
# Health and Safety Plan
# for Additional Investigation and Remediation

Prepared for:

PG&E
ENCON-GAS Transmission and Distribution Construction Yard
Former Gas Holder Tank Area
4930 Coliseum Way
Oakland, California

Prepared by:

Aqua Resources Inc.
a wholly owned subsidiary of The Earth Technology Corporation
2030 Addison Street, Suite 500
Berkeley, California 94704

Aqua Resources Inc.

May 18, 1992

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HEALTH & SAFETY PLAN

## 1.0 INTRODUCTION

This Health and Safety Plan (HSP) is prepared for the remediation work for petroleum hydrocarbon contamination (diesel and waste oil), and lead paint chips at the PG&E General Construction Gas Yard in Oakland, California. The HSP addresses potential health and safety hazards that may be encountered during the additional investigation and capping projects and includes health and safety guidance for the field crew, on-site supervisors and project management personnel to conduct their job responsibilities on the site. The HSP is prepared based on accepted industrial hygiene practice for the hazardous waste industry.

## 2.0 PROJECT OBJECTIVES

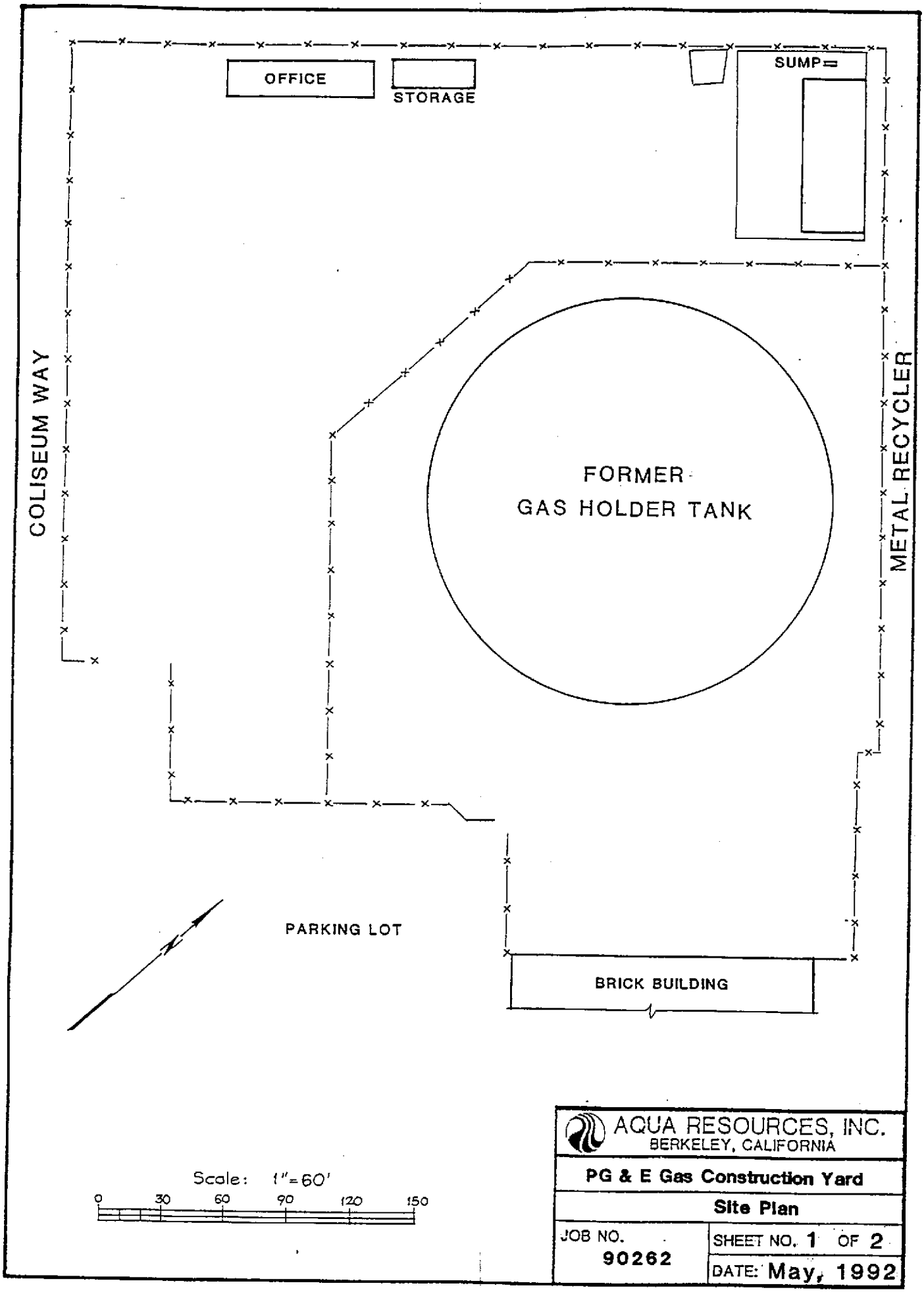
The objectives of the proposed work at the site are to perform additional investigation as to the extent of contamination, to remove any bulk petroleum hydrocarbons, and to prevent vertical and horizontal spread of contamination from lead paint chips in the soil.

Possible field activities at the Site include:

- Use of a hand or power augur and drive sampler to obtain soil samples
- Drilling of soil boring(s)
- Soil sampling during drilling
- Installation and development of monitoring well(s)
- Collection of groundwater samples
- Removal of any bulk hydrocarbons
- Steam cleaning of equipment
- Grading - use of bulldozer
- Asphalt paving.

## 3.0 SITE DESCRIPTION

The site is located at 4930 Coliseum Way in Oakland, California. The site is shown on the Vicinity Map, Sheet 1. The site is used by PG&E as a vehicle, materials and equipment storage and distribution facility. Historically, the site was also used as a vehicle service center and above ground natural gas storage facility. Some surfaces are paved with concrete or asphalt, and a portion of the site is unpaved or surfaced with gravel only.




AQUA RESOURCES, INC.
BERKELEY, CALIFORNIA

**PG & E Gas Construction Yard**

**Site Plan**

JOB NO. 90262

SHEET NO. 1 OF 2

DATE: May, 1992

## 4.0 JOB HAZARD EVALUATION

### 4.1 Chemical Hazards

Petroleum hydrocarbons and lead compounds are expected to be encountered in this project. Hazardous Substance Information Forms contained in Appendix I contain general physical, chemical, and toxicological data on these compounds. Toxicological data are summarized below:

| Substance | Exposure Route | Exposure Symptoms |
|---|---|---|
| Lead, Lead Oxides, Lead Salts | Inhalation* Ingestion | Constipation, insomnia, gastrointestinal disorders, anemia, weakness, joint pain, facial pallor, weight loss, encephalopathy, nephropathy, irritates eyes |
| Petroleum Hydrocarbons | Inhalation* Ingestion Skin Absorption* | Dizziness, drowsiness, headache, nausea, eye irritation |

* Primary exposure route(s)

Petroleum hydrocarbons, like those used at the site, are known to contain benzene which has been identified as a potential carcinogen for man by the International Agency for Research on Cancer (IARC) (IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Volume 7, 1974, and Volume 18, 1978).

The current OSHA permissible exposure limit (PEL) for petroleum hydrocarbons is 2000 $mg/m^3$ over an eight hour day. NIOSH recommends that the permissible exposure limit for petroleum hydrocarbons be 350 $mg/m^3$ averaged over a work shift of up to 10 hours per day, 40 hours per week.

