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March 17, 1999

REPORT
OF
REMEDIATION SYSTEM INSTALLATION
at
Lim Family Property
250 8th Street
Oakland, California

Submitted by:
AQUA SCIENCE ENGINEERS, INC.
208 West El Pintado
Danville, CA 94526
(925) 820-9391

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1
2.0	SITE HISTORY	1
3.0	INJECTION WELL INSTALLATION	2
3.1	Permits	2
3.2	Drilling and Injection Well Installation	2
3.3	Well Development	3
3.4	Subsurface Hydrogeology	4
4.0	HYDROGEN PEROXIDE SYSTEM INSTALLATION	4
4.1	Hydrogen Peroxide Injection System	4
4.2	Hydrogen Peroxide Solution Preparation	4
4.3	Hydrogen Peroxide Solution Pump System	5
4.4	Hydrogen Peroxide Solution Distribution System	5
4.5	Initial Start-up, Operation and Monitoring	5
5.0	CONCLUSIONS	6

LIST OF TABLES

TABLE ONE ANALYTICAL RESULTS GROUNDWATER
TPH-G, TPH-D, BTEX & MTBE

TABLE TWO ANALYTICAL RESULTS GROUNDWATER
LEAD, O&G, VOCs

LIST OF FIGURES

FIGURE 1 SITE LOCATION MAP

FIGURE 2 SITE PLAN

FIGURE 3 INJECTION WELL & SYSTEM LOCATION MAP

FIGURE 4 TYPICAL INJECTION WELL MAP

FIGURE 5 TREATMENT SYSTEM SCHEMATIC

LIST OF APPENDICES

APPENDIX A ALAMEDA COUNTY HEALTH CARE SERVICES AGENCY
LETTER DATED NOVEMBER 5, 1996

APPENDIX B BORING LOGS

1.0 INTRODUCTION

This submittal describes Aqua Science Engineer's, Inc. (ASE) installation of a groundwater remediation system at the Lim Family property located at 250 - 8th Street in Oakland, California (Figure 1). The installation of this groundwater remediation system was initiated by the Lim Family in accordance with a letter received from the Alameda County Health Care Services Agency (ACHCSA), dated November 5, 1996 (Appendix A). Based on the site history presented below and information provided in ASE's remedial action plan (RAP) dated June 5, 1997, ~~ASE has installed a hydrogen peroxide (HP) injection system at the site.~~ This report describes the installation of the groundwater remediation system at the site.

2.0 SITE HISTORY

A gasoline service station previously occupied the site. ~~In May 1992, ASE removed ten underground fuel storage tanks from the site.~~ The tanks consisted of one (1) 10,000-gallon gasoline tank, one (1) 5,000-gallon diesel tank, three (3) 2,000-gallon gasoline tanks, one (1) 2,000-gallon diesel tank, three (3) 500-gallon gasoline tanks and one (1) 250-gallon waste oil tank. Up to 10,000 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPH-G) and 5,900 ppm total petroleum hydrocarbons as diesel (TPH-D) were detected in soil samples collected during the tank removal.

~~Between December 1992 and March 1993, All Environmental of San Ramon, California overexcavated 1,762 cubic yards of soil from the site and off-hauled the soil to the BFI Landfill in Livermore, California.~~ Analytical results show that all on-site soil with hydrocarbon concentrations greater than 10 ppm was removed from the site with the exception of soil along the 8th Street shoring. Up to 1,800 ppm TPH-G and 120 ppm TPH-D were detected in soil samples collected along the shoring indicating that contamination likely extends below 8th Street. This contamination left in place may still be a source for groundwater contamination.

In January 1995, ASE installed monitoring wells MW-1 and MW-2 at the site (Figure 2). High hydrocarbon concentrations were detected in monitoring well MW-2, downgradient of the site. Moderate hydrocarbon concentrations were detected in on-site monitoring well MW-1.

In July 1996, ASE sampled groundwater from each monitoring well and drilled borings BH-C and BH-D to further define the width of the

hydrocarbon plume downgradient of the site. Relatively high hydrocarbon concentrations continued to be detected in groundwater samples collected from monitoring well MW-2 downgradient of the site. Slightly lower but still very high hydrocarbon concentrations were detected in groundwater samples collected from boring BH-D, west of monitoring well MW-2. Very low hydrocarbon concentrations, below California Department of Toxic Substances Control (DTSC) maximum contaminant levels (MCLs) and recommended action levels (RALs) for drinking water, were detected in groundwater samples collected from monitoring well MW-1, located on the site, and boring BH-D, east of monitoring well MW-2. Based on these findings, the plume appears to be moving to the south of Excavation I on the site and not toward the Lum property south-southeast of the site.

Between April 1995 and January 1996, the site was on a quarterly groundwater monitoring schedule. The site is currently on a semi-annual groundwater monitoring schedule with volatile organic compound (VOC) analyses only being performed annually. Analytical results for all previous sampling periods are included in Table One and Table Two of this report.

On June 5, 1997, ASE prepared a RAP addressing the need for groundwater remediation at the site, describing the appropriateness of several remedial options and choosing an option. Hydrogen peroxide injection was chosen as the groundwater remediation option of choice for the site. This report describes the installation of this hydrogen peroxide remediation system.

3.0 INJECTION WELL INSTALLATION

3.1 Permits

Prior to drilling, ASE obtained a drilling permit from the Alameda County Public Works Agency (ACPWA). City of Oakland encroachment and excavation permits were also obtained prior to drilling. Underground Service Alert (USA) was contacted at least 48 hours prior to drilling to have all known utilities marked in the immediate site vicinity. All permits for this project are presented in Appendix A.

3.2 Drilling and Injection Well Installation

On February 2 and 3, 1999, Kvilhaug Well Drilling of Concord, California drilled five (5) soil borings at the site in the locations shown on Figure 3 using a Mobile B-61 drill rig equipped with 8-inch diameter hollow-stem

augers. The drilling was directed by ASE staff geologist Greg Schramm and ASE senior geologist Robert Kitay, R.G. Undisturbed soil samples were collected periodically for subsurface hydrogeologic description. The samples were collected using a split-barrel drive sampler advanced ahead of the auger tip by successive blows from a 140-lb. hammer dropped 30-inches. Soil was described by the site geologist according to the Unified Soil Classification System. Boring logs are presented in Appendix B. Soil cuttings were contained in steel 55-gallon drums and then removed from the site by Ecologix Environmental Services of Chico, California. This soil will be treated by thermal remediation prior to disposal.

All sampling equipment was cleaned in buckets with brushes and a trisodium phosphate (TSP) solution, then rinsed twice with tap water. The drill rig and augers were steam cleaned between borings and prior to departure. Rinsates were contained in 55-gallon steel drums and then removed from the site by Ecologix Environmental Services of Chico, California. This water will be treated by thermal remediation.

