



AEGIS ENVIRONMENTAL, INC.

WORKPLAN FOR LIMITED SITE INVESTIGATION

**ARCO Service Station
1401 Grand Avenue
San Leandro, California**

Aegis Project No. 91-001

April 8, 1992

**Prepared By:
AEGIS ENVIRONMENTAL, INC.
1050 Melody Lane, Suite 160
Roseville, California 95678
(916) 782-2110**

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TABLE OF CONTENTS

| | | |
|-----|---|---|
| 1.0 | INTRODUCTION | 1 |
| 1.1 | Purpose | 1 |
| 1.2 | Scope | 1 |
| 2.0 | BACKGROUND | 2 |
| 2.1 | Site Description | 2 |
| 2.2 | Previous Investigation | 2 |
| 2.3 | Unauthorized Release | 2 |
| 2.4 | Adjacent Land Uses | 2 |
| 2.5 | Utility Locations | 3 |
| 2.6 | Generalized Geology and Hydrogeology | 3 |
| 3.0 | PROPOSED WORKPLAN | 3 |
| 3.1 | Site Safety Plan | 3 |
| 3.2 | Soil Boring and Soil Sampling | 4 |
| 3.3 | Laboratory Analysis and Practical Quantitation Limits | 5 |
| 3.4 | Permitting and Project Contacts | 5 |
| 4.0 | SCHEDULE | 6 |
| 5.0 | REPORTING | 6 |
| 6.0 | REMARKS/SIGNATURES | 7 |

FIGURES

FIGURE 1 SITE LOCATION MAP
FIGURE 2 SITE MAP WITH PROPOSED SOIL BORING LOCATIONS
FIGURE 3 PROPOSED SCHEDULE TIMELINE

APPENDICES

APPENDIX A STANDARD OPERATING PROCEDURES
APPENDIX B SITE SAFETY PLAN

1.0 INTRODUCTION

This workplan outlines the proposed limited subsurface investigation to be conducted by Aegis Environmental, Inc. (Aegis), at the ARCO service station located at 1401 Grand Avenue in San Leandro, California (Figure 1). This workplan is based, in part, on information provided to Aegis by Haber Oil Products, Inc. (Haber Oil), and is subject to modification as newly acquired information may warrant.

1.1 Purpose

The purpose of the investigation is to further:

- characterize the site's shallow subsurface within the vicinity of the existing underground storage tanks (UST); and,
- assess the presence of petroleum hydrocarbons, if any, in the soil beneath the existing UST.

1.2 Scope

The proposed scope of work will be performed according to the Aegis standard operating procedures included in Appendix A, and includes the following:

- Drill, log, and sample one vertical and three slant borings to approximately 30 to 40 vertical feet below surface at the proposed locations shown on Figure 2.
- Based on the results of field observations and measurements, submit selected soil samples to a state-certified laboratory for analysis.
- Upon completion, the borings will be sealed with heavy bentonite/cement slurry from total drilled depth to ground surface.
- Dispose of soil cuttings generated during drilling operations per regulatory requirements.
- Review the data and prepare a factual report of the investigation.

2.0 BACKGROUND

2.1 Site Description

The site is located on the east side of Grand Avenue and west of Highway 580 in San Leandro, California (Figure 2). The site is located within a commercial/residential area and is an active service station/convenience store that retails unleaded gasolines. Three UST exist at the site; a 7,500-gallon tank that previously contained regular-leaded gasoline and now contains regular-unleaded gasoline; a 7,500-gallon tank containing regular-unleaded gasoline; and a 6,000-gallon tank containing super-unleaded gasoline. A single pump island and canopy are located near the center of the property, along Grand Avenue. A storage building with an attached restroom borders the south property boundary.

2.2 Previous Investigation

The previous site investigation includes:

On April 24, 1991, a limited subsurface soil assessment was performed by Aegis ("Soil Boring Results Report," dated June 10, 1991). The investigation included drilling four soil borings to approximately 40 feet below surface. Selected soil samples were submitted to a state-certified analytical laboratory for analysis of total petroleum hydrocarbons (TPH), as gasoline, benzene, toluene, ethylbenzene, and total xylenes (BTEX), total lead, ethylene dibromide (EDB), and 1,2-dichloroethane (EDC). The maximum concentration of petroleum hydrocarbon constituents reported were in a soil sample (B-2) collected at 26.0 feet below surface. The analyses indicated TPH, as gasoline, at 66 parts-per-million (ppm), benzene at 0.94 ppm, toluene at 3.8 ppm, ethylbenzene at 1.3 ppm, total xylenes at 8.7 ppm, total lead at 3 ppm, and EDB and EDC were below the method detection limits. A composite soil sample (SS-1A, SS-1B, SS-1C, and SS-1D) was collected from the drill cuttings and analyzed in accordance with landfill requirements. The composite contained 0.7 ppm TPH, as gasoline, 0.002 ppm benzene, 0.005 ppm total xylenes, and 0.06 ppm soluble lead. Soil boring locations are indicated on Figure 2.

2.3 Unauthorized Release

[REDACTED] indicated an unauthorized release occurred during [REDACTED] of [REDACTED].
[REDACTED] The amount of the unauthorized release is unknown.

2.4 Adjacent Land Uses

Properties surrounding the site are commercial and residential, with U.S. Interstate Highway 580 parallel to the east side of the site.

2.5 Utility Locations

Prior to drilling, a ground penetrating radar (GPR) survey will be performed by NORCAL Geophysical Consultants, Inc., of Petaluma, California. The survey will be performed in the area of the existing UST basin to locate underground facilities, including fuel-related facilities, sewer, electrical, cable TV, compressed air, natural gas, water, and telephone lines for avoidance during drilling. The aboveground utilities will also be located during the GPR survey by Aegis' personnel, including electrical, telephone lines, cable TV, natural gas, etc.

