Tourtelot Cleanup Project
Site-Specific Safety and Health Plan
Benicia, California

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Site-Specific Safety and Health Plan

Tourtelot Cleanup Project

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ACRONYMS/ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AP	anti-personnel
ASR	Archives Search Report
ASTM	American Society of Testing and Materials
ATV	all-terrain vehicle
bgs	below ground surface
BIP	blow in place
bpm	beats per minute
Cal/OSHA	California Occupational Safety and Health Administration
CAM	California Assessment Manual
CCR	California Code of Regulations
CFR	code of federal regulations
CNS	central nervous system
COC	chemical of concern
CPC	chemically protective clothing
CRZ	Contamination Reduction Zone
CWM	chemical warfare material
cy	cubic yard
°	degree
dBA	decibel, A-weighted scale
DOD	Department of Defense
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EIR	Environmental Impact Report
EM	electromagnetic
EMR	electromagnetic radiation
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
F	Fahrenheit
FDEM	fixed domain electromagnetic
FS	Feasibility Study
FTL	Field Team Leader
GPR	ground-penetrating radar
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HE	high explosive
HEPA	high-efficiency particulate air
HERO	Hazards of Electromagnetic Radiation to Ordnance
HSA	hollow-stem auger
HSO	Health and Safety Officer
HTRW	hazardous, toxic, or radioactive waste
LEL	Lower Explosive Level
LUFT	Leaking Underground Fuel Tank
mg/kg	milligram per kilogram

mg/m^3	milligrams per cubic meter
mm	millimeter
MSDS	Material Safety Data Sheet
MTADS	multisensor towed array detection system
NIOSH	National Institute of Occupational Safety and Health
NORCAL	NORCAL Geophysical Consultants, Inc.
OE	ordnance and explosives
OESM	Ordnance and Explosives Safety Manager
OSHA	Occupation Safety and Health Administration
PAH	polyaromatic hydrocarbon
PAT	Proficiency Analytical Testing
PE	Project Engineer
PEL	Permissible Exposure Limit
PETN	pentaerythritol tetranitrate
PM	project manager
PPE	personal protective equipment
PRG	preliminary remediation goal
PWA	Public Withdrawal Area
PWD	Public Withdrawal Distance
QA	quality assurance
QC	quality control
RDX	cyclonite
RI	Remedial Investigation
RRR	Records Research Report
SECOR	SECOR International
SPF	sun protection factor
SSC	Site Safety Coordinator
SSD	safe separation distance
SSHP	Site-Specific Safety and Health Plan
SSO	Site Safety Officer
SUXOS	Senior Ordnance and Explosives Supervisor
SVOC	semivolatile organic compound
TDEM	Transient Domain Electromagnetic
TDS	total dissolved solids
TEPH	Total Extratable Petroleum Hydrocarbons
THA	task hazard analysis
TLV	Threshold Limit Value
TMF	total magnetic field
TNT	trinitrotoluene
TSS	total suspended solids
USA	Underground Service Alert
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
VOC	volatile organic compound
WBGT	wet bulb globe temperature

1.0 INTRODUCTION

1.1 GENERAL

The provisions of this Site-Specific Safety and Health Plan (SSHP) are mandatory for all Earth Tech personnel involved in any activities at the Project Site. This SSHP provides the specification for the minimum acceptable requirements for all subcontractor organizations, and notification of the ordnance and explosives (OE), chemical, and physical hazards expected to be associated with the Earth Tech-managed activities addressed in this document.

Operational changes to this SSHP that could affect the health and/or safety of site personnel, the community, or the environment will not be made without prior approval of the Earth Tech Project Manager (PM), the Earth Tech Health and Safety Officer (HSO), the U.S. Army Corps of Engineers (USACE), and the Department of Toxic Substances Control (DTSC). In the event of a conflict between this Plan and federal, state, or local regulations, the more stringent will apply.

1.2 POLICY STATEMENT

It is the policy of Earth Tech to provide a safe and healthful work environment for all of its employees. Earth Tech considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At Earth Tech, we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This SSHP presents procedures to be employed during all on-site work activities. The practices and procedures presented in this SSHP are mandatory for all Earth Tech employees (and subcontractors) while they are engaged in work operations at the Project Site. Earth Tech also requires that all visitors to areas under its control abide by these procedures.

1.3 APPLICABILITY

This SSHP addresses all applicable SSHP elements as presented in Title 8 of the California Code of Regulations (CCR) Section 5192 (b). The applicable elements include those items that are identified as part of the Scope of Work (Section 2.4) or as potential workplace hazards that may be encountered during the performance of planned work activities. Any elements not discussed in this SSHP have been determined to be inapplicable to planned work activities or to present no significant worker hazards, and have therefore been omitted for clarity. Specifically, elements addressed in 8 CCR Section 5192 (b) that are not addressed in this Plan include:

- Radiation - No radiation hazards will be associated with this project
- Lighting - No work will be conducted beyond normal daylight hours
- Confined Spaces - No confined space hazards are associated with this project
- Spill Response - No hazardous materials in reportable quantities will be imported or produced during this project
- Spill Containment - Will be provided for purged water from wells. Water will be put into a steel drum for laboratory characterization. The drum will be placed into a plastic overpack drum capable of containing 110 percent of the drum contents. The drum and overpack containment system will be covered with polyethylene sheeting to protect from rain.

