aqua science engineers inc.

1-29-92

January 27, 1992

Ms. Pamela J. Evans
Alameda County Health Care Services
Department of Environmental Health
80 Swan Way, Rm. 210
Oakland, CA 94621

Re: Workplan-Proposal for Monitoring Well Services at 21065 Foothill Blvd., Hayward, California.

Ms. Evans,

The following is Aqua Science Engineers' workplan for a monitoring well installation to be conducted at the site referenced above. The scope of work was developed from the Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites of August 10, 1990. The format for the proposal is from the Appendix A workplan for Initial Subsurface Investigation, Proposal Format attachment to the referenced document. The scope of work is designed to help delineate the vertical extent of soil and groundwater contamination, as per Alameda County Health Care Services correspondence.

All the analytical data and procedures presented in this workplan are to the best of our knowledge an accurate description of the site, the work performed at the site and the investigative services that will be provided.

Respectfully,
AQUA SCIENCE ENGINEERS, INC.

David C. Prull
Project Manager

cc. Mr. Roy Breitenbach

aqua science engineers inc.

January 28, 1992

Workplan - Proposal for Monitoring Well Installation

at

21065 Foothill Blvd
Hayward, CA

Prepared for: Mr. Roy Breitenbach
2358 Loma Vista Drive
Prescott, Arizona 86310

Prepared by: Aqua Science Engineers, Inc.
1041 Shary Circle
Concord, CA 94518

REGISTERED PROFESSIONAL ENGINEER
DAVID M. SCHULTZ
No. 38738
Exp. 4-93
CIVIL
STATE OF CALIFORNIA

Greg Gouvea - Geologist

David M. Schults - RCE

I. Introduction

A. Statement of Work Scope:

A preliminary site investigation is to be conducted at 21065 Foothill Blvd. Hayward California. ("the site"), as a result of a previous tank removal. The proposed site assessment activities have been mandated by correspondence from the Alameda County Health Care Services Agency, January 16, 1992. The letter requires that a soil/groundwater investigation be implemented, as described in the August 10, 1990 Tri-Regional Board document. ASE proposes the drilling, installation, soil sampling and analysis, development, sampling and analysis of one groundwater monitoring well. Prior to commencement of field activities, this workplan will be approved by Alameda County Health Care Services, and a well permit will be obtained from the Alameda County Flood Control and Water Conservation District, Zone 7.

B. Site Location

The site is located on the western side of Foothill Blvd. between Mattox and Ash, less than 1/4 mile south of Interstate 580, in Castro Valley, Ca. (Figure 1). The majority of the site is covered with pavement and a single building. The topography of the surrounding area slopes moderately to the south.

C, D. Background and Site History

A single ~~500~~ 1000 gallon underground fuel storage tank was installed in the early 1970's just north of the site structure. The dispenser was located along the nearest wall of the site structure. In October, 1991, Decon Environmental, Hayward, CA executed and documented the excavation, removal, and disposal of the tank, as well as the soil sampling and analysis.

Two soil samples were obtained from native materials beneath the tank. The depth and precise location of the samples has not presently been provided to Aqua Science. Both samples were analyzed for TPH as gasoline, and BTEX. Sample #1 showed 4 ppm TPH as gas with BTEX constituents present in the ppm range. Sample #2 contained 1300 ppm TPH as gas with significantly increased levels of BTEX in the ppm range. Organic lead was not tested for in either sample (Table 1, Soil Sample Analytical Results).

Table 1: Soil Sample Analytical Results

Soil Sample Id	TPH G mg/kg	benzene ug/kg	toluene ug/kg	ethylbenzene ug/kg	xylenes ug/kg
#1	4	N.D.	9	5	160
#2	1300	320	11000	2700	85000

In November 1991, Decon Environmental removed an additional 30 cubic yards of soil from the excavation. Six additional soil samples were retained by Decon for analysis of TPH as gas and BTEX. Two samples were taken from the floor of the excavation and one sample taken from each of the excavation sidewalls. The elevation and precise locations of the samples were not reported. All sample results reported by Superior Precision Analytical, Martinez, Calif. were non-detectable. Detection limits for TPH gas were reported at 1 ppm, BTEX at 3 ppb.

