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**HEALTH AND SAFETY PLAN
(FINAL)
SUPPLEMENTARY SOIL INVESTIGATION
FOR ENGINEERING EVALUATION/COST ANALYSIS
SITE 7C FORMER LOCATION OF BUILDING 547**

**NAVAL AIR STATION, ALAMEDA
ALAMEDA, CALIFORNIA
May 22, 1996**

Prepared By:

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**ENGINEERING SERVICES FOR VARIOUS ENVIRONMENTAL
ENGINEERING PROJECTS AT NAVAL AIR STATION
ALAMEDA, CALIFORNIA**

Contract No. N62474-94-D-7535

Contract Task Order 0001

Navy Remedial Project Manager: George Kikugawa

Moju Project Manager: Akali Igbene

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) is intended to address safety and health hazards/procedures to be observed during subsurface investigation activities at Naval Air Station Alameda Site 7C (see Figure 1-1). This investigation will be undertaken jointly by Moju Environmental Technologies (Moju) and EARTH TECH, supported by various subcontractor organizations. EARTH TECH will have primary responsibility for on-site safety and health related to during investigation activities, as well as responsibility for preparation of this HASP.

1.1 GENERAL

The provisions of this Health and Safety Plan are mandatory for all EARTH TECH, Moju and subcontractor onsite personnel engaged in remedial investigation activities at NAS Alameda - Site 7C. Tasks addressed in the plan include, but are not limited to:

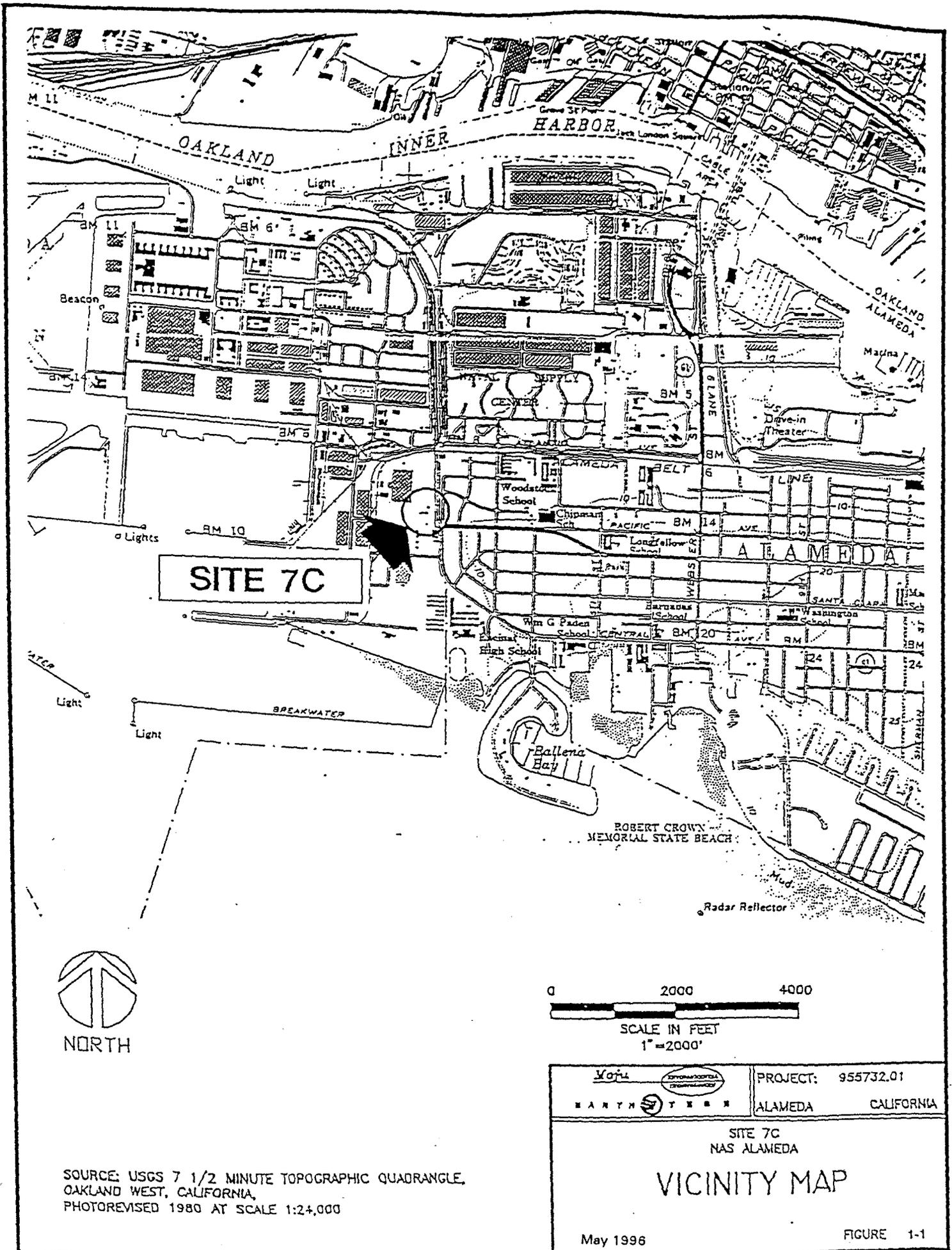
1. Initial work location reconnaissance, including boring location and utility clearance
2. Drilling using conventional hollow-stem auger drilling equipment for soil sample collection
3. Subsurface investigation using trenching equipment.

Operational changes to this plan that could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the cognizant EARTH TECH Project Manager and the EARTH TECH Health and Safety Section.

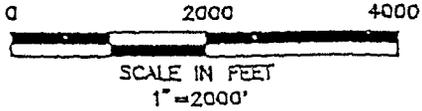
In the event of a conflict between this plan and federal, state, or local regulations, the more stringent will apply.

1.2 POLICY STATEMENT

It is the policy of EARTH TECH to provide a safe and healthful work environment for all its employees. EARTH TECH considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At EARTH TECH,



NORTH



SOURCE: USGS 7 1/2 MINUTE TOPOGRAPHIC QUADRANGLE, OAKLAND WEST, CALIFORNIA, PHOTOREVISED 1980 AT SCALE 1:24,000

	PROJECT: 955732.01 ALAMEDA CALIFORNIA
SITE 7C NAS ALAMEDA VICINITY MAP	
May 1996	FIGURE 1-1

we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Health and Safety Plan presents procedures to be employed during all soil sampling and removal activities. The practices and procedures presented in this Health and Safety Plan are mandatory for all EARTH TECH employees and subcontractors while engaged such operations at any EARTH TECH-managed site. EARTH TECH also requires that all visitors to work sites abide by these procedures.

1.3 REFERENCES

This Health and Safety Plan complies with applicable U.S. Department of Labor Occupational Safety and Health Administration (OSHA), California Occupational Safety and Health Administration (CAL/OSHA), and U.S. Environmental Protection Agency (EPA) regulations. This plan follows the guidelines established by the regulatory agencies in the following documents.

- *Standard Operating Safety Guides*, U.S. EPA, June 1992
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH 85-115, 1985
- Title 8 of the California Code of Regulations, General Industry Safety Orders and the Construction Safety Orders (CAL/OSHA)
- Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (OSHA), with special attention to Section 1910.120, Hazardous Waste Operations and Emergency Response
- Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (OSHA), with special attention to Section 1926.65, Hazardous Waste Operations and Emergency Response
- National Oil and Hazardous Substances Contingency Plan

2.0 HEALTH AND SAFETY RESPONSIBILITIES

Field investigation and subsequent clean-up work entails field operations involving EARTH TECH, Moju and/or subcontractor personnel. The following sections contain the lines of authority and communication which will be established for all work sites.

2.1 ALL PERSONNEL

Each person is responsible for his/her own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to his/her supervisor and/or the Site Supervisor. All personnel are responsible for continuous adherence to these health and safety procedures during the performance of their work. No person may work in a manner that conflicts with the letter or intent of safety and environmental precautions expressed in these procedures. After due warnings, EARTH TECH will dismiss from the site any person who violates safety procedures. EARTH TECH employees are subject to progressive discipline and may be terminated for blatant or continued violations. All onsite personnel will be trained in accordance with 8 CCR §5192 (29 CFR 1910.120) and this document.

2.2 PROJECT MANAGER (Mr. Akali Igbene, Moju Environmental Technologies)

The Project Manager has overall management authority for this operation, and is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The Project Manager will confer with the designated Health and Safety Professional on all matters affecting health and safety. Other responsibilities include:

- Reading and becoming familiar with this plan.
- Requiring a prompt and thorough investigation of all accidents.
- Scheduling an Accident Review Board within 10 days of an injury involving a workers' compensation claim or OSHA-recordability, or any accident with more than a \$500 loss.

2.3 TASK MANAGER (Mr. Marc Ritson, P.E., Moju Environmental Technologies)

The Task Manager is responsible for coordinating with the client, discipline managers, and subcontractors to complete the activities associated with this project to the satisfaction of the client and in accordance with requirements set forth in this plan. The Task Manager will confer with the cognizant Health and Safety Professional on all matters affecting health and safety. Other responsibilities include:

- Reading and becoming familiar with this plan
- Conducting periodic safety reviews of the project site and project documentation
- Maintaining compliance with the Health and Safety Plan and other safety regulations
- Approving in writing each addendum to the Health and Safety Plan.
- Ensuring that site personnel assigned have received the proper training and medical clearance prior to entering the site
- Maintaining the presence of a qualified first-aid provider on site
- Discussing potential health and safety hazards with the designated Health and Safety Professional and the Project Manager.
- Implementing changes as directed by the Project Manager and approved Health and Safety Plan addenda.
- To establish communication with NOSC/NOSCDR, the LEPC or other potential emergency responders.

2.4 SITE SUPERVISOR (Mr. Mark Milani, P.E., EARTH TECH)

The Site Supervisor manages all EARTH TECH, Moju and subcontractor activities at the work site and is responsible for field implementation of the Health and Safety Plan. This includes communicating site requirements to all personnel, observing that field supervisors and subcontractors enforce all provisions of the plan, working with the Site Safety Officer to implement all elements of this Health and Safety Plan, and consulting with the Health and Safety Professional regarding changes to the Health and Safety Plan. Other responsibilities include:

- Reading and becoming familiar with this plan
- Enforcing the Health and Safety Plan and other safety regulations
- Stopping work, as required, to maintain personal and environmental health and safety
- Determining evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site
- Establishing Exclusion, Contamination Reduction, and Support zones
- Presenting tailgate safety meetings and maintaining attendance logs and records
- Implementing the respiratory protection program
- Maintaining decontamination procedures which meet established criteria
- Discussing potential health and safety hazards with the designated Health and Safety Professional and the Project Manager
- Implementing changes as directed by the Project Manager and in approved Health and Safety Plan addenda.

2.5 HEALTH AND SAFETY PROFESSIONAL (Mr. Ronald Partilla, CSP, EARTH TECH)

The designated Health and Safety Professional is responsible for overseeing all aspects of the site safety program, and preparing any site-specific safety guidance documents or addenda to this plan. The designated Health and Safety Professional reports to the EARTH TECH Health and Safety Manager, and is independent of the individual Project Manager. The Health and Safety Professional is the contact for regulatory agencies on matters of safety and health. Other responsibilities of the Health and Safety Professional include:

- General health and safety program administration
- Conducting project health and safety audits
- Developing site-specific employee/community emergency response plans, as required, based on expected hazards
- Determining the level of personnel protection required

- Updating equipment or procedures based on information obtained during site operations
- Establishing air monitoring parameters based on expected contaminants
- Implementing employee exposure assessment notification.

2.6 SITE SAFETY OFFICER (Mr. Roger Lampert, EARTH TECH)

The Site Supervisor or designated alternate will serve as the Site Safety Officer (SSO) at the work site. The SSO is responsible for performing the routine duties for health and safety, with the assistance of the designated Health and Safety Professional. The SSO will administer this Health and Safety Plan and the applicable site-specific safety guidance document. These responsibilities include:

- Performing regular and frequent site inspections to find hazards and observe employees at work
- Stopping work when necessary to prevent injury or illness and ensure personal and environmental health and safety
- Investigating all injuries and illnesses
- Developing and implementing corrective action plans to eliminate or mitigate hazards
- Implementing air monitoring according to directives in this Health and Safety Plan
- Forwarding all employee exposure monitoring information to the Health and Safety Professional to enable the exposure notification.

2.7 SUBCONTRACTORS

Onsite subcontractors and their personnel are responsible for reading, understanding, and complying with all site requirements. Subcontractors are required to follow the guidelines established in this Health and Safety Plan, OSHA HAZWOPER regulations, CAL/OSHA regulations, and Construction Safety Orders, and should develop safety guidance specific to work functions which supplement this Health and Safety Plan for the subcontractor's personnel and at a minimum, shall develop a site-specific task-specific hazard analysis. This safety guidance will be submitted to the Health and Safety Professional for review and approval prior to start of on-site work activities.

Each subcontractor will designate a safety coordinator, with the authority and responsibility to implement health and safety requirements for the subcontractor's employees. The safety coordinator will also serve as the subcontractor's point of contact with the SSO concerning safety issues.

2.8 ONSITE PERSONNEL AND VISITORS

All personnel working for EARTH TECH, Moju and their subcontractors are required to read and acknowledge their understanding of this Health and Safety Plan. All visitors to contaminated areas of the project site must also read and acknowledge their understanding of this Health and Safety Plan. All personnel are expected to abide by the requirements of this Health and Safety Plan and cooperate with site supervision to ensure a safe and healthful work site. A log form showing visitors name, check-in and check-out time and reason for visit will be provided at the site. An example of the log form includes in Appendix A of this HASP. Site personnel are required to report immediately any of the following to the Site Supervisor:

- Accidents and injuries, no matter how minor
- Unexpected or uncontrolled releases of any hazardous substances
- Any symptoms of exposure to a hazardous substance
- Any unsafe or malfunctioning equipment
- Any changes in site conditions which may affect the health or safety of project personnel.

3.0 SCOPE OF WORK

3.1 SITE DESCRIPTION

Site 7C is located between 11th Street and Main Street about 1,000 feet south of the NAS Alameda East Gate. The site occupies about 2 acres and was utilized as the former on-base annex service station. The site contains several buildings including Building 547 (fuel islands), Building S547 (former car wash facility) and a small building housing the service attendant. Five USTs were reportedly operated at the facility. Three 12,000 gallon, fiberglass USTs were used to store fuel. The remaining two USTs included a 10,000 and 5,000 gallon tanks used to store waste oil.

The three fiberglass USTs were located in the northwest corner of the property; the location of the waste oil tanks is not known. The USTs were reportedly installed in 1971. The three fuel USTs and ancillary piping were removed as part of UST closure activities conducted in 1994. Soil spoils generated as part of the tank and piping removal operations are stockpiled at various locations across the site. The UST excavation has been backfilled, reportedly with clean import fill.

3.2 SCOPE OF WORK

The primary objective of this investigation is to collect additional soil samples that will be used in conjunction with analytical data generated previously by others so that estimate of the lateral and vertical extent of soil contamination can be prepared. The data will also be used to evaluate various remediation alternatives as part of an Engineering Evaluation and Cost Analysis (EE/CA) to support a non-time critical removal action.

The specific scope of work for this investigation will include the following elements:

- Site Reconnaissance and Utility Clearance will be performed to verify underground utilities and encumbrances (i.e. overhead utilities, trees, surface structures etc.). Broad areas of the site will be cleared to enable subsurface investigation. The presence of the two unknown waste oil tanks will be identified and areas not accessible to truck-mounted drilling equipment will be detailed during this task.
- Hollow-stem Auger Drilling will be performed at ten (10) locations to depths of 10 feet below ground surface (bgs) across the site. Since the exact locations of the borings has

not been established, the work zones have been developed to enable flexibility. Five (5) of the soil borings will be continuously sampled to the full depth of the boring. In the remaining five borings, three soil sample intervals will be utilized; sample intervals will be staggered between borings.

- Investigation Generated Wastes are anticipated to consist of soil cuttings generated from the drilling operations and trench spoils generated from excavation of soils in the vicinity of the subsurface utility lines. Drill cuttings will be placed in Department Transportation (DOT) approved 17H (open head style) drums.

