June 4, 1993

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SEACOR
Science & Engineering Analysis Corporation

Mr. Kevin Tinsley
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94521

WORK PLAN TO CONDUCT ADDITIONAL SITE INVESTIGATION, GRAND MARINA FACILITY, 2099 GRAND STREET, ALAMEDA, CALIFORNIA

Dear Mr. Tinsley:

The attached Work Plan is submitted by Science & Engineering Analysis Corporation (*SEACOR*) in response to your written request of March 30, 1993. *SEACOR* is authorized to implement this Work Plan upon approval by the Alameda County Health Care Services Agency (ACHCS).

Please note that the attached Work Plan is submitted in partial fulfillment of the requests made in your March 30, 1993 letter. The information gained from implementation of the Work Plan is necessary to fully address your requests.

We would appreciate your review of and comment on the Work Plan. Please do not hesitate to contact us at (415) 882-1548 with any questions or comments.

Sincerely yours,

Science & Engineering Analysis Corporation

REGISTERED GEOLOGIST
JAMES G. RITCHIE
No. 4974
STATE OF CALIFORNIA

James G. Ritchie, R.G.
Principal Geologist

James L. Vais, P.E.
Principal-in-Charge

attachment

cc: Mr. Edgar Howell - ACHCS, Hazardous Materials Division
Mr. Richard Hiett - RWQCB, San Francisco Bay Region

CROGRMAR.WP
50085-001-01

SEACOR
Science & Engineering Analysis Corporation

WORK PLAN TO CONDUCT ADDITIONAL SITE INVESTIGATION

GRAND MARINA FACILITY
Alameda, California

Submitted by
Science & Engineering Analysis Corporation
90 New Montgomery Street, Suite 620
San Francisco, CA 94105

June 4, 1993

Prepared by:

James G. Ritchie, R.G.
Principal Geologist

REGISTERED GEOLOGIST
JAMES G. RITCHIE
No. 4974
STATE OF CALIFORNIA

Reviewed by:

James Vais, P.E.
Principal-in-Charge

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1.0 INTRODUCTION

This Work Plan describes a technical approach, methodologies, and schedule for implementing an Additional Site Investigation at the Grand Marina Facility located at 2099 Grand Street, Alameda, California (the site, shown on Figure 1).

On March 30, 1993, the Alameda County Health Care Services Agency (ACHCS) requested that a Plan of Corrective Action be submitted for the former tank farm area, including related pipelines, and the former underground storage tank (UST) location (collectively referred to as "the site"). The activities described in this Work Plan are intended to further assess the source(s) and extent of petroleum hydrocarbon-affected soil and groundwater underlying specific areas of the site in accordance with the ACHCS requests. The results of this work will be used to guide further site investigation activities, if necessary, and provide a basis for developing a site-specific remediation plan.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The site is located within an irregularly-shaped parcel (Grand Marina Facility) along the southern edge of Alameda Harbor in Alameda, California (see Figure 2). The parcel is approximately 1,300 feet from east to west and approximately 1,225 feet from north to south. The northern and eastern portions of the parcel are under water. The land portion was created through filling which took place in the late 19th and early 20th centuries. The site is bounded to the south by Grand Street, to the west by Fortmann Way, to the north by the Marin Barge and Tug facility, and to the east by Fortmann Basin. The site is currently used as a harbor for the launching and berthing of boats.

2.2 SITE HISTORY

Information regarding the site history is based on our review of an Environmental Assessment performed by Harding Lawson Associates (HLA, 1987) for Encinal Marina and a site history compiled by Bloomfield (1987).

An above ground fuel storage tank farm was previously operated on-site. Use of the fuel storage tank farms was discontinued in 1989. Diesel fuel, lube oil, and slop oil/bilge water were previously stored within the above ground tanks. The materials stored in the tanks were conveyed to or from the tank farm and the pier via underground pipe lines. The 1,000 gallon UST used to store gasoline that was formerly located adjacent to the fuel storage tank farm was removed in May 1988.

Other historical land uses may have included the following:

1893-1940s: Alaska Packers Association operated a fleet of fishing vessels.

1906-1917: Taylor and Company operated a lumber yard.

1917-1983: City of Alameda Corporation Yard used the facility for a variety of activities including auto repair, carpentry, blacksmith, and a dog pound.

1910-1952: Union Oil Company reportedly used the site for fuel storage as early as 1932 and was responsible for constructing the above ground tank farm.

1938-1989: The fuel storage tank farm and portions of the site were reportedly leased by the Harbor Tug and Barge Company.

1980-1986: Healy-Tibbets Construction Company used a portion of the site for storage of marine construction equipment.

2.3 SITE INVESTIGATION HISTORY

Previous site investigations and activities were initiated during April 1987 by Crowley Environmental Services (CES) and HLA which installed six groundwater monitoring wells (W-1 through W-5, and B-7)

(see Figure 3) and advanced six soil borings in the vicinity if the above ground tank farm. HLA also dug six test trenches at various site locations during this investigation. In November 1987 CES excavated and disposed of approximately 285 tons of petroleum hydrocarbon-impacted soil to a maximum depth of five feet below ground surface (bgs) in the vicinity of the tank farm. Free phase petroleum hydrocarbons were observed within the limits of the excavation. In May 1988, Uriah, Inc. removed a 1,000-gallon capacity gasoline underground storage tank (UST). Soil adjacent to the UST was found to be impacted with petroleum hydrocarbons.

In June 1990, Versar, Inc. performed an environmental risk assessment at the site that included collection of water samples from the estuary, four groundwater monitoring wells, and the sump within the tank farm area. Soil samples were also collected from two areas of discolored soil. Nine cubic yards of soil were removed from this area in the vicinity of the tank farm.

In January 1992, Zaccor Corporation (Zaccor) conducted a Limited Environmental Site Assessment at the site. This assessment included the removal of the above ground tank farm, with the exception of the concrete foundation and the product lines. Zaccor also advanced soil borings and collected soil samples from the vicinity of the tank farm, the former 1,000-gallon UST, and the product lines. Four additional groundwater monitoring wells were also installed during this phase of the investigation. Elevated concentrations of petroleum hydrocarbons were detected in both soil and groundwater beneath the site during this phase of the investigation.

2.4 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The site lies within the East Bay Plain along the eastern margin of San Francisco Bay. Lithologic information obtained from soil borings and six test trenches advanced at the site indicate the site is directly underlain by one to five feet of sandy fill material which is in turn underlain by native Bay Mud that extends to a depth of at least 15 feet below ground surface (Zaccor, 1992). The Bay Mud soils are unconsolidated dark gray to black clay and silty clay rich in organic material. Locally, the Bay Mud contains lenses and stringers of silt and sand as well as peat. The Bay Mud has a low permeability and functions as a barrier to the vertical movement of salt water from San Francisco Bay into older alluvium. The Bay Mud is water saturated but is typically not considered a useable source of groundwater because of its low permeability and high salinity.

Groundwater is present at depths of 2.5 to 3 feet below ground surface within the fill and Bay Mud. Groundwater elevation data measured in four on-site monitoring wells in June 1992 indicate that shallow groundwater underlying the site flows towards the northwest under a gradient of 0.0065 foot per foot (Zaccor, 1992).

3.0 PROPOSED SITE INVESTIGATION

3.1 OBJECTIVES AND SCOPE OF WORK

The findings of previous site investigations indicate that soil and groundwater underlying portions of the site have been impacted by petroleum hydrocarbons, namely diesel and higher boiling point hydrocarbons (oil and grease). Data generated during these previous investigations did not fully characterize the source(s) or extent of petroleum hydrocarbon-affected soil and groundwater beneath the site.

The objectives of the proposed Additional Site Investigation are: 1) identify potential on- and off-site sources of hydrocarbons or other releases which may have impacted the site subsurface; and, 2) further characterize the extent of petroleum hydrocarbon-affected soil and groundwater. The results of this investigation will be used to assess the need for additional investigatory tasks, develop a plan for remediating the site subsurface and/or other impacted media, and prepare a schedule for further investigation, monitoring, and remediation of the site.

To meet the above stated objectives, SEACOR will perform the following four tasks:

- Task 1 - Historic Records Review;
- Task 2 - Pipeline Integrity Testing;
- Task 3 - Site Subsurface Investigation; and,
- Task 4 - Data Review and Reporting.

The following sections describe the rationale, scope, and methodologies for each task.

3.2 TASK 1 - HISTORIC RECORDS REVIEW

The purpose of the Historic Records Review task, currently underway, is to identify potential on- and off-site sources of hydrocarbons which have impacted the site subsurface, any remedial work done, and more accurately position borehole locations. The records review task will include:

- Interviews with subject property owner(s), property manager(s), tenants, and maintenance personnel, as available or appropriate, to evaluate site history, operation and maintenance procedures.
- Review of lists and records available from the City of Alameda, the ACHCS, the RWQCB, and other published regulatory agency lists describing known or suspected petroleum hydrocarbon releases to soil or water.
- Review of available regulatory agency waste incident databases, such as State and Federal Superfund lists, toxic substances site lists, and underground storage tank (UST) action lists.
- Review of historical land use maps (Sanborn Fire Insurance Maps) and historic aerial photographs

(Pacific Aerial Photo) of the site and the area within a 1/2-mile radius of the site for information regarding historical site use that could have involved the manufacture, generation, use, storage, and/or disposal of hazardous substances.

The information obtained during the Historic Records Review will be compiled, presented on tables, figures, and/or in written form, and used by *SEACOR* in assessing the potential location of current or historic unauthorized petroleum hydrocarbon release(s) which have impacted the site subsurface. These data may also be used to target specific areas during the subsequent subsurface investigation.

3.3 TASK 2 - PIPELINE INTEGRITY TESTING

Underground pipelines located at the site will be precision tested to determine the integrity of each pipeline and evaluate whether the pipelines may have been contributing sources of petroleum hydrocarbons detected in soil and groundwater. The three pipelines to be precision tested are identified on Figure 3 and are used to convey diesel fuel, fuel oil, and bilge/sludge to and from the former above ground tank farm and fuel pier.

Accutite, a California-certified precision testing contractor, will verify that each pipeline is empty of contents and dry, seal both ends of each pipeline, and introduce approximately one and one-half the operating line pressure of helium. The helium pressure will be monitored within each pipeline for one hour. In the event that no significant pressure reduction occurs, the line will be considered competent. Should a pressure drop occur, Accutite will use a helium detector to locate line leak(s). The results of the pipeline leak testing will be used to assist in locating specific soil boring locations along the pipeline alignment. Results (?)

3.4 TASK 3 - SITE SUBSURFACE INVESTIGATION

The objective of the proposed subsurface investigation is further characterize the horizontal and vertical extent of petroleum hydrocarbon-affected soil and groundwater beneath the site and assess the likelihood of impact to the adjacent Bay.

To meet this objective, a phased site investigation approach is proposed. Initially, *SEACOR* will advance soil borings around the periphery of the former tank farm, along the pipeline alignments, and in areas anticipated to be hydraulically downgradient of these potential hydrocarbon sources and collect subsurface soil and groundwater grab samples. Soil and water samples will then be chemically analyzed in the field using an on-site state-certified mobile laboratory. Using a mobile laboratory will provide analytical data in real time and thus allow for decisions to be made in the field regarding the placement of additional soil and/or groundwater sampling locations.