II. Site Description:

A. Vicinity Description and Hydrogeologic Setting:
The site rests on consolidated Cretaceous sedimentary rocks of the Panoche or Knoxville formations. The site lies between the Hayward Fault, 1/2 mile to the west, and the East Chabot Fault, 1/4 mile to the east. Shallow groundwater is expected to be encountered at greater than 50 feet depth below grade at the site. This data is inferred from similar work conducted at nearby sites.

B,C. Vicinity, Site Maps:
Please see Figures 1 and 2 for maps showing appropriate features.

D. Existing Soil Contamination and Excavation:
Soil materials which were previously sampled indicated gasoline contamination in the immediate vicinity of the removed fuel storage tank. Significant levels of petroleum product contamination was detected in direct proximity to the tank, and apparently diminished greatly within a few foot radius of the initial tank excavation. This information has been inferred from data and observational notes provided by Decon Environmental.

III. Plan for Determining the Extent of Soil Contamination On Site:

The plan for site investigation/remediation includes hollow stem auger drilling, soil sampling and analysis, monitoring well construction, development, and groundwater sampling and analysis.

A. Describe Method/Technique For Determining Extent of Contamination Within the Excavation:

Gasoline contaminated soils were identified in the former underground storage tank excavation. Petroleum contaminated soil was subsequently removed to non-detectable concentrations as demonstrated by six sampling locations within the enlarged excavation.

The focus of this investigation is to determine the possible presence of gasoline contamination in soils and groundwater with variation of depth. A single soil boring will be conducted within 10 feet of the former underground storage tank excavation at an assumed "down gradient" location. Soil and groundwater samples will be submitted for chemical analysis of gasoline and the fractions BTEX at a State Certified laboratory; Chromalab, San Ramon, California.

B. Describe Sampling Methods and Procedures:

Boring Methods, Numbers, Locations, Abandonment:
To determine whether groundwater and site soils have been impacted by gasoline contamination, one boring is proposed within 10 feet of the former tank pit. The boring will be placed in the assumed down "gradient direction", ie., south of the tank pit (Figure 2, Site Plan). The boring will be converted into a groundwater monitoring well (MW-1) if free groundwater is encountered.

A Mobile Drill B-57 hydraulic rotary drill with 4 1/4" I.D. by 8" O.D. hollow stem augers will be used. Drilling will proceed to first encountered groundwater plus 5 to 10 feet, with an expected maximum of 50 feet depth below grade. Soil samples will be obtained on 5 foot intervals using a 2.5 inch dia. hammer driven California Modified split spoon sampler with brass sample sleeves. If groundwater is encountered in the first 50 feet of strata, monitoring well MW-1 will be emplaced within the boring.

Soil Classification and Sampling Methods:

The soil boring will be continuously logged on site by a geologist using the Unified Soil Classification System. Undisturbed soil samples will be taken at 2.5 foot intervals, starting at one foot depth, with a hammer driven California Modified split spoon sampler. The sampler will be advanced ahead of the auger tip by successive hammer blows. The samples will be collected for visual classification and chemical analysis.

Samples designated for laboratory analysis will be sealed on the ends with aluminum foil, plastic caps and tape. The samples will be placed in an ice chest with dry ice and delivered to a State certified laboratory with chain of custody documents. A detailed description of sample collection and handling procedures is appended to this workplan (Quality Assurance and Quality Control Plan).

All sampling equipment will be cleaned in buckets with brushes and a TSP or Alconox solution, then rinsed twice with tap water. The drill rig and augers will be steam cleaned between wells and on site before departure. Rinsates will be contained on site in drums.

C. Describe Methods/Criteria for Screening Soil and Storing Soil:

Soil samples obtained during drilling will be screened in the field via sensory perceptions and portable organic volatile meter.

Cuttings generated during drilling will be stored on site, on plastic sheeting, and covered with plastic sheeting. On site treatment or off site disposal of any soils is not included in this proposal. It is likely that a licensed hauler will be contracted to transport the soils as non-hazardous waste, under appropriate manifests, to a local landfill facility.

D. Security Measures:

The site is currently fenced around the entire perimeter. A working area will be established with barricades and warning tape around the drill rig and well location. Within the working area only authorized personnel will be allowed.