1.4 REFERENCES

This SSHP complies with applicable Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and California Occupational Safety and Health Administration (Cal/OSHA) regulations, and standards developed for the Project Site. This SSHP follows the requirements found in the following documents:

- Title 29 of the Code of Federal Regulations (CFR), Part 1910 (1910), OSHA
- 8 CCR, Chapter 4, Subchapter 4 (Construction Safety Orders) and Subchapter 7 (General Industry Safety Orders)
- USACE Engineering Manual 385-1-1, Safety and Health Requirements Manual, September 1996
- The state of California, Proposition 65, Community Right-to-Know.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 PROJECT LOCATION

The Project Site is in the City of Benicia, Solano County, California, approximately 30 miles northeast of San Francisco (Figure 2-1). Consisting of approximately 220 acres, it is partially within the boundaries of the Former Benicia Arsenal (Figure 2-2). The site has rolling topography that includes areas referred to as the North Valley and the South Valley, and it is bordered by the Southampton residential development to the west and south, the Exxon refinery to the south, industrial and commercial facilities to the east and open space to the north and east (Earth Tech, 1999) (Figure 2-3).

2.2 SITE HISTORY AND DESCRIPTION

2.2.1 Site History

Between 1849 and 1958, the U.S. Army acquired approximately 2,700 acres of land in Benicia and established the Benicia Arsenal for use as a depot for ordnance. In 1944, the Army leased a 200-acre piece of undeveloped ranchland known as the Tourtelot Property that was situated next to the Benicia Arsenal. Between 1945 and 1947, the Army began developing the Tourtelot Property for a number of different activities in both the North Valley and South Valley (see Figure 2-3). In 1955 and 1960, the Army's leases for the Tourtelot Property terminated, and in January 1962, the Department of Defense (DOD) declared the entire Benicia Arsenal excess.

Portions of the arsenal were developed in the late 1960s. The Tourtelot Property remained under private ownership and was not developed. In 1971, portions of the Tourtelot Property were acquired by developers from Mary Tourtelot, and the remaining 110-acre parcel was acquired from Mary Tourtelot in 1981 as part of the Southampton residential development. In 1989, the City of Benicia approved the Environmental Impact Report (EIR) for residential development of the land. In 1990, grading activities were conducted on the Tourtelot Property in support of off- and on-site residential development. The activities included using the Ridge, between the North and South Valleys, as a borrow site for soils and construction of the McAllister Drive Land Bridge, which is a fill that crosses the South Valley and provides access to the Ridge from Rose Drive (see Figure 2-3). A sewer line along the south side of the South Valley was also installed at this time.

In mid-1996, during preliminary site preparation associated with development of the Tourtelot Property, concrete-filled howitzer shells were unearthed, and Granite Property Management (Granite) promptly took several steps to make the Tourtelot Property safe, including stopping the preliminary construction activities, alerting

officials about the shells' discovery, putting a fence around the site, and hiring a security service. Granite retained military-trained explosive specialists and initiated preliminary site investigations for affected soils and OE. Part of the investigation included collection of geophysical data across the majority of the Project Site. Plate 1 depicts the results of the geophysical survey. In late fall 1996, live ordnance was first encountered and reported by Granite to local military personnel for handling. In 1998, the USACE began investigation of the Project Site as part of an arsenal investigation to characterize the area for OE.

The Project Site remains undeveloped except for one structure that recently has been used as a construction office for the Southampton development. The Tourtelot Property is currently fenced and access is controlled. Adjoining land is also enclosed by fencing.

2.2.2 Department of Defense Activities at the Project Site

During the period when the Project Site was used by DOD, it accommodated a range of activities. Based on site inspection, data collected by the USACE for the Former Benicia Arsenal EE/CA report, review of historical aerial photographs, and review of geophysical data collected across the majority of the Project Site, several potential sites have been identified (see Plate 1). Approximately 6 acres in the North Valley were developed with roads and structures where the accuracy of locally manufactured howitzer gun barrels were checked, ordnance was inspected and renovated, and primers were destroyed in a "burn cage." In the South Valley there were at least two demolition sites and a flare site. Demolition activities generally consisted of placing various amounts of out-of-service munitions in a "pit" and placing a countercharge on top of the items and detonating them. Often these areas were used multiple times resulting in a deep pit or crater. The type of munitions placed in the demolition sites in the South Valley is unknown. Part of the Ridge was used to dispose of aged, out-of-service dynamite. The following subsections provide general information about each of the identified sites and the contaminants of concern associated with the areas. Previous OE investigations and findings are presented in Section 2.3.2.

Table 2-1 provides an area nomenclature cross-reference for previous reports. The table includes the names for areas of note to be used for this document and all future documents pertaining to the Project Site.

2.2.2.1 TNT Strips.

The trinitrotoluene (TNT) strips are on the hillside to the north of the North Valley. The Records Research Report (RRR) and the Archives Search Report (ASR) did not find anything in the available records stating what type of activities may have caused the scarring, now referred to as the TNT Strips. The strips are clearly visible in a 1947 aerial photograph. Today, the strips are still clearly visible as is evident by the pronounced lack of vegetation along the strips. There are five strips

varying in length from 300 to 800 feet; each is approximately 6 feet wide. Exposed soil in the strips is characterized by a deep red color with crystalline materials observable in the dry season. In fall 1998, field screening samples were collected from the near-surface along the TNT Strips. TNT was detected in the soil samples from the strips. It has been assumed that the burning of explosives, similar to what was reported for the Dynamite Burn Site, resulted in the TNT Strips on the hillside above the North Valley.

Based on the results of the non-OE RI/FS and other hazardous, toxic, or radioactive waste (HTRW) investigations, TNT and its break-down products, polyaromatic hydrocarbons (PAHs), metals, and dioxins are the contaminants of concern.