Based on the results of this initial phase of work, *SEACOR* will recommend a network of additional monitoring well locations designed to confirm the results of the groundwater grab sampling program and provide longer term groundwater quality monitoring locations.

3.4.1 Preliminary Activities

A site-specific Health and Safety Plan (HASP) has been prepared for the proposed investigatory activities in accordance with 29 CFR 1910.120 and is included as Appendix A. The HASP will be followed by

all *SEACOR* employees performing field tasks; *SEACOR* subcontractors will be required to adopt or prepare an equally protective HASP.

Each of the on-site groundwater monitoring wells will be located and sounded for depth to water and depth to well bottom. These data will be used to verify the depth to and the flow direction and gradient of shallow groundwater beneath the site. This information will also be useful in selecting soil boring locations.

Prior to initiating field work, the proposed soil boring locations will be marked and Underground Services Alert (USA) will be notified and a private utility locator retained to locate buried utilities or other buried subsurface obstructions.

We understand that soil boring permits will not be required by the ACHCS or the City of Alameda; however, *SEACOR* will notify these agencies 48 hours in advance of the subsurface investigation commencement. Need approval by Water Dept.

3.4.2 Soil Boring Locations

The proposed shallow soil boring program includes sixteen (16) sampling locations as shown on Figure 2. The soil boring locations are intended to further assess the extent of petroleum hydrocarbon-affected soil and groundwater in the vicinity of the product pipelines, tank farm perimeter, former UST area, and hydraulically downgradient locations. The boring locations shown on Figure 2 are preliminary and may be altered based upon the pipeline precision testing and/or monitoring well sounding results. At each boring location, selected subsurface soil samples will be collected for subsequent chemical analysis. Grab groundwater samples will also be collected at selected locations for chemical analysis.

At each of these locations, soil borings will be advanced to a depth of approximately 5 feet below the first encountered groundwater. The selected soil and groundwater grab samples will chemically analyzed by an on-site state-certified mobile laboratory.

Results of previous sample analyses suggest that TPHd and total oil and grease (TOG) are the most predominant hydrocarbon constituents in the site subsurface. *SEACOR* proposes to use TPHd as the primary "indicator" compound due to its greater mobility relative to TOG. TPHd will therefore be used as an indicator analyte for assessing the extent of petroleum hydrocarbon-affected soil in the field.

At each of the boring locations where total petroleum hydrocarbons as diesel (TPHd) are detected at or above a concentration of 100 milligrams per kilogram (mg/kg) in soil, a step out boring will be advanced approximately 50 feet further out from the previous boring. The distance between borings may be increased depending on field conditions encountered. This process will be repeated until the western, northern, and eastern extent of petroleum hydrocarbon-affected soil within the parcel has been confirmed. Grab groundwater samples will be collected from the borings located around the perimeter of the impacted area as defined by a TPHd concentration of 100 mg/kg or less. The soil borings proposed in the vicinity of the former UST will use 10 mg/kg of total petroleum hydrocarbons as gasoline (TPHg) as a limiting concentration.

The proposed initial soil boring locations are described below.

Product Lines

Four (4) soil borings are proposed along the assumed product line alignment, particularly in areas adjacent to the Bay and where Zaccor encountered refusal. These locations are shown on Figure 2 as borings PL-1 through PL-4.

Tank Farm Perimeter

Five soil borings are proposed around the Tank Farm perimeter including north and northeast of the pump house, adjacent to the western Tank Farm wall, and between Building G and the former southern Tank Farm wall. The proposed locations are identified on Figure 2 as borings TP-1 through TP-5.

Former UST Area

Three soil borings (UST-1 through UST-3) are proposed around the perimeter of the former UST and in the vicinity of those borings advanced by others.

Hydraulically-Downgradient Area

Four soil borings (HD-1 through HD-4) are proposed in locations assumed to be hydraulically downgradient of Building G, the former Tank Farm, and the Product Lines.

3.4.3 Soil Boring Advancement Procedures

Soil borings will be advanced using a portable, hydraulically-driven soil coring system to obtain soil cores for lithologic and chemical analysis. The soil coring system is mounted on a Case skip-loader, and sampling rods are advanced with vibrators, a hydraulic hammer, or pushed into the ground. Two nested sampling rods are driven simultaneously: small diameter inner sampling rods are used to obtain and retrieve the soil cores, and larger diameter outer rods serve as temporary drive casing. The use of drive casing prevents sloughing of the formation while the inner rods are withdrawn from the hole. This ensures that the drive sampler will always be sampling soil from the desired depth interval, rather than soil that has sloughed in from higher up in the borehole.

As the drive casing and inner rods are advanced, soil is driven into a 1-5/8-inch diameter, three-foot-long sample barrel that is attached to the end of the inner rods. Soil samples will be collected in 1-1/2-inch diameter by six-inch long brass or stainless steel tubes fitted inside the sample barrel. After being driven three feet, inner rods are removed from the borehole with a hydraulic winch. The tubes containing the soil samples will be removed from the drive sampler and retained for lithologic description or chemical analysis. This process will be repeated until the desired depth has been reached. Upon completion, each soil boring will be backfilled to the surface with a cement/bentonite grout mixture.

3.4.4 Soil Sampling and Analysis Procedures

Relatively undisturbed soil samples will be collected from the ground surface to total depth using a continuous soil coring system. The *SEACOR* geologist will describe the soils encountered according to the Unified Soil Classification System (USCS) and will maintain a boring log of these descriptions. A representative sample from each three-foot soil core interval will be screened in the field for the presence

of total volatile organic compounds (VOCs) using a Photoionization Detector (PID). In this procedure, approximately 20 grams of soil will be placed in a clean plastic ziploc bag. After approximately 10 minutes the tip of the PID instrument is inserted into the bag and a headspace concentration in parts per million recorded. The results of the PID screening will be recorded directly on the boring log.

A minimum of one sample tube from each three-foot core interval retrieved will be retained for possible chemical analysis. The exposed ends of the tube will be covered with aluminum foil and fitted with plastic end caps. Each sample will be labeled to indicate job number, boring number, sample depth, sample number, time and date collected, and then stored in a cooler containing ice.

Custody of the soil samples will be relinquished to the state-certified mobile laboratory for immediate analysis of TPHd (EPA Method 5330/8015, modified). In addition, soil samples collected from the "UST-" series borings will be chemically analyzed for TPHg (EPA Method 8015, modified). Selected samples may be delivered to a state-certified fixed laboratory and analyzed for TPHg, TPHd, benzene, toluene, ethylbenzene, and xylenes (BTEX), and Total Oil and Grease (TOG) by EPA Methods 5030/8015, modified, 3510/8015, modified, 8020, and 5520, respectively.

3.4.5 Groundwater Grab Sampling and Analysis Procedures

At locations where groundwater grab samples are to be collected, the borehole will be advanced approximately 5 feet below the first encountered water. After the targeted depth has been penetrated, the drive casing will be pulled up approximately 1 to 3 feet to allow groundwater to flow into the borehole. Groundwater samples will then be collected using a 3/4-inch diameter Teflon or stainless steel bailer. *SEACOR* proposes to chemically analyze groundwater samples collected from those perimeter borehole locations which yield soils containing TPHd and/or TPHg in concentrations below 100 mg/kg and 10 mg/kg, respectively.

If recharge to the borehole is slow, one-inch diameter Schedule 40 PVC casing with five feet of 0.010-inch machined slot screen will be installed in the borehole inside the drive casing. The drive casing will then be pulled up three to five feet to expose the slotted section of PVC casing. Groundwater samples will then be collected from inside the PVC casing with a 3/4-inch diameter Teflon or stainless steel bailer. Upon collecting the water sample, the PVC casing will be removed from the borehole, and the borehole grouted to the surface.

The pH, specific conductivity, and temperature of the removed water will be recorded at the time of sample collection. The *SEACOR* geologist will also record the depth to water and visual observations regarding water turbidity and color. Groundwater samples will be transferred directly from the bailer into three 40-ml VOA vials and one 1-liter amber glass container. Care will be taken when transferring the water from the bailer to the containers to avoid turbulence as much as possible. The containers will be filled and capped so that no air bubbles are trapped. Sample containers will be labeled to indicate project location, job number, well number, sample number, and time and date collected. Sample containers will be placed in a cooler containing ice.

Custody of the groundwater samples will be relinquished to the state-certified mobile laboratory for immediate analysis of TPHd (EPA Method 5030/8015, modified), TPHg (EPA Method 5030/8015, modified) and BTEX (EPA Method 602). These analytes will be used as indicator analyses for assessing the extent of the petroleum hydrocarbon-affected groundwater plume in the field.

3.5 TASK 4 - DATA INTERPRETATION AND TECHNICAL REPORTING

Upon completing Tasks 1 through 3, *SEACOR* will compile and interpret the findings of this and previous investigations and prepare a report. The report will include a summary of previous site investigations, a description of work performed and findings of the current investigation, and conclusions regarding the source(s) and extent of petroleum hydrocarbon-affected soil and groundwater.

The ACHCS has indicated that groundwater monitoring data is needed to the northwest of the former tank farm, in a hydraulically-downgradient direction. The results of the groundwater grab sampling described in Section 3.4 will provide a preliminary assessment of groundwater quality downgradient of the former tank farm and other potential on-site source areas.

As previously noted, the results of the groundwater grab sampling described in the Work Plan will be used to recommend additional monitoring well locations. We anticipate that at a minimum, one additional groundwater monitoring well will be installed downgradient from the former tank farm. Recommendations for the specific number and locations of additional monitoring wells and the proposed field investigation procedures will be included in the report. As requested by the ACHCS, the report will contain an estimated schedule for further investigation and or remediation activities. If appropriate, based upon the data obtained, *SEACOR* may also describe a conceptual remedial alternative(s) for the site.

4.0 QUALITY ASSURANCE PLAN

In order to ensure that accurate and representative data is obtained, strict Quality Assurance and Quality Control (QA/QC) procedures will be followed. These procedures employed will conform to applicable documents and corporate protocols established by *SEACOR*. The following QA/QC procedures will be adhered to during decontamination procedures, sample collection and analysis procedures, laboratory QA/QC procedures, and sample custody control procedures. All field and laboratory procedures will be followed and will be monitored by the project designated QA/QC Manager.

4.1 DECONTAMINATION PROCEDURES

To support the quality of data obtained during the investigation and minimize the potential for cross-contamination between sampling locations, all downhole drilling equipment, soil sampling equipment, and groundwater development and sampling equipment will be thoroughly cleaned prior to initiating work and between each sampling location. Downhole drilling equipment and soil coring equipment will be steam cleaned between each boring location and core run, respectively. Steam cleaning will be performed in a designated area prepared to contain rinsate.

Soil sampling and groundwater development sampling equipment (e.g. sample tubes, bailers, and surge blocks) will be washed in a dilute trisodium phosphate solution (TSP), rinsed with potable water, and final rinsed with distilled water between each sampling location. Because groundwater samples collected from the monitoring wells will be collected with pre-cleaned dedicated bailers, decontamination between sampling locations will not be required.

4.2 QUALITY ASSURANCE SAMPLE COLLECTION AND ANALYSIS

Quality assurance samples will be used to evaluate the quality of the data obtained from the field program. Two distinct types of quality assurance samples will be used during this project.