The soil borings were completed as 2-inch diameter hydrogen-peroxide injection wells. The wells were constructed with 2-inch diameter, flush-threaded, schedule 40, 0.020-inch slotted PVC well screen and blank casing. The wells were screened between 10-feet below ground surface (bgs) and 25-feet bgs. Each well casing was lowered through the augers and #3 Monterey sand was placed in the annular space between the well casing and the borehole from the bottom of the borehole to about 2-feet above the screened interval. Approximately 1-foot of bentonite pellets was placed on top of the sand pack and hydrated with tap water. This bentonite layer is installed to prevent the cement sanitary seal from infiltrating into the sand pack. Cement fills the annular space between the bentonite layer and the surface to prevent surface water from infiltrating into the wells. The well heads are protected by a threaded cap and at-grade, traffic-rated well boxes (see Figure 4 for a Typical Injection Well Map).

3.3 Well Development

On February 10, 1999, ASE staff geologist Greg Schramm developed the wells using two episodes of surge block agitation and bailer evacuation. At least ten well casing volumes of water were removed during the development, and development continued until the water appeared reasonably clear. Purged groundwater was stored in sealed and labeled 55-gallon steel drums and was subsequently removed from the site by

Ecologix Environmental Services of Chico, California. This water will be treated by thermal remediation.

3.4 Subsurface Hydrogeology

Sediments beneath the site consisted primarily of a silty sand. Hydrocarbon odors were present in all of the borings including strong odors in soil from the ground surface in boring IW-5 to the north. The presence of hydrocarbons in the vadose zone well above the water table was surprising since these borings were drilled off-site. The presence of the hydrocarbon contamination in the vadose zone is significant since these hydrocarbons can act as a continued source of hydrocarbons for groundwater contamination if left untreated. It is ASE's opinion that soil remediation will be needed in the vadose zone downgradient of the site prior to the completion of this remediation project. Based on the permeable nature of the soil in this area, soil vapor extraction may be ideal for remediation in the vadose zone at the site.

4.0 HYDROGEN PEROXIDE SYSTEM INSTALLATION

4.1 Hydrogen Peroxide Injection System

A HP solution with a concentration of approximately 1,000 ppm is prepared in a 200 gallon black high density polyethylene (HDPE) tank for injection into the five (5) injection wells. Two variable speed peristaltic pumps are used to meter the HP solution into the five (5) injection wells. The HP solution is pumped to each injection well through buried HDPE tubing (Figure 5). The concentration of DO in the groundwater in each well will be maintained at between 5 and 20 ppm by periodic monitoring of DO concentration in each well using a DO meter and by making necessary adjustments to the HP metering pump flows.

4.2 Hydrogen Peroxide Solution Preparation

The 1,000 ppm HP solution is prepared by diluting 2.0 liters of 30 percent HP with 600 liters of water to make 602 liters of solution. The HP solution is stored in a 200 gallon capacity black HDPE tank equipped with a black HDPE lid, which prevents HP degradation by sunlight and algae. The HP solution is prepared as needed.

$$(2)(.3) = 600(.001) \quad \overset{= 10^3 = 1000 \text{ ppm}}{\text{—————}}$$

.6

4.3 Hydrogen Peroxide Solution Pump System

The HP solution pump system consists of five (5) peristaltic pump heads driven by two variable speed pump motors, which have speeds ranging from one to 100 revolutions per minute (RPM). Three of the pumps heads are driven by one motor. Two of the pump heads are driven by the other motor. Each pump head is equipped with 1/16-inch inside diameter (ID) by 3/16-inch outside diameter (OD) peristaltic pump tubing, which can pump between 0.21 milliliters to 21 milliliters per revolution. The two pump motors are powered by 115-volt alternating-current (AC) single-phase electrical power.

4.4 Hydrogen Peroxide Solution Distribution System

The HP solution is distributed from the HP solution pump system, through buried HDPE tubing, and into the five (5) injection wells. The five (5) peristaltic pump tubes are connected to five 1/8-inch ID by 1/4-inch OD HDPE tubes, which extend from the five pump heads to the five injection wells. The HDPE tubes are contained in secondary containment piping (2-inch ID Schedule 40 PVC) and are buried at approximately 18 inches bgs in trenches extending from the pump heads to the wells. HDPE tubes are covered with concrete paving to protect the tubes from damage. The HDPE tubes extend down into each well to approximately the mid-point of the groundwater column height in each well. Enough tubing has been designed into the injection system to anticipate for groundwater level fluctuations within each injection well.

4.5 Initial Start-Up, Operation, and Monitoring of System

The system was started by ASE on February 18, 1999. The initial HP solution injection rate to each well was set at approximately 5 milliliters per minute (ml/min). The HP solution was injected at this initial rate for about a week to let the HP solution come to equilibrium in each well. Prior to HP injection, the concentration of DO in groundwater for each of the five injection wells and two monitoring wells was measured to establish a baseline DO concentration for each well. After the first week of HP injection, the DO concentration in groundwater was monitored in each injection and monitoring well to determine if the DO had increased to between 5 and 20 ppm. The DO in each injection well measured above 20 ppm within this first week. Therefore, the HP injection rate to the injection wells was adjusted to the engineered flow rate of 1 ml/min. Groundwater DO monitoring and necessary HP pump flow adjustment will continue on a weekly basis until it is established that less frequent DO

monitoring is required to keep DO concentrations in groundwater between 5 and 20 ppm. Weekly monitoring of the DO in groundwater and HP injection adjustments may need to be continued periodically to the end of the bioremediation project to keep concentrations of DO in groundwater between 5 and 20 ppm because of continuous variations in aerobic microbe populations, nutrient concentrations, contaminant concentrations, groundwater flows rates, groundwater temperature, groundwater pH, electrolytes concentrations, groundwater salinity, and atmospheric pressure.

5.0 CONCLUSIONS

Significant hydrocarbon odors were present during the installation of the hydrogen peroxide injection wells. This was not expected since these wells are located off-site and given the extent of the previous overexcavation activities at the site. Since this unsaturated hydrocarbon bearing soil can act as a continued source of hydrocarbons for groundwater contamination, it is ASE's opinion that some further remediation may be necessary to remediate the elevated hydrocarbon concentrations in soil. Given the sandy nature of the soil, soil vapor extraction may be ideal for soil remediation in the vadose zone. It may be possible to do the vapor extraction using the existing hydrogen peroxide injection wells once the hydrogen peroxide injection portion of the project is complete. Significant modifications would be required and it may be necessary to perform additional hydrogen peroxide injection following the soil vapor extraction.