2.6 Generalized Geology and Hydrogeology

The bedrock beneath the surface alluvium is indicated on the "Geologic Map" published by the California Division of Mines and Geology (1977) as sandstone, shale, limestone, chert, and conglomerates associated with the Jurassic age Franciscan Formation. The soils and alluvial materials underlying the site include: a) moderately stiff, moist clays to approximately 12.0 feet below grade; and b) medium dense, damp to moist, silts and sandy silts to approximately 41.0 feet below grade.

Site drainage is mainly toward the west onto Grand Avenue. The site's vicinity is part of the San Leandro Creek watershed, located approximately 1,000 feet to the north.

Groundwater was not encountered during the previous investigation. Review of Alameda County, Zone 7 file information indicated the depth to groundwater at the site is 45 feet below surface. Regionally, groundwater is reported to flow toward the west to San Francisco Bay.

3.0 PROPOSED WORKPLAN

3.1 Site Safety Plan

A site safety plan (SSP) has been prepared and will be on site during all field activities. A copy of the SSP is included as Appendix B. All work on site described herein will be conducted according to the SSP. The SSP contains information on the properties of the hazardous materials determined to be on site (by previous investigation). This information is equivalent to that contained within Material Safety Data Sheets.

3.2 Soil Boring and Soil Sampling

Prior to drilling, Underground Service Alert Network, or other such service, will be contacted for identification of buried utilities entering the site from the public right-of-way. As a further precaution to avoid drilling into or through potential buried obstructions, the first 5 feet of each boring will be augured by hand.

Four soil borings will be drilled to approximately 30 to 40 feet below surface at the locations shown on Figure 2. Two of the borings will be angled beneath the existing tanks. The borings will be sealed with a heavy bentonite/cement slurry from total drilled depth to ground surface. The borings will be drilled using 8-inch-diameter, hollow-stem augers. The total depth of each boring will be determined in the field, but may be as deep as 40 feet vertical below surface.

During drilling, the subsurface soils and alluvial materials of the unsaturated zone will be sampled at 5-foot intervals. The sampling interval may be shortened where subsurface conditions warrant. The deepest sample in each boring will be collected at the depth of boring termination. The soil samples will be screened in the field, using a portable photoionization detector, for possible laboratory analysis.

Drilling and soil sampling equipment will be either steam-cleaned or washed prior to first use and between borings to reduce the possibility of cross-contamination. Rinsewater will be stored temporarily on site in U.S. Department of Transportation-approved 55-gallon drums, pending laboratory analysis of the boring samples. Following receipt of the laboratory results, the rinsewater will be transported from the site to an appropriate disposal facility.

The selected soil samples will be analyzed for concentrations of: a) TPH, as gasoline, by GC/FID Method 5030; b) BTEX, EDB, and EDC by EPA Method 8240; and c) total lead by EPA Method 7421. In addition, the soil sample from each boring with the highest TPH concentration will be analyzed for total priority pollutant metals cadmium, chromium, lead, and zinc by EPA Methods 6010 and 7421 (lead). In each boring, a maximum of two samples will be collected for possible analysis of petrophysical properties, including air or water permeability, porosity, and grain-size distribution.

All drill cuttings will be stored temporarily on site, on and under plastic sheeting, pending laboratory analysis of either the boring samples or additional samples collected from the stockpile that may be required in order to determine proper disposal. Following receipt of the laboratory results, the drill cuttings will be transported, by a licensed hauler, from the site to an appropriate disposal facility.

3.3 Laboratory Analysis and Practical Quantitation Limits

The laboratory to be used for the analyses discussed above is tentatively identified as NET Pacific of Santa Rosa, California, a state-certified analytical laboratory.

In accordance with the Tri-Regional guidelines, dated August 10, 1990, the practical quantitation limits (PQL) for soil and water analyses are as follows:

Soil -

- a) for TPH, as gasoline, the PQL is 1.0 parts-per-million (ppm); and,
- b) for BTEX the PQL is 0.005 ppm.

Water -

- a) for TPH, as gasoline, the PQL is 0.05 ppm; and,
- b) for BTEX the PQL is 0.0005 ppm.

In addition, a spike peak, surrogate sample, and standards will be run to ensure quality assurance and quality control of the analyses.

3.4 Permitting and Project Contacts

Soil boring permits from Alameda County Flood Control and Water Conservation District, Zone 7, will be required for the work prepared herein. In addition, review of this workplan by the City of San Leandro staff is required prior to beginning the fieldwork.

Permitting Contact

Alameda County Flood Control and Water Conservation District, Zone 7

Rich Wyman
Alameda County Flood Control and Water Conservation District, Zone 7
5997 Parkside Drive
Pleasanton, California 94588

Project Contacts/Representatives

Haber Oil Products, Inc.

Manmohan Chopra
ARCO Service Station
1401 Grand Avenue
San Leandro, California
(510) 357-7330

San Leandro Fire Department

Mike Bakaldin
San Leandro Fire Department
835 East 14th Street
San Leandro, California
(510) 577-3331

Aegis Environmental, Inc.

Brian Garber
Aegis Environmental, Inc.
1050 Melody Lane, Suite 160
Roseville, California 95678
(916) 782-2110

4.0 SCHEDULE

The permits for the drilling have been approved by Alameda County. Review of this workplan by Alameda County will take approximately 2 weeks. The fieldwork is anticipated to be completed in 2 to 3 days. Disposal of cuttings may take up to 6 weeks. A non-date-specific timeline of the expected duration of the project is included as Figure 3.

5.0 REPORTING

The report of the proposed investigation will include, but not necessarily be limited to: a) discussions of the site background, investigative methods used, and local and regional hydrogeology; b) boring completion logs; c) distribution map(s) of hydrocarbons in soil; d) cross-section(s) of the project site's shallow subsurface depicting the relationship of soils and alluvial materials to laboratory analytical data; and e) laboratory reports and chain-of-custody forms.

6.0 REMARKS/SIGNATURES

This information contained within this workplan reflects our professional opinions, and was developed in accordance with currently available information and accepted geologic, hydrogeologic, and engineering practices at this time and for this site. This workplan has been prepared solely for the use of Haber Oil Products, Inc. Any reliance on this workplan by parties other than Haber Oil shall be at such parties' sole risk.