Decontamination fluids will be generated as part of cleaning augers, drill bits, sampling equipment and other down-hole equipment. The decontamination fluids will be contained and stored in DOT approved drums. Drums will be labeled by content type and date of accumulation. Drums will be transferred to a designated waste accumulation area on the site.

- Site Restoration activities will include grouting of soil borings using the down-hole tremie method and backfilling of excavated trenches. Following grouting, the surface will be patched with ready mix concrete to match surrounding grade. Construction related debris will be removed from the site and work areas will be swept.

4.0 HEALTH AND SAFETY PROGRAMS

4.1 MEDICAL SCREENING AND HEALTH SURVEILLANCE

All personnel performing work activities inside any Exclusion Zone or Contamination Reduction Zone (see Section 9.2) shall conform with the following medical monitoring requirements.

4.1.1 Physical Examinations

All onsite personnel shall have completed a physical exam in accordance with the requirements of 8 CCR §5192 (f) (29 CFR 1910.120 [f]). The occupational medical physician will determine the content of physical exams.

The results of medical examinations are to be evaluated by a physician specializing in occupational medicine. The medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. The examining physician must document his evaluation/recommendations on an appropriate Health Status Report (HSR) or similar form of documentation. Restrictions of onsite activities may be required for personnel with certain medical conditions which could be aggravated by chemical exposure or physical demands at the site. Each employee is responsible for notifying the Health and Safety Professional of physical or medical restrictions. The Health and Safety Professional will then ensure that project management observes and enforces the restrictions.

A copy of each persons HSR will be made available for review following a request from the Health and Safety Professional. Employees who have not received a medical examination within 12 months (365 days) of their previous medical exam will:

- Be required to immediately obtain an appropriate medical exam and provide a copy of the HSR to the Health and Safety Professional for review prior to starting work on the project
- Be removed from the project until the appropriate medical exam has been performed and a copy of the associated HSR has been provided to the Health and Safety Professional.

Project management or other personnel who are not routinely exposed to site hazards may be waived from the annual medical examination requirement by the Health and Safety Professional provided that they meet the following:

- Medical examinations are received on a frequency determined by the examining physician, but not to exceed every two (2) years
- Site activities performed by the exempted personnel do not entail exposure to contaminants in excess of the permissible exposure limits or other exposure limitations as outlined in this Health and Safety Plan.

4.1.2 Medical Assistance

Telephone numbers and locations for local fire department, hospitals, ambulance service, and other emergency services shall be maintained at the site by the SSO (see Table 11-1).

Information regarding non-emergency medical treatment for onsite injury, onsite illness, or onsite exposure to chemical contaminants will be provided to the hospital by the Site Supervisor.

4.1.3 First Aid

A first aid kit will be available at each work location for use by qualified site personnel. First aid kits will contain only items which have been approved by a physician in writing. An inventory list, signed by the consulting physician, will be included with each first aid kit. At least one person certified in first aid shall be present at the work site at all times. On-site emergency medical assistant is available on Base at the medical facilities, personnel with CPR training and all CPR trained individuals in California also have training in bloodborne pathogens.

4.2 NOTIFICATION AND RECORDKEEPING

Any injury or illness will be immediately reported to the SSO, who will implement any immediate corrective actions and report the incident to the Site Supervisor. Upon learning of an injury or illness, the Site Supervisor shall immediately perform all required notifications, including:

- Project Manager.
- Health and Safety Professional.

CAL/OSHA requires notification within 24 hours, and preferably during the same work shift, in the event of a fatality or severe injury requiring hospitalization. The Health and Safety Professional will make such notifications to OSHA, and therefore must receive the information in time to make the notification without penalty. The Health and Safety Professional will also provide notification to the ROICC within 24 hours of any severe accident.

The Site Supervisor shall record in the site daily activity log who is on site and the personal protective equipment (PPE) used by each person on site.

4.3 GENERAL HEALTH AND SAFETY TRAINING

All field personnel and visitors involved with site activities will have completed the necessary health and safety training courses prior to entering and controlled areas of the site (Exclusion or Contamination Reduction zones) and have participated in at least 24 hours of hazardous waste work activities under the direction of a qualified supervisor. To comply with the provisions established in 8 CCR §5192 (e)(2) and (e)(3) [29 CFR 1910.120 (e)(2) and (e)(3)] (40-hour or 24-hour initial training), the basic training topics will include, but are not limited to:

- Hazard communication
- Flammable atmospheres and ignition controls
- Toxic chemical recognition
- Exposure guidelines
- Protective clothing
- Respiratory protection
- Hearing conservation
- Heat stress
- Decontamination
- Prevention of slip, trip, and fall hazards
- Safe lifting techniques and safe work practices.

All personnel will receive annual refresher training in accordance with 8 CCR §5192 (e)(8) [29 CFR 1910.120 (e)(8)]. Work supervisors will receive an additional required 8 hours of training which addresses supervisor responsibilities and obligations in maintaining an effective health and safety program in accordance with 8 CCR §5192 (e)(4) [29 CFR 1910.120 (e)(4)].

4.4 SITE-SPECIFIC TRAINING

All project personnel will be trained about potential hazards at the site, and exposure prevention or control measures. Field personnel will be:

- Instructed on the contents of applicable portions of this plan
- Made aware of task-specific physical hazards and other hazards which may be encountered during site work (see Section 5.1).
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure, and heat stress
- Made aware of fire prevention measures, fire extinguishment methods, and evacuation procedures.

The site specific training will be performed at the start of the project and on a daily basis thereafter. The training will be conducted by the SSO or his designated representative before daily work activities begin, and shall be documented on the Tailgate Safety Briefing Sign-in Log. A copy of the form is found in Appendix A.

5.0 HAZARD ASSESSMENT

5.1 POTENTIAL HAZARDS

Remedial investigation activities at NAS Alameda - Site 7C present a wide range of potential chemical and physical hazards to which personnel may be exposed. These are due both to the hazards presented by the work location itself (e.g., presence of contamination), and those which may be encountered during the completion of the required scope of work. The potential hazards include, but are not limited to:

1. Exposure to gasoline, diesel, JP-5, waste motor oil, benzene, toluene, ethyl benzene, and xylene (BTEX), polynuclear aromatic hydrocarbons (PAHs), and lead (organic) during investigation activities
2. Cleaning and decontamination of equipment
3. Hazardous noise produced during drilling activities
4. Explosion and fire risk produced during drilling activities due to the presence of volatile organic compounds
5. Heat/Cold stress (depending heavily on time of year), personal protective equipment, and site specific work tasks/activities
6. Hazards involving underground electrical, gas or other utilities, or overhead electrical lines, may be encountered
7. Slippery and unstable surfaces, steep grades and uneven terrain encountered during excavation/backfill activities
8. Snapping cables, slings, and ropes during drilling operations
9. Energized electrical equipment malfunctions in onsite support equipment and machinery

5.2 TASK HAZARD ANALYSIS

5.2.1 Reconnaissance Activities

Reconnaissance activities include initial site walks, staking or other marking activities, geophysical clearance operations, and setup of site security and control measures. During these activities the work site will be walked and work locations identified. Excavation boundaries will be marked with stakes.

Hazards which may be encountered include heat stress and sunburn; although the work area has been used for parking there is still the potential for unprepared walking surfaces to be encountered. Level D personal protective equipment will be worn at all times during site reconnaissance activities. Also, the following requirements should be observed:

1. Watch carefully where you walk. Do not step in shadows until you are sure of your footing. Shadows may hide pits, holes, or other unstable footing.
2. Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces.
3. Stay within site of your buddy.

5.2.2 Drilling and Trenching Operations

Operating around drilling and trenching equipment presents potential hazards from falling equipment, mechanical failure, being caught in machinery, etc. Appendix B provides safety procedures which should be followed by all personnel. Equipment should be properly inspected on a regular basis in accordance with industry-established procedures to minimize the risk of mechanical failure. In addition to physical hazards associated with drilling and trenching equipment, there is the potential for excessive noise to be produced around the drill rig. Section 5.9 provides details concerning the hazards associated with high noise levels.

Soil cuttings produced during drilling operation have the potential to be contaminated with hazardous materials. Cuttings should be handled using proper protective equipment (see Section 7.2). Anyone with the potential to contact contaminated materials (including contact during sample collection and handling) is required to utilize Modified Level D protective equipment, unless on-site monitoring indicates the need

for increased respiratory protection.

5.2.3 Investigation-Generated Waste Management Operations

The investigation will generate drill cuttings, decontamination fluids and grout used for backfilling borings. No wells will be installed and no groundwater sampling will be performed.

5.3 CHEMICALS OF CONCERN

The following chemical products are known or suspected to be present in the work area at Site 7C, and may be encountered during site investigation activities. A summary of the information provided in Sections 5.3.1 - 5.3.7 can be found in Table 5-1.

5.3.1 Gasoline

Gasoline is a complex mixture of hydrocarbons and additives. Chronic exposures or exposures to a high concentration of gasoline vapor may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of gasoline vapor may produce flushing of the face, slurred speech, and mental confusion. Gasoline constituents can be divided into five major groups: alkanes, alkenes, cycloalkenes, aromatics, and additives. The aromatics are the constituents generally regarded as the greatest toxic concern. The major aromatics in gasoline are benzene, toluene, ethyl benzene, and xylene (BTEX). Of these, benzene is considered to be the most potent. Tetra-ethyl and tetra-methyl lead are also constituents found in typical gasoline products. These have both been identified as carcinogens and present a moderate hazard when in contact with exposed skin. Other trace constituents found in gasoline can also be irritating to the skin if repeated or prolonged exposure occurs. Both the OSHA PEL and ACGIH TLV for gasoline are 300 ppm.

TABLE 5-1 Summary of Suspected Contaminant Properties

CHEMICAL/PRODUCT NAME	OSHA PEL (ppm)	ACGIH TLV (ppm)	SIGNIFICANT HEALTH EFFECTS
Gasoline	300	300	CNS Depression, Skin Irritation
Diesel Fuel	NA	NA	CNS Depression, Skin Irritation
JP-5	NA	NA	CNS Depression, Skin Irritation
Waste Oils	NA	NA	Skin Irritation, Liver effects, Exposure to heavy metals
BTEX	Benzene -1 Others - 100	Benzene -1 Others - 100	CNS Depression, Skin Irritation Benzene only: Cancer
PAHs	Varies	Varies	Skin Photosensitization/Irritation, cancer for some compounds
Heavy Metals	Varies	Varies	Liver, Kidney, Blood-forming Organ Damage CNS Deterioration, Lung Damage

5.3.2 Diesel

Like gasoline, diesel fuel is a complex mixture of hydrocarbons. It is manufactured through refining of middle distillate crude oil components, and thus is somewhat less volatile than gasoline (which comes from light stocks). Exposure to diesel fuels can produce intoxication and other CNS depression effects in cases of acute exposure, and can lead to defatting of skin and contact dermatitis in case of contact exposure. Like gasoline, diesel fuel contains some small quantities of volatile hydrocarbon additives, including BTEX members. There are no established exposure standards from either OSHA or ACGIH for diesel fuel, however action levels should be developed that reflect the potential presence of BTEX (particularly benzene) when diesel fuels are present.

5.3.3 JP-5

Jet fuels are mixtures of hydrocarbons distilled from middle hydrocarbon stocks (i.e., similar to kerosene). Health effects associated with jet fuels include depression of CNS functions due to acute exposure, and skin drying and dermatitis in cases of contact exposure. Jet fuels also include various hydrocarbon additives to enhance performance. Additives may include BTEX components and ethylene

glycol monomethyl ether. Neither OSHA nor ACGIH has established specific exposure limits for jet fuels; however, in developing appropriate action levels, consideration should be given to the potential presence of BTEX, and in some confined spaces to EGME.

5.3.4 Waste Oils

Oils are composed of higher molecular weight carbon chain molecules, possessing a low vapor pressure. For this reason they present primarily a contact hazard. The potential for acute exposure is negligible; however, chronic exposure can lead to liver damage. Waste oils, primarily waste motor oils, may also be contaminated by a variety of heavy metals during use.

5.3.5 Volatile Organic Compounds (BTEX)

Benzene: is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, and the ACGIH TLV is 10 ppm.

Toluene: Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause irreversible liver and kidney injury. Both the OSHA PEL and the ACGIH TLV are 100 ppm.

Ethyl benzene: its vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid Ethyl benzene

causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of Ethyl benzene is low, however, ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The established Permissible Exposure Level (PEL) is set well below this intolerable level. The OSHA PEL and the ACGIH TLV are both 100 ppm.

Xylene: Liquid xylene is a skin irritant and causes itching, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylenes can depress the Central Nervous System (CNS), and ingesting it can result in gastrointestinal disturbance; and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and the ACGIH TLV are 100 ppm.

5.3.6 Polynuclear Aromatic Hydrocarbons (PAHs)

Anthrene

Benzo(a)anthracene

Benzo(b)fluoranthene

Benzo(k)fluoranthene

Benzo(g,h,i)perylene

Benzo(d,e,f)phenanthrene

Benzo(a)pyrene

Chrysene

Fluoranthene

Fluorene

Indeno(1,2,3,c,d)pyrene

Phenanthrene

Each of these compounds are a variety of polynuclear aromatic hydrocarbon, which in the pure state are observed to be yellowish crystalline solids. These chemicals are found in coal tar and in products of incomplete combustion. These chemicals have varying degrees of potency for causing cancer, with benzo(a)pyrene being among the most potent. These polynuclear aromatic hydrocarbons are evaluated collectively as *COAL TAR PITCH VOLATILES*. Coal tar pitch volatiles may cause photo-sensitization and a rash where sunlight strikes the skin. Exposure may also cause cancer of lungs, skin, bladder or kidneys. Benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3,c,d)pyrene have been identified as carcinogenic. Polynuclear aromatic compounds are formed when petroleum fuels are burned in a smokey flame.

5.3.7 Heavy Metals

As a group, the heavy metals (including lead, arsenic, chromium, nickel, and selenium) are toxic to a number of organs and organ systems in the body including the liver, kidneys, blood-forming organs (primarily located in the bones), and the CNS (especially lead). Acute exposure to metals can produce symptoms such as stomach distress and vomiting, mental confusion and sluggishness, heart palpitations, breathing difficulties, and renal (kidney) failure. Chronic exposures can be characterized by deterioration in function of the liver and kidneys, CNS degradation, and abnormal changes in blood cell counts (especially white blood cells). Exposure to chromium may also lead to formation of lung and gastric cancers.

The primary route of exposure to heavy metals of concern during this project is contact with contaminated soils and water, which can lead to entry through open wounds or contamination and ingestion of food. Preventing this route of exposure necessitates the use of appropriate protective clothing and proper decontamination procedures.

5.4 DRILL RIG SAFETY

Operating around drilling equipment presents potential hazards from falling equipment, mechanical failure, being caught in machinery, etc. Appendix B provides safety procedures which should be followed by all personnel. Equipment should be properly inspected on a regular basis in accordance with industry-established procedures to minimize the risk of mechanical failure. In addition to physical hazards associated with drilling equipment, there is the potential for excessive noise to be produced around the drill rig. Section 5.9 provides details concerning the hazards associated with high noise levels.

Soil cuttings produced during drilling operation have the potential to be contaminated with hazardous materials. Cuttings should be handled using proper protective equipment (see Section 7.2). Anyone with the potential to contact contaminated materials (including contact during sample collection and handling) is required to utilize Modified Level D protective equipment, unless on-site monitoring indicates the need for increased respiratory protection.

5.5 EXPLOSIVE HAZARDS

Borehole installation activities increase the potential for the occurrence of elevated concentrations of volatile organic compounds that may be released. Explosive concentrations of these constituents could develop in small and confined spaces. Explosivity must be monitored with a Combustible Gas Indicator (CGI) in accordance with the requirements found in Section 6.0 (see Table 6-2). Monitored areas will include all excavations, trenches, confined spaces, well casings, and indoor work areas where explosive concentrations may develop prior to monitoring activities, and locations that could potentially pose hazards as remedial activities progress. Flammable chemical compounds may not be identified and, therefore, any vapor or liquid must be treated as if it were flammable.

Borehole installation activities will cease if concentrations exceed 10% of the Lower Explosive Limit (LEL), and personnel will withdraw to a position upwind of the affected area (see Table 6-2 for action guidelines).