IV. Plan For Determining Groundwater Contamination:

A. Placement and Rational for Monitoring Well Placement

The well is located near the tank pit at a location which is assumed to be down gradient from the tank pit.

B. Monitoring Well Drilling and Installation Specs.:

The monitoring well will be drilled and installed using equipment described above. The well will be constructed of 2 inch flush threaded schedule 40 PVC casing, with up to 20 feet of .01" or .02" factory slotted well screen. The top of the well screen will extend up to 3 feet above encountered water level to account for seasonal fluctuations (Figure 3). The well casing be inserted through the augers to a point a few inches above hole bottom where it will be suspended until the well is secured within thc sand pack. Sand (#2 or #3) will be poured through the augers in one to two foot lifts up to about two feet above the top of the perforated casing. One to two feet of bentonite pellets will be placed above the sand, and activated with tap water. The seal will be finished up to the surface with tremmied cement/bentonite grout. A locking top cap and a flush mounted watertight well cover will be installed.

at least 5

C. Groundwater Sampling Plans:

The well will be developed by swabbing and bailing of water into a DOT 17H drum until the water appears to be reasonably clear with a minimum of 10 well volumes removed.

Groundwater will be checked for sheen and free product prior to purging and sampling. Free product and sheen will be measured with an acrylic bailer which will be lowered slowly to the groundwater surface and filled about half full for direct observation. Water level measurements will be conducted.

OK for now - chemical analysis also req'd for GW inv.

Prior to obtaining water samples from the monitoring well, not less than 5 well volumes of water will be bailed from the well. Samples will be obtained in a precleaned bailer and secured in 40 ml volatile organic analysis vials, placed in a cooler with wet ice and delivered to a State certified lab with Chain of Custody documents. A detailed description of sample collection and preservation procedures is appended to this document (Quality Assurance and Quality Control Plan).

V. Site Safety:

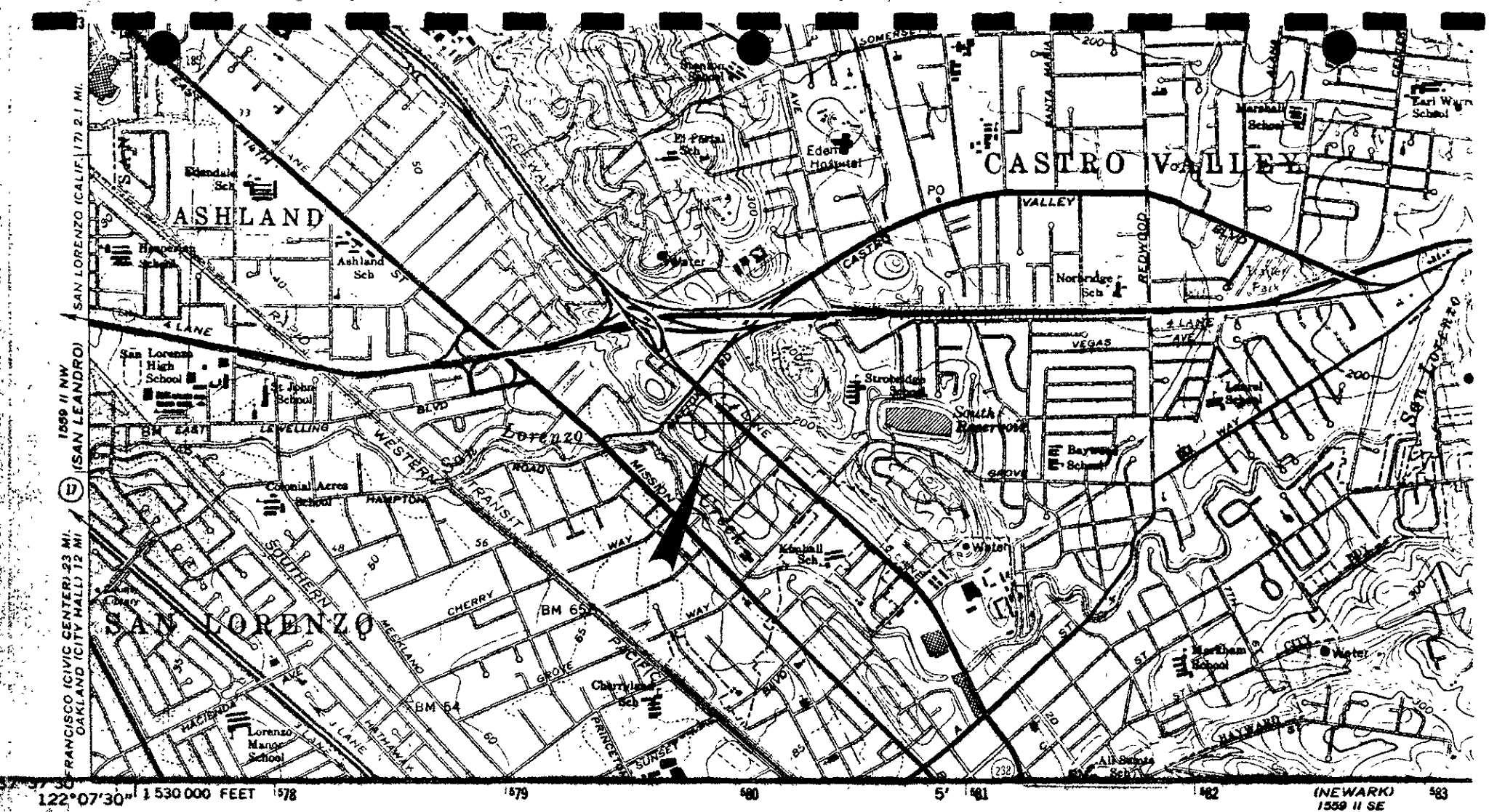
Prior to commencement of field activities, a site safety meeting will be held at a designated command post near the working area. Emergency procedures will be outlined at this meeting. The hazards of the known or suspected chemicals of interest will be explained. Level D personal protection is the anticipated maximum amount of protection needed. A site safety plan which conforms to Part 1910.120 (i) (2) of 29 CFR will be on site at all times during performance of this project.