The OSHA PEL for lead is 0.05 $mg/m^3$ (6 ppb), which is more conservative than the NIOSH value of 0.1 $mg/m^3$.

## 4.2 Heat Stress

Heat stress may occur due to prolonged working under hot weather conditions, poor ventilation, and extensive work hours without adequate resting periods and replacement of water and salt. Kinds or levels of heat stress are listed below:

Heat Rash: Hot humid conditions; red dermatitis

Heat Cramps: Painful spasms in skeletal muscles and pain in extremities and abdomen caused by profuse sweating and water replacement without adequate salt or electrolyte replacement. Larger muscle groups that are fatigued from use are usually most susceptible.

Heat Exhaustion: Characterized by extreme weakness or fatigue, dizziness, nausea, and headache. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. In serious cases, a person may vomit or lose consciousness. Treatment is rest in a cool place (do not chill) and replacement of body water lost by perspiration. Severe cases may require care for several days. There are no permanent effects.

Heat Stroke: Most severe form of heat stress; mortality rate is 50%. Very serious condition caused by a breakdown of the body's heat regulation mechanism. Signs and symptoms include red, hot dry skin, and body temperature 105 °F or higher. No perspiration, but nausea, dizziness, confusion, or convulsions may occur. Quick treatment is necessary. Body heat should be reduced artificially, but not too rapidly, by soaking the person's clothes with water and fanning them. Alternatively, remove as much clothing as possible; wrap injured in a sheet soaked in water and fan vigorously; treat for shock.

Steps to minimize or monitor heat stress are given in Section 10, Monitoring Procedures and Criteria.

### 4.3 Other Hazards

Other hazards may include excessive noise and dust exposure during the construction work and operation of equipment. There are also physical hazards associated with working around equipment and hazards from various activities such as handling heavy equipment. Physical hazards include:

- Falling resulting from tripping on objects lying on the ground, stepping into boreholes or from uneven terrain;

- Injury from moving equipment such as when heavy equipment is in motion or being operated.

The Contractor shall follow appropriate safety regulations to protect the safety of people working around the drilling equipment. Equipment and machinery to be used on site shall be in good condition and shall be operated by qualified employees according to the manufacturer's instructions.

## 5.0 SITE CONTROL

The onsite Command Post and staging areas have been established at the parking area located inside the main gate at the northwest end of the site.

Control boundaries have been established, and the Exclusion Zone (the contaminated area), Contamination Reduction Zone, and Support Zone (clean area) have been identified and designated as follows:

| | |
|---|---|
| Exclusion Zone: | Fenced area around the former gas storage tank. |
| Contamination Reduction Zone: | Area immediately outside and adjacent to the fenced area. |
| Support Zone: | Parking area outside the main gate. |

A site map showing the general location of the site is attached to this Health & Safety Plan (Plate 1). Site perimeter of the property is secured by existing fences and gates. NO UNAUTHORIZED PERSON SHALL BE PRESENT WITHIN THE FENCED YARD AT ANY TIME DURING PERFORMANCE OF ACTIVITIES DESCRIBED IN SECTION 2. The Site Safety Officer or his designated Team Leader is responsible for maintaining site security.

## 6.0 ONSITE ORGANIZATION AND COORDINATION

Project organization is as follows:

Engineer: Aqua Resources Inc. (ARI)
Client: PG&E

Personnel and duties at the site are as follows:

Site Safety Officer: Mr. Voytek Bajsarowicz, ARI
Field Team Leader: Mr. Aaron Stessman, ARI or Mr. Dave Harlan, ARI

Aqua Resources Inc. (ARI) personnel will log the borings, handle the soil and groundwater samples after collection, provide the necessary coordination and supervision to carry out the proposed remediation works, and will be present at the site to ensure the execution of this Health and Safety Plan.

The Site Safety Officer (SSO) will be responsible for the continuous monitoring of the site environment and observation of safety procedures on site. The SSO has the authority to make, if required by a specific site condition, any changes to this Health and Safety Plan such as level of protection, and boundaries of different zoning. All personnel arriving or departing the site should check in and out with the Site Safety Officer. All activities on site must be cleared through the Site Safety Officer.

When the designated SSO is away from the site, Mr. Aaron Stessman shall be the Alternate Site Safety Officer (ASSO). The ASSO shall have the same authority and shall perform the same tasks as the SSO.

The Contractor will perform construction operations, collect soil samples (driller only), decontaminate drilling equipment, and contain drilling wastes in drums. Soil excavated by drilling activities shall be placed in 55 gallon DOT-approved drums.

## 7.0 COMMUNICATION

Site activities in the Contamination Reduction Zone and Support Zones allow for direct voice contact at all times. Voice communication at Exclusion Zone may not be possible due to restriction of the half mask respirator. Where direct voice contact is not possible, personnel shall be briefed on duties to be performed before entering those areas. Hand sign signals

shall be used for communication within such areas. Personnel shall leave the Exclusion Zone as soon as the desired duties are accomplished.

Personnel at the site will remain in constant voice communication or within sight of the Field Team Leader or his designated line-of-sight support person.

A Buddy System shall be established for all personnel working within the Exclusion Zone. Each worker shall have a designated co-worker or "buddy". Each of them shall be able to:

1) Provide their partner with assistance whenever needed.
2) Observe their partner for signs of chemical or heat exposure.
3) Periodically check the integrity of their partner's protective clothing.
4) Notify the SSO or others if emergency help is needed.

The following standard hand signals will be used in case voice communication is impossible.

| | |
|---|---|
| Both arms waving | Someone is injured |
| Hand gripping throat | Out of air, cannot breathe |
| Hands on top of head | Need assistance |
| Thumbs up | OK, I am all right, I understand |
| Thumbs down | No, negative |

## 8.0 STANDARD OPERATING PROCEDURES

1) All personnel arriving or departing the site shall log in/out with the SSO.

2) All equipment shall be checked for proper functioning and calibration at the start of each work day.

3) All activities on site must be cleared through the SSO.

4) All personnel leaving the Exclusion Zone must decontaminate at the Contamination Reduction Zone.

5) No one shall stay in the Exclusion Zone alone.

6) There shall be no smoking or eating in the Contamination Reduction Zone or in the Exclusion Zone.

7) During grading activities, a water truck shall be used to keep the ground moist and thereby minimize the generation of dust. Grading will be accomplished by placing of clean imported fill material over existing native soil. No scraping of existing soil will be allowed.

## 9.0 PERSONNEL PROTECTIVE EQUIPMENT

Based on an evaluation of the potential hazards, the following levels of personnel protection have been designated for the applicable work locations and tasks:

| Location | Job Function | Level of Protection |
|---|---|---|
| Exclusion Zone | All | C |
| All other areas | All | D |

Specific protective equipment shall be as follows:

Level C Protection

- Full face, air-purifying respirator with organic vapor cartridge(s) and particulate prefilter(s); or half mask, air-purifying respirator with same cartridges;
- TYVEK chemical-resistant one-piece suit;
- Inner and outer gloves made of chemical-resistant materials such as viton, nitrile, vinyl or neoprene;
- Chemical-resistant safety boots/shoes;
- Hard hat;
- Eye Protection (safety glasses or goggles);

The OSHA Personal Equipment Standard (29 CFR Part 1910.134) shall be followed when using respirators. A Respiration Protection Program regarding the proper use of air-purifying respirator is presented in Appendix II.

