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Resources
Management

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6 August 2001

Ms. Jill Pollock, P.E.
California Department of Transportation
Office of Environmental Engineering
111 Grand Avenue, 14th Floor
P.O. Box 23660
Oakland, CA 94623-0660

Subject: Site Investigation Workplan
California Department of Transportation District 4 Excess Land
6th and Castro Streets, Oakland, California

Dear Ms. Pollock:

On behalf of the California Department of Transportation (Caltrans) Office of Environmental Engineering, Environmental Resources Management (ERM) has prepared this workplan to further assess environmental conditions near the Caltrans property located at 6th and Castro Streets in Oakland, California.

This workplan was prepared in response to a request for off-site investigation activities made by Alameda County Environmental Health Services (ACEHS) in a letter to Caltrans dated 8 May 2001.

BACKGROUND

The subject property (site) is located in Oakland, California, and is bordered to the north by 7th Street, to the east by Castro Street, to the south by 6th Street, and to the west by Brush Street. Routes 880 and 980 lie immediately adjacent to the site to the northeast. The site is currently vacant and unpaved, and is secured by a locked fence around the site perimeter. Land use at surrounding properties is both commercial and residential. Figure 1, a Site Location Map, shows the site in relation to surrounding properties. Figure 2, a Site Feature Map, depicts pertinent site features.

The site was formerly subdivided into multiple parcels, which have collectively housed a gasoline retail and auto repair station, a machine shop, a dairy, a laundry facility, a materials warehouse, residences, and

retail stores. Land use at these parcels dates back to at least 1936. The majority of the site has been vacant since approximately 1977.

At least four former underground storage tanks (USTs) were installed at the site, and were utilized by a service station, warehouse, and dairy. The Oakland Fire Department issued a permit to Caltrans in January 1971 for the removal of 10,000-, 7,500- and 5,000-gallon USTs at the site. Further information regarding UST removal was not made available to ERM.

PURPOSE AND SCOPE

The objective of these additional investigation activities is to further characterize the lateral extent and magnitude of contaminants of concern in groundwater downgradient of the subject property.

The scope of work of the additional investigation is divided into two phases as follows.

- Phase 1- Perform a reconnaissance groundwater investigation downgradient of the subject facility based on "grab" sampling utilizing direct-push technology. The data generated during this phase of the investigation will be the basis for choosing the location(s) for monitoring wells installed during the second phase.
- Phase 2 - Install an off-site well(s) downgradient of the site and collect and analyze samples from all on- and off-site wells. The location of the new well(s) will be based in part on the results of the reconnaissance sampling performed during Phase 1.

Further discussion of each phase is presented below.

PHASE 1 - RECONNAISSANCE SAMPLING

The proposed scope of work for Phase 1 includes the following activities:

- Obtain permits from the applicable regulatory agencies, including Alameda County, City of Oakland, and Caltrans;
- Prepare and implement a traffic control plan as required by the City of Oakland;
- Notify Underground Services Alert (USA) as required by law;

- Obtain and review copies of available utility maps from the City of Oakland Public Works Department;
- Drill five off-site soil borings along 6th Street to first encountered groundwater, or to a maximum depth of 25 feet below ground surface (bgs), at approximate 50-foot intervals (Figure 2);
- Collect and log soil samples continuously;
- Field screen soil samples for the presence of volatile organic compounds (VOCs);
- Collect a single soil sample from each borehole at the capillary fringe, and analyze for VOCs via U.S. Environmental Protection Agency (EPA) Method 8260, total petroleum hydrocarbons–gasoline (TPH-G) and TPH-diesel (TPH-D) via EPA Method 8015M, and Oil and Grease via EPA Method 1664; (hexane extract, silica gel treatment, gravimetry)
- Collect additional shallow samples if field screening indicates that VOCs are present; and
- Collect groundwater samples and analyze samples for VOCs and TPH-G; if the rate of groundwater infiltration is sufficient, samples will also be collected for Oil and Grease analyses.

Field activities will be performed in accordance with a site-specific Health and Safety Plan prepared by ERM and included in Appendix A. The reconnaissance sampling will be performed using direct-push technology following the Standard Operating Procedures presented in Appendix B.

PHASE 2 – INSTALLATION OF AN ADDITIONAL WELL OR WELLS

The scope of work for Phase 2 consists of the following:

- A maximum of two, 2-inch monitoring wells will be installed and developed. Based on existing data, the wells are envisioned to be installed via hollow-stem auger (HSA), and will be approximately 25 feet in depth, screened between 10 and 25 feet bgs. Actual construction will be based on field observations.
- A single additional well will be installed on the south side of 6th Street, along the central axis of the plume as determined by historical gradient and the reconnaissance sampling (Figure 2). Should reconnaissance sampling indicate that the plume width in 6th Street is

greater than 200 feet, or if an obstruction is present that prevents drilling at the appropriate location along the axis of the plume, two wells will be installed on the south side of 6th Street within the inferred downgradient projection of the plume.

- ERM field personnel will mark the permanent datum point on newly installed wells by cutting a small notch on the north side of the casing. All future static water elevations will be measured from that point. A licensed surveyor will survey the well casing elevation datum to the nearest 0.01 foot. For both wells and soil borings, ground surface elevation and x and y coordinates will be surveyed to the nearest 0.1 foot.
- The new well(s) and all existing wells will be monitored and sampled on a quarterly basis for a period of one year. Samples will be analyzed for the following constituents:
  - VOCs in accordance with EPA Method 8260;
  - TPH-G and TPH-D in accordance with EPA Method 8015M;
  - Oil and Grease in accordance with EPA Method 1664; and

Lead analysis of the existing wells will be discontinued at the start of this sampling program. Well installation and quarterly sampling procedures are presented in Appendix B.

SCHEDULE

Work will be initiated upon approval of this workplan by ACEHS. Permitting (including submittal and approval of the traffic plan) is estimated to require approximately 4-6 weeks. Both phases of field work, including 2 weeks to review the Phase 1 findings, are anticipated to require a total of 5 weeks to implement. A report documenting the findings will be submitted 4 weeks after the completion of Phase 2.

Please do not hesitate to contact the undersigned should you have any questions regarding this submittal.

Sincerely,

REGISTERED GEOLOGIST
JOHN O. CAVANAUGH
No. 6515
STATE OF CALIFORNIA

John Cavanaugh, R.G.
Project Manager

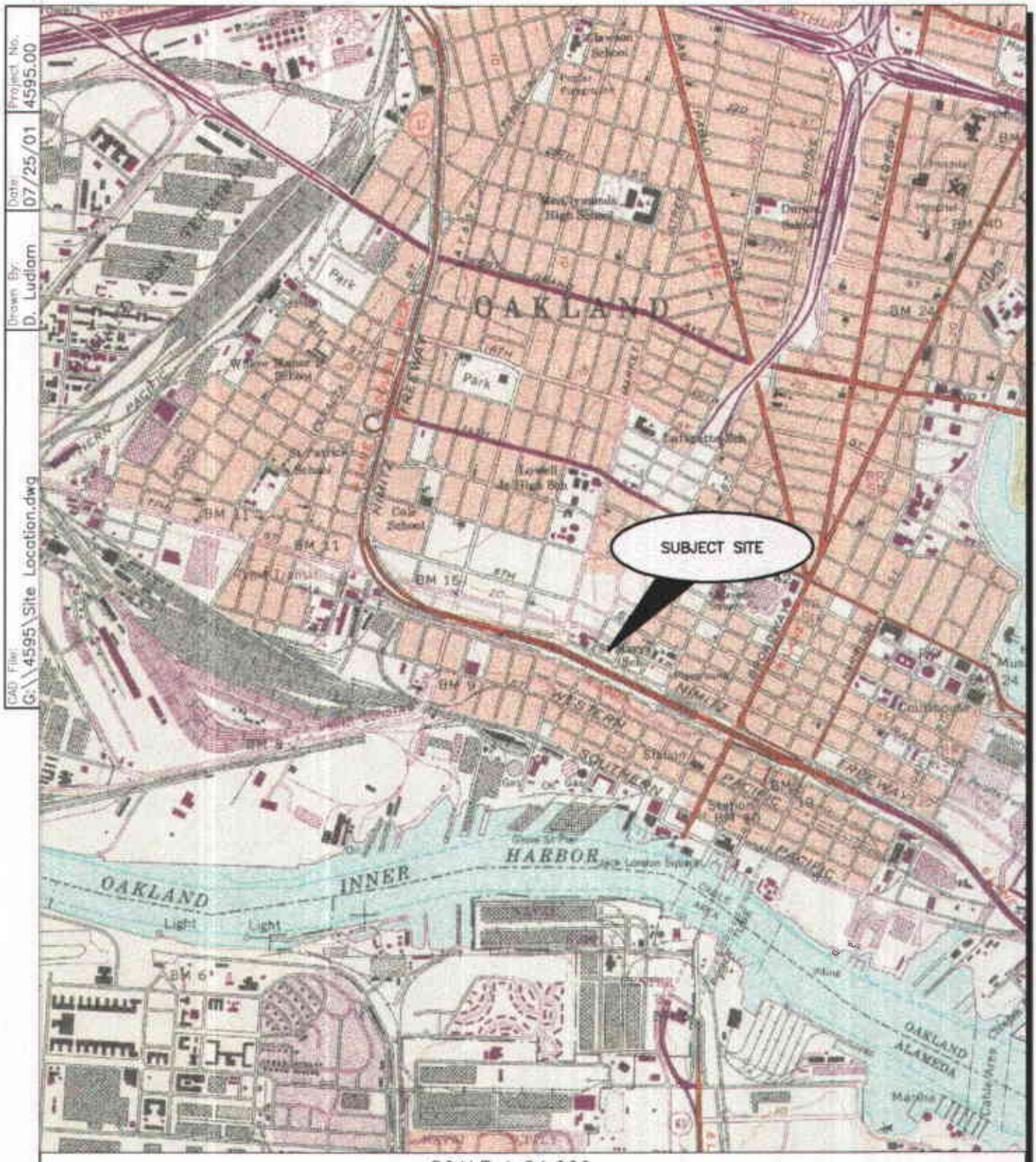
Michael Blanchard
Staff Engineer

JC/MB/kdl/4590.00

Attachments:

Appendix A: Site-Specific Health and Safety Plan
Appendix B: Standard Operating Procedures

Figure 1: Site Location Map
Figure 2: Site Feature Map



References:
U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle,
Oakland West, California
Dated: 1959; Photorevised 1980

Figure 1
Site Location Map
Caltrans District 4 Excess Land
Sixth and Castro Street
Oakland, California
ERM 07/01

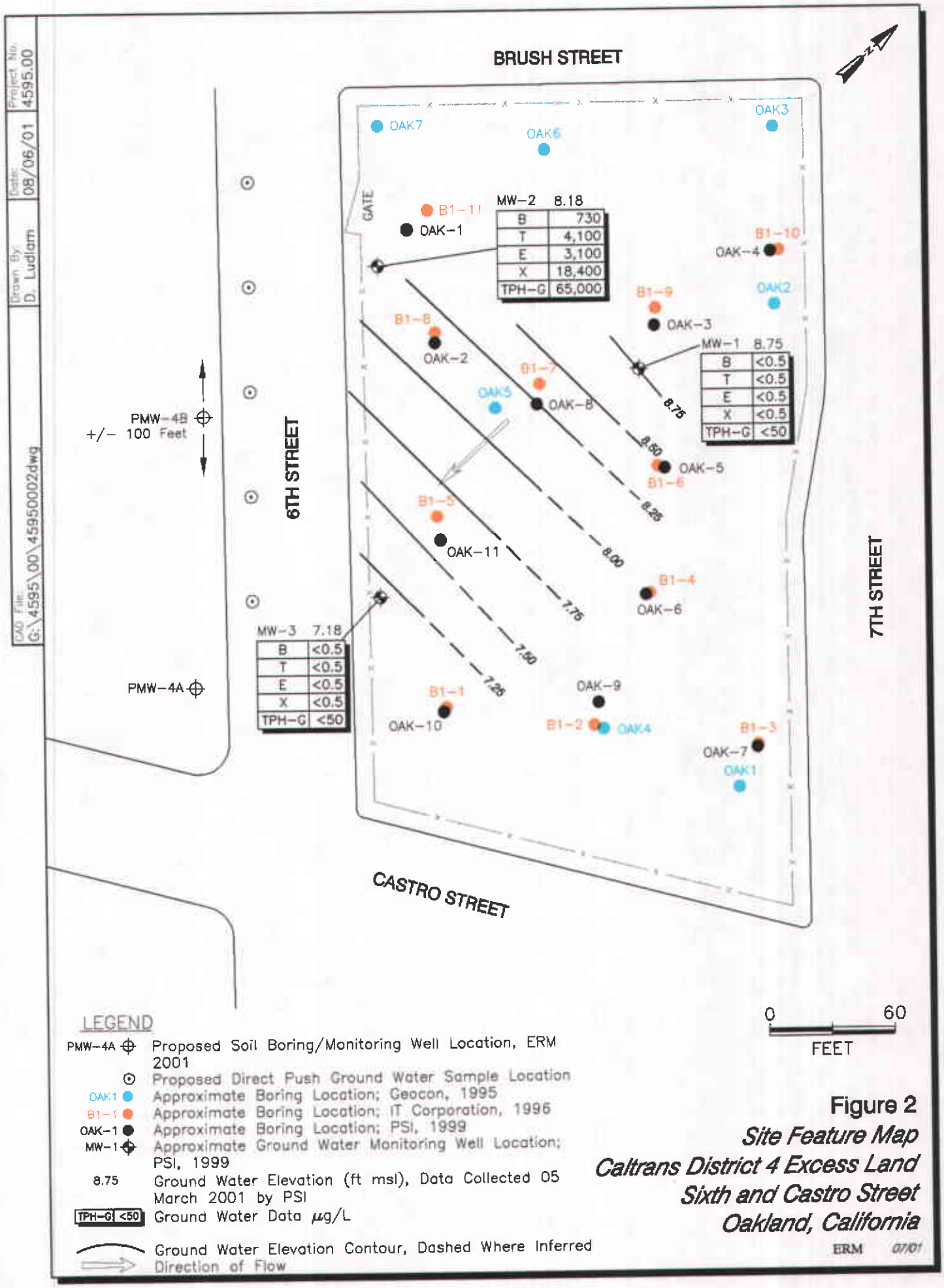


Figure 2

Site Feature Map

Caltrans District 4 Excess Land

Sixth and Castro Street

Oakland, California

ERM 07/01

Appendix A
Site-Specific Health and Safety Plan

California Department of Transportation

Health and Safety Plan

Caltrans District 4 Excess Land
6th and Castro Streets
Oakland, California

August 2001

Environmental Resources Management
1777 Botelho Drive, Suite 260
Walnut Creek, California 94596

