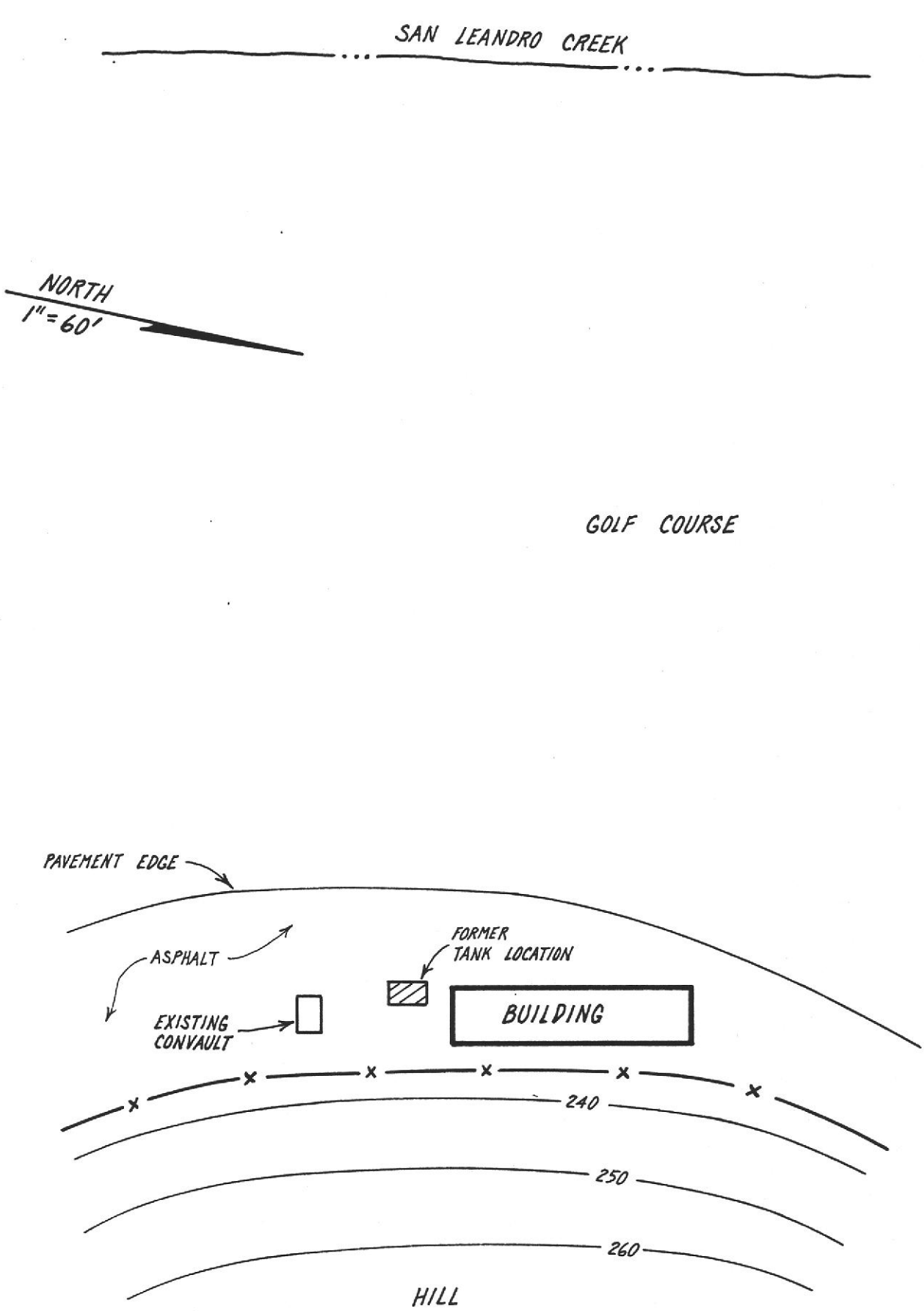


FIGURE 2.
Site Map.

II. SITE DESCRIPTION

Vicinity Description and Hydrogeologic Setting

The location of the site is shown on the site vicinity map (Figure 1). The soils directly beneath the site consist of Quaternary Alluvium deposits that have filled in a portion of a relatively steep and narrow valley located within Cretaceous Marine deposits that comprise the surrounding San Leandro Hills (Geologic Map of California, San Francisco Sheet, State of California Division of Mines and Geology, 1980). During the borings for the well installations, varying amounts of clay, sand, and gravel can be expected to be encountered. In addition, relatively shallow bedrock is likely to be encountered in the vicinity of the former underground storage tank location.

The major hydrologic feature with respect to the site appears to be San Leandro Creek. This creek cuts through the alluvial valley (golf course) to the west of the site, and provides a drainage path for various surface waters to flow into Lake Chabot to the north.

Based upon the surface topography, as well as the various hydrologic features shown on the site location map, the shallow groundwater beneath the site can be expected to flow from the location of the steep hillside behind the former underground storage tank location (area of recharge) and move toward San Leandro Creek to the west (area of discharge). It should be noted that the placement of a single monitoring well will not allow the **exact** determination of the flow direction of the shallow groundwater beneath the site. Should results of groundwater sampling indicate the need for further subsurface investigation, the addition of two additional monitoring wells would be required for proper

definition of the shallow water table gradient and shallow groundwater flow direction.

Site Description

A map of the site is shown in Figure 2. This map shows the layout of the facility, along with the location of the previous tank excavation. The ground surface in the immediate vicinity of the maintenance area has been graded flat, and is covered by asphalt pavement. The unpaved area to the west is a golf course that is covered by regularly mowed grass and various trees. The golf course appears to be irrigated on a regular basis.

III. EXTENT OF SOIL CONTAMINATION ON SITE

Based upon the information presented in Attachment A, soil samples taken from the tank pit during the underground tank removal indicated a Gasoline concentrations of up to 35 mg/kg (ppm).

The plan for determining groundwater contamination, as discussed in Section IV of this proposal, provides for the analysis of all soil and groundwater samples for 1) total petroleum hydrocarbons as Gasoline, and 2) Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX). An attempt will be made to determine the concentrations and extent of these petroleum hydrocarbons that may be present in the soil.

During the proposed drilling, soil samples for chemical analyses will be collected at 5-foot intervals until the shallow water table is encountered, or to a maximum depth of fifty (50) feet if no groundwater is encountered. Each soil sample will be collected by driving a split-barrel sampler fitted with clean brass liners. All samples will be immediately placed on ice, then transported under chain-of-custody to the laboratory upon completion of the soil boring. All soil samples will be analyzed for Total Petroleum Hydrocarbons as Gasoline and BTXE.

The plan for determining groundwater contamination, as discussed in Section IV of this proposal, provides for the analysis of all soil samples collected during the well installations for Total Petroleum Hydrocarbons as Gasoline and BTXE. An attempt will be made to determine the concentrations of any detectable hydrocarbons that may be remaining in the soil beneath the site. An attempt will be made to correlate any new soil sampling data with those from the previous soil sample analyses.

IV. PLAN FOR DETERMINING GROUNDWATER CONTAMINATION

Placement of Monitoring Well

The purpose of the proposed groundwater investigation is to install and sample one on-site monitoring well in order to define the extent of any petroleum constituents that may be present in the shallow groundwater down-gradient the former underground tank location. The proposed location of the well is shown in Figure 3.

Monitoring Well Installation

Well installation will begin as soon as possible, following approval by the appropriate regulatory agencies. The well will be installed with a truck-mounted drill rig using 8-inch hollow-stem augers. During the drilling, soil samples for chemical analyses will be collected at 5-foot intervals until the shallow water table is encountered, or to a maximum depth of fifty (50) feet if no groundwater is encountered. If no groundwater is encountered down to a depth of 50 feet, the boring will be backfilled with neat cement grout after all of the soil samples have been collected. Each soil sample will be collected by driving a split-barrel sampler fitted with clean brass liners. The ends of one brass liner from each drive will be sealed with teflon film, over which will be placed a plastic end-cap. The end-cap will then be sealed onto the brass tube with clean plastic adhesive tape. All samples will be immediately placed on dry ice, then transported under chain-of-custody to the laboratory by the end of the work day.