A working area will be established with barricades and warning tape to delineate the zone where hard hats and steel toed shoes must be worn, and where unauthorized personnel will not be allowed. If, during drilling, fuel product odors are deemed to be substantial, half face respirators with organic vapor cartridges will be worn.

A nearby hospital will be designated in the site safety plan as the emergency medical facility of first choice. A map with a course plotted to the hospital will be on site.

Reporting

A complete and final report of methods, findings, and conclusions from work proposed herein will be submitted to the client for forwarding to the appropriate agencies. The report will be submitted under the seal of a State Registered Civil Engineer, Mr. David Schultz (#38738). Mr. Schultz has implemented hundreds of tank removal, site investigation, and remediation projects for ASE since our inception as a company in 1983.



Mapped, edited, and published by the Geological Survey

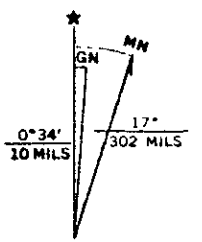
Control by USGS, USC&GS, USCE, and Alameda County

Topography from aerial photographs by photogrammetric methods and by planetable surveys 1947. Revised from aerial photographs taken 1958. Field check 1959

Polyconic projection
10,000-foot grid based on California coordinate system, zone 3
1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 14 meters north and 95 meters east as shown by dashed corner ticks

Red tint indicates areas in which only landmark buildings are shown

There may be private inholdings within the boundaries of the National or State reservations shown on this map



UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Revisions shown in purple and woodland compiled from aerial photographs taken 1979 and other source data
This information not field checked. Map edited 1980