California Department of Transportation

Health and Safety Plan

Caltrans District 4 Excess Land
6th and Castro Streets
Oakland, California

Gary Rosenblum, C.I.H.
Health & Safety Director

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1.0 *INTRODUCTION*

Environmental Resources Management (ERM) on behalf of the California Department of Transportation (Caltrans) has developed this Health and Safety Plan (HASP) to establish the health and safety procedures for monitoring well installation activities performed at the Caltrans District 4 Excess Land property (site), located at the corner of Sixth and Castro Streets in Oakland, California. This HASP has been designed to minimize potential hazards to personnel involved in well installation activities and will serve as a guideline for site activities. A site location map is provided as Figure 1.

The procedures in this HASP have been developed based on current knowledge regarding the specific chemical and physical hazards that are known or anticipated to be potentially associated with the site investigation. The provisions of this HASP will apply to ERM personnel and contractors who may be exposed to potential safety and/or health hazards related to this project. This HASP does not directly apply to client personnel, although ERM will advise the client on health and safety aspects of the work based on the guidelines specified in this HASP.

This HASP has been written to comply with ERM's health and safety policies. It is ERM's policy that activities at the site will be conducted in compliance with all applicable federal, state, and local regulations, including the California Occupational Health and Safety Administration (Cal/OSHA), Title 8 of the California Code of Regulations (CCR), Section 5192; the Cal/OSHA Construction Safety Orders, Title 8 of the CCR, Subchapter 4; and the Federal/OSHA Construction Industry Standards in Title 29 of the Code of Federal Regulations (CFR), Part 1926.

On-site personnel who cannot, or will not, comply with the policies and requirements incorporated in the HASP will be excluded from project activities. Prior to the commencement of field activities, all ERM and subcontractor personnel covered by this HASP must review this document and sign and return the Health and Safety Signature Sheet to the Project Manager. A copy of this form is provided in Appendix A.

1.1 *SITE DESCRIPTION*

The site is located adjacent to the I-880 Cypress Replacement Freeway overpass, immediately west of the junction of I-880 and Route 980. The property is bordered to the north by 7th Street, to the south by 6th Street, to the east by Castro Street, and to the west by Brush Street. Land use in the vicinity of the site is residential and industrial.

The site is on the East Bay Plain lowlands, composed of tidal flats and alluvial deposits formed by streams carrying sediment from the mountains to the east. The East Bay Plain is bound by the Berkeley/Oakland Hills to the east, the San Francisco Bay to the west, the city of Albany on the north, and the city of Hayward on the south. The site is essentially flat at an approximate elevation of 6 feet above sea level.

1.2 *PURPOSE*

The purpose of this HASP is to establish health and safety procedures to minimize potential hazards associated with well installation activities at the site. Specific activities include drilling, soil sampling, and groundwater monitoring.

1.3 *PREVIOUS INVESTIGATIONS*

Numerous soil and ground water investigations have been conducted at the facility between 1987 and the present. Investigation and remediation activities performed during this period are summarized in the background section of the *Final Report – Hazardous Waste Preliminary Site Investigation* (PSI, 14 October 1999).

Numerous soil borings have been advanced at the site, as seen in Figure 2. Ground water monitoring wells MW-1, MW-2, and MW-3 were installed in July 1999 as part of a subsurface investigation at the site. Quarterly ground water monitoring and sampling has been performed since summer 1999.

1.4 *SITE ACTIVITIES*

As outlined in ERM's 2001 *Supplemental Investigation Workplan*, specific site activities will include:

- Advancement of 5 direct-push soil borings in Castro Street;
- Installation of one monitoring well downgradient of MW-3; and
- Soil and groundwater sampling.

2.0 *KEY PERSONNEL*

The key personnel for this project are:

Title	ERM Personnel
Project Manager (PM)	John Cavanaugh, R.G.
Task Manager/Site Health & Safety Officer (TM/HSO)	Mike Blanchard
Internal Health and Safety Coordinator (IHSC)	Gary Rosenblum
Principal-in-Charge (PIC)	Jay Patil, P.E.
Staff Engineer/Field Personnel	Mike Blanchard/Darin Ross

All contractors will be OSHA-trained per 29 CFR 1910.120 (8 CCR 5192 in California) and certified to work on hazardous waste sites.

2.1 *PROJECT MANAGER*

The PM will supervise the overall execution of the project and coordinate the tasks performed in compliance with the stated objectives of the scope of work, Caltrans, and DTSC directives. The PM's specific responsibilities include:

- Ensuring that all ERM personnel have received a copy of and have read this HASP, and signed the Health and Safety Signature Sheet (Appendix A);
- Requiring the attendance of all ERM personnel to a tailgate briefing apprising them of the contents of this HASP and specific hazards identified to be present at the facility prior to performing work (a Tailgate Safety Meeting Form is included in Appendix A;
- Ensuring that sufficient personal protective equipment (PPE), as required by this HASP, is available during the project;
- Maintaining a high level of health and safety consciousness among employees at the facility; and
- Maintaining communications with the DIHS, as referenced in the following section, in the event of any health and safety conflicts.

2.2 *TASK MANAGER/SITE HEALTH AND SAFETY OFFICER*

The ERM TM/HSO has primary responsibility for ensuring the overall health and safety of this project, including the primary responsibility for enforcing HASP requirements once work begins.

The TM/HSO has the authority to immediately correct all situations where HASP noncompliance is noted and to immediately stop work in cases where an immediate danger is perceived.

The TM/HSO's specific responsibilities include:

- Ensuring that all project personnel have received a copy of and have read this HASP, and have completed the Health and Safety Signature Sheet (Appendix A);
- Ensuring that all contractors who use this HASP read and sign the "Disclaimers and Limitations on Use" (Appendix A);
- Requiring the attendance of all Site personnel to a Daily Tailgate Safety Briefing apprising them of the contents of this HASP and specific hazards identified to be present at the facility prior to performing work and if work locations or task(s) change during a day, and documenting this briefing on the Daily Tailgate Safety Briefing Form (included in Appendix A);
- Ensuring that sufficient personal protective equipment (PPE), as required by this HASP, is available during the project, and procuring and distributing the PPE and air monitoring instrumentation needed for the project;
- Verifying that all PPE and health and safety equipment is in good working order;
- Obtaining all subcontractor documentation of employee participation in a medical monitoring and training plan;
- Maintaining a high level of health and safety consciousness among employees at the facility;
- Maintaining communications with the IHSC, as referenced in the following section, in the event of any health and safety conflicts;
- Setting up and maintaining the personnel decontamination facility;
- Controlling Site entry for unauthorized personnel;

- Supervising and monitoring the safety performance of all personnel to ensure that required safety and health procedures are followed and correcting any deficiencies;
- Conducting accident/incident investigations and preparing investigation reports (an Accident/Incident Investigation Form is included in Appendix A); and
- Initiating emergency response procedures.

2.3 *INTERNAL HEALTH AND SAFETY COORDINATOR*

ERM's IHSC is responsible for the preparation, interpretation, and modification of this HSP. Modifications to this HASP that may result in less stringent precautions cannot be undertaken by the TM/HSO without the approval of the IHSC.

Specific responsibilities of the IHSC include:

- Advising the TM/HSO on matters relating to health and safety on this project;
- Maintaining contact with the PIC in the case of injury, exposure, or other related issues;
- Recommending appropriate PPE and air monitoring instrumentation to protect personnel from potential hazards present on site;
- Performing field audits, when necessary, to monitor compliance with the HASP and its effectiveness;
- Conducting or directing personal exposure monitoring, where required and where deemed necessary, to determine the adequacy of protective measures and PPE specified by this HASP;
- Maintaining contact with the TM/HSO to regularly evaluate project conditions and new information which might require modification to this HASP;
- Working with the TM/HSO to ensure that sufficient PPE is available at the Site; and
- Conducting briefing meetings, when necessary, to apprise personnel of the contents of this HASP and the project hazards.

2.4 *PRINCIPAL-IN-CHARGE*

ERM's PIC is responsible for assisting the IHSC in case of injury, exposure, or with any other issues in which the IHSC may need guidance or technical support. The PIC may also serve in the role of IHSC, and in such cases, the PIC is responsible for ensuring the tasks as described in Section 2.3 are accomplished as necessary.

2.5 *FIELD PERSONNEL*

All field and subcontractor personnel are responsible for following HASP procedures and for performing their work in a safe and responsible manner. Specific requirements include:

- Obtaining a copy of this HASP and reading it, in its entirety, prior to the start of field activities;
- Signing the Health and Safety Signature Sheet (Appendix A), acknowledging receipt and understanding of this HASP;
- Bringing forth any questions or concerns regarding the content of the HASP to the TM/HSO or IHSC prior to the start of work;
- Reporting accidents/incidents and the presence of potentially hazardous working situations to the TM/HSO; and
- Complying with the requests of the TM/HSO.

3.0 *PARTICIPANT QUALIFICATIONS*

Information regarding required training for site personnel, medical monitoring, and recordkeeping is provided in the following subsections.

3.1 *TRAINING REQUIREMENTS*

All ERM personnel and subcontractors working at the site will have completed an extensive training course and have previously worked at least 3 days at a hazardous waste site. The training course must be designed to meet the requirements of 29 CFR 1920.120 (8 CCR 5192 in California). The training course must consist of a combination of 40 hours of classroom and field exercises, plus an annual 8-hour refresher. These training requirements will apply to any authorized entrant on the site, who may be potentially exposed to a health or safety hazard.

All authorized site participants will be required to show proof of current training (less than 1 year since initial or refresher training) prior to participation in field activities. Intended participants without current training documentation will be barred from site activities.

3.2 *MEDICAL SURVEILLANCE*

All on-site workers, subcontractors and visitors will be required to have a written statement from a licensed physician stating they have had a medical examination that meets the requirements of 8 CCR 5192. This examination must include pulmonary function testing, as well as certification by the physician of the employee's ability to wear a negative-pressure respirator and perform strenuous work. If a person sustains an injury or contracts an illness related to work on site that results in lost work time, he/she must obtain written approval from a physician to regain access to the site.

3.3 *RECORDKEEPING*

Air monitoring via industrial hygiene monitoring or direct reading instrumentation will become part of the written record. Both medical and air monitoring data will be retained for 30 years. Training records shall be

maintained in appropriate files and are available for inspection at any time. Subcontractor training and medical surveillance certification will also be maintained in appropriate files.

4.0 HAZARD EVALUATION

Potential health hazards associated with this project are discussed in the following subsections.

4.1 CHEMICAL HAZARDS

Based on previous data collected from soil and groundwater in the vicinity of the site, the primary contaminants of concern (COCs) on site include VOCs, SVOCs, TPH, and metals. These materials may exist in the soil and/or as chemical hazards in subsurface soil and water. Although not all of these compounds have been detected on site, they are included in the hazard evaluation based on their potential presence in the subsurface during drilling and soil and groundwater sampling.

4.1.1 *Metals*

Metals represent a large and toxicologically diverse group of chemicals that occur naturally in the environment. In general, the mobility of most metals in soil depends on pH. In acidic soil conditions, metals generally become more soluble and can be mobilized by infiltrating water. Otherwise, metals may be relative immobile in soil. Metals are not subject to biodegradation and will persist in one form or another in the environment.