2.2.2.2 Howitzer Test Facility.

The Howitzer Test Facility consisted of three permanent structures in the North Valley (see Plate 1). Building 181 consisted of two parallel tunnels; each had a 10-foot by 10-foot opening and extended approximately 100 feet into the hillside. The second structure contained the open firing butts, and a third building was a concrete powder loading room. A disposal area is believed to have been situated adjacent to the tunnels where shell casings, OE scrap, and debris were discarded. The facility was used to test howitzer barrels and propellant by firing various-sized howitzer projectiles filled with concrete or gravel. This was performed in order to determine if the barrels functioned correctly and whether the propellant was the right mixture. The facility was in operation from approximately 1945 to 1955.

In 1957 and 1958, a cement block test cell was built between the firing butts and the tunnels. Two buildings were constructed; one building pad was 12 feet by 20 feet, but there were no records of the size of the second building. Records do not clearly reveal what the test block was used for; however, a former employee interviewed for the RRR referred to this facility as the Calibration Facility (Jacobs Engineering, 1999). In mid-1996, during preliminary site preparation for development, all the facilities in this area were dismantled and most of the construction debris removed from the area. A large number of concrete-filled howitzer shells were unearthed during these activities. A small debris/waste dump was encountered during preliminary site preparation activities. The debris pile was situated on the east side of the facility adjacent to the current soils stockpiles in the area. The debris encountered was described mainly as parts of wooden crates and pallets. The soil that was mounded around the tunnels is currently stockpiled in the North Valley at the east end of the area.

Gravel and soil piles around the howitzer test tunnels were screened under the observation of a qualified unexploded ordnance (UXO) expert. Several howitzer shells were removed from the soils during this operation. An attempt was made to separate soils with a large amount of gravel and inert OE fragments from cleaner soils.

Based on the results of the non-OE remedial investigation (RI)/feasibility study (FS) and other HTRW investigations at the Howitzer Test Facility, the following contaminants of concern are present:

- Solvents
- Nitrogen
- Diesel and motor oil
- Kerosene
- Explosives.

2.2.2.3 Ammunition Renovation/Primer Destruction Site.

The Ammunition Renovation/Primer Destruction Site is in the North Valley adjacent to the Howitzer Test Facility (see Plate 1). Typically, primers were destroyed by dumping them into a "squirrel cage" or metal tank. Primers for various munitions were pulled out and placed onto a conveyor belt, then dropped into a cage and burned. An oil burner was attached to the cage or tank and was left running in order to ignite the primers. The burned primers, now inert scrap metal, were removed from the cage and recycled. The Primer Destruction Site was used from 1945 to 1947.

The Ammunition Renovation/Primer Destruction Site consisted of two wooden buildings and two canvas shelters (Jacobs Engineering, 1999), which were used to inspect and refurbish ordnance items stored at the arsenal. The RRR stated that a canvas structure in the middle of the area was used for breakdown operations, cleaning, and processing of ammunition casings in preparation for painting. The Ammunition Renovation/Primer Destruction Site was constructed in 1950. It is uncertain how long the area was in operation.

Both of these facilities were removed during preliminary site development in 1996. During the removal of the foundations for the various facilities, soils in the area were disturbed. Some of the soils disturbed during the demolition of structures associated with the Ammunition Renovation/Primer Destruction Site were also stockpiled in the North Valley.

Based on the results of the non-OE RI/FS and other HTRW investigations at the Ammunition Renovation/Primer Destruction Site, the following contaminants of concern are present:

- Solvents
- PAHs
- Diesel and motor oil
- Kerosene
- Explosives.

2.2.2.4 Flare Site.

The Flare Site is in the South Valley and is evident by the ash, OE scrap, and fragments recovered from the area (see Plate 1). The Flare Site was used to burn

and dispose of flares. This usually consisted of placing flares on the ground in rows, adding an accelerant, and igniting flares. It is uncertain if the Flare Site was used to dispose of ordnance. A relatively large number of anomalies is evident in the geophysical data, and the site is clearly visible in a number of the historical aerial photographs reviewed.

Based on the results of the non-OE RI/FS and other HTRW investigations at the Flare Site, the following contaminants of concern are present:

- Metals
- PAHs
- Explosives.

Metals contamination is significantly higher at the Flare Site in respect to the remaining property.

2.2.2.5 Demolition Site #1.

No live ordnance items have been recovered from this area (see Plate 1). However, OE scrap and fragmentation are visible in the side walls of the drainage containing the Demolition Site. This area is evident in the geophysical data and appears disturbed in the historical aerial photographs.

Based on the results of the non-OE RI/FS and other HTRW investigations at Demolition Site #1, the following contaminants of concern are present:

- Metals
- PAHs
- Explosives.

2.2.2.6 Demolition Site #2.

The suspected Demolition Site shows relatively little evidence of use. This area is on the south side of the South Valley between the Flare Site and the other Demolition Site (see Plate 1). The site is suspected because it appears disturbed or barren in several of the historical aerial photographs. Review of geophysical data does not indicate that the area has a high anomaly count similar to the two known demolition sites, and large amounts of OE scrap or fragments have not been observed during area visits.

Based on the results of the non-OE RI/FS and other HTRW investigations at Demolition Site #2, the following contaminants of concern are present:

- Metals
- PAHs
- Explosives.

2.2.2.7 Demolition Site #3.

Several ordnance items were recovered from this area both by Granite and the USACE (see Plate 1). Also, an armored personnel vehicle was removed from this area, hauled up the north slope of the South Valley, and sliced into pieces that were recycled at a local metal fabrication shop. The area is evident in the geophysical data.

Based on the results of the non-OE RI/FS and other HTRW investigations at Demolition Site #3, the following contaminants of concern are present:

- Metals
- PAHs
- Explosives.