SMOKING IS PROHIBITED INSIDE THE WORK AREA

Fires involving flammable liquids are considered *Class B* fires. They require blanketing or smothering to extinguish the fire, which will act to keep oxygen away from the fuel. Fire extinguisher types appropriate for use on flammable-liquid fires include carbon dioxide (CO₂), dry chemical, film-forming foam, or multipurpose dry chemical. A Class B extinguisher is designated with a white "B" on a square background of red.

5.6 HEAVY MACHINERY

The use of heavy machinery (drilling, trenching and digging equipment, cranes, etc.) in areas where unprotected personnel are operating warrants special attention on the part of all personnel. Operators should ensure that equipment is working properly and is being run in a safe manner, and should be aware of the location of unprotected personnel at all times while operating this machinery to avoid serious accidents. Other personnel must be aware of heavy equipment operations, and exercise proper caution to avoid placing themselves in an unsafe situation.

5.7 HEAT STRESS

Heat stress is a major hazard, especially for workers wearing protective clothing. The same protective materials that shield the body from chemical exposure also limit the dissipation of body heat and moisture. Personal protective clothing can therefore create a hazardous condition. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties. Treatment for heat exhaustion is to "Keep the Victim Cool" but not expose victim to extreme cold weather. Fluid intake to avoid heat stress will be emphasized.

5.7.1 Heat Exhaustion

Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, with clammy skin, and he or she may perspire profusely. The pulse is weak and fast, breathing is shallow. He or she may faint unless they lie down. This may pass, but sometimes it remains and death could occur.

First Aid: Immediately remove the victim to the Contamination Reduction Zone, in a shady or cool area with good air circulation (avoid drafts or sudden chilling). Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise his or her feet 6-12 inches and keep him or her warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him or her sips of water. Transport victim to a medical facility as soon as possible.

5.7.2 Heat Stroke

Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats, body temperatures often rise to between 105°-110°. As the victim progresses toward heat stroke symptoms such as headache, dizziness, nausea, oppression, can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

First Aid: Immediately evacuate the victim to a cool and shady area. Remove all protective outer wear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. Apply cold wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling the victim. Give no stimulants or hot drinks. Since heat stroke is a severe medical condition requiring professional medical attention emergency medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility.

5.7.3 Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids. On the site there must be plenty of fluids available. Personnel should replace water and electrolytes lost through sweating. Electrolytes can be replaced by commercial mixes such as Gatorade.

5.7.4 Prevention of Sunburn

When working in the sun, whether it is hot or cold, exposed skin is vulnerable to sunburn. Protect exposed skin with an appropriate sun-screen. A sun-screen with a sun protection factor (SPF) of 15 or greater is recommended for a full day in the sun.

5.8 SLIPS, TRIPS, FALLS, AND PROTRUDING OBJECTS

Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to ensure the prevention of such injuries.

5.9 HAZARDOUS NOISE ENVIRONMENTS

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

The Health and Safety Professional will monitor employee exposure to hazardous noise levels from time to time as part of the hearing conservation program (see Section 6.2). However, for the purposes of this plan, hearing protection will be worn at all times when normal conversation becomes difficult at distances of 3 feet or less.

5.10 UNDERGROUND UTILITIES

Various forms of underground utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, geophysical clearance is mandated, as well as obtaining authorization from all concerned public and base utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SSO and the Health and Safety Manager will be notified immediately. Work will be suspended until the appropriate actions for the particular situations can be taken.

5.11 ELECTRICAL SAFETY

Electrical safety practices to prevent electrical injuries to employees and to protect EARTH TECH property will be utilized at all times. This is primarily concerned with electrical power service equipment, electrical distribution systems and testing and trouble shooting electronic equipment

5.11.1 Instructions

The following instructions will be followed during all work activities where energized electrical equipment is exposed:

1. Observe all equipment operating procedures as recommended by manufacturers.
2. Appropriately ground all electrical equipment.

3. Provide standard warning signs to identify the electrical hazards, their exact location and actions necessary to avoid the hazard.
4. Observe good housekeeping practices at all times. Give attention to keeping work areas clear around switches, terminals, controls, etc.
5. Identify circuit breakers and cut-off switches to indicate equipment controlled.
6. Do not perform work on electrical or electronic equipment unless adequately illuminated.
7. Use protective equipment such as rubber mats, rubber gloves, and insulated tubing wherever operations warrant.
8. Wear approved eye, face and head protection while working around high voltages.

5.11.2 Treatment in Case of Injury

The nearest medical treatment facility (see Figure 11-1) will be notified in all cases involving injury from electrical shock. The employee is not permitted to resume work until given clearance by the Health and Safety Manager after consultation with EARTH TECH's occupational physician.

5.12 EQUIPMENT LOCKOUT

This section establishes the minimum requirements for lockout of energy sources that could cause injury to personnel due to unexpected energizing, start-up, or release of stored energy during the operation, repair, or maintenance of equipment or a process.

Where complexity of the equipment/process requires a more comprehensive procedure, it shall be developed and included as part of the site-specific safety guidance document.

Only authorized employees shall perform the lockout procedure. All authorized employees shall receive training in recognition of the applicable hazardous energy sources and in adequate methods and means for their isolation.

Employees authorized to perform lockout shall be certain as to which switch, valve, or other energy-isolating devices apply to the equipment being locked out. More than one energy source (electrical, mechanical, etc.) may be involved. Any questionable identifications of sources shall be

cleared by project management.

5.12.1 Instructions

The following lock-out procedures shall be observed:

1. Notify all affected employees of the need and requirement for a lockout.
2. Shut down operating equipment by normal stopping procedures (depress stop button, open toggle switch, etc.).

Make sure power sources (electrical, mechanical, hydraulic, etc.) are disconnected or isolated from the equipment. Stored energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc., must also be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

Lockout the energy-isolating devices with an assigned individual lock. If the device(s) cannot accommodate a lock, contact the site safety officer to approve any alternate methods of protection or warning (e.g., tagout, barricade, etc.).

After ensuring that no personnel are exposed, and to ensure that all energy sources have been disconnected, operate the push button or other normal operating controls to make certain the equipment will not operate.

CAUTION: Return operating control to neutral position after the test.

5.12.2 Restoring Equipment to Service

When the operation is complete and equipment is ready for testing or normal service, check the equipment area to see that no one is exposed. When the equipment is all clear, locks can be removed *by the person(s) placing each lock only*. The energy-isolating devices may be operated to restore energy to equipment.

SPECIAL CAUTION: When restoring pressurized air to an equipment/process, keep all personnel clear of machine pinch points.

5.12.3 Procedure Involving More Than One Person

If more than one individual is required to lock out equipment, each individual involved shall place his or her own personal lock on the energy isolating device(s). The SSO may lock out equipment for all of the personnel. In such cases, it shall be the responsibility of the SSO to carry out all steps of the lockout practice and inform the field personnel when it is safe to work on the equipment. Additionally, the SSO shall not remove any locks until it has been verified that all individuals are clear.

6.0 MONITORING PLAN

This section of the Health and Safety Plan outlines monitoring strategies and analytical methods which can be used to assess employee exposure to chemical and physical hazards. Monitoring will consist primarily of on-site determination of various parameters (airborne contaminant concentrations, heat stress effects, etc.), but may be supplemented by more sophisticated monitoring techniques where necessary.

6.1 AIRBORNE CONTAMINANT CONCENTRATIONS

To assess the concentrations of airborne organic vapors that may be released during soil sampling, removal and handling activities, monitoring will be accomplished both in worker breathing zones and at the boundaries of the Exclusion Zone. Monitoring will be conducted using the instrumentation specified in Table 6-1.

TABLE 6-1 Air Contaminant Monitoring Instrumentation

INSTRUMENT	MANUFACTURER/MODEL	SUBSTANCES DETECTED
Flame Ionization Detector (FID) (Required)	Foxboro OVA 108 Foxboro OVA 128	Combustible/organic vapors and gases, hydrocarbons
Photo Ionization Detector (PID) (Required)	H-Nu PI-101 Photovac MicroTIP MSA Photon Thermo Environmental OVM	Chlorinated (TCE) and aromatic hydrocarbons
Detector Tube Kit (Required)	Draeger 81-01841	Benzene only 0.5-10 ppm
Multi gas Detector (Required)	Neotronics Exotox-55 ISC TMX-410 GasTech GX-91 MSA 360 or 361	Oxygen, %LEL (combustible and flammable vapors and gases), hydrogen sulfide, and methane

6.1.1 Workspace (Exclusion Zone) Monitoring

Workplace monitoring must be sufficient to properly characterize employee exposures, and provide knowledge of work location conditions in enough detail to determine PPE requirements as work progresses. Required monitoring procedures, instrumentation, frequency and locations are specified in Table 6-2, along with response actions based upon monitoring results.

In general, monitoring will be used to evaluate worker breathing zone concentrations of site contaminants as a measure of exposure potential and for determination of the need for changes in specified respiratory protection. Evaluation of specific workspace areas (confined spaces, trenches, etc.) can also be required (see Table 6-2 and hazard-specific guidance provided in Section 5.0). In addition, monitoring for explosive conditions shall be conducted as specified in Table 6-2.

6.1.2 Work Area Boundary Monitoring

Monitoring will be conducted to assess release of contaminants to the surrounding "community" (the area, and anyone in it, not within the controlled work area(s) related to this project). Release of contaminants to the community can be monitored through determination of airborne levels of contaminants present at the boundary of the controlled area(s). This evaluation will be conducted using the same direct reading instrumentation employed for workspace evaluation (see Section 6.1.1 and Table 6-1). Monitoring results will be evaluated against the appropriate action level criteria specified in Table 6-2. In the event that concentrations of contaminants released at the work area boundary exceed established action levels, appropriate mitigation measures will be implemented as directed by the SSO/Field Supervisor, or onsite work will cease.

6.2 NOISE EXPOSURE

Exposure to excessive noise can damage hearing ability and cause permanent hearing loss. It is the intent of EARTH TECH to prevent permanent hearing loss from noise exposure.

TABLE 6-2 Monitoring Program Action Levels

PARAMETER	LOCATION AND INTERVAL	RESPONSE LEVEL	RESPONSE
Hydrocarbons (Total by FID or PID)	Breathing zone, every 15 minutes during intrusive work or contaminated soil handling	< 10 ppm	Continue Level D/modified D work and continue monitoring
Hydrocarbons (Total by FID or PID)	Breathing zone, every 15 minutes during intrusive work or contaminated soil handling	10 - 15 ppm above background	Monitor for benzene in the breathing zone. Continue work in Level D/modified D unless benzene is indicated.
Hydrocarbons (Total by FID or PID)	Breathing zone, every 15 minutes during intrusive work or contaminated soil handling	15 - 50 ppm above background	Contact SSO, upgrade PPE to Level C, organic vapor cartridge
Hydrocarbons (Total by FID or PID)	Breathing zone, every 15 minutes during intrusive work or contaminated soil handling	> 50 ppm	Cease work, exit, and contact SSO
Hydrocarbons (Total by FID or PID)	Edge of Exclusion Zones, every 15 minutes during intrusive work	< 10 ppm	Continue work and continue monitoring
Hydrocarbons (Total by FID or PID)	Edge of Exclusion Zones, every 15 minutes during intrusive work	> 10 ppm	Cease work and contact the SSO
Benzene (Draeger 81-01841 Benzene 0.5/c)	Breathing Zone, every 30 minutes as indicated by hydrocarbon monitoring	No color change noted	Continue Level D/modified D work and continue monitoring

When noise levels exceed 85 decibels on the A-weighted scale (85 dBA), workers will use appropriate hearing protection. All EARTH TECH field personnel who are medically monitored participate in a hearing conservation program. This program is mandatory for employees whose 8-hour equivalent noise exposure exceeds 85 dBA ($L_{eq} > 85$ dBA). The hearing conservation program includes the following elements:

- Baseline survey of noise exposures.
- Baseline audiometric testing.
- Annual audiometric testing.
- Annual training on the use and need for hearing protection.
- Distribution of hearing protectors to employees in the program.
- Maintenance of records.

6.3 HEAT STRESS MONITORING

In hot, sunny environments there is a high potential for heat stress to pose a significant safety hazard to workers. This is especially true where the use of mandated protective clothing will limit the body's ability to dissipate excess heat through evaporation of sweat. To mitigate the effects of heat stress, it will be necessary to establish a work routine that incorporates appropriate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring) and rest. The frequency and length of such work breaks must be determined by the individual work location supervisor based upon factors such as the ambient temperature and sunshine, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used. In any case, breaks must be sufficient to prevent workers from manifesting symptoms of heat stress, which can include irritability, confusion, lethargy, and headache.

Workers are encouraged to immediately report any difficulties or heat-related problems that they may experience or observe in fellow workers. Supervisors shall use such information to alter the work-break schedule to accommodate such problems. During breaks, workers should be encouraged to drink plenty of water or other liquids to replace lost fluids and to help cool off. If any worker exhibits signs of severe heat distress, such as profuse sweating, extreme confusion and irritability, or pale, clammy skin, that worker shall be relieved of all duties at once and made to rest in a cool location and drink plenty of

water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) will be taken **immediately** to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.). Heat stroke is a life threatening condition that must be treated by competent medical authority.

6.4 PERSONAL SAMPLING

Measurement of employee exposure to chemical contaminants will be performed at the discretion of the Health and Safety Professional. Monitoring techniques will also be determined by the Health and Safety Professional, and will conform with applicable OSHA and NIOSH sampling methods. Samples will be collected by, or under the direction of, a member of the EARTH TECH Health and Safety Department. Any analytical laboratory performing analysis of personal samples shall be accredited by the American Industrial Hygiene Association (AIHA) and be a participant in the AIHA Proficiency Analytical Testing (PAT) program.

6.5 MAINTENANCE AND CALIBRATION OF EQUIPMENT

All monitoring equipment will be maintained and calibrated in accordance with manufacturer recommendations. All pertinent data will be logged in a health and safety logbook and maintained on site for the duration of site activities. All monitoring equipment will be properly calibrated before and after each period of use in accordance with manufacture's recommendations and standard industrial hygiene practice.

6.6 SAMPLING RESULTS

Where personal sampling is performed, the EARTH TECH Health and Safety Department will be responsible for informing employees and subcontractors of their monitoring results to comply with OSHA regulations and good occupational health practices. Within 5 working days after the receipt of monitoring results, the each employee will be notified, in writing, of the results which represent that his/her exposure.

Whenever the results indicate that employee exposure exceeds the permissible exposure limits, notification

shall be provided to affected employee stating that the permissible exposure limit was exceeded and providing a description of the corrective action taken to reduce exposure to a level below the PEL. Results of monitoring for other hazardous and harmful physical agents shall also be reported to employees in the same manner.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 PERSONAL PROTECTIVE CLOTHING

The harmful effects that chemical substances may have on the human body often necessitate the use of protective clothing. Proper selection of personal protective equipment (PPE) depends upon a number of factors. Protection against different types of chemicals and differing concentrations of those substances can be quite varied. The tasks to be performed and the probability of exposure to the substance must also be considered when specifying protective clothing.

Once the specific hazard has been identified, appropriate clothing can be selected. The protection level assigned must match the hazard confronted. Protective clothing ensembles range from safety glasses, hard hats, and safety shoes to fully encapsulating suits with a supplied source of breathing air. Selection of appropriate PPE are specified in the task hazard analyses found in Section 5.2, and upgrade criteria are based upon on-site monitoring results are presented as Table 6-2. In addition, Section 7.2 provides additional guidance concerning the appropriate levels of protection which should be utilized during site activities.

7.1.1 Head Protection

Employees will wear hard hats during all outdoor work activities at Site 7C. Ear protection and face shields may be attached to hard hats.

7.1.2 Eye Protection

Eye protection will be worn inside the Exclusion Zones at all times. Due to the limited potential for high velocity impact hazards associated with the activities, the use of sunglasses will be permitted at the work sites. Wire framed sunglasses used for eye protection will not be permitted at any time. Subcontractor employees who do not have suitable eye protection will have an appropriate type of eye protection provided to them by their respective employers.

Eye protection will meet the following minimum requirements:

- Provide adequate protection against the particular hazards for which they are designed
- Be reasonably comfortable when worn under the designated conditions
- Fit snugly and not unduly interfere with the wearer's movements
- Be durable
- Be easily cleaned and disinfected.