Tabulated and graphical information on the dissolved oxygen readings for all of the site wells will be included in future groundwater monitoring reports for this site.

Should you have any questions or comments, please feel free to call us at (925) 820-9391.

Respectfully submitted,

AQUA SCIENCE ENGINEERS, INC.



David Allen, R.E.A.
Senior Project Manager



Robert E. Kitay, R.G., R.E.A.
Senior Geologist

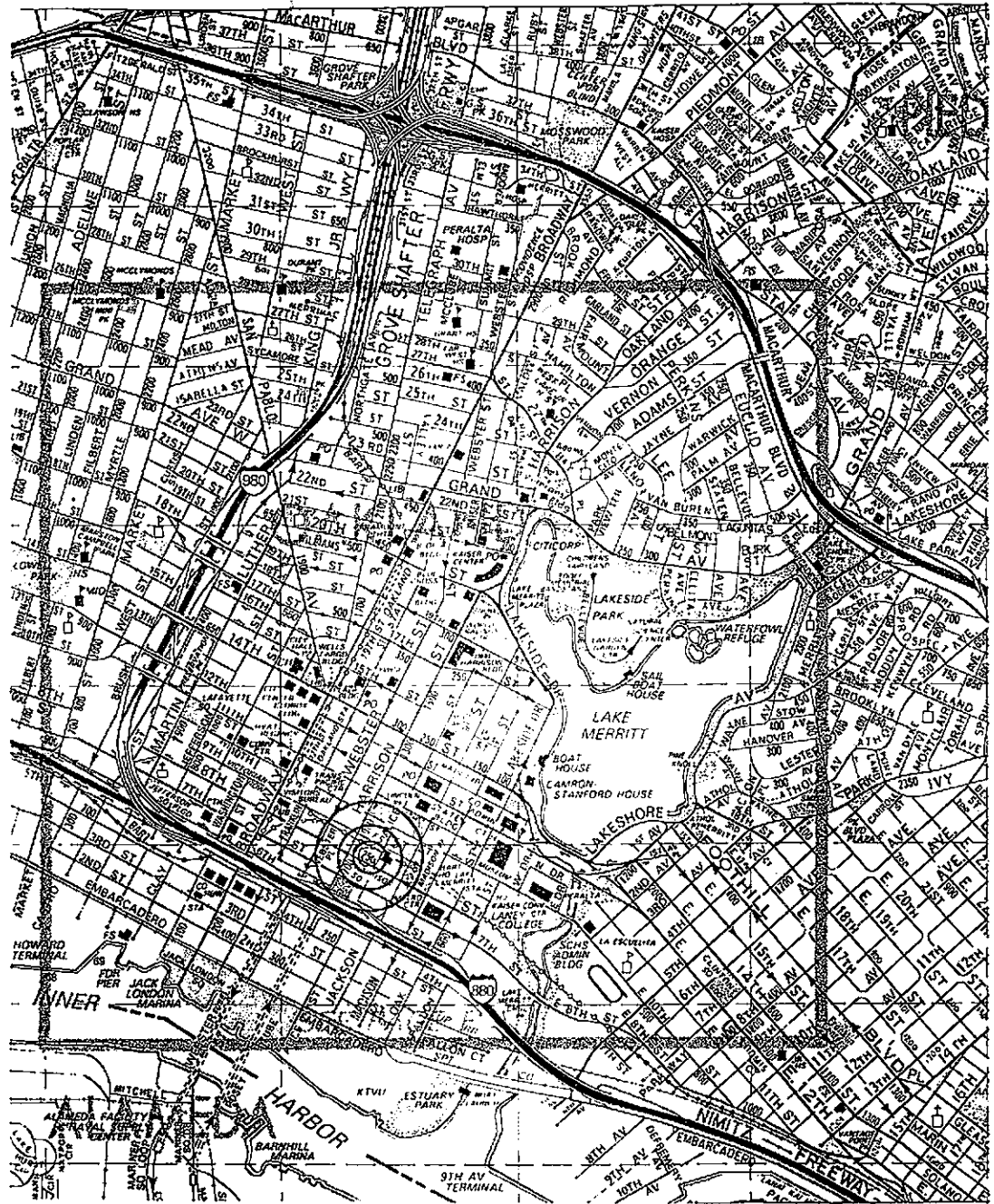


cc: Mr. Russell Lim, 3100 La Playa Court, Lafayette, CA 94549

Mr. Larry Seto, Alameda County Health Care Services Agency, 1131 Harbor Bay Parkway, Suite 250, Alameda, CA 94502-6577

Mr. Chuck Headlee, California Regional Water Quality Control Board, San Francisco Bay Region, 1515 Clay Street, Suite 1400, Oakland, CA 94612

Mr. Mark Owens, California State Underground Storage Tank Cleanup Fund, P.O. Box 944212, Sacramento, CA 94244-2120



SITE LOCATION MAP

Lim Property
250 8th Street
Oakland, California

Aqua Science Engineers

Figure 1

LEGEND



AGE Monitoring Well



ALL Monitoring Well



NORTH

SCALE
1" = 30'

Buildings

SIDEWALK

8th Street



MW-2

CHURCH

PROPERTY LIMITS

BUILDING

LIM
Property

Excavation I

Excavation II



MW-1

SIDEWALK

Alice Street

SIDEWALK

LUM-1



LUM Property

LUM-2



SIDEWALK




SITE PLAN

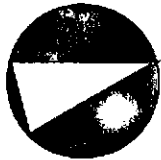
LIM PROPERTY
250 8TH STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC.

Figure 2

LEGEND

-  ASE Monitoring Well
-  ALL Monitoring Well
-  Injection Well



NORTH

SCALE
1" = 30'

Buildings

SIDEWALK

8th Street

INJECTION
WELL
(TYPICAL)