The work proposed herein shall be conducted under the direct supervision of the professional geologist, registered with the State of California, whose signature appears below.

AEGIS ENVIRONMENTAL, INC.

Michael Kitzko
for

John Giorgi
Staff Geologist

Douglas I. Sheeks

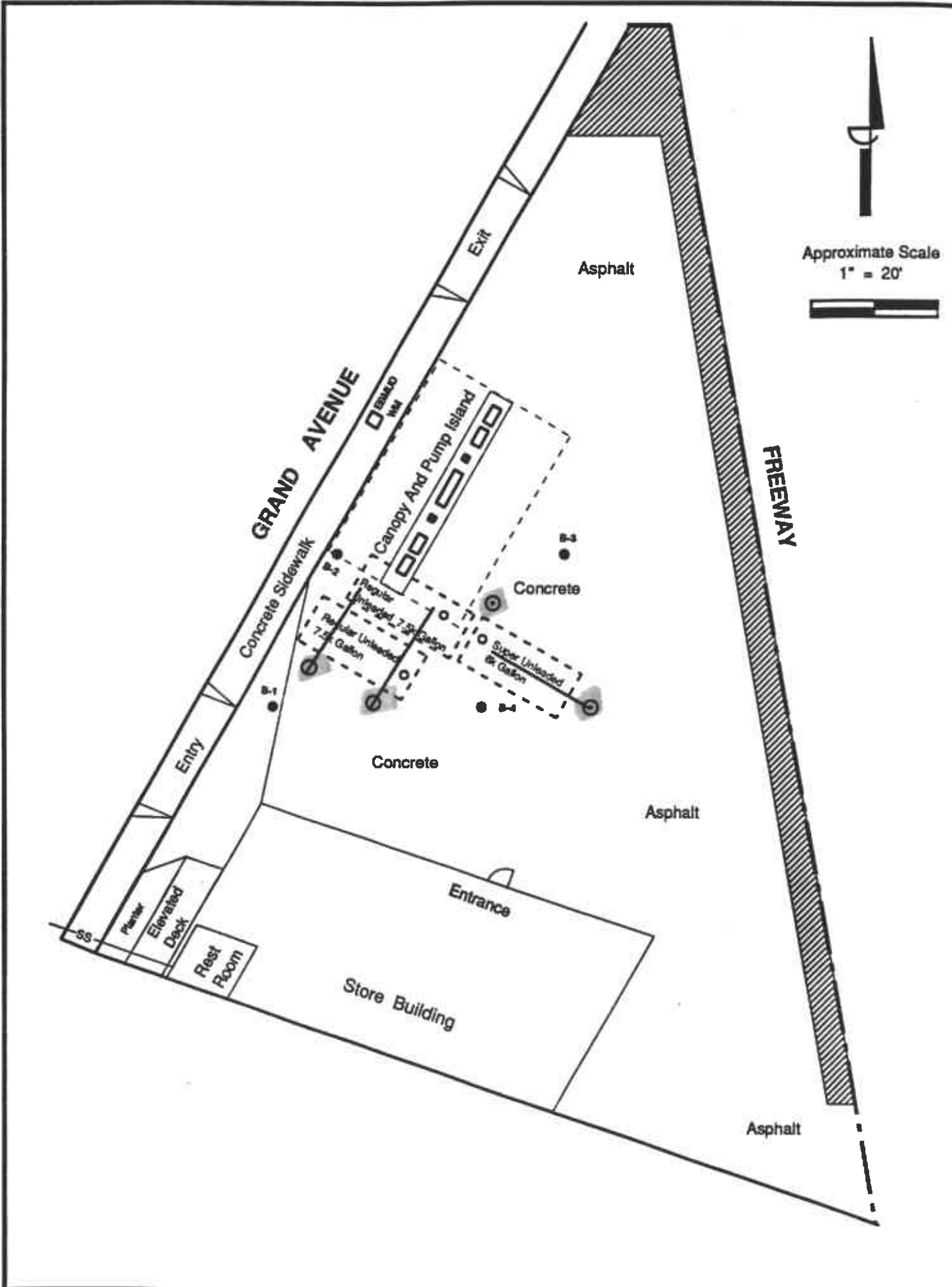
Douglas I. Sheeks
Senior Geologist
CRG No. 5211



4-9-92

Date

JG/DIS/mjg/law



Approximate Scale
1" = 20'

LEGEND

- 7.5k 7500 Gallon Underground Storage Tank
- 6k 6000 Gallon Underground Storage Tank
- ss- Sanitary Sewer Line
- EBMUD East Bay Municipal Utility District
- wm Water Meter
- Former AEGIS Soil Boring

PROPOSED SOIL BORING LOCATIONS

- Vertical Boring
- Slant Boring (30° From Vertical)

NOTE: Site Sketch After Generalized As Built Plan,
Drawing Scale Approximate

All Locations Are Approximate

| | |
|--|---------------------------------------|
| <p>FIGURE 2 SITE MAP WITH PROPOSED SOIL BORING LOCATIONS 1401 Grand Avenue San Leandro, CA</p> | |
| <p>AEGIS Job Number 91 - 001</p> | |
| <p>DRAWN BY: J. Paradis REVIEWED BY:</p> | <p>DATE: March 17, 1992 DATE:</p> |

APPENDIX A
STANDARD OPERATING PROCEDURES

AEGIS ENVIRONMENTAL, INC.
STANDARD OPERATING PROCEDURES
RE: SOIL BORING SAMPLING
SOP-1

During drilling, soil samples for chemical analysis are collected in thin-walled brass tubes, of varying diameters and lengths (e.g., 4 or 6 inches long by 2 inches outside-diameter). Three or four of the selected tubes, plus a spacer tube, are set in an 18-inch long split-barrel sampler of the appropriate inside-diameter.