Contact lenses do not provide adequate eye protection. Contact lens wearers must use the same additional eye protection as for non-lens wearers. Contact lenses may be worn under full-face respirators, but are generally not acceptable with half-mask respirators.

Persons whose vision requires correction and are required to wear eye protection may wear goggles or spectacles of one of the following types:

- Spectacles whose protective lenses provide optical correction (Rx).
- Goggles that can be worn over corrective (Rx) spectacles without disturbing the adjustment of the spectacles.
- Goggles that incorporate corrective (Rx) lenses mounted behind the protective lenses.

7.1.3 Ear Protection

Appropriate hearing protection, including ear plugs, canal caps, and ear muffs, will be provided when noise may be a problem, such as around heavy machinery, power support equipment, and impact tools, or whenever normal conversation becomes difficult at distances of 3 feet or less. Employees who may be exposed to hazardous noise must be participants in a hearing conservation program which meets the requirements of 8 CCR §5096-5100 (29 CFR 1910.95).

7.1.4 Foot Protection

Employees will wear appropriate foot protection while working on site, which will consist of leather or water- and chemical-resistant boots with safety toes. Footwear (including leather work boots and chemical-resistant boots) must meet the specifications of ANSI Z41.1-1969, which is the standard for industrial footwear with safety toes. Protection against liquid hazardous chemicals requires boots of neoprene, polyvinyl chloride (PVC), butyl rubber, or other material selected for resistance to the specific chemical. For tasks where contact with contaminated materials is expected to be slight or nonexistent, leather work boots with safety toes are appropriate.

7.1.5 Hand Protection

Employees will use appropriate hand protection when exposed to hazards that could cause injury to the hands. Gloves must resist puncturing and tearing as well as provide any necessary chemical resistance.

Protective clothing will be worn over glove cuffs to prevent any liquid from spilling into the gloves. A pair of inner gloves adds an extra layer of protection for the hands during the removal of outer gloves and other chemically protective items and will be worn at all times when outer protective gloves are required. Where necessary heavy leather gloves may be worn over chemical protective gloves when doing heavy work. If they become contaminated, they will be discarded because leather is difficult to decontaminate.

7.1.6 Respiratory Protection

The use of respiratory protection is not anticipated for this project, and will not be allowed without the concurrence of the Health and Safety Professional. If respiratory protection is used the following requirements will be enforced:

- Only personnel who have been trained to wear and maintain respirators properly shall be allowed to use respiratory protection.
- Only properly cleaned, maintained, NIOSH-approved respirators shall be used on site.
- Selection of respirators will be made by the Health and Safety Professional or his

designee. On-site any decisions regarding upgrading or downgrading of respiratory protection will be made by the SSO based upon site conditions and requirements specified in Table 6-2.

- Used air-purifying cartridges shall be replaced at least daily or more often if breathing resistance becomes excessive or if the wearer detects odor, taste or irritation. Powered Air-Purifying Respirator (PAPR) cartridges will be changed when flow falls below 4 cfm through the cartridge.
- Positive and negative pressure tests shall be performed each time the respirator is donned.
- Only personnel who have been fit tested within the last 12 months will be allowed to work in atmospheres where respirators are required. Subcontractors shall provide certificates of a respirator fit test completed within the last 12 months for each employee on site.
- Respirator users shall be instructed in the proper use and limitations of respirators.
- All employees are medically tested and fit tested before commencement to field work. If an employee has difficulty in breathing during the fit test or during use, he/she shall be evaluated medically to determine if he/she can continue to wear a respirator safely while performing assigned tasks.
- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the health or safety of the employee will be impaired by respirator use.
- Air-supplied respirators shall be assembled according to manufacturer's specifications. Hose length, couplings, valves, regulators, manifolds, and all accessories shall meet American National Standards Institute (ANSI) and the manufacturer's requirements.
- Respirators shall be cleaned and sanitized daily after use.
- Respirators shall be inspected during cleaning. Worn or deteriorated parts shall be replaced.
- Facial hair that might interfere with a good face piece seal or proper operation of the respirator is prohibited.
- When respiratory protection is in use, the SSO shall review the respiratory protection program daily to ensure employees are properly wearing and maintaining their respirators and that the respiratory protection is adequately protecting the employees.

7.1.7 Body Protection

Protective clothing and body protection is selected on the basis of the tasks to be performed and the

hazards, both chemical and physical, to which the worker may be exposed. For all work areas, including the "clean" support and administrative areas, appropriate work clothing will be worn that at least covers from the knees to shoulders. Tank and halter tops are not appropriate. Bathing suits, shorts, and cut-off pants are not appropriate.

In more hazardous work areas, substantial pants and long sleeves are appropriate. Chemical-protective body protection will be selected using predicted chemical exposures and the clothing manufacturer's chemical-specific permeation and degradation information to provide optimum protection.

7.2 CHEMICAL PROTECTIVE ENSEMBLES

Often, personal protective equipment is required for protection from more than one hazard. Common assemblies of personal protective equipment have evolved in the hazardous waste practice.

The designated levels of protection are, in increasing complexity: D, C, B, and A. These ensembles provide progressively increasing protection against chemical hazards. The specific equipment comprising each level of protection will vary slightly, but are defined primarily by the type of respiratory protective equipment used, and secondly by skin protection.

The information presented below consists of a description of each level of protection and the typical PPE associated with that level. Variations of the PPE requirements for each task associated with this project are outlined in Table 7-1.

7.2.1 Level D

Level D protection is the lowest level of personal protection allowed on hazardous waste sites. Respiratory protection is not required, as the atmosphere is assumed to be breathable and uncontaminated.

Hard hats are required if there is the potential for overhead hazards, especially around heavy equipment (drill rigs). A face shield and/or safety glasses will also be worn.

During site activities, Level D protection will be the primary level of protection worn during all

operations where contact with contaminated materials is unlikely (e.g., geophysical testing). Upgrading to greater levels of protection will be executed as required in the monitoring guidelines outlined in Table 6-2.

Table 7-1 Task Specific PPE Guidance

Activities to be performed:			
<input checked="" type="checkbox"/> Borehole Installation	<input checked="" type="checkbox"/> Excavating & Sampling	<input checked="" type="checkbox"/> Well Sampling	<input checked="" type="checkbox"/> Well Installation/Development
<input type="checkbox"/> Sediment/Surf. H ₂ O Samp.	<input type="checkbox"/> Oil/Water Sep. Sampling	<input type="checkbox"/> Site Reconnaissance	<input type="checkbox"/> Hand Augering/Soil Sampling
<input type="checkbox"/> Drum Sampling	<input type="checkbox"/> Catch Basin Sampling	<input type="checkbox"/> Soil Gas Testing	<input type="checkbox"/> Other: _____
Borehole Installation: Modified Level D			
<input checked="" type="checkbox"/> Typical Work Uniform	<input checked="" type="checkbox"/> Outer Protective Gloves	<input type="checkbox"/> Tyvek® Coveralls*	<input type="checkbox"/> Safety-Toe Rubber Boots
<input checked="" type="checkbox"/> Hard Hats	<input type="checkbox"/> Polycoated Tyvek®	<input checked="" type="checkbox"/> Safety-Toe Boots	<input checked="" type="checkbox"/> Safety Glasses/Face Shield
<input type="checkbox"/> Nomex® Coveralls	<input checked="" type="checkbox"/> Inner Protective Gloves	<input checked="" type="checkbox"/> Hearing Protection	
Well Installation: Modified Level D			
<input checked="" type="checkbox"/> Typical Work Uniform	<input checked="" type="checkbox"/> Outer Protective Gloves	<input checked="" type="checkbox"/> Tyvek® Coveralls*	<input checked="" type="checkbox"/> Safety-Toe Rubber Boots
<input checked="" type="checkbox"/> Hard Hats	<input type="checkbox"/> Polycoated Tyvek®	<input type="checkbox"/> Safety-Toe Boots	<input checked="" type="checkbox"/> Safety Glasses/Face Shield
<input type="checkbox"/> Nomex® Coveralls	<input checked="" type="checkbox"/> Inner Protective Gloves	<input checked="" type="checkbox"/> Hearing Protection	
Well Development: Modified Level D			
<input checked="" type="checkbox"/> Typical Work Uniform	<input checked="" type="checkbox"/> Outer Protective Gloves	<input checked="" type="checkbox"/> Tyvek® Coveralls	<input checked="" type="checkbox"/> Safety-Toe Rubber Boots
<input checked="" type="checkbox"/> Hard Hats	<input type="checkbox"/> Polycoated Tyvek®	<input type="checkbox"/> Safety-Toe Boots	<input checked="" type="checkbox"/> Safety Glasses/Face Shield
<input type="checkbox"/> Nomex® Coveralls	<input checked="" type="checkbox"/> Inner Protective Gloves	<input checked="" type="checkbox"/> Hearing Protection	
Well Sampling: Modified Level D			
<input checked="" type="checkbox"/> Typical Work Uniform	<input checked="" type="checkbox"/> Outer Protective Gloves	<input checked="" type="checkbox"/> Tyvek® Coveralls	<input checked="" type="checkbox"/> Safety-Toe Rubber Boots
<input checked="" type="checkbox"/> Hard Hats	<input type="checkbox"/> Polycoated Tyvek®	<input type="checkbox"/> Safety-Toe Boots	<input checked="" type="checkbox"/> Safety Glasses/Face Shield
<input type="checkbox"/> Nomex® Coveralls	<input checked="" type="checkbox"/> Inner Protective Gloves	<input type="checkbox"/> Hearing Protection	
Other H&S considerations: * - Tyvek Coveralls need not be donned during well installation and drilling activities until drilling depth reaches 10 feet above groundwater or Level C upgrade conditions are encountered.			

Criteria for Selection of Level D Protection

The use of Level D protective equipment is permissible if all of the following conditions are met:

1. Total hydrocarbon and other contaminant concentrations have not been measured above the Level C upgrade action levels specified in Table 6-2.
2. Work functions preclude splashes, immersion, significant skin contact or potential for unexpected inhalation of any chemical contaminants.

Level D protection is primarily a work uniform. It can be worn in areas where only boots may be slightly contaminated, and there are no inhalable toxic substances.

Typical Level D Equipment List

Hard hat

Safety glasses/face shield

Safety-toed work boots

Hearing protection (as required)

Full-face air purifying respirator (available for emergency use).

7.2.2 Modified Level D

If the potential exists for contact with chemical contaminants (e.g., splashes, "dirty operations," etc.), however the respiratory hazard is low, the use of a Modified Level D ensemble is appropriate. Modified Level D consists of protective clothing to preclude hazards due to contact with contaminated materials, but does not provide increased respiratory protection. The use of protective clothing in a Modified Level D ensemble can also serve to aid in personal cleaning and decontamination efforts through the use of disposable outer protective garments.

The use of Modified Level D PPE will be required for on-site operations where contact with contaminated soils can be expected (i.e., hand augering, sample collection, excavation activities, soil

handling/containerization).

Typical Modified Level D Equipment List

Chemical-resistant disposable outer coveralls (e.g., Tyvek™ or polyethylene-coated Tyvek™ coveralls)

Chemical-resistant (e.g., nitrile) outer gloves (taped to outer coveralls)

Chemical-resistant (e.g., nitrile) inner gloves

Butyl apron (optional, for use where splash potential is high)

Hard hat

Safety glasses/face shield

Chemical-resistant safety boots (taped to outer coveralls)

Hearing protection (as required)

Full-face air purifying respirator (available for emergency use).

7.2.3 Level C

Level C protection is defined by the use of a full-face, air-purifying respirator. This level of protection can be used when low levels of contaminants of a known nature are present, sufficient oxygen is available, and contaminants are not considered immediately dangerous to life or health (IDLH).

Due to the low volatility of the expected site contaminants, the use of Level C PPE is not anticipated.

Typical Level C Equipment List

Full-face air-purifying respirator equipped with organic vapor/acid gas/high-efficiency particulate air cartridges

Chemical-resistant disposable outer coveralls (e.g., Tyvek™ or polyethylene-coated Tyvek™ coveralls)

Chemical-resistant (e.g., nitrile or Silver Shield®) outer glove (taped to outer coveralls)

Chemical-resistant (e.g., nitrile) inner gloves

Butyl apron (optional, for use where splash potential is high)

Hard hat

Chemical resistant safety boots (taped to coveralls)

Hearing protection (as required)

Self-contained breathing apparatus (available for emergency use).

7.2.4 Level B

The need for the use of Level B protective equipment during site activities is considered to be highly unlikely. Should on-site monitoring indicate that Level C PPE is inadequate, the SSO will contact the Health and Safety professional for further guidance. Upgrade to Level B PPE will not be permitted without the concurrence of the Health and Safety Professional, and the preparation of supplemental Health and Safety requirements addressing the additional procedures which will be observed.

7.2.5 Level A

The use of Level A protective equipment is not permissible for this project. Where the use of Level B equipment is insufficient, all work operations will cease and the Health and Safety Professional shall be contacted for appropriate response procedures.

8.0 DECONTAMINATION

Decontamination of equipment and personnel will be performed to control the contaminant migration from hazardous waste site operations.

Decontamination involves the physical removal and/or neutralization of harmful contaminants. The extent of decontamination depends on the hazard and the quantities of the contaminant.

Contamination can occur from:

- Contacting vapors, gases, mists, or air particulates
- Splashes while sampling or opening containers
- Walking or driving through puddles or on contaminated soil
- Handling contaminated instruments or equipment
- Assisting contaminated personnel during routine operations, decontamination procedures, and emergencies
- Chemicals used for the decontamination of equipment.

All decontamination will be performed by personnel wearing protective gear appropriate for the level of decontamination as determined by the SSO. The decontamination work tasks may be split or rotated among support and work crews.

8.1 DECONTAMINATION PROCEDURES

Contamination reduction procedures appropriate for the existing work area will be developed and specified by the SSO. Such procedures must be in place before site operations begin, and they must remain in place (modified as necessary) throughout the period of activity. Wherever possible, the need for decontamination should be reduced through work practices that minimize contact with contaminants. Personnel should avoid walking through heavily contaminated areas, should not kneel or directly touch contaminated materials, and should use remote handling and sampling techniques when feasible.

Decontamination will be performed only in designated areas. Separate areas may be set up for equipment and personnel. A Contamination Reduction Corridor will be established at each station. Personnel and equipment must move through this corridor during all phases of the decontamination process.

8.2 DECONTAMINATION HAZARDS

Contamination on the upper areas of protective clothing pose a greater risk to the worker because volatile compounds could make breathing hazardous both for the worker and for the decontamination personnel. There is also an increased probability of contaminant contact with the skin when the worker is doffing the upper part of the clothing.

Disposable items (Tyvek™ coveralls, inner gloves, and latex over boots) must be replaced as they become heavily soiled, torn at any portion, or when personnel break for extended periods of time. Dual respirator canisters will be changed as deemed appropriate by site air monitoring data, personnel determination of contaminant breakthrough, or as specified by the Health and Safety Department.

The assigned level of protection for a site also impacts the complexity of the decontamination effort. The higher the level of protection, the more equipment must be managed with every site entry or exit. Additional personnel must be available to handle the equipment load and the standby emergency response duties.

8.3 CONTAMINATION REDUCTION CORRIDOR

A decontamination corridor is a pathway established for the egress of personnel and equipment from the Exclusion Zone to the support zone (Section 8.9.2). As one moves through the decontamination corridor, one must observe the required steps for decontamination, one at a time, in sequence as specified by the SSO.

Exit from the Exclusion Zone is only through this pathway. A separate pathway into the Exclusion Zone may be established. Control over entry and egress traffic is handled by the SSO, or the designated work site safety representative.

8.4 PERSONNEL DECONTAMINATION

Decontamination procedures are carried out on all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuations) will personnel be allowed to leave the site without decontamination.

Decontamination of personnel should be performed at the Personal Decontamination Station on the site and should consist primarily of soap and water washing and water rinse of exterior protective gear to remove contaminants, followed by doffing of the gear. Coveralls should be removed by turning the clothing inside out. A procedure appropriate to the degree of contamination should be established. The extent of washing required, or modifications to the sequence, may be specified as appropriate.

