aqua science engineers inc.

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February 26, 1999

WORKPLAN
for a
SOIL AND GROUNDWATER ASSESSMENT
at
The Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

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

1.0 INTRODUCTION

This submittal outlines Aqua Science Engineers, Inc. (ASE)'s workplan for a soil and groundwater assessment at the former Olympic Service Station located at 1436 Grant Avenue in San Lorenzo, California (Figure 1). The site assessment activities were initiated by the property owner, Mr. George Jaber, as required in a letter from the Alameda County Health Care Services Agency (ACHCSA) dated October 21, 1998 (Appendix A).

2.0 BACKGROUND INFORMATION

2.1 Underground Storage Tank Removal Project

On July 8, 9 and 10, 1998, one 10,000 gallon gasoline, one 8,000 gallon gasoline, one 5,000 gallon diesel, and one 250 gallon waste-oil underground storage tank (UST) were removed from the subject site by Reese Construction. The fuel tanks served six dispensers which were also removed by Reese. Groundwater was present in the fuel UST pit; no water was present in the waste-oil UST pit. Soil samples collected from the excavation sidewalls and bottoms and stockpiled soil indicated elevated levels of petroleum hydrocarbons, solvents and lead. The highest concentrations were as follows: total petroleum hydrocarbons as gasoline (TPH-G) at 5,700 parts per million (ppm), total petroleum hydrocarbons as diesel (TPH-D) at 1,300 ppm, oil and grease at 4,300 ppm, benzene at 30 ppm, toluene at 180 ppm, ethylbenzene at 93 ppm, xylenes at 430 ppm, MTBE at 27 ppm, and lead at 1,900 ppm. The waste-oil UST excavation also contained 26 parts per billion (ppb) 1,1-DCA, 100 ppb cis-1,2-DCE, and 1,200 ppb PCE. See the Reese Construction UST Removal letter dated September 14, 1998.

2.2 Stockpiled Soil Sampling

On November 11, 1998, ASE collected soil samples from the stockpiled soil which previously surrounded the gasoline and diesel-fuel USTs. The sampling event was performed to identify if the stockpiled soil was suitable for re-use as backfill material. Four composited soil samples were collected from the two fuel UST stockpiles and were analyzed by Chromalab, Inc. of Pleasanton, California (ELAP # 1094) for TPH-G by EPA Method 8015M, TPH-D by EPA Method 8015M, BTEX and MTBE by EPA Method 8020, and total lead by EPA Method 6010, see Figure 2. The soil samples contained no detectable concentrations of TPH-G, up to 280 ppm TPH-D, no detectable concentrations of benzene, up to 0.055 ppm toluene, 0.026 ppm ethylbenzene, 0.066 ppm total xylenes, 0.012 ppm MTBE and 110 ppm total lead. These results were reported in an ASE letter report dated November 24, 1998 to Mr. Scott Seery of the Alameda

County Health Care Services Agency (ACHCSA). Soon after his receipt of the stockpile sampling report, Mr. Seery contacted ASE to give verbal approval for re-use of the stockpiles back in the fuel USTs' excavation. The fuel UST excavation was subsequently backfilled and compacted by a company subcontracted directly by Mr. Jaber.

2.3 Waste-Oil UST Overexcavation

Due to the presence of elevated concentrations of petroleum hydrocarbons, oil and grease, volatile organic compounds (VOCs) and total lead at the bottom of the waste-oil UST excavation, ASE recommended overexcavation of the area followed by confirmation soil sampling. On December 18, 1998, ASE witnessed the overexcavation of the waste-oil UST pit, see Figure 3. The excavation activities continued to a depth of 12-feet below ground surface (bgs) using a backhoe. Deeper excavation was not feasible due to the presence of the excavation in relation to the adjacent building wall. The excavated spoils were stockpiled with the spoils generated during the UST removal.

Soil sample WO-OEX-12' was collected from the bottom of the excavation. A four-point composite soil sample was collected from the stockpiled soil, WO-STKP (A-D), see Figure 3. Both of the soil samples were analyzed by Chromalab for TPH-G, TPH-D and motor oil (TPH-D/MO), BTEX and MTBE, oil & grease, LUFT 5 metals, VOCs, and semi-volatile organic compounds (SVOCs). Sample WO-STKP (A-D) was also analyzed for lead using the waste extraction test (WET) and the toxicity characteristic leaching procedure (TCLP).

The bottom of excavation soil sample contained the following: TPH-MO at 940 ppm, TPH-D at 250 ppm, oil & grease at 570 ppm, and total lead at 996 ppm. The remaining compounds have concentrations below action levels. The TPH concentrations of the 12-foot bgs soil sample are significantly lower than the concentrations within the soil sample collected just below the UST after it removal. The most obvious concern relates to the lead concentration which is only slightly less than the US EPA Region IX Preliminary Remedial Goal (PRG) for industrial soil. This current total lead concentration is roughly half of the concentration of the soil sample collected just below the UST after it removal.

The stockpiled soil sample contained elevated concentrations of TPH-MO at 2,100 ppm, TPH-D at 550 ppm, oil & grease at 1,300 ppm, and WET lead at 54 ppm. The TCLP lead result was less than the detection limit of 1 ppm. The remaining compounds have concentrations below action levels. This volume of stockpiled soil will require disposal at a hazardous landfill.

The waste-oil UST excavation was subsequently backfilled completely with import material. The stockpiled soil remains at the site pending approval into a hazardous waste landfill.

2.4 Dispenser Area

On December 18, 1998, ASE also collected a soil sample after overexcavation activities in the area of one of the former dispensers, see Figure 2. This was performed in an attempt to eliminate the source of soil contamination that caused a soil sample collected during the dispenser removal operation to contain 5,700 ppm TPH-G. Soil sample D1G-OEX-3.5' was collected and analyzed for TPH-G, TPH-D, BTEX, MTBE and total lead. TPH-G, TPH-D, BTEX and MTBE was not detected above detection limits. The total lead concentration was 6.3 ppm.

3.0 PROPOSED SCOPE OF WORK (SOW)

Based on the requirements of the ACHCSA, ASE's proposed SOW is as follows:

1) Prepare a workplan and a health and safety plan for approval by the ACHCSA.

2) Obtain a drilling permit from the Alameda County Public Works Agency (ACPWA).

3) Drill three (3) soil borings to approximately 25-feet bgs at the site, see Figure 4.

4) Analyze at least one soil sample from each boring at a CAL-EPA certified analytical laboratory for TPH-G by modified EPA Method 5030/8015, TPH-D by modified EPA Method 3550/8015, BTEX and MTBE by EPA Method 8020, and total lead by EPA Method 6010. The soil sample collected from the boring drilled near the former waste-oil UST will also be analyzed for TPH-MO by EPA Method 3550/8015M, oil & grease by Standard Method 5520 E&F, LUFT 5 metals by EPA Method 6010, VOCs by EPA Method 8010, and SVOCs by EPA Method 8270.

5) Install 2-inch diameter groundwater monitoring wells in each boring described in task 3.

6) Develop the monitoring wells.

7) Collect groundwater samples from each monitoring well for analyses.

8) Analyze the groundwater samples at a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, BTEX and MTBE. The groundwater sample collected from the boring drilled near the former waste-oil UST will also be analyzed for TPH-MO, oil & grease, VOCs, and SVOCs.