Level D Protection

- Safety boots/shoes;
- Outer gloves made of chemical-resistant materials such as viton, nitrile, vinyl or neoprene;
- Hard hat, if appropriate;
- Eye Protection (safety glasses or goggles);
- Gloves, cloth or leather for general use;

Personnel shall also be provided with adequate hearing protection such as ear plugs or ear muffs when performing activities that produce high noise level.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER.

## 10.0 MONITORING PROCEDURES AND CRITERIA

Personal monitoring shall be in effect to prevent injury to workers due to excessive exposure to hazardous chemicals, heat stress and noise. The following program of monitoring will be in effect for all personnel engaged in conduct of the work.

- Body temperature monitoring: The expected air temperature range will be 60-70°F. Metabolic heat load due to work activities is not expected to exceed 300 kcal-hour. Personnel shall decrease work if oral temperature is greater than 99.6 °F; do not wear (semi-) impermeable clothing if oral temperature is greater than 100.6 °F. Body temperature shall be taken at the request of the Site Safety Officer or the worker himself.

- Heart rate: Decrease work if heartbeat is greater than 110 beats per minute at the beginning of a rest period.

- Body water loss: Measure weight at beginning and end of each day. Weight loss should not exceed 1.5% of total body weight in a work day.

Personnel will be instructed in self heat stress monitoring (awareness of signs such as shortness of breath, excessive perspiration and general discomfort). If personnel self-monitoring indicates that heat stress monitoring is required, the following procedures shall be followed:

- Physiological monitoring frequency shall be every 180 minutes of work.
- Heart Rate: radial pulse during a 30-second period as early as possible in the rest period.
- Oral temperature: measured with a clinical thermometer (3-minutes under the tongue).

Personnel shall read this Health and Safety Plan and be familiar with the symptoms caused by excessive exposure to the various chemicals that may be encountered during the site activities (Section 4.1 Chemical Hazards) and shall stop their activities and report to the SSO should they suspect the development of such symptoms.

## 11.0 DECONTAMINATION PROCEDURES

Personnel and equipment leaving the exclusion zone shall be decontaminated. The standard level decontamination protocol shall be used with the following decontamination steps:

(1) Equipment drop
(2) Outer boot wash and rinse
(3) Tape and outer glove removal
(4) Coverall wash/rinse or disposal as required
(5) Remove coverall
(6) Inner glove wash/rinse
(7) Remove respirator
(8) Inner glove removal
(9) Field wash/rinse

The above decontamination steps shall be carried out at the Contamination Reduction Zone. ARI will provide the following decontamination and first aid equipment at the Contamination Reduction Zone: plastic buckets, brush, plastic bags for disposable surgical (inner) gloves and first aid kit.

Soap and water will be provided and used as the decontamination solution.

Decontamination rinse water shall be stored in appropriate containers that are clearly labeled. The decontamination rinse water may have to be analyzed for levels of petroleum

hydrocarbons or lead and, if required, disposed of as hazardous waste in conformance with all Federal, State and local laws by the Client.

## 12.0 EMERGENCY RESPONSE PROCEDURES

### 12.1 SITE SAFETY OFFICER

The Site Safety Officer shall record all injuries happened at the site including nature of injuries, response actions to each injury, and cause of injuries, if known. The SSO shall give a precise report to hospital as to extent of decontamination of the injured person and nature of contaminants involved.

### 12.2 EMERGENCY MEDICAL CARE

For any emergency, call "911" first. Highland Hospital, located at 1411 E. 31st Street in Oakland is approximately 5 minutes from this site. A map showing the location of this facility will be available at the site, and is included in this Health and Safety Plan (Sheet 2).

First-aid equipment will be available on site, consisting of a first-aid kit. Local ambulance service is available by calling 911.

First Aid Instructions

In the event that concentrated chemicals are found at the site and they come in contact with the eyes, then the affected eye will be immediately washed with large amount of water, occasionally lifting the lower and upper lids. Immediate medical attention will be sought. To reduce the risk of eye injuries, personnel will not be permitted to wear contact lenses while working.

If concentrated chemicals come into contact with the skin, the affected area will be washed with soap and water.

Both the Engineer and the Contractor shall have personnel(s) familiar with first aid and CPR.

EMERGENCY PHONE NUMBERS: (This list is reprinted in Appendix III).

Emergency: 911
Police Department: (510) 596-3737
Fire Department: (510) 596-3771
Hospital: (510) 534-8055
Public Health Advisor, Hazard Evaluation System and Information Service (HESIS) (510) 540-3014

## 12.3 EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone or the Contamination Reduction Zone: Upon notification of an injury in the Exclusion Zone or Contamination Reduction Zone, the designated emergency signal (voice contact) shall be sounded. All site personnel shall assemble at the Contamination Reduction Zone. The Site Safety Officer will evaluate the nature of the injury, and the affected person will be decontaminated to the extent possible prior to movement to the Support Zone. If the SSO judges it to be necessary, an ambulance will be called and the designated medical facility will be contacted to receive the case. No person shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the Support Zone, the Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, and the affected personnel will be conveyed to the designated medical facility, as deemed necessary by the SSO. If the injury increases the risk to others, the SSO may require all activities on site to stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion on site, the SSO will order all site personnel to assemble outside the entrance gate of the site. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Equipment Failure: If any equipment on site fails to operate properly, the Site Safety Officer shall be notified and he will then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents continued progress for the

work, all personnel within the Exclusion Zone or the Contamination Reduction Zone shall proceed to the Support Zone until the situation has been evaluated by the SSO.

Re-entry of Exclusion Zone: In all situations, when an onsite emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed.
- The Site Safety Plan has been reviewed.
- Site personnel have been briefed on any changes in the Site Safety Plan.

## 13.0 HEALTH & SAFETY TRAINING AND MEDICAL SURVEILLANCE

All site personnel shall be properly trained for the purpose of this project. The training shall comply with OSHA, 1910.120 (e). This Health and Safety Plan shall be made available to each Field Team Leader, the Site Safety Officer, local hospital, and the Contractor. The Contractor shall be responsible for making his employees familiar with the names and alternates for site safety and health. This includes SSO, ASSO, and Project Team Leader. It is the Contractor's responsibility to ensure that his employees have adequate training in the following:

- Names of personnel and alternates responsible for site safety and health;
- Safety, health and other hazards present on the site;
- Use of Personal Protection Equipment;
- Work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment on the site;
- Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
- Sections 5 through 12 of this Health & Safety Plan.

## 14.0 ACKNOWLEDGEMENT

The undersigned have read the above plan and are familiar with its provisions.

| | SIGNATURE |
|---|---|
| Site Safety Officer: | _____ |
| Field Team Leader: | _____ |
| Other Site Personnel: | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |

APPENDIX I

HAZARDOUS SUBSTANCE INFORMATION FORMS

- Explanation of Codes and Abbreviations
- Petroleum Hydrocarbons
- Lead Monoxide

12/30/81

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

# MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

## SECTION I

| | |
|---|---|
| MANUFACTURER'S NAME: ABC Incorporated | EMERGENCY TELEPHONE NO.: (000) 000-0000 (000) 000-0000 (nights) |
| ADDRESS (Number, Street, City, State, and ZIP Code): 1 Main Street, Anytown, Anystate (00000) | |
| CHEMICAL NAME AND SYNONYMS: Lead Monoxide, Lead Oxide | TRADE NAME AND SYNONYMS: Litharge "X" Brand |
| CHEMICAL FAMILY: Metal Oxides | FORMULA: PbO CAS# 1317-36-8 |

## SECTION II - HAZARDOUS INGREDIENTS

| PAINTS, PRESERVATIVES, & SOLVENTS | % | TLV (Units) | ALLOYS AND METALLIC COATINGS | % | TLV (Units) |
|---|---|---|---|---|---|
| PIGMENTS Not applicable (NA) | | | BASE METAL NA | | |
| CATALYST " | | | ALLOYS " | | |
| VEHICLE " | | | METALLIC COATINGS " | | |
| SOLVENTS " | | | FILLER METAL PLUS COATING OR CORE FLUX " | | |
| ADDITIVES " | | | OTHERS " | | |
| OTHERS " | | | | | |

| HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES | % | TLV (Units) |
|---|---|---|
| Lead Monoxide | 99.8 | 0.05 mg/m |

NOTE: Effective July 29, 1979, the OSHA permissible exposure limit (PEL) for inorganic lead was reduced to 0.05 mg/m$^3$. Consult OSHA regulation 29 CFR 1910.1025 for additional requirements.