8.4.1 Level D Personnel Decontamination

Personnel exiting the Exclusion Zone while site activities require the use of Level D PPE (as outlined in Section 7.2.1) will perform decontamination in accordance with the following guidelines:

- Place tools, instruments, samples and trash at an appropriate location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash
- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the Exclusion Zone areas
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed
- Prior to exiting the Exclusion Zone areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

8.4.2 Modified Level D Personnel Decontamination

Where activities are performed in Modified Level D PPE (as outlined in Table 7-1) personnel will perform decontamination using the following guidelines:

- Place tools, instruments, samples and trash at an appropriate location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash
- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the exclusion zone areas
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed
- Wash and rinse outer work gloves and boots (boot covers) with soap and water
- Wash/brush off outer protective coverall (Tyvek™)
- Untape wrists and ankles
- Remove outer work gloves and place them in an appropriate container specified for waste PPE
- Remove outer Tyvek™ coveralls and place them in an appropriate container specified for waste PPE
- Wash, rinse, and remove inner protective gloves and place them in an appropriate container specified for waste PPE
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

8.4.3 Level C Personnel Decontamination

Personnel involved in Site Activities which require the use of Level C PPE (see Table 7-1) will observe the decontamination procedures outlined below. These guidelines consist of the following:

- Place tools, instruments, samples and trash at an appropriate location. These areas should be clean and dry, and at a minimum contain plastic bags for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment, samples and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples and tools prior removal from the exclusion zone areas.
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Wash and Rinse outer work gloves and boots (boot covers) with soap and water
- Wash/brush off outer protective coverall (Tyvek)
- Untape wrists and ankles
- Remove outer work gloves and place them in an appropriate container specified for waste PPE.
- Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
- Remove respirator mask (also goggles if worn).
- Wash, rinse, and remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

8.5 EQUIPMENT DECONTAMINATION

Equipment to be decontaminated includes heavy equipment, tools, monitoring equipment, sampling equipment, and sample containers; trucks and trailers; and the decontamination equipment itself when the decontamination is closed down.

Before entering the site, all equipment will be cleaned to remove grease, oil, encrusted dirt, or other potential contaminants. Wherever possible, gross contamination of equipment will be removed in the Exclusion Zone prior to bringing equipment back to the Contamination Reduction Corridor.

General equipment decontamination consists of a soap and water wash, and a water rinse. If soap and water alone cannot remove contamination, additional procedures may be used such as a solvent rinse/wipe or steam cleaning.

Tools: Tools will be dropped into a plastic pail, tub or other container in the Exclusion Zone. They will be brushed off, rinsed, and transferred into a second pail to be carried to the decontamination station. Generally, tools will be washed with a detergent solution, rinsed with methanol and/or hexane, and finally rinsed with clean water.

Avoid using wooden tools; they cannot be adequately decontaminated due to their absorptive properties. If used, wooden tools cannot be removed from the Exclusion Zone until the end of the project, and then only to be disposed of as hazardous waste.

Sampling Equipment: Sampling equipment will be decontaminated before and between sampling to prevent cross contamination, and when the equipment leaves the Exclusion Zone. Sampling equipment may include trowels, shovels, bailers, submersible pumps, geotechnical samplers, sleeves, and backhoes buckets.

All sampling equipment will be decontaminated using an Alconox wash, or equivalent, followed by two clean water rinses. The sampling tool will then be rinsed with deionized or distilled water and air dried.

Heavy Equipment: Trucks, bulldozers, backhoes and other heavy equipment shall be cleaned with high-pressure water or a portable high-pressure steam spray followed by a soap and water wash and rinse. Loose material shall be removed by brush.

All cleaning water should be collected and stored in approved 55-gallon drums or suitable containers and sampled to determine proper disposal options.

Respirator Decontamination: Respirators when worn will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside or disposed of and the rest

placed in a cleansing solution. Personnel will inspect their own masks to be sure of proper strap readjustment for correct fit.

Certain parts of contaminated respirators, such as the harness assembly or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded, and replaced.

In addition to being decontaminated, all respirators, protective clothing, and other personal articles must be sanitized before they can be used again. The insides of masks and clothing become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator mask. If practical, protective clothing should be machine washed after a thorough decontamination. Otherwise, it should be cleaned by hand.

Instruments: Monitoring equipment should be protected as much as possible from contamination. Drape, mask, or otherwise cover as much of the instruments as possible with plastic without hindering the operation of the unit. The Hnu™ meter, for example, can be placed in a clear plastic bag that allows reading of the scale and operation of the knobs. The HNu™ sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

Contaminated instruments will be taken from the drop area, their protective coverings removed, and disposed of in appropriate containers. Any remaining dirt or obvious contamination will be brushed or wiped with a damp disposable paper wipe. The units can then be placed in a clean plastic tub, taken inside, wiped with damp disposable wipes and dried.

Be aware that many instrument manufacturers and rental companies will not accept contaminated equipment for repair, and that a heavily contaminated piece of equipment, if improperly handled, may have to be disposed of as hazardous waste.

8.6 DISPOSAL OF DECONTAMINATION WASTES

Solid and liquid decontamination waste should be containerized. Solids may be double bagged, or placed in a sealed drum or similar container. Liquids will be collected during decontamination and placed in sealed containers or pumped into holding tanks for future testing and disposal. Containers must be clearly labeled for content, the operation from which they were filled, and the dates.

8.7 DECONTAMINATION DURING EMERGENCIES

Often during emergencies the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost or the additional handling of an injured person during the decontamination process may cause greater harm to the individual than the exposure that would be received by undressing that person without proper

decontamination.

This decision must be made by the SSO. The SSO, as the onsite focus for safety matters, must be familiar with the safety criteria and the logic behind them. Each operation is different, and the risks to personnel from exposure vs. injury are different.

An additional consideration to include when bypassing decontamination of injured personnel is the acceptance of contaminated personnel at emergency facilities. Many facilities will not accept contaminated personnel. Site response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

8.7.1 Physical Injury

Physical injuries can range from minor to life threatening. Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if this does not cause delays, interfere with treatment, or aggravate the problem. Respiratory masks and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away.

If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and/or the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim unless it is known that he has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

8.7.2 Heat Stress

Heat-related illness ranges from heat fatigue to heat stroke, the latter being the most serious. Heat stroke requires prompt treatment to prevent irreversible damage to health or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized

and treatment begun immediately.

8.7.3 Chemical Exposure

Chemical exposure can be divided into two categories:

1. Direct contact through either touch (e.g., acid burns) or inhalation.
2. Indirect contact through gross contamination of clothing or equipment.

Injuries from contaminant inhalation can only be treated by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract its effect. First-aid treatment usually involves flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants may be transferred to the wearer or to treatment personnel and cause injuries. Unless severe medical problems could be created by splashing, the protective clothing should be washed off as rapidly as possible and carefully removed.

Personnel must be aware of the chemical properties of the site hazards as well as the decon rinse solutions used to prevent cross contamination during the sampling process. The SSO shall discuss with all personnel the compatibilities of the water rinse solution with the contaminants being removed prior to decon activities.

9.0 SITE CONTROL AND WORK ZONES

Control will be established around each work location to protect untrained or unprotected workers from exposure to contaminants or other hazards. The SSO or his designated work location safety representative will be responsible for delineating these areas based upon requirements set forth in Section 9.1, results of monitoring obtained during work operations, and site-specific conditions (e.g., proximity of roads or buildings and terrain peculiarities).

9.1 GENERAL

Each work crew will use the "buddy system" during all field work activities, unless a specific written exemption is made by the Health and Safety Professional. In addition, the following procedures shall be observed:

- Personnel shall not enter any area identified with hazard warning signs.
- When lightning is within 3 miles, field operations shall cease.
- All vehicles must be operated in a safe manner.
- The use of seat belts is mandatory at all times when the vehicle is in operation.
- Personnel will not enter a proposed or existing work area or continue remedial activities if unsafe site conditions are present. This includes the presence of unfriendly people or animals.

Control will be established around each work site to prevent the endangerment of untrained or unprotected workers.

9.2 THE EXCLUSION AND CONTAMINATION REDUCTION ZONES

Work locations where ongoing operations create the potential for contact with or inhalation (above action levels) of contaminants are considered to be limited-access, controlled areas. An **Exclusion Zone** must be established at each such work location to prevent unauthorized access by personnel when there is the potential for exposure to contaminants. Once work begins, no one will be allowed within the Exclusion

Zone without wearing the designated level of protective equipment and meeting the training and medical monitoring requirements specified in this plan.

A single entry/exit point should be established at the edge of each Exclusion Zone to facilitate control of personnel entering the area, and as the location for the set-up of decontamination stations outside the Exclusion Zone. An area 10 feet around this decontamination/entry area, but outside the boundary of the Exclusion Zone itself, should be considered as having the potential for exposure to contaminants brought out of the Exclusion Zone by work personnel, and therefore should also be access-controlled. This area will be designated as the **Contamination Reduction Zone (CRZ)**, and should be located upwind from the work location, if possible, or else cross-wind. The CRZ should never be downwind from the work area. Figure 9-1 depicts an example of Exclusion/Contamination Reduction Zone set-up.

Initial requirements for Exclusion Zone set-up are presented here as a guide, however location-specific factors must also be considered. It must be emphasized that Exclusion Zone limits must be sufficient to prevent anyone outside the zone from being exposed to any contaminated materials, or airborne contaminants released during work activities in excess of the action levels established in Table 5-2, as well as physical hazards due to the operations. The CRZ must be large enough to encompass decontamination activities and prevent unauthorized personnel from approaching closer than is safe, typically 10 feet away from all activities (decontamination, etc.) in all directions except toward the Exclusion Zone (where full PPE use is in effect). Typical distances for initial set up of the Exclusion Zone are:

Hand Augering: Ten feet in all directions from the sampling location (using visual control only, no "Caution tape)

Excavation Operations: Thirty feet in all directions from the outer extent of the work location

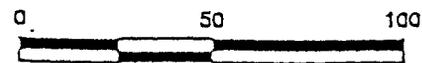
Bulk Soil Handling and Containerization: Thirty feet in all directions from the outer extent of the work location

Drilling Operations (soil boreholes installation): Thirty feet in all directions from the outer extent of the work area

Soil Gas Sampling/Testing: Ten feet in all directions from the sampling location (using visual control only, no CAUTION tape needed)



NORTH



SCALE IN FEET
1"=50'

LEGEND

- EXCLUSION ZONE (EZ)
- CONTAM. REDUCTION ZONE (CRZ)
- LANDSCAPE AREA
- WATER LINE
- SANITARY SEWER LINE
- NATURAL GAS LINE

	PROJECT: 955732.01 ALAMEDA CALIFORNIA
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SITE 7C
NAS ALAMEDA

PROPOSED WORK ZONE

SOURCE: PRC SITE PLAN, FIGURE B-1, UNDATED, SCALE 1"=113'

May 1996

FIGURE 9-1

Soil Sampling: Ten feet in all directions from the sampling location (using visual control only, no "Caution tape)

Decontamination: Thirty feet in all directions from the decon location for large (vehicle, drilling equipment, etc.) efforts conducted at a decon pad. For personal and small parts decon conducted at the work location, keep decon activities within the applicable Exclusion/Contamination Reduction Zone established for that operation.

Exclusion Zones should be delineated, where practical, using yellow "CAUTION" tape and/or fencing to provide a physical barrier to any non-site personnel. Placement of vehicles can be used to provide additional security. The use of "CAUTION" tape (or other visible marker) to delineate the CRZ is not required so long as access to the area is limited to work personnel only. Additionally, all personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (Exclusion Zones and CRZs). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all work at that location must cease. All personnel, equipment and supplies which enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

At the conclusion of all hazardous work location tasks, controlled areas must be properly cleaned so as to be nonhazardous ("clean") prior to relaxation of entry control procedures and PPE requirements. This will occur at tank removal locations when backfill of the excavation has reached the level of the top of the tank (prior to its removal). Once this occurs, Exclusion Zone requirements and use of chemically protective PPE can be discontinued, however use of Level D PPE will still be required.

9.3 THE SUPPORT ZONE

Areas outside the controlled-access portions of the work location (Exclusion Zones and CRZs) are considered to be the Support Zone. In this area the potential to encounter contamination is highly unlikely.

The Support Zone can be used for set up and storage of all equipment, vehicles and supplies which are not required for immediate use in the Exclusion Zone, and can serve as a work area for all nonhazardous tasks which might be undertaken (e.g., paperwork). A break area will also be designated in the Support Zone where personnel can eat, drink, and smoke. The break area is the only place at the work location

where such activities are permitted. In most instances the boundaries of the Support Zone will not be delineated in any special way, and can be regarded as the general area of the work location which is outside the controlled-access areas.

9.4 COMMUNICATIONS

Effective communication is essential to safe working conditions and the successful completion of the project. External communication is maintained by EARTH TECH using cellular telephone links. Cellular phones will be required during sampling, monitoring activities, excavation/trenching, and all other remedial activities to maximize communications with emergency response units (e.g., police, ambulance teams, fire department, etc.).

9.5 EXCLUSION ZONE CONTROL RECORDS

Exclusion Zone control records will be maintained on a daily basis. Site visitors and personnel who enter the Exclusion Zones should be annotated as part of the work location control records. These records will be recorded and maintained as part of the health and safety records or appropriately annotated in the SSO's Field Log Book. Other information to be recorded will include details concerning monitoring efforts undertaken and results (if available), and unusual events that may occur.

10.0 HEALTH AND SAFETY OPERATING PROCEDURES

10.1 GENERAL

10.1.1 Smoking, Eating, and Drinking

Smoking, eating, drinking, and application of cosmetics will not be permitted inside Exclusion Zones and Contamination Reduction Zones (CRZs) at any time. Field workers will first wash hands and face after leaving Exclusion Zones or CRZs prior to eating or drinking. Consumption of alcoholic beverages is prohibited at the site.

10.1.2 Contact with Contaminated Materials

Field personnel should avoid contact with potentially contaminated substances. They should not walk through puddles, pools, mud, etc., and should avoid, whenever possible, kneeling on the ground and leaning or sitting on equipment or the ground. Monitoring equipment should not be placed on a potentially contaminated surface, including the ground surface.

All field crew members should make use of their senses (all senses) to alert them to potentially dangerous situations, e.g., presence of strong, irritating, or nauseating odors.

10.1.3 Site Awareness

Field crew members shall be familiar with the physical characteristics and requirements of the work site, including:

- Entering Exclusion Zones upwind from contamination sources
- Accessibility to equipment and vehicles
- Communication
- Hot zones (areas of known or suspected contamination)
- Site access

- Emergency procedures and evacuation assembly points
- Location of protective and emergency equipment and relevant first-aid procedures.

The number of personnel and equipment in the contaminated area should be minimized, consistent with site operations.

10.2 SITE HEALTH AND SAFETY MEETINGS

10.2.1 Site Safety Orientation

The SSO will conduct a site safety orientation for every person assigned to the project on the following occasions:

- Before field personnel begin work at the site.
- When there are significant revisions or modifications to the Health and Safety Plan.
- When additional workers or subcontractors begin field work and when authorized visitors are required to enter the Exclusion Zone Areas.

A record of the site safety orientation will be documented by each personnel's signing of the signature page which accompanies each site-specific addendum. Additional meetings, including attendees, will be maintained in the project health and safety file. The Health and Safety Professional will assist the SSO to develop the site safety orientation. As a minimum, the orientation and training meeting agenda must include:

- A review of this Health and Safety Plan and the site-specific safety guidance document.
- Verification of medical and safety training clearances, including respirator fit testing.
- Hazard awareness of chemicals which may be encountered on site.
- Fire safety training, fire extinguishment, and evacuation procedures.
- Distribution of the Health and Safety Plan and the site-specific safety guidance document.

- Attendee signatures to acknowledge receipt and understanding of the plan and an agreement to comply.

10.2.2 Tailgate Safety Briefings

The Site Supervisor will conduct a tailgate safety briefing at the start of each work day to review and discuss the health and safety issues associated with the work, problems encountered, and modifications to existing procedures. Documentation of the tailgate safety briefings will be accomplished by using the tailgate safety briefing sign-in log located in Appendix A. The Site Supervisor maintains copies of the tailgate safety briefing sign-in logs in the project files. All field personnel associated with each days project activities are required to attend these meetings.