9) Survey the top of casing elevation of each well, and determine the groundwater flow direction and gradient beneath the site.

10) Prepare a report detailing the methods and findings of this assessment.

Details of the assessment are presented below.

TASK 1 - PREPARE A WORKPLAN AND HEALTH AND SAFETY PLAN

Based on the site history and the analytical results of the soil and groundwater samples collected during the previous assessment at the site, ASE has prepared a site-specific health and safety plan. A nearby hospital is designated in the site safety plan as the emergency medical facility of first choice. A copy of the site specific Health and Safety Plan is appended to this report (Appendix B).

TASK 2 - OBTAIN NECESSARY PERMITS

ASE will obtain a drilling permit from the Alameda County Public Works Agency (ACPWA). ASE will also notify Underground Service Alert (USA) to have underground utility lines marked in the site vicinity.

TASK 3 - DRILL THREE SOIL BORINGS AT THE SITE

ASE will drill three soil borings at the locations shown on Figure 4. The borings will be drilled using a hollow-stem auger drill rig. The drilling will be directed by a qualified ASE geologist. **Undisturbed soil samples will be collected at least every 5-feet, at lithographic changes, and from just above the water table for subsurface hydrogeologic description and possible chemical analysis.** The samples will be described by the ASE geologist according to the Unified Soil Classification System. The samples will be collected in brass tubes using a split-barrel drive sampler advanced ahead of the auger tip by successive blows from a 140-lb. hammer dropped 30-inches. Each sample will be immediately removed from the sampler, trimmed, sealed with Teflon tape and plastic caps, secured with duct tape, labeled with the site location, sample designation, date and time the sample was collected, and the initials of the person collecting the sample. The samples will be placed into an ice chest containing wet ice for delivery under chain of custody to a CAL-EPA certified analytical laboratory.

Soil from the remaining tubes not sealed for analysis will be removed for hydrogeologic description and will be screened for volatile compounds with an organic vapor meter (OVM). The soil will be screened by emptying soil from one of the tubes into a plastic bag. The bag will be sealed and placed in the sun for approximately 10 minutes. After the hydrocarbons have been allowed to volatilize, the OVM will measure the vapor through a small hole punched in the bag. These OVM readings will be used as a screening tool only since these procedures are not as rigorous as those used in an analytical laboratory.

All sampling equipment will be cleaned in buckets with brushes and a trisodium phosphate (TSP) or Alconox solution, then rinsed twice with tap water. Rinsates will be contained on-site in 55-gallon steel drums until off-site disposal can be arranged.

TASK 4 - ANALYZE AT LEAST ONE SOIL SAMPLE FROM EACH BORING

At least one soil sample from each boring will be analyzed at a CAL-EPA certified environmental laboratory for TPH-G by modified EPA Method 5030/8015, TPH-D by modified EPA Method 3550/8015, BTEX and MTBE by EPA Method 8020, and total lead by EPA Method 6010. The soil sample collected from the boring drilled near the former waste-oil UST will also be analyzed for TPH-MO by EPA Method 3550/8015M, oil & grease by Standard Method 5520 E&F, LUFT 5 metals by EPA Method 6010, VOCs by

TPH-D G BTEX/M OG VOC SVOC

EPA Method 8010, and SVOCs by EPA Method 8270. **The soil sample to be analyzed will be the sample which appears to be the most contaminated based on odors, staining and/or OVM readings.** If there is no indication of contamination in any of the samples, the sample collected from just above the water table (the capillary zone) will be selected for analysis.

TASK 5 - COMPLETE THE BORINGS AS MONITORING WELLS

ASE will complete the borings described in task 3 as 2-inch diameter groundwater monitoring wells. The wells will be constructed with 2-inch diameter, flush-threaded, schedule 40, 0.020-inch slotted PVC well screen and blank casing. The well casing will be lowered through the augers and #3 Monterey sand will be placed in the annular space between the well casing and the borehole to approximately 1.5-feet above the screened interval. Approximately 0.5-foot of bentonite pellets will be placed on top of the sand pack and hydrated with deionized water. This bentonite layer will prevent the cement sanitary seal from infiltrating into the sand pack. Cement mixed with 3 to 5 percent bentonite powder by volume will be used to fill the annular space between the bentonite layer and the surface to prevent surface water from infiltrating into the well. The well head will be protected by a locking well plug and an at-grade, traffic-rated well box (See Figure 5 - Typical Monitoring Well).

The well will be screened to monitor the first water-bearing zone encountered. Wells are typically screened with 5-feet of screen above the water table and 10 to 15-feet of screen below the water table. However, since ASE anticipates groundwater to be encountered at a very shallow depth beneath the site, less vadose zone will be screened than usual to allow for a reasonable sanitary seal to be installed. ASE anticipates that the wells will be screened between 4-feet bgs and 19-feet bgs.

TASK 6 - DEVELOP THE MONITORING WELLS

The monitoring wells will be developed after waiting at least 72 hours after well construction. The wells will be developed using at least two episodes of surge block agitation and bailer or pump evacuation. At least ten well casing volumes of water will be removed during the development, and development will continue until the water appears to be reasonably clear. The well development purge water will be stored temporarily on-site in sealed and labeled 55-gallon steel drums until off-site disposal can be arranged.

TASK 7 - SAMPLE THE MONITORING WELLS

After waiting 72 hours after the well development, ASE will sample the monitoring wells. Prior to purging and sampling, the groundwater surface in each well will be checked for sheen or free-floating hydrocarbons. The thickness of any free-floating hydrocarbons will be measured with an acrylic bailer which will be lowered slowly to the groundwater surface and filled approximately half full for direct observation. ASE will also measure the depth to groundwater in all site wells prior to purging water from any well. Prior to sampling, each well will be purged of at least four well casing volumes of groundwater. The temperature, pH and electrical conductivity of evacuated water will be monitored during the well purging, and purging will continue beyond four well casing volumes if these parameters have not stabilized. Groundwater samples will be collected from each well using disposable polyethylene bailers. Groundwater samples to be analyzed for volatile compounds will be decanted from the bailers into 40-ml glass volatile organic analysis (VOA) vials, preserved with hydrochloric acid, sealed without headspace and labeled with the site location, sample designation, date and time the samples were collected, and the initials of the person collecting the samples. The samples to be analyzed for non-volatile compounds will be contained in 1-liter amber glass containers. The samples will then be placed into an ice chest with ice for transport to the analytical laboratory under chain of custody. Purged groundwater will be stored temporarily on-site in sealed and labeled 55-gallon steel drums until off-site disposal can be arranged.

TASK 8 - ANALYZE THE GROUNDWATER SAMPLES

The groundwater samples will be analyzed by a CAL-EPA certified analytical laboratory for TPH-G by modified EPA Method 5030/8015, TPH-D by modified EPA Method 3550/8015, BTEX and MTBE by EPA Method 8020. The groundwater sample collected from the well near the former waste-oil UST will also be analyzed for TPH-MO by EPA Method 3550/8015M, oil & grease by Standard Method 5520 E&F, VOCs by EPA Method 8010, and SVOCs by EPA Method 8270.

TPH-G
D
BTEX/M
TPH-MO
OG
VOC
SVOC

TASK 9 - SURVEY THE TOP OF CASING ELEVATION OF EACH WELL

ASE will survey the top of casing elevation of each well relative to a project datum. These elevations will be used with the depth to groundwater measurements to determine the groundwater flow direction and gradient beneath the site.