Where possible, the split-barrel sampler is driven its entire length either hydraulically or using a 140-pound drop hammer. The sampler is extracted from the borehole and the brass tubes, containing the soil samples, are removed. Upon removal from the sampler, the selected brass tubes are either immediately trimmed and capped with aluminum foil or Teflon sheets and plastic caps or the samples are extruded from the tubes and sealed within other appropriate cleaned sample containers (e.g., glass jar). The samples are then hermetically sealed, labeled, and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. These procedures minimize the potential for cross-contamination and volatilization of volatile organic compounds (VOC) prior to chemical analysis.

One soil sample collected at each sampling interval is analyzed in the field using either a portable photoionization detector (PID), flame ionization detector, organic vapor analyzer, catalytic gas detector or an explosimeter. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons, and the samples to be analyzed at the laboratory. The soil sample is sealed in either a brass tube, glass jar or plastic bag to allow for some volatilization of VOC. The PID is then used to measure the concentrations of hydrocarbons within the containers's headspace. The data is recorded on both field notes and the boring logs at the depth corresponding to the sampling point.

Other soil samples are collected to document the soil and/or stratigraphic profile beneath the project site, and estimate the relative permeability of the subsurface materials. All drilling and sampling equipment are either steam-cleaned or washed in solution and double-rinsed in deionized water prior to use at each site and between boreholes to minimize the potential for cross-contamination.

AEGIS ENVIRONMENTAL, INC.
STANDARD OPERATING PROCEDURES
RE: SOIL CLASSIFICATION
SOP-3

Soil samples are classified according to the Unified Soil Classification System. Representative portions of the samples may be shipped under strict chain-of-custody to an analytical laboratory for further examination and verification of the in-field classification, and analysis of soil mechanical and/or petrophysical properties. The soil types are indicated on logs of either excavations or borings together with depths corresponding to the sampling points, and other pertinent information.

AEGIS ENVIRONMENTAL, INC.
STANDARD OPERATING PROCEDURES
RE: SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES
SOP-4

Sample identification and chain-of-custody procedures ensure sample integrity, and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any in-field measurements made, sampling methodology, name(s) of on site personnel and any other pertinent field observations also recorded on the field excavation or boring log.

Chain-of-custody forms are used to record possession of the sample from time of collection to its arrival at the laboratory. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time. The sample-control officer at the laboratory will verify sample integrity, correct preservation, confirm collection in the proper container(s) and ensure adequate volume for analysis.

If these conditions are met, the samples will be assigned unique laboratory log numbers for identification throughout analysis and reporting. The log numbers will be recorded on the chain-of-custody forms and in the legally-required log book maintained in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

AEGIS ENVIRONMENTAL, INC.
STANDARD OPERATING PROCEDURES
RE: LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL
SOP-5

In addition to routine instrument calibration, replicates, spikes, blanks, spiked blanks, and certified reference materials are routinely analyzed at methods specific frequencies to monitor precision and bias. Additional components of the laboratory Quality Assurance/Quality Control program include:

1. Participation in state and federal laboratory accreditation/certification programs;
2. Participation in both U.S. EPA Performance Evaluation studies (WS and WP studies) and inter-laboratory performance evaluation programs;
3. Standard operating procedures describing routine and period instrument maintenance;
4. "Out-of-Control"/Corrective Action documentation procedures; and,
5. Multi-level review of raw data and client reports.

APPENDIX B
SITE SAFETY PLAN

POST ON-SITE
FIELD INVESTIGATION TEAM
SITE HEALTH AND SAFETY PLAN

A. GENERAL INFORMATION

Client: Mr. Manmohan Chopra Aegis Project Number: 91-001

Site Name: ARCO Service Station Client Project Number:

Street Address: 1401 Grand Avenue
San Leandro, CA

Plan Prepared by: Mike Kitko Date: 2/7/92

Approved by: Brian Garber Date: 3/20/92

Revised by: Date:

Revision Approved by: Date:

Objectives:

Phase I - Conduct limited subsurface investigation

Phase II - To be announced

Proposed Date of Investigation: March 1992

Hazard Summary/Level of Protection

A: _____ B: _____ C: _____ D: XX (with modifications)

B. SITE/WASTE CHARACTERISTICS

Waste/Contaminant Type(s): XX Liquid XX Soil ___ Solid ___ Sludge
___ Gas

Characteristic(s): ___ Corrosive XX Ignitable ___ Radioactive
XX Volatile XX Toxic ___ Reactive
___ Unknown ___ Other (Name):

Contaminant Source: Self serve retail gasoline station with
underground fuel storage tanks.

Surrounding Features: Commercial and residential area.

Status: Tanks, associated piping and pumps are active.

History: No history of injury or public complaint

C. HAZARD EVALUATION

Have all contaminants been identified that may be present on site?

Yes XX No _____ Unknown _____

List all chemicals below that have been identified or are suspected on site and their maximum concentrations in soil/water. Information on hazardous properties are listed in the appendix. For chemicals not shown in the SECTION G , enter the hazardous property information in the spaces provided.

| <u>Chemical Name</u> | Maximum Concentration : <u>In Soil</u> |
|----------------------|---|
| TPH gasoline | 66.00 ppm |
| Benzene | 0.94 ppm |
| Toluene | 3.80 ppm |
| Ethelbenzene | 1.30 ppm |
| Xylenes | 8.70 ppm |
| Total Lead | 3.00 ppm |
| EDB | 0.00 ppm |
| EDC | 0.00 ppm |

TPH = Total Petroleum Hydrocarbons

(ppm) = parts per million

(ppb) = parts per billion

NA = Not Applicable

P = results pending

EDB = Ethylene Dibromide

EDC = 1,2 Dichloroethane

Free product present? _____ Yes _____ No XX Unknown

Type of product present: XX Leaded XX Unleaded _____ Diesel

D. SITE SAFETY WORKPLAN

PERSONNEL

| <u>Team Member</u> | <u>Title</u> | <u>Responsibility</u> |
|--------------------|------------------|-----------------------|
| Mike Kitko | Geologist | Site Geologist |
| Brian Garber | Senior Geologist | Project Manager |
| Brian Garber | Senior Geologist | Site Safety Officer |