The well boring will extend to approximately 10 feet below

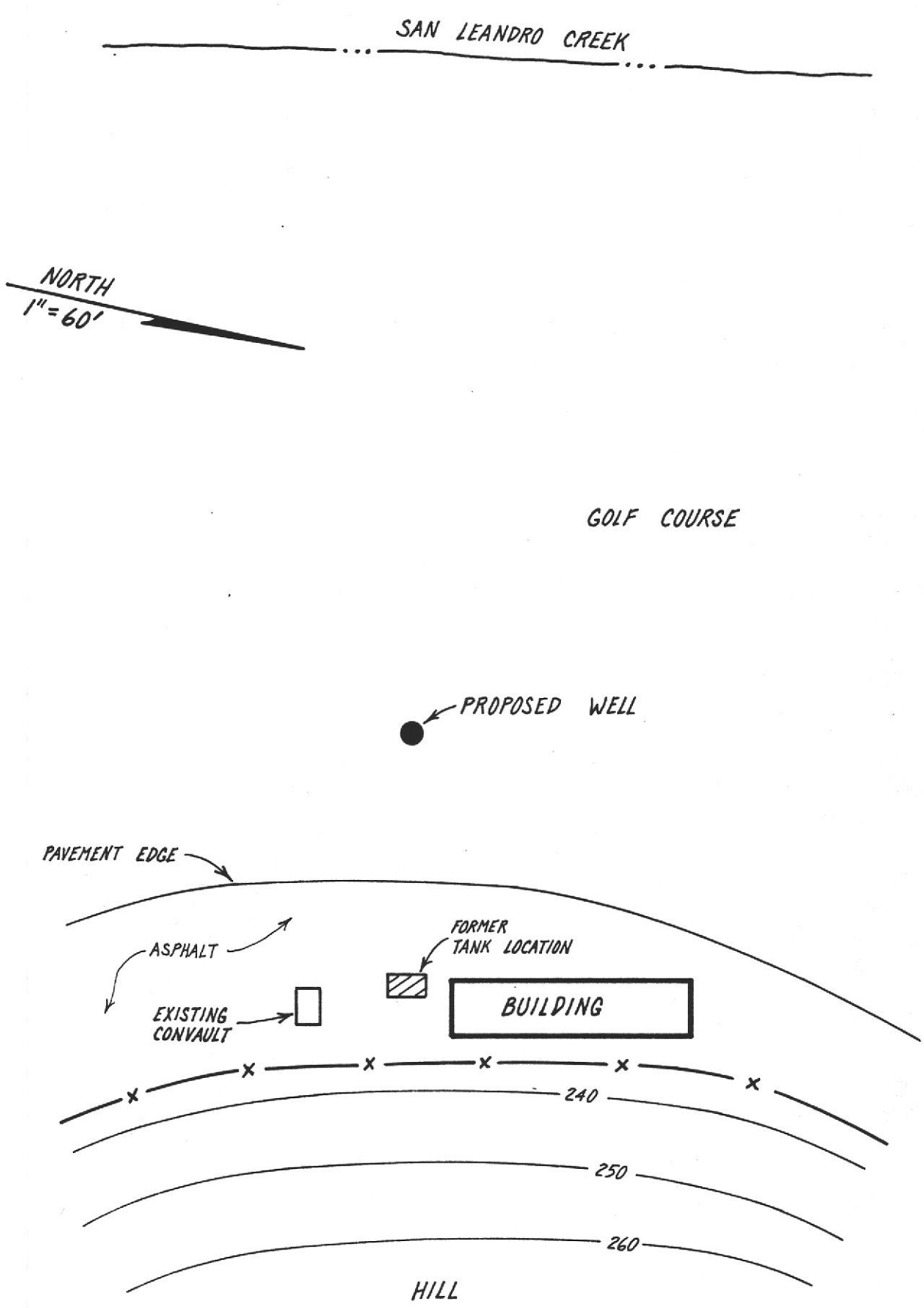


FIGURE 3. Proposed Shallow Groundwater Monitoring Well Location.

the shallow water table. The well will be cased to approximately five feet above the shallow water table with 2-inch PVC slotted screen pipe (0.02" slots). The annular space of the well will be packed to one foot above the slotted section with #3 Monterey Sand. At least one foot of wetted bentonite pellets will be placed upon the sand pack, followed by a neat cement/bentonite seal up to the ground surface. The well will be fitted with a locking steel traffic lid. The boring will be logged in the field by Gary Aguiar, Registered Civil Engineer #34262 (a statement of qualifications is included as Attachment B). A typical well construction diagram is shown in Figure 4.

Prior to the installation of the well, all drilling equipment, including augers, drill stem, and split barrel samplers, will be steam-cleaned on-site.

All drill cuttings will be stockpiled and stored on-site until the results of laboratory anaylses are obtained. Depending upon these results, the cuttings will be disposed of as either a non-hazardous waste, or else as a hazardous waste under proper manifest to an appropriate TSD facility. In the case of contaminated soil, it may be possible to remove residual Gasoline concentrations by aeration under permit from the Bay Area Air Quality Management District (BAAQMD), and thereby facilitate disposal as a non-hazardous waste.

Groundwater Sampling Plan

The development of the newly installed monitoring well will not occur for at least 24 hours after construction. It is proposed that the well will be developed by removing water with a teflon bailer until the water is relatively clear, or until the apparent turbidity of the water being removed has

TYPICAL MONITORING WELL CONSTRUCTION

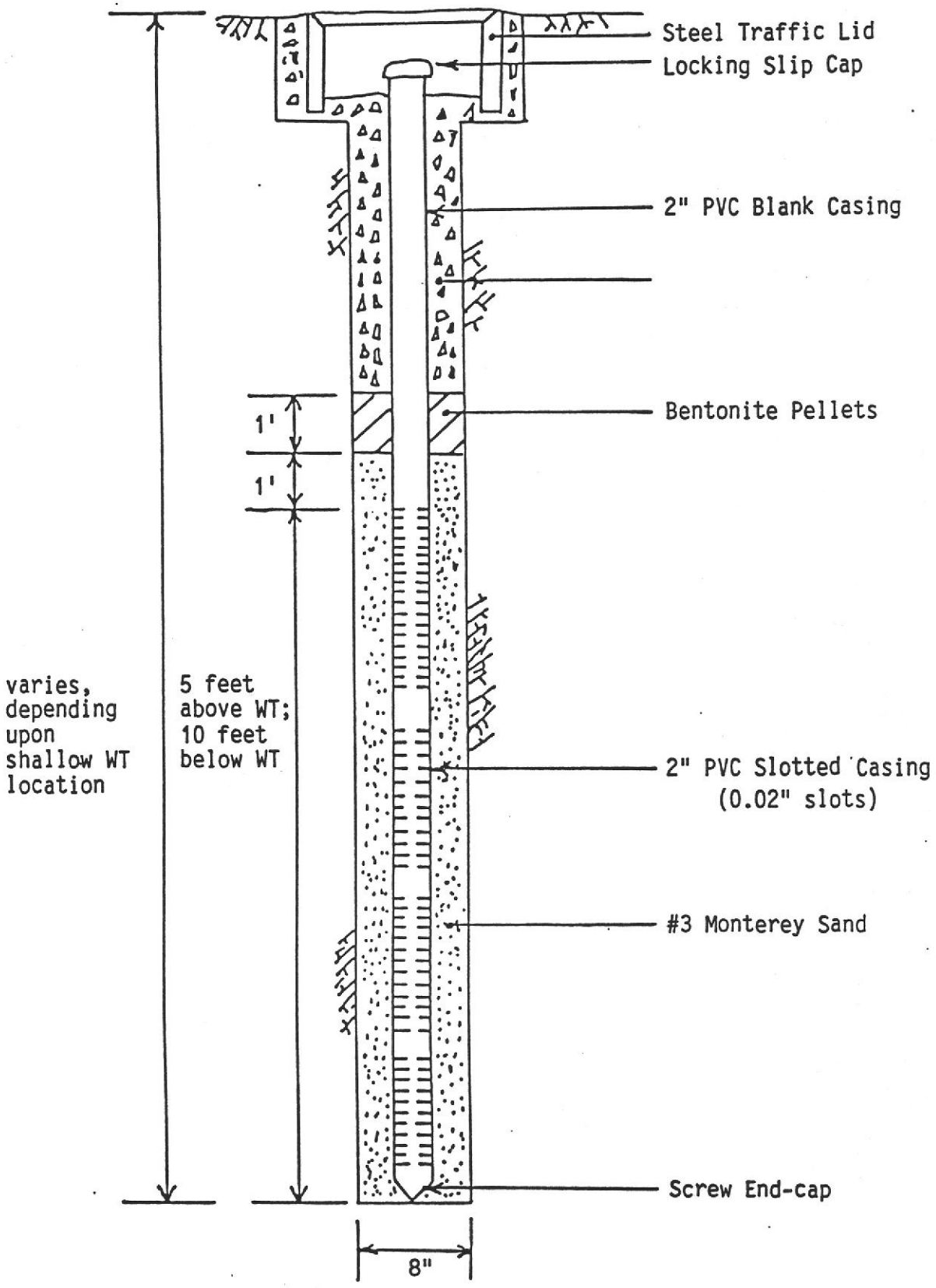


FIGURE 4.

Typical Monitoring Well Construction.

stabilized. A mechanical air-lift pump will be available in the event that bailing does not appear to be providing adequate well development.

Prior to groundwater sampling, the well will be purged by bailing 3 to 5 casing volumes of water. Field conductivity, temperature, and pH meters will be present on-site during the monitoring well sampling. As the purging process proceeds, these three parameters will be monitored. Purging must continue until readings appear to have reasonably stabilized. After the water level has attained 80% or more of the original static water level, a groundwater sample will be collected using a clean teflon bailer. The water sample will be placed inside a 40 mL VOA vial free of any headspace. The sample will immediately be placed on ice, then transported under chain-of-custody to the laboratory at the end of the work day (Chromalab Laboratory, San Ramon, CA).

At the time the monitoring well is sampled, the following information will be recorded in the field: 1) depth-to-water prior to purging, using an electrical well sounding tape, 2) identification of any floating product, sheen, or odor prior to purging, using a clear teflon bailer, 3) sample pH, 4) sample temperature, and 5) specific conductance of the sample.

All analyses will be conducted by a California State DOHS certified laboratory in accordance with EPA recommended procedures. All soil and groundwater samples will be analyzed for Total Petroleum Hydrocarbons as Gasoline and Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTXE).