10.3 ACCIDENT OR INCIDENT REPORTS

All accidents and incidents that occur on site during field activities associated with this project will be promptly reported to the SSO and the Site Supervisor. The Site Supervisor will provide timely notification to the Project Manager. The supervisor of the injured employee or work crew where the accident occurred will initiate the written report. For convenience, the *Injury Report* form in Appendix A may be used to ensure all relevant information is recorded. The Project Manager or Field Supervisor may complete the "Manager" section of the Injury Report and forward the Injury Report to the EARTH TECH Health and Safety Section in the Long Beach Office. The SSO will investigate every accident or illness and, if related to work, complete the Accident/Injury Investigation form found in Appendix A. The Health and Safety Professional will assist accident investigations and Accident Review Boards. The Project Manager will ensure the Accident Review Board recommendations are implemented. The Health and Safety Professional will provide copies of accident documentation to the ROICC within 24 hours of receipt.

10.4 VISITOR CLEARANCES

Visitors will not be allowed within the Exclusion Zones unless they comply with the health and safety requirements of this plan, and can demonstrate a need for entry into the work area which is acceptable to the Site Supervisor. All visitors (including the site owner or the owner's representative, regulatory

agency representatives or EARTH TECH clients) desiring to enter any Exclusion Zone must observe the following procedures:

- The SSO has received written confirmation that each of the visitors has received the proper training and medical monitoring required by this plan. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
- The visitor has been briefed on the hazards associated with the site activities being performed and have acknowledged receipt of this briefing by signing the appropriate tailgate safety briefing form

If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended and monitoring using direct reading instruments must indicate that no airborne contaminant concentrations are present which exceed the established background levels. Until these requirements have been met entry will not be permitted.

10.5 HOUSEKEEPING

During site activities work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Anyone observed throwing contaminated material or PPE away with municipal wastes will be removed from the site.

10.5.1 Water Supply

A water supply meeting the requirements of 8 CCR §1524 will be utilized, consisting of the following:

Potable Water. An adequate supply of potable water will be available for field personnel consumption. Potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water. Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes.

10.5.2 Toilet Facilities

In accordance with 8 CCR §1526 a minimum of one toilet facility will be provided for each sex in a group of 20 employees or less. Where there are least than 5 employees, a toilet facility for each sex need not be provided.

Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

10.5.3 Washing Facilities

In accordance with 8 CCR §1527, employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be used by each employee following exit from the Exclusion Zone, prior to breaks and at the end of daily work activities.

10.6 CONTRACTOR SAFETY

In addition to the requirements of this Health and Safety Plan, subcontractors of EARTH TECH will observe the rules outlined in the "General Safety Rules for Contractors" which are located in Appendix C of this document. Compliance with these rules will be observed by subcontractors during all phases of site activities.

10.7 BUDDY SYSTEM

All onsite personnel shall use the buddy system unless exempted by the SSO (see Section 9.1). The work crew shall be paired off in teams of two. Team members shall maintain visual contact with each other. Team members must observe each other and be alert for signs of heat stress or toxic exposure, including nonvisual effects of toxic exposure, such as:

1. Changes in complexion and skin discoloration.
2. Changes in coordination or demeanor.
3. Excessive salivation and pupillary response.
4. Changes in speech pattern.
5. Headaches, dizziness, blurred vision.
6. Nausea, cramps.
7. Irritation of eyes, skin or respiratory tract.

Anyone exhibiting symptoms should be taken immediately to the nearest medical facility, taking steps to cool the person during transportation, including removing clothing, applying cool water to the skin, placing in air conditioned space, etc.

11.0 EMERGENCY CONTINGENCY PLAN

11.1 GENERAL

There are three major categories of emergencies that could occur during the NAS Alameda - Site 7C project:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic event (fire, explosion, earthquake, or chemical)
3. Safety equipment problems.

Although a catastrophic event or severe medical emergency is unlikely to occur during work activity at the site, an emergency contingency plan has been prepared for this project should such critical situations arise. The purpose of this plan is to establish the appropriate response actions for emergency situations, the means of communication, and the responsibilities of key personnel at the site.

11.2 RESPONSIBILITIES

11.2.1 Site Safety Officer (SSO)

The SSO will be the primary contact individual and coordinator of all emergency activities. He/she will be responsible for:

- Evaluating the severity of the emergency
- Implementing appropriate response action and providing first aid
- Summoning appropriate emergency services (fire department, ambulance, etc.).
- Notifying all site personnel, the Health and Safety Professional, and concerned authorities of the emergency situation.

11.2.2 Other Onsite Personnel

It will be the obligation of the field personnel to inform the SSO of all emergency situations and to abide by their issued response actions. Special medical problems of field personnel such as allergies to insects, plants, prescription medication, etc. will be reported to the SSO.

11.3 WORK STOPPAGE AND CORRECTIVE ACTIONS

The SSO will require temporary work stoppage and implementation of corrective actions in certain or all work zones if the following conditions are encountered:

- Air monitoring shows concentrations of airborne contaminants exceeding Level C requirements as presented in Table 6-2
- Concentrations of airborne contaminants outside the site exceeds 50 percent of the unprotected exposure limits recommended by OSHA (OSHA PELs)
- Emergency conditions directly affect the health and safety of onsite workers or offsite residents or properties.

Corrective actions may include modification of personal protection levels, ventilation, evacuation, or other necessary measures as indicated in site-specific guidance documents. The SSO will be empowered to unilaterally stop work if necessary to meet health and safety requirements.

11.4 MEDICAL EMERGENCIES

Medical emergencies can be described as situations that present a significant threat to the health of personnel. These can result from chemical exposures, heat stress, cold stress, and poisonous insect or snake bites. Medical emergencies must be dealt with immediately and proper care should be administered. Primary emergency response organization will be the Base Emergency response unit. This may be in the form of first aid and emergency hospitalization.

11.5 SAFETY EQUIPMENT PROBLEMS

An emergency may develop due to malfunction or other problems associated with health and safety equipment being used by field personnel. These equipment problems must be corrected before proceeding with field activities. Health and safety problems that may occur include:

- Leaks or tears in protective clothing
- Failure of respiratory protective devices (SCBA, air-purifying respirators)
- Encountering contaminants for which prescribed protective equipment may not be suitable.

11.6 EMERGENCY EQUIPMENT

Provisions will be made to have appropriate emergency equipment available and in proper working condition.

11.6.1 First Aid Kits

Each work site shall have a first-aid kit meeting the following requirements:

- First-aid kits in weather-proof containers, approved by EARTH TECH Occupational Physician and meeting all regulatory requirements, shall be present at all locations where EARTH TECH employees will be working.
- Whenever a new first-aid kit is assembled, a new Inventory List/Physician's Authorization Certificate shall be placed in the first-aid kit as part of its inventory.
- First-aid kits shall be available at the job site at all times.
- Use of any item from the first-aid kit shall necessitate completion of a Supervisor's Employee Injury Report. The report shall be submitted to Health and Safety within 1 working day.
- For local field services work, first-aid kits shall be returned to the storeroom at the end of each workday.
- First-aid kits shall be inspected and restocked weekly. An inventory of first-aid supplies

sufficient to restock kits on a weekly basis shall be maintained.

- For jobs outside the local area, the site supervisors shall replenish the kit from the nearest pharmaceutical source, with equivalent supplies to those used (until proper restocking by the storeroom can be accomplished), unless such supplies can economically be made available to the job from the storeroom.
- Personnel permitted to use first-aid kits shall possess a current first-aid card.

11.6.2 Eyewash Units

Eyewash units meeting the requirements of ANSI Standard Z358.1-1981 will be utilized at the site. All units shall also comply with the provisions of 8 CCR §5162, and shall be capable of supplying hands-free irrigation for both eyes for at least 15 minutes at a flow rate of at least 0.4 gallons per minute.

11.6.3 Fire Extinguisher

A fire extinguisher capable of extinguishing Class A, B, and C fires will be available for use at the site at all times. Site personnel will be readily aware of the location of the fire extinguisher at all times in the event of an incident where a fire extinguisher may be utilized. At a minimum the fire extinguisher shall carry a rating of 1-A,10B,C.

11.7 CATASTROPHIC EVENT PROCEDURES

In the event of a catastrophic incident:

- Work activities will cease and all project personnel will be evacuated from the work location. The evacuation will proceed in a direction opposite of the critically affected area with all personnel assembling in a predesignated location outside of the job site proper.
- A headcount will be taken of the assembled employees and any injured individuals shall be administered first aid
- If not present at the work location, the SSO will be contacted immediately

A universal signal for emergency evacuation (e.g., use of a horn), and designation of the evacuation

assembly location, shall be established by the SSO and briefed to all workers during initial site-specific training. Any changes mandated by changing site conditions shall be determined by the SSO and communicated to workers during the daily tailgate safety briefing.

11.8 MEDICAL EMERGENCY PROCEDURES

In the event of a medical emergency:

- All injured individuals may be given appropriate emergency first aid by a qualified individual trained in first aid
- Severely injured personnel shall be transported to the designated hospital listed in Table 11-1.

TABLE 11-1 EMERGENCY TELEPHONE NUMBERS

<u>Local Emergency Contacts:</u>	<u>Base Phone</u>	<u>Off-Base Phone</u>
Ambulance	9-911	(510) 869-4444
Industrial Medical Clinic (Building No. 10)	4444	(510) 869-3173
Fire Department	9-911	(510) 869-4333
Security	6575	(510) 869-3053

Hospital Facilities

Alameda Hospital 2070 Clinton Avenue	9-522-3700	(510) 522-3700
Hospital Emergency Room	9-523-4357	(510) 523-4357

Directions to Hospital (also see Figure 11-1): From the East Gate of site proceed east along Atlantic Ave. to its intersection with Webster St. Turn right (south) onto Webster, and proceed to its intersection with Central Ave. Turn left (east) onto Central and proceed to the intersection with Encinal Ave. Bear right onto Encinal and proceed to the intersection with Grand St. Turn right on Grand St. and left on Clinton Ave. Hospital is on the right-hand side, at the intersection of willow and Clinton.

Information and Response Organizations

Poison Control Center (Regional)	(800) 484-5151
Poison information available at Los Angeles County Medical Association	
CHEMTREC	(800) 424-9300
National Poison Control Center	(800) 458-5842
Local Poison Control Center	(800) 523-2222
TSCA Hotline	(202) 554-1404
Centers for Disease Control (CDC)	(404) 452-4100 (404) 329-2888
National Response Center	(800) 424-8802
EPA Environmental Response Team (ERT)	(201) 321-6660
Resource Conservation and Recovery Act (RCRA) Hotline	(800) 424-9346

EARTH TECH Personnel

Health and Safety Professional

Ronald A. Partilla, CSP, OHST (310) 495-4449
Pager (310) 527-6331

Health and Safety Manager

Robert M. Poll, CIH, CSP (310) 495-4449
Pager (310) 764-7507

Project Manager

Akali Igbene (510) 874-5400

Task Manager

Mark Milani. (510) 540-6954

EFA-West Remedial Project Manager (EFA-West RPM)

Mr. George Kikugawa (415) 244-2549

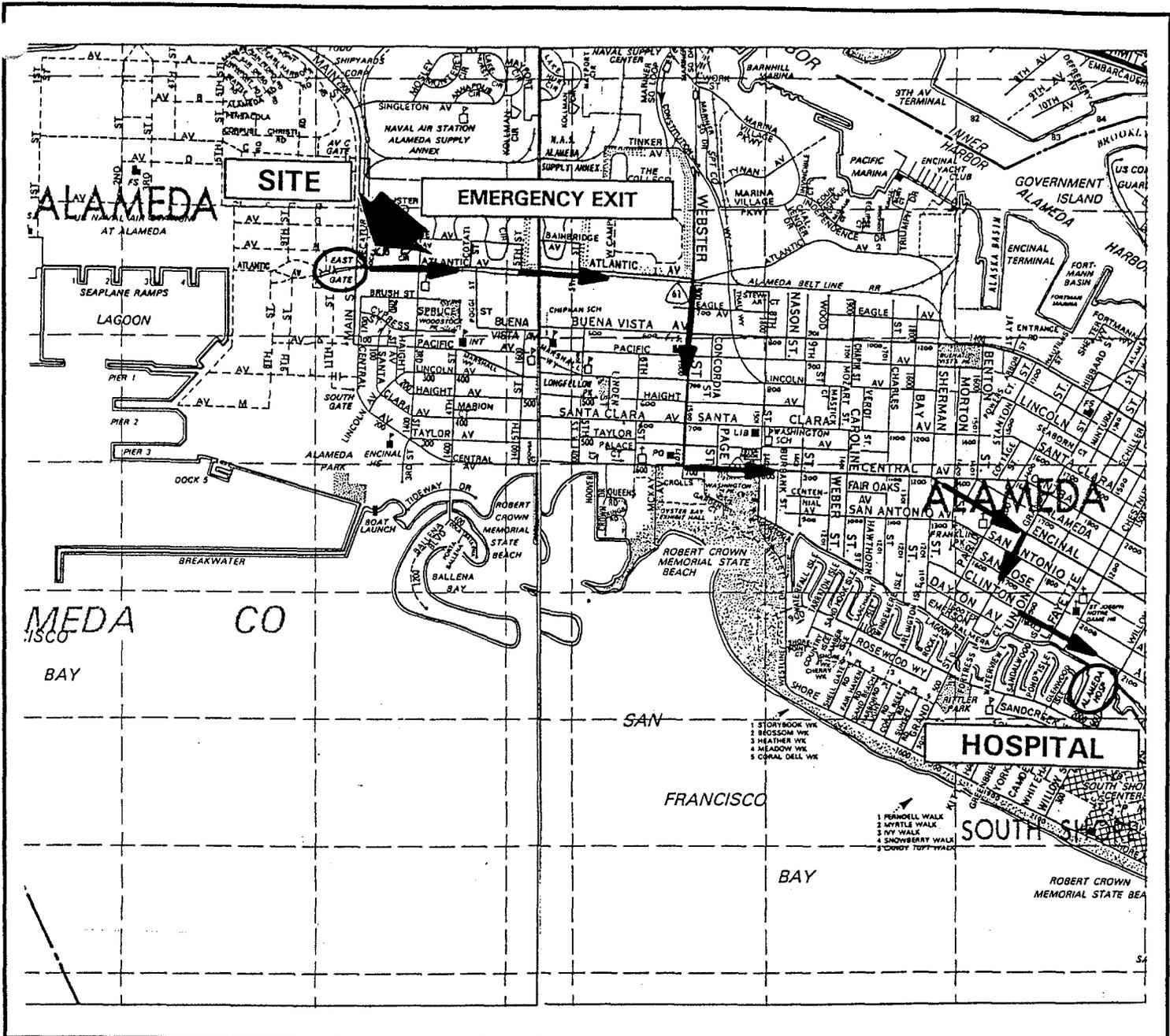
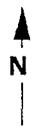


Figure 11-1
 SITE VICINITY MAP AND HOSPITAL ROUTE
 - SITE 7C NAS ALAMEDA



Resource: Thomas Bros Maps

Project No. - 95A7C01
 May, 1996

APPENDIX A

HEALTH AND SAFETY FORMS

Injury Report

E A R T H  T E C H

This is an official document to be initiated by the injured employee's supervisor. Please answer all questions completely. This report must be forwarded to the Health and Safety section office within 24 hours of the injury.

Injured's name		S.S.No.	Sex	Birthdate
Home address		City	State	Zip
Job Title	Section	Hire date	Hourly wage	Phone

Supervisor

Date of incident	Time	Time reported	To whom
Client name	Client address		Time shift began
Exact location of incident		Did injured leave work?	When?
Has injured returned to work? <input type="checkbox"/> Yes <input type="checkbox"/> No		Did employee miss a regularly scheduled shift? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Doctor/hospital name		Address	
Witness name		Statements attached <input type="checkbox"/> Yes <input type="checkbox"/> No	
Nature of injury		Body part	
Medical attention			
Job assignment at time of accident			
Describe incident			
What caused the accident?			
What corrective action has been taken to prevent recurrence?			
Supervisor/foreman Print name		Signature	Date

Manager

Comments on incident and corrective action		
Manager Print name	Signature	Date

Health and Safety

Concur with action taken? <input type="checkbox"/> Yes <input type="checkbox"/> No Remarks:		
OSHA classification <input type="checkbox"/> Incident only <input type="checkbox"/> First aid <input type="checkbox"/> No lost work days <input type="checkbox"/> Lost work days <input type="checkbox"/> Restricted activity <input type="checkbox"/> fatality		
Days away from work	Days of restricted work	Total days charged
HS Professional Print name	Signature	Date

Accident/Injury Investigation

Must be completed within 72 hours



1. Date _____ Section _____ Date of Accident /Injury _____

Employee Name _____

Supervisor Name _____

Job Number/Name _____

Location of Accident/Injury _____

2. Accident/Injury Classification

- Injury** Near Miss **Vehicle** Chargeable **DOT** DOT Vehicle
 First Aid Nonchargeable DOT Reportable
 OSHA Recordable Not at Fault
 Lost Workday **General Liability**

3. Description (Provide facts, describe how incident occurred, provide diagram (on back) or photos)

4. Analysis 1 (What unsafe acts or conditions contributed to the incident?)

5. Analysis 2 (What systematic or management deficiencies contributed to the incident?)

6. Corrective action (List corrective action items, responsible person, scheduled completion date)

7. Witnesses (Attach statements or indicate why unavailable)

8. Investigated by	_____	_____	_____
	Print Name	Signature	Date
Manager	_____	_____	_____
	Print Name	Signature	Date

Attach additional pages if needed.