PERIMETER ESTABLISHED

| | | |
|-----------------------|---------------|--------------|
| Map/Sketch Attached? | Yes___ | No <u>XX</u> |
| Site Secured? | Yes___ | No <u>XX</u> |
| Perimeter Identified? | Yes <u>XX</u> | No___ |
| Zero line defined? | Yes___ | No <u>XX</u> |

INVESTIGATION-DERIVED MATERIAL DISPOSAL:

Soil from investigative activities will be stockpiled and stored on site until analyses are available to describe the levels of petroleum hydrocarbon constituents contained in them. Soil stockpiled on site will be underlain by and covered with plastic sheeting or contained in drums if required by local regulatory agencies. Water from investigative activities will be stored in DOT-approved 55-gallon drums. Any material disposed off site will be disposed of in accordance with existing regulation and guidelines.

D1. PERSONAL SAFETY

SITE ENTRY PROCEDURES: Notify store manager

PERSONNEL PROTECTION:

Level of protection: A_____ B_____ C_____ D_XX_

Modifications:

1. All personnel must wear hard hat, safety shoes, safety glasses and/or face shield.
2. Neoprene gloves and tyvek/saranax suit should be worn if contact with contaminated water or soil is likely.
3. Hearing protection must be worn if noise levels prevent normal conversation at a distance of three feet. No smoking, eating, or drinking is allowed on site.
4. Respiratory protection is dependent on conditions listed in the next section.
5. No personnel are to enter or approach any excavation area where there is a danger of wall collapse or confined space entry.

Surveillance Equipment and Materials:

| <u>Instrumentation</u> | <u>Action Level</u> | <u>Action</u> |
|------------------------|--|---|
| photoionization | 5 units or 5 times background (breathing zone) | use halfmask respirator with organic cartridges |
| oxygen meter | <19.5% oxygen | do not enter area or confined space until levels are reduced. |
| explosimeter | >10% LEL | eliminate all ignition sources and |
| | >20% LEL | reduce levels immediately or leave site. |

First Aid Equipment: Standard first aid kit, portable eye wash.

First Aid Procedures:

Ingestion: DO NOT induce vomiting, summon medical help.

Inhalation: Move victim to fresh air, seek medical attention if needed.

Dermal Exposure: Remove contaminated clothing, flush with water.

DECONTAMINATION PROCEDURE:

Personnel: Flush exposed skin with soap and water.

WORK LIMITATIONS:(time of day, weather, heat/cold stress):

In high ambient temperatures, follow heat-stress precautions: Provide plenty of cool water and electrolytes (e.g., Gatorade), remove protective clothing during breaks: check resting pulse and increase number of breaks if pulse does not return to normal during work break.

In cold ambient temperatures (<35°F.), follow hypothermia precautions. Work may only progress during daylight hours or under conditions of adequate lighting.

ELECTRICAL HAZARDS:

Will be located by U.S.A. before drilling.

Maintain at least 10 feet clearance from overhead power lines. If unavoidably close to overhead or buried power lines, turn power off and lockout circuit breaker. Avoid standing in water when operating electrical equipment.

CONFINED SPACES:

Monitor organic vapors and oxygen before entering. If the following values are exceeded, do not enter.

1. Oxygen < 20.0%.
2. Total hydrocarbons > 5 ppm above background, if all air contaminants have not been identified.
3. Concentrations of specific air contaminants exceeding action levels in Section D, if all air contaminants have been identified.

If entering a confined space, monitor oxygen and organic vapors continuously.

AGENCIES CONTACTED IN UNDERGROUND UTILITY SEARCH:

E. EMERGENCY INFORMATION

LOCAL TELEPHONE NUMBERS (provide area codes):

| | | |
|-------------------------|----------------|----------------------------------|
| Ambulance | 911 | |
| Hospital Emergency Room | (510) 357-8300 | Physicians Community Memorial |
| Poison Control Center | 911 | |
| Fire Department | 911 | |
| Airport | (510) 293-8678 | Hayward Airport |
| Explosives Unit | 911 | |

SITE RESOURCES:

| | | |
|------------------------------------|---------------|----------------|
| Water supply available on site: | Yes <u>XX</u> | No <u> </u> |
| Telephone available on site: | Yes <u>XX</u> | No <u> </u> |
| Bathrooms available on site: | Yes <u>XX</u> | No <u> </u> |
| Other resources available on site: | Yes <u>XX</u> | No <u> </u> |
| :Electricity | | |

EMERGENCY CONTACTS

PHONE NO.

| | |
|---|----------------|
| 1. Project Manager: Brian Garber | (916) 782-2110 |
| 2. Health and Safety Officer: Brian Garber | (916) 782-2110 |
| 4. Site Contact: Jay Anast | (510) 357-7330 |
| 5. Regulatory Contact: Larry Ceto Alameda County | (510) 271-4320 |

F. EMERGENCY ROUTES

HOSPITAL: Physicians Community Hospital
2800 Benedict Drive
San Leandro, California
(510) 357-8300
North on Grand Avenue - over freeway
Right on Benedict Drive
3 blocks through residential
Hospital easily spotted
Approximate travel time: 10 to 15 minutes

G. HAZARD EVALUATION

| <u>PARAMETER</u> | <u>TLV</u> <u>(ppm)</u> | <u>OT</u> <u>(ppm)</u> | <u>IDLH</u> <u>(ppm)</u> | <u>VOLA-</u> <u>TILITY</u> | <u>SKIN</u> <u>HAZARD</u> | <u>EXPLO-</u> <u>SIVITY</u> |
|------------------|----------------------------|---------------------------|-----------------------------|-------------------------------|------------------------------|--------------------------------|
| Benzene | 0.1 | 4 | 2,000 | H | L | H |
| Ethylbenzene | 100 | NS | 2,000 | M | L | H |
| Toluene | 100 | 2 | 2,000 | M | L | H |
| Xylene | 100 | <1 | 10,000 | H | M | H |
| Gasoline | 300 | NS | NS | H | L | H |

KEY: TLV = Threshold Limit Value (Worker - 8 Hours)
OT = Odor Threshold
DLH = Immediately Dangerous to Life and Health
NS = None Specified
NR = Not Reported
H = High
M = Medium
L = Low
U = Unknown

APPENDIX A: HAZARDOUS PROPERTY INFORMATION

Explanations and Footnotes

Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline for example, is insoluble in the gross sense, and will be found as a discreet layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene will also be found in solution in the ground water at the part per million or part per billion level.