## SECTION III - PHYSICAL DATA

| | | | |
|---|---|---|---|
| BOILING POINT (°F.) | NA | SPECIFIC GRAVITY ($H_2O$=1) | 9.53 |
| VAPOR PRESSURE (mm Hg.) | NA | PERCENT, VOLATILE BY VOLUME (%) | NA |
| VAPOR DENSITY (AIR=1) | NA | EVAPORATION RATE (_____ =1) | NA |
| SOLUBILITY IN WATER | Insol. | Melting Point (°F) | 1630 |
| APPEARANCE AND ODOR | Odorless, yellow-orange powder. | | |

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

| | | | |
|---|---|---|---|
| FLASH POINT (Method used): Nonflammable | FLAMMABLE LIMITS: NA | Lel | Uel |
| EXTINGUISHING MEDIA: NA | | | |
| SPECIAL FIRE FIGHTING PROCEDURES: Wear NIOSH/MSHA aporoved self-contained breathing apparatus and protective clothing. | | | |
| UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE | | | |

## SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
(See Section II)

EFFECTS OF OVEREXPOSURE
Early symptoms of lead intoxication include constipation, insomnia, gastrointestinal disorders, anemia, weakness and joint pain.

EMERGENCY AND FIRST AID PROCEDURES
Remove immediately from further exposure and place individual under the care of an occupational physician. If ingested, induce vomiting in a conscious individual and immediately call a physician.

## SECTION VI - REACTIVITY DATA

| | | | |
|---|---|---|---|
| STABILITY | UNSTABLE | | CONDITIONS TO AVOID NA |
| | STABLE | X | |

INCOMPATABILITY *(Materials to avoid)*
Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
At temperatures above the melting point, lead oxide fumes may be evolved.

| | | | |
|---|---|---|---|
| HAZARDOUS POLYMERIZATION | MAY OCCUR | | CONDITIONS TO AVOID NA |
| | WILL NOT OCCUR | X | |

## SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
A clean-up procedure (vacumming, if feasible) which minimizes exposure is required. If the possibility of dust or fume exposure exists, wear approved respiratory protection (see below). Place all material in closed containers.

WASTE DISPOSAL METHOD
Dispose of material in accordance with Federal, State and Local air pollution, water pollution and solid waste regulations. Recommend disposal in an EPA approved hazardous waste landfill.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
NIOSH/MSHA approved respirator for toxic dust and/or fume (see below).

| | | |
|---|---|---|
| VENTILATION | LOCAL EXHAUST<br>Required (see below) | SPECIAL |
| | MECHANICAL *(General)* | OTHER |

| | |
|---|---|
| PROTECTIVE GLOVES<br>(see below) | EYE PROTECTION<br>Recommended |

OTHER PROTECTIVE EQUIPMENT Protective clothing is required if lead exposures exceed the OSHA PEL or significant contact occurs. Remove all work clothing before leaving plant premises.

## SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Local exhaust ventilation and/or respiratory protection is required for melting, grinding, drossing, soldering and other operations where airborne lead exposures in excess of the PEL may occur.

OTHER PRECAUTIONS Avoid ingestion and inhalation. Practice good personal hygiene and housekeeping procedures (see OSHA lead standard). Wash thoroughly before smoking, eating or drinking.

Form OSHA-20
Rev. May 72

# BENZENE

BNZ

| Common Synonyms | Watery liquid | Colorless | Gasoline-like odor |
|---|---|---|---|
| Benzol<br>Benzole | Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F. | | |

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor
Isolate and remove discharged material.
Notify local health and pollution control agencies.

**Fire**

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide
Water may be ineffective on fire.
Cool exposed containers with water

**Exposure**

CALL FOR MEDICAL AID
**VAPOR**
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

Move to fresh air
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen
**LIQUID**
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water

**Water Pollution**

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

## 1. RESPONSE TO DISCHARGE

**(See Response Methods Handbook)**
Issue warning-high flammability
Restrict access

## 2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

## 3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $C_6H_6$
3.3 **IMO/UN Designation:** 3.2/1114
3.4 **DOT ID No.:** 1114
3.5 **CAS Registry No.:** 71-43-2

## 4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic; rather pleasant aromatic odor; characteristic odor

## 5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.
5.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death.
5.3 **Treatment of Exposure:** SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
5.4 **Threshold Limit Value:** 10 ppm
5.5 **Short Term Inhalation Limits:** 75 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; $LD_{50}$ = 50 to 500 mg/kg
5.7 **Late Toxicity:** Leukemia
5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 4.68 ppm
5.11 IDLH Value: 2,000 ppm

## 6. FIRE HAZARDS

6.1 **Flash Point:** 12°F C.C.
6.2 **Flammable Limits in Air:** 1.3%-7.9%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 1097°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 6.0 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

## 7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

## 8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/$TL_m$/tap water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb, 10 days
8.4 **Food Chain Concentration Potential:** None

## 9. SHIPPING INFORMATION

9.1 **Grades of Purity:**
industrial pure .....99+ %
Thiophene-free .....99+ %
Nitration .....99+ %
Industrial 90% .....85+ %
Reagent ..... 89+ %
9.2 **Storage Temperature:** Open
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

## 10. HAZARD ASSESSMENT CODE

**(See Hazard Assessment Handbook)**
**A-T-U-V-W**

## 11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

| Category | Rating |
|---|---|
| Fire | 3 |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 3 |
| Water Pollution | |
| Human Toxicity | 3 |
| Aquatic Toxicity | 1 |
| Aesthetic Effect | 3 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 1 |
| Self Reaction | 0 |

11.3 **NFPA Hazard Classification:**

| Category | Classification |
|---|---|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

## 12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 78.11
12.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.3°K
12.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K
12.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K
12.6 **Critical Pressure:** 710 psia = 48.3 atm = 4.89 MN/m²
12.7 **Specific Gravity:** 0.879 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 2.7
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
12.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94.1 cal/g = 3.94 X $10^5$ J/kg
12.13 **Heat of Combustion:** —17,460 Btu/lb = —9698 cal/g = —406.0 X $10^5$ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 30.45 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 3.22 psia

