SOIL AND GROUNDWATER REMEDIATION AT THE SOUTHEASTERN CORNER OF 1650 65TH STREET EMERYVILLE, CALIFORNIA

HEALTH AND SAFETY PLAN

PREPARED FOR

EMERYVILLE BAYFRONT LIMITED PARTNERSHIP
OAKLAND, CALIFORNIA

PREPARED BY

ENGINEERING-SCIENCE
DESIGN • RESEARCH • PLANNING
600 BANCROFT WAY, BERKELEY, CALIFORNIA 94710 • 415/548-7970
OFFICES IN PRINCIPAL CITIES

FEBRUARY 1988

ENGINEERING-SCIENCE

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

MAR 0 1 1988

G 2

ES

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ENGINEERING — SCIENCE
600 BANCROFT WAY
BERKELEY, CALIFORNIA 94710
(415) 548-7970

Date: 26 February 1988

ES Project No. NC049.08

IF MATERIAL NOT AS LISTED, PLEASE NOTIFY US AT ONCE

To: Regional Water Quality Control Board
1111 Jackson Street, Room 6040
Oakland, CA 94607

Attn: Greg Zentner

Re: Health and Safety Plan, 1650 5th Street

HOW MAILED:
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WE ARE SENDING YOU

☐ ATTACHED ☐ UNDER SEPARATE COVER VIA ___

☐ SHOP DRAWINGS ☐ TRACINGS
☐ PRINTS ☐ CATALOGS
☐ DOCUMENTS ☐ COPY OF LETTER
☐ SPECIFICATIONS ☐ ___

COPIES	DATE	ITEM
1	2/22	Health and Safety Plan for the Soil and Groundwater
		Remediation at the Southeastern Corner of 1650 5th St.
		Emeryville, CA.

REMARKS ___

COPY TO

☐ File
☐ Author
☐ Reading File
☐ ___

SIGNED: Katherine A. Chesick

Katherine A. Chesick
Project Manager

(ES Berk. 6 78)

2/88

HEALTH AND SAFETY PLAN

WAREHOUSE BUILDING
1650 65th Street
Emeryville, California

1.0 Project Description

Beginning February 24, 1988 Riedel Environmental Services, Inc. (RES) plans to excavate and dispose of an estimated sixty (60) cubic yards of contaminated soils from the paved area southwest of the warehouse building at 1650 65th Street, Emeryville, California. The excavation will cover an area specified by the plans and maps furnished with the bid package prepared for the project by Engineering-Science, Inc. and will be to a depth of approximately twelve (12) feet or to groundwater, but not below. The water table is roughly estimated at 12.3 feet below ground surface. All excavated material will be removed, transported, and disposed in a Class I hazardous waste landfill. Upon completion of sampling and analytical work by Engineering-Science, Inc. and a authorization to proceed with backfilling of the excavation, RES will backfill and compact to 90 percent relative compaction, then asphalt paving will begin per the specifications of the bid package.

2.0 Plan Purpose

The purpose of this plan is to set forth the minimum acceptable requirements and procedures for site occupational health and safety activities for all RES personnel and subcontractors.

The following sections describe the on site Health and Safety program that will be in effect at the Emeryville project.

3.0 Primary Responsibilities

a. Project Manager

The Project Manager has overall responsibility for implementation of the site safety plan. He will have direct responsibility for circulating the plan to the appropriate on site personnel and ensuring the plan is posted in a place accessible to all RES personnel and subcontractors and maintain oversight of the work so that compliance to the plan will be maintained. He will take immediate actions to correct any violations as they occur. In the event of any accident or injury he will arrange for first aid and/or removal of an injured employee or subcontractor to the nearest medical facility.

3.0 Primary Responsibilities (Continued)

B. Site Personnel

All RES and subcontractor personnel will be responsible for understanding and complying with the Health and Safety Plan. It is a condition of employment with RES that each employee perform his job duties in a safe manner consistent with his training and common sense.

4.0 Procedure

Prior to any excavation, RES will make every effort through the aid of Underground Services Alert and local utility companies to determine the existence and location of any underground installations, i.e., sewer, telephone, water, fuel and electric lines. Once the locations is established and determined to be in the area of the excavation RES will take reasonable care not to damage and provide proper support to the installation if uncovered. A RES employee operating a Case 580E (or equivalent) backhoe will then excavate to the specified dimensions, loading the excavated material into dump trucks for disposal. RES anticipates digging to a depth of twelve (12) feet. During this operation RES personnel will closely monitor the ground around the backhoe and immediately alert the operator to any changes indicating hazardous ground movement. RES personnel will also closely monitor the excavation and ground around and near the warehouse building and immediately alert the operator and Project Manager to any change indicating hazardous ground movement. OSHA regulations stipulate that "sides of trenches in unstable or soft material, 5 feet or more in depth, be shored, sheeted, braced or sloped, or otherwise supported by means of sufficient strength to protect the employees working within them." (1926.652(b)) Since the nature of the excavation does not necessitate sending employees into the excavated area RES does not plan additional shoring, sloping or bracing of any kind. In the event it becomes necessary, due to sloughing or unstable soils, to underpin the building and shore the excavation, RES will halt all work and consult Engineering-Science, Inc. prior to proceeding with a shoring plan to complete the excavation.

Finally, RES will provide adequate physical barrier protection around the excavation in the form of barricades and caution tape and will backfill the excavation upon completion of its operation, at which time it will be prepared for final asphalt paving operations.

5.0 General Safety Requirements

a. All personnel will receive instruction on the suspected health and safety concerns of all aspects of the project prior to initial work commencement. In addition, a safety and health meeting will be conducted daily, prior to work starting, to cover suspected hazards expected for the day's work and the precautions necessary to deal with these hazards. All site personnel are to attend.

b. Wear approved hard hats in all construction areas.

c. Wear sturdy work boots or shoes at the site. Steel-toes boots are preferred.

d. Wear hearing protection when performing tasks around heavy equipment which emit noise levels greater than 85 dBA.

e. Wear safety glasses or face shields whenever the situation poses eye hazard, as determined by the Project Manager.

6.0 Emergencies

In the event of an accident, the procedure listed below shall be followed:

1. Remove the injured or exposed person(s) from immediate danger.

2. If a serious injury or life-threatening condition exists Call an ambulance and alert Alta Bates Hospital that an injury has occurred. Clearly describe location, injury and conditions to the ambulance dispatcher. Designate a person to direct emergency equipment to the injured person.

3. If there is any question as to the nature of injury or what should be done, call the emergency numbers.

4. Evacuate other on site personnel to a safe place until the Project Manager determines that it is safe for work to resume.

6.0 Emergencies (Continued)

5. Steps to prevent a recurrence of the accident shall be immediately implemented.

Emergency telephone numbers for the Emeryville area are:

Alta Bates Hospital (Emergency) (415) 540-1303

Ambulance, Fire Department and Police Department 911

A map of the general locations of the Alta Bates Hospital relative to the project site is shown on Figure 1.