- **Blind duplicate samples** for groundwater will be submitted at a minimum rate of one per ten primary samples obtained. Blind duplicate samples will be analyzed for the same analytical parameters as the primary samples. The blind duplicate samples provide an indication of the precision of the analytical methodology as well sampling methodology and sample matrix variability.

- **Trip blank samples** will be submitted at a minimum rate of one per shipping container (cooler). Trip blanks consist of analyte free water placed in an appropriate container. Trip blanks will be prepared by the analytical laboratory and accompany the primary samples during sampling and transport to the laboratory. Trip blanks will be analyzed for TPHg and BTEX compounds, only. Trip blanks provide a measure of positive interferences introduced by sample preservation, transportation, and storage and analysis.

4.3 LABORATORY QA/QC PROCEDURES

Soil and groundwater samples will be submitted to a State of California-certified analytical laboratory for analysis. Established QA/QC procedures for the selected analytical laboratory include sample custody procedures, standards of analytical precision and accuracy, analysis of control samples (spikes, blanks, and duplicates), data reduction, verification of raw analytical data, and maintenance of control charts to monitor analytical performance. These QA/QC procedures are available upon request.

4.4 SAMPLE CUSTODY CONTROL PROCEDURES

All samples submitted to the analytical laboratory will be accompanied by a completed chain-of-custody (COC) form. The COC form will be used to document the handling and shipping procedures as well as identify and ensure traceability of the samples collected. The COC form will be completed and signed by the sample collector and subsequently signed through all custody transfers. At the analytical laboratory, the COC form will be checked for accuracy and completeness, and then signed and dated by the laboratory custodian accepting the samples. A separate COC form(s) will accompany each shipment of samples. If all of the samples in a given shipment cannot be recorded on a single COC form, an additional form(s) will be used.

5.0 WASTE CONTAINMENT AND DISPOSAL PLAN

This section provides guidelines for the handling of any potentially contaminated materials generated during the field activities associated with this investigation.

Soils brought to the surface will be temporarily stored on-site in DOT-approved, sealed containers. The containers will remain on-site until analytical results are obtained from the laboratory. The soils will be disposed of appropriately, based on the analytical results.

The water collected during steam cleaning operations, as well as the water removed from the wells during the development, purging, and sampling, will be stored on-site in sealed DOT-approved 55-gallon drums. The drums will be labeled with the well I.D. number(s), date, and nature of contents. All drummed liquids will be sampled and properly disposed of based on the analytical results.

Waste that may be generated during the investigation will be manifested as required for transportation and disposal. Disposal of all wastes will be conducted in accordance with federal, state and local regulations.

6.0 SCHEDULE

SEACOR can begin work on this project immediately upon approval of this Work Plan. We estimate the project can be completed within 14 weeks after Work Plan approval is received. This assumes two (2) weeks for the Historic Records Review (Task 1), one (1) week for precision pipeline testing (Task 2), and one (1) week for the subsurface field investigation (Task 3). Chemical analysis of submitted samples will require two (2) weeks from the date of sample submittal. A report (Task 4) will be submitted to the ACHCS within eight (8) weeks from completing the field investigation activities.

7.0 REFERENCES

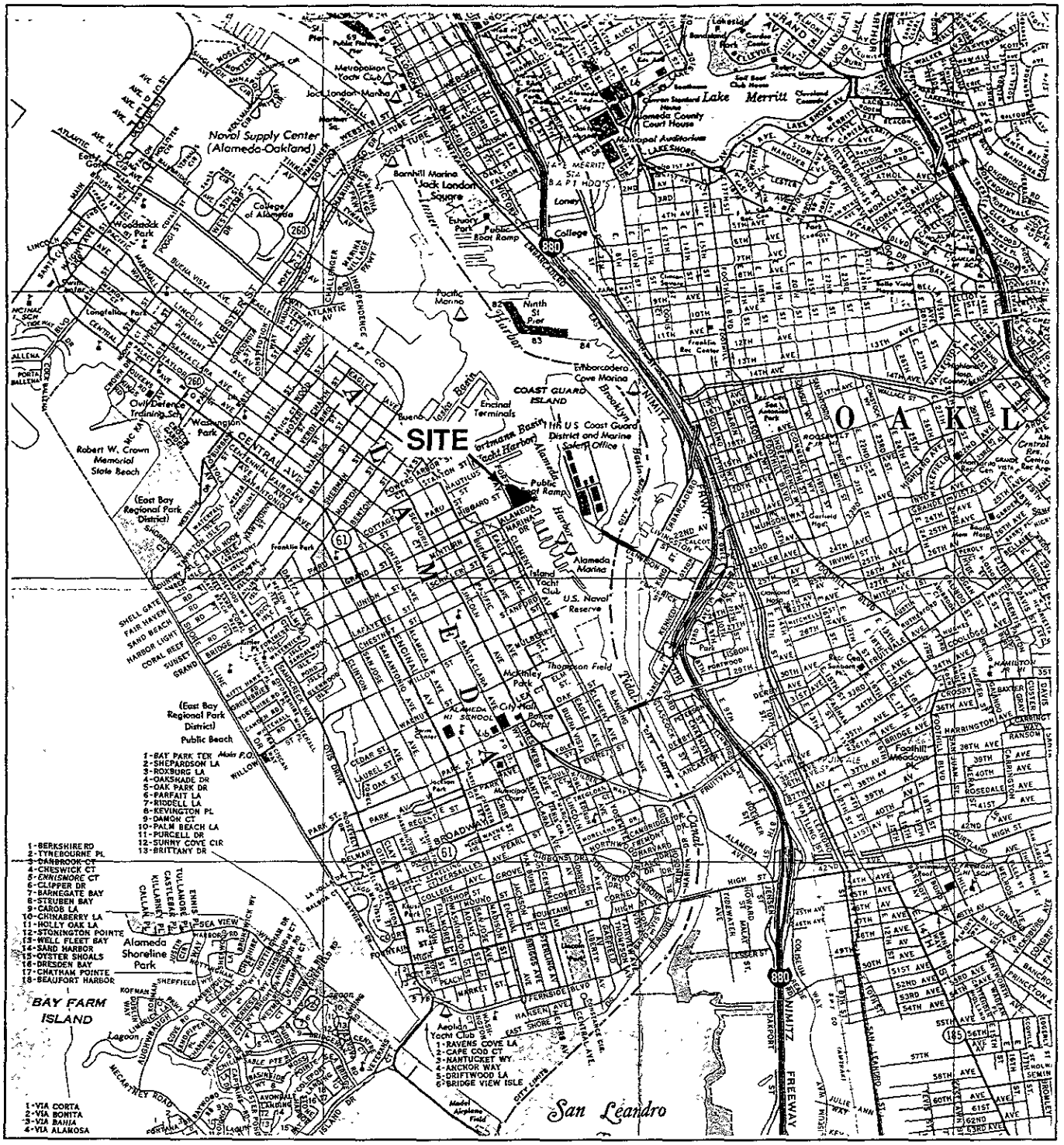
Anne Bloomfield, Site History of the Encinal Marina Project, 2051 Grand Street, Alameda, California, March 1987.

Harding Lawson Associates, Environmental Assessment Encinal Marina Alameda California, HLA Job No. 19247,001.02, July 17, 1987.

Harding Lawson Associates, Petroleum Hydrocarbons in Soils and Groundwater Fuel Storage Area Encinal Marina Alameda, California, HLA Job No. 18247,001.02, July 17, 1987.

Uriah, Inc., Summary of the Subsurface Investigation performed at Encinal Marina located at 2041 Grand Street in Alameda, California, June 3, 1988.

Zaccor Corporation, A Report Documenting a Limited Environmental Site Assessment of Soil and Groundwater at: Grand Marina Foot of Grand Street Alameda, California, June 26, 1992.

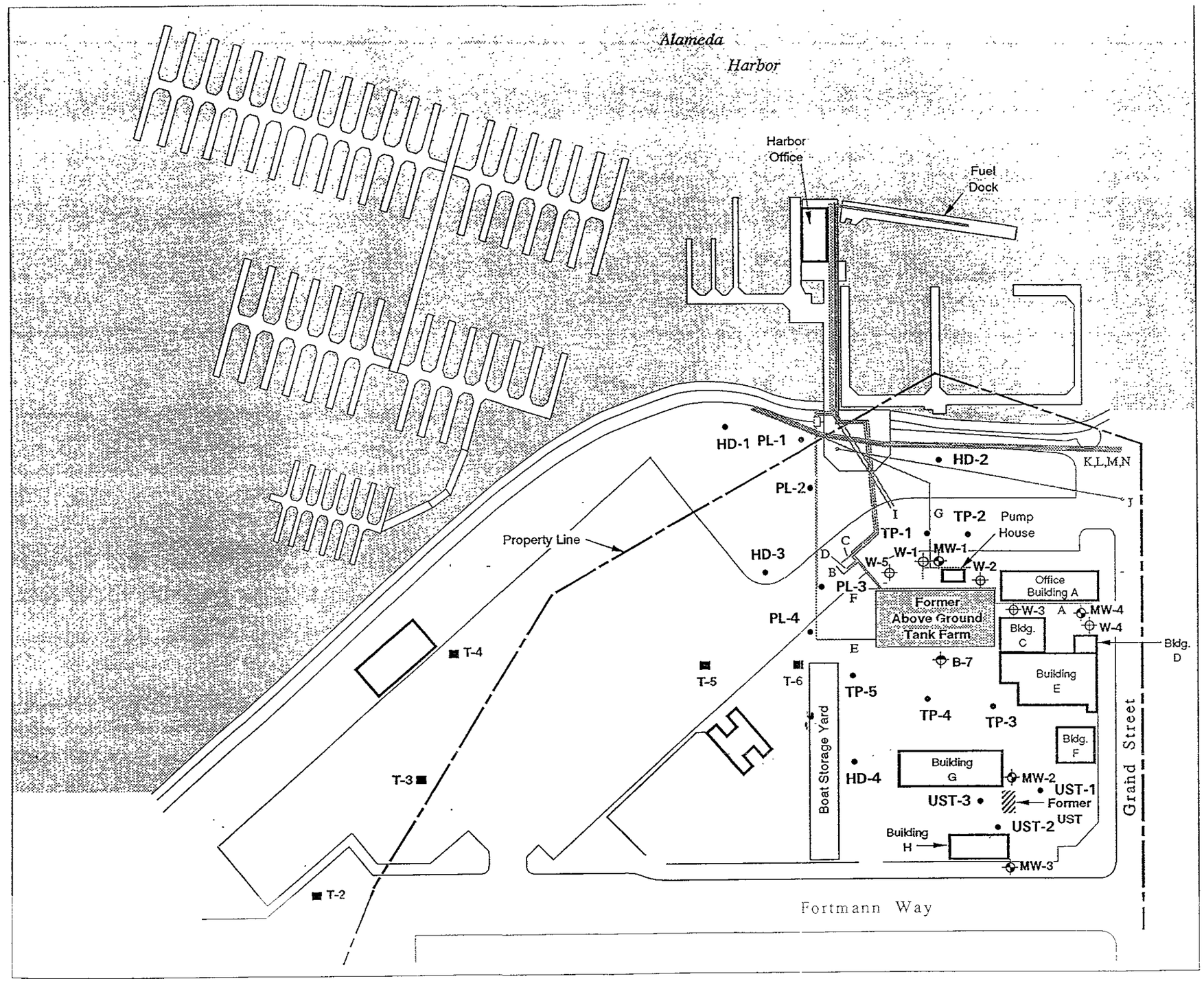


SOURCE:
H. M. Gousha, 1988, Oakland and East Bay Cities

0 1 Mile

SITE LOCATION MAP
Additional Site Investigation
Grand Marina Facility
Alameda, California
FIGURE 1

SEACOR
SJN 50085 CC



PROPOSED SOIL BORINGS

- • Proposed Soil Borings
- TP = Tank Farm Perimeter
- UST = Former UST Vicinity
- PL = Product Line Area
- HD = Hydraulically Downgradient Area

LEGEND

- ⊕ Monitoring Well (Zacoor, 5/92)
- ⊕ Monitoring Well (Harding-Lawson, 6/87)
- ⊕ Monitoring Well (Crowley Environmental Services, 4/87)
- ■ Test Trench (Harding-Lawson, 6/87)

NOTE:
Locations are approximate and based on previous site plans.