All water removed from the well during development and purging was drummed and stored on-site until the results of laboratory anaylses were obtained. Depending upon these results, the water will be sewered as a non-hazardous liquid waste in accordance with local sewering agency permit

requirements, or else it will be transported as a hazardous liquid waste under proper manifest to an appropriate TSD facility for treatment and disposal.

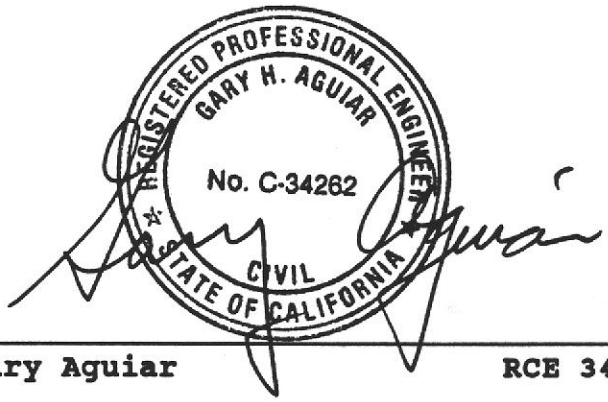
V. REPORT

A report will be written that will provide a description of all field work, present the geologic log, and present all laboratory results. The report will include, but not be limited to, the following:

1) soil and formation conditions.
2) depth to groundwater.
3) description of drilling procedures.
4) a map showing well location.
5) description of sampling procedures.
6) results of laboratory analyses.
7) analysis of results.

V. SITE SAFETY PLAN

A set of health and safety operating procedures for field investigations of underground spills of motor oil and petroleum distillate fuel is provided in Attachment C. In order to maintain a safe working environment for field personnel, a copy of these operating procedures will be kept on-site during the field operations, and will be followed in accordance with the magnitude of petroleum contamination encountered.



Gary Aguiar **RCE 34262**

ATTACHMENT A

Data Pertaining to Previous Tank Removal

LAW OFFICES
RANDICK & O'DEA
1800 HARRISON, SUITE 1771
OAKLAND, CALIFORNIA 94612

TELEPHONE
(415) 836-3555

TELECOPIER
(415) 834-4748

ROBERT A. RANDICK, JR.
BRIAN M. O'DEA
SUSAN M. TEEL
ROBERT W. DRANE
BERNARD F. ROSE, PH.D.
REBECCA T. DIXON
JULIE M. ROSE
WILLIAM J. TRINKLE

COPY

February 22, 1991

Mr. Scott Seery
ALAMEDA COUNTY HEALTH AGENCY
Division of Hazardous Materials
Department of Environmental Health
80 Swan Way, Rm. 200
Oakland, CA 94621

Mr. Steven Abbors
EAST BAY MUNICIPALITY UTILITY DISTRICT
P.O. Box 24055
Oakland, CA 94623

Mr. Ted Krebs
EAST BAY REGIONAL PARKS DISTRICT
11500 Skyline Boulevard
Oakland, CA 94619

Mr. Lester Feldman
REGIONAL WATER QUALITY CONTROL BOARD
San Francisco Bay Region
1800 Harrison, Ste. 700
Oakland, CA 94612

Mr. Joe Damas
EAST BAY MUNICIPALITY UTILITY DISTRICT
P.O. Box 24055
Oakland, CA 94623

Mr. Thomas Paulson
EAST BAY MUNICIPALITY UTILITY DISTRICT
P.O. Box 24055
Oakland, CA 94623

Re: Site Investigation Plan For Willow Park Golf Course
Location: 17007 Redwood Road, Castro Valley, California

Gentlemen:

On behalf of my clients, Willow Park Golf Course, Rene Viviani Sr. and Rene Viviani, Jr., I thank you for your attendance at the February 20, 1991, meeting at the offices of Mr. Feldman where we discussed the future site assessment requirements at the golf course in light of discovery of low level petroleum hydrocarbon contamination subsequent to the removal of an underground storage tank. I believe that the rapid evolvement of a reasonable site investigation plan at the meeting was possible only because of the understanding and commitment of all concerned.

In order to be absolutely sure that we all are in agreement as to what is to be done, I offer the following synopsis of what we agreed on for your consideration and comment:

Willow Park's management will engage the services of an environmental consulting firm which will determine the optimal location for the installation of a one (1) groundwater monitoring well in the assumed (although quite accurately, I believe) down gradient direction from the removed underground storage tank. The well will be sited where it's installation will be the least impeded by the bedrock formations that underlay the area. The well will be drilled to whatever depth is necessary to reach ground water or to a maximum of fifty (50) feet if no ground water is encountered. Soil samples will be taken every five (5) feet, if possible. If ground water is not encountered and the soil samples are either totally devoid of petroleum hydrocarbons or contain such low levels as to make migration to ground water implausible, it will be assumed that, due to the low level of source contamination initially discovered and the fact that the alleged source has been removed, ground water contamination is extremely unlikely and no further work will be required at the site by Alameda County or the Board.

If ground water is encountered within fifty (50) feet of ground surface, the well will be developed and sampled. Regardless of the result of the initial analysis, the well will be retested in ninety (90) days.

The well siting and testing protocol will be submitted to Alameda County and the Board for approval before work commences. It was agreed that there was no need for a formal target date for the submission of the work plan, but the Vivianis offered their projection that it should not take more than ninety (90) days from the date of the meeting.

If the results of the two ground water analyses reveal no actionable levels of petroleum hydrocarbon and no potential source of later contamination is suggested by the soil samples taken during the well installation, no further work will be required and the well will be destroyed in the prescribed manner.

If actionable hydrocarbon contamination is found in the ground water or petroleum hydrocarbons are found in the soil above ground water level at concentrations suggesting possible later ground water involvement, the Vivianis will meet and confer with the county and the Board to evaluate the results of the study and determine how best to proceed.

If any of the above does not comport with your understanding of the outcome of the meeting, please contact me at your earliest convenience with your thoughts and comments so that we might embark on this project with a crystal clear and uniform perception of what is to be done.

The patience, courtesy and cooperation of each of you is greatly appreciated.

Yours truly,

RANDICK & O'DEA

Bernard F. Rose by P.A.

Bernard F. Rose
by P.A. Karella, Secretary

BFR/pak
Dictated but not read.

WILLOW PARK GOLF COURSE

17007 Redwood Road
Castro Valley, California

Closure Report

K T W & ASSOCIATES

43289 Osgood Road, Fremont, Calif. 94539
(415) 623-0480
Cal. State Cont. Lic. # 572427

Mr. Renee Viviani
17007 Redwood Road
Castro Valley, California 94546

Mr. Viviani:

K.T.W. & Associates is pleased to submit this report describing closure activities associated with removal of one 1000 gallon underground fuel tank located in Castro Valley, California. This report provides a description of site activities and observations, the condition of excavated tanks, the condition of tank backfill and other subsurface materials, sampling procedures and locations, laboratory analytical procedures and certified analytical results, chain of custody documentation, and hazardous waste manifest.

Site Description

The site is located at 17007 Redwood Road, Castro Valley, California. A site location map is presented in Plate 1. One 1000 gallon underground gasoline tank was formerly located at the subject site. A site map showing the location of the site structure, former underground tank and dispensing island is presented in Plate 2.

Closure Plan and Permitting

A closure plan and permit application for removal of underground tanks was completed and submitted to the Alameda County Health Care Services Agency (ACHCSA), and the City of Castro Valley Fire Department (CVFD). Closure activities proceeded under ACHCSA permit No.U5689888.

Underground Tank Closure

Tank removal activities occurred on August 28, 1990. Inspector Scott Seery of the ACHCSA was present to observe the tank removal and sampling activities. Construction services associated with closure were performed by K.T.W. & Associates. A K.T.W. & Associates California Registered Geologist provided environmental sampling and documentation services.

Closure activities were documented in the Hazardous Material Inspection Form prepared by Scott Seery. Upon removal the structural integrity of the one 500 gallon tank was observed to be sound. The tank was wrapped, and was observed to contain no corrosion holes. The tank was removed and transported from the site by a permitted hazardous waste transporter under hazardous waste manifest. Copies of the hazardous waste manifest are presented in Attachment A.

General Observations, Underground Tank Closure

The tank, which had been used to store gasoline prior to it's removal, contained no trim other than a riser assembly for filling, a product line and a vent line.

The condition of the lines prior to removal were sound, however, they were unwrapped. All the fittings were properly installed. The riser assemblies that constituted the fill pipe for the tank was sound and free of defects, however, some of the wrap at the fill end had deteriorated. Very slight hydrocarbon odor was observed while removing the overburden surrounding the fill, and the overburden material contained some discoloration. The backfill material consisted of native soil with large quantities of shale.

Soil Sampling

Two (2) soil samples were collected from the gasoline tank excavation below the tank and one (1) composite soil sample was collected from the stockpiled material. Soil sampling of the tank occurred on August 28, 1990.

These samples were obtained by excavating to the native soil/interface and driving a brass tube into the native soil; some difficulty in obtaining samples was due to the high percentage of shale in the native soil.