SCALE 1:24000

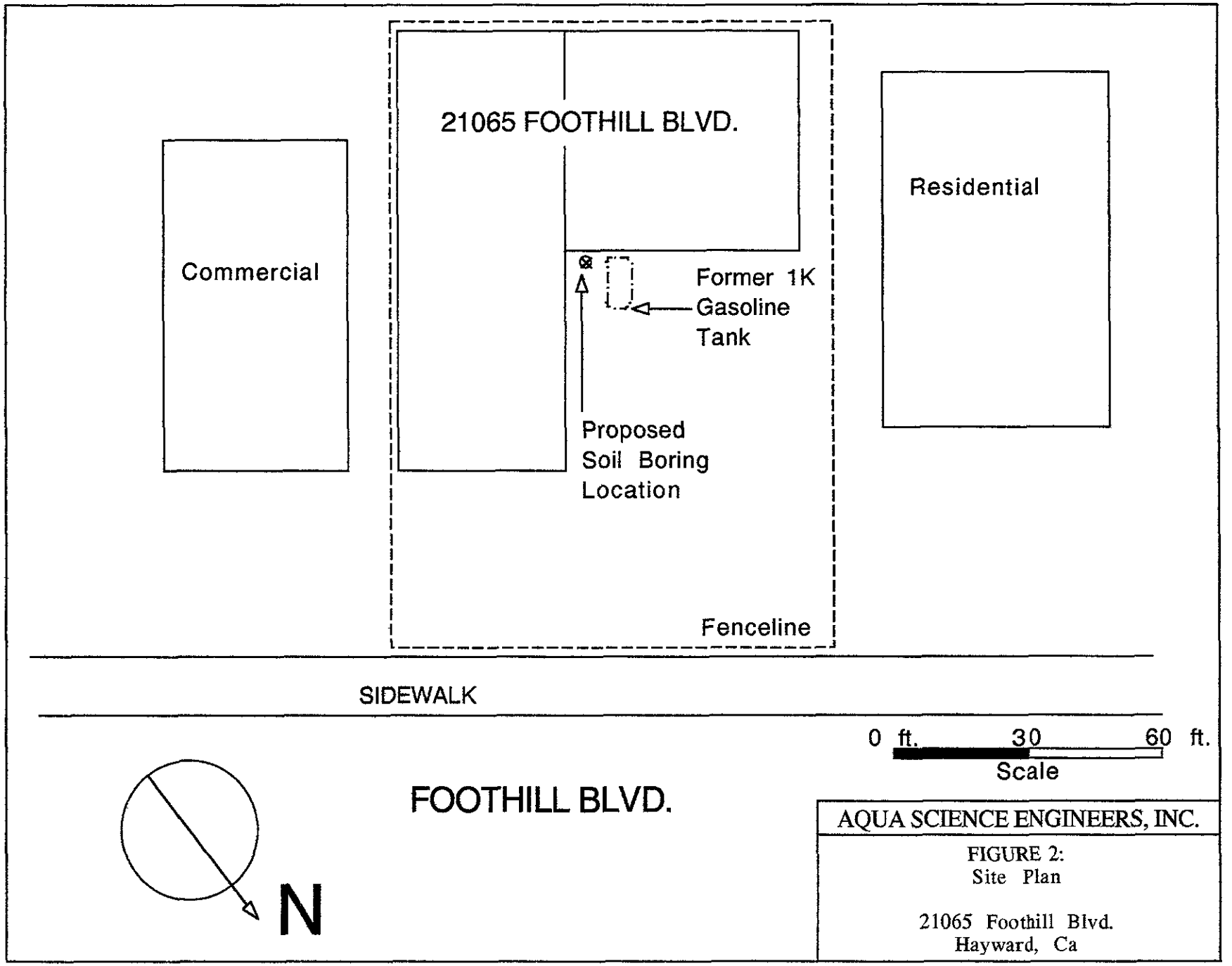
1 0 1/2
1000 0 1000 2000 3000 4000
1 5 0

CONTOUR INTERVAL 20 FEET

AQUA SCIENCE ENGINEERS, INC.

FIGURE 1:
Site Location Map

21065 Foothill Blvd.
Hayward, Ca



AQUA SCIENCE ENGINEERS, INC.

FIGURE 2:
Site Plan

21065 Foothill Blvd.
Hayward, Ca

Quality Assurance and Quality Control Plan

General Guidelines -

The remedial Investigation (RI) Quality Assurance/Quality Control (QA/QC) program is intended to facilitate the acquisition of accurate and reliable data. Environmental data gathered during the RI will be collected and analyzed following procedures described in the QA/QC Program.