APPENDIX B
DRILL RIG SAFETY GUIDELINES

DRILLING EQUIPMENT OPERATIONS

B.1 General Drilling Practices

Prior to the start of site work, the drilling subcontractor will inspect all drilling equipment. The inspection will be documented in the field records. If field operations last longer than one week, the drilling equipment inspection must be repeated on a weekly basis.

EARTH TECH will conduct geophysical clearance and determine the location of all underground utilities before the start of drilling operations. In addition to obtaining the utility locations from the client, EARTH TECH will make a utility survey of each drilling point. The utility survey shall include both magnetometer and ground penetrating radar survey. Documentation that nearby utilities have been marked on the ground and that the drill site has been cleared shall be kept on file by EARTH TECH and confirmed to the drilling subcontractor.

Drill rig maintenance and safety is the responsibility of the drilling subcontractor. The following information is provided as general guidelines for safe practices during drilling activities, and installation of monitoring/extraction wells.

1. No food or beverage will be consumed or stored in the work area.
2. EARTH TECH will contact appropriate utilities agency to survey, mark and flag locations of buried utility lines.
3. Maintain orderly housekeeping on and around the drill rig.
4. Store tools, materials and supplies to allow safe handling by drill crew members. Proper storage on racks or sills will prevent spreading, rolling or sliding.
5. Avoid storage or transportation of tools, materials or supplies within or on the drill rig derrick.
6. Maintain working surfaces free of obstructions or potentially hazardous substances.
7. Store gasoline only in containers specifically designed or approved for such use.
8. Wear eye protection when chipping, chiseling or breaking material that presents risk of flying objects.
9. The departing driller should inform the oncoming driller of any special hazards or ongoing work that may affect the safety of the crew.
10. Fire fighting equipment should not be tampered with and should not be removed for other than the intended fire-fighting purposes or for servicing.
11. If lubrication fittings are not accessible with guards in place, machinery should be stopped for oil and greasing.

12. Rigging material equipment for material handling should be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging should be removed from service.
13. The area around the derrick ladder should be kept clear to provide unimpeded access to the ladder.
14. Work areas and walkways should not be obstructed.
15. The rotary table of the rig floor shall be kept free of obstructions and free of undue accumulation of oil, water, ice, or circulating fluids.

B1.1 Moving Rig to Drilling Location

1. Inspect the route of travel before moving drill rig off-road. Note rocks, trees, erosion, and uneven surfaces.
2. Remove all passengers from the cab before moving drill rig onto rough or sloped terrain.
3. Engage multiple drive power trains (when available) on rig vehicle when mobilizing off-road.
4. Travel directly up or down grade on slopes when feasible. Avoid off-camber traverse approaches to drill sites.
5. Approach changes in grade squarely to avoid shifting loads or unexpected unweighting.
6. Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
7. Use hand brakes and block rig wheels when grades are steep.
8. Lower rig mast before moving rig.
9. Secure all loads to rig prior to off-road mobilization.
10. EARTH TECH will use geophysical techniques, or equivalent, to locate buried utility lines.

B1.2 Raising Mast

1. Locate visually overhead and buried utilities prior to drilling operations.
2. Treat overhead electrical lines as if they were energized and maintain at least 40 feet clearance.
3. EARTH TECH will contact appropriate utilities agency to manipulate and deactivate overhead service in areas that interfere with drilling operations. Do not attempt to handle utilities.
4. Stabilize and level each work site prior to drill rig set-up.
5. The derrick must not be raised until the rig has been blocked, leveled, and chocked.

6. Note wind speed and direction to prevent overhead utility lines from contacting rig derrick. Allow at least 20 feet clearance between rig mast and utility lines.

B1.3 Hoisting Operations

1. Drillers should never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.
2. Unless the draw works is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.
3. Drill pipe or casing should not be picked up suddenly.
4. Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrick man has signaled that he may safely hoist the pipe.
5. During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor and no one should be on the rig or derrick.
6. The brakes on the draw works of every drilling rig should be tested by each driller, when he comes on shift, to determine whether they are in good order. The brakes should be thoroughly inspected by a competent individual each week.
7. A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.
8. Workers should never stand near the well bore whenever any wire line device is being run.
9. Hoisting control stations should be kept clean and controls labeled as to their functions.
10. Inspect wire, rope, hoisting hardware, swivels, hooks, bearings, sheaves, guides, rollers, clutches, brakes for the following:
 - abrasions
 - breaks
 - wear
 - fatigue
 - corrosion
 - jamming
 - kinking
11. Avoid the suspension of loads when hoist is unattended.
12. Prevent hoisting loads directly over field personnel.
13. Restrict hoisting operations during unfavorable environmental conditions such as rain or high winds.

14. Maintain safe hand distance from hoisting equipment (e.g., wire rope, hooks, pinch points) when slack is reduced.

B1.4 Riding Hoisting Equipment

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

B1.5 Cat Line Operations

1. Only experienced workers will be allowed to operate the cat head controls. The kill switch must be clearly labeled and operational prior to operation of the cat line.
2. The cat head area must be kept free of obstructions and entanglements.
3. The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.
4. Personnel should not stand near, step over, or go under a cable or cat line which is under tension.
5. Employees rigging loads on cat lines should:
 - Keep out from under the load
 - Keep fingers and feet where they will not be crushed
 - Be sure to signal clearly when the load is being picked up
 - Use standard visual signals only and not depend on shouting to coworkers
 - Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

B1.6 Pipe Handling

1. Pipe should be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer should be effectively blocked or chocked.
2. Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.
3. Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.
4. Slip handles should be used to lift and move slips. Employees should not be permitted to kick slips into position.
5. When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.
6. Pipe stored in racks, catwalks, or on flatbed trucks should be chocked to prevent rolling.

B1.7 Derrick Operations

1. The derrick climber should be used whenever climbing the derrick. Personnel on the derrick should be tied off, or otherwise protected from falling when working in an unguarded elevated position.
2. All stands of pipe and drill collars racked in a derrick should be secured with rope or otherwise adequately secured.
3. Tools, derrick parts, or materials of any kind should not be thrown from the derrick.
4. The elevators must be properly clamped onto all pipe joints prior to the driller engaging the load.

B1.8 Making and Breaking Joints

1. Tongs should be used for the initial making up and breaking of the joint. The rotary table should not be used for the initial breaking of a joint.
2. Employees making or breaking joints should not be permitted to stand within the arc of the tong handles when the tong pull line is under tension. Employees should handle the tongs only by the appropriate handles.
3. Employees should be trained in the safe use of spinning chains. Spinning chains should not be handled near the rotary table while it is in motion.

B1.9 Drilling Operations

1. Begin auger borings slowly with the drive engine operating at low speed.
2. Establish a communication system between driller, helper and geologist for responsibilities during drilling operations.
3. Engage auger to power coupling as recommended by manufacturer.
4. Restrict contact with power coupling or auger during rotation.
5. Prevent placing hands or feet under auger during rotation.
6. Prevent placing hands or feet under auger sections during hoisting over hard surfaces.
7. Avoid the removal of spoil cuttings with hands or feet.
8. Assure drill rig is in neutral and the augers are not rotating before cleaning augers.

APPENDIX C
GENERAL SAFETY RULES FOR CONTRACTORS

Introduction

The rules and requirements contained in this attachment have been written for the guidance of Contractors who are performing work under contract with EARTH TECH. This booklet prescribes general requirements and regulatory references only, where revisions to such documents provide more stringent guidelines than established here the new guidelines will be followed.. Additional specific rules may be necessary to ensure the safety of workers on a particular job. The Contractor, working in collaboration with the EARTH TECH representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with all EARTH TECH, regulatory, and insurance requirements and those of our clients. EARTH TECH health and safety professionals are available to assist.

The term Contractor, as used in this attachment, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to EARTH TECH.

Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. EARTH TECH may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to EARTH TECH property or job sites or our client's property for those Contractors not in compliance.

In order to assist Contractor in following these instructions, a EARTH TECH Representative will be assigned to the Contractor to act as EARTH TECH's agent in all matters relative to work activities at EARTH TECH facilities or job sites. Under no circumstances shall any work be started until the EARTH TECH Representative has been contacted, a job orientation has been conducted by the EARTH TECH Representative, and all permits, insurance, EARTH TECH, client, and regulatory pre-job requirements met.

The EARTH TECH Representative and the EARTH TECH Health and Safety professionals are authorized to stop any work which they may consider hazardous to EARTH TECH personnel or equipment or Contractor personnel. This authority may be delegated to appropriate individuals.

General Safety Rules and Requirements

Accident Reporting

All accidents (personal and property damage) shall be reported orally to the EARTH TECH Representative as soon as emergency conditions no longer exist. A written report shall follow within 7 days after emergency conditions are resolved.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on EARTH TECH property or job sites. Personnel under the influence of alcohol or drugs shall not be allowed on EARTH TECH property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorization and approval from the EARTH TECH Representative before:

- Working on existing pipelines or equipment
- Entering tanks or closed vessels
- Entering any designated high-hazard areas
- Using torches, electrodes, electronic motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source
- Closing walkways, roads, or restricting traffic
- Starting excavations
- Removing tanks from excavations
- Backfilling excavations
- Using utilities such as steam, water, compressed air, or electricity
- Sandblasting, spray painting, or guniting
- Storing flammable materials such as gasoline, oil, paints, oxygen cylinders, etc.
- Walking or working on roofs of buildings or equipment
- Drilling, boring, preparing test pits, or using geophysical equipment or any other

exploratory equipment requiring penetration of surfaces

- Operating cranes or similar equipment near overhead power lines or pipelines
- Opening cutting through firewalls or berms
- Fueling or repairing Contractor operating equipment on EARTH TECH property or job sites.

Security

For security reasons, entrance to and exit of EARTH TECH facilities and job sites is restricted to those areas designated as the Contractor's work area.

Speed Limits

All vehicles on EARTH TECH job sites and facilities must observe a maximum speed limit of 10 mph unless otherwise posted.

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Vehicles will only be operated by personnel with valid licenses and good driving records.
- Vehicles shall have all required inspection and operating permits.
- Seat belts shall be used.

Safe Work Practices

Communication

Communication and coordination is vital to prevent accidents on construction sites. Every worker must be aware of equipment operating in his vicinity.

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the EARTH TECH Representative of intent to enter. The EARTH TECH Representative will review with Contractor the safe entry requirements which include:

Removal of Contents. Before entering, confined spaces should be as clean and free of hazardous materials and chemicals as possible. Where appropriate, confined spaces may be purged by water or other suitable means. Purging with hazardous solvents should be avoided where possible.

Isolation. All input lines which discharged into the confined space shall be disconnected and capped or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable provided that dangerous air contaminants are not introduced by such venting. Isolation valves shall be locked closed, vent or drain valves shall be locked open, and the key shall be kept by that person performing the job.

Electrical Lockout. Where electrical devices located within the confined space (motors, switches, etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the line, each must place a lock on the switch and retain his own key.

- Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.
- Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers. All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot close. See Excavations and Trenches for guarding requirements.

Testing Atmosphere. A qualified person (NIOSH Publication No. 80-106) using only equipment approved and tagged for Class 1, Division 1 locations shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit
- Oxygen content is no less than 20 percent and no greater than 25 percent
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established threshold limit values (TLVs).

Continuous Monitoring. If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, continuous monitoring of the atmosphere and/or the oxygen content drops below 20 percent, all personnel shall evacuate the confined space immediately.

Ventilation. All confined spaces found to be unsafe must be ventilated by means of mechanical exhaust systems arranged so as to avoid recirculating contaminated air. The Contractor must contact the EARTH TECH Representative to obtain approval not to ventilate. Personnel shall be evacuated immediately in the event of failure of the mechanical ventilation system. The confined space shall be retested prior to reentry following ventilation system repair.

Buddy System. At least two workers shall remain outside the confined space. One standby worker shall be stationed just outside the access opening of the any confined space while such space is occupied. This person shall:

- Maintain continuous awareness of the activities and well-being of the occupant in the confined space
- Be able to maintain communication at all times
- Be alert and fully capable of quickly summoning help
- Be physically able and equipped to assist in the rescue of an occupant from a confined space under emergency conditions.

Safety Gear and Personal Protective Equipment. All Contractor employees must be instructed in accordance with OSHA regulations regarding safety gear and personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering

any confined space.

Confined Space Entry Permit. Each subcontractor engaging in the entry of a confined space shall utilize an entry permit meeting the requirements of 29 CFR 1910.146. The permit shall be approved and signed by the EARTH TECH SSO prior to initiation of the entry procedure.

Compressed Gas Cylinders

Valve protection caps. Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored.

Cylinder valves. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.

Compressed gas cylinders. Compressed gas cylinders shall be secured against rolling or tipping (roped or chained) at all times, except when cylinders are actually being hoisted or carried.

Gas regulators. Gas regulators shall be in proper working order while in use.

Leaks. If a leak develops in a gas cylinder, after donning appropriate safety equipment, immediately remove it to a safe location. If the leak cannot be corrected, report it to the EARTH TECH Representative.

Identification of Contents. Cylinders should be permanently marked or stenciled to identify the type of gas in the cylinder.

Breathing Air. All compressed breathing air shall meet OSHA specifications for breathing air quality. All compressed breathing air cylinders shall have their contents checked at the job site for correct oxygen concentration and rejected for breathing air if the oxygen concentration is not $20.7\% \pm 0.2\%$.

Oil and oily rags. Oil and oily rags shall be kept away from oxygen equipment.

Cranes, Hoists, and Other Heavy Equipment

Contractor personnel will not be permitted to use hoists and powered apparatus belonging to EARTH TECH unless approval is obtained in each instance from the EARTH TECH Representative.

ROPs. Roll over protection shall be used when conditions or regulations call for such use.

Cutting or Welding

Hot Work/Welding/Burning. "Hot Work" authorization must be obtained from the EARTH TECH Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the EARTH TECH Representative at the completion of the job or at the end of each workday.

Welding Flash. Noncombustible or flame-proof shields or screens must be provided to protect welder or others who might be harmed by direct rays or arc.

Personal Protective Equipment. Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the EARTH TECH Representative.
- Contractor shall provide his own calibrated combustible gas meter or other instruments for checking areas before hot work.
- Documentation of calibration shall be submitted to the EARTH TECH Representative for review by the EARTH TECH Health and Safety Section.
- Contractor is responsible for all testing and monitoring required by applicable regulations and to assure work place safety.
- EARTH TECH shall have the right, not the responsibility, to perform additional testing. EARTH TECH testing shall not be in lieu of Contractor's requirements.
- In the event of a bona fide emergency, such as emergency spill response work, and where the Contractor warrants that he cannot conduct the required testing, EARTH TECH may upon written agreement then conduct all tests necessary to assure safety and regulatory compliance. The Contractor shall cosign the "hot work" permit form when tests are conducted by EARTH TECH personnel.
- Contractor shall provide his own fire extinguisher(s) for welding and cutting, as designated by the EARTH TECH Representative.

Electrical Safety

Grounding. The noncurrent-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Electrical connections shall include a ground-fault interrupter system. Ground wires shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

Extension Cords. Extension Cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage; do not fasten with staples or extend across an aisle way or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.

Light Bulbs. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is likely and shall meet Class I, Division I requirements.

Electrical Receptacles. Receptacles for attachment plugs shall be of the approved, dead-front, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Wet Environments. Work done in wet environments shall require ground fault interrupters and water-tight connectors.