Samples were collected in brass tubes, sealed in teflon and plastic caps, and promptly stored in a cooler. Following completion of field work, samples were submitted to Anametrix Laboratory, San Jose, CA (DOHS #151) certified analytical laboratory for analyses under appropriate chain of custody protocol.

Two (2) soil samples were taken from beneath the former tank (TX1-S1) and (TX1-S2). Their locations are noted in Plate 2. The samples were taken from the fill end (S-2) and the vent end (S-1) of the excavation. The results of that analysis is shown in attachment B.

Certified Analytical Results

Samples collected for minimum verification analyses (MVA) were analyzed in accordance with appropriate regulatory guidelines contained within Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks (RWQCB, 1988). Copies of soil analytical results are presented in Attachment B.

MVA for Underground Fuel Tank Excavation

The soil samples collected from the fill-natural materials interface below the fuel tank contained concentrations of the constituents sought 35 parts per million (ppm), total petroleum hydrocarbons as gasoline (TPH-G) (S-2) and not detected (N.D.) (S-1).

Regulatory Guidelines

The RWQCB - San Francisco Bay Region has established a level of 100 ppm TPH concentrations in soil as a general decision value for requiring further definition of site soil and groundwater contamination where shallow groundwater conditions are known to exist.

The origin of the 100 ppm level was to "develop a method to prioritize the case load and indicate whether a significant volume of fuel had been released or discharged" (RWQCB, June, 1988). In the interest of prudence and caution, the stockpiled material should not be re-introduced as fill, but should be disposed of at a Class III Landfill.

Copies of this report should be submitted to:

Regional Water Quality Control Board
1111 Jackson Street, Rm. 6000
Oakland, CA 94607
Attn: Dyan Whyte

Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, CA 94621

Additional copies of this report have been provided for the purpose of regulatory submittal.

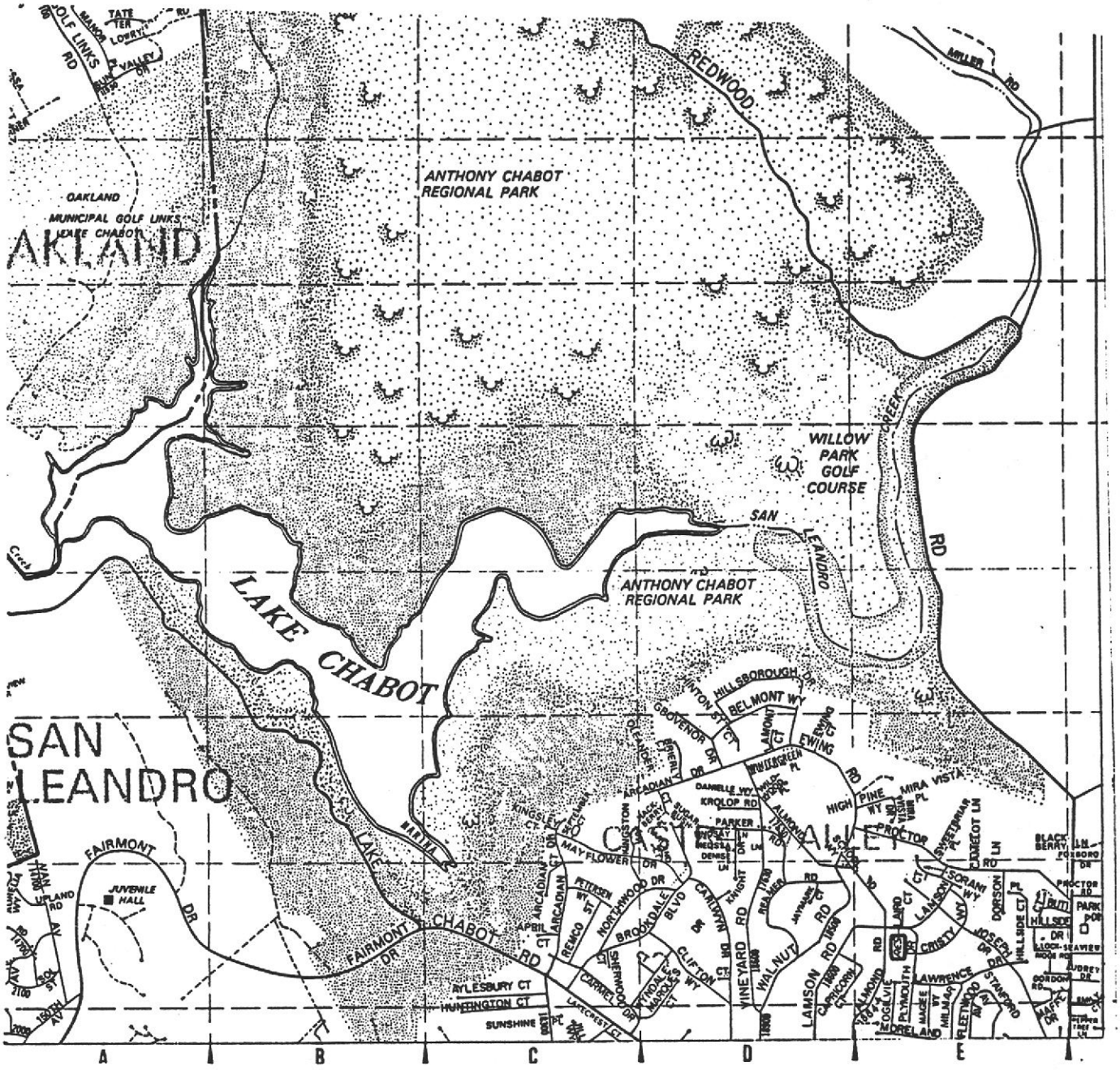
Should you have any questions or comments regarding the evaluations presented in this report, please call.

Respectfully,

Thomas M. Gregory
President

Kevin M. Krause
Vice President
KK/emm

Attachments



SCALE	NTS
DATE	9/25/90
DRWG. BY	CLS

KTN & ASSOCIATES

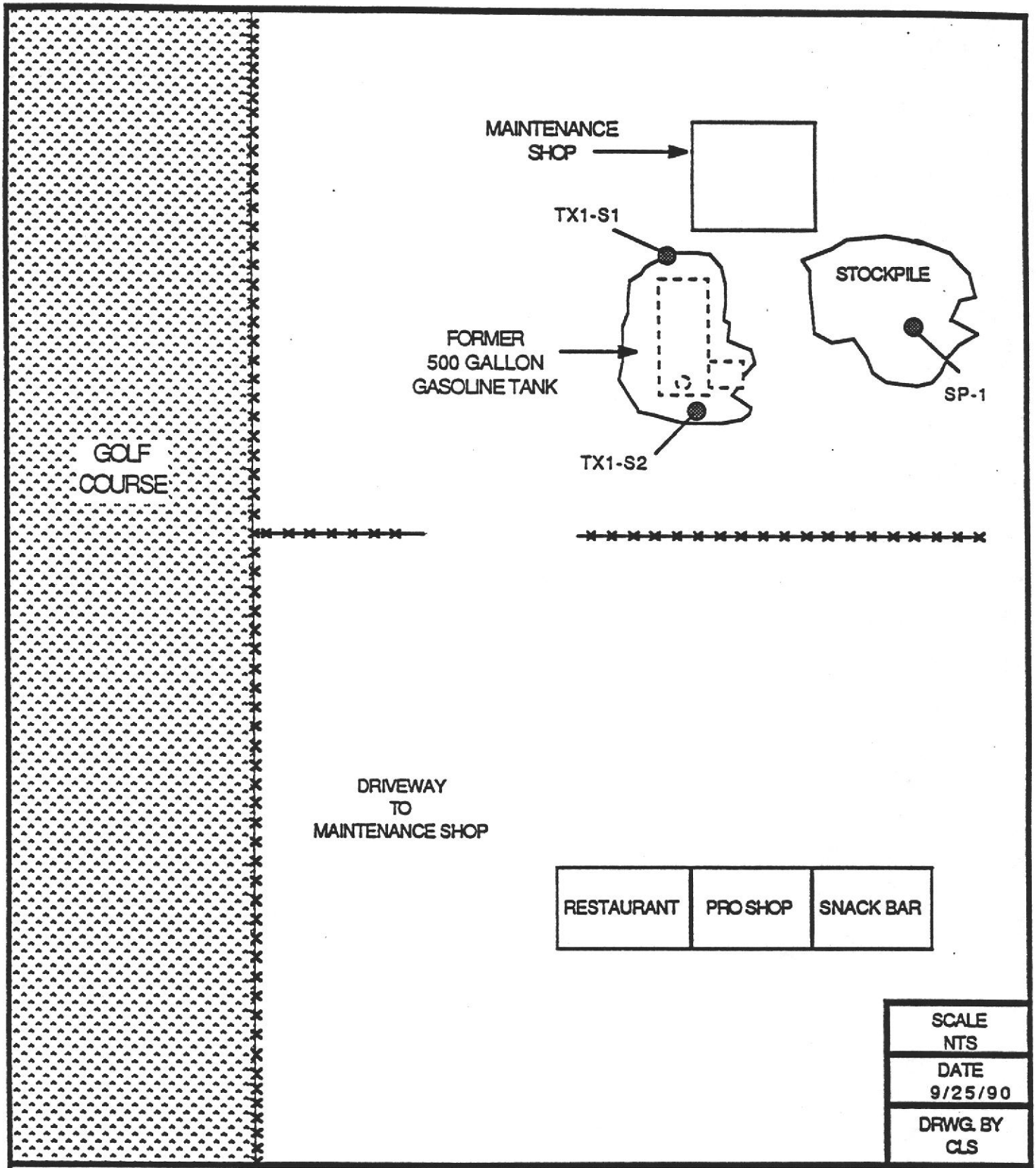
PROJECT:

SITE LOCATION

Willow Park Golf Course
17007 Redwood Road
Castro Valley, California

PLATE

1



SCALE	NTS
DATE	9/25/90
DRWG. BY	CLS

KTN & ASSOCIATES

PROJECT:

GENERALIZED SITE PLAN

Willow Park Golf Course
17007 Redwood Road
Castro Valley, California

PLATE

2

ATTACHMENT A

Hazardous Waste Manifests

State of California—Health and Welfare Agency
Form Approved OMB No. 2050—0039 (Expires 9-30-91)
Please print or type. (Form designed for use on elite (12-pitch typewriter).