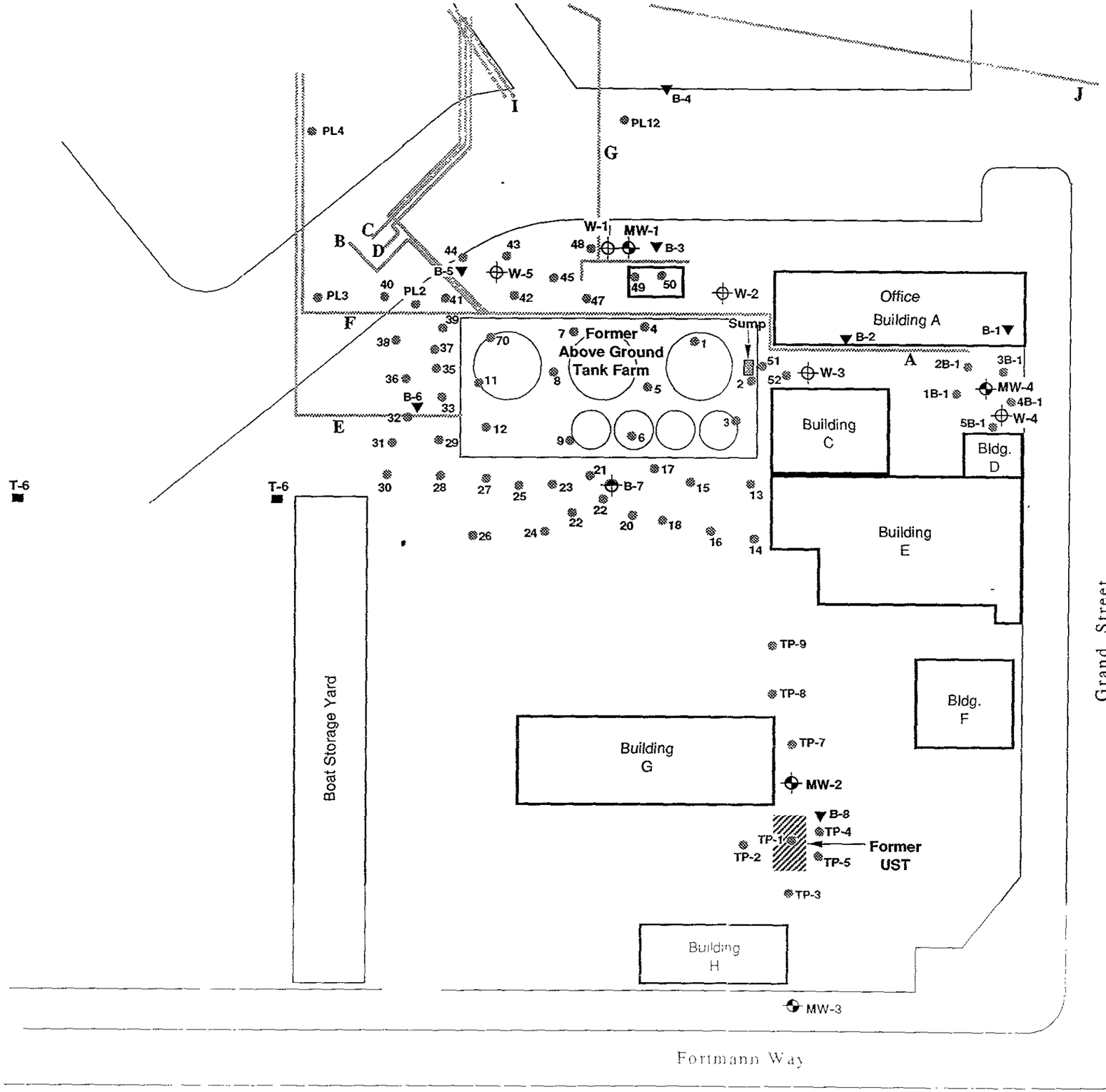
KEY FOR UTILITIES

- **A** 3" Commercial Diesel Line
- **B** Diesel Vent Line
- **C** Gasoline Line
- **D** Diesel Line
- **E** Abandoned Bilge/Sludge Line (4")
- **F** Abandoned Diesel Line (4")
- **G** Abandoned Lube Oil (3")

  (E, F, G: Proposed Secondary Pipe Enclosure Chase for Future Use)
- **H** 8" Concrete Storm Drain
- **I** 3" Copper Pump-up Fire Hydrants
- **J** 6" Sewer V.C.P.
- **K** 2 x 3" High Voltage Electrical
- **L** 4" Electrical Secondary
- **M** 2 x 3" Telephone
- **N** 2 x 2" Cable T V.

SEACOR
SJN 50085 001-01

SITE PLAN AND PROPOSED SAMPLE LOCATIONS
Additional Site Investigation
Grand Marina Facility
Alameda, California
FIGURE 2



LEGEND

- Monitoring Well (Zacoor, 5/92)
- Soil Boring (Zacoor, 5/92)
- Monitoring Well (Harding-Lawson, 6/87)
- Soil Boring (Harding-Lawson, 6/87)
- Test Trench (Harding-Lawson, 6/87)
- Monitoring Well (Crowley Environmental Services, 4/87)

NOTE:
Locations are approximate and based on previous site plans.

KEY FOR UTILITIES

A	3" Commercial Diesel Line
B	Diesel Vent Line
C	Gasoline Line
D	Diesel Line
E	Abandoned Bilge/Sludge Line (4")
F	Abandoned Diesel Line (4")
G	Abandoned Lube Oil (3")
H	8" Concrete Storm Drain
I	3" Copper Pump-up Fire Hydrants
J	6" Sewer V.C.P.
K	2 x 3" High Voltage Electrical
L	4" Electrical Secondary
M	2 x 3" Telephone
N	2 x 2" Cable T.V.

Proposed Secondary Pipe Enclosure Chase for Future Use

0 100 Feet

SEACOR
SJN 50085-001-01

PREVIOUS SAMPLING LOCATIONS
Additional Site Investigation
Grand Marina Facility
Alameda, California
FIGURE 3

APPENDIX A

Health and Safety Plan

SEACOR

SITE HEALTH AND SAFETY PLAN:
UST & AST FIELD OPERATIONS

SEACOR
90 New Montgomery Street
Suite 620
San Francisco, California 94105

SITE HEALTH AND SAFETY PLAN (HASP) DATA FORM

SEACOR PROJECT NO. 50085-001-01

PROJECT IDENTIFICATION:

Site Name Grand Marina

Client Crowley Environmental Services/Grand Marina, Inc.

Work Location Address Grand Marina, 2099 Grand Street, Alameda, CA 94501

SITE HISTORY:

Describe Briefly Previous site investigations and activities were initiated during April 1987 by Crowley Environmental Services (CES) and HLA who installed six groundwater monitoring wells (W-1 through W-5, and B-7) and advanced six soil borings in the vicinity if the above ground tank farm. This tank farm was previously used for the storage of diesel fuel, lube oil, and slop oil/bilge water. HLA also dug six test trenches at various site locations during this investigation. In November 1987 CES excavated and disposed of approximately 285 tons of petroleum hydrocarbon-impacted soil to a maximum depth of five feet below ground surface (bgs) in the vicinity of the tank farm. Free phase petroleum hydrocarbons were observed with the limits of the excavation. In May 1988, Uriah Inc. removed a 1,000-gallon capacity gasoline underground storage tank (UST), soil adjacent to the UST was found to be impacted with petroleum hydrocarbons.

In June 1990, Versar Inc. performed an environmental risk assessment at the site that included collection of water samples from the estuary, four groundwater monitoring wells, and the sump within the tank farm area. Soil samples were also collected from two areas of discolored soil and nine cubic yard of soil were removed from this area in the vicinity of the tank farm.

In January 1992, Zaccor Corporation (Zaccor) conducted a Limited Environmental Site Assessment at the site. This assessment included the removal of the above ground tank farm, with the exception of the concrete foundation and the product lines. Zaccor also advanced soil borings and collected soil samples from the vicinity of the tank farm, the former 1,000-gallon UST, and the product lines. Four additional groundwater monitoring wells were also installed during this phase of the investigation. Elevated concentrations of petroleum hydrocarbons were detected in both soil and groundwater beneath the site during this phase of the investigation.

SCOPE OF WORK:

Describe Briefly Phase I and II Site Investigations, in compliance with Alameda County requirements. Contaminants include hydrocarbons (gasoline, diesel, and and oil and grease) and metals. Shallow soil and groundwater sampling and analysis and precision pipeline testing will be conducted.

REVIEW AND APPROVAL DOCUMENTATION:

Prepared By

6/4/93
Date

Reviewed By:

Site Safety Officer — Date: 6/4/93

Project Manager — Date: 6-4-93

Principal-In-Charge — Date: 6/4/93

Approved By:

Safety and Health Director — Date: 6/4/93

Project Start Date _____ End Date _____

This Site HASP Must Be Reissued/Reapproved For Any Activities Conducted After:

Date_____Amended Date(s) 1._____ 2._____ 3._____ 4._____ 5._____

SECTION 1
INTRODUCTION

1.1 Purpose

This document has been prepared to serve as a standard health and safety protocol for the identified tasks relating to underground storage tanks (USTs) and aboveground tanks (AGTs), collectively referred to as "Tanks" containing petroleum products. The purpose of this document is to provide consistent and comprehensive procedures to protect the health and safety of *SEACOR* personnel, *SEACOR* subcontractors, and the public during these field activities. Through this plan, it is expected that the high standard of *SEACOR* health and safety will be maintained by ensuring consistent application of the safety practices described herein.

1.2 Scope and Applicability

This standard Health and Safety Plan (the plan) has been developed to cover selected activities relating to underground storage tank projects. This plan applies only to Tanks containing, or formerly containing petroleum hydrocarbon products such as gasoline, diesel fuel, heating fuels, lubricants, turbine fuel, or waste oil. The application of a standard plan is appropriate for these projects because of the foreknowledge of site conditions and hazards, and the repetitive nature of the work activities. Tasks involving Tanks associated with chemicals or materials other than those mentioned are NOT covered under this plan. Furthermore, this plan is NOT valid for Tank projects where Level B personal protection is required, or where entry or demolition of Tanks is undertaken. Therefore, this plan applies to the following activities when they are performed on petroleum containing underground storage tanks:

- Activities associated with standard site characterizations such as soil and groundwater sampling.
- Tank and product dispensing line removal.
- Excavation of petroleum contaminated soil.
- Tank tightness testing.
- Installation of groundwater treatment systems and soil vapor extraction systems.
- Tank installation oversight.