NOTES

| BNZ | BENZENE |
|---|---|

| 12.17 SATURATED LIQUID DENSITY | |
|---|---|
| Temperature (degrees F) | Pounds per cubic foot |
| 55 | 55.330 |
| 60 | 55.140 |
| 65 | 54.960 |
| 70 | 54.770 |
| 75 | 54.580 |
| 80 | 54.400 |
| 85 | 54.210 |
| 90 | 54.030 |
| 95 | 53.840 |
| 100 | 53.660 |
| 105 | 53.470 |
| 110 | 53.290 |
| 115 | 53.100 |
| 120 | 52.920 |
| 125 | 52.730 |
| 130 | 52.540 |
| 135 | 52.360 |
| 140 | 52.170 |
| 145 | 51.990 |
| 150 | 51.800 |
| 155 | 51.620 |
| 160 | 51.430 |
| 165 | 51.250 |
| 170 | 51.060 |
| 175 | 50.870 |

| 12.18 LIQUID HEAT CAPACITY | |
|---|---|
| Temperature (degrees F) | British thermal unit per pound-F |
| 45 | .394 |
| 50 | .396 |
| 55 | .398 |
| 60 | .400 |
| 65 | .403 |
| 70 | .405 |
| 75 | .407 |
| 80 | .409 |
| 85 | .411 |
| 90 | .414 |
| 95 | .416 |
| 100 | .418 |

| 12.19 LIQUID THERMAL CONDUCTIVITY | |
|---|---|
| Temperature (degrees F) | British thermal unit-inch per hour-square foot-F |
| 75 | .988 |
| 80 | .981 |
| 85 | .975 |
| 90 | .969 |
| 95 | .962 |
| 100 | .956 |
| 105 | .950 |
| 110 | .944 |
| 115 | .937 |
| 120 | .931 |
| 125 | .925 |
| 130 | .919 |
| 135 | .912 |
| 140 | .906 |
| 145 | .900 |
| 150 | .893 |
| 155 | .887 |
| 160 | .881 |
| 165 | .875 |
| 170 | .868 |

| 12.20 LIQUID VISCOSITY | |
|---|---|
| Temperature (degrees F) | Centipoise |
| 55 | .724 |
| 60 | .693 |
| 65 | .665 |
| 70 | .638 |
| 75 | .612 |
| 80 | .588 |
| 85 | .566 |
| 90 | .544 |
| 95 | .524 |
| 100 | .505 |
| 105 | .487 |
| 110 | .470 |
| 115 | .453 |
| 120 | .438 |

| 12.21 SOLUBILITY IN WATER | |
|---|---|
| Temperature (degrees F) | Pounds per 100 pounds of water |
| 77.02 | .180 |

| 12.22 SATURATED VAPOR PRESSURE | |
|---|---|
| Temperature (degrees F) | Pounds per square inch |
| 50 | .881 |
| 60 | 1.171 |
| 70 | 1.535 |
| 80 | 1.989 |
| 90 | 2.547 |
| 100 | 3.227 |
| 110 | 4.049 |
| 120 | 5.033 |
| 130 | 6.201 |
| 140 | 7.577 |
| 150 | 9.187 |
| 160 | 11.060 |
| 170 | 13.220 |
| 180 | 15.700 |
| 190 | 18.520 |
| 200 | 21.740 |
| 210 | 25.360 |

| 12.23 SATURATED VAPOR DENSITY | |
|---|---|
| Temperature (degrees F) | Pounds per cubic foot |
| 50 | .01258 |
| 60 | .01639 |
| 70 | .02109 |
| 80 | .02681 |
| 90 | .03371 |
| 100 | .04196 |
| 110 | .05172 |
| 120 | .06317 |
| 130 | .07652 |
| 140 | .09194 |
| 150 | .10960 |
| 160 | .12980 |
| 170 | .15270 |
| 180 | .17850 |
| 190 | .20750 |
| 200 | .23970 |
| 210 | .27560 |

| 12.24 IDEAL GAS HEAT CAPACITY | |
|---|---|
| Temperature (degrees F) | British thermal unit per pound-F |
| 0 | .204 |
| 25 | .219 |
| 50 | .234 |
| 75 | .248 |
| 100 | .261 |
| 125 | .275 |
| 150 | .288 |
| 175 | .301 |
| 200 | .313 |
| 225 | .325 |
| 250 | .337 |
| 275 | .349 |
| 300 | .360 |
| 325 | .371 |
| 350 | .381 |
| 375 | .392 |
| 400 | .402 |
| 425 | .412 |
| 450 | .421 |
| 475 | .431 |
| 500 | .440 |
| 525 | .449 |
| 550 | .457 |
| 575 | .465 |
| 600 | .474 |

# GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

**Common Synonyms**
Motor spirit
Petrol

Watery liquid — Colorless to pale brown or pink — Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

**Fire**

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

**Exposure**

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

**Water Pollution**

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

## 1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Evacuate area
Disperse and flush

## 2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

## 3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: (Mixture of hydrocarbons)
3.3 IMO/UN Designation: 3.1/1203
3.4 DOT ID No.: 1203
3.5 CAS Registry No.: Data not available

## 4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to brown
4.3 Odor: Gasoline

## 5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective goggles, gloves.
5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat.
5.3 Treatment of Exposure: INHALATION: maintain respiration and administer oxygen; enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
5.4 Threshold Limit Value: 300 ppm
5.5 Short Term Inhalation Limits: 500 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; $LD_{50}$ = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.25 ppm
5.11 IDLH Value: Data not available

## 6. FIRE HAZARDS

6.1 Flash Point: —36°F C.C.
6.2 Flammable Limits in Air: 1.4%-7.4%
6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 853°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

## 7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 30

## 8. WATER POLLUTION

8.1 Aquatic Toxicity:
30 ppm/24 hr/juvenile American shad/$TL_m$/fresh water
91 mg/l/24 hr/juvenile American shad/$TL_m$/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 5%, 5 days
8.4 Food Chain Concentration Potential: None

## 9. SHIPPING INFORMATION

9.1 Grades of Purity: Various octane ratings; military specifications
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

## 10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U-V-W

## 11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
Flammable liquid
11.2 NAS Hazard Rating for Bulk Water Transportation:

| Category | Rating |
|---|---|
| Fire | 3 |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | 1 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 0 |
| Water | 0 |
| Self Reaction | 0 |

11.3 NFPA Hazard Classification:

| Category | Classification |
|---|---|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

## 12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm:
140—390°F
= 60—199°C = 333—472°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity:
0.7321 at 20°C (liquid)
12.8 Liquid Surface Tension:
19-23 dynes/cm
= 0.019—0.023 N/m at 20°C
12.9 Liquid Water Interfacial Tension:
49-51 dynes/cm
= 0.049—0.051 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 3.4
12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054
12.12 Latent Heat of Vaporization:
130—150 Btu/lb = 71—81 cal/g
= 3.0 — 3.4 X $10^4$ J/kg
12.13 Heat of Combustion: —18,720 Btu/lb
= —10,400 cal/g = 435.1 X $10^3$ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.4 psia