The following general field and laboratory procedures will be implemented to ensure that QA/QC objectives are met:

1.0 Field QA/QC Plan

The Field QA/QC Plan includes protocols for:

- √ Data Collection
- √ Equipment Decontamination
- √ Soil Sampling
- √ Groundwater Sampling
- √ Groundwater Monitoring
- √ Well Development

The following descriptions are general summaries of the QA/QC procedures for field activities. Detailed sampling procedures are described in the attached protocols. This section relates to sampling procedure QA/QC.

All information pertinent to the field investigations will be kept in a field log book or sheets. Information to be documented includes at least the following:

- √ Sample numbers
- √ Locations of sample collection
- √ Soil boring and well numbers as applicable
- √ Depths at which samples were taken
- √ Names of the sampling personnel
- √ Dates and times of collection
- √ Purpose of sample
- √ Sample distribution (e.g., laboratory, archive, etc.)
- √ Field observations

Other pertinent filed measurements such as PID readings, pH, weather, and any other conditions that may effect the sample should be included.

Samples will be placed in laboratory prepared containers, appropriate for the analysis required.

2.0 Sample Preservation

Sample containers will be stored in a cool place for transportation to the site. All samples will be taken in a manner as to completely fill the container provided. Soil samples placed in stainless steel or brass tubes will have the ends covered with aluminum foil and closed with a plastic airtight cap. Water samples will be sealed with a teflon lined screw-on type top, in such a way, that no air is trapped within the sample container. All samples will be placed immediately into a cooler and kept chilled with dry ice (for soil samples) or wet ice sealed in plastic (for water samples), until delivered to the laboratory.

3.0 Chain-Of-Custody Procedures

3.1 Sample Labels

Each sample container will be labeled prior to filling to prevent misidentification. The label will contain at least the following information:

- √ Sample number which uniquely identifies the sample
- √ Project Title or Number
- √ Location of sample collection
- √ Soil boring or well number if applicable
- √ Name of collector
- √ Date and time of collection
- √ Type of analysis requested

3.2 Chain-of-Custody Record and Sample Analysis Request Form

A Chain-of-Custody record for each container or sample will be used to track possession of the samples from the time they were collected until the time they were released to the Laboratory for analysis.

The Chain-of-Custody record will contain the following information:

- √ Site Name
- √ Signature of collector
- √ Date and time of collection
- √ Sample Identification number(s)
- √ Number of containers in sample set
- √ Name and signature of persons, and the companies or agencies they represent, who are involved in the chain of possession
- √ Inclusive dates and times of possession
- √ Requested analysis for each sample
- √ Type of material found in each sample container

3.3 Delivery of Samples to the Laboratory

Samples will be delivered to the laboratory on a daily basis or as described in the scope of work for each specific project. All samples will be chilled as described in Section 2.0. The laboratory shall note on the Chain-of-Custody form the date and time of receipt.

4.0 Laboratory QA/QC Plan

Soil or groundwater samples will be submitted to a State Certified Hazardous Waste Laboratory for chemical analysis of hazardous constituents. Established QA/QC procedures for analytical operations will include sample custody procedures, standards of analytical accuracy, analysis of matrix spikes and method blanks, data reduction, verification of raw analytical data, and maintenance of control charts to monitor analytical performance. These QA/QC procedures are outlined in the laboratory QA/QC plan which is available upon request. Organic chemical analysis will be performed in accordance with standard procedures established by the USEPA under 40 CFR Part 136, October 1984. The laboratory is periodically evaluated through external performance audits conducted by the EPA and DHS using QC labs.

Provided the data base for a particular site is of sufficient size, statistical techniques may be employed for data verification.

SOIL SAMPLING PROTOCOL

1. Sample Collection During Drilling Activities

   A proposal will be submitted to the lead Regulatory Authority with proposed boring/sampling locations. The exact location and number of borings at each site will be determined in the field by the Project Manager/Geologist/Engineer.

   Prior to arriving at the sample site, the drill augers and sampling equipment will be steam cleaned. The cleaning will be conducted on-site on all sampling equipment between each sample interval.