2.2.2.8 Dynamite Burn Site.

On the Ridge, aged, out-of-service dynamite was reportedly disposed of through burning (see Plate 1). Aged dynamite was burned by placing multiple sticks of dynamite in rows up to 100 feet long on a piece of paper and igniting the paper. This area is believed to have been used from 1947 to 1948. The area used for burning of dynamite was approximately one-half the size of a football field. The ridge used for the Dynamite Burn Site was used as a borrow site for soils during grading activities associated with the Southampton development in 1990 (see Section 1.2.2 regarding grading activities). For this reason, no further work associated with the Dynamite Burn Site is presently anticipated.

Based on the results of the non-OE RI/FS and other HTRW investigations at the Dynamite Burn Site, contaminants of concern are present.

- Metals.

2.2.3 Past Grading Activities

Development of the area adjacent to the Project Site started in 1990. A review of rough grading plans, preliminary soils reports, testing and observation service reports, notes from the grading subcontractor, and historical aerial photographs provides a good insight as to where the material was placed as fill. The basic assumption used to determine where soils were placed is that standard grading techniques call for establishing the shortest haul routes between cut-and-fill areas. Based on this assumption, review of available documents, professional judgment, and understanding of standard mass grading techniques, soils within the affected area were most likely moved as follows:

- Rough grading for the Southampton development began in April 1990. Grading began in the area referred to as D-1 and D-2 on Plate 1. The majority of D-1 was a cut area; the majority of D-2 was a fill area. Standard grading techniques and aerial

photographs and grading observation records confirm that the initial cut materials from D-1 most likely were placed in the D-2 fill sites.

- The other major fill areas in the development are along the Rose Drive/Panorama Drive fill sites, south of Kearney Street (see Plate 1). Fill for this area was most likely derived from the adjacent cut area to the east. Cutting and filling for this area appear to have begun shortly after D-1/D-2. The D-1/D-2 area continued to be active after grading began in this area.

- There is an area referred to as the "East Crossing" in the final testing and observation reports for the Southampton development. Elevation of the compaction tests taken here, as well as the geography of the development, suggest that the East Crossing was the "McAllister Drive Land Bridge." Based on this assumption, preparatory work for the land bridge began as early as June 1990. However, the majority of the fill was placed in mid- to late August 1990. During the August time frame, most of the other major fills in the development had little activity based on test results. After completion of the McAllister Drive land bridge, the major fills were once again active.

- The Ridge between the North and South Valleys was used as a soils borrow area (see Plate 1). An estimated 600,000 cubic yards (cy) of soil (40 to 50 feet in elevation) was removed. The May 13, 1990, aerial photograph indicates that the soils borrow area is relatively undisturbed. The September 1990 aerial photograph shows that the soils from the Ridge down to approximately the 260-foot contour line had been removed, approximately the eastern 2/3 of the aerial extent. It is evident from the aerial photographs that the removed soils were used to construct the McAllister Drive Land Bridge. According to construction drawings, the land bridge required approximately 200,000 cy of soil. The observation and test results report indicates that during the construction of the land bridge, most of the other fill areas received little or no fill. Once the land bridge was completed, the D-2 and Rose Drive/Panorama Drive/McCall Street fill sites became active again. The remaining cut from the Ridge soils borrow area may have been used in these areas. After February 1991, the maximum extent of the Ridge borrow site appears to have been reached.

- Grading activities along the Kearney Street lots were completed between June 21, 1991, and September 3, 1993, based on an aerial photography review.

- In September 1993, stockpiled soils appear on the ridge borrow site. The stockpiled soil on the ridge borrow site appears to have been generated from development activities associated with the development of the Kearney Street lots.

- The structures in the North Valley were removed in 1996 during preliminary site construction activities. Recyclable material, such as the concrete, culverts, and rebar from the buildings, was temporarily stockpiled in the area and hauled away. Disturbed soils are currently stockpiled in the North Valley.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 Remedial Investigation Activities

There have been several investigations of the Project Site for both ordnance and non-ordnance issues. A complete summary of past ordnance investigations is presented in the OE Work Plan. There have been two separate non-OE investigations of the Project Site. The first was conducted in late 1998 by SECOR International (SECOR); the second by Earth Tech in June 1999.

SECOR conducted the initial investigations on portions of the Project Site in 1998. Eighty-four soil samples were collected from selected areas on the Project Site during this investigation. The majority of the samples were collected at approximately 2 to 5 inches below ground surface (bgs). Two sets of samples were collected: SS-series soil samples that were provided to a laboratory for analysis and FSS-series samples that were field screening samples for TNT. Most of the SS-series samples were analyzed for metals (EPA Method 6010A/7000 series), explosive compounds (EPA Method SW8330), phosphate (EPA Method 365.3), and nitrate and nitrate/nitrite as nitrogen (EPA Method 353.2) by California-certified Sequoia Analytical Laboratory of Petaluma (Sequoia Analytical). The FSS-Series samples were analyzed for TNT and cyclonite (RDX) using the Ensys® Soil Test System, a field testing method. Confirmation analyses for TNT and RDX were also performed in the laboratory for selected samples for which the field test method was utilized. In addition, two surface water samples were collected from the Wetlands. Water samples were analyzed for total and dissolved metals (EPA Method SW6010A), explosive compounds (EPA Method SW8330), and nitrate and nitrate/nitrite as nitrogen (EPA Method 353.2) by Sequoia Analytical.

The results from the SECOR sampling indicate that explosives, metals, PAHs, and dioxins/furans exist at various sampling locations above the preliminary remediation goals (PRGs) and known background levels. The contaminants include:

- 2,4,6-TNT
- Antimony (Flare Site Only)
- Arsenic
- Barium (Flare Site Only)
- Copper (Flare Site Only)
- Iron
- Lead (Flare Site Only)
- Manganese
- Benzo(a)pyrene (Ammunition Renovation/Primer Destruction Site)

- 2,3,7,8-tetrachlorodibenzo-p-dioxin (Flare Site Only)
- Total hexachlorinated dibenzo-p-dioxins (Flare Site Only).