- A. Water solubility expressed as 0.2g means 0.2 grams per 100 grams water at 20°C.
- B. Solubility of metals depends on the compound in which they are present.
- C. Several chlorinated hydrocarbons exhibit no flash point in conventional sense, but will burn in presence of high energy ignition source or will form explosive mixtures at temperatures above 200°F.
- D. Practically non-flammable under standard conditions.
- E. Expressed as mm Hg under standard conditions
- F. Explosive concentrations of airborne dust can occur in confined areas.
- G. Values for Threshold Limit Value - Time Weighted Average (TLV-TWA) are OSHA Permissible Exposure Limits (PEL) except where noted in H. and I.
- H. TLV - TWA adopted by the American Conference of Government Industrial Hygienists (ACGIH) which is lower than the OSHA PEL.
- I. TLV - TWA recommended by the National Institute for Occupational Safety and Health (NIOSH). A TLV or PEL has not been adopted by the ACGIH or OSHA.
- J.
 - A. - Corrosive
 - B. - Flammable
 - C. - Toxic
 - D. - Volatile
 - E. - Reactive
 - F. - Radioactive
 - G. - Carcinogen
 - H. - Infectious
 - K. - Dermal Toxicity data is summarized in the following three categories:

Skin penetration

- A - negligible penetration (solid-polar)
- B - slight penetration (solid-nonpolar)
- C - moderate penetration (liquid-nonpolar)
- D - high penetration (gas/liquid-nonpolar)

Systemic Potency

- E - slight hazard - $LD_{50} = 500-15,000$ mg/kg
lethal dose for 70 kg man = 1 pint-1 quart
- F - moderate hazard - $LD_{50} = 50-500$ mg/kg
lethal dose for 70 kg man = 1 ounce-1 pint
- G - extreme hazard - $LD_{50} = 10-50$ mg/kg
lethal dose for 70 kg man = drops to 20 ml

Local Potency

- H - slight - reddening of skin
- I - moderate - irritation/inflammation of skin
- J - extreme - tissue destruction/necrosis

1. Acute Exposure Symptoms

- A - abdominal pain
- B - central nervous system depression
- C - comatose
- D - convulsions
- E - confusion
- F - dizziness
- G - diarrhea
- H - drowsiness
- I - eye irritation
- J - fever
- K - headache
- L - nausea
- M - respiratory system irritation
- N - skin irritation
- O - tremors
- P - unconsciousness
- Q - vomiting
- R - weakness

HAZARDOUS PROPERTY INFORMATION - FUELS

| <u>Material</u> | <u>Water^A Solubility</u> | <u>Specific Gravity</u> | <u>Vapor Density</u> | <u>Flash Point °F</u> | <u>Vapor^C Pressure</u> | <u>LEL UEL</u> | <u>LD₅₀ mg/kg</u> | <u>TLV-TWA^C</u> | <u>IDLH Level</u> | <u>Odor Threshold or Warning Concentration</u> | <u>Hazard^D Property</u> | <u>Dermal^K Toxicity</u> | <u>Accute^L Exposure Symptoms</u> |
|-----------------|---|-----------------------------|--------------------------|-------------------------------|---------------------------------------|--------------------|----------------------------------|----------------------------|-----------------------|--|--|--|---|
| Diesel Fuel | insoluble | 0.81-0.90 | --- | 130 | --- | 0.6-1.3 6.0-7.5 | | none established | NE | 0.008 ppm | BCD | CI | BCEFHIKL MNP |
| Gasoline | insoluble | 0.72-0.76 | 3-4 | -45 | variable | 1.4% 7.6% | | 300 ppm | NE | < 1 ppm | BCDG | CI | BCEFHIKL MNP |
| Kerosene | insoluble | 0.83-1.0 | --- | 100-165 | 5 | 0.7% 5.0% | | none established | NE | 0.008 ppm | BCD | CI | BCEFHIKL MNP |