TASK 10 - PREPARE A SUBSURFACE ASSESSMENT REPORT

ASE will prepare a subsurface assessment report outlining the methods and findings of this assessment. This report will include a summary of the results, the site background and history, description of the well construction, development and sampling, tabulated soil and groundwater analytical results, conclusions and recommendations. Formal boring logs, analytical reports, and chain of custody documents will be included as appendices. This report will be submitted under the seal of a California registered civil engineer or geologist.

4.0 SCHEDULE

ASE plans to begin field activities immediately upon approval of this workplan by the ACHCSA.

Should you have any questions or comments, please 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

Distribution List:

Mr. George Jaber, Property Owner
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Alameda, CA 94501

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Alameda County Health Care Services Agency
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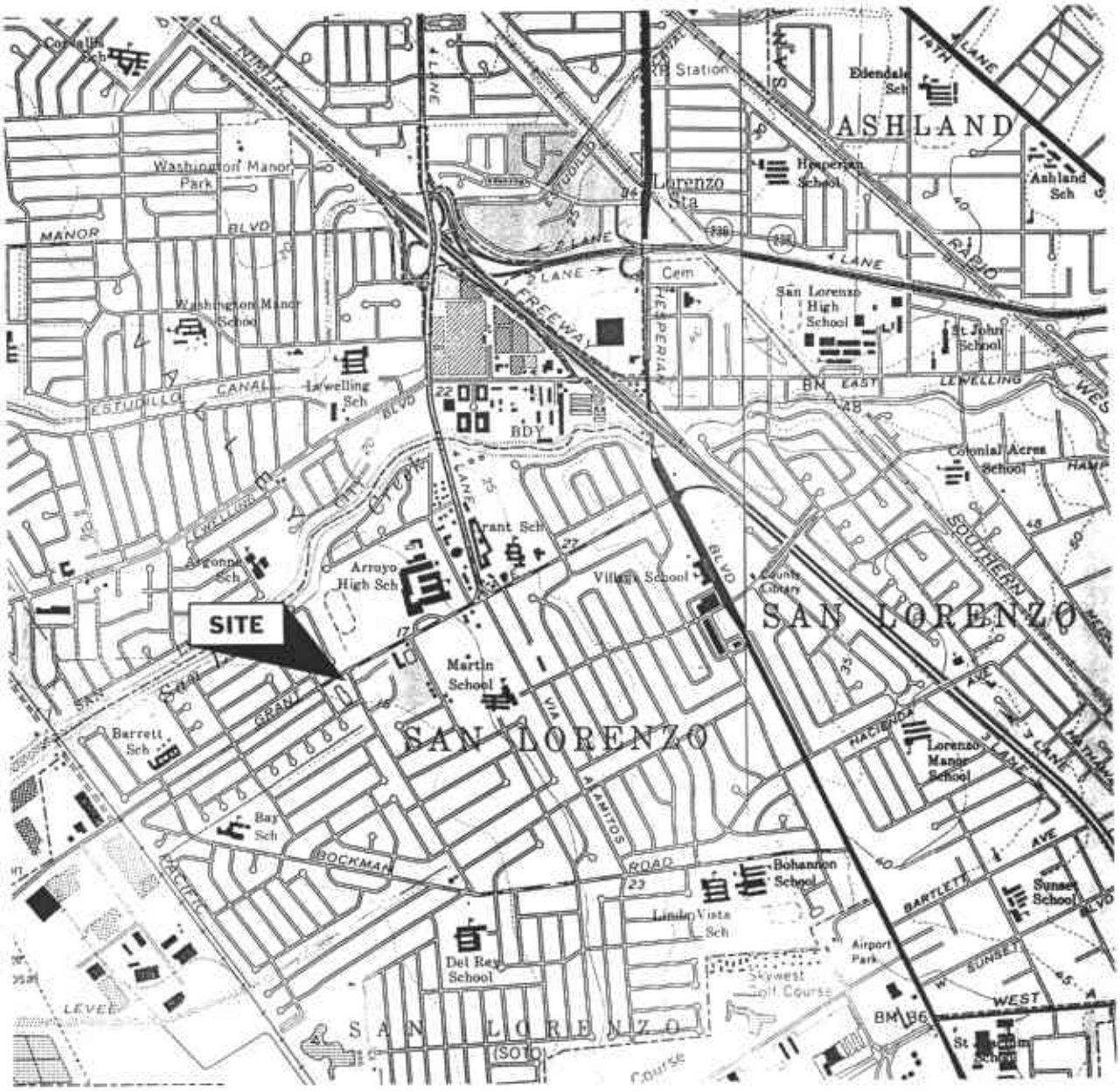
Alameda, CA 94502