The toxicity of metals and metal compounds depends on their chemical form and is difficult to generalize. In addition to the carcinogenic potential of various metals found on site, many metals may also include a variety of non-carcinogenic adverse health effects, including effects on the liver, kidney, and nervous, cardiovascular, and respiratory systems at sufficient dosages. Specific attributes of lead and arsenic have been provided below, as these are commonly encountered in urban areas.

4.1.1.1 *Arsenic*

Arsenic is a naturally occurring gray metal-like element normally found in the environment combined with other elements such as oxygen, chlorine, and sulfur (inorganic arsenic). Organic forms of arsenic are usually less harmful than inorganic forms. Inorganic arsenic has no smell or taste. Health effects via ingestion include irritation of the stomach and

intestines, pain, nausea, vomiting and diarrhea. Blood cell changes, blood vessel damage and impaired nerve function can also result from chronic arsenic ingestion. Other effects include skin changes, irritation of the throat, increased risk of cancer of the liver, bladder, kidney, and lung. The current Cal/OSHA permissible exposure limit (PEL) is listed as 10 micrograms per cubic meter ($\mu g/m^3$) for inorganic forms of arsenic.

4.1.1.2 *Lead*

Lead is a poisonous metal by ingestion and a suspected human carcinogen of the lungs and kidneys. Considerable data exist on the effects of lead exposure in humans. There is data to suggest that lead is a mutagen and can cause reproductive effects. Human systemic effects by ingestion and inhalation (the two routes of absorption) include: loss of appetite, anemia, malaise, insomnia, headache, irritability, muscle and joint pains, tremors, flaccid paralysis without anesthesia, hallucinations and distorted perceptions, muscle weakness, gastritis, and liver changes.

Recent experimental evidence suggests that blood levels of lead below 10 micrograms per deciliter ($\mu g/dl$) can have the effect of diminishing the IQ scores of children. The current Cal/OSHA PEL for lead is listed as 0.05 milligrams per cubic meter (mg/m^3) as an 8-hour time-weighed average. Cal/OSHA also requires follow-up medical monitoring for all employees whose blood-lead levels are at or above 40 $\mu g/dl$.

4.1.2 *Total Petroleum Hydrocarbons*

The measurement for TPH includes assessment of any of a number of individual petroleum compounds falling into several broad chemical categories of widely varying physical, chemical, and toxicological properties. Heavy waste oils, including lubricants, grease, and used motor and hydraulic fluids, have been shown to cause skin cancer during prolonged dermal exposure in laboratory animals. Therefore, dermal protection must be provided when contact with used oil is suspected. Contaminated skin should be washed as soon as possible.

Most hydrocarbons, except those known to be carcinogenic, exhibit similar hazard effects in humans. Effects on the central nervous and respiratory systems as well as skin irritation predominate.

4.1.2.1 *Gasoline*

Gasoline varies in composition, but, in general, consists of hexanes, heptanes, octanes, and aromatic hydrocarbons. Exposure to gasoline and other petroleum hydrocarbons can produce narcotic effects such as dizziness, headaches, and giddiness similar to alcohol intoxication. Gasoline is also an irritant to the mucous membranes and can irritate the eyes, throat, and skin. The Cal/OSHA PEL for gasoline is 300 parts per million (ppm). The short-term exposure limit (STEL) for 15 minutes is 500 ppm. Most people can detect gasoline vapor in concentrations as low as 50 ppm via sense of smell. Exposed skin should be washed promptly with soap and water, and eyes should be flushed immediately with eyewash solution for a minimum of 15 minutes. Ingestion warrants immediate medical attention.

4.1.2.2 *Diesel*

Diesel is a mix of hydrocarbons, chiefly of the methane series having 10 to 16 carbon atoms per molecule. It is a severe skin irritant with systemic effects by ingestion. It is combustible when exposed to heat or flame and can react with oxidizing materials. The vapor is also moderately explosive when exposed to heat or flame.

4.1.2.3 *Heavy Waste Oils*

Heavy waste oils, including lubricants, grease, and used motor and hydraulic fluids, have been shown to cause skin cancer during prolonged dermal exposure in laboratory animals. Therefore, dermal protection must be provided when contact with used oil is suspected. Contaminated skin should be washed as soon as possible.

4.1.3 *Volatile Organic Compounds*

Most VOCs, except those known to be carcinogenic, exhibit similar hazard effects in humans. Effects on the central nervous and upper respiratory systems, as well as skin irritation, predominate. Therefore, although a summary of the hazards of the identified VOCs are listed separately as follows, additive effects of the mixture will be taken into consideration when determining established action levels. Based on site activities, gasoline constituents and dry-cleaning chemicals either previously found on-site or reasonably expected to be found on-site are listed.

4.1.3.1 *Benzene*

This compound is a known human carcinogen that can cause leukemia via chronic exposure. It is a severe eye and moderate skin irritant. Human effects by inhalation and ingestion include: euphoria, changes in sleep and motor activity, nausea and vomiting, other blood effects, dermatitis, and fever. In industry, inhalation is the primary route of chronic benzene poisoning. Poisoning by skin contact has also been reported. Although the current Cal/OSHA PEL for this compound is 1 ppm, recent research (1987) indicates that effects are seen at less than 1 ppm over extended periods. The short-term exposure limit is 5 ppm, averaged over a sampling period of fifteen minutes.

4.1.3.2 *Toluene*

Human systemic effects of exposure to toluene include: central nervous system changes, hallucinations or distorted perceptions, motor activity changes, psychophysiological changes and bone marrow changes. It is a severe eye irritant and an experimental teratogen. The current Cal/OSHA PEL is 50 ppm. The short-term exposure limit (STEL) for toluene is 150 ppm and the ceiling is 500 ppm.

4.1.3.3 *Xylene*

Xylene exhibits the general chlorinated hydrocarbon central nervous system effects and olfactory (smell) changes, eye irritation and pulmonary changes. It is also a severe skin irritant; symptoms can start at an exposure level of 200 ppm. The current Cal/OSHA PEL is 100 ppm for all three isomers (ortho, meta, and para). The STEL for xylene is 150 ppm and the ceiling is 300 ppm.

4.1.3.4 *Methyl Tertiary-Butyl Ether (MTBE)*

Review of literature on the toxicity and health effects of MTBE has indicated three areas of uncertainty and potential concern: 1) symptoms reported after short-term exposure in a number of communities using fuel containing oxygenates; 2) neurotoxicity based on effects on motor activity observed in studies of rats exposed to MTBE; and 3) tumors observed in rodents after exposure to MTBE.

Symptoms in response to short-term exposure, including noticeable odor, headaches, eye irritation, dizziness, and a burning sensation in the nose and throat, were reported in various communities after MTBE was

introduced. Based on the studies conducted to date, it appears that most people do not experience unusual symptoms or significant medical consequences in response to short-term exposure to MTBE in gasoline. A controlled study confirmed that human exposure of MTBE among healthy human volunteers at air concentrations as high as 50 ppm did not cause increased symptoms or any notable measurable response. However, MTBE in gasoline may cause acute symptoms in some people under some circumstances (e.g., exposure in cold, dry climate).

The observation of increased levels of motor activity in rats exposed to high concentrations of MTBE raises concerns about neurotoxic effects. Because of the lack of detailed studies, the possibility of neurotoxic effects at lower levels of exposure must be considered.

Researchers have observed an increase in the frequency of tumors in several organs of rats and mice exposed to high, toxic levels of MTBE via two routes of exposure (inhalation and oral administration). Because of the absence of data at lower concentrations, the EPA considers MTBE a suspect human carcinogen.

4.1.3.5 *Chloroethane*

Chloroethane is an irritant to the skin, eyes, and mucous membranes. It gives warning of its presence because it is irritating, but it is possible to tolerate exposure until one becomes unconscious. It is the least toxic of all chlorinated hydrocarbons. The current OSHA PEL is listed as 1,000 ppm.

4.1.3.6 *1,1-Dichloroethene (1,1-DCE)*

1,1-DCE is an experimental carcinogen, tumorigen, and teratogen. It is a poison by inhalation and ingestion and can cause general anesthesia, liver and kidney changes, and reproductive effects. The current OSHA PEL is listed as 1 ppm due to its identification as a carcinogen by the National Institute for Occupational Safety and Health (NIOSH).

4.1.3.7 *1,2-Dichloroethene (1,2-DCE)*

This compound, due to its chemical similarity to 1,1,-DCE is a suspected human carcinogen. In high concentrations, it has produced liver and kidney injury in experimental animals. The current OSHA PEL is listed as 200 ppm.

4.1.3.8 *Tetrachloroethylene (PCE)*

PCE is a clear, non-flammable VOC with an etheral odor. Its major uses include commercial dry cleaning and metal degreasing. Exposure to PCE can result in effects on the central nervous system, mucous membranes, eyes, lungs, liver, kidney, heart, and skin. The most frequent effects include unconsciousness, dizziness, headache, and light-headedness.

Skin contact may create a dry, scaly, itchy dermatitis. Recent studies suggest that PCE can cause liver cancer in rats and mice. The current OSHA PEL is listed as 25 ppm.

4.1.3.9 *1,1,1-Trichloroethane (1,1,1-TCA)*

1,1,1-TCA is moderately toxic by inhalation and skin contact. It is a skin irritant and can cause central nervous system effects such as hallucinations or distorted perceptions, motor activity changes, irritability, and aggression. Gastrointestinal changes such as diarrhea, nausea, or vomiting have also been reported from 1,1,1-TCA exposure at high concentrations. The current OSHA PEL is listed as 350 ppm.

4.1.3.10 *Trichloroethylene (TCE)*

TCE is a mildly toxic VOC that is also an experimental carcinogen, tumorigen, and teratogen. It can cause eye effects, hallucinations and distorted perceptions when inhaled. TCE is an eye and severe skin irritant. Inhalation can cause narcosis, headaches and drowsiness. Chronic exposure can cause liver and other organ damage. The current Cal/OSHA PEL for TCE is listed as 50 ppm.

4.2 *PHYSICAL HAZARDS*

Physical hazards associated with site activities include slips, trips, falls, contact- and crushing-type injuries, eye abrasions, contusions, lacerations, flammability, and heat-stress concerns. The potential for such hazards necessitates the use of heavy duty cotton or leather work gloves or chemical-resistant gloves, and safety shoes or boots that meet American National Standards Institute (ANSI) Z41.1, eye protection that meets ANSI Z87.1, and hard hats that meet ANSI Z89.1. Personnel engaged in strenuous physical labor are to wear sturdy cotton or leather work gloves.

Table 2 lists potential physical hazards that may be encountered during all site activities, and the procedures that will be utilized to minimize these potential hazards.

Table 2 ***Potential Physical Hazards***

Potential Hazard	Source of Hazard	Procedures to Be Used to Minimize Hazard
Struck by heavy equipment	Drill rigs and other heavy equipment.	Maintain eye contact with operators and use of PPE.
Puncture of utility line	Electrical, gas, water, or sewer line underground.	Locate existing utilities prior to start of operations.
Slip, trips, or falls due to refuse and debris	Construction refuse and materials, trash, or excavated materials.	Maintain clean work areas and dispose of refuse promptly.
Fire/electrical hazard	Spark or heat producing equipment in the vicinity of combustibles.	Operate equipment away from combustibles such as vegetation. Maintain portable fire extinguishers nearby.
Heat stress	Personnel working in environments with high ambient temperatures may be subject to adverse temperature-related effects.	Employ the buddy system. Each worker will be responsible to monitor his/her buddy for signs of heat stress (loss of concentration, profuse sweating, dizziness, etc.). The TM/HSO will also monitor working conditions via use of an ambient monitor when conditions warrant. Work/rest regimens may be followed.
Noise (>85 dB[A])	Drilling rigs and other heavy equipment.	Sustained noise levels exceeding the Cal/OSHA action level of 85 dB(A) requires the use of earplugs or earmuffs. Noise levels in excess of 90 dB(A) would also require the use of temporary engineering controls.

Notes:
> = more than
dB(A) - decibels on an A-weighted scale

4.2.1 *Use of Equipment*

Any equipment, including drilling rigs, or other heavy machinery will be operated in strict compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. Hazards associated with specific equipment to be used on site are listed in Table 3.

Table 3 ***Potential Hazards of Site Equipment***

	Potential Hazard							
Equipment	Slips, Trips, Falls	Crush Injuries	Abrasions	Contusion	Lacerations	Flammability	Heat Stress	Noise (>85 dB (A))
Drilling Rigs	✓	✓	✓	✓	✓			✓
Hand Held Tools	✓	✓	✓	✓	✓	✓		✓

4.2.1.1 *Heavy Equipment*

All heavy equipment used on site shall be equipped with audible and visual (reverse lights) back-up warning devices. The operator is responsible for inspecting the equipment daily to ensure that it is functioning properly and safely. This inspection will include all pins, pulleys, and connections subject to faster than normal wear and all lubrication points.