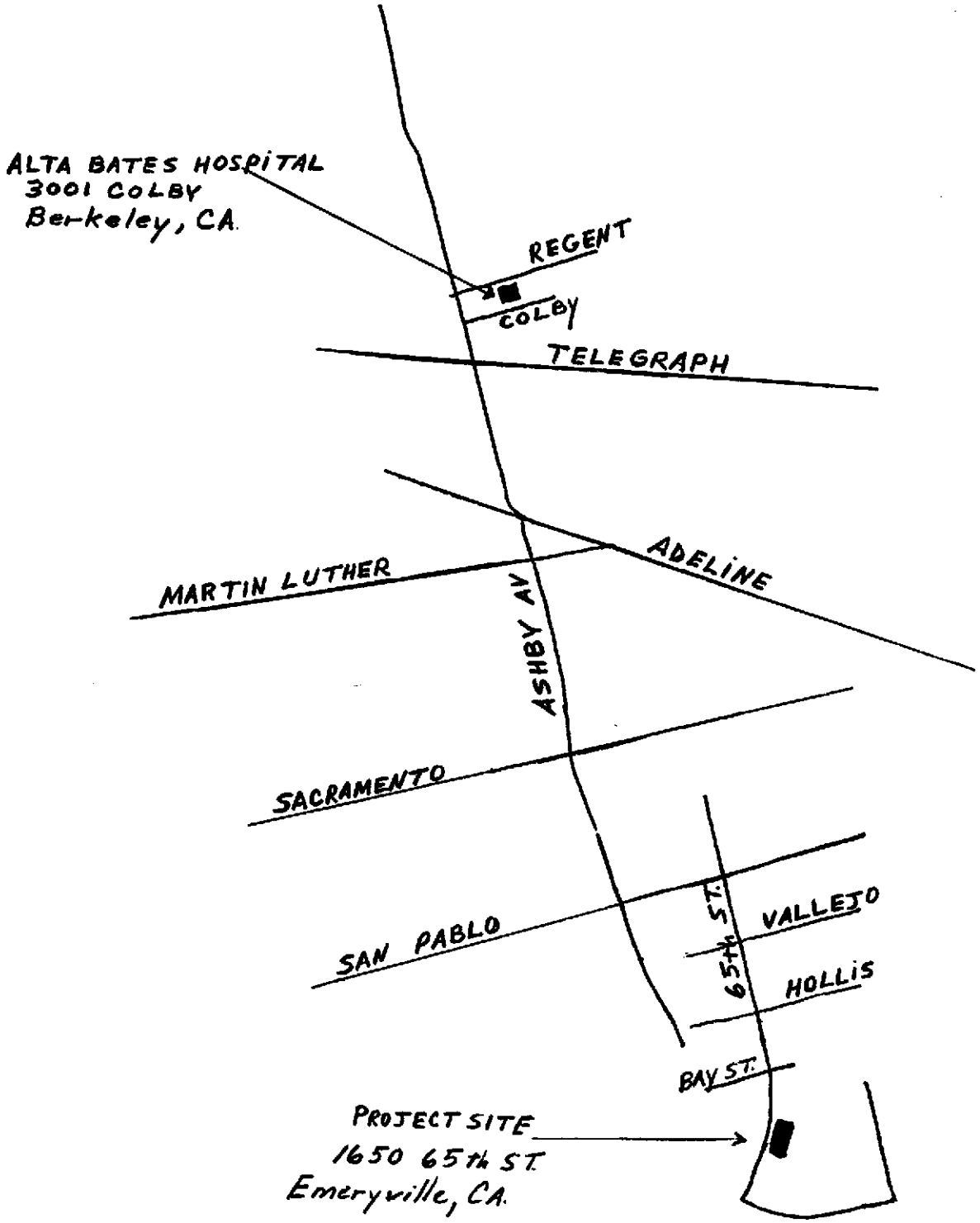


FIGURE 1
LOCATION OF ALTA BATES HOSPITAL

Health and Safety Plan
for
Soil and Groundwater Remediation
of the
Southeastern Corner of 1650 65th Street
Emeryville, California

NC049

Prepared for
Emeryville Bayfront Limited Partnership
Oakland, California

Prepared by
Engineering-Science, Inc.
600 Bancroft Way
Berkeley, California

February 1988

Health and Safety Plan
for
Soil and Groundwater Remediation
of the
Southeastern Corner of 1650 65th Street
Emeryville, California

Prepared by:

Katherine A. Chesick
Project Manager

2/22/88
(Date)

Reviewed and approved by:

E M. A
Office Health and Safety
Representative

2/24/88
(Date)

CHAPTER 1

PURPOSE AND POLICY

The purpose of this plan is to establish personnel protection standards and mandatory safety practices for remedial activities conducted on the southeastern corner of the 1650 65th Street property in Emeryville. The plan also provides for contingencies that may arise during field investigations and operations.

The provisions of this plan are mandatory for all remedial work. All Engineering-Science (ES) personnel who engage in on-site remedial work shall be familiar with this plan and comply with its requirements. Any supplemental plans used by subcontractors shall conform to this plan as a minimum.

A site description and scope of work summary for the project is provided in Chapter 2. Chapter 3 presents the project team organization, personnel responsibilities, and lines of authority. Training and medical monitoring requirements are contained in Chapter 4. Chapter 5 presents a safety and health risk analysis. Chapter 6 contains the emergency procedures and list of emergency contacts. Site-specific requirements for levels of protection are included in Chapter 7, and air monitoring procedures are provided in Chapter 8. Site control measures, including designation of site work zones, are contained in Chapter 9, while Chapter 10 provides detailed site-specific decontamination procedures. Chapter 11 contains the health and safety plan acceptance form. Site forms are provided in Appendix A and ES' annual medical monitoring program is described in Appendix B.

CHAPTER 2

SITE DESCRIPTION AND SCOPE OF WORK

SITE DESCRIPTION

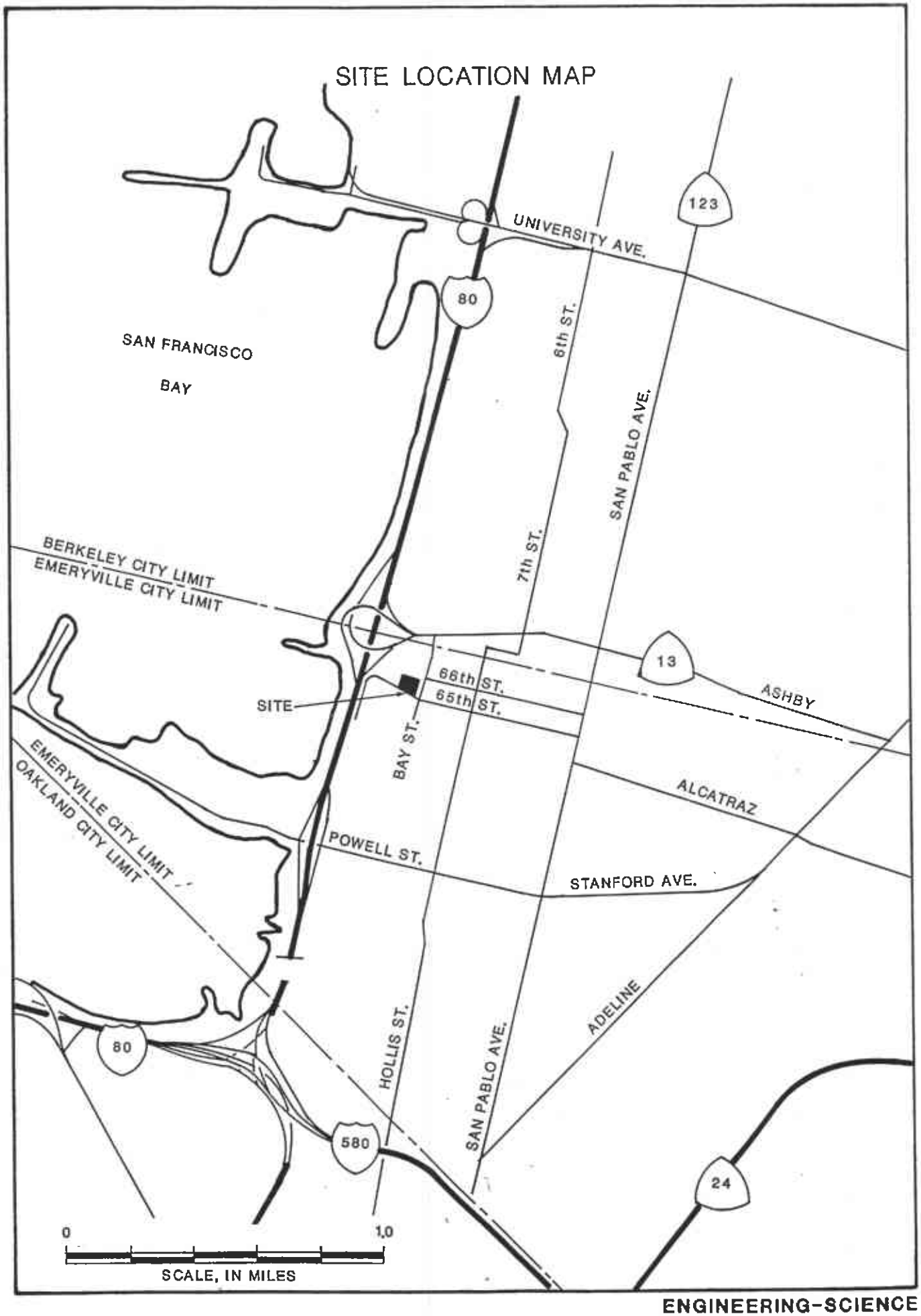
The 1650 65th Street property is located in the industrial area of western Emeryville. It comprises 5.5 acres of relatively flat land and hosts a one-storey rectangular concrete warehouse and associated parking areas. At this time, the United States Postal Service leases the warehouse, using it for equipment repair, storage and distribution. The eastern property boundary is abutted by a one-storey concrete-block warehouse. The property location is shown in Figure 2-1. Figure 2-2 is a site plan.

The soils of the property are of both natural and artificial origin. The deeper soils, consisting of bay muds, were deposited when the property was beneath the bay. Soils overlying these muds are artificially emplaced fill. The lower fill was deposited around the turn of the century with the extension of the Emeryville shoreline. The upper fill was emplaced from the early 1940s to the mid 1950s when the property was used as a municipal disposal site. This upper fill is presumed to be a combination of clean fill, demolition debris and industrial wastes. No evidence exists that the site was used for the systematic disposal of potentially hazardous materials.