HAZARDOUS PROPERTY INFORMATION - VOLATILE ORGANIC PRIORITY POLLUTANTS

| Material | Water ^a Solubility | Specific Gravity | Vapor Density | Flash Point °F | Vapor ^f Pressure | LEL UEL | LD ₅₀ mg/kg | TLV-TWA ^c | IDLH Level | Odor Threshold or Warning Concentration | Hazard ^d Property | Dermal ^k Toxicity | Accute ^l Exposure Symptoms |
|-----------------------------|----------------------------------|---------------------|------------------|----------------------|--------------------------------|----------------|---------------------------|----------------------|-------------------|---|---------------------------------|---------------------------------|---|
| Acrolein | 22% | 0.8410 | 1.9 | -15 | 214 mm | 2.8% 31.0% | 46 | 0.1 ppm | 5 ppm | 0.1-16.6 (0.21-0.5) | BCED | BJ | ABDFGHK LMNOPQR |
| Acrylonitrile | 7.1% | 0.8060 | 1.8 | 30 | 83 mm | 3.0% 17.0% | 82 | 2.0 ppm | 4,000 ppm | 19-100 | BCEGD | DIG | FGIKLMN Q R |
| Benzene | 820 ppm | 0.8765 | 2.8 | 12 | 75 mm | 0.339% 7.1% | 3800 | 10.0 ppm | 2,000 ppm | 4.68 | BCGD | CIG | BCDFHIK MNOQR |
| Bromomethane | 0.1 g | 1.732 | 3.3 | none | 1.88 atm | 13.5% 14.5% | | 5.0 ppm | 2,000 ppm | no odor | CD | | BCDEIJK L MNOQR |
| Bromodichloromethane | insoluble | 1.980 | -- | none | n/a | non- flam. | 916 | none established | none specified | | CGD | | BIMN |
| Bromoform | 0.01 g | 2.887 | -- | none | 5 mm | non- flam. | 1147 | 0.5 ppm | n/a | 530 | CD | | BCDKMN |
| Carbon Tetrachloride | 0.08% | 1.5967 | 5.3 | none | 91 mm | non- flam. | 2800 | 5.0 ppm | 300 ppm | 21.4-200 | CD | JGH | ABCDFGHN Q |
| Chlorobenzene | 0.01 g | 1.1058 | 3.9 | 84 | 8.8 mm | 1.3% 9.6% | 2910 | 75.0 ppm | 2,400 ppm | 0.21-60 | BCD | CIF | BCFIKLM NOPQR |
| Chloroethane | 0.6 g | 0.8978 | 2.2 | -58 | 1.36 atm | 3.8% 15.4% | | 1000.0 ppm | 20,000 ppm | | BCD | | BFHIKMNP |
| 2-Chloroethylvinyl Ether | insoluble | 1.0475 | 3.7 | 80 | 30 mm | -- | 250 | none established | none specified | | BCD | | HIM |
| Chloroform | 0.8 g | 1.4832 | 4.12 | none | 160 mm | non- flam. | 800 | 10.0 ppm | 1,000 ppm | 50-307 fatigue (>4096) | CD | | BCEGIKLM N |
| Chloromethane | 0.74% | 0.9159 | 1.8 | 32 | 50 atm | 7.6% 19.0% | | 50.0 ppm | 10,000 ppm | 10-100 no odor (500-1000) | BCD | DHF | ABCDEFGI JKLOQR |
| Dibromochloromethane | insoluble | 2.451 | -- | -- | -- | -- | 848 | none established | none specified | | BCD | | BFHIMNPQ |

HAZARDOUS PROPERTY INFORMATION - VOLATILE ORGANIC PRIORITY POLLUTANTS (CONTINUED)

| Material | Water ^a Solubility | Specific Gravity | Vapor Density | Flash Point °F | Vapor ^e Pressure | LEL UEL | LD ₅₀ mg/kg | TLV-TWA ^c | IDLH Level | Odor Threshold or Warning Concentration | Hazard ^d Property | Dermal ^k Toxicity | Accute ^l Exposure Symptoms |
|--------------------------------|----------------------------------|---------------------|------------------|----------------------|--------------------------------|-----------------------------------|---------------------------|------------------------|-------------------|---|---------------------------------|---------------------------------|---|
| 1,1-Dichloroethane (DCA) | 0.1 g | 1.1757 | 8.4 | 22 | 182 mm | 6.0% 16.0% | 725 | 100.0 ppm | 4,000 ppm | 5 ppm | BCD | | ABHIMNO |
| 1,2-Dichloroethane | 0.8% | 1.2554 | 3.4 | 55 | 87 mm | 6.2% 16.0% | 670 | 10.0 ppm ^h | 1,000 ppm | 6 ppm | BCDG | | BCFGLMNQ |
| 1,1-Dichloroethylene (DCE) | 2250 mg/l @ 77°F | -- | 3.4 | 3 | 591 mm | 7.3% 16.0% | 200 | 5.0 ppm ^h | none specified | | BCD | | BIMN |
| Trans-1,2-Dichloroethylene | slightly soluble | 1.2565 | -- | 36 | 400 mm | 9.7% 12.8% | | none established | none specified | .0043 mg/l | BCD | | ABFILOQ |
| 1,2 Dichloropropane | 0.26% | 1.1583 | 3.9 | 60 | 40 mm | 3.4% 14.5% | 1900 | 75.0 ppm | 2,000 ppm | 50 | BCD | | ABGHKMN Q |
| Cis-1,3-Dichloropropane | insoluble | 1.2 | 3.8 | 83 | 28 mm | 5.0% 14.5% | 250 | 1.0 ppm ^h | none specified | | BCD | | ABGHKLM NP |
| Trans-1,3-Dichloropropane | insoluble | 1.2 | 3.8 | 83 | 28 mm | 5.0% 14.5% | | 1.0 ppm ^h | none specified | | BCD | | ABGHKLM NP |
| Ethylbenzene | 0.015 g | 0.867 | 3.7 | 59 | 7.1 mm | 1.0% 6.7% | 3500 | 100.0 ppm | 2,000 ppm | 0.25-200 (200) | BCD | CIF | ABFHKLM NPQR |
| Methylene Chloride | slightly soluble | 1.335 | 2.9 | none | 350 mm | 12.0% ^c unavailable | 167 | 100.0 ppm ^h | 5,000 ppm | 25-320 (5000) | CED | CIF | BCIKLMNP R |
| 1,1,2,2-Tetrachloroethane | 0.19% | 1.5953 | 5.8 | none | 5 mm | non- flam. | | 1.0 ppm ^h | 150 ppm | 3-5 | CD | | ABCFHIKL MNOQ |
| Tetrachloroethylene | 0.15 g/ml | 1.6227 | 5.8 | none | 15.8 mm | non- flam. | 8850 | 50.0 ppm ^h | 500 ppm | 4.68-50 (160-690) | CD | | ACFHIKLM NP |
| 1,1,1-Trichloroethane (TCA) | 0.07 g | 1.3390 | 4.6 | none | 100 mm | 8.0% ^c 10.5% | 10300 | 350.0 ppm | 1,000 ppm | 20-400 (500-1000) | BCED | | ABEFHIKL NOP |
| 1,1,2-Trichloroethane | 0.45 | 1.4397 | 4.6 | none | 19 mm | 6.0% ^c 15.5% | 1140 | 10.0 ppm | 500 ppm | 0 | C | | BEFGHIKL MNOQ |