All drilling rigs and other heavy equipment will be equipped with guards, canopies, or grills to protect the operator from falling and flying objects. Either the protective structures will be certified by the manufacturer or by a licensed engineer in compliance with Society of Automotive Engineers (SAE) recommended practices. In addition to falling object protective structures, all heavy equipment will be equipped with functioning seat belts and rollover protection (ROP).

4.2.1.2 *Portable Hand Tools*

All portable equipment and tools will be inspected prior to each day's use and as often as necessary to ensure safety. Defective equipment and tools will be removed from service immediately. Examples of defective tools include: hooks and chains stretched beyond allowable deformations, cables and ropes with more than the allowable number of broken strands, missing grounding prongs on power tools, defective on/off switches, mushroomed heads of impact tools, sprung wrench jaws, missing or broken handles or guards as well as wooden handles that are cracked, splintered, or loose. All equipment and tools will be used within their rated capacities and capabilities.

The location of all underground pipes, electrical conductors, fuel, water, and sewer lines must be determined prior to any excavation work. All lines must be de-energized, locked-out, or blinded off where feasible.

4.2.2 *Flammability Hazards*

The nature of this project and the activities to be performed do not have the potential to increase volatilization and cause a flammability hazard. Site activities will not increase the potential flammability hazard beyond that which is normally associated with the operation of heavy equipment.

As outlined in Section 4.2.1.2, equipment used during the project will be inspected to ensure that it is in good repair before use on site. Only approved, listed equipment and components will be used.

Although explosive limits are not expected, only equipment listed as explosion-proof will be used in areas where explosivity is sustained at or above 5 percent of the lower explosive limit (LEL).

As outlined in Section 7.5 a minimum of one fire extinguisher with a 20BC class rating will be provided within 50 feet of site operations.

4.2.3 *Heat Stress Concerns*

Conditions related to heat stress and heat stress monitoring are discussing in the following subsections.

4.2.3.1 *Heat Stress Symptoms*

Heat stress is the combination of both environmental and physical work factors that contribute to the total heat load imposed on the body. Environmental factors that contribute to heat stress include air temperature, radiant heat exchange, air movement, and humidity.

The body's response to heat stress is reflected in the degree of symptoms. When the stress is excessive for the exposed individual, a feeling of discomfort or distress may result and a heat-related disorder may ensue. The severity of the response will depend not only on the magnitude of the prevailing stress, but also on the age, physical fitness, degree of acclimatization, and dehydration of the worker.

Heat stress is a general term used to describe one or more of the following heat-related disabilities and illnesses:

Heat Cramps is a condition characterized by painful, intermittent spasms of the voluntary muscles following hard physical work in a hot environment. Cramps usually occur after heavy sweating and often begin at the end of a work shift.

Heat Exhaustion is a condition characterized by profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. The skin is cool and sometimes pale and clammy with sweat. Body temperature is normal or subnormal. Nausea, vomiting, and unconsciousness may occur.

Heat Stroke is a condition in which sweating is diminished or absent. The skin is hot, dry, and flushed. Increased body temperature, if uncontrolled, may lead to delirium, convulsions, coma, and even death. **Medical attention is needed immediately.**

Workers will be instructed on identifying the signs and symptoms of heat stress and will be required to monitor themselves and others for the signs of heat stress as previously outlined.

4.2.3.2 *Heat Stress Potential*

As discussed, the potential for heat stress is dependent on a number of environmental factors including temperature. Historic average and average maximum temperatures for the months of June and July were obtained for the Oakland Museum, the weather station nearest the site. Average and average maximum temperatures over this period range from

62.3 to 65.5 degrees Fahrenheit (°F) and 71.7 to 72.8 °F, respectively. This indicates a fairly temperate climate and a relatively low potential for heat stress to occur during site activities.

Due to the short duration of the project and temperate climate associated with the site, worker acclimatization to prevent heat stress is not considered necessary.

4.2.3.3 *Heat Stress Monitoring*

Based on the concentrations of COCs in site soils it is not anticipated that activities will require higher levels of PPE than Level D (i.e. normal clothing). Experience has shown that the following work/rest regimen is appropriate for field workers while wearing Level D.

Table 4 Work/Rest Regimen for Level D Protective

Temperature °Fahrenheit (F)/ °Celsius (C)	Water Intake (quarts per hour)	Work/Rest Cycle (Minutes)
82 – 85 (28 - 29)	At least 0.5	50/10
85 - 88 (29 - 31)	At least 1	45/15
88 - 90 (31 - 32)	At least 1.5	30/30
90 and above (above 32)	More than 2	20/40

The workload classes are defined in The American Conference of Governmental Industrial Hygienists' booklet, "Threshold Limit Values and Biological Exposure Indices for 1998."

In the event that higher levels of protective clothing (i.e. semi-impermeable or impermeable garments) are required for workers undertaking strenuous physical labor, the TM/HSO will implement the monitoring schedule outlined in Table 5, whenever the ambient temperature exceeds 70 °F.

Table 5 ***Heat Stress Monitoring Schedule (Impermeable Protective Clothing)***

Ambient Temperature °F	Monitoring Frequency
70-75	Every 120 minutes.
75-80	Every 90 minutes.
80-85	Every 60 minutes.
85-90	Every 30 minutes.
>90	Every 15 minutes of work.

> = more than

Source: *Health and Safety at Hazardous Waste Sites*, Steven P. Maslansky and Carol J. Maslansky, copyright 1997, Table A-5.2.

Monitoring will include an assessment of the heat stress symptoms outlined above, as well as the following vital signs:

- Heart Rate. If the heart rate measured at the wrist (radial pulse) exceeds 110 beats per minute (BPM) over a 30-second period at the beginning of the rest period, the next work cycle will be shortened by one third. This pattern will be continued until the heart rate falls below 110 BPM; and

- Temperature. If the measured oral temperature exceeds 99.6 °F at the end of each work period (measured over 3 minutes), the next work cycle will be shortened by one third. This pattern will be continued until the heart rate falls below 99.6 °F. Workers with an oral temperature exceeding 100.6 °F will not be permitted to wear impermeable clothing.

A portable supply of drinking water will also be maintained on site to prevent dehydration, which can significantly increase the potential for heat stress.

4.2.4 Hearing Conservation

Previous experience indicates that noise levels during the use of heavy equipment have the potential to exceed the Cal/OSHA action level of 85 dB(A). Therefore, all personnel working on site during use of this equipment will be issued with hearing protection in the form of plugs

and/or muffs. Sustained noise levels in excess of 90 dB(A) would also require the use of temporary engineering controls. All personnel entering the work area are required to have current OSHA 40 hour training, which covers training on hearing conservation and the proper use of hearing protectors.

5.0 *EXPOSURE MONITORING PLAN*

The following subsections outline general area and personal monitoring procedures.

5.1 *GENERAL AREA AND PERSONAL MONITORING*

Area monitoring will be conducted to determine the presence of on-site hazardous conditions and help determine the level of PPE required. Area monitoring will also be used to evaluate potential impacts from site activities to off-site receptors. Environmental monitoring equipment includes a photoionization detector (PID) or a flame ionization detector (FID). A Mini-RAM dust monitor will be used during drilling activities. Characterization with these instruments will determine airborne contaminants present and the respective concentrations in the workplace and will help assess worker safety.

ERM will use soil sampling results that were collected at the site for initial assessment of personal protective equipment requirements. Initially, respiratory protection will not be used, unless further periodic air monitoring indicates otherwise.

The intent of general area monitoring is to utilize generic field instruments and action levels to assess the continuous exposure to field personnel during the investigation and upgrade or downgrade PPE in response to the monitoring. The general monitoring shall consist of daily breathing zone monitoring every 30 minutes using the PID and Mini-RAM during drilling activities, both upwind and downwind of the exclusion zone. Daily calibration and maintenance of the PID will also be recorded and performed according to the specific manufacturer's recommendations. The PID will be calibrated against a primary standard and/or span gas, such as isobutylene. The Mini-RAM will be zeroed during each day of use. All breathing zone readings will be recorded on daily field logs.

5.2 *ACTION LEVELS*

Details regarding air quality monitoring are discussed as follows.

5.2.1 *Air Quality*

Total organic vapor (TOV) and dust action levels have been established for site activities. Decisions to upgrade personal protection will be based on sustained breathing zone TOV or total dust that exceeds background levels. Breathing zone refers to the area from the top of the shoulders to the top of the head. Specific criteria for upgrading personal protection based on TOV are presented in Table 6 as follows.

Table 6 ***Action Levels for Total Organic Vapors***

Sustained Breathing Zone (TOV)	Level of Protection
Background + 5 ppm	Level D (no respiratory protection)
5 ppm to 10 ppm	Level C (half-face, air-purifying respiratory (APR) equipped with organic vapor/HEPA cartridges)
10 ppm to 25 ppm	Level C (full-face, APR equipped with organic vapor/HEPA cartridges)
Above 25 ppm	Level B (supplied air respirators)
Above 50 ppm	Cease activities and evacuate the site

HEPA = high-efficiency particulate air

The action levels for total organic vapors (TOV) and dust were established by assuming that benzene (for TOV) and lead (for dust) are present and the concentrations detected by the PID and Mini-RAM represent benzene and lead only. Therefore, the action levels are protective of a worst case scenario, where vapors contain benzene and dust contains lead. These action levels are higher than the respective PELs, however the PID/Mini-RAM will be used to assess breathing zone concentrations every 30 minutes. If the action levels are exceeded for 30 minutes, then upgrading will be performed. The PELs are based on 8 hour time-weighted averages. Because additional respiratory protection will be worn if the established action levels are exceeded, the PEL will not be exceeded.

The sampling data obtained from the Mini-RAM will be compared against the action levels listed in Table 7, to determine the required level of PPE.

Table 7 *Actions Levels for Dust*

Sustained Breathing Zone (Dust)	Level of Protection (as per Table 5)
Background + 0.5 mg/m^3	Level D (no respiratory protection)
0.5 mg/ m^3 to 2 mg/m^3	Level C half-face APR
2 mg/ m^3 to 5 mg/m^3	Level C full-face APR
Above 5 mg/m^3	Level B
Above 10 mg/m^3	Cease activities and evacuate the site

5.2.2 *Noise*

Contractors supplying and operating equipment on site will be informed of the requirements of local noise ordinances. The need for temporary engineering controls or residential mufflers during drilling activities, will be determined based on a comparison of noise levels to applicable noise ordinance criteria.

5.3 *FIELD LOGS*

A daily field activity log will be maintained to document field activities and the sequence of events. Each field log will include, but will not be limited to, such items as follow:

- Project name;
- Contractor names;
- Data collected;
- Description of field activities;
- Starting and ending dates of events/activities;
- Caltrans and DTSC/RWQCB personnel; and
- Weather conditions.

The PM will be responsible for ensuring that all of the activities are documented in the field logs and details of these activities are accurately recorded on the appropriate form(s). These field logs will become a part of the project file. In addition to the field log, a variance log will also be maintained to record any significant deviations from the planned activities from the planned activities, including this HASP.

6.0 GENERAL SAFE WORK PROCEDURES

The following subsections discuss various aspects of safe work procedures.

6.1 SITE CONTROL

Site security and communications procedures are outlined as follows.

6.1.1 Security Measures

Procedures must be followed to ensure suitable site control so that persons who may be unaware of site conditions are not unnecessarily exposed to hazards. The site is barricaded with a chain link fence sufficient to prevent unauthorized site entry. All access to the site will be through the gate, located at the southwest corner of the site on 6th Street.

6.1.2 Communications

Off-site communications will be via cellular telephone. The TM/HSO will a carry a cellular phone on site at all times in case of an emergency. On-site communications will not require the use of phones/radios due to the small site area.

6.2 SITE FACILITIES

Due to the anticipated short duration of the project, portable toilet facilities will not be provided on site.

A source of potable water is not currently available on site. A portable supply of water will be provided on site daily during remedial activities.

6.3 ILLUMINATION

All work on this project will be conducted during daylight hours and therefore illumination will not be required. Work hours will be confined to the hours between 7:00 a.m. and dusk.

6.4 *PERSONAL PROTECTION*

Further details regarding personal levels of protection are provided as follows.

6.4.1 *Initial Personal Protection (Level D)*

Initial protection shall include a long sleeve shirt and long pants, hard hats, eye protection, inner latex or polyvinyl chloride gloves, outer nitrile gloves, and safety boots. This is equivalent to Level D PPE. Data will be collected during site activities to assess the need for a higher level of initial personal protection.

6.4.2 *Level C Protection*

Sustained Mini-RAM or PID readings exceeding the actions levels for Level D protection (Tables 6 and 7) will require upgrading to Level C protection. Level C protection requires Level D protection, plus the following:

- Half-face, APR equipped with combination organic vapor/HEPA filter cartridges;
- Tyvek coveralls; and
- Leather boots with rubber overboots.

6.4.3 *Level B Protection*

Sustained Mini-RAM or PID readings exceeding the actions levels for Level C protection (Tables 6 and 7) will require upgrading to Level B protection. Level B protection consists of the following:

- Pressure-demand, full-face piece self contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA;
- Chemical-resistant clothing (e.g. Saranex or poly-coated Tyvek); and
- Leather boots with rubber overboots.