Department of Health Services
Toxic Substances Control Division
Sacramento, California

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. CAL000060339 — Manifest Document No. 88E3793 — 2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address: Willow Park Golf Course, 12207 Redwood Rd Castro Valley CA.

4. Generator's Phone (46) 537-9999

A. State Manifest Document Number: 88E3793

B. State Generator's ID:

5. Transporter 1 Company Name: Erickson Trucking, Inc. — 6. US EPA ID Number: CAD009466392 — C. State Transporter's ID: 106347 — D. Transporter's Phone: (415) 235-1393

7. Transporter 2 Company Name — 8. US EPA ID Number — E. State Transporter's ID: — F. Transporter's Phone:

9. Designated Facility Name and Site Address: Erickson, Inc., 255 Parr Blvd., Richmond, CA 94801 — 10. US EPA ID Number: CAD009466392 — G. State Facility's ID: — H. Facility's Phone: (415) 235-1393

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	J. Waste No.
a. Waste empty storage tank Non-RCRA Hazardous Waste Solid	001	TP	490	P	State 512 / EPA/Other
b.					State / EPA/Other
c.					State / EPA/Other
d.					State / EPA/Other

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Keep away from sources of ignition. Always wear hardhats when working around U.S.T.'s

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR — Printed/Typed Name: A D Viviani — Signature — Month Day Year: 10 9 90

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Maurice Hagley — Signature — Month Day Year: 10 9 90

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name — Signature — Month Day Year

IN CASE OF AN EMERGENCY OR SPILL, CALL THE NATIONAL RESPONSE CENTER 1-800-424-8802; WITHIN CALIFORNIA CALL 1-800-852-7550

DHS 8022 A (1/88)
EPA 8700—22
(Rev. 9-88) Previous editions are obsolete.

Do Not Write Below This Line

YELLOW: GENERATOR RETAINS

white -env.health
yellow -facility
pink -files

ALAMEDA COUNTY, DEPARTMENT OF ENVIRONMENTAL HEALTH

80 Swan Way, #200
Oakland, CA 94621
(415) 271-4320

Hazardous Materials Inspection Form

II, III

Site ID # ____ Site Name Willow Park G.C. Today's Date 8/28/90

Site Address 17007 Redwood Rd.

City Castro Valley Zip 94546 Phone ____

____ MAX AMT stored > 500 lbs, 55 gal., 200 cft.?

Inspection Categories:
- ____ I. Haz. Mat/Waste GENERATOR/TRANSPORTER
- ____ II. Business Plans, Acute Hazardous Materials
- X III. Underground Tanks

• Calif. Administration Code (CAC) or the Health & Safety Code (HS&C)

II.A BUSINESS PLANS (Title 19)

___	1. Immediate Reporting	2703
___	2. Bus. Plan Stds.	25503(b)
___	3. RR Cars > 30 days	25503.7
___	4. Inventory Information	25504(a)
___	5. Inventory Complete	2730
___	6. Emergency Response	25504(b)
___	7. Training	25504(c)
___	8. Deficiency	25505(a)
___	9. Modification	25505(b)

II.B ACUTELY HAZ. MATLS

___	10. Registration Form Filed	25533(a)
___	11. Form Complete	25533(b)
___	12. RMPP Contents	25534(c)
___	13. Implement Sch. Req'd? (Y/N)	___
___	14. OffSite Conseq. Assess.	25524(c)
___	15. Probable Risk Assessment	25534(d)
___	16. Persons Responsible	25534(g)
___	17. Certification	25534(i)
___	18. Exemption Request? (Y/N)	25536(b)
___	19. Trade Secret Requested?	25538

III. UNDERGROUND TANKS (Title 23)

General

___	1. Permit Application	25284 (H&S)
___	2. Pipeline Leak Detection	25292 (H&S)
___	3. Records Maintenance	2712
___	4. Release Report	2651
___	5. Closure Plans	2670

Monitoring for Existing Tanks

___ 6. Method
1) Monthly Test
2) Daily Vadose-
Semi-annual gndwater
One time soils
3) Daily Vadose
One time soils
Annual tank test
4) Monthly Gndwater
One time soils
5) Daily Inventory
Annual tank testing
Cont pipe leak det
Vadose/gndwater mon.
6) Daily Inventory
Annual tank testing
Cont pipe leak det
7) Weekly Tank Gauge
Annual tank tstng
8) Annual Tank Testing
Daily Inventory
9) Other ____

___	7. Precis Tank Test Date: ____	2643
___	8. Inventory Rec.	2644
___	9. Soil Testing.	2646
___	10. Ground Water.	2647

New Tanks

___	11. Monitor Plan	2632
___	12. Access. Secure	2634
___	13. Plans Submit Date: ____	2711
___	14. As Built Date: ____	2635

Rev 6/88

Comments: Arrived 1:00 PM
On-site to witness closure of one (1) UST. David Glick of David C. Glick & Assoc (geologist) and Tom Gregory of KTW & Assoc on site coordinating activities. Tank was uncovered and overburden stockpiled on Visqueen upon my arrival. Once Bob Bohmen of CVFD arrived and verified O2/LEL, the tank was pulled. The tank was in excellent shape, still retaining most of its former tar paper wrapping. No holes were evident. The wrap at the fill end of the tank was partially dissolved in some areas. The soil beneath the tank was discolored, with a slight odor of gasoline evident coming from the hole.
Samples were collected from either end of the tank pit. Native material was composed of fractured shale. The sample collected from the fill end was very difficult to collect; native material was all rock. Therefore, material just above the bedrock interface was collected for analyses.

II, III

Contact: Tom Gregory
Title: Project Manager
Signature: [signature]

Inspector: S. Seery
Signature: [signature]

ATTACHMENT B

Certified Analytical Reports

ANAMETRIX INC
Environmental & Analytical Chemistry
1961 Concourse Drive, Suite E, San Jose, CA 95131
(408) 432-8192 • Fax (408) 432-8198

REPORT

MR. KEVIN KRAUSE
KTW & ASSOCIATES
43289 OSGOOD ROAD
FREMONT, CA 94539

Workorder # : 9008295
Date Received : 08/28/90
Project ID : AC26E5
Purchase Order: N/A

The following samples were received at Anametrix, Inc. for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9008295- 1	TX1-S1
9008295- 2	TX1-S2
9008295- 3	SP-1-S1

This report is paginated for your convenience and ease of review. It contains 3 pages excluding the cover letter. The report is organized into sections. Each section contains all analytical results and quality assurance data related to a specific group or section within Anametrix. The Report Summary that precedes each section will help you determine which group at Anametrix generated the data. The Report Summary will contain the signatures of the department supervisor and a chemist, both of whom reviewed the analytical data. Please refer all questions to the department supervisor that signed the form.

If you have any further questions or comments on this report, please give us a call as soon as possible. Thank you for using Anametrix.

Frank Fihon for

Burt Sutherland
Laboratory Director

09-12-90
Date

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

MR. KEVIN KRAUSE
KTW & ASSOCIATES
43289 OSGOOD ROAD
FREMONT, CA 94539

Workorder # : 9008295
Date Received : 08/28/90
Project ID : AC26E5
Purchase Order: N/A
Department : GC
Sub-Department: TPH

SAMPLE INFORMATION:

ANAMETRIX SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9008295- 1	TX1-S1	SOIL	08/28/90	TPHg/BTEX
9008295- 2	TX1-S2	SOIL	08/28/90	TPHg/BTEX
9008295- 3	SP-1-S1	SOIL	08/28/90	TPHg/BTEX

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

MR. KEVIN KRAUSE
KTW & ASSOCIATES
43289 OSGOOD ROAD
FREMONT, CA 94539

Workorder # : 9008295
Date Received : 08/28/90
Project ID : AC26E5
Purchase Order: N/A
Department : GC
Sub-Department: TPH

QA/QC SUMMARY :

- No QA/QC problems encountered for samples.