Emergency Equipment

EARTH TECH's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the EARTH TECH Representative.

Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, or blocked without the express permission of the EARTH TECH Representative.

Excavations and Trenches

Permits. Before any excavation work begins, all required permits shall be obtained.

"Dig-Alert". Before any excavation work begins, the existence and location of underground pipes, electrical conductors, etc., must be determined by Contractor who shall in turn notify the EARTH TECH Representative.

Cave In Protection. The walls and spaces of all excavations and trenches (which will be entered by people) more than 4 feet deep shall be guarded by shoring, sloping of the ground, or some other equivalent means, in accordance with Cal/OSHA regulations.

Daily Inspections. Daily inspections of excavations shall be made by the Contractor. If there is evidence of possible cave-in or slide, all work in the excavation shall cease until the necessary safeguards have been taken.

Egress. Trenches more than 4 feet deep shall have ladders or steps located so as to require 10 feet or less of lateral travel between means of access.

Backfill. All trenches shall be backfilled as soon as practical after work is completed and all associated equipment removed.

Housekeeping. All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner which ensures the safety of EARTH TECH and Contractor employees at all times.

Fall In Protection. All trenches shall be completely guarded on all sides. Standard guardrails are preferred. However, when wooden or metal barricades are used for trench guarding, they shall be spaced no further apart than 20 feet, and at least two feet from the edge of the trench. Such barricades shall be at least 36 inches high when erected.

- Battery-lighted barricades shall be used as follows:
 - (1) A minimum of two battery-lighted barricades shall be used at corners, one on each side of the barricade.
 - (2) At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.
 - (3) Where trenches parallel roadway, distance between battery-lighted barricades shall not exceed 40 feet unless this requirement conflicts with Item (1), above, and additional units are required.
 - (4) All battery-lighted units shall be serviced as necessary to ensure equipment is operating.
- Caution tape shall be stretched securely between barricades. The caution tape shall be at least 3/4-inch-wide and shall be yellow or yellow and black and may have the words "CAUTION - DO NOT ENTER."
- Barricaded sections immediately adjacent to where pedestrians cross trenches shall be arranged to direct pedestrians to the walkway or bridge.

Encroachment. Use of other trench excavating equipment, or storage of equipment or supplies within

a distance equal to the depth of the trench, will not be permitted without approval by the EARTH TECH Representative.

Bridges. All pedestrian bridges shall be of sufficient strength to prevent no greater vertical deflection than one-half inch when a 250-pound weight is applied to the center of the bridge.

- Handrails shall consist of intermediate and top rails on both sides of the bridge. The top rail shall be between 42 and 45 inches above the walking surface and be capable of withstanding a lateral force of 200 pounds against the center of the top rail.
- All surfaces which a person could reasonably contact should be sufficiently free of splinters, nails, or protrusions which may cause injury.
- All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Earth Grading Activity

Vest. All persons within an area where earthmoving are operating shall wear a safety vest or jacket at all times. Vests may be red, orange, or day-glo green in color, but bright or fluorescent orange is preferred. Significantly faded or damaged vest must be replaced.

Communication. Anytime a test pit is to be excavated, the technician shall notify the grading contractor's **authorized** representative for that area. That individual may be acting in the capacity as a dump man, operator, or supervisor from an independent vehicle. Advise that representative of the test pit location and request their cooperation to promote safety during the test period. This should include their advising those under their supervision of your existence in the grading area. Make a notation on your records of the name of the individual with whom you spoke so that the communication is documented.

- Provide notice to the grading contractor
- Identify location of test pit
- Request the cooperation through the completion of the tests and document accordingly.
- A flag must be affixed to any vehicle driving in an earth grading activity area and hazard warning lights shall be operated.

Flags. Every over-the-road vehicle operating in the area of earthmoving equipment activity must carry a flag. The flag must be at least 300 square inches in area with no dimension less than 12 inches. Flags must be high visibility red, orange, day-glo green and mounted approximately 12 feet above grade level.

Hazard Warning Lights. Every over-the-road vehicle operating in the area of earthmoving equipment

activity must operate the hazard warning flashers at all times.

Rotating or Flashing Beacon. All vehicles stationary in the grading area shall use a rotating or flashing amber beacon or strobe light on the top of the cab of the vehicle during all field testing.

Orientation of Test Pits. The technician is responsible for selecting a test pit location. Of paramount concern is the technician's safety. The test pit should be located behind the established pattern of grading equipment and outside any existing patterns. The orientation of the pit should include the use of the technician's vehicle as a barrier to potential oncoming traffic. The waste pile created from the excavation of the test pit should be opposite the vehicle so that the test pit is positioned between the vehicle and the waste pile. A flag shall be placed immediately on top of the waste (spoil) pile, satisfying the same requirements as the vehicle flag. See Figures C-1 and C-2.

Zone of Non-Encroachment. The location of the test pit must be selected so that no earthmoving equipment will approach closer than 50 feet from the center of the test pit. See Figure C-1. This is not only for the technician's safety, but to ensure the integrity of the test. Excessive vibration from the operation of earthmoving equipment operating too closely may impair the accuracy or spoil the test results.

Completion of Tests. Immediately upon completion of tests, record the data and withdraw flags and vehicles outside the grading area to record notes and do calculations.

Fire Prevention

EARTH TECH Representative, or his designee, is authorized to correct any condition which he may consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Foreman in regard to fire hazards without waiting for the EARTH TECH Representative.

Floor Openings

Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of pedestrians or vehicular traffic. Barriers will be supplied by the Contractor.

Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

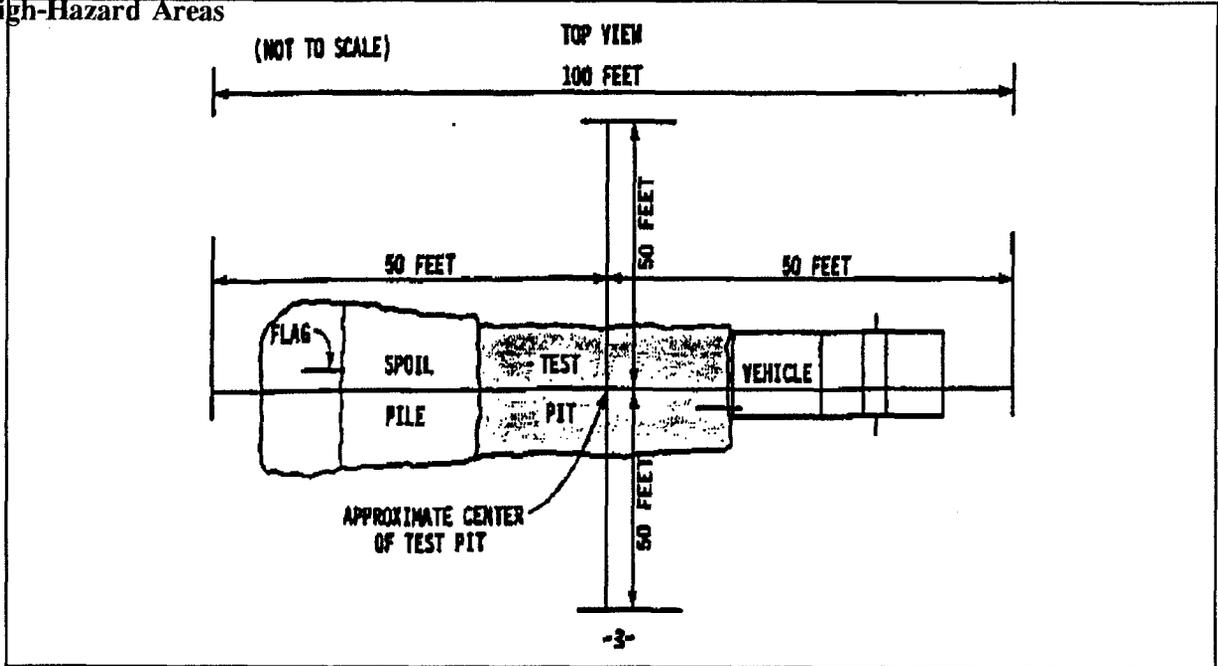


Figure C-1

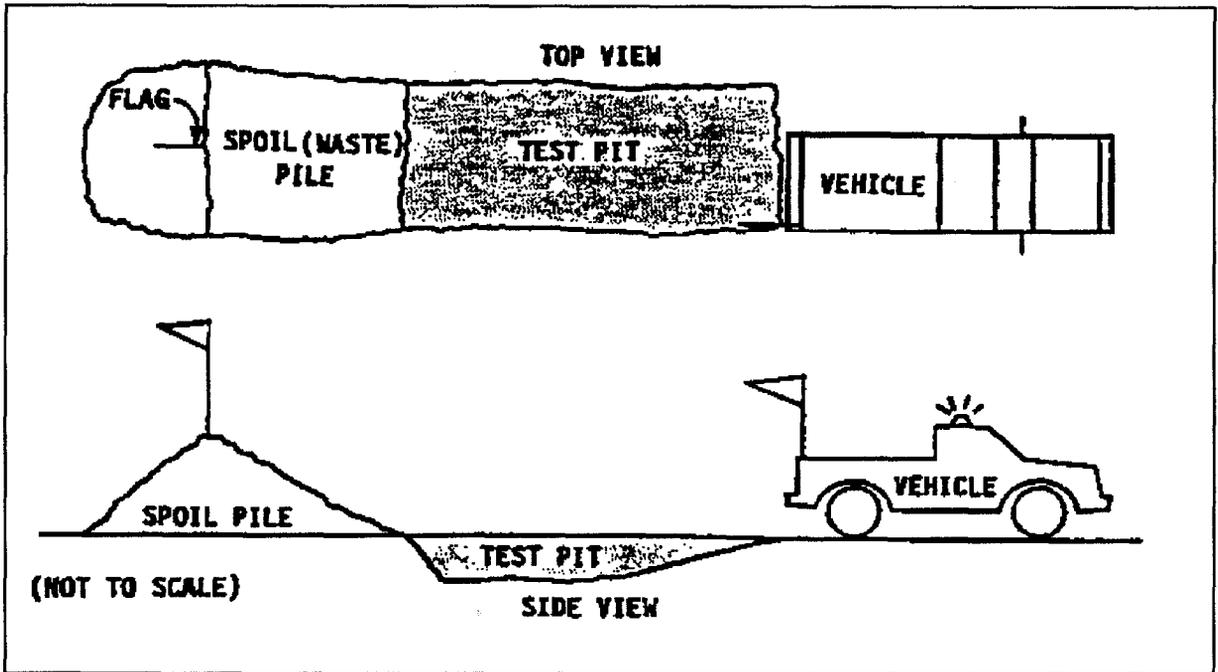


Figure C-2

Although this list may not be all inclusive, there are certain areas and operations at EARTH TECH

facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, the Contractor is required to check with the EARTH TECH Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Laboratories
- Chemical storage and disposal areas.

The contractor is also required to check with the EARTH TECH Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anyplace on the site.

Housekeeping

Material should be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency safety showers, fixed ladders, stairways, or electrical breaker panels.

- Nails protruding from boards must be removed or bent over.
- All work areas shall be kept clear of form and scrap lumber and all other debris.
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals.
- Containers shall be provided for the collection and separation of refuse by type. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each work day, Contractor shall provide for pick up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.

- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.

- Tie off top of ladder to structure.

Medical Service and First Aid

Emergency Medical Service. Preplanned emergency medical service shall be provided as designated by Contractor and approved by the EARTH TECH Representative.

First Aid Kit. Each Contractor shall provide a first aid kit for his employees which meets minimum OSHA requirements.

Mobile Cranes

Mobile cranes, including portable crane derricks, power shovels, or similar equipment, shall not be operated within ten feet of overhead electrical power lines.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and protective clothing is required. The type of protective equipment to be worn will be determined by the degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at EARTH TECH job sites. When in doubt of the safety measures to be observed, Contractor shall contact the EARTH TECH Health and Safety Section. This shall not, however, relieve Contractor of his responsibilities to determine appropriate protection.

Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing
- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc.
- Burning or welding
- Other situations which create a possible eye hazard, e.g., chemical environments.

Photographs

Only EARTH TECH photographers are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the EARTH TECH Representative.

Power Tools

Power and Air-Actuated Tools. Gasoline-powered, electric, or air-actuated tools are not to be used on EARTH TECH property or job sites without prior approval of the EARTH TECH Health and Safety Department. To obtain approval, Contractor must contact the EARTH TECH Representative.

Explosive-Actuated Tools. Explosive-actuated (powder-actuated) fastening tools shall meet the design requirements in "American National Standard Safety Requirements for Explosive-Actuated Fastening Tools" (ANSI A10.3-1970). A tool which does not meet these design standards cannot be used.

- Power tools shall never be left unattended in a place where they would be available to unauthorized persons.
- Power tools shall not be used in explosive or flammable atmospheres.

Fall Protection

Appropriate fall protection, such as safety harness and lanyard, must be worn when worker is exposed to falling more than 6 feet. Lanyard or lifeline must be tied off to appropriate structure capable of supporting five times the weight of the person (nominal 1000 pounds).

- Appropriate fall protection, such as safety harness and lanyard, must be worn when working above eight feet on straight or extension ladders when the work involves pushing, pulling, or action which may dislodge the person from the ladder.
- Safety harnesses are also required on swinging or portable scaffolds when handrails and toeboards are not provided (six feet or more above ground or floor level).
- Safety harnesses and lifelines (including extraction devices for top entry spaces) are required on all work performed in confined spaces where an oxygen deficiency or toxic vapors may exist.
- All lifelines shall be safety secured to stable and adequate supports.
- Safety harnesses and lifelines must be worn on rooftops where there are no guardrails and where the work is within ten feet of the edge.

Salamanders

- "Hot work" authorization must be obtained from the EARTH TECH Representative before using a salamander.

- Salamanders must be a Factory Mutual or Underwriters Laboratories-approved type.
- Position salamanders away from all combustible material to reduce the possibility of uncontrolled fire.
- Guard salamanders from traffic to prevent them from being overturned.

Scaffolds

All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in ANSI A10.8-1988, Safety Requirements for Scaffolding. Rolling scaffolds shall maintain a three-to-one height-to-base ratio.

- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting at least four times the maximum intended load without failure.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.
- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.
- All scaffolds, boatswain's (bosun's) chairs, and other work access platforms shall conform to the requirements set forth in the federal OSHA Regulations for Construction (29 CFR 1926.451) except where the specifications in ANSI A10.8 or state or local regulations are more rigorous.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.
- Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside the buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data sheets, for materials used by the Contractor, shall be maintained by the Contractor, and a copy provided to the EARTH TECH Representative.

Tarpaulins

When tarpaulins are required for the detection of hot slag, dust, paint drippings, etc., or as security barriers, they shall be flame-resistant and in good condition.

Tools

Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and should not be used. Hammers should have handles which are not cracked, split, or broken.

Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to EARTH TECH, Contractor, and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than 10 feet.

- Tools, materials, and equipment must not be left unattended in access ways.
- Tools, material, and equipment shall not be removed from the job site without permission of the EARTH TECH Representative.

Walking and Work Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings of more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers, barricades, etc. wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees. EARTH TECH management may stop or suspend work at any time the Contractor fails to comply with EARTH TECH rules and regulations.

Regulatory References

- (a) *Standard Operating Safety Guides*, USEPA, November 1984
- (b) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH 85-115, 1985
- (c) Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (USDOL/OSHA), with special attention to Section .120, Hazardous Waste Operations and Emergency Response
- (d) Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (USDOL/OSHA)
- (e) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 7, (commencing with Section 3200) General Industry Safety Orders (Cal/OSHA), with special attention to Section 5192, Hazardous Waste Operations and Emergency Response
- (f) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 4, (commencing with Section 1500) Construction Safety Orders (Cal/OSHA)
- (g) Title 22 of the California Code of Regulations, Division 4, Chapter 30 (commencing with Section 66000) Environmental Health Standards for the Management of Hazardous Waste (California Environmental Protection Agency, Department of Toxic Substances Control)
- (h) Title 22 of the California Code of Regulations, Division 2, Chapter 3, (commencing with Section 12000) Safe Drinking Water and Toxic Enforcement Act Regulations (California Health and Welfare Agency)
- (i) National Oil and Hazardous Substances Contingency Plan