MW-2

BURIED
TUBING

CHURCH
FENCED
COMPOUND
HP SOLUTION TANK

PUMPS

BUILDING

LIM
Property

Excavation I

Excavation II

MW-1

PROPERTY LIMITS

SIDEWALK

Alice Street

SIDEWALK

LUM-1

LUM Property

LUM-2

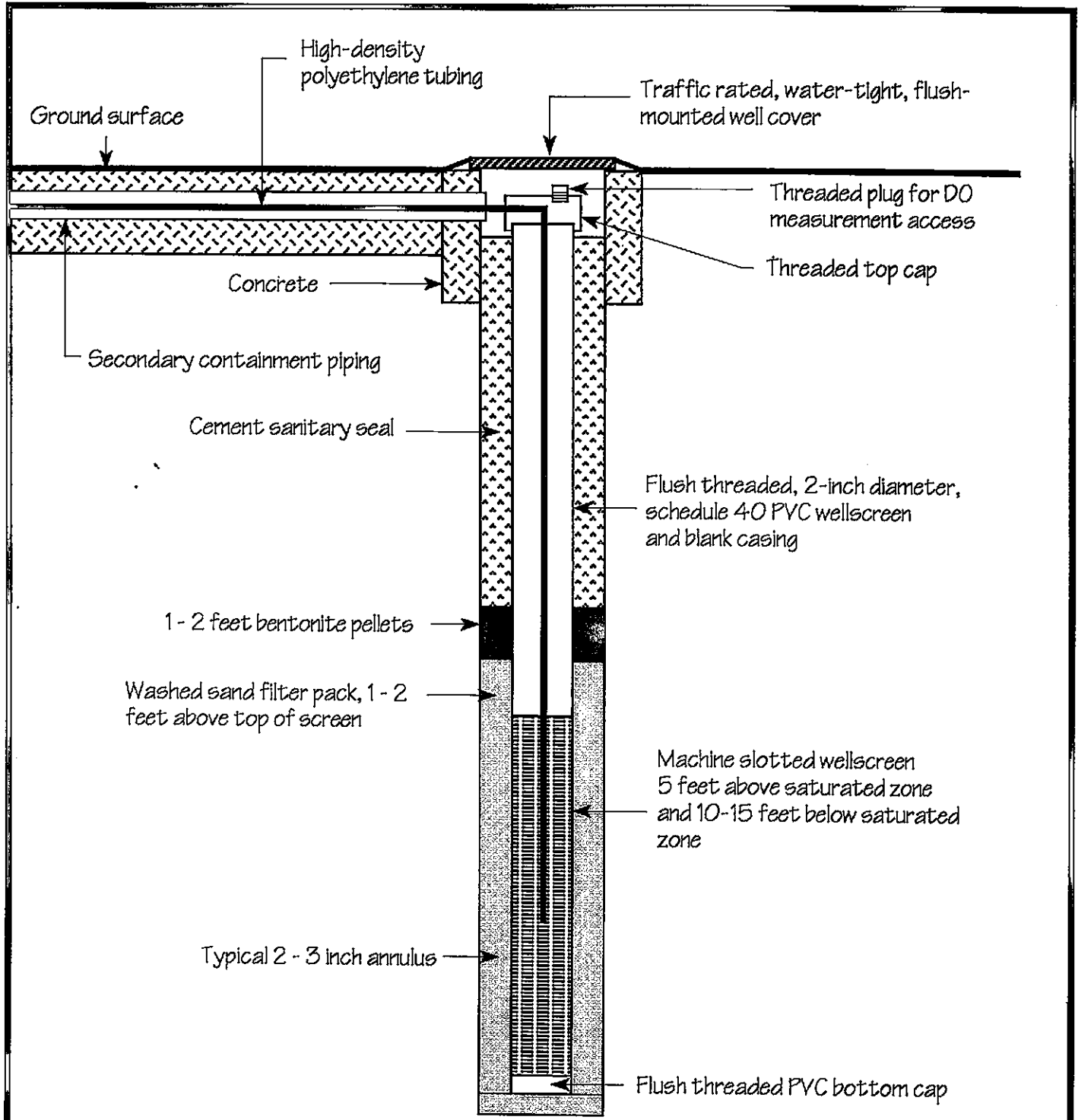
SIDEWALK

**INJECTION WELL
LOCATION MAP**

LIM PROPERTY
250 8TH STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC.

Figure 3



**TYPICAL
INJECTION WELL CONSTRUCTION
IN CROSS SECTION**

LIM PROPERTY
250 8TH STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC.	Figure 4
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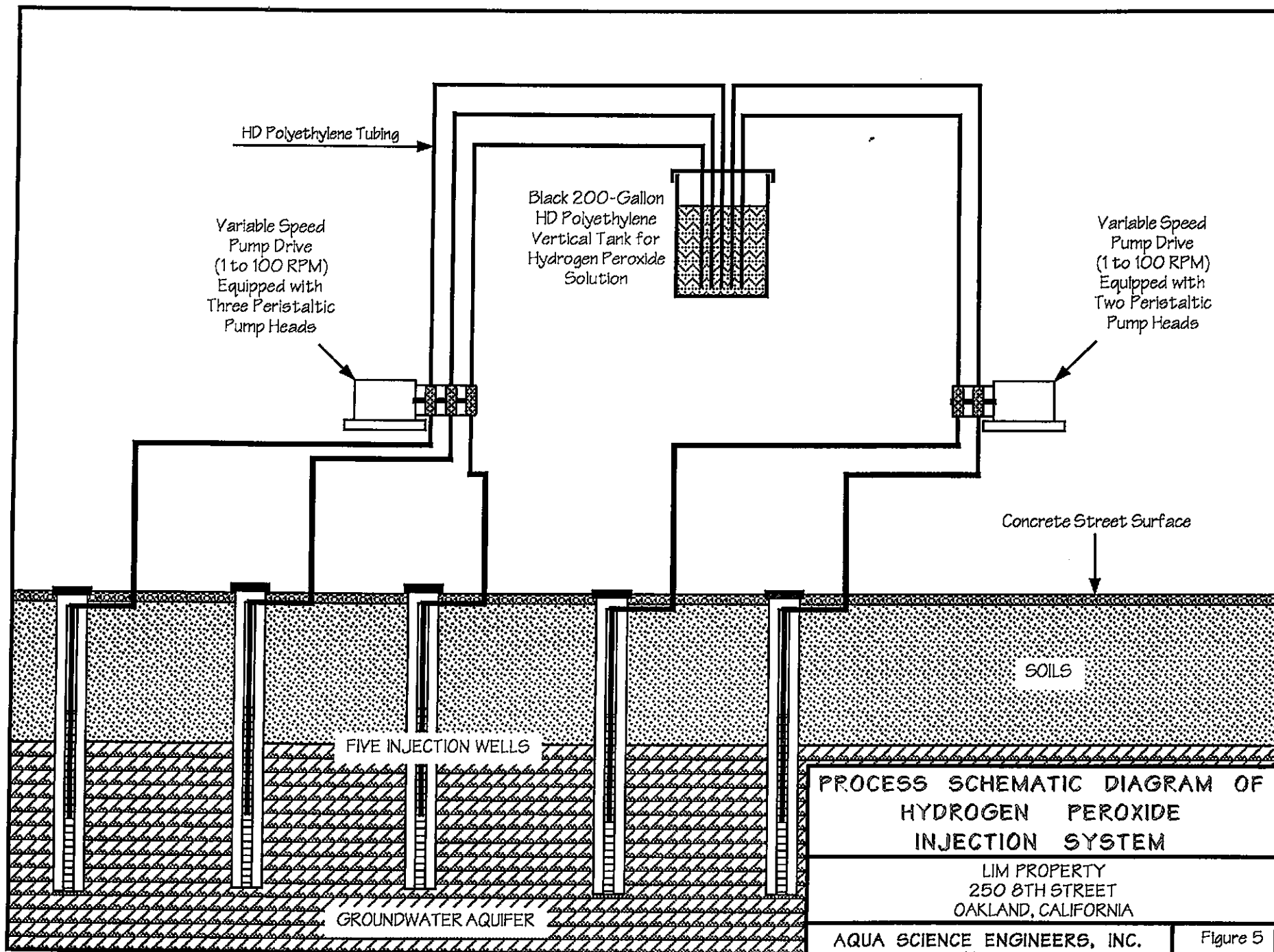