NOTES

GAT

# GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

| 12.17 SATURATED LIQUID DENSITY | | 12.18 LIQUID HEAT CAPACITY | | 12.19 LIQUID THERMAL CONDUCTIVITY | | 12.20 LIQUID VISCOSITY | |
|---|---|---|---|---|---|---|---|
| Temperature (degrees F) | Pounds per cubic foot | Temperature (degrees F) | British thermal unit per pound-F | Temperature (degrees F) | British thermal unit-inch per hour-square foot-F (estimate) | Temperature (degrees F) | Centipoise |
| 45 | 46.270 | 10 | .459 | 40 | .909 | 46 | .521 |
| 50 | 46.130 | 15 | .462 | 50 | .900 | 48 | .514 |
| 55 | 46.000 | 20 | .464 | 60 | .891 | 50 | .507 |
| 60 | 45.850 | 25 | .467 | 70 | .883 | 52 | .500 |
| 65 | 45.710 | 30 | .470 | 80 | .874 | 54 | .494 |
| 70 | 45.560 | 35 | .472 | 90 | .865 | 56 | .487 |
| 75 | 45.400 | 40 | .475 | 100 | .856 | 58 | .481 |
| 80 | 45.240 | 45 | .478 | 110 | .847 | 60 | .475 |
| 85 | 45.080 | 50 | .480 | 120 | .838 | 62 | .469 |
| 90 | 44.910 | 55 | .483 | 130 | .829 | 64 | .463 |
| 95 | 44.750 | 60 | .486 | 140 | .821 | 66 | .457 |
| 100 | 44.570 | 65 | .488 | 150 | .812 | 68 | .451 |
| 105 | 44.390 | 70 | .491 | 160 | .803 | 70 | .446 |
| 110 | 44.210 | 75 | .494 | 170 | .794 | 72 | .440 |
| 115 | 44.030 | 80 | .496 | 180 | .785 | 74 | .435 |
| | | 85 | .499 | 190 | .776 | 76 | .430 |
| | | 90 | .502 | | | 78 | .424 |
| | | 95 | .504 | | | 80 | .419 |
| | | 100 | .507 | | | 82 | .414 |
| | | 105 | .510 | | | 84 | .410 |
| | | | | | | 86 | .405 |
| | | | | | | 88 | .400 |
| | | | | | | 90 | .396 |
| | | | | | | 92 | .391 |
| | | | | | | 94 | .387 |
| | | | | | | 96 | .382 |

| 12.21 SOLUBILITY IN WATER | | 12.22 SATURATED VAPOR PRESSURE | | 12.23 SATURATED VAPOR DENSITY | | 12.24 IDEAL GAS HEAT CAPACITY | |
|---|---|---|---|---|---|---|---|
| Temperature (degrees F) | Pounds per 100 pounds of water | Temperature (degrees F) | Pounds per square inch | Temperature (degrees F) | Pounds per cubic foot | Temperature (degrees F) | British thermal unit per pound-F |
| | INSOLUBLE | | DATA NOT AVAILABLE | | NOT PERTINENT | | DATA NOT AVAILABLE |

# OILS: DIESEL

ODS

| Common Synonyms | Oily liquid | Yellow-brown | Lube or fuel oil odor |
|---|---|---|---|
| Fuel oil 1-D<br>Fuel oil 2-D | Floats on water. | | |

Stop discharge if possible.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

**Fire**

Combustible.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

**Exposure**

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

**Water Pollution**

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

## 1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Mechanical containment
Should be removed
Chemical and physical treatment

## 2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

## 3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not applicable
3.3 IMO/UN Designation: 3.1/1270
3.4 DOT ID No.: 1270
3.5 CAS Registry No.: Data not available

## 4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Light brown
4.3 Odor: Like fuel oil

## 5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Goggles or face shield.
5.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur.
5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min.
5.4 Threshold Limit Value: No single TLV applicable.
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 1; $LD_{50}$ = 5 to 15 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

## 6. FIRE HAZARDS

6.1 Flash Point: (1-D) 100°F C.C.; (2-D) 125°F C.C.
6.2 Flammable Limits in Air: 1.3-6.0 vol.%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: (1-D) 350-625°F (2-D) 490-545°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

## 7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

## 8. WATER POLLUTION

8.1 Aquatic Toxicity: 204 mg/l/24 hr/juvenile American shad/$TL_m$/salt water
8.2 Waterfowl Toxicity: >20 ml/kg /$LD_{50}$/mallards
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

## 9. SHIPPING INFORMATION

9.1 Grades of Purity: Diesel Fuel 1-D (ASTM); Diesel Fuel 2-D (ASTM)
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

## 10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

## 11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Combustible liquid
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

| Category | Classification |
|---|---|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

## 12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 350—640°F = 266—338°C = 581—612°K
12.4 Freezing Point: 0 to —30°F = —18 to —34°C = 255 to 239°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.841 at 16°C (liquid)
12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: —18,400 Btu/lb = —10,200 cal/g = 429 X $10^6$ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Varies

## NOTES

ODS

# OILS: DIESEL

| 12.17 SATURATED LIQUID DENSITY | |
|---|---|
| Temperature (degrees F) | Pounds per cubic foot (estimate) |
| 50 | 52.430 |
| 52 | 52.430 |
| 54 | 52.430 |
| 56 | 52.430 |
| 58 | 52.430 |
| 60 | 52.430 |
| 62 | 52.430 |
| 64 | 52.430 |
| 66 | 52.430 |
| 68 | 52.430 |
| 70 | 52.430 |
| 72 | 52.430 |
| 74 | 52.430 |
| 76 | 52.430 |
| 78 | 52.430 |
| 80 | 52.430 |
| 82 | 52.430 |
| 84 | 52.430 |

| 12.18 LIQUID HEAT CAPACITY | |
|---|---|
| Temperature (degrees F) | British thermal unit per pound-F |
| 10 | .429 |
| 15 | .431 |
| 20 | .434 |
| 25 | .436 |
| 30 | .439 |
| 35 | .441 |
| 40 | .444 |
| 45 | .446 |
| 50 | .448 |
| 55 | .451 |
| 60 | .453 |
| 65 | .456 |
| 70 | .458 |
| 75 | .461 |
| 80 | .463 |
| 85 | .466 |
| 90 | .468 |
| 95 | .471 |
| 100 | .473 |
| 105 | .475 |

| 12.19 LIQUID THERMAL CONDUCTIVITY | |
|---|---|
| Temperature (degrees F) | British thermal unit-inch per hour-square foot-F |
| 30 | .968 |
| 35 | .966 |
| 40 | .965 |
| 45 | .963 |
| 50 | .962 |
| 55 | .961 |
| 60 | .959 |
| 65 | .958 |
| 70 | .957 |
| 75 | .955 |
| 80 | .954 |
| 85 | .952 |
| 90 | .951 |
| 95 | .950 |
| 100 | .948 |
| 105 | .947 |
| 110 | .946 |
| 115 | .944 |
| 120 | .943 |
| 125 | .941 |
| 130 | .940 |

| 12.20 LIQUID VISCOSITY | |
|---|---|
| Temperature (degrees F) | Centipoise |
| 100.42 | 11.950 |

| 12.21 SOLUBILITY IN WATER | |
|---|---|
| Temperature (degrees F) | Pounds per 100 pounds of water |
| | INSOLUBLE |

| 12.22 SATURATED VAPOR PRESSURE | |
|---|---|
| Temperature (degrees F) | Pounds per square inch (estimate) |
| 70 | .042 |
| 75 | .049 |
| 80 | .057 |
| 85 | .065 |
| 90 | .076 |
| 95 | .087 |
| 100 | .100 |
| 105 | .114 |
| 110 | .131 |
| 115 | .149 |
| 120 | .170 |
| 125 | .193 |
| 130 | .218 |
| 135 | .247 |
| 140 | .279 |
| 145 | .314 |
| 150 | .352 |
| 155 | .395 |
| 160 | .443 |
| 165 | .495 |
| 170 | .552 |
| 175 | .615 |
| 180 | .683 |
| 185 | .758 |
| 190 | .841 |
| 195 | .930 |

| 12.23 SATURATED VAPOR DENSITY | |
|---|---|
| Temperature (degrees F) | Pounds per cubic foot |
| | NOT PERTINENT |

| 12.24 IDEAL GAS HEAT CAPACITY | |
|---|---|
| Temperature (degrees F) | British thermal unit per pound-F |
| | NOT PERTINENT |