Actual subtasks relating to the identified activities will be discussed in detail in Section 3 - Task Risk Analysis. The plan is valid only when used to support the identified activities, and will not be accepted for use on projects other than described.

1.3 Site Specific Information

Although this plan is designed to address the known conditions of Tank related projects, certain site specific information is necessary to complete it. Therefore, this information must be provided before the plan can be authorized for use. Sections 6 and 7 provide the relevant pages from the *SEACOR* corporate health and safety plan which must be completed and made part of the plan. Information regarding key personnel, sub-contractors, and emergency contacts must be identified on these pages. In addition, the plan requires the inclusion of *SEACOR* Safety Operating Practices for the respective activities and conditions expected on site. For example, the Drilling Safety Protocol must be included for site characterization activities, and similarly, heat stress monitoring procedures must be added when that particular hazard exists. These practices shall be attached to the plan as Attachment 1. Copies of *SEACOR* Safety Operating Practices can be obtained from the Corporate Safety and Health Director (CSHD).

SECTION 2
HAZARD ASSESSMENT

The hazard classifications expected to be encountered during the referenced tasks include physiochemical, chemical, physical, and biological hazards. Most of the hazards found on site emanate from the Tank and associated contents. However, project location, site operations, and climatic conditions contribute to the overall hazard assessment.

2.1 Physiochemical Hazards

In gasoline Tank removal activities, flammability and explosion hazards are of paramount concern. Vapors from stored products are likely to remain in the tank at high concentrations even after the contents and residues have been removed. Furthermore, vapors may be present in the excavation and the work area at concentrations sufficient to support combustion. Therefore, precautions will be taken to eliminate build-up of combustible vapors by properly purging or inerting tanks and venting displaced vapors. During these operations, all potential sources of ignition will be removed from the area and *SEACOR* Hot Work Permit procedures must be used. Frequent monitoring with a combustible gas indicator (CGI) is required. Due to lower vapor pressures and higher flashpoints, diesel fuel and heating oils do not present the extreme explosion hazard as that of gasoline. However, vapors from these fuels can accumulate in confined or low-lying spaces and, in the presence of an ignition source, cause an explosion. A fire extinguisher and emergency telephone numbers will be maintained on site. Table I presents the chemical properties of the components and/or products of concern.

2.2 Chemical Hazards

Although petroleum products are blends of numerous hydrocarbon compounds, most present relatively minor health hazard during Tank related activities. However, benzene, toluene, ethyl benzene, and xylenes are regular constituents of gasoline, and do present the potential for ill health affects. All four of these substances have high vapor pressures (see Table I). Routes of exposure include inhalation, ingestion, and absorption through the skin and eyes. When high concentrations of these chemicals are inhaled, symptoms of intoxication may result. These symptoms, ranging from simple dizziness to excitement or unconsciousness, are similar to those produced by alcohol or anesthetic gases. If such effects occur, the individual should be removed to fresh air. Benzene and tetraethyl lead, an additional fuel additive, require special toxicity considerations and are discussed below.

Benzene is a known animal carcinogen and human leukemogen, as well as a suspected human carcinogen. The present exposure limit for benzene is 1 ppm as set by the Occupational Safety and Health Administration (OSHA) with a Short Term Exposure Limit (STEL) of 5 ppm. *SEACOR* has developed a special protocol for monitoring and responding to situations involving benzene (see Section 4.3.2).

Tetraethyl lead, an organic form of lead, can cause diseases of the central nervous system, the kidneys, and the blood. Skin absorption of this compound is a major route of entry into the

TABLE 1
PHYSICAL PROPERTIES OF CHEMICAL CONTAMINANTS OF CONCERN

Chemical Substance	Physical Hazard	Physical State	Flash Point/ LEL/UEL	BP/MP	Vapor Pressure	Water Soluable	Incompatibilities	Exposure Limits (PEL/TLV)
gasoline	flammable	liquid	-36°/F/ /	140°F/				300ppm/ 300ppm
benzene	flammable	gas	12°F/ 1.3% / 7.1%	176°F/ 42°F	75 mm	0.18	strong oxidizers chlorine	1 ppm/ 10 ppm
toluene	flammable	gas	40°F/ 1.3% / 7.1%	231°F/ -139°F	22 mm	0.05	strong oxidizers	100 ppm/ 100 ppm
ethyl benzene	flammable	gas	59°F/ 1.0% / 6.7%	277°F/ -139°F	7.1 mm	0.015	strong oxidizers	100 ppm/ 100 ppm
total xylenes	flammable	gas	81-90°F/ 1.1% / 7.0%	282°F/ -12 to -55	7-9 mm	0.00003	strong oxidizers	100 ppm/ 100 ppm
tetraethyl lead	combustible	liquid	200°F/ 1.85 / ?	228°F/ -109°F	0.2 mm	insol	strong oxidizers sulfuryl chloride	0.075 mg/m^3 0.1 mg/m^3
Methyl tert-butyl ether	flammable	gas		55°F/ -109°F	245 mm	4.8	acid solutions	none
diesel fuel	flammable	liquid						
heating oil	flammable	liquid						

body, however, it can also be inhaled as a constituent of dust. Care should be taken to avoid inhalation of and contact with dust on Tank sites. The OSHA exposure limit is 0.075 mg/m^3 of air while the ACGIH exposure limit is 0.1 mg/m^3.

2.3 Physical Hazards

Physical hazards vary in type and number among the tasks related to Tank operations, and not all of the described physical hazards are necessarily present during individual Tank related projects. However, it is reasonable to expect that some combination of these hazards will be present, and therefore will be discussed in the plan. Most of these hazards have specific Safety Operating Practices that will be attached on a site-by-site basis. Safety Operating Practices can be obtained through the Corporate Safety and Health Director (CSHD).

The weather presents a variety of physical hazards that will vary from season to season, and must be addressed accordingly. High temperatures frequently present the potential for heat stress. When conditions exist for potential heat stress, an appropriate heat stress monitoring program must be included in the plan, and must be implemented and documented on site. Warmer weather also presents the possibility for thunderstorms and lightning. Tank projects requiring the use of drill rigs, cranes, backhoes, and similar equipment will be shutdown in the event of thunderstorms. Cold weather presents yet a different group of hazards including the potential for hypothermia, frost bite, freezing liquids and surfaces, faulty monitoring equipment, and metal stress. Appropriate precautions for cold weather operations will be made part of this plan.

Heavy equipment is involved in most aspects of Tank closures and site characterizations. When such equipment is operated by *SEACOR* or a *SEACOR* subcontractor, appropriate inspections and operating guidelines shall be employed as discussed in relevant operating practices. When work details require the use of hand tools and power hand tools caution and good judgment must be employed. In addition to general health hazard by way of electric shock and physical injury, power hand tools can act as ignition sources during Tank operations. Electrical hand tool use requires utilization of Ground Fault Circuit Interrupters or establishment of an assured ground program. Hot work such as the cutting or welding of tanks is not covered under the plan. If these activities are required, an approved amendment to this plan is necessary. Similarly, the plan does not cover any form of confined space entry either into a tank or excavated areas.

Tank closure and installation will require varying degrees of excavation. Physical hazards encountered during the excavation process range from moving heavy machinery to sloping and shoring concerns of the excavation itself. *SEACOR* personnel or their subcontractors are not permitted to enter any unsecured excavation. Excavations and trenches must comply with OSHA's standard (29 CFR 1926.651/652). If it is necessary that an excavation or trench be entered, the provisions of the OSHA standard must be fully implemented. A competent person must inspect all trenches and excavations prior to entry or commencement of work nearby. Prior to excavation a full utility search must be conducted to identify locations of underground services. Care must be taken during site activities to stay clear of overhead utilities.

Tank operations are frequently conducted in high traffic areas. Proper signage and barricading must be employed to ensure that the area is visibly identified as a construction site. Site

operations must be conducted in such a fashion that the risk of injury from vehicular traffic is minimized.

2.4 Biological Hazards

The likelihood of injury through biological sources on standard Tank projects is low. The typical setting for such work is mostly in urban/suburban areas where snakes, animals, or poisonous plants are not likely to be encountered. However, because of their ubiquitous nature, there is a potential exposure to insects. Untreated sewage may be encountered through the breaching of active sewer lines during excavation or drilling.

SECTION 3
TASK RISK ANALYSIS

As previously described, there are a variety of hazards encountered during Tank activities, but not all are necessarily present on any given project. The following discussion identifies the predictable and characteristic hazards associated with individual tasks, and comments on the likelihood of exposure from each.

3.1 Tank Removal and Remedial Activities

The potential exposure to a physiochemical incident during the removal of Tanks should be considered significant, although this assessment varies slightly with tank condition, contents, and ambient influences. In most cases involving petroleum storage tanks, the Tanks initial internal atmosphere is too vapor-rich to support combustion. However, before the tank(s) can be removed that atmosphere must be brought down through the flammable range to a condition which is too lean to support combustion. The inerting/purging process and the resultant displacement of vapors is the primary physiochemical concern. However, risk associated with the process will be minimized when tank inerting/purging and site control procedures follow the *SEACOR* Tank protocols.

Petroleum vapors liberated during tank inerting or purging present the most significant chemical hazard. Site personnel must move to a position upwind of the vapor source and perform continuous monitoring for the presence of volatile organic compounds (VOC) in the breathing zone. The protocol for personal protection described in Section 4 of this plan must be implemented if VOC are detected in the breathing zone at or above the prescribed action levels. Further chemical exposure is possible during the remediation of contaminated soils and/or the purging of associated product piping. Chemical exposure is possible through dermal contact during contaminated soil sampling activities, therefore, suitable hand protection is required. The referenced personal protection plan must be implemented during all of these activities.

Any of the hazards discussed in Section 2 may be present during Tank removal. The likelihood of injury from such sources is possible. However, pre-planning and awareness will minimize these risks.

3.2 Site Characterizations

The likelihood of physiochemical incident during site characterization activities is relatively low. However, a very real potential exists for contact with underground and overhead utilities, and can result in severe physical injury. Of greater concern is injury from the physical hazards related to drilling. Such hazards range from simple pinch and impact injuries to significant trauma incidents. Regular drill inspections, utility locates, caution and awareness during drill operation, and proper oversight can limit these occurrences.

Because of the lack of interaction with contaminant sources and the relatively benign impact on subsurface conditions, site characterization activities present relatively low opportunity for

chemical exposure. Though contact and/or proximity to soil cuttings, core samples, and well liquids do present the potential for exposure, such exposures can be minimized through personal monitoring and use of prescribed personal protective wear.

3.3 Tank Tightness Testing

Chemical exposure is of greatest concern during tank tightness testing activities. This process usually involves direct handling of petroleum products and close proximity to organic vapors. Most testing techniques require product to be open to the atmosphere thereby creating the potential for ignition. Occasionally, tanks must be uncovered to facilitate testing. These operations introduce the previously discussed hazards related to excavation.