SITE CONTAMINATION

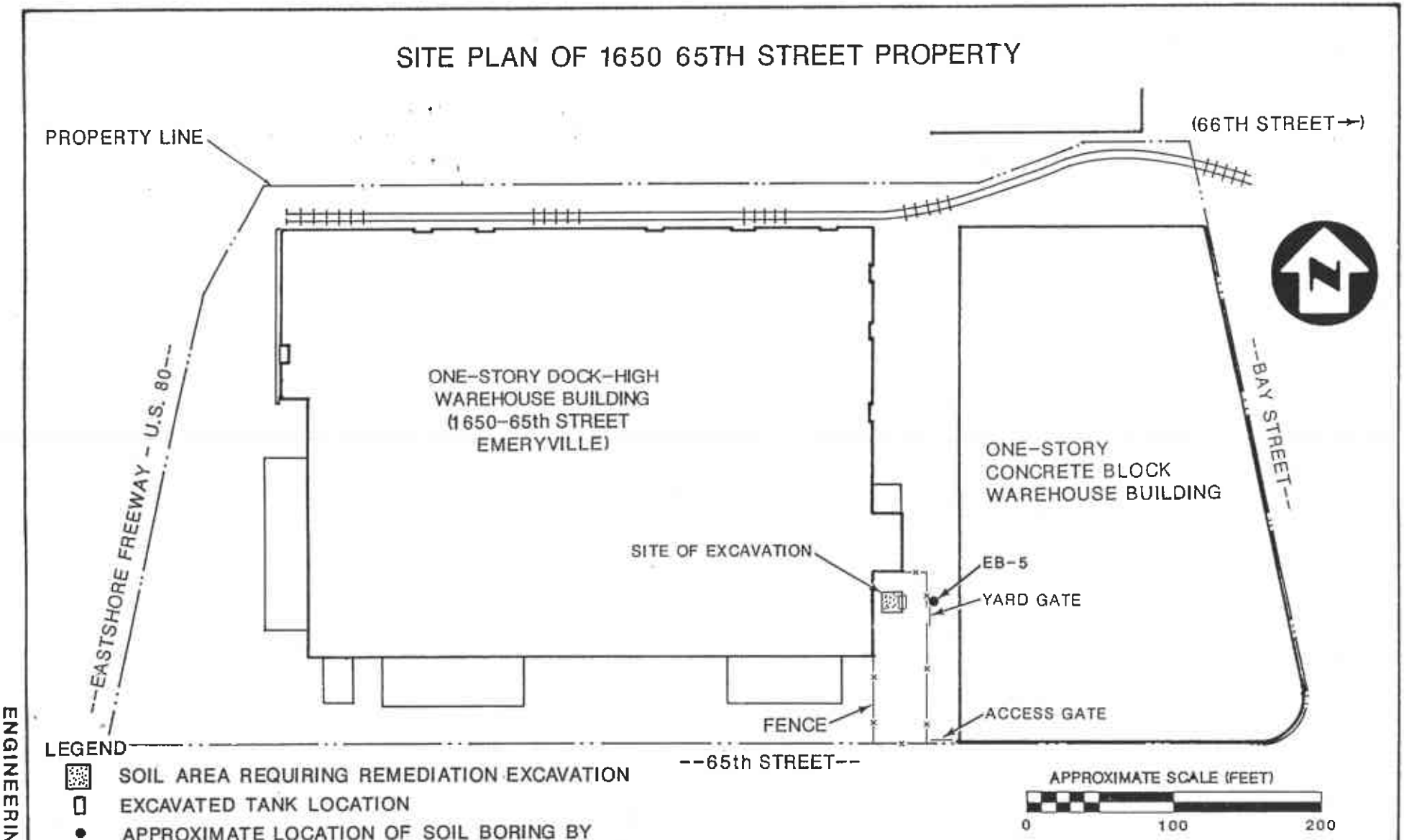
The southeastern corner of the property was contaminated by gasoline and minor amounts of waste oil which leaked from a 2,000 gallon underground storage tank. The tank, excavated on 2 July 1987, was located east of the southeastern warehouse corner. Its former location is shown on Figure 2-2. Fumes emanating from the soil excavated during

FIGURE 2-1



ENGINEERING-SCIENCE

SITE PLAN OF 1650 65TH STREET PROPERTY



BASE: PETER KALDVEER AND ASSOCIATES, INC. 1987, FROM "TOPO MAP", BY TRONOFF ASSOCIATES, DATED FEBRUARY 3, 1983

ENGINEERING-SCIENCE

FIGURE 2-2

tank removal were sufficiently strong to cause irritation to the postal workers inside the warehouse and to require closure of the warehouse roll-up door behind the excavation area.

Soil and groundwater samples were collected from the area during exploratory soil boring, tank removal and well installation. Analysis of these samples reveals contamination consists predominantly of gasoline and lead. The greatest concentration of gasoline was detected in a soil sample (MW-10) collected roughly three feet west of the former tank location. This sample, collected ten feet below ground surface, contained 6,600 mg/kg. The maximum known lead concentration, 36 mg/kg, was detected in a sample (FP-1) taken three feet below the former tank product line. Table 2-1 summarizes analytical results of all soil and groundwater samples collected in the area to date. Sample locations are shown on Figures 2-2 and 2-3.

SCOPE OF WORK

Soil and groundwater remediation activities will take place in the southeastern corner of the site. Remediation activities will involve soil excavation and sampling, and the installation and sampling of one groundwater monitoring well.

An estimated 60 cubic yards of gasoline and lead contaminated soil will be removed during soil excavation work. The excavation will cover a 10 by 12 foot region west of the former tank area and extend to a depth of 12 feet. The soil will be disposed of at a Class I landfill. Soil excavation is scheduled to begin February 24, 1988. Figure 2-4 is a detail of the excavation area.

Following soil excavation and removal, one or more monitoring wells will be installed in the excavation vicinity. The exact number and location of the wells will be determined following completion of the excavation. Soil cuttings and all water purged during well development and sampling will be drummed. The drums will remain on-site until samples have been analyzed and proper disposal methods have been identified.

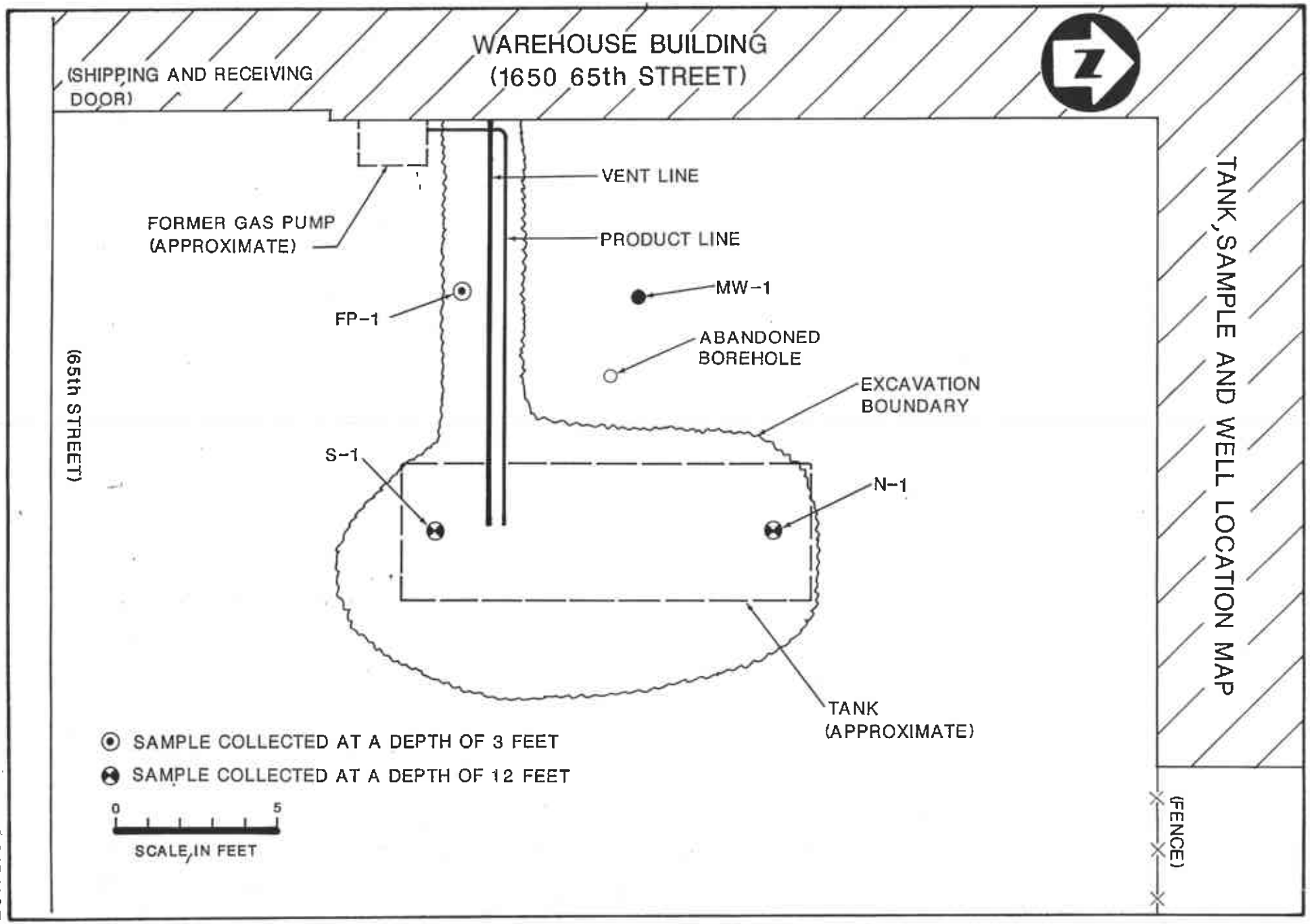


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FIGURE 2-3

TABLE 2-1

SUMMARY OF SOIL AND GROUNDWATER ANALYTICAL RESULTS

Sample I.D.	Depth (ft)	Matrix	Analysis			
			Total Fuel Hydrocarbons	EPA Method 8020 Toluene (ppm)	EPA Method 8020 Xylene (ppm)	Lead (mg/kg, dry)
N-1	12	Soil	<.01 ppm	<.03	<.04	5
S-1	12	Soil	<.01 ppm	<.03	<.04	4.8
FP-1	3	Soil	490 ppm	0.90	23	36
MW-5[a]	5	Soil	170 mg/kg	NA	NA	NA
MW-10[b]	10	Soil	6,600 mg/kg	NA	NA	NA
MW-1		Water	33 mg/l	NA	NA	NA
EB-5[c]	7.5, 9	Soil	200 mg/kg	NA	NA	NA