Figure 5

TABLE ONE
Summary of Chemical Analysis of GROUNDWATER Samples
TPH-G, TPH-D, BTEX and MTBE
All results are in parts per billion

Well/ Date Sampled	TPH Gasoline	TPH Diesel	Benzene	Toluene	Ethyl Benzene	Total Xylenes	MTBE
<u>MW-1</u>							
01-30-95	740	200	3	5	1	4	--
04-12-95	400	500	<0.5	<0.5	3	<2	--
07-14-95	520	400	1	<0.5	2	3	--
10-17-95	400	200	0.5	1	3	<2	--
01-12-96	120	890	<0.5	<0.5	<0.5	<1.0	<2
07-08-96	320	300	0.52	2.7	1.2	2.3	<5
01-06-97	110	75	<0.5	0.68	<0.5	<0.5	<5
<u>MW-2</u>							
01-30-95	88,000	800	19,000	18,000	2,400	10,000	--
04-12-95	110,000	990	21,000	28,000	2,800	14,000	--
07-14-95	120,000	5,000	20,000	25,000	3,200	15,000	--
10-17-95	190,000	4,000	15,000	26,000	4,900	23,000	--
01-12-96	32,000	2,600	10,000	8,000	1,100	4,800	<2
07-08-96	110,000	2,500	20,000	18,000	2,500	12,000	<500
01-06-97	230,000	37,000	11,000	19,000	4,300	20,000	<1,200
EPA METHOD	5030/ 8015M	3550/ 8015M	8020	8020	8020	8020	8020

TABLE TWO**Summary of Chemical Analysis of GROUNDWATER Samples
Lead, Oil & Grease and Volatile Organic Compounds**

All results are in parts per billion

<u>Compound</u>	<u>MW-1</u>	<u>MW-2</u>
<u>1-30-95</u>		
Dissolved Lead	< 0.04	< 0.04
Total Oil and Grease	< 500	19,000 .
Hydrocarbon Oil and Grease	< 500	17,000
Chloroform	0.5	< 30
Tetrachloroethene (PCE)	8	< 30
Other VOCs	< 0.5-2	< 30-100
<u>4-12-95</u>		
Dissolved Lead	< 0.04	< 0.04
Hydrocarbon Oil and Grease	< 500	22,000
Tetrachloroethene (PCE)	6	0.9
1,2-Dichloroethane	< 0.5	43
Other VOCs	< 0.5-2	< 30-100
<u>7-14-95</u>		
Total Oil and Grease	< 500	25,000
Hydrocarbon Oil and Grease	< 500	23,000
1,2-Dichloroethane	< 0.5	35
Tetrachloroethene (PCE)	4	< 5
Other VOCs	< 0.5-2	< 5-20
<u>10-17-95</u>		
Total Oil and Grease	< 1,000	15,000
Hydrocarbon Oil and Grease	< 1,000	13,000
Tetrachloroethene (PCE)	5	< 0.5
Trichloroethene (TCE)	< 0.5	5
<u>01-12-96</u>		
Hydrocarbon Oil and Grease	< 5,000	< 5,000
<u>07-08-96</u>		
Hydrocarbon Oil and Grease	---	< 1,000
Chloroform	0.8	< 0.5
Tetrachloroethane (PCE)	6.4	< 0.5
Other VOC's	< 0.5-3	< 0.5-3
<u>01-06-97</u>		
Hydrocarbon Oil and Grease	---	4,100

APPENDIX A

Permits

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY



DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, #250
Alameda, CA 94502-6577
(510) 567-6700 FAX (510) 337-9335

November 5, 1996
STID 1585

Alice, Edward, and May Lim
c/o Russell Lim
601 Brush St.
Oakland CA 94607

RE: former Exxon station, 250-8th St., Oakland CA 94607

Dear Lim Family,

I am in receipt of the "Report of Soil and Groundwater Assessment and Semi-Annual Groundwater Sampling," prepared by Aqua Science Engineers, dated 8/1/96.

This report documents the Geoprobe investigation conducted in July 1996. Two borings were emplaced, and soil and grab groundwater samples collected. Results indicated minor to ND-soil contamination, while groundwater had elevated concentrations in MW2 and BH-C (the boring to the west of MW2). Maximum concentrations included 20,000 ppb benzene, 110,000 ppb TPH-gasoline (MW2), and 3,200 ppb TPH-diesel (BH-C). In addition, there was a hydrocarbon sheen in MW2.

The gasoline contamination in MW2 has been fairly consistent since monitoring began in 1/95. Benzene concentrations have ranged from 10,000 ppb to 21,000 ppb, while TPH-gasoline concentrations have shown more fluctuation in their range (from 32,000 ppb to 190,000 ppb). **Therefore, you are requested to review options for groundwater remediation in the vicinity of MW2. At a minimum, a hydrocarbon absorbent sock should be placed in MW2 to absorb the hydrocarbon sheen.**

Please respond in writing within 45 days, or by December 20, 1996. If you have any questions, please contact me at 510-567-6761.

Sincerely,

Jennifer Eberle
Hazardous Materials Specialist

cc: **Mr. Kitay**, Aqua Science Eng., 2411 Old Crow Canyon Rd #4, San Ramon CA 94583
Cheryl Gordon, SWRCB, UST Cleanup Fund
J. Eberle/file

je.1585-E

Descr 5 monitoring wells. encroachment permit on file.