Cheryl Balmer 9/11/90
Department Supervisor Date

Scott Voyt 9/11/90
Chemist Date

ANALYSIS DATA SHEET - TOTAL PETROLEUM HYDROCARBONS
(GASOLINE WITH BTEX)
ANAMETRIX, INC. - (408) 432-8192

Anametrix W.O.#: 9008295
Matrix : SOIL
Date Sampled : 08/28/90

Project Number : AC26E5
Date Released : 09/11/90

COMPOUNDS	Reporting Limit (mg/Kg)	Sample I.D.# TX1-S1 -01	Sample I.D.# TX1-S2 -02	Sample I.D.# SP-1-S1 -03	Sample I.D.# 04B0910A BLANK
Benzene	0.005	ND	ND	0.22	ND
Toluene	0.005	ND	ND	0.43	ND
Ethylbenzene	0.005	ND	0.14	0.45	ND
Total Xylenes	0.005	ND	2.2	1.3	ND
TPH as Gasoline	0.5	ND	35	25	ND
% Surrogate Rec.		60%	111%	112%	89%
Instrument #		HP4	HP4	HP4	HP4
Date Analyzed		09/10/90	09/10/90	09/10/90	09/10/90
RLMF		1	25	5	1

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.
RLMF - Reporting Limit Multiplication Factor.

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

Analyst — Date: 12 Sept 90

Supervisor: Cheryl Balmer — Date

(2)

CLIENT CHAIN-OF-CUSTODY RECORD

PROJECT NUMBER: AC2GE5

NAME: KIW & ASSOCIATES Willow Park Golf Course

Send Report Attention of: KEVIN KRAUSE

Report Due: / /

Verbal Due: / /

	Sample Number	Date	Time	Comp	Grab	Station Location	Number of Cntnrs	Type of Containers	Type of Analysis: TPH G / BTXE	Condition of Samples	Initial
01	TX1 - S1	8/28/90	1354	✓		VENT END	1 EA	BRASS	✓		
02	TX1 - S2	8/28/90	1402	✓		PRODUCT FILL END	1 EA	BRASS	✓		
03	SP-1 - S1	8/28/90	1438	✓		STOCKPILE	1 EA	BRASS	✓		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
[signature]	8/28/90 1440	[signature]	08/29/90 16:10
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time

Remarks: STANDARD TURNAROUND

COMPANY: KIW & ASSOCIATES
ADDRESS: 43284 OSGOOD ROAD FREMONT CA
PHONE : 415 623 0480 FAX : 415 623 0482

2066

ATTACHMENT B

STATEMENT OF QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

Gary Aguiar:

- B.S., Chemical Engineering, University of California, Berkeley, 1977
  M.S., Sanitary Engineering, University of California, Berkeley, 1981

- Registered Civil Engineer, California, C.E. 34262
  Registered Civil Engineer, Oregon, C.E. 13353
  Registered Civil Engineer, Alaska, C.E. 7769

- Over the past ten years, has participated in all aspects of hydrogeological investigations, groundwater pollution investigations, water resource studies, and hazardous waste management.

- His extensive teaching experience includes the following:

UNIVERSITY OF CALIFORNIA

1/82 - present **EXTENSION, Berkeley, Ca.**

Instructor: Develop and teach courses on the principles of groundwater hydrology, groundwater pollution, and hazardous waste management.

Advisory Committe member: Member of advisory committee for U.C. Berkeley Hazardous Materials Management Certificate Program.

CALIFORNIA STATE UNIVERSITY CONSORTIUM, Hayward, Ca.

9/83 - 12/83

Assistant Professor: Developed and taught a course on the engineering aspects of environmental planning.

RESOURCE SEMINARS, Berkeley, Ca.

1/81 - 9/83

Lecturer: Lectured on the principles of groundwater hydrology at seminars given in various U.S. cities.

- Other Qualifications:

Water Treatment Plant Operator Grade III Certificate, California State Department of Health.

Basic Qualified Earth Shorer Certificate, American Society of Safety Engineers.

Radiation Safety / Nuclear Soils Gauge Operator Certificate, Campbell Pacific Nuclear Corp.

- Professional Affiliations:

Member, American Chemical Society
Member, American Water Works Association
Member, National Water Well Association

Gary Aguiar began a private consulting practice in 1984. The first project was the installation of three deep monitoring wells within the drinking water aquifer beneath McKesson Chemical Company's Union City chemical packaging facility. This project involved casing a highly contaminated upper zone prior to drilling through the Newark aquitard. After supervising the drilling operations, properly disposing of the drilling spoils, and sampling the wells, a detailed report was prepared that presented an analysis of the data, as well as an assessment of the impact that shallow groundwater contamination has had upon the quality of the drinking water in the area.

The following is a list of typical projects for which Gary Aguiar has provided technical services:

- Assessment of local hydrogeology around solvent recycling sites located in Denver, Co. and Azusa, Ca., prior to purchase by a national chemical recycler.

- Consultation to a local geologic firm concerning the design of a dewatering and contaminant removal system in tight clays at an electronics factory site located in Santa Clara County.

- Design of a pump test to determine aquifer characteristics prior to design of an extraction system for the removal of gasoline from an underground tank site in Morgan Hill, Ca.

- Hydrogeologic analysis and design of a recovery system for the remediation of gasoline contamination that threatened a drinking water supply in Woodside, Ca.

- Data analysis and professional representation in negotiations with the Regional Water Quality Control Board for a commercial property owner in Santa Clara County. Solvent contamination had been discovered beneath the site.

- In association with a local hydrogeologic consulting firm, a site assessment of a laser manufacturing plant in Palo Alto, Ca. This project involved assessing the local hydrogeology, sampling surface and groudwaters, formulating a risk assessment in terms of contaminants that may enter the groundwater due to factory processes, and removing hazardous wastes that have been left from past operations.

- Consultation to a local geologic firm concerning the results of soil and groundwater sampling at a large oil refinery in Hanford, Ca. This project has involved assessing the local hydrogeology, relating the presence of subsurface contaminants to specific above-ground refinery processes, and recommending specific chemical analyses to be performed. An assessment of the impact of subsurface contamination was made in terms of the potential for deep migration. In addition, an assessment of the legal impact was made in terms of applicable hazardous waste laws (Title 22 and 40CFR).

- Analysis of hydrogeologic/groundwater quality data for a chemical facility in Freeport, Grand Bahama Island. This project currently involves an assessment of potential contaminant migration, as well as remedial action plan development. The assessment is complicated by karst geology, a strong tidal influence and the occurence of groundwater in a freshwater lens.

- Project management of a soil and groundwater study in and around the chrome plating shop at Mare Island Naval Base, Vallejo, CA. This project has included the installation of a number of monitoring wells, collection of soil samples, and determining the influence of nearby tidal action. The study is complicated by hard-rock geology, a significant tidal influence, the occurence of groundwater in confined gravel lenses, and the heterogeneity of soils within fill

areas.

- Analysis of hydrogeologic/groundwater quality data for production facilities in Clarecastle, Ireland, and in Cuernavaca, Mexico. The work is part of an in-house program of environmental auditing and regulatory compliance being conducted by a large pharmaceuticals company at all of their facilities.

- Implementation of groundwater contamination remediation program at a service station in Prunedale, CA. This project has involved the installation of 16 monitoring wells, the design of a free product extraction and recovery system, design of an air-stripping treatment system, and design of an injection groundwater injection system for treated water.

By providing education for the professional community, Gary Aguiar has maintained close contact with the University of California. Through this contact, experts in particular fields can be easily networked, while maintaining low operating overhead costs. In addition, the latest technologies in sampling and contamination remediation are continually evaluated and made available to the client.

STATEMENT OF QUALIFICATIONS

Bruce Hageman:

- B.A., Business Administration,
  San Jose State College, 1954

- Thirty five years experience in the petroleum industry, including five years as Vice President of Marketing and Operations, Mohawk Petroleum Corporation and Getty Refining and Marketing Company.

- Principle Responsibilities: design and construction of retail and wholesale marketing facilities (service stations, bulk fuel distribution facilities, etc.), management of all company operated service stations in the states of California, Oregon and Nevada.

- Extensive experience in corporate financial planning and budgeting policies.

- Bruce Hageman has testified as a witness before many local and state governmental committees during the formulation of air quality legislation. Also served on the ad hoc committee for the public right-to-know legislation for the city and county of San Francisco.

Bruce Hageman founded Hageman-Schank, Inc., an environmental services company in 1985. The company has been involved in many areas of the environmental industry. The following is a list of typical projects:

- Precision testing of standby fuel tanks for American Telephone and Telegraph in their remote microwave facilities in Northern California. In addition, tank removals and the installation of new above-ground storage tanks at their satellite facility in Livermore.

- Tank removals and new installations for Intel Corporation's standby fuel storage. This project also included the installation of vadose zone monitoring equipment.

- The removal of thirty five underground storage tanks at the United States Navy Postgraduate School in Monterey, California. This project included the removal of one 50,000 gallon underground jet fuel storage tank, as well as all necessary soil sampling, laboratory analyses, and reporting.

- Tank removals and tank abandonments for Emporium-Capwell at all Emporium stores in the San Francisco Bay Area.

- Groundwater monitoring well installation at the City of South San Francisco maintenance yard.

- Underground storage tank removals, groundwater monitoring well installations, field supervision, and project management for the John Berry Organization/Mariner Warehouse in Alameda, California. This project involved the excavation and remediation of approximately 2500 cubic yards of soil that was found to be contaminated by oil and solvents. Prepared reports and recommendations for remediation, to

be submitted to the Alameda County Health Department for approval.