6.4.4 *Work Stoppage*

Sustained PID readings over 50 ppm or Mini-RAM readings over 10 mg/m^3 will require the cessation of excavation activities and evacuation of site personnel.

6.5 *WORK ZONES AND DECONTAMINATION PROCEDURES*

Work zones and decontamination procedures will be established in accordance with guidance provided in Chapters 9 and 10 of the NIOSH/OSHA/United States Coast Guard (USCG)/EPA document "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities."

The location of the exclusion, decontamination and support zones may be modified to fit applicable field conditions such as wind direction; however, proposed modifications must be approved by the TM/HSO.

6.5.1 *Exclusion Zone*

The exclusion zone will include the site in its entirety, except for a 15-foot by 15-foot decontamination zone immediately north of the site gate.

6.5.2 *Decontamination Zone*

The location of the decontamination zone will be determined on a daily basis according to the predominant wind direction. In the vicinity of the site, wind is predominantly from the south to southwest. The decontamination zone will be located in the vicinity of the site gate, which is the upwind portion of the property.

6.5.3 *Support Zone*

Based on the limited extent and short duration of proposed activities, a substantial support zone will not be required. All heavy equipment used will be rendered inoperable and secured on-site at the end of each day.

6.5.4 *Decontamination Procedures*

Despite protective procedures, personnel may come in contact with potentially hazardous compounds while performing work tasks. Consequently, all personnel leaving the site will be required to undertake appropriate decontamination procedures.

A basin wash/rinse station will be placed in the decontamination zone to facilitate cleaning and removal of PPE. The station will be used by workers to clean and rinse boots and gloves. The ground beneath these basins will be covered with plastic to ensure the ground is not

contaminated with basin rinse water. A drum or another type of container will be designated to dispose of PPE that will not be reused.

Direct contact with contaminated PPE can be avoided by the proper decontamination sequence. To avoid a potential inhalation hazard during decontamination, respirators, if used, are not to be removed before leaving the contaminated area.

The appropriate order for cleansing and removal during decontamination includes: (1) boots, (2) outer gloves, (3) coveralls or protective suit, (4) respirators, and (5) inner gloves.

Water, soap, and paper towels will be available for cleaning of hands and face before breaks, eating, drinking, or smoking.

Decontamination of equipment used will be as follows:

- An Alconox or Tri-sodium phosphate and water solution will be used to wash the equipment; and
- The equipment will be rinsed first with tap water then last with distilled water.

Each person must follow these procedures in order to ensure that potential for cross contamination does not occur.

Wash and rinse water generated from decontaminating equipment or personnel that was used in areas of known concern will be drummed and sampled to determine proper disposal procedures; non-disposable items will be sanitized before reuse. The TM/HSO is responsible for the maintenance, decontamination, and sanitizing of the PPE.

6.6 *GENERAL SAFETY RULES*

In addition to the specific requirements of this site-specific HASP, common sense should prevail at all times. The following general safety rules and practices will be in effect at the site:

- Prior to conducting any boring operations, underground utility locations will be identified. The site representative and local utility authorities (or Underground Services Alert) will be contacted to provide locations of underground utility lines and product piping. All boring, excavation, and other site work will be planned and performed with consideration for underground lines.

- Smoking and ignition sources in the vicinity of flammable or contaminated material are prohibited. Designated smoking areas will be delineated.
- No drilling activities will be allowed on excessively windy days. For purposes of this HASP, excessive wind will be defined as wind with sufficient velocity to render dust suppression techniques at the site inadequate. This determination will be based on perimeter monitoring by the designated TM/HSO present at the site. If perimeter dust concentrations exceed the nuisance dust threshold limit value (TLV) of 10 mg/m^3, work activities will cease. Personnel should remain upwind from impacted areas on windy days.
- All site activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs, lights, canopies, buildings, other structures, and construction, as well as natural features such as trees, boulders, bodies of water, and terrain.
- When working in areas where a flammability hazard exists, particular care must be exercised with tools and equipment that may be sources of ignition. All tools and equipment so provided must be properly bonded and/or grounded.
- Beards that interfere with respirator fit are not allowed within the site boundaries. This is necessary because all site personnel may be called upon to use respirator protection in some situations, and beards do not allow for proper respirator fit.
- No smoking, eating, or drinking will be allowed in the contaminated zone.
- Tools and hands must be kept away from the face.
- Personnel must shower at the end of the shift or as soon as possible after leaving the site.
- Each sample must be treated and handled as though it was extremely toxic.
- Do not touch obviously contaminated materials. Avoiding contact with these materials will facilitate decontamination.
- Persons with long hair and/or loose-fitting clothing that could become entangled in power equipment are not permitted in the work area.
- Employees shall be suitably dressed to perform their duties safely and in a manner that will not interfere with their vision, hearing, or

free use of their hands or feet. Only waist-length shirts with sleeves and trousers that cover the entire leg are to be worn.

- Horseplay is prohibited in the work area. The TM/HSO has the authority to discharge site personnel for horseplay.
- Work while under the influence of intoxicants, narcotics, or controlled substances is prohibited.

6.7 *JOB SAFETY BRIEFING*

If present, the Caltrans representative will lead the briefing. If a Caltrans representative is not present, the contractor's Employee-In-Charge (TM/HSO) will lead the briefing. Safety Briefings will include, but not be limited to:

- Review of the HASP;
- Review of the planned job tasks and areas of work for that day; and
- Review of the Caltrans property and operations on the property in and near the Contractor's work zones.

Job safety briefings are required prior to starting a job, at the beginning of each workday (tailgate meeting), when any new personnel enter the job site, and at the completion of the job. All personnel involved in the work must have documented attendance at the briefing (see attached form). Additionally, all job safety meetings (pre-job, daily, and post-job) should be documented in writing. A typical job safety briefing should include the following four steps and be led by the TM/HSO:

Step 1 Plan the Job Safety Briefing

I. Develop the work plan:
   - A. Review the work to be accomplished;
   - B. Check the job location and work area;
   - C. Observe and make all personnel aware of Caltrans' operations within and near the work area; and
   - D. Determine what safety rules and procedures apply.

II. Consider potential and existing hazards as a result of:
   - A. Job location and weather conditions;
   - B. Tools, equipment, and materials used;
   - C. Chemical and physical properties of contaminants that may be present; and

D. Safety or personal protective equipment that may be required.

Step 2 Conduct the Job Briefing:

I. Explain the work.

II. Discuss existing or potential hazards and ways to eliminate or protect against them:

A. HASP Review;

B. Personal Protective Equipment Review;

C. Check to see if all utilities have been located.

Step 3 Follow up by Supervisor, TM/HSO, or PM.

I. Frequent checks should be made by the Supervisor, TM/HSO, or PM to make certain safety work practices are being used:

A. Health and safety audits; and

B. Any hidden hazards identified have actions initiated to eliminate them or other precautions have been taken.

Step 4 Individual responsibility:

I. Everyone is responsible for their own safety and the safety of their co-workers.

7.0 *EMERGENCY RESPONSE/ACCIDENT INVESTIGATION*

The telephone hone numbers of the police and fire departments, ambulance services, local hospital, and ERM representatives are provided in the reference sheet in Section 8 of this HASP. Directions to the nearest hospital are also provided on the sheet. The reference sheet will be maintained at the work site by the TM/HSO.

Any accident/incident resulting in an OSHA-recordable injury or illness, treatment at a hospital or physician's office, property damage, or a near-miss accident requires that an accident/incident report be completed and submitted to the ERM IHSC. A copy of this form is provided in Appendix A. The investigation will be initiated as soon as emergency conditions are under control. The purpose of this investigation is not to attribute blame, but to determine the pertinent facts so that repeat or similar occurrences can be avoided.

7.1 *PLANNING*

Prior to facility entrance, the TM/HSO shall plan emergency actions and discuss them with personnel conducting project work. Initial planning includes establishing the best means for evacuation from the area in case of a catastrophe.

7.2 *EMERGENCY SERVICES*

A tested system must exist for rapid and clear distress communications, preferably voice, from all personnel to the TM/HSO. The TM/HSO shall ensure that all personnel working at the facility know how to communicate with the appropriate local emergency response units as well as provide adequate and clear directions between work locations and the locations of support personnel, prior to commencing any facility investigation or operations. Emergency response contacts and telephone numbers are included in the emergency reference sheet provided in Section 8. A copy of this information must be posted in a visible location at the project site before site activities commence.

7.3 *GENERAL EVACUATION PLAN*

In case of fire, explosion, or toxic vapor release and a site evacuation is ordered by the TM/HSO, he/she will perform the following steps:

- Announce the evacuation;
- Evaluate the immediate situation and downwind direction (all personnel will evacuate in the upwind direction);
- Order all personnel to assemble in an upwind area when the situation permits and conduct a head count; and
- Determine the extent of the problem and dispatch response teams in PPE and SCBA on site to evaluate any missing personnel and correct the problem.

7.4 *EVACUATION/MEETING POINT*

In the case of an emergency, utilize the following location as an evacuation/meeting point, and provide this information to emergency personnel:

1. The intersection of Mandela and Third Streets.

The TM/HSO shall meet emergency personnel and guide them to the incident scene.

7.5 *FIRST AID*

Qualified first aid personnel on site will be identified during daily safety meetings and will administer first aid and stabilize any worker needing assistance. Life support techniques such as cardio-pulmonary resuscitation (CPR) and treatment of life-threatening problems (such as bleeding, airway maintenance, and shock) shall be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity. If assistance beyond first aid is required, phone 911, and request emergency medical assistance.

A first aid kit and emergency eyewash shall be maintained readily accessible to all workers.

Emergency first aid for exposure, inhalation, or exposure to organic compounds is summarized as follows.

7.5.1 *Eyes*

Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If injury occurs or irritation persists, transport person to an emergency room as soon as possible.

7.5.2 *Skin*

Wash skin thoroughly with soap and water. See a doctor if any unusual signs or symptoms or if any skin irritation occurs. Launder chemically impacted clothing.

7.5.3 *Inhalation*

Move exposed person to fresh air. If breathing has stopped, apply CPR. **Call 911 immediately.**

7.5.4 *Ingestion*

If swallowed, **DO NOT** induce vomiting. **Call Poison Control Center immediately: 1-800-876-4766.**

7.6 *FIRE PROTECTION AND RESPONSE*

To minimize fire and explosion hazards, plans and procedures must be coordinated with the local fire department. A permit may be required before gasoline or other flammable liquids may be removed. **Call 911 in the event of any fire at a work location.** At least one fire extinguisher, with a minimum class rating of 20BC, shall be provided within 50 feet of site activities.

7.7 *SPILL CONTAINMENT*

Site activities include drilling using direct-push and hollow-stem auger technology, and spills are not likely to be a hazard. Transportation of excess soils generated during drilling activities may result in small quantities of potentially contaminated soil being spilt on site during truck

loading operations. This material will be collected using a hand shovel and placed into a drum for proper disposal.

It is not anticipated that large volumes of hazardous materials will be generated or stored on site. However, if large volumes of hazardous or potentially hazardous liquids are stored on site, adequate secondary containment will be provided around the storage area. In addition, spill containment equipment (absorbent socks, clay, and shovels, and a salvage drum) will be kept at the site to respond to small spills of hazardous liquids or solids. Should a spill occur, immediate steps to contain the spill must be taken. Such steps include shutting off valves, closing doors or vents, protecting sanitary sewers and surface waters, or shutting off pumps. At no time will a spill be contained if such action presents a hazard. The TM/HSO must then be notified of the situation and will be responsible for directing the investigation and cleanup of the spill.

8.0 EMERGENCY REFERENCES

The following subsections provide emergency information.

8.1 KEY TELEPHONE NUMBERS

AMBULANCE: 911

POLICE: 911

FIRE: 911

HOSPITAL: 911

NATIONAL RESPONSE CENTER: 1-800-424-8802

POISON CONTROL CENTER: 1-800-876-4766

TOXLINE: 1-301-496-1131

CHEMTREC: 1-800-424-9300

ERM, IRVINE: 1-949-476-3040

ERM, WALNUT CREEK: 1-925-946-0455

CITY OF OAKLAND OFFICE OF
EMERGENCY SERVICES (Mr. Leroy Griffen) ..... (925) 238-7759

DTSC (Mr. Tom Tse) ..... (925) 540-3835

Caltrans (Ms. Jill Pollock) ..... (510) 286-5638

8.2 NEAREST HOSPITALS

PRIMARY HOSPITAL:
SUMMIT MEDICAL CENTER ..... (510) 655-4000
400 29th Street
Oakland, California 94609

SECONDARY HOSPITAL:
ALTA BATES MEDICAL CENTER ..... (510) 204-4444
5700/5730 Telegraph Avenue
Oakland, CA 94609

8.2.1 *Directions to Hospitals*

Directions to the primary hospital is provided as follows.