Earth Tech performed follow-on environmental sampling in June 1999. Earth Tech reviewed the previous collected data and designed a sampling program to further identify contaminants of concern and to try to define the lateral extent of contaminants at known sites. A total of 120 soil samples were collected during this investigation. The samples were analyzed for metals (EPA Method SW6010B/7000), PAHs (EPA Method SW8310), explosive compounds (EPA Method SW8330), and, in some instances, for dioxins/furans (EPA Method SW8290) and semivolable organic compounds (SVOCs) (EPA Method 8270C). The samples were obtained at various depths: surface to 0.5 foot bgs; 0.5-1.0 foot bgs; 1.0-1.5 feet bgs; 2.0-2.5 feet bgs; 3.5-4.0 feet bgs; 3.75-4.25 feet bgs; and 4.0-4.5 feet bgs. The sampling was performed at the Demolition and Flare Sites, the TNT Strips, the stockpiles in the North Valley, and at the Wetlands.

A summary of the previous investigation results by site is provided in Appendix A. The results from previous sampling indicate that explosives, metals, PAHs, and dioxins/furans exist at various sampling locations above the PRGs and estimated local background levels. The contaminants are listed by site in Table 2-1.

Earth Tech performed a remedial investigation (RI)/feasibility study (FS) in December 1999. The RI/FS scope of work included soil, sediment, surface water, and groundwater sampling and analysis. Upon receipt of the analytical results, this SSHP will be amended as necessary to assure proper PPE, air and personnel monitoring, and materials handling. Appendix A will also be updated.

2.3.2 Previous Unexploded Ordnance Investigations

DOD conducted OE clearance activities at the Demolition Site on the Project Site in 1955 (U.S. Army Corps of Engineers, St. Louis District, 1994a,b). However, during a later inspection of the area in 1955, several live OE items were found; it was recommended that a second clearance be performed in the area. No record of a possible second clearance could be found. The next reported OE clearance activity was initiated when a concrete-filled howitzer shell was encountered during preliminary site preparation activities associated with site development in mid-1996. The developer, Granite, retained OE experts and initiated OE investigations on the Tourtelot Property. The work included geophysical mapping and OE removal.

The initial geophysical surveys at the site were limited to the Howitzer Test Facility and limited random data collection areas across the Project Site. An EM61, a high resolution, time-domain electromagnetic (TDEM) metal detector, was used to collect data for the initial surveys. Data collection within the Howitzer Test Facility was performed prior to site preparation activities, which included the removal of the test tunnels and firing butts.

In 1997, NORCAL Geophysical Consultants, Inc. (NORCAL) performed a total magnetic field (TMF) vertical gradient survey over the majority of the Project Site in an effort to determine if any OE existed within the area. The survey consisted of the investigation of contiguous, 200-foot by 200-foot grids utilizing cesium vapor magnetometers arrayed to measure the vertical gradient of the total magnetic field. The magnetometer survey did not include borrow areas where surficial materials had been stripped and the ground surface regraded, nor wetlands in the South Valley.

During the USACE OE site investigation for the arsenal, the magnetometry data were evaluated by direct comparison of EM61 data collected during the Former Benicia Arsenal Engineering Evaluation/Cost Analysis (EE/CA) investigation. To evaluate the comparative anomaly detection resolution of the survey parameters used to collect the magnetometer data, electromagnetic (EM) data were collected over OE sampling grids (100 feet by 100 feet) and processed to identify anomalies of interest. The EM data collected by Earth Tech and the magnetometer gradiometer data collected in 1997 were then compared to the data from OE sampling grids.

The conclusions of this comparison indicated that magnetometers did not perform as well as EM systems in detecting small, near-surface targets, and the line spacing (5 feet versus 2.5 feet to be used for the EM data) was too great to adequately resolve targets that are more distant from the traverse centerline. However, the magnetic data were sufficient to discriminate an adequate range of target types. Further detail regarding the evaluation of the geophysical data is available in the Former Benicia Arsenal EE/CA (Earth Tech, 1999).

In selected grids of the North Valley and South Valley, identified magnetic anomalies were investigated by excavating the location of the anomaly until an anomaly source was located. When OE was encountered, it was identified, removed, and disposed of by demolition. Six OE items were removed, including two 37-millimeter (mm) high-explosive (HE) rounds, two 40mm anti-aircraft HE rounds, one 60mm HE mortar shell, and one 76mm anti-personnel (AP) HE round. All of the items found during this portion of the investigation were found in grids around the demolition areas in the South Valley. The OE investigation was suspended pending further investigation of the arsenal by the USACE.

The USACE conducted an EE/CA investigation for the entire Former Benicia Arsenal, including portions of the Project Site. Portions of the property were geophysically mapped, and subsurface anomalies that were identified were sampled to determine the presence or absence of OE. Two OE items were encountered at Demolition Site #1 (one 75mm unfuzed shrapnel projectile and one 37mm fuzed projectile) during the EE/CA investigation; these were disposed of by demolition (Earth Tech, 1999). The entire project site has not been geophysically mapped. Figure 2-4 indicates the areas that have been geophysically mapped and cleared.

Earth Tech performed a preliminary soils investigation in May 1999 and found one expelling charge.