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

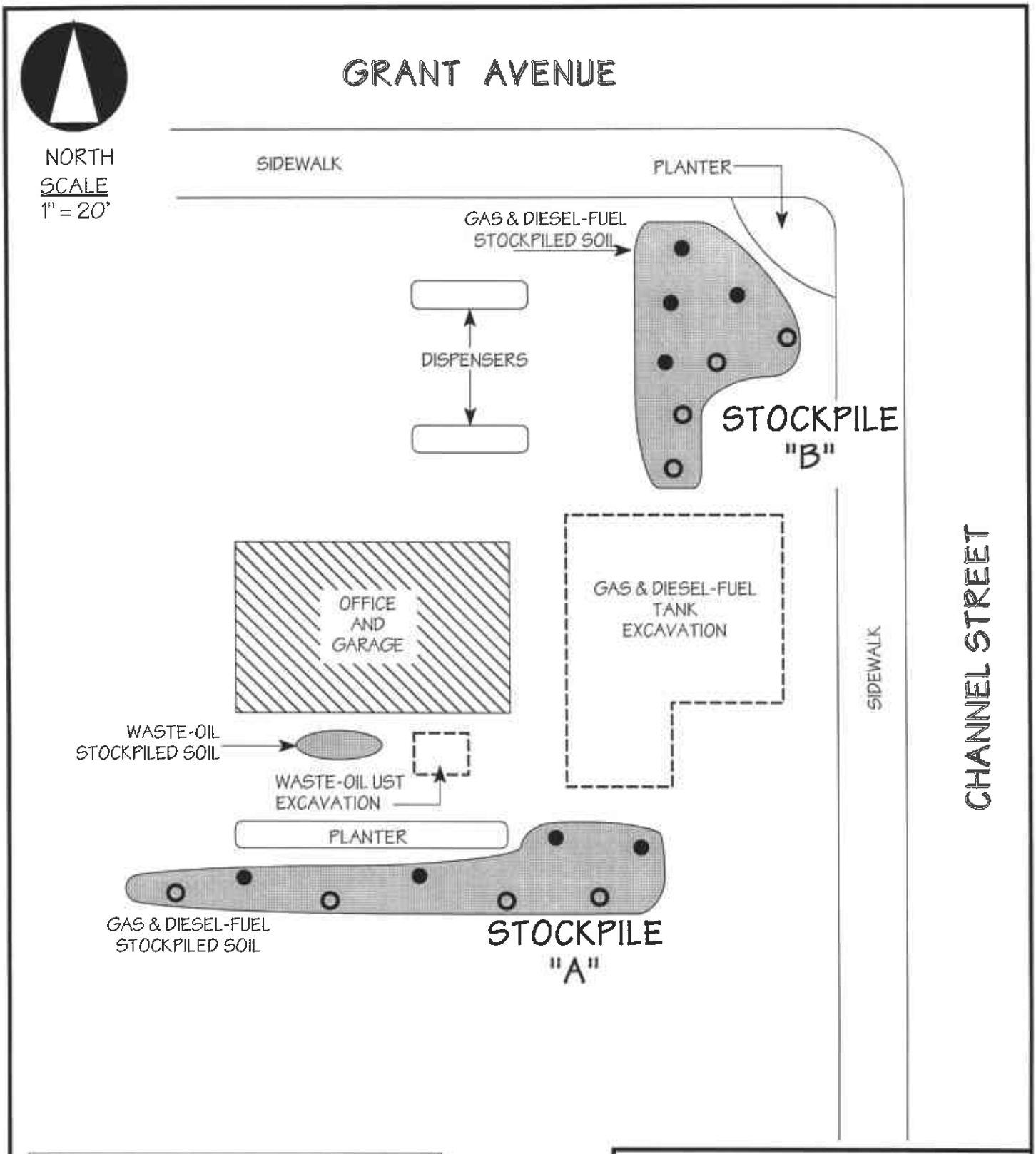
NORTH



LOCATION MAP

Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

AQUA SCIENCE ENGINEERS, INC. | Figure 1



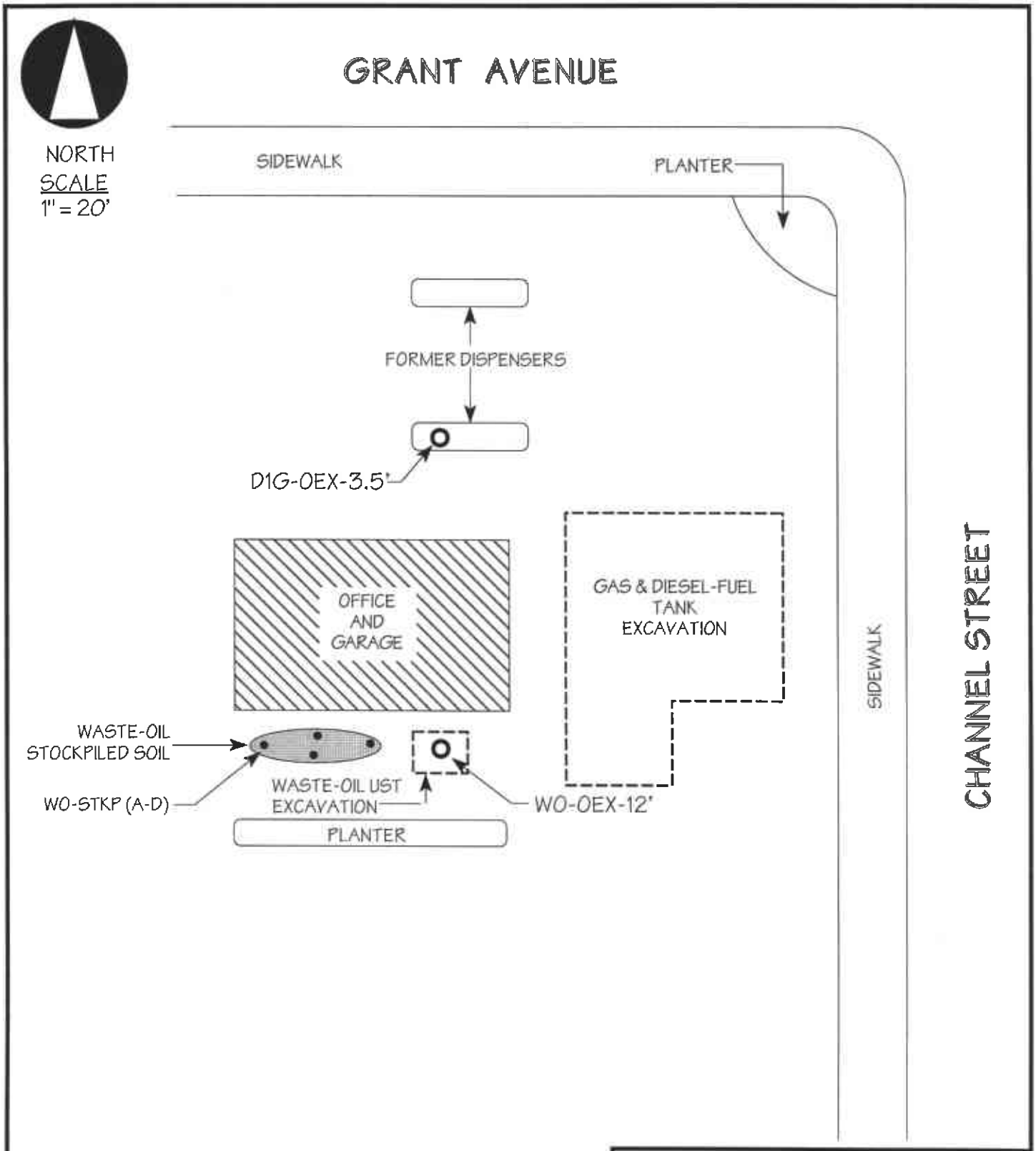
LEGEND

- ○ COMPOSITE SOIL SAMPLES 1-4
- ● COMPOSITE SOIL SAMPLES 5-8

STOCKPILED SOIL SAMPLING MAP

Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

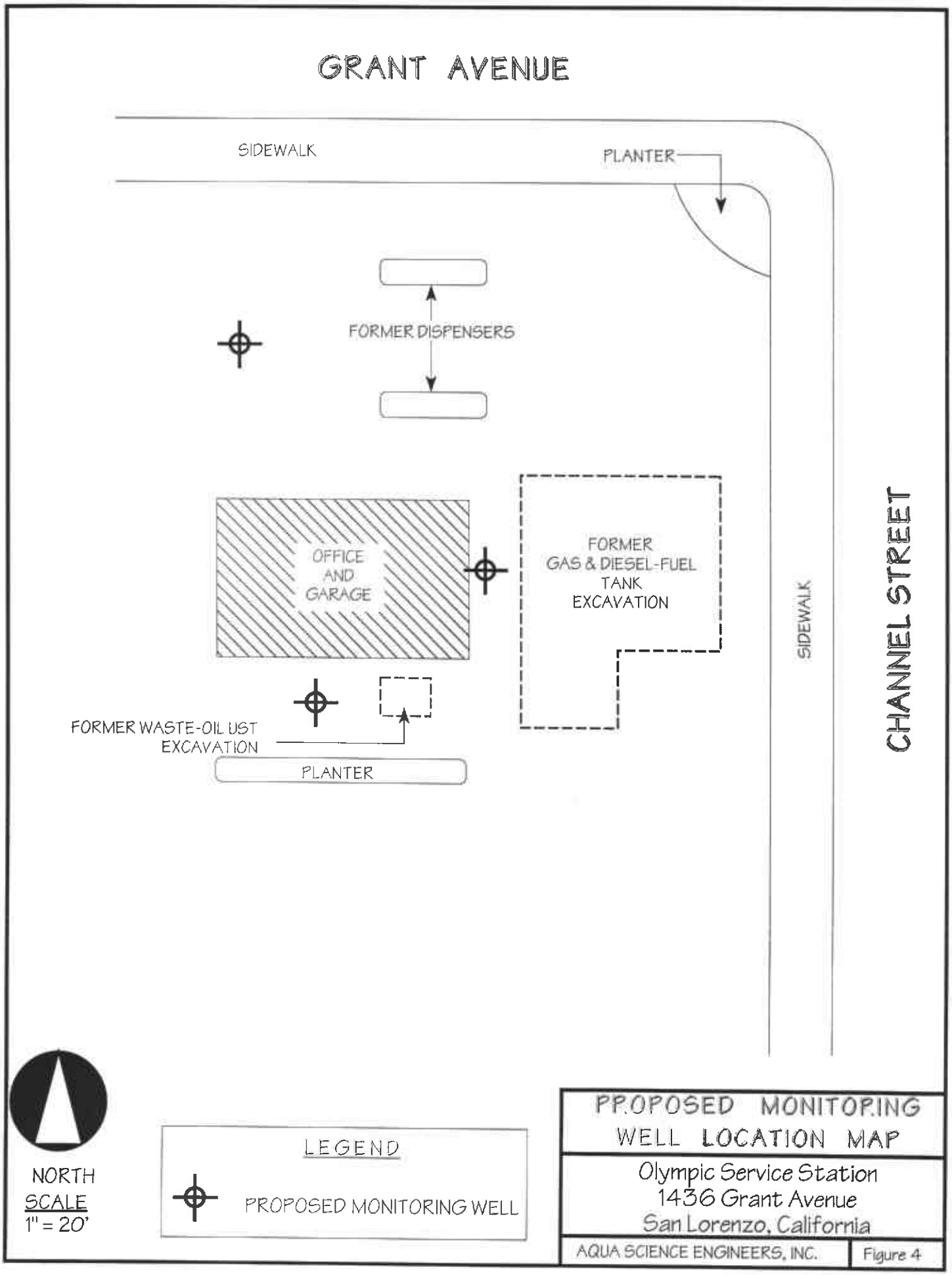
AQUA SCIENCE ENGINEERS, INC. | Figure 2



WASTE-OIL UST OVEREX. SAMPLING MAP

Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

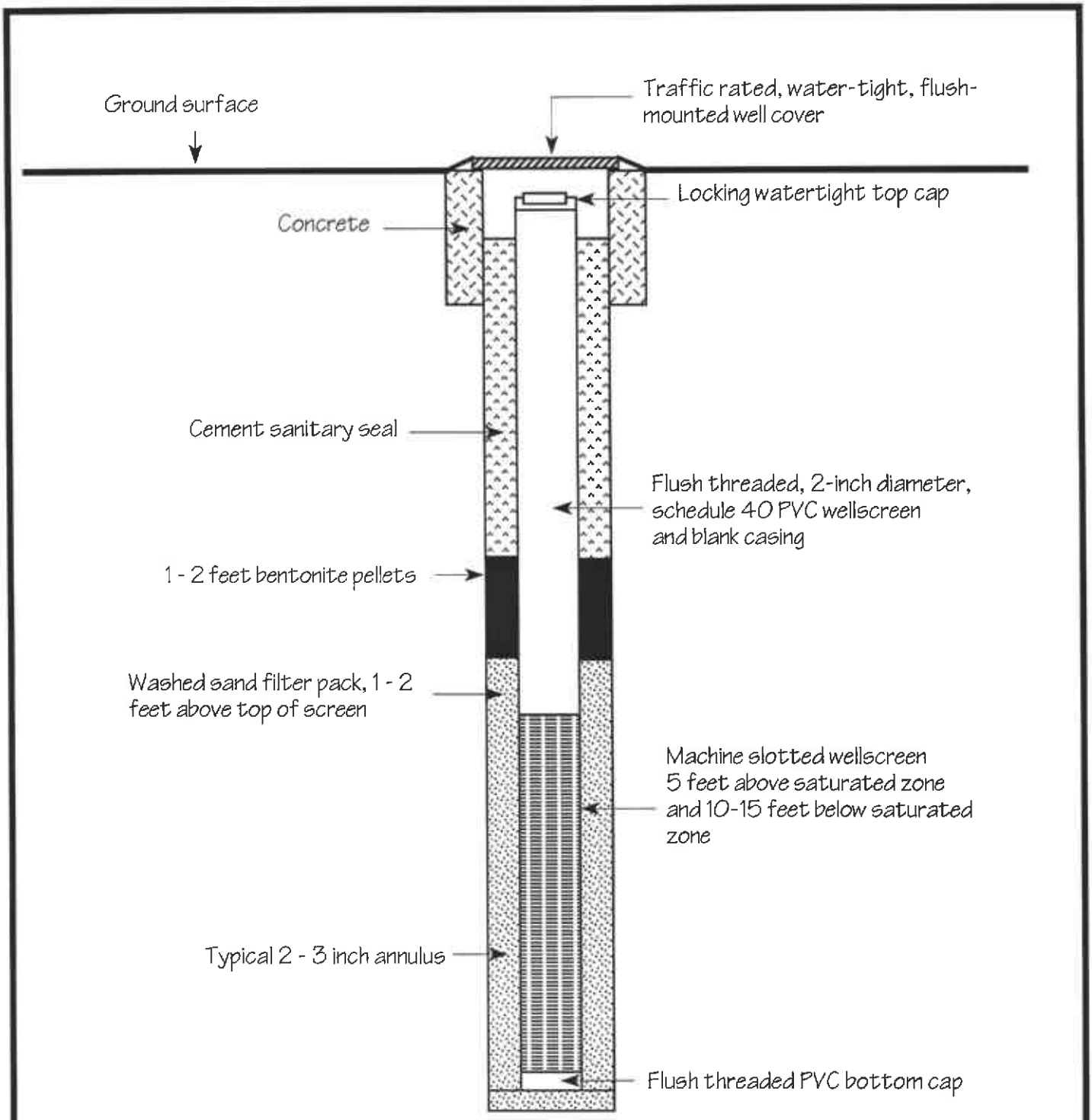
AQUA SCIENCE ENGINEERS, INC. | Figure 3



PROPOSED MONITORING WELL LOCATION MAP

Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

AQUA SCIENCE ENGINEERS, INC. | Figure 4



TYPICAL
MONITORING WELL CONSTRUCTION
IN CROSS SECTION

Aqua Science Engineers | Figure 5

APPENDIX A

Alameda County Health Care Services Agency Letter

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

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

October 21, 1998

STID 1791

Mr. George Jaber
2801 Encinal Avenue
Alameda, CA 94501

RE: Olympic Service Station, 1436 Grant Avenue, San Lorenzo – Request for Stockpile Management and Site Restoration Plan, and Preliminary Site Assessment Work Plan

Dear Mr. Jaber:

We are in receipt and have completed review of the September 14, 1998 Reese Construction final report documenting the July 8 – 10, 1998 closure of three (3) fuel and one waste oil underground storage tanks (UST) at the subject site. One 10,000-gallon gasoline, one 8000-gallon gasoline, one 5000-gallon diesel, and one 250-gallon waste oil USTs were removed during the course of this project. All fuel USTs were comprised of tar-wrapped steel; the waste oil UST was comprised of bare steel. All tanks were of single-wall construction.

Evidence of an unauthorized release was observed during the course of the tank closures. Such evidence included the presence of stained and odorous soil within both UST excavations, as well as the appearance of apparent product sheen on groundwater which entered the fuel UST excavation. The waste oil tank also exhibited several throughgoing holes.