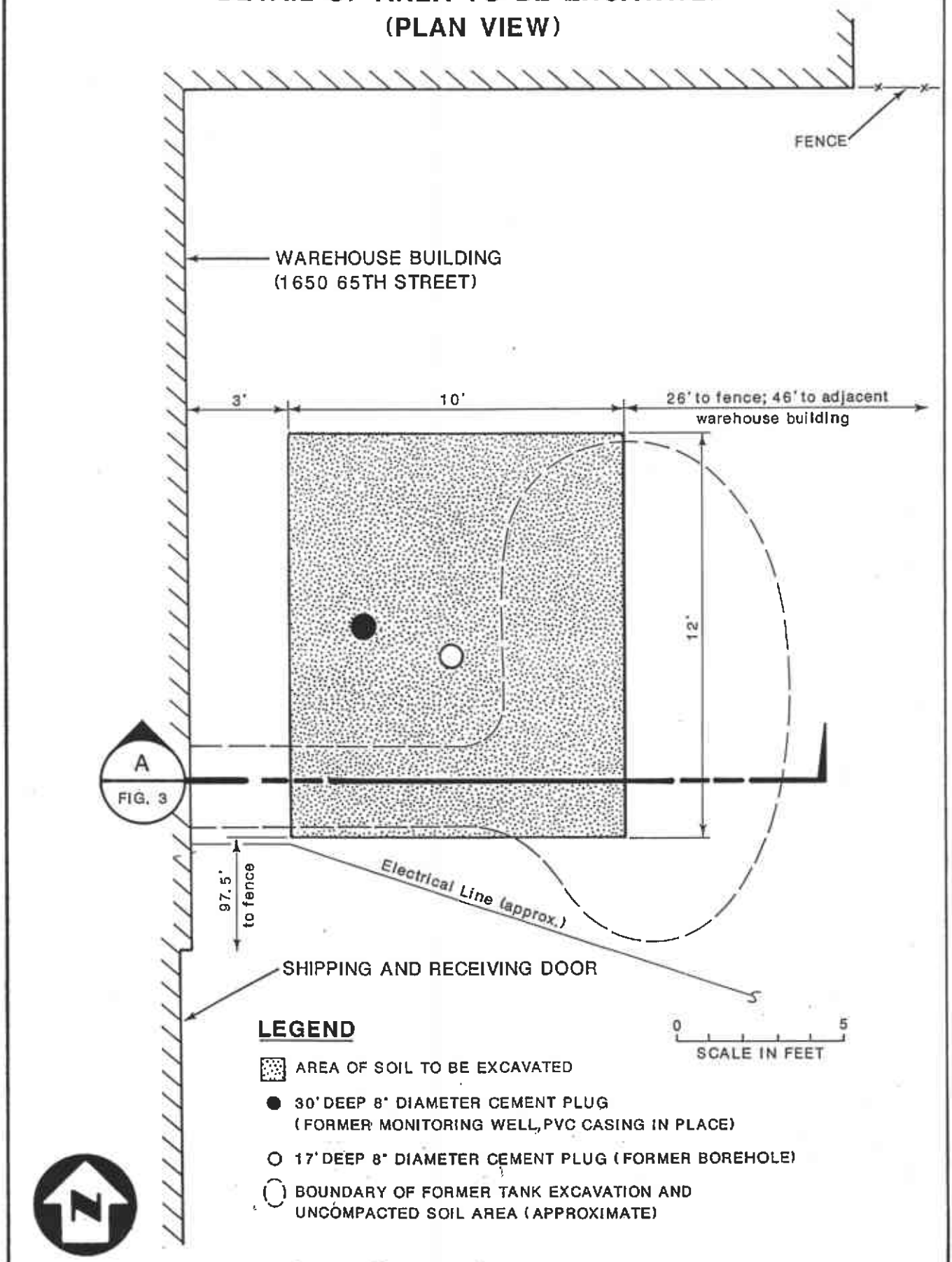
NA - not analyzed.

[a] All gasoline. This sample was collected during drilling of the abandoned borehole.

[b] Mostly gas with 3 to 5 percent diesel; unquantified waste oil was also present in the sample. This sample was collected during drilling of the abandoned borehole.

[c] Sample collected by Peter Kaldveer and Associates, Inc. 1987.

DETAIL OF AREA TO BE EXCAVATED
(PLAN VIEW)



CHAPTER 3

PROJECT TEAM ORGANIZATION

The following personnel are designated to carry out the stated job function on-site.

Project Manager:	Katherine Chesick
Field Team Leaders:	Eric Storrs
	Ajay Singh
Project Health and Safety Officers:	Eric Storrs
	Ajay Singh
Field Team Members:	Katherine Chesick
	Eric Storrs
	Ajay Singh
	Wayne Hauck
	Riedel Environmental Services personnel
	Drilling personnel (unnamed)

Table 3-1 describes the responsibilities of all on-site personnel.

TABLE 3-1

ON-SITE PERSONNEL

Title	General Description	Responsibilities
Project Team Leader (Manager)	Reports to upper-level management. Has authority to direct response operations. Assumes total control over site activities.	o Prepares and organizes the background review of the situation, the Work Plan, the Project Health and Safety Plan, and the field team. o Obtains permission for site access and coordinates activities with appropriate officials. o Ensures that the Work Plan is completed and on schedule. o Briefs the field teams on their specific assignments. o Uses the Project Health and Safety Officer to ensure that safety and health requirements are met. o Prepares the final report and support files on the response activities. o Serves as the liaison with public officials.
Project Health and Safety Officer	Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety.	o Periodically inspects protective clothing and equipment. o Ensures that protective clothing and equipment are properly stored and maintained. o Controls entry and exit at the Access Control Points. o Confirms each team member's suitability for work based on a physician's recommendation. o Monitors the work parties for signs of stress, such as cold exposure, heat stress, and fatigue. o Implements the health and safety plan. o Conducts periodic inspections to determine if the Project Health and Safety Plan is being followed. o Enforces the "buddy" system. o Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department. o Notifies, when necessary, local public emergency officials. o Coordinates emergency medical care. o Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on site. o Controls the decontamination of all equipment, personnel, and samples from the contaminated areas. o Assures proper disposal of contaminated clothing and materials. o Ensures that all required equipment is available. o Advises medical personnel of potential exposures and consequences. o Notifies emergency response personnel by telephone or radio in the event of an emergency.
Field Team Leader	Responsible for field team operations and safety.	o Manages field operations. o Executes the work plan and schedule. o Enforces safety procedures. o Coordinates with the Project Health and Safety Officer in determining protection level. o Enforces site control. o Documents field activities and sample collection. o Serves as a liaison with public officials.
Work Team	Drillers, samplers. The work party must consist of at least two people.	o Safely completes the on-site tasks required to fulfill the work plan. o Complies with project health and safety plan. o Notifies Project Health and Safety Officer or supervisor of suspected unsafe conditions.

CHAPTER 4

TRAINING AND MEDICAL MONITORING

The ES employees that will be involved in site remediation activities are enrolled in a medical surveillance program. This program requires the employees to receive a baseline physical and yearly check-up exams. The tests performed during the annual exam are listed in Appendix B. No additional medical monitoring is deemed necessary for performance of remediation activities described in this plan. In the event that an employee is exposed to adverse levels of contaminants during site work, the employee will be examined to evaluate and treat potential health problems resulting from the exposure.

ES employees involved in remediation work have received 40 hours of health and safety training meeting the requirements of 29 CFR 1910.120 paragraph e. ES employees who may need to wear respirators during site activities will receive instructions, demonstration and practice on how the respirator should be worn, how to adjust it, and how to determine if the respirator fits properly (29 CFR 1910.134). Health and safety personnel working at the site will be familiar with the operation, calibration, and limitations of all field monitoring equipment.

The on-site field team will have the following health and safety equipment readily available:

Copy of the Health and Safety Plan
First aid kit
Eye wash bottle
Duct tape
Paper towels
Fire blanket

Plastic garbage bags

A list of emergency contacts

Combustible gas indicator

Photovac Tip 1

Sensidyne gas pump with Benzene colorimetric tubes

CHAPTER 5

HEALTH AND SAFETY RISK ANALYSIS

Chemical and construction related hazards will exist at the 1650 65th Street property at various times during remediation activity.