8.2.1.1 *Directions to Summit Medical Center (Primary Hospital)*

The address of the hospital is 400 29th Street. The approximate distance and travel time is 2.8 miles and 7 minutes, respectively. A map is included as Figure 3 and directions to this hospital are as follows:

- From the site, go east on Seventh Street to Broadway.
- Turn left onto Broadway, drive approximately 1 mile.
- Bear left onto Telegraph Avenue, drive approximately 1 mile.
- Turn right onto 29th Street. Hospital is on left.

8.2.1.2 *Directions to Alta Bates Medical Center (Secondary Hospital)*

The address of the hospital is 5700 Telegraph Avenue. The approximate distance and travel time is 3.5 miles and 9 minutes, respectively. Directions to this hospital are as follows:

- From the site, go east on 7th Street to Broadway.
- Turn left onto Broadway, drive approximately 1 mile.
- Bear left onto Telegraph Avenue, drive approximately 2 miles.

8.2.1.3 *Directions to the Site*

The site is located at the intersection of 6th and Castro Streets in West Oakland, immediately west of the junction of Interstate I-880 and Route 980. The nearest cross streets are Brush Street and 7th Street.

- From Route 880: Exit Market Street, right on 6th to Castro.

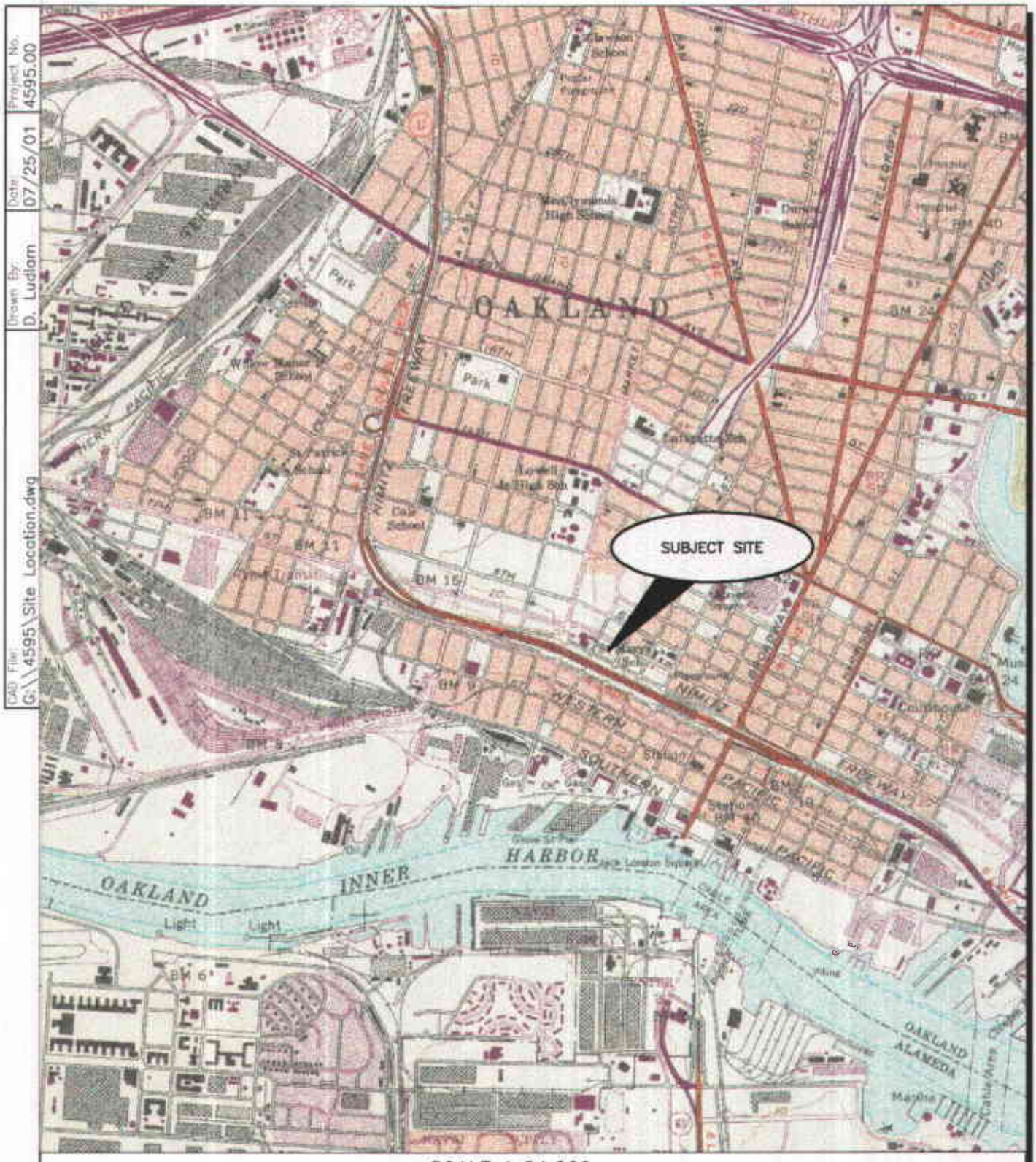
8.3 *ERM REPRESENTATIVES*

The following ERM representatives will serve in the role of TM/HSO:

John Cavanaugh and Mike Blanchard.

ERM's IHSC is Gary Rosenblum, CIH.

ERM's project manager is John Cavanaugh, R.G.



References:
U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle,
Oakland West, California
Dated: 1959; Photorevised 1980

Figure 1
Site Location Map
Caltrans District 4 Excess Land
Sixth and Castro Street
Oakland, California
ERM 07/01

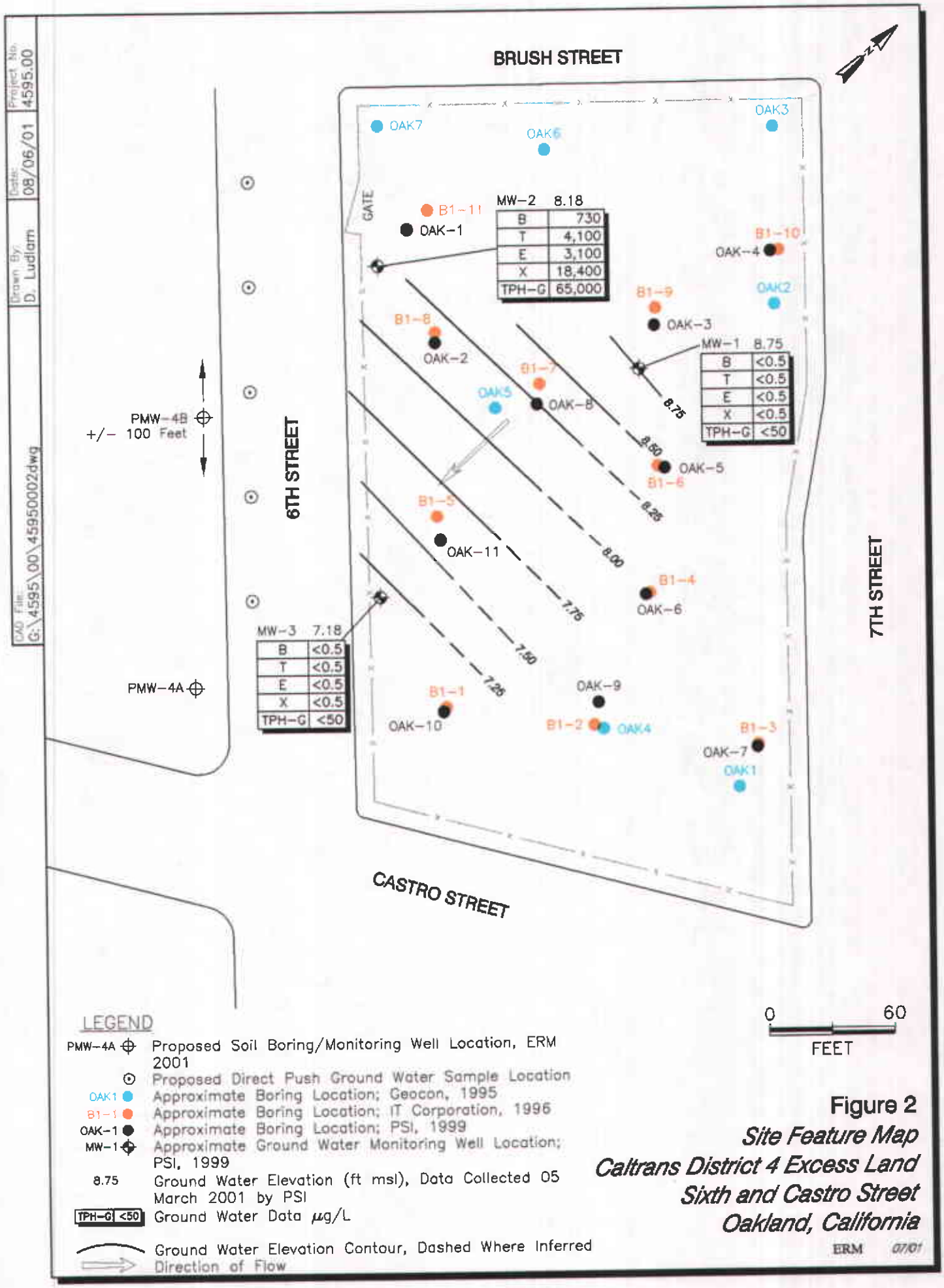


Figure 2

Site Feature Map

Caltrans District 4 Excess Land

Sixth and Castro Street

Oakland, California

ERM 07/01

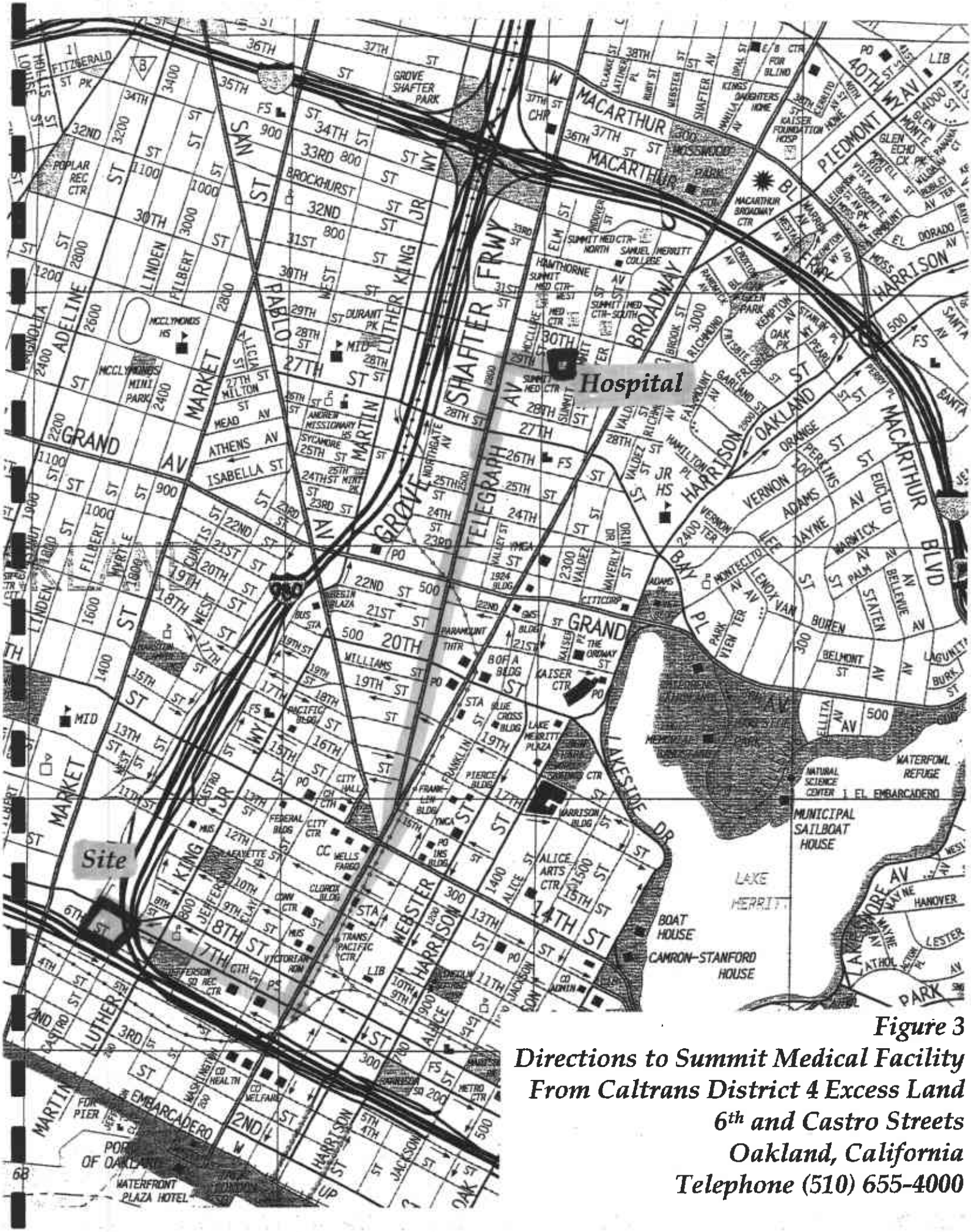


Figure 3
Directions to Summit Medical Facility
From Caltrans District 4 Excess Land
6th and Castro Streets
Oakland, California
Telephone (510) 655-4000

APPENDIX A

Health and Safety Forms

HEALTH AND SAFETY SIGNATURE SHEET

The following signatures indicate that the Safety and Health Program has been read and accepted by ERM management and personnel, as well as all contractors and subcontractors and their personnel.