# OILS, MISCELLANEOUS: MOTOR

OMT

| Common Synonyms | Oily liquid | Yellow-brown | Lube oil odor |
|---|---|---|---|
| Crankcase oil<br>Lubricating oil<br>Transmission oil | Floats on water. | | |

Stop discharge if possible.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

**Fire**

Combustible.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

**Exposure**

CALL FOR MEDICAL AID.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids down and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

**Water Pollution**

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

## 1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

## 2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

## 3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not applicable
3.3 IMO/UN Designation: 3.3/1270
3.4 DOT ID No.: 1270
3.5 CAS Registry No.: Data not available

## 4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Yellow fluorescent
4.3 Odor: Characteristic

## 5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: INGESTION: minimal gastrointestinal irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.
5.3 Treatment of Exposure: INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious amounts of water. SKIN: wipe off oil and wash with soap and water.
5.4 Threshold Limit Value: Data not available
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 1: $LD_{50}$ = 5 to 15 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

## 6. FIRE HAZARDS

6.1 Flash Point: 275—600°F C.C.
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 325—625°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

## 7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

## 8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

## 9. SHIPPING INFORMATION

9.1 Grades of Purity: Various viscosities
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

## 10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

## 11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Not listed
11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification: Not listed

## 12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: Very high
12.4 Freezing Point: —29.9°F = —34.4°C = 238.8°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.84—0.96 at 15°C (liquid)
12.8 Liquid Surface Tension: 36-37.5 dynes/cm = 0.036—0.0375 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 33—54 dynes/cm = 0.033—0.054 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: —18,456 Btu/lb = —10,270 cal/g = —429.96 X $10^3$ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

# OILS, MISCELLANEOUS: MOTOR

## 12.17 SATURATED LIQUID DENSITY

| Temperature (degrees F) | Pounds per cubic foot (estimate) |
|---|---|
| 50 | 52.430 |
| 52 | 52.430 |
| 54 | 52.430 |
| 56 | 52.430 |
| 58 | 52.430 |
| 60 | 52.430 |
| 62 | 52.430 |
| 64 | 52.430 |
| 66 | 52.430 |
| 68 | 52.430 |
| 70 | 52.430 |
| 72 | 52.430 |
| 74 | 52.430 |
| 76 | 52.430 |
| 78 | 52.430 |
| 80 | 52.430 |
| 82 | 52.430 |
| 84 | 52.430 |

## 12.18 LIQUID HEAT CAPACITY

| Temperature (degrees F) | British thermal unit per pound-F (estimate) |
|---|---|
| 50 | .460 |
| 52 | .461 |
| 54 | .462 |
| 56 | .463 |
| 58 | .464 |
| 60 | .465 |
| 62 | .466 |
| 64 | .467 |
| 66 | .468 |
| 68 | .469 |
| 70 | .470 |
| 72 | .471 |
| 74 | .472 |
| 76 | .473 |
| 78 | .474 |
| 80 | .475 |
| 82 | .476 |
| 84 | .477 |
| 86 | .478 |
| 88 | .479 |
| 90 | .480 |
| 92 | .481 |
| 94 | .482 |
| 96 | .483 |
| 98 | .484 |
| 100 | .485 |

## 12.19 LIQUID THERMAL CONDUCTIVITY

| Temperature (degrees F) | British thermal unit-inch per hour-square foot-F (estimate) |
|---|---|
| 35 | .920 |
| 40 | .919 |
| 45 | .918 |
| 50 | .917 |
| 55 | .916 |
| 60 | .915 |
| 65 | .914 |
| 70 | .913 |
| 75 | .912 |
| 80 | .911 |
| 85 | .910 |
| 90 | .909 |
| 95 | .908 |
| 100 | .907 |
| 105 | .906 |
| 110 | .905 |
| 115 | .904 |
| 120 | .903 |

## 12.20 LIQUID VISCOSITY

| Temperature (degrees F) | Centipoise |
|---|---|
| 100.42 | 275.000 |

## 12.21 SOLUBILITY IN WATER

| Temperature (degrees F) | Pounds per 100 pounds of water |
|---|---|
| | INSOLUBLE |

## 12.22 SATURATED VAPOR PRESSURE

| Temperature (degrees F) | Pounds per square inch (estimate) |
|---|---|
| 70 | .042 |
| 75 | .049 |
| 80 | .057 |
| 85 | .065 |
| 90 | .076 |
| 95 | .087 |
| 100 | .100 |
| 105 | .114 |
| 110 | .131 |
| 115 | .149 |
| 120 | .170 |
| 125 | .193 |
| 130 | .218 |
| 135 | .247 |
| 140 | .279 |
| 145 | .314 |
| 150 | .352 |
| 155 | .395 |
| 160 | .443 |
| 165 | .495 |
| 170 | .552 |
| 175 | .615 |
| 180 | .683 |
| 185 | .758 |
| 190 | .841 |
| 195 | .930 |

## 12.23 SATURATED VAPOR DENSITY

| Temperature (degrees F) | Pounds per cubic foot |
|---|---|
| | NOT PERTINENT |

## 12.24 IDEAL GAS HEAT CAPACITY

| Temperature (degrees F) | British thermal unit per pound-F |
|---|---|
| | NOT PERTINENT |

# EXPLANATION OF CODES AND ABBREVIATIONS
# HAZARDOUS SUBSTANCES INFORMATION FORMS

## CHEMICAL NAME AND FORMULA

The chemical name given is usually that found in 29 CFR 1910, Subpart Z, General Industry Standards for Toxic and Hazardous Substances (OSHA). The chemical formula is also provided.

Below the chemical formula is the Chemical Abstract Service (CAS) registry number. This number, in the format xxx-xx-x, is unique for each chemical and allows more efficient searching on other data bases such as the Chemical Substances Information Network (CSIN).

Also included is the NIOSH Registry of Toxic Effects of Chemical Substances (RTECS) number, in the format ABxxxxxxx. RTECS may be useful in obtaining additional information on a chemical.

Under the RTECS number, the U.S. Department of Transportation (DOT) UN or NA identification number and the corresponding guide number have been placed. Their format is xxxx xx and indicates that the chemical is regulated by DOT. The guide number (xx) refers to actions to be taken to stabilize an emergency situation. This information can be found in the DOT Hazardous Materials Emergency Response Guidebook, DOT P5800.3.

## SYNONYMS

Several common synonyms, if any, are listed for each chemical in this column.

## EXPOSURE LIMITS

The permissible exposure limit (PEL), as found in 29 CFR 1910, Subpart Z, General Industry Standards for Toxic and Hazardous Substances as of March 11, 1984, is listed first. Unless noted otherwise, exposure limits are 8-hour time-weighted average (TWA) concentrations. OSHA ceiling concentrations shall not be exceeded at any time.

IDLH LEVEL

The Immediately Dangerous to Life or Health (IDLH) level is listed in either ppm or $mg/m^3$. This level represents a maximum concentration from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. Where the notation "Carcinogen" appears, NIOSH has recommended that the substance be treated as a potential human carcinogen.

PHYSICAL DESCRIPTION

A brief description of the appearance and odor of each substance is provided.