CHEMICAL HAZARDS

The chemical compounds encountered on site to date are gasoline, gasoline related compounds such as toluene and xylene, lead and minor amounts of diesel and waste oil. Benzene, a component of gasoline, and ethylene dibromide, a leaded gasoline additive, have not been detected on site but may be encountered during site work. Hazards associated with presence of these substances in the soil or groundwater consist of inhalation of vapors, skin contact, fires and explosions.

The potential for vapor inhalation or skin contact with the anticipated chemical substances will be present during soil excavation, soil sampling, drilling and groundwater sampling. These substances can have severe health effects. Gasoline constituents including benzene and EDB have demonstrated carcinogenic activity in certain animal species. Acute levels of gasoline can cause symptoms of headaches, nausea, and dizziness while inhalation of acute concentrations of gasoline fumes can cause central nervous system depression. Gasoline is also a defatting agent such that repeated or prolonged exposure can cause dermatitis; gasoline can also be absorbed into the body through the skin.

Safe working habits and adherence to the use of proper protective clothing and respiratory protection will minimize the chances of exposure to site chemicals. A Photovac Tip 1 and a Sensidyne gas pump equipped with benzene colorimetric tubes will be used to monitor organic vapors and to determine the proper level of respiratory protection.

Protective clothing which has low permeability to gasoline will be used, such as saranex or viton rather than tyvek for chemically resistant suits, and neoprene or polyvinyl chloride rather than butyl rubber or latex for boots and gloves.

Because gasoline is an extremely flammable compound having a flash point of -45 F, the potential for an explosion or fire will be greatest whenever heat or sparks are generated during work activities. Activities having the greatest fire and explosion hazard are excavation, drilling or split-spoon soil sampling. Excavation and drilling may release explosive levels of gasoline vapors which could be ignited by sparks and heat generated from drilling and excavation equipment. Hammering required in split spoon sampling could generate sparks. Monitoring of gases on-site with a combustible gas meter will identify potential explosive conditions and permit corrective actions to be taken. Non-sparking tools should be used when possible, for example, a brass split-spoon can be substituted for a stainless steel split-spoon whenever fumes of combustible nature are present. The local fire department may be able to offer alternative methods for safely performing tasks. No smoking will be allowed on site.

Table 5-1 lists the substances known and suspected to be on site along with their known concentrations, hazards, and characteristics.

CONSTRUCTION RELATED HAZARDS

Construction related hazards consist of accidents that can occur during operation of excavation and drilling equipment, an open excavation pit, and underground power lines. Potential for equipment and excavation related accidents will be reduced by observing standard safety procedures for construction, by wearing hard hats and steel toed boots, and by barricading the excavation perimeter. No one will enter the excavation pit if it is deeper than five feet unless it has been shored. The Underground Service Alert will be notified prior to onset of the excavation to identify any underground lines near the remediation area. Careful attention will be paid to the electrical line bounding the southern end of the proposed excavation area.

TABLE 5.1
POTENTIAL HEALTH AND SAFETY HAZARDS

Chemical	Maximum Known Concentration On Site	Hazard Potential [a,b]	Hazardous Concentrations PEL [c,d] (ppm)	TLV [b,e] (ppm)	IDLH [c,f] (ppm)	Odor Threshold (ppm)	Ionization Potential (eV)	Route of Exposure [b]	Recognition Qualities [b]	Symptoms of Exposure [b]
Benzene	N.D., soil	Suspected human carcinogen Highly flammable Moderate explosion hazard	1 50 ceiling	10	2,000	4.68	9.25	Inhalation Dermal Ingestion Eye contact	Colorless liquid with aromatic solventy odor	Eye, nose, respiratory irritation; giddiness; nausea; headache; staggered gait; fatigue; dermatitis; abdominal pain
Toluene	0.90 ppm, soil	Flammable Slight fire hazard Moderate explosion hazard	200 300 ceiling	100	2,000	0.17-40	8.82	Inhalation Dermal Ingestion Eye contact	Colorless liquid with benzene-like odor	Dizziness; headache; fatigue and weakness; confusion; tearing; nervousness; dermatitis
Xylene	23 ppm, soil	Flammable	100	100	10,000	0.47-200	8.56	Inhalation	Colorless liquid with aromatic odor (p-xylene is solid at <55 F)	Dizziness; drowsiness; excitement; incoordination; staggering gait; eye, nose, throat irritation; nausea vomiting; abdominal pain; dermatitis
Ethylene Dibromide	N.A.	Suspected human carcinogen Extreme fire hazard Moderate explosion hazard	20 30 ceiling		400	10-25	9.45	Dermal Inhalation Ingestion Eye contact	Colorless liquid or solid with mild sweet odor	Eye, respiratory irritant; dermatiti
Lead	36 mg/kg, soil	Moderate fire hazard Moderate explosion hazard						Dermal Inhalation Ingestion Eye contact	Blue-ish gray soft metal	
Tetra ethyl Lead as Lead	N.A.	Poisonous (B) Moderate fire hazard Moderate explosion hazard	0.075 mg/m3	0.1 mg/m3	40 mg/m3		11.1	Dermal Inhalation Ingestion Eye contact	Colorless liquid (red, orange or blue if dyed) with a slight musty odor	Anxiety tremor; hyperreflexia; spast bradycard; hypotension; hyperthem; nausea; hallucinations; convulsions; eye irritation
Gasoline	~6,350 mg/kg, soil ~33 mg/l, water	Highly flammable Explosive vapors		300		0.005-10	10.0-10.2	Inhalation Dermal	Clear aromatic volatile liquid	Dermatitis; pulmonary edema; hyperemia of eye conjunctiva
Diesel	~250 mg/kg, soil	Combustible Dangerous fire hazardous				0.01-0.25	10.0-10.2		Brown, slightly viscous liquid	

[a] Information summarized from Sax, "Dangerous Properties of Industrial Materials", Fifth Edition, 1979.
[b] "Threshold Limit Values and Biological Exposure Indices", 1986-1987.
[c] Information from "NIOSH Pocket Guide to Chemical Hazards", 1985.
[d] PEL: Permissible Exposure Limit. OSHA Limit as found in 29 CFR 1910, Subpart Z as of March 11, 1984.
[e] TLV: Threshold Limit Value, 8-hour time weighted average. From American Conference of Governmental Industrial Hygenists (ACGIH).
[f] IDLH: Immediately Dangerous to Life and Health, NIOSH.
[g] N.D.: Not detected.
[h] N.A.: Not analyzed.

CHAPTER 6

EMERGENCY PROCEDURES AND CONTACTS

EMERGENCY PROCEDURES

In the event that an emergency develops on-site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposures while on site.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below must be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water, preferably under a shower.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.

- If necessary, the victim should be transported to the nearest hospital or medical center. An ambulance should be called to transport the victim, if necessary.
- All chemical exposure incidents must be reported in writing.

Personal Injury

In case of personal injury at the site, the following procedures are to be followed:

- Field team members trained in first aid should administer treatment to an injured worker.
- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The site manger is responsible for making certain that an accident report form is completed. This form is to be submitted to the health and safety coordinator. Follow-up action should be taken to correct the situation that caused the accident.

Fire or Explosion

A fire or explosion hazard exists when a combustible atmosphere may be generated by operations such as excavation and drilling in areas contaminated with combustible materials. Hazard conditions shall be identified by the project manager. Under these conditions, the following precautions must be taken:

- Continuous monitoring of work areas with a combustible gas detector will be conducted if the potential for fire or explosion exists, as during welding operations, or when ignition sources (vehicles, motors, etc.) are present in the contaminated area.
- If monitoring indicates the existence of a combustible atmosphere (20 % LEL), the area will be immediately evacuated and emergency personnel will be contacted. Re-entry will not take place until it can be done safely.

- During operations involving a high hazard of fire or explosion, fire fighting and other emergency personnel will be on hand while the operation is taking place. The site safety officer shall establish liaison and coverage with fire-fighting and emergency facilities, and contact these facilities in case of emergency.
- Emergency personnel should be aware of potential emergencies involving fire and explosion.
- Smoking will not be allowed by any person on site during the remediation activity.