NAME/TITLE	COMPANY	SIGNATURE/DATE

ENVIRONMENTAL RESOURCES MANAGEMENT - DAILY TAILGATE SAFETY BRIEFING FORM

DATE:_____ TIME:_____ JOB NUMBER: 4595.00
PROJECT NAME: Caltrans District 4 Excess Land
SPECIFIC LOCATION: – 6th and Castro Streets, Oakland, CA
TYPE OF WORK: _____
CHEMICALS PRESENT: _____

SAFETY TOPICS DISCUSSED

Protective Clothing/Equipment: _____
_____

Hazards of Chemicals Present: _____
_____

Physical Hazards: _____
_____

Emergency Procedures: _____
_____

Hospital/Clinic: _____ Phone: _____ Paramedics: _____
Hospital Address: _____

Special Hazards: _____
_____

Other Topics: _____
_____

ATTENDEES

Name (printed)	Signature
_____	_____
_____	_____
_____	_____
_____	_____

SUPERVISOR'S ACCIDENT/INCIDENT INVESTIGATION REPORT

Injured Employee:	Title:	
Date of Accident/Incident:	Dept.:	
Location:	Time on this Job:	
Engaged in what work when injured:		
Nature of accident/incident:		
How did accident/incident occur?		
What can be done to prevent recurrence of the accident?		
What has been done to prevent recurrence of the accident?		
Supervisor's Signature:	Dept.:	Date:
Reviewer's Signature:	Dept.:	Date:
NOTE: Form to be submitted to the ERM Director of Internal Health and Safety within 2 days of the accident/incident.		

DISCLAIMERS AND LIMITATIONS ON USE

ERM-West, Inc. ("ERM") developed the following site-specific Health and Safety Plan (the "HASP") for use by ERM personnel and by ERM subcontractors (individually, an "ERM Contractor" and collectively, "ERM Contractors") in connection with the soil investigation activities (the "Project") being performed by ERM for the California Department of Transportation (Caltrans, the "Client") at the Caltrans District 4 Excess Land property located at Sixth and Castro Streets, in Oakland, California (the "Site"). ERM personnel must adhere to the practices and procedures specified in the HASP.

Each ERM Contractor must review the HASP and agree to accept and abide by the HASP, subject to any modifications to the HASP (to address the ERM Contractor's more stringent practices and procedures) agreed upon in writing by ERM and the ERM Contractor. The ERM Contractor shall indicate such acceptance by executing a copy of this notice of disclaimers and limitations on use as indicated below and returning it to ERM's project manager for the Project prior to its commencing work at the Site. However, if any ERM Contractor commences work at the Site, the ERM Contractor shall be deemed to have accepted the HASP and the terms hereof and the failure to execute and return to ERM a copy of this notice shall not be relevant to such interpretation.

If a contractor or a person other than the Client, ERM employees and ERM Contractors (individually, a "Third Party" and collectively, "Third Parties") receives a copy of the HASP, such Third Party should not assume that the HASP is appropriate for the activities being conducted by the Third Party. **NO THIRD PARTY HAS THE RIGHT TO RELY ON THE HASP. EACH THIRD PARTY SHOULD ABIDE BY ITS OWN SITE SPECIFIC HEALTH AND SAFETY PLAN IN ACCORDANCE WITH ITS OWN PROFESSIONAL JUDGMENT AND ESTABLISHED PRACTICES.**

ERM shall not be responsible for the implementation of any Third Party's safety program(s), except to the extent otherwise expressly agreed upon by ERM and a Third Party in writing. The services performed by ERM for the Client and any right of the Client and/or an ERM Contractor to rely on the HASP shall in no way inure to the benefit of any Third Party, including, but not limited to, employees, agents, or consultants and subcontractors of ERM Contractors, so as to give rise to any cause of action by such Third Party against ERM.

The HASP generated by ERM in connection with the Project is for use on a specific site and in connection with a specific project. ERM makes no representation or warranty as to the suitability of the HASP for reuse on another site or as to the suitability of the HASP for reuse on another project or for modifications made by the Client or a Third Party to the HASP.

ERM Contractors Only
Agreed and Accepted:

By: _____
Title: _____
Date: _____

Appendix B
Standard Operating Procedures

APPENDIX B

California Department of Transportation

Standard Operating Procedure
Soil and Ground Water Sampling Techniques

August 2001

4595.00

Environmental Resources Management
1777 Botelho Drive, Suite 260
Walnut Creek, CA 94596

TABLE OF CONTENTS

List of Tables

1.0 PURPOSE AND SCOPE

The purpose of this document is to define the standard operating procedure (SOP) for conducting direct-push soil and ground water sampling. Direct-push sampling offers an alternative, or a supplement, to conventional drilling methods by enabling rapid, high quality subsurface exploration and sampling, while significantly reducing site disturbance and waste generation.

The ultimate goal of direct-push sampling is to obtain representative data and samples that meet acceptable standards of accuracy, precision, comparability, and completeness. In this SOP, all steps that could affect tracking, documentation, or integrity of samples have been explained in sufficient detail to allow different sampling personnel to collect samples that are equally reliable and consistent. The following items will be discussed in detail in the procedure section of this SOP (Section 3.0):

- Direct-push investigation techniques;
- Soil sampling;
- Ground water sampling; and
- Soil and ground water disposal.

Specifically, the procedures section describes the equipment, field procedures, sample containers, storage and holding times, decontamination, documentation, and field quality assurance/quality control (QA/QC) procedures necessary to conduct direct-push investigation and sampling at the Oakland site. The procedures are described in sufficient detail to allow field personnel to obtain data of sufficient integrity and to ensure representative soil and ground water sample collection.

This SOP serves as a reference to the workplan and applies to all direct-push investigation and sample collection by Environmental Resources Management (ERM) personnel or their subcontractors. This workplan is to be strictly followed, and any modification to the procedure shall be approved by the project manager (PM) in advance.

2.0 *RESPONSIBILITIES AND QUALIFICATIONS*

The PM is responsible for assigning project staff to perform direct-push investigation and sampling activities and for ensuring that this and any other appropriate procedures are followed by all project personnel.

The project staff assigned to the collection of data, soil samples, and ground water samples with direct-push techniques are responsible for completing their tasks according to this and other appropriate procedures. All staff are responsible for reporting deviations from the procedure or nonconformance to the PM or project QA/QC officer.

Only qualified personnel shall supervise subcontractors hired to perform this procedure. At a minimum, ERM employees qualified to supervise direct-push investigations and sampling will be required to have:

- Reviewed this SOP;
- Indicated to the PM that all procedures contained in this SOP are understood;
- Completed the Occupational Safety and Health Association (OSHA) 40-hour training course, and/or annual 8-hour refresher course, as appropriate; and
- Previously performed direct-push investigations and sampling in a manner generally consistent with the procedures described in this SOP.

ERM employees who do not have previous experience supervising direct-push techniques will be trained on site by a qualified ERM employee. A qualified registered geologist or professional engineer will oversee progress of the project, results, and interpretations. The PM shall document personnel qualifications related to this procedure in the project QA files.

3.0 *PROCEDURE FOR DIRECT-PUSH ANALYSIS, AND SOIL AND GROUND WATER SAMPLING*

3.1 *EQUIPMENT LIST*

Typical equipment for direct-push analysis, soil sampling, and ground water sampling:

- Direct-push rig;
- Soil sampling tools;
- Stainless-steel, brass, or polyvinyl chloride (PVC) liners;
- Teflon film;
- Plastic caps;
- Self-adhesive labels;
- Appropriate HydroPunch or similar device for sampling ground water;
- Sample bottles for water samples (prepared by laboratory);
- Water quality test kit;
- Ice chest/cooler;
- Ice or frozen ice packs;
- Field notebook and location map;
- Personal protective equipment, including nitrile or powderless surgical gloves, hard hat, steel-toed boots, and respirator;
- Drums or bulk containers for storage of ground water and soil;
- Photoionization detector (PID) and/or flame ionization detector (FID); and
- Data collection forms.

Typical equipment for decontamination:

- Brushes;
- Wash/rinse tubs;
- Alconox detergent (or equivalent); and

- Deionized water.

Typical equipment for sample filtration, if needed:

- Disposable, in-line, 0.45-micron pore size, high capacity filter;
- One clean, plastic container, approximately l-liter size;
- Sample container with necessary preservatives;
- Peristaltic pump; and
- A length of disposable polyethylene and/or surgical tubing.

3.2 *PROCEDURE*

The PID shall be checked at least once a day to ensure that it is calibrated and operational. A background reading shall be taken and the instrument shall be reset to zero each time the instrument is used.

Health and safety equipment described in a site-specific Health and Safety Plan (HSP) will be donned before proceeding to the sample location. Organic vapor readings measured in the breathing zone with a PID will be used to determine if respirators are needed throughout the direct-push sampling procedures, based on action levels set by the HSP. Air monitoring readings will be recorded in the field notebook and/or on data collection forms.

Although the number and type of soil samples to be collected may vary according to the workplan, the sequence of steps will generally follow that described in this section. If a soil or water sample is to be submitted for laboratory analysis, the procedures for sample labeling, handling, and tracking, described in Section 4.0 of this SOP, will be followed.

3.2.1 *Direct-Push Soil Sampling*

A direct-push soil sampling rig will be used to collect soil at each specified location. The necessary sampling equipment shall be assembled and checked for proper operation before soil sampling. Soil sampling devices vary between subcontractors but most consist of a piston-type sampler with a retractable point and an inner liner. The specific soil sampling tool will be identified in the workplan. The general sampling procedure will be as follows:

- The soil sampling tool will be deployed using a truck-mounted sampling rig to collect soil samples at the intervals specified in the

workplan, for visual inspection and/or chemical analysis at a certified off-site laboratory;

- The soil sampling tool is pushed to the desired sampling depth with the drive tip locked in place to prevent soil from entering the sampler body;
- At the desired sampling depth, the locking mechanism is released, causing the drive tip to retract inside the drive rod and seat above the liner; and
- The sampling device is subsequently pushed into the soil to collect a sample.

The method of sample retrieval is dependent on the subcontractor. The most common form of retrieval is achieved by pulling the drive rods from the sample location and unthreading the sampling tool from the rods. A wireline system can also be employed by a number of subcontractors. Following retrieval, the liner shall be removed from the sampler and placed on a flat surface for evaluation. The top and bottom of the core and sampled interval will be marked on the liner. The ends of each liner containing soil to be submitted for analysis shall be covered with Teflon film before being covered with plastic caps. Each submitted sample will be labeled with the boring number, bottom depth of liner, date and time of sampling, the individual performing the sampling, and job number. The information may also be recorded directly on the liner. The labeled liners shall be placed in self-sealing plastic bags in a cooler with ice or frozen ice packs for storage until they are delivered to the analytical laboratory. Each cooler shall contain a chain-of-custody (COC) record, and each sample placed in a given cooler shall be listed on the COC record for that cooler. The COC protocols are presented in Section 4.3 of this SOP. The remainder of the soil sample shall be logged for lithology, soil structure, Unified Soil Classification System (USCS), and other pertinent information.

3.2.2 *Ground Water Sampling*

The necessary sampling equipment shall be assembled and checked before ground water sampling to ensure proper operation. Ground water samplers vary depending on the direct-push subcontractor used; however, most offer HydroPunch-type samplers. The ground water sampler is hydraulically pushed with the sampling rig to the water table, or to a depth specified in the workplan.

The HydroPunch-type samplers consist of an air-tight, water-tight, sealed intake screen and sample chamber that is isolated from soil and ground water while the tool is advanced. As the tool advances, soil particles are displaced to the side and compacted into the walls of the hole, producing a tight annular seal around the tool. The surface of the HydroPunch is designed to prevent the downward transport of chemical constituents. Collection of a discrete ground water sample from a specific depth is made possible by the tight annular seal.

Upon reaching the desired depth for collecting a sample, the HydroPunch is opened by pulling back on the tool shaft. The drive cone (with attached screen) is held in place by soil friction as the body is pulled back. Once the HydroPunch is open and the O-ring seal (between the drive cone and the body of the tool) is broken, the tool fills from the bottom with ground water. No aeration and minimal agitation of the water sample occurs during this procedure.

A temporary ground water sampling point may be used if:

- The first occurrence of ground water is to be sampled;
- A sample of floating product is desired; or
- A large volume of sample is required.