2.4 SCOPE OF WORK

Various types of samples (e.g., soil, sediment, surface water, groundwater) will be collected for chemical analysis. Soil/sediment and bedrock samples will also be logged in the field by the geologist supervising the sample collection activities. Immediately following sample collection, the samples will be handled and shipped to an analytical laboratory for analysis or analyzed on site in a mobile laboratory.

To enhance safety before, during, and after sampling, vegetation removal may be required to gain access to sampling locations. Vegetation removal will be performed using a tractor-drawn bushhog (mechanical flailing machine) or hand-held, gas-powered tools. Prior to vegetation removal, the area to be cleared will be inspected for debris and OE by a UXO escort. The UXO escort will perform OE surface inspections using both visual and magnetometer-assisted inspection sweep methods, as specified in the OE Safety and Health Program (Appendix B and in the Earth Tech Health and Safety Procedures [Appendix C]). All areas proposed for sampling have either been disturbed by previous grading activities or have been surface swept including removal of vegetation as part of previous OE clearance activities. However, as an added safety measure, all sampling crews will be led by the UXO escort to assure OE avoidance.

2.4.1 Description of Remedial Investigation/Feasibility Study Sampling

The proposed scope of work for the field investigation activities at the Project Site will be conducted in accordance with the protocols and procedures presented in the Field Sampling Plan. The field sampling program is being conducted to better define the nature and extent of potential contamination in the following areas: five TNT Strips in the North Valley; the Ammunition Renovation/Primer Destruction Site in the North Valley; the Howitzer Test Facility in the North Valley; two demolition sites in the South Valley; and one Flare Site, also in the South Valley. Surface water and groundwater at the Project Site will also be investigated through the collection of surface water samples and surface seep/spring samples from the South Valley, and groundwater samples through the installation of temporary groundwater monitoring wells in the North Valley and South Valley. Additional sampling of two soil stockpile areas within the Ammunition Renovation/Primer Destruction Site in the North Valley, nine soil stockpile areas and shallow soil on the Ridge between the North Valley and South Valley (Former Dynamite Burn Site), and sediment in the Wetlands in the South Valley have also been included in the field sampling program.

Additional sites may be sampled as required in accordance with associated project site Field Sampling Plans. This SSHP will be amended as necessary to address specific sampling activities not currently discussed and reflect the findings of future sampling activities.

In addition to the proposed field sampling program, existing site geology data will be supplemented through field geologic mapping of any outcrop areas within the Project Site.

2.4.1.1 TNT Strips.

Three of the TNT strips (TNT Strips #1, #4, and #5) have been chosen for additional investigation to further define the vertical and lateral extent of the contamination by advancing a series of step-out borings at a distance of 5 feet, 10 feet, and 20 feet from the center axis of the TNT Strips (see Plate 1). The TNT-1F-series step-out borings will be oriented along a firebreak, which is observed to cross TNT Strip #1 on historical aerial photographs. The TNT-4C-series step-out borings will be advanced beyond the end of TNT Strip #4 and across the strip in an upslope and downslope direction, intersecting previous boring location TNT-4C. The TNT-5A-series step-out borings will be advanced across TNT Strip #5 in an upslope and downslope direction, intersecting previous boring location TNT-5A.

The 5-feet and 10-feet step-out borings will be advanced to a maximum depth of 10 feet bgs or to competent bedrock, whichever is encountered first. Soil samples will be collected at the surface, and at 1 foot, 4 feet, 6 feet, 8 feet, and 10 feet bgs. Surface samples will be collected only from the 20-foot step-out borings. One additional boring will be advanced during the TNT-1F-series borings, on the center axis of the strip, since this location was not previously sampled. This boring will be advanced to a maximum depth of 10 feet bgs or to competent bedrock, whichever is encountered first. Soil samples will be collected at the surface, and at 1 foot, 2 feet, 4 feet, 6 feet, 8 feet, and 10 feet bgs.

The soil samples will be tested in the field for TNT using either a field soil test kit (see Section 2.8.1 of RI/FS Work Plan), which provides a quantitative result by EPA Method SW8515, or an on-site mobile laboratory utilizing EPA Method SW8330 (see Section 2.8.2 of RI/FS Work Plan). The soil samples will be tested in sequence in order to determine the extent of the step-out program (i.e., shallowest to deepest soil samples, starting with those borings nearest to the TNT strip center axis). Soil samples will be tested until TNT is nondetect. If the TNT nondetect field testing criterion is met, any remaining deeper samples from a particular boring will not be analyzed. If a surface sample meets the TNT nondetect field testing criterion, samples from further step-out borings will not be analyzed. Although not anticipated, if the surface sample from the 20-foot step-out boring exceeds the TNT nondetect field testing criterion, additional samples will be collected at 1 foot, 4 feet, and 6 feet bgs for analysis using a field soil test kit or an on-site mobile laboratory. Additional step-out borings (i.e., 40 feet) will also be advanced until the surface samples no longer exceed the TNT nondetect field testing criterion.

The highest concentration of TNT detected to date at the TNT Strips is at the southeastern end of TNT Strip #1, where 380,000 milligrams per kilogram (mg/kg)

of TNT was detected at 1 foot bgs at boring location TNT-1C (see Figure 1.5-1 of RI/FS Work Plan). Given the high concentration of TNT detected, the potential for lateral and vertical migration of TNT was considered to be greatest at this location.