3.4 Installation of New Tanks or Soil/Groundwater Treatment Systems

The installation of new Tanks is usually in clean non-contaminated soils. Thus the likelihood of chemical hazard during this activity is negligible. If the installation of new Tanks, or more likely, Soil/Groundwater Treatment systems is immediately following the removal and remediation of soils containing petroleum hydrocarbons, then there is the potential for health hazards from these operations, and the health and safety protocols described in this plan shall be implemented. As with Tank removal, heavy equipment is used and should be considered as a physical hazard. Physiochemical hazards are not likely but may be present if petroleum products are brought on site. Ground-water treatment system installation involving product recovery may present the potential for physiochemical and chemical hazards. Equipment used for pumping of product or severely contaminated ground water should be certified as intrinsically safe.

SECTION 4
PERSONNEL PROTECTION PLAN

The major elements of the personnel protective plan are presented in this section. However, as iterated throughout the plan, there are key site and condition specific details that must be added to the plan to make it complete. The plan will not be approved without proper and relevant documentation of the supplemental personnel protective requirements attached.

4.1 Administrative Controls

4.1.1 Personnel Training and Medical Requirements

Consistent with *SEACOR* standard operating practices and Federal regulation, all *SEACOR* site personnel and *SEACOR* subcontractors must meet specified training and medical requirements. All *SEACOR* personnel must be authorized for field work through current training certification and annual medical examination. Sub-contractors must provide documentation of current training and medical authorization for each individual on site. In addition, sub-contractors must provide written documentation of their corporate training program, their medical surveillance program, and their ability to provide personal protective equipment for their personnel. Personal protective equipment will not be provided for non-*SEACOR* personnel.

An individual maintaining current supervisor status will be required to perform as the Site Safety Coordinator (SSC) for each project under which this plan is implemented The SSC will have supervisory status equivalent to or greater than the level of protection in which site activities are conducted. This individual will be responsible for the implementation of the principles and protocols established in this plan.

Each individual participating in site activities will be required to read and understand the content of this plan. Acknowledgement of that understanding will be demonstrated by signing the last page of this document.

4.1.2 Safety Operating Practices

Provided below is the list of *SEACOR* Safety Operating Practices for selected physical hazards that may be present during Tank related activities. The SSC for the site will identify from this list the practices that are applicable to the site and are attached to this plan in Attachment 1. Where hazards exist beyond those presented by the list, the SSC will identify them in the spaces provided and attach the respective operating practice when available.

HAZARD	PRESENT (Y/N)	TASK NO.	OP ATTACHED
1. Noise	(✓)	____	YES
2. Heat/Cold (Ambient Air)	( )	____	_____
3. "Hot Work"	( )	____	_____
4. Traffic (Site Control)	( )	____	_____
5. Heavy Equipment Operation	( )	____	_____
6. Lifting Equipment Operation	( )	____	_____
7. Excavating/Trenching	( )	____	_____
8. Haz. Mat. Use/Storage - flam. liq/gas	( )	____	_____
9. Hand Tools	( )	____	_____
10. Power Hand Tools	( )	____	_____
11. High Pressure Water/Stream	( )	____	_____
12. Inclement Weather	( )	____	_____
13. Drilling	(✓)	____	YES
14. Other Utilities	(✓)	____	YES
15. Other _____	( )	____	_____
16. Other _____	( )	____	_____
17. Other _____	( )	____	_____

4.2 Engineering Controls

Personal protection through engineering controls on Tank projects will follow those recommended guidelines established by the MFPA and API. These methods may include, but are not limited to, inerting/purging tanks, vapor ventilation, grounding and bonding.

4.3 Personal Protective Equipment

The following combinations of personal protective clothing will be employed in accordance with the Action Levels prescribed below.

4.3.1 Personal Protective Ensembles

	LEVEL D	LEVEL C (modified*)
Head	Hard Hat (when overhead hazards are present)	Hard Hat (when overhead hazards are present
Eye and Face	Safety Glasses with Sideshields	Safety Glasses with Sideshields (with Half Face APR)
Whole Body	Cotton Coveralls or similar Work ensemble	Cotton or Tyvek Coveralls
Hand - gloves - gloves	Cotton (if necessary) Vinyl Surgical (when sampling)	Cotton (if necessary) Vinyl Surgical (when sampling)
Foot - boots - booties	Steel toe	Steel toe Latex outer (when in contact with contaminated soils)
Respiratory	Not Required	Full/Half-Face APR with Organic vapor/acid gas/HEPA Cartridges

* Modified Level C using a Half-Face APR may be used according to the Action Levels stated below.

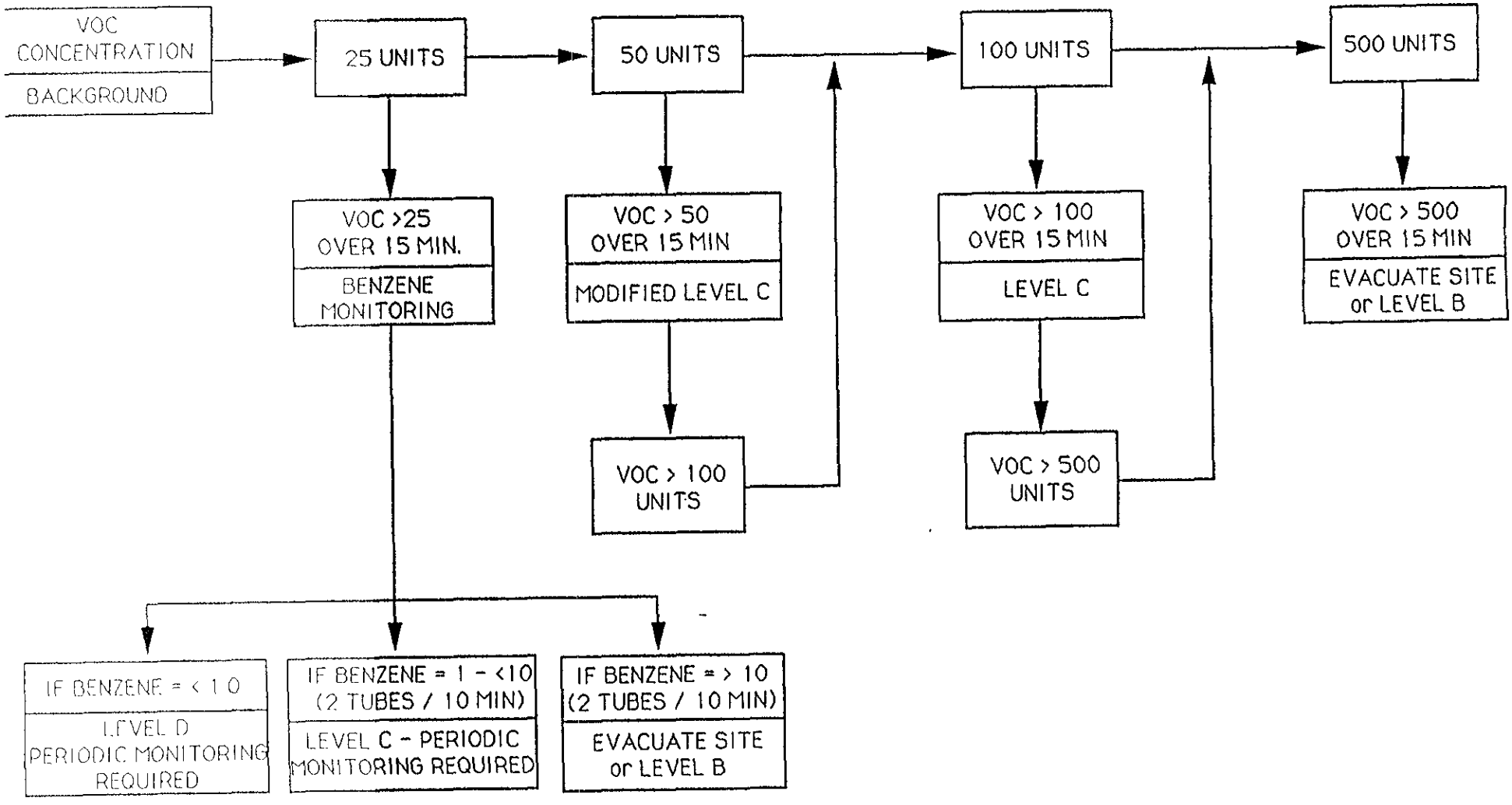
4.3.2 Action Levels for Personal Protective Ensembles

The following levels of protection shall be implemented based on the action levels and monitoring scheme described below. Figure 4-1 provides a graphic illustration of these action levels, the necessary exposure monitoring practice, and the required personal protective equipment.

Level D - Organic vapor concentrations in the Breathing Zone no greater than fifty (50) units above measured background as detected with direct reading instrumentation sensitive to aromatic hydrocarbon compounds (eg. OVA, HNU, OVM). VOC concentrations greater than 50 units will require upgrade to either Modified Level C or full Level C protection. However, when organic vapor concentrations exceed 25 units above background in the breathing zone over a fifteen minute period then site personnel shall initiate benzene specific monitoring using colorimetric detector tubes sensitive to 0.5 ppm Benzene. Specific Action Levels for benzene are graphically depicted in Figure 4-1. In lieu of PPE upgrade, site personnel may evacuate to a position upwind where organic vapor concentrations return to that of background.

Modified Level C - Sustained organic vapor concentrations in the Breathing Zone greater than 50 units above recorded background readings. At this point, Benzene-specific monitoring shall already have been initiated, and the conditions of Modified Level C shall be subject to these action levels as well. Modified Level C shall employ the use of a half-face APR instead of a full-face model (full Level C), while all other level C PPE requirements are employed. VOC concentrations

FIGURE 4-1
ACTION LEVEL GUIDELINES
FOR
UNDERGROUND STORAGE TANK FIELD ACTIVITIES



greater than 75 units will require upgrade to full Level C protection. This plan does NOT cover Tank operations requiring Level B protection.

Level C - Organic vapor concentrations in the Breathing Zone greater than 75 units but less than 500 units above recorded background readings. Benzene-specific monitoring shall already have been initiated. Level C shall employ the use of a full-face APR as well as the other specified PPE. VOC concentrations greater than 500 units will require evacuation of the site. This plan does NOT cover Tank operations requiring Level B protection.

4.3.3 Air Monitoring Instrumentation

The following instruments shall be used on site to ensure personal protection against the forementioned hazards. Table 2 presents important information regarding the response factors of the organic vapor monitoring instruments. All air monitoring equipment will be calibrated daily prior to use on site (and ideally, once more during the course of the work day). All instrument calibration records will be made on the pages supplied in Section 8 and maintained as part of this document.

- **Organic vapor detectors (PID / FID).** On standard Tank sites, either photoionization or flame ionization detectors will be used to perform real-time evaluations of airborne concentrations of VOC. If a PID monitor (eg. Hnu or OVM) is selected, it should be accompanied by a 10.0 eV (OVM) or 10.2 eV (Hnu) detector module. As shown by Table 2, the Foxboro OVA 128 is suitable for use with all the expected chemical compounds. Monitoring with organic vapor detectors will be conducted continuously while in the vicinity of site operations, with periodic monitoring in the breathing zone(s) of site personnel. Response to detected VOC concentrations will follow the stated Action Levels.