Permit Issued 01/19/95

Work Type EXCAVATION-PRIVATE P

USA #

Util. Co. Job #
Util. Fund #:

Acctg#:

Applicant Phone# Lic# --License Classes--

Owner LIM EDWARD W & MAY L TRS & ALI
Contractor AQUA SCIENCE ENGINEERS, INC. X (925)820-9391 487000 A C57

Arch/Engr
Agent

Applic Addr 208 WEST EL PINTADO, DANVILLE, CA., 94526

\$246.00 TOTAL FEES PAID AT ISSUANCE	
\$41.00 Applic	\$205.00 Permit
\$.00 Process	\$.00 Rec Mgmt
\$.00 Gen Plan	\$.00 Invstg
\$.00 Other	

CITY OF OAKLAND



EXCAVATION PERMIT

TO EXCAVATE IN STREETS OR OTHER SPECIFIED WORK

CIVIL
ENGINEERING

PAGE 2 of 2

PERMIT NUMBER X9900053		SITE ADDRESS/LOCATION 250 - 87TH ST.
APPROX. START DATE	APPROX. END DATE	24-HOUR EMERGENCY PHONE NUMBER (Permit not valid without 24-Hour number)
CONTRACTOR'S LICENSE # AND CLASS		CITY BUSINESS TAX #

ATTENTION:

- 1) State law requires that the contractor/owner call Underground Service Alert (USA) two working days before excavating. This permit is not valid unless applicant has secured an inquiry identification number issued by USA. The USA telephone number is 1 (800) 642-2444. UNDERGROUND SERVICE ALERT (USA) #:
- 2) **48 hours prior to starting work, YOU MUST CALL (510) 238-3651 TO SCHEDULE AN INSPECTION.**

OWNER/BUILDER

I hereby affirm that I am exempt from the Contractor's License Law for the following reason (Sec. 7031.5 Business and Professions Code: Any city or county which requires a permit to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for such permit to file a signed statement that he is licensed pursuant to the provisions of the Contractor's License law Chapter 9 (commencing with Sec. 7000) of Division 3 of the Business and Professions Code, or that he is exempt therefrom and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than \$500):

I, as an owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044, Business Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who does such work himself or through his own employees, provided that such improvements are not intended or offered for sale. If however, the building or improvement is sold within one year of completion, the owner-builder will have the burden of proving that he did not build or improve for the purpose of sale).

I, as owner of the property, am exempt from the sale requirements of the above due to: (1) I am improving my principal place of residence or appurtenances thereto, (2) the work will be performed prior to sale, (3) I have resided in the residence for the 12 months prior to completion of the work, and (4) I have not claimed exemption on this subdivision on more than two structures more than once during any three-year period. (Sec. 7044 Business and Professions Code).

I, as owner of the property, am exclusively contracting with licensed contractors to construct the project, (Sec. 7044, Business and Professions Code: The Contractor's License Law does not apply to an owner of property who builds or improves thereon, and who contracts for such projects with a contractor(s) licensed pursuant to the Contractor's License law).

I am exempt under Sec. _____, B&PC for this reason _____

WORKER'S COMPENSATION

I hereby affirm that I have a certificate of consent to self-insure, or a certificate of Worker's Compensation Insurance, or a certified copy thereof (Sec. 3700, Labor Code).

Policy # _____ Company Name _____

I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Worker's Compensation Laws of California (not required for work valued at one hundred dollars (\$100) or less).

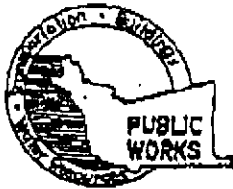
NOTICE TO APPLICANT: If, after making this Certificate of Exemption, you should become subject to the Worker's Compensation provisions of the Labor Code, you must forthwith comply with such provisions or this permit shall be deemed revoked. This permit is issued pursuant to all provisions of Title 12 Chapter 12.12 of the Oakland Municipal Code. It is granted upon the express condition that the permittee shall be responsible for all claims and liabilities arising out of work performed under the permit or arising out of permittee's failure to perform the obligations with respect to street maintenance. The permittee shall, and by acceptance of the permit agrees to defend, indemnify, save and hold harmless the City, its officers and employees, from and against any and all suits, claims, or actions brought by any person for or on account of any bodily injuries, disease or illness or damage to persons and/or property sustained or arising in the construction of the work performed under the permit or in consequence of permittee's failure to perform the obligations with respect to street maintenance. This permit is void 90 days from the date of issuance unless an extension is granted by the Director of the Office of Planning and Building.

I hereby affirm that I am licensed under provisions of Chapter 9 of Division 3 of the Business and Professions Code and my license is in full force and effect (if contractor), that I have read this permit and agree to its requirements, and that the above information is true and correct under penalty of law.

Signature of Permittee Agent for Contractor Owner Date **11/19/99**

DATE STREET LAST RESURFACED 88	SPECIAL PAVING DETAIL REQUIRED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	HOLIDAY RESTRICTION? (NOV. 1 - JAN. 1) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	LIMITED OPERATION AREA? (7AM-9AM & 4PM-6PM) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
ISSUED BY m. Miller		DATE ISSUED 11/19/99	

477000



ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION

951 TURNER COURT, SUITE 300, HAYWARD, CA 94545-2651
PHONE (510) 670-6575 ANDREAS GODFREY FAX (510) 670-5262
(510) 670-5248 ALVIN KAN

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT Lim Property
250-8th Street
Oakland, CA

California Coordinates Source U. Accuracy 1
CON ACE ACE

CLIENT
NAME Lim Family
Address 3100 La Plata Ct Phone _____
City Lafayette, CA Zip 94549

APPLICANT
Name Aqua Science Engineers Inc.
Attn: Robert Kirby FAX 25-837-4853
Address 209 W. El Portal Rd Phone 925-834-2591
City Danville, CA Zip 94524

TYPE OF PROJECT
Well Construction Geotechnical Investigation
Cathodic Protection General
Water Supply Contamination
Monitoring Well Destruction

PROPOSED WATER SUPPLY WELL USE
New Domestic Replacement Domestic
Municipal Irrigation
Industrial Other _____

DRILLING METHOD:
Mud Rotary Air Rotary Auger
Cable Other

DRILLER'S LICENSE NO. C-57 487000

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum Depth 25 ft.
Casing Diameter 8 in. Number 5
Surface Seal Depth 8 ft.

GEOTECHNICAL PROJECTS
Number of Borings _____ Maximum Depth _____ ft.
Hole Diameter _____ in.