- Installation of 16 shallow groundwater monitoring wells at a gasoline service station in Prunedale, California. This project, undertaken for Sturdy Oil Company, involved the design and installation of an air stripping system to treat and remediate shallow groundwater that had become impacted as a result of gasoline-contaminated soil. This project also included application and approval for an NPDES permit, issued by the Regional Water Quality Control Board.

The purpose of Hageman-Schank, Inc. is to provide its clients with the expertise to solve a wide variety of environmental problems in a cost-effective manner. Particular emphasis is placed upon underground storage tanks, soil and groundwater investigations, and remediation of soil and groundwater contamination.

STATEMENT OF QUALIFICATIONS

Keith Jay:

- B.A., Biochemistry,
  University of Wisconsin, Madison, 1977.

- Twelve years experience in the field of applied chemistry, including: chemical process design, analytical laboratory techniques, chemical process control, and environmental chemistry.

- His extensive past chemistry experience includes the following:

  1989 - 1990

  Environmental Chemist: Field sampling supervisor, project QA/QC, sample collection, hydrocarbon vapor monitoring, supervisor of all monitoring well development and sampling activities, and liaison with analytical laboratories, for an environmental services company located in San Francisco, CA.

1988 - 1989

Environmental Chemist: Provide EPA compliance assistance for the mining industry while working for Nevada Environmental Consultants, Inc.

1985 - 1988

Plant Manager: Managed precious metals recovery plant employing chemical extraction techniques with full laboratory capabilities in trace metal detection.

1979 - 1985

Chemist: Laboratory analysis and process control for a metallurgical plant conducting chemical extraction of precious metals.

In April 1990 Keith Jay joined Hageman-Aguiar, Inc., as an environmental chemist. The following is a list of typical environmental projects that Keith Jay has participated in:

- Technical support for the implementation of groundwater contamination remediation program conducted by Hageman-Aguiar, Inc., at a gasoline service station in Prunedale, CA. Field sampling, water treatment system monitoring, project QA/QC. This project has involved the installation of 22 monitoring wells, the operation of a free product extraction and recovery system, operation and monitoring of an air-stripping treatment system, and the operation of an injection system for treated water.

- Field supervision, sample collection, and hydrocarbon vapor monitoring at various underground storage tank removals and associated contaminated soil excavations conducted by Hageman-Aguiar, Inc.

- Field supervision and sample QA/QC during various monitoring well installations conducted by Hageman-Aguiar, Inc. In addition, Keith Jay is the supervisor of all monitoring well development and sampling activities, with specific attention to such items as sample QA/QC, sample preservation, measurement of field parameters, and liaison with the analytical laboratories.

- Carry out investigations at various regulatory agencies, as well as conduct site inspections and neighboring property reconnaissance, in conjunction with various Environmental Site Assessments conducted by Hageman-Aguiar, Inc.

ATTACHMENT C

SITE SAFETY PLAN

HEALTH AND SAFETY PROCEDURES
FOR
FIELD INVESTIGATION OF UNDERGROUND SPILLS OF
MOTOR OIL AND PETROLEUM DISTILLATE FUEL

1.0 PURPOSE

This operating procedure established minimum procedures for protecting personnel against the hazardous properties of motor oil and petroleum distillate fuels during the performance of field investigations of known and suspected underground releases of such materials. The procedure was developed to enable health and safety personnel and project managers to quickly prepare and issue site safety plans for investigations of such releases.

2.0 APPLICABILITY

This procedure is applicable to field investigations of underground releases of the substances listed below and involving one or more of the activities listed below.

Substances

Motor oil (used and unused)
Leaded and unleaded gasoline
No. 1 Fuel oil (kerosene, JP-1)
No. 1-D Fuel oil (light diesel)
No. 2 Fuel oil (home heating oil)
No. 2-D Fuel oil (medium diesel)
No. 4 Fuel oil (residual fuel oil)
No. 5 Fuel oil (residual fuel oil)
No. 6 Fuel oil (Bunker C fuel oil)
JP-3, 4 & 5 (jet fuels)
Gasahol

Activities

Collection of samples of subsurface soil with aid of truck-mounted drill rig, hand-held power auger or hand auger.

Construction, completion and testing of groundwater monitoring wells.

Collection of groundwater samples from new and existing wells.

Observing removal of underground fuel pipes and storage tanks.

This procedure must not be used for confined space entry (including trench entry) or for installing or operating pilot and full-scale fuel recovery systems.

No safety plans needed for non-intrusive geophysical surveys, reconnaissance surveys and collection of surface soil, surface water and biota.

3.0 RESPONSIBILITY AND AUTHORITY

Personnel responsible for project safety are the Business Unit Health and Safety Officer (HSO), the Project Manager (PM) and the Site Safety Officer (SSO).

The HSO is responsible for reviewing and approving site safety plans and any addenda and for advising both PM and SSO on health and safety matters. The HSO has the authority to audit compliance with the provisions of site safety plans. suspend work or modify work practices for safety reasons, and to dismiss from the site any individual whose conduct on site endangers the health and safety of others.

The PM is responsible for having site safety plans prepared and distributing them to all field personnel and to an authorized representative of each firm contracted to assist with on-site work. The PM is also responsible for ensuring that the provisions of safety plans and their addenda are carried out.

The SSO is responsible for assisting the PM with on site implementation of site safety plans. Responsibilities include:

1. Maintaining safety equipment supplies.

2. Performing or supervising air quality measurements.

3. Directing decontamination operations and emergency response operations.

4. Setting up work zone markers and signs if such zones are specified in the site safety plan.

5. Reporting all accidents, incidents and infractions of safety rules and requirements.

6. Directing other personnel to wear protective equipment when use conditions described in Section 5.0 are met.

The SSO may suspend work anytime he/she determines that the provisions of the site safety plan are inadequate to ensure worker safety and inform the PM and HSO of individuals who on-site behavior jeopardizes their health and safety or the health and safety of others.

4.0 HAZARD EVALUATION

Motor oil and petroleum distillate fuels are mixtures of aliphatic and aromatic hydrocarbons. The predominant classes of compounds in motor oil, gasoline, kerosene and jet fuels are the paraffins (e.g., benzene, toluene). Gasoline contains about 80 percent paraffins, 6 percent naphthenes, and 14 percent aromatic. Kerosene and jet fuels contain 42-48 percent paraffins, 36-38 percent naphthenes, and 16-20 percent aromatic. Diesel fuels and heating oils contain less than 10 percent paraffins, 14-23 percent naphthenes, and 68-78 percent non-volatile aromatic. These heavier fuels contain almost no volatile aromatic compounds. Chemicals are usually added to automotive and aviation fuels to improve their burning properties. Examples are tetraethyl-lead and ethylene dibromide. Most additives are proprietary materials.

Flammability

Crude oil and petroleum distillate fuels possess two intrinsic hazardous properties, namely, flammability and toxicity. The flammable property of the oil and fuels presents a far greater hazard to field personnel than toxicity because it is difficult to protect against and can result in catastrophic consequences. Being

flammable, the vapors of volatile components of crude oil and the fuels can be explosive when confined.

The lower flammable or explosive limits (LFL or LEL) of the fuels listed in SEction 508.2 range from 0.6 percent for JP-5 to 1.4 percent for gasolines. LFL and LEL are synonyms. Flash points range from -36°F for gasoline to greater than 150°F for No. 6 fuel oil. JP-5 has a flash point of 140°F. Although it has a lower LEL than gasoline, it can be considered less hazardous because its vapors must be heated to a higher temperature to ignite.

Crude oil and petroleum distillate fuels will not burn in the liquid form; only the vapors will burn and only if the vapor concentration is between the upper and lower flammable limits, sufficient oxygen is present, and an ignition source is present. If these conditions occur in a confined area an explosion may result.

The probability of fire and explosion can be minimized by eliminating any one of the three factors needed to produce combustion. Two of the factors -- ignition source and vapor concentration -- can be controlled in many cases. Ignition can be controlled by prohibiting open fires and smoking on site, installing spark arrestors on drill rig engines, and turning the engines off when LELs are approached. Vapor concentrations can be reduced by using fans. In fuel tanks, vapor concentrations in the head space can be reduced by introducing dry ice (solid carbon dioxide) into the tank; the carbon dioxide gas will displace the combustible vapors.

Toxicity

Crude oil and petroleum distillate fuels exhibit relatively low acute inhalation and dermal toxicity. Concentrations of 160 to 270 ppm gasoline vapor have been reported to cause eye, nose and throat irritation after several hours of exposure. Levels of 500 to 900 ppm can cause irritation and dizziness in one hour, and 2000 ppm produces mile anesthesia in 30 minutes. Headaches have been reported with exposure to 25 ppm or more of gasoline vapors measured with a photoionization meter. Most fuels, particularly gasoline, kerosene and jet fuels are capable of causing skin irritation after several hours contact with the skin.

Petroleum fuels exhibit moderate oral toxicity. The lethal dose of gasoline in children has been reported to be as low as 10-15 grams (2-3 teaspoons). In adults, ingestion of 20-50 grams of gasoline may produce severe symptoms of poisoning. If liquid fuel aspirated (passed in to the lungs) gasoline and other petroleum distillate fuels may cause secondary pneumonia.

Some of the additives to gasoline, such as ethylene dichloride, ethylene dibromide, and tetraethyl and tetramethyl lead, are highly toxic; however, they are present in such low concentrations that their contribution to the overall toxicity of gasoline and other fuels is negligible in most instances.