CHEMICAL AND PHYSICAL PROPERTIES

A number of important chemical and physical properties are given for each substance:

MW: Molecular weight
UEL: Upper explosive limit in air, % by volume
LEL: Lower explosive limit in air, % by volume
IP: Ionization Potential, Ev
MEC: Minimum explosive concentration for a dust in air, g/l

INCOMPATIBILITIES

Potentially hazardous incompatibilities of each substance are listed.

PERSONAL PROTECTION AND SANITATION

A summary of recommended practices specific to each toxic substance is presented. These recommendations supplement general work practices (e.g., no eating where chemicals are used).

ROUTE OF HEALTH HAZARD

The toxicologically important routes of entry for each substance are listed.

SYMPTOMS

Potential symptoms as a result of exposure are listed.

FIRST AID

First aid procedures are listed for response to eye and skin contact, inhalation, and ingestion of the toxic substance.

TARGET ORGANS

The organs which are affected by exposure to each substance are listed.

APPENDIX II

RESPIRATORY PROTECTION PROGRAM

Because of the anticipated hazards of exposure to lead and petroleum hydrocarbons during the execution of the investigation and remediation, respirators will be required for personnel working in the Exclusion Zone. The OSHA Personal Equipment Standard (CFR Part 1910.134), attached to the end of this appendix, shall be followed when using a respirator. The respirator and cartridge to be used shall be NIOSH/OSHA certified which are approved for use in atmospheres containing specific chemicals up to designated concentration, AND NOT FOR IDLH ATMOSPHERE. The respirator and cartridge to be used in this Plan shall be pesticide type with particulate prefilter, and can be used only when the ambient atmosphere contains sufficient oxygen (19.5%). The following procedures shall be observed when using respirators:

1) Respirator fit test shall be performed to ensure the "fit" or integrity of the facepiece-to-face seal of a respirator. Appendix D of the OSHA lead standard (29 CFR Part 1910.1025) contains a quality respirator fit testing protocol and is attached to the end of this appendix.

2) A respirator shall not be worn when the following conditions prohibits a tight facepiece-to-face seal: facial hair, scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco.

3) A cartridge may be used up to its expiration date as long as it was not opened previously. It shall not be opened when it is not for immediate use and shall be discarded after use and should not be used for longer than one shift or when breakthrough occurs, whichever comes first.

4) When warning signals of cartridge breakthrough such as odor or irritation are detected, or when the respirator has an approved end-of-service-life indicator which indicates the sorption capacity of the cartridge has been exhausted, personnel shall leave the Exclusion Zone, decontaminate, and replace the cartridge(s) on the respirator.

5) The Contractor shall provide their employees who are required to enter the Exclusion Zone, including emergency situations, with certified respirators and cartridges and shall supervise and ensure the proper use of these respirators by their employees.

APPENDIX III
EMERGENCY PHONE NUMBERS:

Agency/Facility

Emergency: 911

Police Department: (510) 596-3737

Fire Department: (510) 596-3771

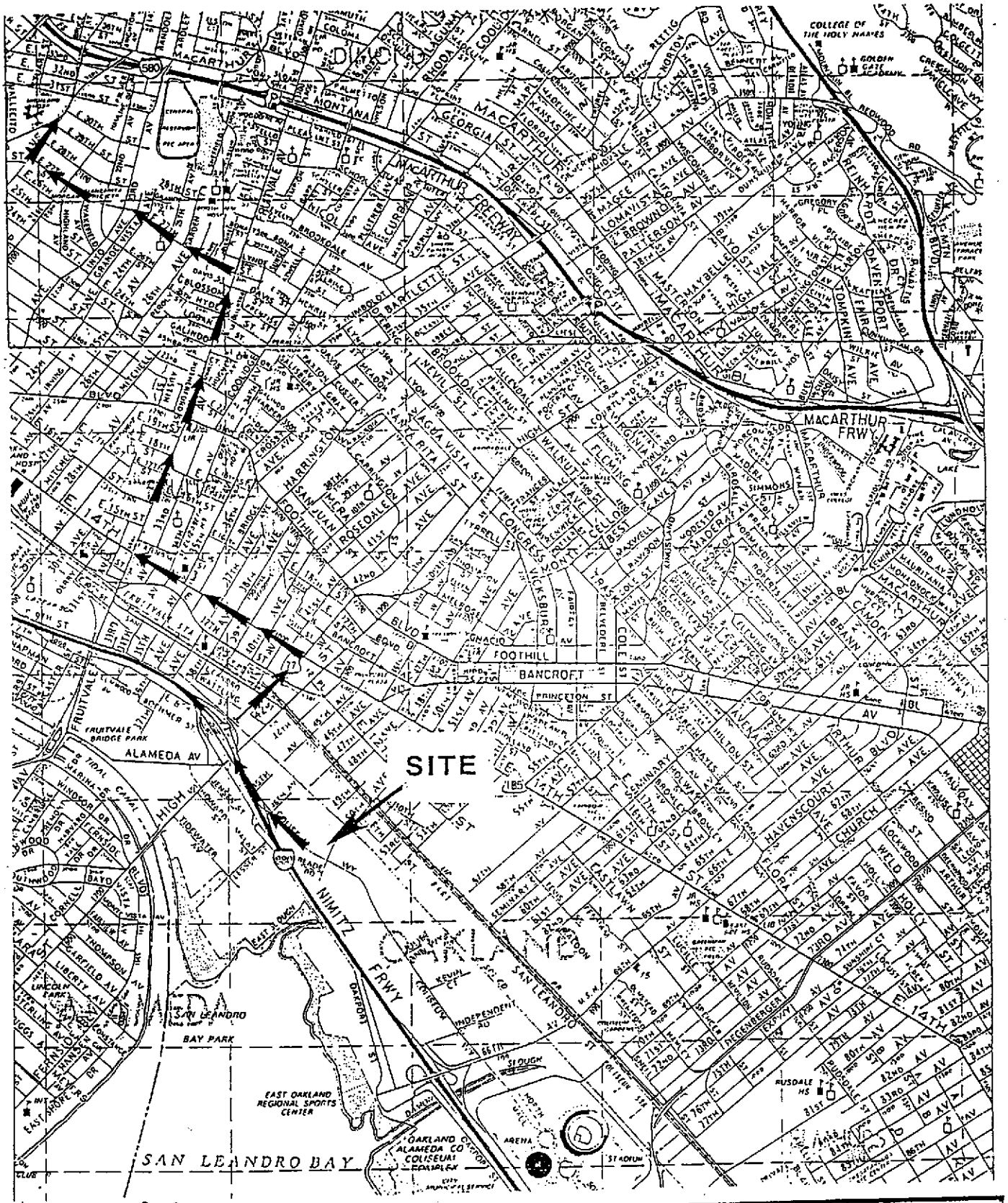
Hospital: (510) 534-8055 — Highland Hospital, 1411 E. 31st Street, Oakland

Public Health Advisor: Hazard Evaluation System and Information Service (HESIS) (510) 540-3014.

Aqua Resources Incorporated: 2030 Addison Street, Suite 500, Berkeley, California (510) 540-6954

Pacific Gas and Electric: (415) 973-5615 (Wally Pearce)

Ensco: 41674 Christy Street, Fremont, California (415) 659-0404




| AQUA RESOURCES, INC. BERKELEY, CALIFORNIA | |
|---|---|
| PG & E Gas Construction Yard | |
| Route to Hospital | |
| JOB NO. 90262 | SHEET NO. 2 |
| | DATE: Dec. 11 1990 |