Review of laboratory data presented in the cited Reese Construction report indicates up to 3800 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPH-G) and 30 ppm benzene, among other fuel compounds, were detected in soil samples collected from the fuel tank excavation. Up to 5700 ppm TPH-G, among other fuel compounds, was identified in a sample collected beneath one of the dispenser islands. In addition, 1900 ppm inorganic lead (Pb), 4300 ppm oil & grease, 200 ppm TPH-G, 1300 ppm TPH as diesel (TPH-D), and various halogenated volatile organic compounds (HVOC) and semi-volatile organic compounds (SVOC), among others detected, were identified in the sample collected beneath the waste oil tank. The Pb concentration alone constitutes a *hazardous waste* level in California.

Soil stockpiles are currently poorly secured and arranged around the periphery of the site. Portions of one stockpile encroach on the adjoining shopping center parking lot. Stockpiles are only partially covered with plastic sheeting. The tank pits remain open.

At this time you are to submit the following documents:

1. *Stockpile Management and Site Restoration Plan (SMSRP)*

2. *Preliminary Site Assessment (PSA)* work plan

The SMSRP is to describe necessary tasks for the appropriate management of the reported 200-yds^3 soil stockpile and restoration of the UST excavations at the site. The SMSRP will include i) a stockpile sampling, management, treatment, transport, disposal and/or reuse elements; and ii) a proposal to restore the UST excavations to grade. These two elements are intimately intertwined, as it is conceivable that some of the stockpile material may be acceptable for placement back into the excavations, often a much less expensive alternative to hauling the material to a licensed landfill. It is anticipated that additional testing *and treatment* of the stockpile will be necessary to facilitate this option. Clean, imported fill will nonetheless be necessary to restore the excavations completely, whether some portion is filled with (treated) stockpile soil or not.

The SMSRP must also include plans to address the *hazardous waste* levels of Pb within the waste oil UST excavations. This Pb-impacted material must be excavated to levels that do not exceed hazardous waste concentrations. Management of the stockpile associated with the waste oil UST will not include the potential for its reuse as fill for the UST excavations. This material will require removal to an acceptable landfill. The SMSRP will need to address this.

And finally, consistent with provisions of Article 11, *Corrective Action Requirements*, Section 2720 et seq., Title 23, California Code of Regulations (CCR), a PSA must be conducted to assess the extent of the UST release at the site. The PSA work plan will present the scope of work necessary to complete this initial phase of the assessment process. This task will typically involve the installation of several soil borings and construction of an array of monitoring wells strategically located to track contaminant location. General guidance for the elements of a PSA work plan is presented in the attached Appendix A.

Both the SMSRP and PSA work plan require that you hire a California-licensed or registered engineer or geologist with the appropriate experience in conducting such environmental projects. Such licensing and registration is by provision of the Business and Professions Code.

The **SMSRP** is due within **30 days** of the date of this letter. The **PSA work plan** is due within **60 days** of the date of this letter.

Please be advised that the SMSRP must be implemented before the onset of the rainy season.

Please call me at (510) 567-6783 should you have any questions.

Sincerely,

Scott O. Seery, CHMM
Hazardous Materials Specialist

Enclosure

cc: Mee Ling Tung, Director, Environmental Health
Chuck Headlee, RWQCB

APPENDIX B

Health and Safety Plan

aqua science engineers inc.

HEALTH & SAFETY PLAN

for the

Jaber Jobsite
Former Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

prepared by

Aqua Science Engineers, Inc.
208 West El Pintado Road
Danville, California 94526
(925) 820-9391

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AQUA SCIENCE ENGINEERS, INC.
HEALTH & SAFETY PLAN
for the
JABER JOBSITE

A. GENERAL DESCRIPTION

Site: 1436 GRANT AVENUE, SAN LORENZO, CALIFORNIA

Work Scope: AQUA SCIENCE ENGINEERS WILL INSTALL THREE GROUNDWATER MONITORING WELLS AT THE ABOVE REFERENCED SITE.

SAFETY POLICY:

This Health and Safety Plan is written specifically for the Jaber jobsite. All persons on site will follow OSHA safe operating practices as outlined in 29 CFR 1910 and 1926, as well as established guidelines from their respective companies or organizations.

Plan Prepared by: Robert Kitay Date: 2/25/99

Plan Approved by: David Allen Date: 2/25/99

Background Review Done? Complete: 2/25/99
Preliminary:

Overall Hazard Level: Serious: Low: XXX
Moderate: Unknown:

Project Organization:
Site Manager for A.S.E.: Robert Kitay
A.S.E. Safety Officer: David Allen
Other A.S.E Personnel: Greg Schramm

B. SITE/WASTE CHARACTERISTICS

Waste Type(s): Solid: XXX Sludge: Liquid: XXX Gas:

Characteristics: HYDROCARBON RESIDUALS, TOXIC

Site Parameter:
THE MONITORING WELL LOCATIONS ARE IDENTIFIED AS AN EXCLUSION ZONE. A MINIMUM BOUNDARY OF THREE FEET IS TO BE MAINTAINED AS MUCH AS IS POSSIBLE.

C. HAZARD EVALUATION

CHEMICAL HAZARDS

Potential chemical hazards include skin and eye contact or inhalation exposure to potentially toxic concentrations of hydrocarbon vapors. The potential toxic compounds that may exist at the site are listed below, with descriptions of specific health effects of each. The list includes the primary potential toxic constituents of gasoline and waste oil known to be on site. Exposure levels and symptoms are taken from the NIOSH Pocket Guide to Chemical Hazards.

1. BENZENE

a. Colorless, clear, highly flammable liquid with characteristic odor.
b. High exposure levels may cause acute restlessness, convulsions, depression, respiratory failure. BENZENE IS A KNOWN CARCINOGEN.
c. Permissible exposure level (PEL) for a time weighted average (TWA) over an eight hour period is 1.0 ppm.

2. TOLUENE

a. Colorless liquid with a benzene-like odor.
b. High exposure levels may cause fatigue, euphoria, confusion, dizziness. TOLUENE IS LESS TOXIC THEN BENZENE.
c. PEL for a ten hour TWA is 100 ppm.

3. XYLENE

a. Colorless, flammable liquid with aromatic odors.
b. high exposure levels may case dizziness, drowsiness, narcosis.
c. PEL for a ten hour TWA is 100 ppm.

4. ETHYLBENZENE

a. Clear, colorless, highly flammable liquid with characteristic odor.
b. High exposure levels may cause irritation to skin, nose and throat, dizziness, constriction in chest, loss of consciousness, respiratory failure.
c. PEL for an eight hour TWA is 100 ppm.

5. LEAD

a. A heavy, ductile, soft, gray solid.
b. High exposure levels can affect the CNS, kidneys and blood.
c. PEL for an eight hour TWA is 0.05 ppm.

6. PCE

a. A colorless liquid with a mild chloroform-like odor.
b. High exposure levels can affect the CNS, kidneys, liver, and RESP.
c. PEL for an eight hour TWA is 100 ppm.

ALL SUBSTANCES AS THEY EXIST ON SITE ARE EXPECTED TO BE STABLE.