   Soil samples will be obtained using a California Split-spoon sampler containing three or four six inch long, two inch diameter brass tubes. The sampler will be driven 18 inches ahead of the hollow stem auger by a 140 pound hammer with a 30 inch drop in accordance with American Society for Testing and Materials (ASTM) Methods D 1586-84 for split barrel sampling of soil and D 1587-83 for thin walled tube sampling of soils. The blows required to drive the sampler each six inch interval will be recorded on the boring log. The sampler will be removed from the boring and opened to reveal the brass tubes. The bottom tube or middle tube will be capped with aluminum foil and plastic end caps, taped and labeled with the following information; date, time, project ID, sample ID, name of sampler and type of analysis. This sample will be immediately placed into a cooler containing dry ice. The samples will be delivered to a state certified laboratory under chain-of-custody procedures as soon as possible.

   Soil samples will be collected in 5 foot intervals, at significant changes in lithology, and at intervals of obvious contamination in order to develop a complete profile of soil contamination. The soil samples shall not be composited. Soil borings will extend through the entire interval of contaminated soil and will terminate if saturated soil is encountered.

2. Sample Collection During Tank Removal

Soil samples will be collected as soon as possible after removal of the tank. Where feasible, all preparations for soil sampling will be made prior to tank removal. Soil samples collected fro a backhoe bucket or directly from the excavation floor will be collected in a thin-walled stainless steel or brass cylinder at least three inches long by one inch in diameter. From 3 to 24 inches of soil will be removed from the immediate surface area where the sample is to be taken and the cylinder then pounded into the soil with a wooden mallet, bulk density driver, or other decontaminated driving device. No head space will be present in the cylinder once the sample is collected. Care will be taken to avoid contamination of both the inside and outside of the cylinder as well as it's contents.

Once the sample is collected, each end of the cylinder will be covered with aluminum foil or teflon tape and then capped with a polyethylene lid, and labeled. The sample will then be placed in an ice chest containing dry ice for delivery to a state certified laboratory. Sample identification, storage, and transportation will be conducted as outlined in the previous section.

3. Sampling from Soil Piles or Shallow Soil Pits

Soil samples will be collected and transported from excavated material in the manner described in the previous section, however, a backhoe will not be utilized. If composite samples are to be collected, four brass cylinders will be collected for every 50 cubic yards of material to be sampled unless otherwise specified by the lead regulatory agency. The samples will be composited by the state certified analytical laboratory personnel prior to testing.

GROUNDWATER SAMPLING PROTOCOL

Prior to arriving at the sampling site, all sampling equipment will be washed with laboratory grade detergent or equivalent, and rinsed twice with tap water and once with deionized water. The sample washing procedure will be carried out on site before sampling of other monitoring wells, in such cases where more than one monitoring well is being sampled, with the sampling device.

Immediately prior to sampling, the depth to water (DTW) level in the well will be recorded. The thickness of product on top of the groundwater, if present, will be measured using an interface probe or clear graduated bailer.

If free product is detected, analysis of groundwater for dissolved product will not be conducted. The product will be sampled for content, if the collection of a sample is possible. Before collecting at least two groundwater samples from each well, the well will be purged until indicator perimeters (temperature, pH, or conductivity) stabilize. This will entail the removal of at least four or five well casing volumes by bailing or pumping. The indicator perimeter will be taken both before and after purging of each well casing volume. Once the well is purged and well water chemistry has stabilized, a sample will be collected after the water level approaches 80 percent of it's initial elevation. Where water level recovery is slow, the sample will be collected after stabilization is achieved and enough water is present to fill sample containers.

Cross contamination from transferring pumps from well to well will be avoided by utilizing dedicated equipment. Where this is not feasible, thorough cleaning of equipment will be performed between sampling rounds. Sampling will proceed from the least contaminated to the most contaminated well, if information is available before sample collection, or if it is indicated by field evidence.

Groundwater samples will be collected with a teflon bailer equipped with a bottom emptying device. Duplicate samples will be transferred to vials or containers that meet Regional Board Specifications. Groundwater from the bailer will be transferred to the sample container by allowing the fluid to flow slowly along the sides of the vessel. All containers will be filled above the top of the opening to form a positive meniscus.

No head space should be present in the sample container once it is sealed. If it is not possible to collect a sample without head space, the problem will be noted in the field technician's sampling log.