- **Combustible Gas Indicator/Oxygen Meter (CGI/O_2).** This instrument will be required only when *SEACOR* personnel are responsible for ensuring that combustible atmospheres do not prevail in tanks during removal or at other locations on site. In the event that *SEACOR* must make the determination that Tanks are in a non-combustible state prior to their removal, the SSC shall follow the established protocols for properly inerting/purging the tanks. Action Levels established for safe removal of Tanks (or non-combustible conditions around the site) are less than 20% of the LEL for the substances contained in the tank AND less than 10% oxygen content of the measured atmosphere. **Note: at oxygen concentrations less than approximately 14%, the GasTech CGI/O_2 meter readings may become unreliable in the LEL mode.**

- **Colorimetric Detector Tubes.** Detector tubes sensitive to 0.5 ppm benzene in air will be employed on site as described in Section 4.3.2.

TABLE 2
RELATIVE RESPONSE CHARACTERISTICS
OF AIR MONITORING EQUIPMENT

Chemical Substance	Ionization Potential	Instrument Response OVA	Hnu (10.2eV)	Hnu (11.7)	OVM (10.0eV)
Benzene	9.245eV	150%	100%	122%	150%
Toluene	8.82eV	110%	100%	100%	200%
Ethyl Benzene	8.76eV	100%	NR	NR	59%
Xylene	8.5eV	111%	100%	NR	143%
Paraffinic Hydrocarbons	9.86 - 12.98eV				
(C1 - C4)		80 - 100%	NR	VR	VR
(C5 - C7)		80 - 100%	10 - 30%	>80%	VR

NR - No Response
VR - Variable response dependent upon compound. For best response use FID.

4.3.4 Emergency Contingency Plans and Equipment

- **Medical.** Site specific medical care facilities and emergency response contacts will be described in Section 6 of this plan. The forms provided in Section 6 must be fully completed for this plan to be authorized for use. In addition, a map illustrating the route to the referenced hospital must be added to that section. Site personnel covered under this plan must be aware of the location on site of this information (eg. SSC's project vehicle). A first aid kit adequate for treating minor injuries and an appropriate eye wash device will be maintained by the SSC in the project vehicle. Minor injuries incurred on site will initially be treated on site; professional medical attention may be sought as necessary at a later time. Injuries of a more extensive nature will be transported to the referenced medical facility. All injuries will be reported to the Safety and Health Director and the Corporate Safety Officer.

- **Fire/Explosion.** At least one Type ABC fire extinguisher will be maintained by the SSC in the project vehicle. Additional fire extinguishers are required if *SEACOR* is responsible for site-wide health and safety. In the event of a fire/explosion the SSC will make the determination as to whether the incident can be controlled with the manpower and equipment on site. If necessary, the referenced fire response agency will be contacted.

- Spill Contingency. Spill containment and clean-up will be the responsibility of the construction contractor or the *SEACOR* construction sub-contractor. These companies will provide the necessary equipment and manpower to properly handle such an emergency. In most cases, however, the Tanks have been pumped free of any appreciable amount of liquids prior to

removal. These liquids are usually removed via vacuum truck where the likelihood of release is minimal. If such an event occurs and conditions present a health hazard to site personnel, the *SEACOR* SSC will assume responsibility for the safety of *SEACOR* personnel and their sub-contractors.

SECTION 5
DECONTAMINATION PLAN

5.1 Personal Decontamination

Waste resulting from contaminated personal protective equipment and disposable sampling equipment will be appropriately containerized on site. Arrangements will be made with the company contracted to dispose of contaminated soils to accept these wastes at the end of the project. Personnel shall wash hands and face upon leaving the site or prior to eating, drinking, or smoking.

5.2 Equipment Decontamination

Decontamination of non-disposable sampling equipment, hand tools, and heavy machinery will be performed prior to their leaving the site or at the conclusion of site activities. All equipment will be washed with detergent and water. Liquids resulting from this process will be collected, and arrangements made with the contracted waste handler to provide disposal. During site characterizations, sampling equipment may be decontaminated between boreholes to prevent cross-contamination. These liquids will similarly be contained and disposed of at the end of the project. Decontamination personnel are required to wear, at a minimum, latex gloves and suitable splash protective clothing including splash goggles.

SECTION 6

EMERGENCY CONTINGENCY INFORMATION

EMERGENCY CONTINGENCY INFORMATION

EMERGENCY CONTACTS AND PHONE NUMBERS:

Agency	Contact	Phone Number
Local Medical Emergency Facility	Highland Hospital	(510) 534-8055
SEACOR Health and Safety	Donald W. Moore	(415) 882-1548
Fire Department	Alameda Fire Department	(510) 522-4102 / 911
Police Department	Alameda Police Dept.	(510) 748-4508 / 911
On Site Coordinator	N/A	
Site Telephone		(510) 865-1200
Nearest Telephone	At Grand Marina Store/Office (Location)	

LOCAL MEDICAL EMERGENCY FACILITY(S):

Name of Hospital Highland County Hospital

Address: 1411 East 31st Street, Oakland Phone No. (510) 534-8055

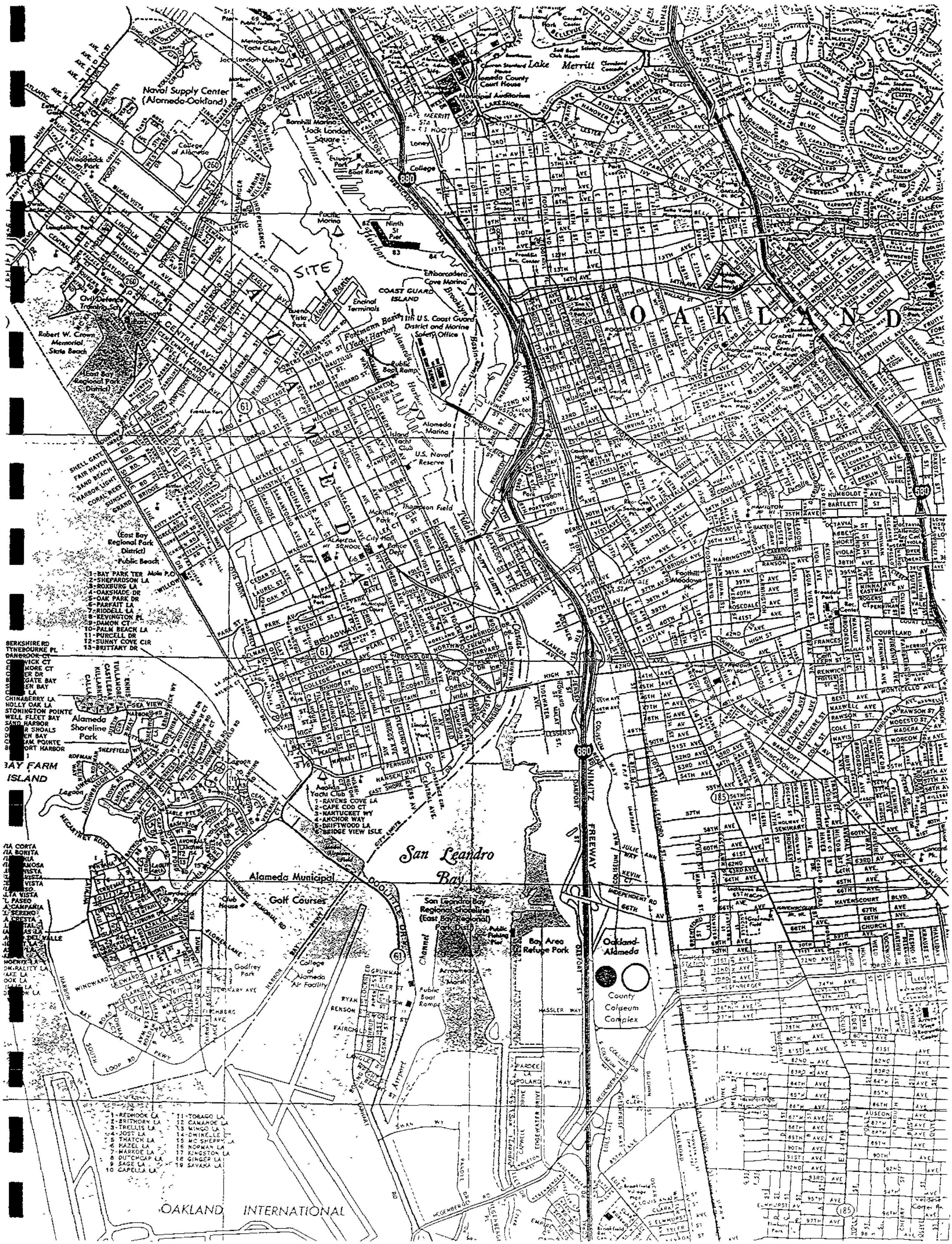
Name of Contact Emergency Room Phone No. (510) 437-4557

Type of Service - Physical Trauma only ☐ Chemical Exposure only ☐
Physical Trauma & Chemical Exposure ☑ Available 24 Hours ☑

Route to Hospital: **(Attach Map)** West on Grand Street; south on Clement Ave.; east on 29th Avenue; north on 23rd Avenue to 880; north on 880; 14th Avenue Exit; east on 14th Avenue to 31st Avenue; north on 31st Avenue; Highland Hospital - 1411 East 31st Avenue, Oakland

Travel Time From Site (Minutes) 10 minutes Distance to Hospital (miles) 5 miles

Name/Number of 24-hour Ambulance Service



Naval Supply Center (Alameda-Oakland)
College of Alameda
Jack London Marina
Metropolitan Yacht Club
Barnhill Marina
Jack London Square
Lake Merritt
Alameda County Court House
Municipal Auditorium
Inner Harbor
Pacific Marina
Ninth St Pier
SITE
Alaska Basin
Encinal Terminals
COAST GUARD ISLAND
11th U.S. Coast Guard District and Marine Safety Office
Embarcadero Cove Marina
Brooklyn Basin
Buena Vista Park
Fortmann Basin (Yacht Harbor)
Public Boat Ramp
Alameda Marina
Island Yacht Club
U.S. Naval Reserve
Thompson Field
Robert W. Crown Memorial State Beach
East Bay Regional Park District
Civil Defence Training Sch.
Washington Park
ALAMEDA
OAKLAND
Tidal Canal
Bay Farm Island
Alameda Shoreline Park
Aeolian Yacht Club
San Leandro Bay
Alameda Municipal Golf Courses
San Leandro Bay Regional Shoreline (East Bay Regional Park Dist.)
Bay Area Refuge Park
Oakland-Alameda County Coliseum Complex
Arrowhead Marsh
Godfrey Park
College of Alameda Air Facility
Channel
Foothill Meadows
OAKLAND INTERNATIONAL
NIMITZ FREEWAY
1-BAY PARK TER
2-SHEPARDSON LA
3-ROXBURG LA
4-OAKSHADE DR
5-OAK PARK DR
6-PARFAIT LA
7-RIODELL LA
8-KEVINGTON PL
9-DAMON CT
10-PALM BEACH LA
11-PURCELL DR
12-SUNNY COVE CIR
13-BRITTANY DR
1-RAVENS COVE LA
2-CAPE COD CT
3-NANTUCKET WY
4-ANCHOR WAY
5-DRIFTWOOD LA
6-BRIDGE VIEW ISLE

SECTION 7

SITE PERSONNEL AND CERTIFICATION STATUS

Certificate of Award

THIS CERTIFIES THAT

1663

DONALD MOORE

successfully completed the <u>initial 40 Hour</u> requirements
listed under OSHA Regulation 29 CFR 1910.120
HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

this eighteenth day of August 1991

Provided by: **Geo Line Safety Services**
1940 The Alameda
San Jose, CA 95126-1428

Geo Line
Safety
Services

Jay Jamali
Training Center Dean

Certificate Of Completion

Science & Engineering Analysis Corporation

hereby certifies that

Donald W. Moore

has successfully completed the 8-Hour Safety and Health Refresher Training for Hazardous Waste Site Operations in accordance with 29 CFR 1910.120.