PHYSICAL HAZARDS

Personnel shall maintain the maximum distance possible from the borings while performing their activities. Other on-site hazards include physical injuries due to the proximity of workers to engine-driven heavy equipment and tools. Heavy equipment used during drilling includes a drill rig. Only trained personnel will operate machines, tools and equipment; all will be kept clean and in good repair. Minimum safety apparel required around heavy equipment will include a hardhat, steel-toed boots and hearing conservation devices. ALL WORK WILL BE PERFORMED IN ACCORDANCE WITH OSHA GUIDELINES.

Inspections of well location, the adjacent areas, and protective systems are to be made by a qualified person while personnel are on site.

1. USE SAFETY EQUIPMENT, MASK RESPIRATORS WITH NIOSH APPROVED C-21 CARTRIDGES FOR ORGANIC VAPORS, AS NECESSARY.

2. HAVE AT LEAST ONE DRY CHEMICAL MODEL PA-200 A-B-C FIRE EXTINGUISHER PRESENT.

LEVEL OF PROTECTION

A contamination Reduction Zone (CRZ) will be maintained and adjusted as work proceeds and moves around the site. The workers on-site will wear level 'D' protective clothing. (This protection level may be upgraded after on-site conclusions of data are completed). THE LEVEL OF PROTECTION FOR PERSONNEL WORKING IN THE AREA WILL BE UPGRADED IF: THE ORGANIC VAPOR LEVELS IN THE OPERATOR'S BREATHING ZONE EXCEEDS 5 PPM ABOVE BACKGROUND LEVELS CONTINUOUSLY FOR MORE THAN FIVE MINUTES (to be monitored by a hand-held OVM). In this event, personnel protective equipment will include full face respirators with double-cartridge filters for organic vapors and particulates, in addition to hardhat, steel-toed boots and coveralls. If work proceeds in an environment where vapor concentrations exceed 200 ppm, a self contained breathing apparatus or airline respirator will be utilized by the personnel.

Levels of Protective Clothing are defined on the following pages as described in the "EPA Standard Operating Safety Guidelines":

LEVEL A PROTECTION

Components:

1) Pressure-demand, supplied air respirator that is MSHA and NIOSH approved. Respirators may be pressure demand, self contained breathing apparatus (SCBA), or pressure demand, airline respirator with an escape bottle for atmospheres with an extreme IDLH.

2) Fully encapsulating chemical resistant suit.

3) Inner, chemical resistant gloves.

4) Disposable gloves and boot covers, worn over the fully encapsulating suit.

5) 2-way radio communications is highly recommended.

LEVEL B PROTECTION

Components:

1) Pressure-demand, supplied air respirator that is MSHA and NIOSH approved. Respirators may be pressure demand, self contained breathing apparatus (SCBA), or pressure demand, airline respirator with an escape bottle for atmospheres with an extreme IDLH.

2) Chemical resistant clothing which includes overalls and long sleeved jacket or, hooded one or two piece chemical splash suit or disposable chemical resistant one piece suit..

3) Outer chemical resistant gloves.

4) Inner chemical resistant gloves.

5) Chemical resistant, steel toed and shank boots.

6) Disposable chemical resistant boot covers.
7) Hardhat.

8) 2-way radio communications is highly recommended.

LEVEL C PROTECTION

Components:

1) Air purifying respirator, full face, with twin cartridge or cannister equipped filters, that are MSHA and NIOSH approved.

2) Chemical resistant clothing which includes coveralls or, hooded one-piece or two-piece chemical splash suit or chemical resistant hood and apron; disposable chemical resistant coveralls.

3) Outer chemical resistant gloves.

4) Inner chemical resistant gloves.

5) Chemical resistant, steel toed and shank boots.

6) Disposable chemical resistant boot covers.

7) Hardhat.

LEVEL D PROTECTION

Components:

1) Coveralls.

2) Gloves.

3) Leather boots, shoes or chemical resistant, with steel toe and shank.

4) Safety glasses or chemical splash goggles.

5) Hardhat or face shield.

SITE ENTRY PROCEDURES

Any personnel entering the site will observe all conditions set forth by the owners/operators of the property, including vehicle travel speeds, restricted areas and conduct. Eating, drinking, smoking and other practices which increase the probability of hand-to-mouth transfer of contamination is prohibited in the work zone. All field personnel will be instructed to thoroughly wash their hands and face upon leaving the work area for breaks or cessation of day's activities.

DECONTAMINATION PROCEDURES

If required, equipment and personnel decontamination areas will be designated by the Project Manager at the start of the project. To prevent the transfer of contamination from the work site into clean areas, all tools will be cleaned adequately prior to final removal from the work zone. Disposable protective clothing such as Tyvek coveralls, latex gloves, boot covers, etc. will be changed on a daily basis or at the discretion of the Project Manager on site. All disposable protective clothing will be put into plastic bags and disposed of in a proper manner. All respirator cartridges will be discarded and replaced with fresh units on a daily basis, disposal will be in the same manner as the protective clothing. Excavated material and drill cuttings will be stockpiled in an area designated by the Project Manager, to be handled as agreed upon in the scope of work contract with the client.

In the event of a medical emergency, the injured party will be taken through decontamination procedures, if possible. However, the procedures may be omitted when it may aggravate or cause further harm to the injured party. member of the work team will accompany the injured party to the medical facility to advise on matters

concerning chemical exposure. The injured person will not transport themselves to the medical facility!

Personnel Protection Level will be Level 'D'. Protective clothing levels may be upgraded in the event that on site conclusions determine a greater then anticipated danger to personnel.

Site Entry: BARRICADES, CONES, OR BANNER GUARD MAY BE ERECTED TO CONTROL FOOT TRAFFIC AWAY FROM THE WORK ACTIVITY.

Decontamination-

Personnel and Equipment: IF REQUIRED, PERSONNEL AND EQUIPMENT WILL BE DECONTAMINATED AS PER USEPA STANDARD OPERATING SAFETY GUIDELINES. A SMALLER MODIFIED DECONTAMINATION LINE MAY BE USED DUE TO SPACE RESTRICTIONS.

Work Limitations (time, weather):

NONE ARE ANTICIPATED; HOWEVER, PERSONNEL WORKING ON SITE MAY EXPERIENCE ELEVATED TEMPERATURES DURING THE WORK DAY. IN THE EVENT THAT AMBIENT TEMPERATURES REACH OR EXCEED 80 DEGREES FAHRENHEIT, THE FOLLOWING GUIDELINES ARE RECOMMENDED.

1. Periods of work should be reduced to no less then one hour time frames and separated by breaks intended to reduce personnel stress due to reduced natural ventilation from wearing protective clothing.

2. All personnel wearing level C protective clothing or greater, will be subject to medical monitoring of body temperature after work periods, by the following guidelines;

a. Heart Rate (HR) should be measured by counting the radial pulse rate for 30 seconds and doubling count for the correct pulse rate. This should be done as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes, while the length of the rest period remains the same. If the HR is 100 beats per minute at the beginning of the next rest period, the following work period should be shortened by an additional 10 minutes.

b. Body temperatures should be measured orally with a clinical thermometer as soon as possible in each resting period. Oral

Temperatures (OT) should not exceed 99 degrees Fahrenheit. If it does, the next work period should be reduced by 10 minutes while the length of the resting period remains the same. If the OT exceeds 99 degrees Fahrenheit at the beginning of the next work period, the following work period should be reduced by an additional 10 minutes. OT should be measured at the end of each rest period to ensure that the body's temperature has dropped below 99 degrees Fahrenheit.