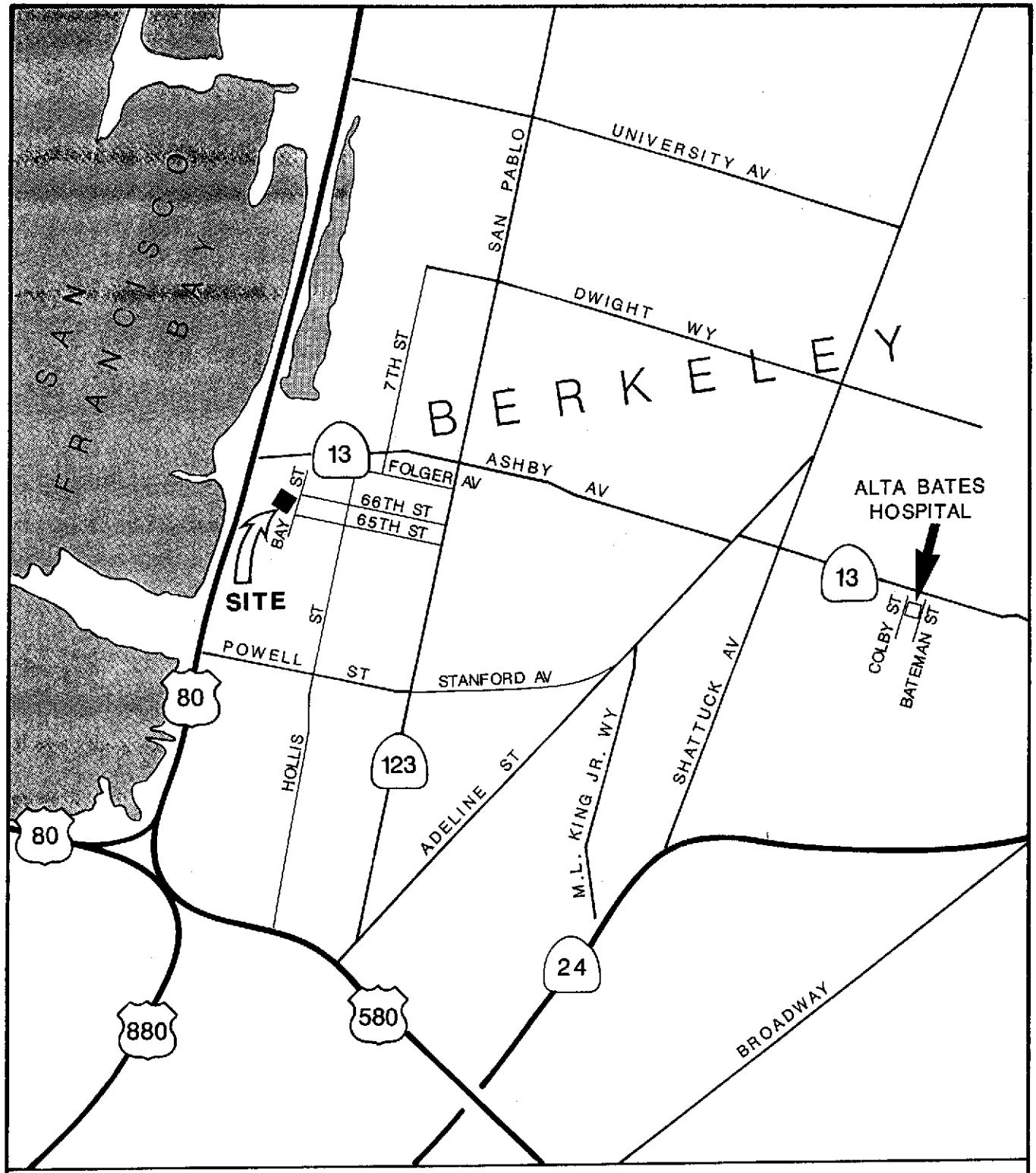
EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring outside assistance or support services, the appropriate contact(s) should be made from the list below. The closest telephones to the site are inside the 1650 65th Street warehouse. One telephone is located in the office immediately to the left of the roll-up door behind the remediation area. Telephones are also available in the office cluster inside and to the right of the 65th Street warehouse door. Figure 6-1 is a map showing the route to Alta Bates Hospital, the nearest emergency room facility. In the case of severe trauma, as defined by paramedics, an injured person may be transported to the highland General Hospital Emergency Room.

Emergency Assistance

For all fire, police and medical emergencies:	911
Emeryville Fire Department (non-emergency):	(415) 652-4575
Emeryville Police Department (non-emergency):	(415) 653-5455
Poison Control Center or San Francisco Poison Control Center at the San Francisco General Hospital	(415) 428-3248 (415) 476-6600
Chem-trec	(800) 424-9300

FIGURE 6-1



MAP TO HOSPITAL

ENGINEERING-SCIENCE

Emergency Room

Alta Bates Hospital Emergency Room (closest to site)
3001 Colby
Berkeley, California 94705 (415) 540-1303

Route: 65th Street to Hollis; left on Hollis; right on Folger; left on 7th; right on Ashby (Rt 13); right on Colby. SEE MAP PREVIOUS PAGE.

Highland General Hospital Emergency Room (for major trauma)
1411 E 31st Street
Oakland, California 94602 (415) 534-0967

ES Medical Monitoring Facility

Merritt Peralta Occupational Health Service
384 34th Street
Oakland, California (415) 652-3992

ES Contacts

Project Manager: Katherine Chesick (415) 548-7970
ES Berkeley, California

Office Health and Safety Representative: (415) 548-7970
Eric Storrs, ES Berkeley, California

Deputy Corporate Health and Safety Manager: (404) 325-0770
Edward Grunwald, ES Atlanta, Georgia

Corporate Health and Safety Manager: (818) 440-6000
Phil Storrs, ES Pasadena, California

Client Contact

Emeryville Bayfront Limited Partnership: (415) 834-1337
Ron V. Schwartz or Anthony Duckworth

Site Contact

United States Postal Service: Walter Butler (415) 655-9596 or (415) 655-9597

CHAPTER 7

LEVELS OF PERSONNEL PROTECTION REQUIRED FOR SITE ACTIVITIES

Personnel protective equipment, divided into respiratory and dermal protection categories, is described below. All remediation activities will initially require use of respiratory and dermal protection level D. However, the actual protection levels appropriate for the activity will depend on air monitoring measurements and field conditions. Contingencies for use of dermal protection level C and respiratory protection levels B and C will be provided for excavation, drilling and soil sampling activities. For groundwater sampling activities contingencies requiring use of dermal protection levels B or C and respiratory protection level C are planned.

RESPIRATORY PROTECTION

The appropriate level of respiratory protection for site activities will depend upon air monitoring measurements. Respiratory protection air monitoring will be done for benzene, ethylene dibromide, and organic vapors. Selection of respiratory protection will be based on the following tables. In the event that the three monitoring systems indicate the need for different levels of respiratory protection, the most conservative protection level will be used.

BENZENE

Airborne Concentration of Benzene	Respiratory Protection
≤1 ppm	No protection needed
>1 ppm to ≤50 ppm	Full facepiece respirator with organic vapor cartridges
	Full facepiece gas mask with chin style canister
>50 ppm to ≤100 ppm	Full facepiece powered air purifying respiratory with organic vapor canister
>100 ppm to ≤1,000 ppm	Supplied air respirator with full facepiece in positive pressure mode
>1,000 ppm or unknown concentration	Self-contained breathing apparatus with full face piece in positive pressure mode
	Full facepiece positive pressure supplied-air respirator with auxiliary self-contained air supply
Escape	Any organic vapor gas mask
	Any self-contained breathing apparatus with full facepiece

ETHYLENE DIBROMIDE

Airborne Concentration of Ethylene Dibromide	Respiratory Protection
Background levels	Level D
0 ppm to 20 ppm	Level D
20 ppm to 160 ppm	Level C
160 ppm and above	Level B

TOTAL ORGANIC VAPORS

Airborne Concentration of Total Organic Vapors	Respiratory Protection
Background levels	Level D
0 ppm to 100 ppm (lowest TLV listed in Table 5-1, excluding benzene and ethylene dibromide)	Level D
100 ppm to 800 ppm (40 percent of the lowest IDLH listed in Table 5-1, excluding benzene and ethylene dibromide)	Level C
800 ppm and above	Level B

Respiratory Protection Levels

Level D Operations

- No respiratory protection

Level C Operations

- Full-face air purifying respirator equipped with organic vapor canister or cartridges (NIOSH approved)

Level B Operations

This level of respiratory protection is required for atmospheres with concentrations of known substances greater than protective factors associated with full-face air purifying respirators, concentrations of known substances exceeding 40 % of the substance IDLH level, or for atmospheres containing less than 19.5 percent oxygen.

- Pressure-demand full-face piece, self contained breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA (NIOSH approved)

DERMAL PROTECTION

The level of dermal protection required depends upon the nature of the site activities. Selection of dermal protection shall be made according to need, based on the following information:

Dermal Protection Levels

Level D Operations

This level of protective clothing will be worn where work functions preclude potential for splashes or immersion.

Excavation and Drilling Activities; Soil Sampling

- Hard Hat
- Safety glasses or goggles
- Neoprene Rubber Boots, steel toe and shank
- Coveralls
- Neoprene work gloves

Ground-water Sampling

- Safety glasses or goggles
- Neoprene Rubber Boots
- Coveralls
- Neoprene work gloves

Level C Operations

This level of protective clothing will be worn where liquid splashes or other direct contact will not adversely affect or be absorbed through any exposed skin.