A temporary ground water point is equipped with a 3- to 5-foot screen that may be reused or disposed depending on the specific system. The reusable screens are constructed of stainless steel and decontaminated between samples. Using a temporary ground water sampling point, the tool is connected to the surface with hollow sampling rods. These rods are large enough to permit the passage of a bailer. The sample is collected by lowering the bailer through the rods into the screened section of the tool. This configuration allows for the collection of floating product phases. In addition, the system allows for the collection of large volumes of ground water.

Ground water sampling will commence as soon after installation of the ground water sampling tool as is practical. All ground water sampling equipment will be thoroughly decontaminated in accordance with the procedures described in Section 5.0, prior to sampling at each designated depth and/or location. Care will be taken to ensure that all decontaminated equipment avoids contact with potentially contaminated materials prior to obtaining samples. Sampling personnel will put on new or freshly decontaminated gloves prior to sampling ground water to reduce the potential for cross-contamination.

The sample containers, preservatives, and holding times required for specific ground water parameters are specified in Section 4.0. Upon commencement of sampling, the volatile organic analysis (VOA) vials will be completely filled first. Each filled, capped vial will be inverted and tapped to ensure no air bubbles are present. If an air bubble is present, the vial will be opened and topped off with additional sample. The vial will be immediately capped and checked again for bubbles. If air bubbles are still present, the VOA vial will be discarded and a new vial used. The VOA vial filling procedure is repeated until no air bubbles are present.

After the VOA vials are filled, the other sample containers will be filled. Samples collected for metals and general minerals analysis will be filled to the base of the bottle neck. Care will be taken not to aerate the sample during transfer from the bailer to the sample bottles and not to overfill bottles containing preservatives. All water samples will be kept in a cooler with ice or frozen ice packs from the time they are collected until they are extracted or analyzed.

3.2.3 *Monitoring Well Installation*

The boring for the monitoring well(s) will be advanced using 8-inch hollow stem augers. Following completion of the soil boring, the boring will be converted to a ground water monitoring well. The well will be constructed with 2-inch inner diameter (ID) Schedule 40 polyvinyl chloride (PVC) casing, with 0.020-inch machine cut slot in the screened interval. The screened interval for the well(s) is anticipated to extend from 10 to 25 feet bgs although actual construction will be based on observations made in the field. A filter pack will be installed in the annulus around the well screen, and will consist of washed sand appropriately sized for the field-observed lithology. The filter pack will extend from the screen bottom to one foot above the top of the screen. A one-foot layer of bentonite pellets will be placed atop the filter pack and hydrated to create a seal against vertical groundwater migration. The remainder of the borehole annulus will be filled with cement to ground surface.

The well will be completed with a lockable traffic rated box. A permanent gauging mark will be made on the top of the casing. The casing elevations for all site wells will then be surveyed to the nearest 0.01 foot by a licensed California Professional Land Surveyor (PLS).

The newly installed well will be developed a minimum of 24 hours after installation using a disposable bailer. Well development will occur by alternating bailing and surging to cause fines to be removed from the well

and surrounding filter pack. The bailing and surging activities will be alternated until water clarity has stabilized. In addition, temperature, conductivity, and pH will be monitored during the development process until these parameters stabilize. A minimum of 10 well volumes will be removed. The well development information will be recorded on a well development form.

3.2.4 *Grouting Techniques*

Upon completion of testing and sampling, the open hole shall be grouted after the direct-push and/or HydroPunch™ equipment has been removed. Grout will be introduced by a tremie into the bottom of the open hole and filled to the surface. The grout mix will be approximately 1 sack (94 pounds) Portland cement, and approximately 5.5 gallons water.

3.2.5 *Cuttings and Wastewater Disposal*

Upon completion of sampling and investigation activities, all soil cuttings, if generated, will be collected and stored on site in labeled drums or bulk containers until ultimate disposal is performed, if necessary. A drum log will be completed each time a drum is used. Labeled information includes the direct-push and/or HydroPunch™ location number, contents, and the date of filling. Any fluids from the subsurface investigation will be stored and appropriately disposed of, pending ground water sampling analytical results.

4.1 SAMPLE CONTAINERS, IDENTIFICATION, AND LABELING

4.1.1 Sample Containers

Soil samples for laboratory analysis will be collected in stainless steel, brass, or PVC liners. The liners will have the ends covered with Teflon film and plastic caps.

Ground water samples will be immediately transferred to the appropriate sample bottles. Table 1 indicates the appropriate sample containers, preservatives, and holding times for test parameters.

4.1.2 Sample Identification

Sample identification numbers will follow the labeling conventions discussed in the workplan.

4.1.3 Sample Labeling

Samples will have a plastic or waterproof paper label attached that will be filled out using waterproof ink, or information may be recorded directly on the sampling container. The label will contain the following information:

- Project number;
- Task number (if appropriate);
- Site/project name;
- Sample number;
- Boring number;
- Sample depth;
- Sampler's name;
- Date and time the sample was collected;
- Sample description (soil or water);
- Preservatives; and

- Parameters for analysis.

4.2 SAMPLE PRESERVATION AND HANDLING

4.2.1 Sample Preservation

After collection, samples will be immediately stored in a cooler with ice or frozen ice pack. The appropriate preservation techniques for soil and water samples are shown in Table 1.

4.2.2 Sample Handling

4.2.2.1 Packing and Storage

Samples will be packaged and stored in a manner that will prevent damage to each sample container. If sample bottles are used in addition to liners, they will be labeled, wrapped in protective packing material, and placed right side up in a cooler for delivery to the laboratory.

4.2.2.2 Transportation

The samples will be delivered or shipped to the laboratory on the date of sample collection, or as soon afterwards as possible. The temperature will be maintained at 4 degrees Celsius until the samples are received by the laboratory.

4.2.2.3 Holding Times

The holding times for the various analytical parameters listed in Table 1 are the total time from sample collection to extraction or analysis. The analyses required for each soil and ground water sample will be specified in the workplan.

4.3 SAMPLE TRACKING

A COC record will be filled out in the field, and will accompany every shipment of samples to the analytical laboratory. The purpose of the COC record is to document possession of a sample from the time of collection in the field to its final disposal by the laboratory.

Information to be provided on the COC record includes:

- Project name and number;
- Sampler signatures;
- Sample number;
- Sample collection date and time;
- Analytical parameters;
- Number of containers;
- Preservatives; and
- Comments.

The laboratory will record the following information:

- Name of persons receiving the sample;
- Date of sample receipt; and
- Sample condition.

All corrections to the COC record will be initialed and dated by the person making the corrections. Each COC record will include signatures of the appropriate individuals indicated on the form. The originals will follow the samples to the laboratory, and copies documenting each custody change will be retained and kept on file by ERM. The COC record will be maintained until final disposition of the samples.

4.4 *QUALITY ASSURANCE/QUALITY CONTROL SAMPLES*

4.4.1 *Trip Blanks*

A trip blank is a suite of VOA sample bottles containing deionized water that is prepared by the laboratory. Trip blanks (aqueous) will accompany each shipment of water sample containers from the laboratory. The trip blanks will be kept with the same shipment of sample containers at all times and will be returned, unopened, to the laboratory with that shipment. Trip blanks will be used to detect any contamination or cross contamination during handling and transportation. One trip blank set is sent per cooler of samples for volatile analysis per day.

4.4.2 *Rinsate Samples*

Rinsate samples are defined as samples that are obtained by running deionized water through sample collection equipment (i.e., soil samplers,

HydroPunch tools, bailers) after decontamination. These rinsate samples will be collected in the appropriate sample containers and sent to the laboratory for analysis. They will be used to determine if decontamination procedures have been effective. One rinsate sample per 20 samples will be collected and sent to the laboratory. If only disposable equipment is used, no rinsate samples are necessary.

4.4.3 *Matrix Spike/Matrix Spike Duplicate for Soil Samples*

Matrix spikes and matrix spike duplicates (MS/MSD) are prepared in the laboratory to assess precision and accuracy of an analytical method on various matrixes. An MS/MSD is generated by preparing three separate samples for analysis from the same soil sample, and then spiking the second and third samples with selected target compounds. For metals determined by inductively coupled plasma (ICP) analysis, for example, the spike contains all the analyte metals at levels approximately five times the reporting limit. Following the addition of the spike to the MS/MSD, these two QC samples are carried through all laboratory procedures and analyzed as are the routine soil samples taken for the investigation. One MS/MSD will be prepared per 20 samples shipped to the laboratory.

The collection and handling of all QA/QC samples will be documented in the field notebook and/or on data collection forms.

5. 0 *EQUIPMENT DECONTAMINATION*

Specific equipment decontamination procedures are described in the following paragraphs. Equipment decontamination will include the following:

- Decontamination of direct-push and/or HydroPunch equipment (rods and sampling devices) will be conducted between individual sampling points to minimize potential cross contamination. Sampling equipment will be decontaminated between each sample collected.
- The direct-push soil sampling rig and hollow stem equipment, depending on the extent of chemical occurrence and the cleaning requirements, will be decontaminated at each sampling site or at the equipment decontamination area.

5.1 *EQUIPMENT DECONTAMINATION PROCEDURES*

The following steps will be used to decontaminate sampling equipment.

- Personnel will dress in suitable safety equipment to reduce personal exposure.
- If any equipment remains caked with soil or other material, it will be placed in a wash tub. The caked material will be scraped off with a flat-bladed scraper. The scrapings will be disposed in drums or roll-off bins.
- All direct-push and/or HydroPunch devices (rods and sampling equipment) that will not be damaged by water will be sprayed with pressurized hot water and detergent by a steam cleaner, then rinsed with clear potable water. Rinsate will be contained in a 55-gallon drum for later disposal.
- Equipment that may be damaged by water will be carefully wiped clean using a sponge and detergent water, then wiped again with deionized water. Care will be taken to prevent any equipment damage.
- Rinse and detergent waters will be replaced between borings.

Following decontamination, equipment will be placed in a clean area on clean plastic sheeting to prevent contact with contaminated soil. If the

equipment is not used immediately, the equipment will be covered or wrapped in plastic sheeting to minimize potential airborne contamination.

5.2 *HEAVY EQUIPMENT DECONTAMINATION PROCEDURES*

The following steps will be used to decontaminate drilling and heavy equipment.

- Personnel will dress in suitable safety equipment to reduce personal exposure.
- Equipment caked with soil or other material will be scraped off with a flat-bladed scraper. The scrapings will be disposed in drums or roll-off bins.
- Equipment that will not be damaged by water, such as the direct-push soil sampling rig and shovels, will be sprayed with detergent water by a high-pressure steamer, then rinsed with clear potable water.

Following decontamination, equipment will be placed on the clean direct-push soil sampling rig and moved to a clean area. If the equipment is not used immediately, it should be stored in a designated, secure, clean area.

5.3 *QA/QC SAMPLING AND DOCUMENTATION*

Field rinsate samples will be taken from the decontaminated sampling equipment to verify the effectiveness of the decontamination procedures. The rinsate procedure will include rinsing reagent-quality deionized water through or over a decontaminated sampling tool (such as liners or bailers). Samples of the rinsate water will be collected in sample bottles and sent to the laboratory for analysis. The rinsate procedure will be recorded by qualified ERM personnel.

6.0 DOCUMENTATION

The field documentation requirements for the ERM direct-push rig supervisor will include recording all observations made during probing, sampling, or decontamination that could affect the quality of a sample. The documentation for each sample should be entered in a bound field notebook with consecutively numbered pages or on a data collection form.

Documentation should include at a minimum:

- Date of investigation/location/diagram or map;
- Date of sample collection;
- Time of day;
- Direct-push rig identification number;
- Depth of sample;
- Type of sample (i.e., soil or water, QA/QC sample);
- Sampling device;
- Surrounding conditions (i.e., weather, etc.);
- Unusual conditions;
- Decontamination procedures;
- FID or PID readings;
- Generalized log with sample locations, sample numbers, and relevant observations; and
- A brief description of the area around the direct-push and/or HydroPunch location and the weather conditions at the time of sample collection (each entry, or page, in the field notebook should be dated and initialed by the individual making the entry).

Detailed field data logs of each boring will be kept by the ERM direct-push soil sampling rig supervisor.

Table 1 ***Sample Containers, Preservative, and Holding Times For Test Parameters***

Parameter	Matrix	Container	Preservative	Lab Holding Times
Aromatic Volatile Organic Compounds including TPH-g	Water	40 ml vial with Teflon® faced septa cap	Acidity to pH of 2 or below with hydrochloric acid. Refrigerate at 4° C	Analysis performed 14 days from sample collection
Aromatic Volatile Organic Compounds	Soil	Brass or stainless-steel liner with Teflon® tape and plastic caps	Refrigerate at 4° C	Analysis performed within 14 days from sample collection
Total Petroleum Hydrocarbons (Extractable)	Soil	Brass or stainless steel liner with Teflon® tape and plastic caps	Refrigerate at 4° C	Analysis performed within 14 days from sample collection
Total Petroleum Hydrocarbons (Extractable)	Water	1-liter glass bottles with Teflon®-lined cap	Refrigerate at 4° C	Extract within 7 days from collection/ analyze within 14 days from sample extraction