Immediately following sample collection, samples will be labeled and stored in an ice chest containing dry ice (for soil samples) or wet ice sealed in plastic bags (for water samples). Sample labels will contain the following information; date, time, project ID, sample ID, name of sampler, and type of analysis. All samples will be transported to a state certified laboratory under chain-of-custody procedures, as soon as possible.

aqua science engineers inc.

92 FEB -5 PM 1:40

January 29, 1992

Ms. Pamela J. Evans
Alameda County Health Care Services
Department of Environmental Health
80 Swan Way, Rm. 210
Oakland, CA 94621

Re: Amendments to Workplan-Proposal for Monitoring Well Services at 21065 Foothill Blvd., Hayward, California.

Ms. Evans,

Per our conversation this afternoon regarding the proposed workplan of monitor well construction at 21065 Foothill Blvd., Hayward, please consider the following amendments.

01 When in the course of soil boring, a groundwater monitoring well is to be installed at the site, machine slotted well screen will be installed between the elevations 10 feet below static groundwater and five feet above static groundwater.

02 Please find enclosed a copy of the site specific Health and Safety Plan for the project.

It is our understanding that the workplan has been approved with the aforementioned changes. Drilling is tentatively scheduled for Monday, Feb 3, 1992. We will notify your offices prior to performing the work. We appreciate your prompt review of the workplan.

Respectfully,

David C. Prull
Project Manager

(1) encl.
cc. Mr. Roy Breitenbach w/o encl.
Mr. Michael Tanzillo w/o encl.
Mr. Eddy So, RWQCB w/o encl.

aqua science engineers inc.

HEALTH & SAFETY PLAN

for the

BREITENBACH PROPERTY
21065 Foothill Blvd.
Hayward, CA

prepared by

Aqua Science Engineers, Inc.
1041 Shary Circle
Concord, CA 94518

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

A. GENERAL DESCRIPTION

Site: 21065 FOOTHILL BLVD., HAYWARD, CALIFORNIA

Work Scope: AQUA SCIENCE ENGINEERS WILL INSTALL A TOTAL OF ONE SOIL BORING/MONITOR WELL AT THE ABOVE REFERENCED SITE.

SAFETY POLICY:

This Health and Safety Plan is written specifically for the breitenbach jobsite, located at 21065 Foothill Blvd., Hayward, California. 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: Michael D. Dirk Date: 1/28/92

Plan Approved by: Greg Gouvea Date: 1/28/92

Proposed Start Date: February 3, 1992

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

Project Organization:
Site Manager for A.S.E.: Greg Gouvea
A.S.E. Safety Officer: Michael Dirk
Other Potential A.S.E Personnel: Tom McMullen, Randy Wolf, William Smith

B. SITE/WASTE CHARACTERISTICS

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

Characteristics: HYDROCARBON RESIDUALS, COMBUSTIBLE, TOXIC

Site Parameter: THE MONITORING WELL LOCATION IN ADDITION TO ANY STOCKPILED MATERIAL ARE IDENTIFIED AS EXCLUSION ZONES. A MINIMUM BOUNDARY OF THREE FEET SURROUNDING BOTH IS TO BE MAINTAINED IN 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 diesel 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 SUSPECTED 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
(Lead Arsenate)
a. Odorless, colorless solid with properties that vary depending upon specific compounds.

b. High exposure levels may cause nausea, diarrhea, inflamed mucous membranes, abdominal pains, weakness. LEAD IS A SUSPECTED CARCINOGEN.
c. PEL for an eight hour TWA is .05 milligrams per cubic meter (airborne).
ALL SUBSTANCES AS THEY EXIST ON SITE ARE EXPECTED TO BE STABLE.

PHYSICAL HAZARDS

Under no circumstances will anyone climb on any drill cutting material piles. 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 may include the drill rig or other equipment as part of soil sampling and subsequent well installation operations. 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.

Inspection of the well location, the adjacent areas, and protective systems are to be made by a qualified person while personnel are on site. Attention will be made to note if any evidence of potential cave-in exists.

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 then five minutes. 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.

8.) 2-way radio communications is recommended.

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. A first aid kit and at least one 20 pound A-B-C fire extinguisher will be available at the site.

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. Drill cuttings soil 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 A 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.

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