Excavation and Drilling Activities; Soil Sampling

- Hard Hat
- Safety glasses or goggles if a full face respirator is not required.
- Neoprene Rubber Boots, steel toe and shank
- Coveralls
- Saranex or tyvex coated with saranex suit (over coveralls)
- Neoprene gloves
- Inner gloves

Ground-water Sampling

- Safety glasses or goggles if a full face respirator is not required
- Neoprene Rubber Boots
- Coveralls
- Saranex or tyvex coated with saranex suit (over coveralls)
- Neoprene Gloves
- Inner gloves

Level B Operations

This level of protective clothing will be worn when liquid splashes or other direct contact will adversely affect or be absorbed through exposed skin; when it is highly unlikely that small areas of the head or neck left exposed by this level of clothing will be contacted by splashes of extremely hazardous substances; and when types and concentrations of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body.

Excavation and Drilling Activities; Soil Sampling

- Hard hat
- Safety glasses or goggles if a full face respirator is not required
- Neoprene Rubber Boots, steel toe and shank
- Coveralls
- Hooded Saranex or tyvek coated with saranex suit (over coverall)
- Neoprene Gloves
- Inner gloves

Groundwater Sampling

- Safety glasses or goggles if a full face respirator is not required
- Neoprene Rubber Boots
- Coveralls
- Hooded Saranex or tyvek coated with saranex suit (over coveralls)
- Neoprene Gloves
- Inner gloves

All hard hats, safety eye wear, and foot wear must meet applicable OSHA standards. These requirements can be found in OSHA General Industry Standards, 24 CFR 1910. The manufacturer should specify if their product meets this criteria.

Note: Latex gloves are relatively permeable to leaded and unleaded gasolines. These gloves can only be used as inner gloves and not the sole source of hand protection.

CHAPTER 8

AIR MONITORING PROCEDURES

Air monitoring will be used to identify and quantify airborne levels of hazardous substances.

ORGANIC VAPORS

General monitoring for organic vapors will be conducted using Photovac TIP 1 with a 10.6 ev lamp. The photovac should be calibrated for ethylene dibromide or toluene prior to use according to the manufacturers specifications. Specific air monitoring will be done for benzene and ethylene dibromide (EDB) because of their high health hazards and low PEL compared to other chemicals likely to be present on site. Benzene and EDB monitoring will be performed using a sensidyne colorimetric gas detector pump with benzene and EDB tubes. All respiratory protection air monitoring will be done in the breathing zone during excavation, drilling and sampling activities.

EXPLOSIVE/COMBUSTIBLE GASES

Air monitoring for combustible gases/vapors will be conducted during excavation, drilling and split spoon sampling with a combustible gas meter. Guidelines have been established by the National Institute for Occupational Safety and Health (NIOSH) concerning the action levels to be utilized when working in a potentially explosive environment. Action levels are based on vapor explosive and flammability limits.

Lower Explosive Limit (LEL) - The LEL is the lowest concentration of a gas or vapor in air by volume that will explode when there is an ignition source. Lower Flammability Limit (LFL) - The LFL is the lowest

concentration in a gas, vapor or air by volume that will burn when there is an ignition source.

NIOSH guidelines on the use of the combustible gas indicator:

1. 10 percent LEL - limit all activities in area to those that do not generate sparks.

2. 20 percent LEL - limit all activities in area.

When readings exceed 20 percent LEL on the indicator all activities must cease to allow time for the combustible gases to vent.

Limitations: When a hot-wire type combustible gas indicator is used to test vapors of leaded gasoline, a combustion product of tetra-ethyl lead is deposited of the filament unit, reducing the catalytic activity of the filament. To circumvent this effect a special version of the standard instrument is available for gasoline testing. In these instruments, the voltage is boosted across the detector to maintain a sufficiently high filament temperature to prevent contamination.

In any atmosphere where there is a likelihood of a chemical fire, there is the risk of creating toxic vapors in the fire or of asphyxiation caused by reduction of the oxygen content.

Contaminant concentrations in the ambient air, in excess of the Lower Flammability Limit are considered to be Immediately Dangerous to Life and Health (IDLH). At or above the LFL, the use of respirators is limited to those devices that provide the maximum protection, such as a positive pressure self-contained breathing apparatus (SCBA).

Work on these sites will be restricted to vapor concentrations below the Lower Flammability Limit.

Displacement of Combustible Gases

If explosive/combustible concentrations of gases are encountered during any activity, work shall cease to allow time for vapors to disperse. If concentrations of gases in a well/bore-hole are not diminshed after allowing adequate time to vent, then the following steps should be taken.

1. Obtain an air compressor (minimum 1.5 horsepower). The hose on the pressure side of the compressor should have a length equivalent to the depth of the well/bore-hole.

2. Place hose into the well/bore-hole until it reaches bottom.

3. Start air compressor and "run" it for 15 minutes. (The air compressor should be placed a safe distance from the well/bore-hole, or should be non-sparking).

4. Measure the percent LEL in the well/bore-hole. If explosive reading continues above 20% LEL repeat step 3. If level of combustible gases/vapor in the well are now below 20% LEL proceed with Step 5.

5. Monitor well/bore-hole for five minutes with combustible gas indicator; if readings remain below 20% LEL continue with drilling or split-spoon sampling activities.

6. Continue monitoring explosive gas concentrate placed a safe distance from the well/bore-hole, or should be non-sparking).

OXYGEN MONITORING

NIOSH requires the use of self-contained breathing apparatus when oxygen concentrations fall below 19.5%. An oxygen indicator should be used to monitor the atmospheric oxygen concentration during excavation or activities in which our circulation is poor.

Note: The combustible gas indicator is intended for use only in normal atmospheres, not ones that are oxygen enriched or deficient. Oxygen concentrations that are less than or greater than normal may cause erroneous readings.

All monitoring equipment used during these studies must be certified for operation in a Class I atmosphere. A Class I atmosphere consists of flammable vapors and gases, such as gasoline and hydrogen. The instrument's instruction manual contains information on the use of the instrument in an explosive atmosphere.

CHAPTER 9

SITE CONTROL MEASURES

A six foot high chain link fence and the building bordering the eastern property line protect the remediation area from unauthorized access. The access gate, located at the southeastern most corner of the property, will be unlocked only during United States Postal Service working hours. Should remediation work hours extend beyond those of the USPS, the field engineer will be responsible for securing the site before leaving at the end of the day.

Barricades will be set up during soil excavation to maintain a safe distance between the excavation and any USPS workers passing through the area.

During soil excavation, control boundaries delineating the exclusion zone (contaminated area) contamination reduction zone and the support zone (clean area) will be established if needed. Control boundaries will be identified by boundary tape. The location of the boundaries will be determined daily at the site dependent upon actual wind direction.

CHAPTER 10

DECONTAMINATION PROCEDURES

Activities at this site will be of short to moderate duration and exposure to these petro-chemicals should be minimal if proper precautions are followed. Simple and expedient decontamination procedures, appropriate to the site and work conditions will be followed.

Based on the work to be performed at the 1650 65th Street property, it may be necessary to establish a zone of exclusion. If this occurs, a decontamination pad will be established at the entrance/exit point to the exclusion zone. Workers entering this area must be equipped in the proper level of protection. Workers leaving the exclusion zone shall follow the appropriate decontamination procedures described below.

PERSONNEL DECONTAMINATION

Level D Operations

Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation of the drop reduces the probability of cross-contamination.

Equipment: various size containers
plastic liners
plastic drop cloths

Station 2: Safety Boot Wash

Thoroughly wash safety boots. Scrub with long-handle, soft-bristle scrub brush and copious amounts of detergent solution. Repeat as many times as necessary.

Equipment: container (30 gallons)
detergent solution
2 to 3 long-handle, soft-bristle scrub brushes

Station 3: Safety Boot Rinse

Rinse off detergent solution using copious amounts of water. Repeat as many times as needed.

Equipment: container (30 gallon), or
spray unit
water
2 to 3 long-handle, soft-bristle brushes

Station 4: Glove Removal

Scrub gloves with detergent solution.

Equipment: container (20 gallon)
detergent solution
2 to 3 long-handle, soft-bristly scrub brushes

Station 5: Glove Rinse

Rinse off detergent solution.

Equipment: container (30 gallons), or
spray unit
water
2 to 3 long-handle, soft-bristle scrub brushes

Station 6: Boot and glove Removal

Remove boots and gloves; and place in segregated plastic bags.

Equipment: plastic bags

Level C Operations

Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each item will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment: various size containers
plastic liners
plastic drop cloths

Station 2: Glove Wash

Scrub outer gloves with decontaminant solution or detergent/water.

Equipment: container (20 gallons)
decontaminant solution, or
detergent water
2 to 3 long-handle, soft-bristle scrub brushes

Station 3: Glove Rinse

Rinse off decontaminant solution from Station 2 using copious amounts of water. Repeat as many times as necessary.

Equipment: container (30 gallons), or
spray unit
water
2 to 3 long-handle, soft-bristle scrub brushes

Station 4: Outer Glove Removal

Remove outer gloves and deposit in container with plastic liner.

Equipment: container (20 gallons)
plastic liners

Station 5: Suit/Safety Boot Wash

Thoroughly wash saranex suit and safety boots. Scrub with long-handle, soft-bristle scrub brush and copious amounts of decontaminant solution or detergent/water. Repeat as many times as necessary.