San Francisco, California

October 15, 1992

for Science & Engineering Analysis Corporation

11.30.92
Date

RESPIRATORY PROTECTION AUTHORIZATION
QUANTITATIVE FIT-TESTING FORM

PLOYEE REQUESTING AUTHORIZATION	EMPLOYEE NUMBER	LOCATION/DEPARTMENT
Donald Moore		

PE(S) OF WORK TO BE PERFORMED
Field Geology / Site Investigation

ROVAL CLASS NEEDED:

- [ ] (1) EMERGENCY, HEAVY WORK, SCBA, HIGH STRESS
- [ ] (2) MODERATE LOAD, CONFINED SPACE, 02 DEFICIENT OR CARCINOGEN
- [ ] (3) VARYING LOAD, DAILY USE, FOR ROUTINE OPERATIONS
- [ ] (4) CASUAL, USE, NOT DAILY

CONTAMINENT(S) ENCOUNTERED: TLV

MENTS

LTH & SAFETY SIGNATURE DATE

- [x] MEDICALLY QUALIFIED
- [ ] MEDICALLY UNQUALIFIED

NAME OF CLINIC/EVALUATING GROUP: P.A. Medical Clinic
NAME OF PHYSICIAN: Dr. Mazzi

- [ ] CLASSROOM INSTRUCTION
- TIME SINCE LAST TRAINING SESSION (YEARS)

- [ ] BEARD GROWTH
- [ ] FACIAL SCARS
- [ ] RUPTURED EAR DRUM
- [ ] DENTURES ABSENT
- [ ] WRINKLES
- [ ] OTHER (DESCRIBE) _____

R ING SPIRATORS
- [x] 1/2 MASK
- [ ] FULL-FACE
- [ ] POWERED AIR
- [ ] GAS MASK
- [ ] CHEMICAL CARTRIDGE (disposable)
- [ ] DUST/MIST FILTER

SUPPLIED AIR RESPIRATORS
- [x] SCBA
- [ ] AIR-LINE
- [ ] OTHER: _____

RATOR TYPE NORTH SIZE [redacted] SMALL

- [ ] SOAMYL ACETATE TEST
- [ ] SACCHARIN TEST
- [ ] IRRITANT SMOKE TEST

- [x] NORMAL BREATHING
- [x] DEEP BREATHING
- [x] TALKING

- [ ] SCBA DON/DOFF, ASSEMBLI
- [ ] UP AND DOWN
- [ ] SIDE TO SIDE

TS

LOYEE SIGNATURE DATE 8/15 FIT-TESTOR'S SIGNATURE DATE

SEACOR

RESPIRATOR ISSUANCE AND QUALITATIVE FIT TEST RECORD

NAME: DONALD MOORE DATE: 2/15/93

LOCATION: LOS ALTOS, CA

NAME OF TEST ADMINISTRATOR: GERRY LABUDDE

TEST RESULTS	ATMOSPHERE	
	Isoamyl Acetate	Irritant Smoke
Test Atmosphere Recognition:	(pass)/fail	(pass)/fail
Type of Mask: FULL FACE	(pass)/fail	(pass)/fail
Manufacturer: A O.		
Model: 57400		
Size: ONE SIZE FITS ALL		
Type of Mask:	pass/fail	pass/fail
Manufacturer:		
Model:		
Size:		
Type of Mask:	pass/fail	pass/fail
Manufacturer:		
Model:		
Size:		

RECOMMENDATIONS: DON'T GROW BEARD MUCH LONGER

CLEAN SHAVEN? NO

SPECTACLE KIT REQUIRED? NO

I hereby certify that the above named individual has been qualitatively fit-tested and that the above information reflects the results of the test.

Test Administrator: Gerry LaBudde

Signature

Test Subject: Donald W. Moore

Signature

SECTION 8

INSTRUMENT CALIBRATION RECORDS

DIRECT READING AIR MONITORING INSTRUMENTS
CALIBRATION RECORD

Date	Instrument, Model, Serial No.	Time	Calibration, Standard/ Concentration	Initial Setting & Reading	Final Setting & Reading	Comments	Calibrator Initials

ATTACHMENT 1

SEACOR
SAFETY OPERATING PRACTICES

1.4.1 Utilities - General - SSP 1

Related SSPs:

SSP 9	-	Hot Processes - Steam
SSP 12.1	-	Machinery and Mechanized Equipment
SSP 12.2	-	Drill Rigs
SSP 12.3	-	Cranes/Lifting Equipment
SSP 7	-	Excavating and Trenching
SSP 14.1	-	Electrical Safety - General
SSP 14.2	-	Electrical Safety - High Voltage

1.4.1.1 Survey for and Identification of Utilities - SSP 1.1

Discussion:

Prior to beginning work on site or in or around facilities, buildings or other structures that could be served by or connected to utilities, a search must be conducted by the SHSO or official locating service, ideally in association with someone familiar with the facility, to identify any overhead, underground and in-work place utilities such as:

- Electrical lines and appliances
- Gas lines
- Pipelines
- Steam lines
- Water lines
- Sewer lines
- Pressured air lines

The location of any utility that could pose a risk to workers must be communicated to all workers during site safety indoctrination. Utilities should be marked or access otherwise restricted to avoid chance of accidental contact.

Utilities shall be considered "live" or active until a reliable source has documented them to be otherwise.

1.4.1.2 Overhead Utilities - SSP 1.2

Discussion:

For operations adjacent to overhead power lines, the following conditions must exist:

- Overhead transmission and distribution lines will be carried on towers and poles which provide safe clearance over roadways and structures.

- Clearances will be adequate for the movement of vehicles and for the operation of construction equipment.

Overhead or above ground electric lines shall be considered "live" or active until a reliable source has documented them to be otherwise.

Elevated work platforms, ladders, scaffolding, manlifts, drill or vehicle superstructures shall be erected a minimum of 20 feet (the actual distance is dependant upon the voltage of the line) from overhead electrical lines until the line is de-energized, grounded or shielded, and a competent electrician has certified that arcing can not occur between the work place or superstructure.

For other overhead or in-place utilities, workers must be instructed to use care in working under or around utilities to avoid hot surfaces, loud noises, pressured gases or air, leaking of pipelines, discharge of stream or hot liquids, and must work to prevent accidental contact with or breakage.

1.4.1.3 Underground Utility Searches - SSP 1.3

Discussion

No excavating, drilling or boring shall be done until a thorough underground utility survey, conducted by knowledgeable persons or agencies, has been made and it is found safe to begin.

Even when a search is completed, drilling, boring and excavation should commence carefully until past the depth at which such utilities are usually located.

All underground utilities shall be considered "live" or active until reliable sources demonstrate otherwise.

The SHSO is responsible for ensuring underground utility searches are performed and procedures are adhered to.

2.4.1 Noise Protection - SSP 10

Related SSPs:

SSP 9	-	Hot Processes - Steam
SSP 12	-	Heavy Equipment Operation
SSP 30	-	Drilling Safety Guide

Discussion

Noise is defined as unwanted sound. Noise can cause sudden traumatic hearing loss, long-term more slowly occurring sensory-neural hearing loss which is irreversible, disruption of communication and masking of warning devices and alarms, and increased stress levels and effects on the cardio-vascular and nervous systems. These latter two effects may occur at levels below that which cause damage to hearing and in situations where the conditions are more or less constant and daily.

OSHA regulations generally apply to 8-hour exposures, and consider 85 dBA as an action level for a Hearing Conservation Program.

Where feasible, noise exposure will be controlled by engineering controls. Where high noise levels are encountered and where engineering controls are infeasible or until engineering controls can be accomplished, hearing protection devices will be used for worker protection from noise-induced hearing loss.

Some of the sources of noise on hazardous materials, construction and industrial sites of a magnitude to cause hearing damage are: compressor motors, drill rig engine, hammer blows (from split spoon or other), compressor motors, compressed air, compressed water and heavy equipment. The list is not all inclusive.

Any sound level surveys indicating noise levels of 85 dBA or above, or, in the absence of sound level measuring instrumentation, any noise/sound preventing normal levels of vocal discussion between two individuals at arms length distance will dictate the need for hearing protection.

Hearing protection will be afforded by either disposable ear plugs or ear muffs. Administrative time control is not an acceptable method for preventing noise exposure since extreme noise for a short duration can cause severe, permanent hearing loss.

In addition to these protocols, BPP's Hearing Conservation Program includes physical examination and audiometric testing during annual medical monitoring.

Special precautions must be taken for handling fuel and refueling the drill rig or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.
- Refuel in a well-ventilated area.
- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.
- Do not spill fuel on hot surfaces. Clean any spillage before starting an engine.
- Wipe up spilled fuel with cotton rags or cloths; do not use wool or metallic cloth.
- Keep open lights, lighted smoking materials and flames or sparking equipment well away from the fueling area.
- Turn off heaters in carrier cabs when refueling the carrier or the drill rig.
- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.
- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- Keep fuel containers and hoses in contact with a metal surface during travel to prevent the buildup of static charge.

1.4.30.22 First Aid

At least one member of the drill crew, preferably the drilling safety supervisor, should be trained to perform first aid. First aid is taught on a person-to-person basis, not by providing or reading a manual. Manuals should only provide continuing reminders and be used for reference. It is suggested that courses provided or sponsored by the American Red Cross or a similar organization would best satisfy the requirements of first aid training for drill crews.

For drilling operations, it is particularly important that the individual responsible for first aid should be able to recognize the symptoms and be able to provide first aid for electrical shock, heart attack, stroke, broken bones, eye injury, heat stress, snake bites and cuts or abrasions to the skin. Again, first aid for these situations is best taught to drill crew members by instructors qualified by an agency such as the American Red Cross.

An adequate first aid kit should be available and well maintained on each drill site.

1.4.30.23 Drill Rig Utilization

Do not attempt to exceed manufacturers' ratings of speed, force, torque, pressure, flow, etc. Only use the drill rig and tools for the purposes that they are intended and designed.

1.4.30.24 Drill Rig Alterations

Alterations to a drill rig or drilling tools should only be made by qualified personnel and only after consultation with the manufacturer.

HEALTH AND SAFETY PLAN SIGN-OFF FORM

SEACOR

HEALTH AND SAFETY PLAN
AGREEMENT OF UNDERSTANDING

By signing below, I acknowledge that I have read and understood the contents of this site health and safety plan. Furthermore, I have had the opportunity to ask questions regarding safety practices and specific hazards related to this site. My signature below indicates that I agree to follow the practices set-forth in this health and safety plan during my activities on site.

Site Safety Coordinator	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date
Name (Print)	Signature	Date