One boring (TNT-1C2) will be advanced adjacent to previous boring location TNT-1C at the southeastern end of TNT Strip #1 to confirm the elevated TNT levels detected at this location and to evaluate the maximum depth of contamination associated with the elevated contamination levels. This boring will be advanced to a maximum depth of 10 feet bgs or to competent bedrock, whichever is encountered first. Soil samples will be collected at the surface, and at 1 foot, 2 feet, 4 feet, 6 feet, 8 feet, and 10 feet bgs. The soil samples will be tested in the field for TNT using a field soil test kit or an on-site mobile laboratory. Samples will be analyzed sequentially using the field testing criterion previously described. If the TNT nondetect field testing criterion is exceeded, the sample will be submitted to the analytical laboratory and analyzed for the following compounds provided the concentration of explosives is less than 3 percent (30,000 mg/kg):

- PAHs by EPA Method SW8310
- California Assessment Manual (CAM) 17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives by EPA Method SW8330.

In addition, the sample collected at 1 foot bgs at boring TNT-1C2 will be analyzed for dioxins/furans by EPA Method SW8290.

The TNT-1C series step-out borings will be advanced at 5 feet, 10 feet, and 20 feet from the center axis of TNT Strip #1, as previously described. Soil samples from the 5-foot and 10-foot step-out borings will be collected at the surface, and at 1 foot, 4 feet, and 6 feet bgs. Surface samples will be collected only from the 20-foot step-out borings. Samples will be analyzed sequentially using the field testing criterion previously described. If the TNT nondetect field testing criterion is exceeded, the sample will be submitted to the analytical laboratory for analysis of PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, sodium, and explosives, by the test methods previously listed. Although not anticipated, if the surface sample from the 20-foot step-out boring exceeds the TNT nondetect field testing criterion, additional samples will be collected at 1 foot, 4 feet, and 6 feet bgs for analysis using a field soil test kit or an on-site mobile laboratory. Any sample exceeding the TNT nondetect field testing criterion will be submitted to the analytical laboratory for analysis of PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, sodium, and explosives by the test methods previously listed. Additional step-out

borings (i.e., 40 feet) will also be advanced until the surface samples no longer exceed the TNT nondetect field testing criterion.
In addition, four borings (TNT-1D, TNT-1E, TND-1G, and TNT-1H) will be advanced along the suspected extension of TNT Strip #1 toward the southeast, and one boring (TNT-5F) will be advanced along the suspected downslope extension of TNT Strip #5. The borings will be advanced to a maximum depth of 6 feet bgs or to competent bedrock, whichever is encountered first. Soil samples will be collected at the surface, and at 1 foot, 4 feet, and 6 feet bgs, and will be tested in the field for TNT using a field soil test kit or an on-site mobile laboratory. Samples will be analyzed sequentially using the field testing criterion previously described.

The field sampling program for the TNT Strips is summarized in Tables 2.2-1 through 2.2-3 of the RI/FS Work Plan. Ten percent of the samples tested in the field using the soil test kit will be submitted to an analytical laboratory for confirmation analysis by EPA Method SW8330. The decision of which samples will be submitted for confirmatory analysis will be based on the soil test kit results, and will consist of a combination of nondetect results and a range of the detected results.

Additional samples may be collected during the TNT Strips sampling program at greater step-out distances and depths than indicated in the RI/FS Work Plan, should the analytical results obtained from either the field soil test kit or the on-site mobile laboratory indicate that additional samples need to be collected to further define the vertical and lateral extent of contamination in a particular area of investigation.

2.4.1.2 Howitzer Test Facility.

Six borings will be advanced within and adjacent to the Howitzer Test Facility. Three borings (HF-1 through HF-3) will be advanced toward the northern end of the Howitzer Test Facility (see Figure 2.2-2 of the RI/FS Work Plan). Borings will be advanced to competent bedrock. Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, until bedrock is encountered and analyzed for the following:

- PAHs by EPA Method SW8310
- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives, including nitroglycerin and pentaerythritol tetranitrate (PETN), by EPA Method SW8330
- Nitrate/nitrite as nitrogen by EPA Method 300.0

- TEPHs as kerosene by California LUFT Modified EPA Method SW8015

- Volatile organic compounds (VOCs) by EPA Method SW8260B.

The remaining three borings (TW-4, TW-5, and TW-6) will be advanced to first encountered groundwater for possible temporary well installation (see Section 2.5 of the RI/FS Work Pan). Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, until bedrock is encountered, and analyzed for the compounds previously listed.

2.4.1.3 Ammunition Renovation/Primer Destruction Site.

There are two stockpiles (SP1 and SP2) within the Ammunition Renovation/Primer Destruction Site (see Figure 2.2-2 of the RI/FS Work Plan). Because these stockpiles have been previously sampled, only one additional soil sample will be collected from each of the stockpiles from 2 feet below the stockpile surface. This sample will be analyzed for the following compounds:

- PAHs by EPA Method SW8310

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A

- Explosives, including nitroglycerin and PETN, by EPA Method SW8330

- Nitrate/nitrite as nitrogen by EPA Method 300.0

- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015

- TEPHs as kerosene by California LUFT Modified EPA Method SW8015.

Six borings will be advanced within the Ammunition Renovation/Primer Destruction Site. Four of the borings (AR-1 through AR-4) will be advanced to competent bedrock. Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, 20 feet bgs, and at every 5 feet thereafter, until bedrock is encountered, and analyzed for the compounds previously listed. The remaining two borings (TW-1 and TW-7) will be advanced to first encountered groundwater or to competent bedrock, whichever is encountered first, for possible temporary monitoring well installation (see Section 2.5 of the RI/FS Work Plan). Soil samples will be collected at 0.5 foot, 4 feet, 10 feet, 15 feet, and 20 feet bgs and analyzed for the compounds previously listed. All soil samples collected from the six borings will also be analyzed for VOCs by EPA Method 8260B.

Stockpile samples will not be analyzed for VOCs, since it is assumed that any volatiles that may have been present in the stockpile soil will have long since volatilized.