Equipment: container (30 gallons)
decontaminant solution, or
detergent/water
2 to 3 long-handle, soft-bristle scrub brushes

Station 6: Suit/Safety Boot Rinse

Rinse off decontaminant solution or detergent/water using copious amounts of water. Repeat as many times as necessary.

Equipment: container (30 gallons), or
spray unit
water
2 to 3 long-handle, soft-bristle scrub brushes

Station 7: Canister or Mask Change

If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves donned, and joints taped. Worker returns to duty.

Equipment: canister (or mask)
tape
boot covers
gloves

Station 8: Safety Boot Removal

Remove safety boots and deposit in container with plastic liner.

Equipment: container (30 gallons)
plastic liners
bench or stool

Station 9: Suit Removal

With assistance of helper, remove Saranex suit. Deposit in container with plastic liner.

Equipment: container (30 gallons)
bench or stool
plastic liner

Station 10: Inner Glove Wash

Wash inner gloves with decontaminant solution of detergent/wash that will not harm skin. Repeat as many times as necessary.

Equipment: decontaminant solution or detergent/water
basin or bucket

Station 11: Inner Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary.

Equipment: water basin or bucket
small table

Station 12: Facepiece Removal

Remove facepiece. Avoid touching face with gloves. Deposit facepiece in a clean plastic bag.

Equipment: plastic bags

Station 13: Inner Glove Removal

Remove inner gloves and deposit in container wit;h plastic liner.

Equipment: container (20 gallons)
plastic liners

Station 14: Field Wash

Wash hands and face.

Equipment: water
soap
tables
wash basins/buckets

Station 15: Redress

Put on clean clothes.

Equipment: tables
chairs
clothes

Equipment Needs

Long-handle, soft bristle scrub brushes

Alcanox mixed with water

Containers (20 and 30 gallons)

Wash basin

Tables

Chairs

EQUIPMENT DECONTAMINATION

Excavation and drilling equipment will be steam cleaned before excavation or drilling work is begun. Excavation equipment will also be decontaminated between use in different excavations. Downhole drilling equipment will be decontaminated prior to each boring. The decontamination procedure of choice is as follows:

1. Steam clean all down-hole or in-pit equipment to remove gross contamination.
2. Wash equipment contacting undisturbed soils in a detergent (Alcanox) water solution.
3. Rinse the equipment with tap water followed by acetone and distilled water rinses.

The equipment should then be air-dried in a clean section of the decontamination area.

Excavation equipment and drill rigs will be steam cleaned upon the completion of the final excavation or boring. A work sequence hierarchy (from less likely to more likely contaminated locations) will be imposed to reduce the potential of cross-contamination.

All soil and ground-water sampling equipment will be decontaminated in compliance with the methodology established above for in-pit or down-hole excavation and drilling equipment. All wash solutions will be directed into the sanitary sewer as allowed by the City of Emeryville Public Works Department.

Excavation spoils will be hauled off site by Riedel Environmental Services, Inc., the excavation and disposal contractor. Contaminated

drill cuttings will be drummed until appropriate removal based on soil cutting analysis can be arranged. The level of respiratory protection needed to carry out this task shall be determined by air monitoring of the soils and cuttings. Dermal protection shall consist of neoprene outer gloves, inner gloves, neoprene rubber boots, and a saranex suit.

CHAPTER 11

PROJECT HEALTH AND SAFTEY PLAN ACCEPTANCE FORM

I have read and agree to abide by the contents of the

Health and Safety Plan
for
Soil and Groundwater Remediation
of the
Southeastern Corner of
1650 65th Street
Emeryville, California

_____
Signed

_____
Dated

Return to: Eric Storrs
Engineering-Science, Berkeley
Office Health and Safety Representative

ES ENGINEERING-SCIENCE COMPANIES

ACCIDENT REPORT FORM

Project: _____

EMPLOYER

1. Name: _____

2. Mail Address: _____
(No. and Street) (City or Town) (State)

3. Location, if different from mail address: _____

_____

INJURED OR ILL EMPLOYEE

4. Name: _____ Social Security Number: _____
(First) (Middle) (Last)

5. Home Address: _____
(No. and Street) (City or Town) (State)

6. Age: _____ 7. Sex: Male ( ) Female ( )

8. Occupation: _____
(Specific job title, not the specific activity employee was performing at time of injury)

9. Department: _____
(Enter name of department in which injured persons is employed, even though they may have been temporarily working in another department at the time of injury)

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident of exposure: _____
(No. and Street) (City or Town) (State)

11. Was place of accident or exposure on employer's premises? Yes ( ) No ( )

12. What was the employee doing when injured? _____
(Be specific - Was employee

_____
using tools or equipment or handling material?)

_____

13. How did the accident occur? _____
(Describe fully the events that resulted in the

_____
injury or occupational illness. Tell what happened and how. Name objects

_____
and substances involved. Give details on all factors that led to accident.

_____
Use separate sheet for additional space.)

14. Time of accident: _____

15. ES WITNESS TO ACCIDENT _____
(Name) (Affiliation) (Phone No.)

_____
(Name) (Affiliation) (Phone No.)

_____
(Name) (Affiliation) (Phone No.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

16. Describe injury or illness in detail; indicate part of body affected:

_____

_____

17. Name the object or substance that directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.).

_____

_____

18. Date of injury or initial diagnosis of occupational illness _____
(Date)

19. Did the accident result in employee fatality? Yes ( ) No ( )

OTHER

20. Name and address of physician _____

_____

21. If hospitalized, name and address of hospital _____

_____

Date of report _____ Prepared by _____

Official position _____

ES ENGINEERING-SCIENCE COMPANIES

AIR PURIFYING RESPIRATOR LOG

SITE: _____

LOCATION: _____

DATES OF INVESTIGATION: _____

User	Date of Use	Cleaned and Inspected Before Use (Initials)	Cartridges Changed Before Use (Yes, No, N/A)	Total Hours on Cartridge

_____

Project Health and Safety Officer or ES Project Manager — Date

Return to Office Health and Safety Representative at the completion of field activities.

ENGINEERING-SCIENCE COMPANIES

SCBA RESPIRATOR LOG

SITE: _____

LOCATION: _____

DATES OF INVESTIGATION: _____

User	Date of Use	SCBA #	Satisfactory Checkout (Yes/No - Initials)	Date Cleaned

SCBA Performance Comments:

_____

Project Health and Safety Officer or ES Project Manager — Date

Return to Office Health and Safety Representative at the completion of field activities.

APPENDIX B

ANNUAL MEDICAL EXAMINATION

Each ES employee's annual medical examination will involve compiling an interval medical history and undergoing a thorough medical examination as outlined below.

INTERVAL MEDICAL HISTORY

Interval medical history will be performed focusing on changes in health status, illnesses, and possible work-related symptoms. The worker will provide the examining physician with information about the worker's interval exposure history, including exposure monitoring results (if performed).

PHYSICAL EXAMINATION

- Height, weight, temperature, pulse, respiration, and blood pressure.
- Head, nose, throat.
- Vision tests that measure refraction, depth perception, and color vision.
- Chest (heart and lungs).
- Peripheral vascular system.
- Abdomen and rectum (including hernia exam).
- Spine and other components of the musculoskeletal system.
- Genitourinary system.
- Skin.
- Nervous system.
- Blood test.
- Urine test.

ADDITIONAL TESTS

Additional medical testing may be performed, depending on available exposure information, medical history, and examination results. Testing should be specific for the possible medical effects of the worker's exposure. Multiple testing for a large range of potential exposures is

not always useful; it may involve invasive procedures (e.g., tissue biopsy), be expensive, and may produce false-positive results.

Pulmonary Function

Pulmonary function test should be administered if the individual uses a respirator, has been or may be exposed to irritating or toxic substances, or if the individual has breathing difficulties, especially when wearing a respirator.

Audiometric Tests

Annual retest are required for personnel subject to high noise exposures (an 8-hour, time-weighted average of 85 dBA or more), those required to wear hearing protection, or as otherwise indicated.

Electrocardiogram

An electrocardiogram (EKG) will be performed annually for those over 40 and every three years for all others. The EKG will be the standard 12- lead resting type.

Chest X-Rays

Chest x-rays will be performed when clinically indicated or every three years. The x-ray should be at least 14 by 17-inch P-A (posterior/anterior).

Blood and Urine Test

Blood and urine test frequently performed by occupational physicians include:

Blood Test

- Complete blood count with differential and platelet evaluation
- White cell count
- Red blood cell count
- Hemoglobin
- Hematocrit
- Reticulocyte count
- Total protein
- Albumin
- Globulin

- Total bilirubin
- Alkaline phosphatase
- Gamma glutamyl transpeptidase (GGTP)
- Lactic dehydrogenase (LDH)
- Serum glutumigoxaloacetic transaminase (SGOT)
- Serum glutamic-pyruvic transaminase (SGPT)
- Blood urea nitrogen (BUN)
- Creatinine
- Uric Acid

Urinalysis

- Color
- Specific gravity
- pH
- Qualitative glucose
- Protein
- Bile
- Acetone
- Microscopic examination of centrifuged sediments