OSHA has not developed permissible workplace exposure limits for crude oil and petroleum distillate fuels. It recommends using permissible exposure limits for individual components, such as benzene. ACGIH has established a permissible exposure limit of 300 ppm for gasoline. The limit took into consideration the average concentration of benzene in gasoline (one percent) as well as its common additives. Exposure limits established by other countries range from 250 to 500 ppm. Chemical data sheets, prepared for the U.S. Coast Guard's Chemical Hazard Information System (CHRIS), list 200 ppm as the permissible exposure limit for kerosene and jet fuels. This limit was not developed by NIOSH/OSHA or ACGIH.

5.0 HEALTH AND SAFETY DIRECTIVES

5.1 Site-Specific Safety Briefing

Before field work beings, all field personnel, including subcontractor employees, must be briefed on their work assignments and safety procedures contained in this document.

5.2 Personal Protective Equipment

The following equipment should be available on-site to each member of the field team:

- NIOSH-approved full or half-face respirator with organic vapor cartridges (color coded black)
- Saranex or polyethylene-coated Tyvek coveralls
- Splash-proof safety goggles
- Nitrile or neoprene gloves
- Neoprene or butyl boots, calf-length with steel toe and shank
- Hardhat

Equipment Usage

Chemical-resistant safety boots must be worn during the performance of work where surface soil is obviously contaminated with oil or fuel, when product quantities of oil or fuel are likely to be encountered, and within 10 feet of operating heavy equipment.

Respirators must be worn whenever total airborne hydrocarbons levels in the breathing zone of field personnel reach or exceed a 15-minute average of 25 ppm. If total airborne hydrocarbons in the breathing zone exceeds 100 ppm, work must be suspended, personnel directed to move a safe distance from the source, and the HSO or designee consulted.

Chemical resistant gloves must be worn whenever soil or water known or suspected of containing petroleum hydrocarbons is collected or otherwise handled.

Chemical resistant coveralls must be worn whenever product quantities of fuel are actually encountered and when oil or fuel-saturated soil is handled.

Safety goggles must be worn when working within 10 feet of any operating heavy equipment (e.g., drill rig, backhoe). Splash-proof goggles or face shields must be worn whenever product quantities of oil or fuel are encountered.

Hardhats must be worn when working within 10 feet of an operating drill rig, backhoe or other heavy equipment.

Operators of some facilities, such as refineries, often require all personnel working within facility boundaries to wear certain specified safety equipment. Such requirements shall be strictly observed

5.3 Vapor Monitoring

Required Equipment

--- Organic vapor meter with flame or photoionization detector
--- Combustible gas meter

Monitoring Requirements and Guidelines

Vapor monitoring shall be performed as often as necessary and whenever necessary to protect field personnel from hazardous vapors. Monitoring must be performed by individuals trained in the use and care of the monitoring equipment.

During drilling operations, vapor emissions from boreholes must be measured whenever the auger is removed from the boring and whenever flights are added or removed from hollow-stem augers. This requirement does not apply to borings less than five feet deep and borings of any depth made to install monitoring wells in uncontaminated soils. Measurements should be made initially with an organic vapor meter, followed with a combustible gas meter if vapor levels exceed the highest concentration measurable with the organic vapor meter.

Initially measurements shall be made about 12 inches from the bore hole, both upwind and downwind positions. If the total hydrocarbon concentrations exceed the respirator use action level (See Section 508.5.2), measurements must be made in the breathing zone of the individual(s) working closest to the borehole. Decisions regarding respiratory protection should be made using vapor concentrations in the breathing zone.

Organic vapor meters capable of being operated continuously without attention may be operated in that fashion if desired. However, the instrument must be equipped with an alarm set to sound when vapor concentrations reach 25 ppm and must be protected against physical damage and soilage.

If total organic vapor concentrations within 12 inches of the borehole exceed the capacity of the organic vapor meter, a combustible gas meter (CGM) must be used to determine if explosive conditions exist. Operations must be suspended, the drill rig motor shut down, and corrective action taken if combustible gas concentrations reach 40 percent of LEL within a 12-inch radius of

the borehole or 10 percent of LEL at a distance greater than 24 inches from the borehole. This procedure must also be followed whenever the organic vapor meter goes offscale at its highest range and no CGM is available. If corrective action cannot be taken, field personnel and all other individuals in the vicinity of the borehole must be directed to move to a safe are and the local fire department and facility management must be alerted.

Organic vapor meters with flame ionization detectors (FID) are much more sensitive to paraffins, with the major component of gasoline, kerosene, and jet fuels, then are meters with 10.0 or 10.2 eV photoionization detectors. As the data in Table 1 show, an FID instrument, such as the Century Systems OVA (Foxboro Analytical), will detect 70-90 percent of actual paraffin concentrations, whereas PID instruments, such as the HNU Model PI-101, AID Model 580, and Photovac TIP with 10.0 to 10.2 eV lamp will detect only 17-25 percent of actual paraffin concentrations when calibrated with benzene and only 24-35 percent when calibrated with isobutylene. Both types of meters are equally sensitive to most aromatic, including benzene, toluene, xylene and ethylbenzene. For these compounds, meter readings equal or exceed 100 percent of actual concentrations. PIDs with 11.7 eV lamps are extremely sensitive to paraffins and aromatic. When calibrated to isobutylene, an 11.7 eV PID will register about twice actual paraffin concentrations and 100 percent or more of actual concentrations of benzene, toluene, and xylene.

An FID meter, recently calibrated with methane and in good working condition, can be expected to provide readings close enough to actual petroleum hydrocarbon concentrations to make corrections unnecessary. Value obtained with a PID must be corrected when measuring for paraffins. For 10.0 and 10.2 eV PIDs, the meter reading should be multiplied by 5 if the instrument is calibrated with benzene. If the instrument is calibrated with isobutylene, the meter readings should be multiplied by 3. If the instrument is equipped with an 11.7 eV probe and is calibrated with isobutylene, the meter reading should be divided by 2.

5.4 Area Control

Access to hazardous and potential hazardous areas of spill sites must be controlled to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors and the public. A hazardous or potentially hazardous area includes any area where

1. Field personnel are required to wear respirators.

2. Borings are being drilled with powered augers.

3. Excavating operations with heavy equipment are being performed.

The boundaries of hazardous and potentially hazardous areas must be identified by cordons, barricades, or emergency traffic cones or posts, depending on conditions. If such areas are left unattended, signs warning of the danger and forbidding entry must be placed around the perimeter if the areas are accessible to the public. Trenches and other large holes must be guarded with wooded or metal barricades spaced no further than 20 feet apart and connected with yellow or yellow and black nylon tape not less and 3/4-inches wide. The barricades must be placed no less than two feet from the edge of the excavation or hole.

Entry to hazardous areas shall be limited to individuals who must work in those areas. Unofficial visitors must not be permitted to enter hazardous areas while work in those areas is in progress. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if they agree to abide by the provisions of this document, follow orders issued by the site safety officer and are informed of the potential dangers that could be encountered in the areas.

5.5 Decontamination

Field decontamination of personnel and equipment is not required except when contamination is obvious (visually or by odor). Recommended decontamination procedures follow:

Personnel

Gasoline, kerosene, jet fuel, heating oil, gasahol and diesel oil should be removed from skin using a mild detergent and water. Hot water is more effective than cold. Liquid dishwashing detergent is more effective than hand soap. Motor oil and the heavier fuel oils (No. 4-6) can be removed with dishwashing detergent and hot ware also; however, if weathered to an asphaltic condition, mechanic's waterless hand cleaner is recommended for initial cleaning followed by detergent and water.

Equipment

Gloves, respirators, hardhats, boots and goggles should be cleaned as described under personnel; however, if boots do not become clean after washing with detergent and water, wash them with a strong solution of trisodium phosphate and hot water and, if this fails, clean them with diesel oil followed by detergent and water to remove diesel oil.

Sampling equipment, augers, vehicle undercarriages and tires should be steam cleaned. The steam cleaner is a convenient source of hot water for personnel and protective equipment cleaning.

5.6 Smoking

Smoking and open flames are strictly prohibited at sites under investigation.

TABLE 1
RELATIVE SENSITIVITIES OF FID AND PID INSTRUMENTS TO SELECTED COMPONENTS OF OILS AND PETROLEUM DISTILLATE FUELS

Component	Sensitivity in Percent of Standard		
	FID	PID	
		10.2 eV[a]	11.7 eV[b]
Paraffins			
Pentane	65	--	141
Hexane	70	22 (31)	189
Heptane	75	17 (24)	221
Octane	80	25 (35)	--
Nonane	90		--
Decane	75	--	--
Napthenes			
Cyclopentane	--	--	--
Methylcyclopentane	80	--	--
Cyclohexane	85	34 (40)	--
Methylcyclohexane	100	--	--
Aromatic			
Benzene	150	100 (143)	122
Toluene	110	100 (143)	100
Ethylbenzene	100	--	--
p-Xylene	116	114 (60)	--
Cumene	100	--	--
n-Propylbenzene	--	--	--
Napthaeine	--	--	--

[a] Values are relative to benzene standard. Values in parentheses are relative to isobutylene standard and were calculated.

[b] Values are relative to isobutylene standard.