HAZARDOUS PROPERTY INFORMATION - VOLATILE ORGANIC PRIORITY POLLUTANTS (CONTINUED)

| Material | Water ^a Solubility | Specific Gravity | Vapor Density | Flash Point °F | Vapor ^c Pressure | LEL UEL | LD ₅₀ mg/kg | TLV-TWA ^c | IDLH Level | Odor Threshold or Warning Concentration | Hazard ^d Property | Dermal ^e Toxicity | Accute ^f Exposure Symptoms |
|-------------------------|----------------------------------|---------------------|------------------|----------------------|--------------------------------|----------------|---------------------------|-----------------------|-------------------|---|---------------------------------|---------------------------------|---|
| Trichloroethylene (TCE) | 0.1% | 1.4642 | 4.5 | 90 | 58 mm | 12.5% 90.0% | 4920 | 50.0 ppm ^h | 1,000 ppm | 21.4-400 | BC | | BFKLNOPQ |
| Trichlorofluoromethane | 0.11 g | 1.494 | -- | none | 0.91 atm | non- flam. | | 1000.0 ppm | 10,000 ppm | 135-209 | CD | | BFHKLQ |
| Toluene | 0.05 g | 0.866 | 3.2 | 40 | 22 mm | 1.3% 7.1% | 5000 | 100.0 ppm | 2,000 ppm | 0.17-40 fatigue (300-400) | BC | BHE | BEFHIKLM NOPQ |
| Vinyl Chloride | negligible | 0.9100 | 2.24 | -108 | 3.31 atm | 3.6% 33.0% | 500 | 1.0 ppm | none specified | 260 | BCEG | DJG | ABFHIKLN R |

HAZARDOUS PROPERTY INFORMATION - HEAVY METALS

| Material | Water ^a Solubility | Specific Gravity | Vapor Density | Flash Point °F | Vapor ^c Pressure | LEL UEL | LD ₅₀ mg/kg | TLV-TWA ^e | IDLH Level | Odor Threshold or Warning Concentration | Hazard ^d Property | Dermal ^k Toxicity | Acute ^l Exposure Symptoms |
|-----------|----------------------------------|---------------------|------------------|----------------------|--------------------------------|------------|---------------------------|--------------------------------------|----------------------|---|---------------------------------|---------------------------------|--|
| Arsenic | B | 5.727 | n/a | none | n/a | F | | 10.0 ug/m ³ | none specified | | CEG | CJG | ACDGJLMO QR |
| Beryllium | B | 1.85 | n/a | none | n/a | F | | 2.0 ug/m ³ | none specified | | C | | IJMNR |
| Cadmium | B | 8.642 | n/a | none | n/a | F | 225 | 0.5 mg/m ³ | 40/mg ³ | | C | | ABGKLMN QR |
| Chromium | B | 7.20 | n/a | none | n/a | F F | | 0.5 mg/m ³ ^{3H} | 500/mg ³ | | | | FMNQ |
| Copper | B | 8.92 | n/a | none | n/a | F | | 0.1 mg/m ³ | none specified | | C | | FGIJLMOQ R |
| Lead | B | 11.3437 | n/a | none | n/a | F | | 50.0 ug/m ³ | none specified | | C | | ACDFGOQR |
| Mercury | B | 13.5939 | 7.0 | none | 0.0012 mm | F | | 50.0 ug/m ³ ^{3H} | 28 mg/m ³ | | C | | AGLMNQ |
| Nickel | B | 8.9 | n/a | none | n/a | F | | 1.0 mg/m ³ | none specified | | C | | DGJLMNQ |
| Silver | B | 10.5 | n/a | none | n/a | F | | 0.01 mg/m ³ | none specified | | C | | IN |
| Thallium | B | 11.85 | n/a | none | n/a | F | | 0.1 mg/m ³ | 20 mg/m ³ | | C | BG | ADGLNOQ |
| Zinc | B | 7.14 | n/a | none | n/a | F | | none established | none specified | | C | | DF |

HAZARDOUS PROPERTY INFORMATION - MISCELLANEOUS

| Material | Water ^A Solubility | Specific Gravity | Vapor Density | Flash Point °F | Vapor ^C Pressure | LEL UEL | LD ₅₀ mg/kg | TLV-TWA ^C | IDLH Level | Odor Threshold or Warning Concentration | Hazard ^D Property | Dermal ^E Toxicity | Accute ^F Exposure Symptoms |
|---------------|----------------------------------|---------------------|------------------|----------------------|--------------------------------|---------------|---------------------------|-----------------------|----------------------|---|---------------------------------|---------------------------------|---|
| Acetone | soluble | 0.8 | 2.0 | -4 | 400 mm | 2.5% 12.8% | 9750 | 750 ppm | 10,000 ppm | 100 | BCD | DI | N |
| Asbestos | insoluble | 2.5 | n/a | none | n/a | non- flam. | | 0.2-2 fibers/cc | none specified | | CG | | MN |
| Chromic Acid | soluble | 1.67-2.82 | n/a | none | n/a | non- flam. | | none established | none specified | | ACEG | | GIN |
| Cyanides | 58-72% | | n/a | none | n/a | non- flam. | | 5 mg/m ³ | 50 mg/m ³ | | CE | | FKLN PQ |
| PCB (Generic) | slightly soluble | -- | n/a | none | n/a | non- flam. | | 1.0 ug/m ³ | none specified | | CG | | CHLPQ |
| Phenol | 8.4% | 1.0576 | 3.2 | 175 | 0.36 mm | 1.8% 8.6% | 414 | 5 ppm | 100 ppm | 0.047-5 (48) | C | | ABCDGIKM NOQ |
| Xylene | 0.00003% | 0.8642 | 3.7 | 84 | 9.0 mm | 1.1% 7.0% | 5000 | 100 ppm | 10,000 ppm | 0.5-200 (200) | BCD | | ABFHIKLM NPQ |