Body Water Loss (BWL) from sweating, could result in dehydration and further complications and stress on personnel working in protective clothing under adverse weather conditions. It is strongly recommended that plenty of stress relief beverages be available on site to replace body fluids. Commercial drink mixes that provide electrolyte balancing solutions or water are adequate for replacing body fluids.

Alternate methods of heat stress reduction can be made available such as,

Portable showers or hose-down facilities,
Shelter cover to protect against direct sunlight,
Rotating teams of personnel wearing protective clothing,
Performing extremely arduous tasks early in the workday.

EMERGENCY INFORMATION

In the event of an injury or suspected chemical exposure, the first responsibility of the project Manager will be to prevent any further injury. This objective will normally require an immediate stop to work until the situation is remedied. The Project Manager may order the evacuation of the work party. Other primary responsibilities in the event of an accident will be the first aid and decontamination of the injured team member(s). The injured party will be moved to a designated safe area and initial first aid will be rendered.

Employees are asked to make every effort and take personnel responsibility to prevent accidents involving machinery or any other aspect of the job, either by individual action or by notifying the Project Manager immediately of any unsafe condition that may exist.

In the event of an unexpected hazardous material discovery on site, the following actions will be taken by any employee involved;

1. The person having uncovered the unexpected material will notify the Project Manager and other workers of the danger. The site will be cleared of personnel if deemed necessary by the Project Manager. If site evacuation is required, appropriate local agencies such as the Fire Department or Health Department will be notified as well.

2. Immediate action will be taken to contain the hazardous material, provided the workers involved are properly attired with adequate protective clothing to avoid exposure.

3. Proper containment procedures will be determined for the hazardous material encountered prior to cleanup commencing. All personnel involved in the containment effort will be properly protected to prevent exposure. Backup personnel will be similarly protected while monitoring the work being done for any additional dangers.

4. The container(s) will be staged on-site, away from the major activity areas and in such a way that if loss of containment occurs, the

material will be withheld from further spread by a secondary containment berm or vessel.

5. The owner or agent controller of the property will be notified promptly of the incident and will be apprised as to the options available for proper disposal.

EXPOSURE SYMPTOMS AND FIRST AID

EXPOSURE ROUTE	SYMPTOMS	FIRST AID
Skin	Dermatitis, itching redness, swelling	Wash immediately with soap and water contact ambulance if evacuation is needed.
Eyes	Irritation, watering	Flush with water, transport directly to emergency room, if necessary.
Inhalation	Vertigo, tremors	Move person to fresh air, cover source of exposure.
Ingestion	Nausea, vomiting	Call Poison Control Center, DO NOT INDUCE VOMITING, transport to medical facility.

Local Resources:
HEALTH AND SAFETY CONTACT FOR ASE:

David Allen
Office: (925) 820-9391

Police : **911**
Fire

POISON CONTROL: SF (415) 476-6600

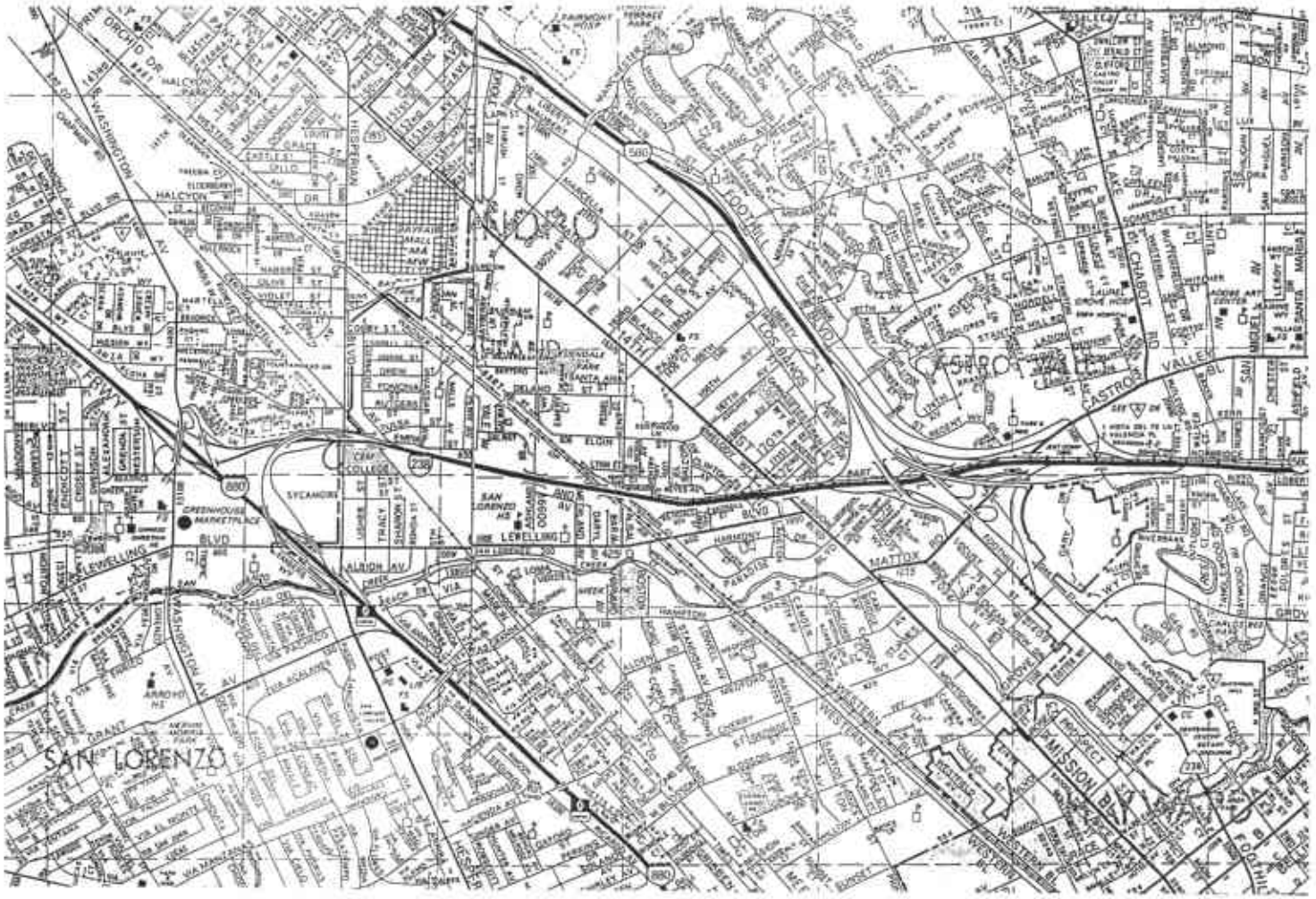
Hospital: Eden Hospital
20103 Lake Chabot Road
Castro Valley, CA
PHONE: 510-537-1234
(See attached Map)

AQUA SCIENCE ENGINEERS INC.

HAZARDOUS MATERIALS SITE SAFETY PLAN

The below signed personnel have read this plan, understand it's contents and agree to follow the guidelines set forth;

EMPLOYEE NAME (print)	SIGNATURE	DATE



HOSPITAL LOCATION MAP

Olympic Service Station
1436 Grant Avenue
San Lorenzo, California

AQUA SCIENCE ENGINEERS, INC. | Figure H