ESTIMATED STARTING DATE 1-24-99
ESTIMATED COMPLETION DATE 1-26-99

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Robert Kirby DATE 1-13-99

FOR OFFICE USE

PERMIT NUMBER 99WR018
WELL NUMBER _____
APN _____

PERMIT CONDITIONS

Circled Permit Requirements Apply

- (A) GENERAL**
 1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
 2. Submit to ACPWA within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
 3. Permit is void if project not begun within 90 days of approval date.
- B. WATER SUPPLY WELLS**
 1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
 2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.
- (C) GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS**
 1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
 2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.
- D. GEOTECHNICAL**
Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, cement grout shall be used in place of compacted cuttings.
- E. CATHODIC**
Fill hole above anode zone with concrete placed by tremie.
- F. WELL DESTRUCTION**
See attached.
- G. SPECIAL CONDITIONS**

APPROVED [Signature] DATE 1/20/99

APPENDIX B

Boring Logs

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well IW-1

Project Name: Lim Family

Project Location: 250 - 8th Street, Oakland, CA

Page 1 of 1

Driller: Kvilhaug Well Drilling

Type of Rig: Hollow-Stem Auger

Size of Drill: 8.0" Diameter

Logged By: Greg Schramm

Date Drilled: February 3, 1999

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 15'

Total Depth of Well Completed: 25.0'

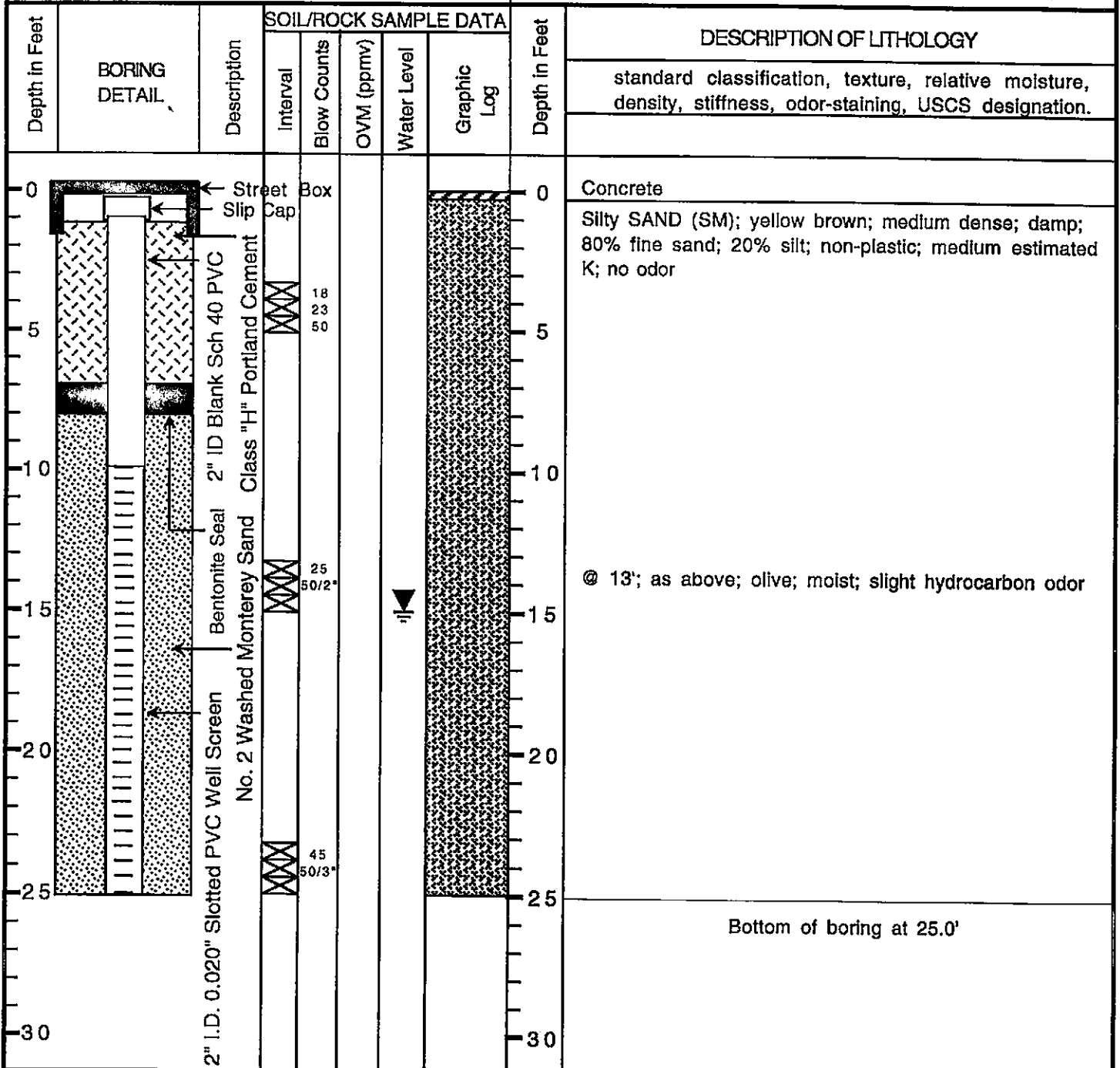
Well Screen Type and Diameter: 2" Diameter PVC Casing

Static Depth of Water in Boring: 15'

Well Screen Slot Size: 0.020"

Total Depth of Boring: 25.0'

Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler



SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well IW-2

Project Name: Lim Family

Project Location: 250 - 8th Street, Oakland, CA

Page 1 of 1

Driller: Kvilhaug Well Drilling

Type of Rig: Hollow-Stem Auger

Size of Drill: 8.0" Diameter

Logged By: Greg Schramm

Date Drilled: February 3, 1999

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 15'

Total Depth of Well Completed: 25.0'

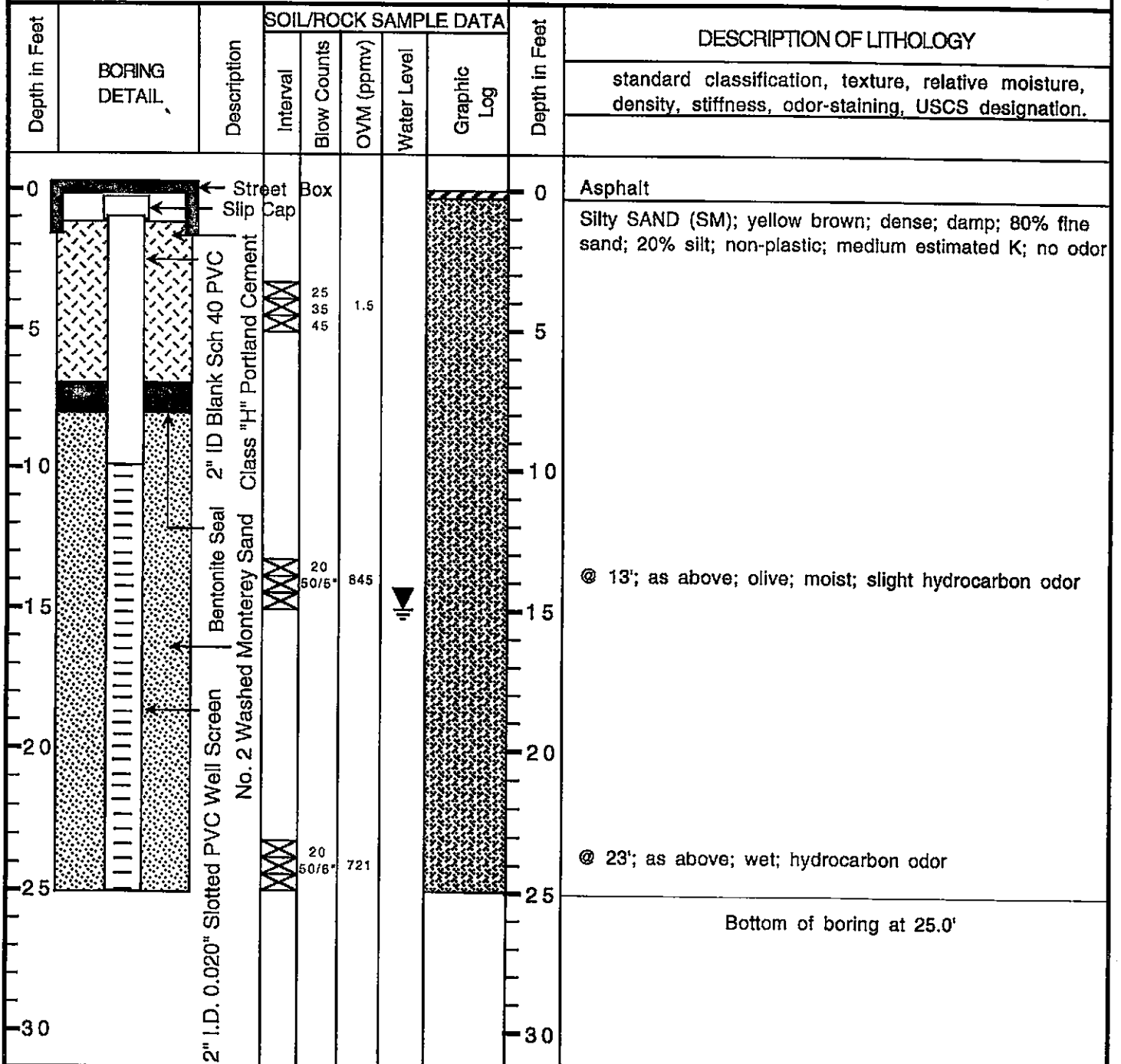
Well Screen Type and Diameter: 2" Diameter PVC Casing

Static Depth of Water in Boring: 15'

Well Screen Slot Size: 0.020"

Total Depth of Boring: 25.0'

Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler



SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well IW-3

Project Name: Lim Family

Project Location: 250 - 8th Street, Oakland, CA

Page 1 of 1

Driller: Kvilhaug Well Drilling

Type of Rig: Hollow-Stem Auger

Size of Drill: 8.0" Diameter

Logged By: Greg Schramm

Date Drilled: February 3, 1999

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 15'

Total Depth of Well Completed: 25.0'

Well Screen Type and Diameter: 2" Diameter PVC Casing

Static Depth of Water in Boring: 15'

Well Screen Slot Size: 0.020"

Total Depth of Boring: 25.0'

Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

Depth in Feet	BORING DETAIL	Description	SOIL/ROCK SAMPLE DATA				Depth in Feet	DESCRIPTION OF LITHOLOGY
			Interval	Blow Counts	OVM (ppmv)	Water Level		
0							Asphalt	
0							Silty SAND (SM); yellow brown; dense; damp; 80% fine sand; 20% silt; non-plastic; medium estimated K; no odor	
5								
5								
10								
10								
15							@ 13'; as above; olive; moist; slight hydrocarbon odor	
15								
20								
20							Silty SAND (SP); olive; dense; wet; 90% fine to medium sand; 10% silt; non-plastic; high estimated K; hydrocarbon odor	
25								
25								
30							Bottom of boring at 25.0'	
30								

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well IW-4

Project Name: Lim Family

Project Location: 250 - 8th Street, Oakland, CA

Page 1 of 1

Driller: Kvilhaug Well Drilling

Type of Rig: Hollow-Stem Auger

Size of Drill: 8.0" Diameter

Logged By: Greg Schramm

Date Drilled: February 2, 1999

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Total Depth of Well Completed: 25.0'

Depth of Water First Encountered: 15'

Well Screen Type and Diameter: 2" Diameter PVC Casing

Static Depth of Water in Boring: 15'

Well Screen Slot Size: 0.020"

Total Depth of Boring: 25.0'

Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

Depth in Feet	BORING DETAIL	Description	SOIL/ROCK SAMPLE DATA					Depth in Feet	DESCRIPTION OF LITHOLOGY standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
			Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log		
0		Street Box Slip Cap						0	Concrete
0-5		2" ID Blank Sch 40 PVC	22-25	880				0-5	Silty SAND (SM); dark yellow brown; dense; moist; 80% fine sand; 20% silt; non-plastic; medium estimated K; no odor @ 3.5'; as above; olive; slight hydrocarbon odor
5-10		Bentonite Seal	12-16	153				5-10	@ 10'; as above; wet; strong hydrocarbon odor
10-15		Class "H" Portland Cement	15-16					10-15	@ 14'; as above; yellow brown and red; no odor
15-20		No. 2 Washed Monterey Sand	30-35					15-20	@ 19'; as above; olive; strong hydrocarbon odor
20-25		2" I.D. 0.020" Slotted PVC Well Screen	35-35					20-25	
25-30			50/4"					25-30	Bottom of boring at 25.0'

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well IW-5

Project Name: Lim Family

Project Location: 250 - 8th Street, Oakland, CA

Page 1 of 1

Driller: Kvilhaug Well Drilling

Type of Rig: Hollow-Stem Auger

Size of Drill: 8.0" Diameter

Logged By: Greg Schramm

Date Drilled: February 2, 1999

Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Total Depth of Well Completed: 25.0'

Depth of Water First Encountered: 15'

Well Screen Type and Diameter: 2" Diameter PVC Casing

Static Depth of Water in Boring: 15'

Well Screen Slot Size: 0.020"

Total Depth of Boring: 25.0'

Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

Depth in Feet	BORING DETAIL	Description	SOIL/ROCK SAMPLE DATA					Depth in Feet	DESCRIPTION OF LITHOLOGY
			Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log		
0		Street Box Slip Cap						Concrete	
0 - 5		2" ID Blank Sch 40 PVC	22 23 26					Silty SAND (SM); yellow brown; dense; damp; 80% fine sand; 20% silt; non-plastic; medium estimated K; strong hydrocarbon odor	
5 - 10		Bentonite Seal							
10 - 15		Class "H" Portland Cement							
15 - 20		No. 2 Washed Monterey Sand	17 17 16						
20 - 25		2" I.D. 0.020" Slotted PVC Well Screen	30 40 50/4					@ 19'; as above; olive; strong hydrocarbon odor	
25 - 30			25 50/4					Bottom of boring at 25.0'	