2.4.1.4 North Valley Groundwater.

Up to nine borings for possible temporary monitoring well installations (TW-1 through TW-9) will be advanced in the North Valley to first encountered groundwater or to competent bedrock, whichever is encountered first (see Figure 2.1-2 of the RI/FS Work Plan). First groundwater is anticipated to be encountered in the alluvium (if sufficient thickness is present) and/or the underlying weathered bedrock zone. A temporary monitoring well will be installed in those borings where groundwater is encountered.

For those wells to be installed in and around the Howitzer Test Facility (TW-4, TW-5, and TW-6), soil samples will be collected from the borings and analyzed as described in Section 2.2.2.2 of the RI/FS Work Plan. For those wells to be installed in the Ammunition Renovation/Primer Destruction Site (TW-1 and TW-7), soil samples will be collected from the borings and analyzed as described in Section 2.2.2.3 of the RI/FS Work Plan.

Bulk soil samples will also be collected of the major lithologies encountered during advancement of borings for possible temporary monitoring wells TW-1 and TW-2. Bulk soil samples will be analyzed for the following:

- Total organic carbon by EPA Method SW9060
- Grain size by American Society of Testing and Materials (ASTM) Standard D422.

Groundwater, if present, will be collected and analyzed using the following compounds:

- Dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- VOCs by EPA Method SW8260B
- PAHs by EPA Method SW8310
- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015
- TEPHs as kerosene by California LUFT Modified EPA Method SW8015

- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; TDS by EPA Method 160.1; and total suspended solids [TSS] by EPA Method 160.2)

- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

2.4.1.5 Ridge Soil Stockpiles.

Soil samples will be collected from nine stockpiles (RSP-1 through RSP-9) on the ridge between the North Valley and South Valley (see Figure 2.1-4 of the RI/FS Work Plan). Four soil samples will be collected from each of the larger stockpiles (RSP-1 through RSP-5). Two soil samples will be collected from each of the smaller stockpiles (RSP-6 through RSP-9). Soil samples will be collected from 2 feet below the stockpile surface. Soil samples from each stockpile will be composited into one sample by the analytical laboratory and analyzed for the following compounds:

- TEPHs as diesel and motor oil by California LUFT Modified EPA Method SW8015

- Explosives by EPA Method SW8330

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A.

Prior to excavation, four near-surface soil/bedrock samples will also be collected from the Ridge in the area occupied by the Former Dynamite Burn Site. Ridge samples will be composited into one sample by the analytical laboratory and analyzed for nitroglycerin and PETN by EPA Method SW8330 and for nitrate/nitrite as nitrogen by EPA Method 300.0.

2.4.1.6 Flare Site.

Three borings will be advanced at the Flare Site (see Figure 2.2-3 of the RI/FS Work Plan). One boring (FA-4) will be advanced toward the periphery of the Flare Site in an upslope direction. One boring (FA-5) will be advanced toward the periphery of the Flare Site in a downslope direction. The remaining boring (FA-6) will be advanced to as close to the center of the Flare Site as possible. If OE clearance permits, the borings will be advanced to a maximum depth of 10 feet bgs, or to competent bedrock, whichever is encountered first. Soil samples will be collected from the central boring location at 1 foot, 2 feet, 5 feet, and 10 feet bgs. Soil samples will be collected from the peripheral boring locations at the surface, and at 1 foot, 2 feet, 5 feet, and 10 feet bgs. Flare Site samples will be analyzed for the following compounds:

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A

- Total phosphorous by EPA Method 365.2.

In addition, the 1-foot sample from the central boring location will also be analyzed for PAHs by EPA Method SW8310, for explosives, including nitroglycerin and PETN, by EPA Method SW8330, nitrate/nitrite as nitrogen by EPA Method 300.0, and for dioxins/furans by EPA Method SW8290.

Location and maximum boring depths at the Flare Site may need to be modified in the field based on OE avoidance procedures.

2.4.1.7 Demolition Sites.

Demolition Site #1. Additional samples and locations are being proposed at this site. The final location and number of samples will be determined at a later date. However, any samples collected from this site would be analyzed for the following compounds:

- PAHs by EPA Method SW8310

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, AND SW7471A

- Explosives including nitroglycerin and PETN by EPA Method SW8330

- Nitrate/nitrite as nitrogen by EPA Method 300.0.

Demolition Site #3. Four additional borings will be advanced at Demolition Site #3 (see Figure 2.2-3 of the RI/FS Work Plan). Two of the borings (DA3-3 and DA3-4) will be advanced toward the downslope periphery of the demolition area, through undisturbed soils. The remaining two borings (DA3-5 and DA3-6) will be advanced toward the center of the demolition area through previously disturbed soils (i.e., backfill material) into the underlying alluvium and/or weathered bedrock. The borings will be advanced to competent bedrock. Selected sample depths will be retained for chemical analysis at major changes in lithology or at a minimum of 5-foot intervals.

For the central borings, samples will be retained, at a minimum, from the disturbed fill material, immediately below the fill material, and immediately above the competent bedrock. Soil samples will be analyzed for PAHs, CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium and explosives, by the test methods previously listed. The sample collected immediately below the fill material will also be analyzed for nitroglycerin and PETN by EPA Method SW8330, and nitrate/nitrite as nitrogen by EPA Method 300.0.

2.4.1.8 South Valley Wetlands Sediment and Surface Water.

Sediment and surface water samples will be collected from several locations in the Wetlands (see Figure 2.1-3 of the RI/FS Work Plan). Sediment and surface water samples will be collected upgradient (WET-1 and SW-1) and downgradient (WET-2 and SW-2), respectively, of the Demolition Sites and the Flare Site.

Sediment samples will be analyzed for the following compounds:

- CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- PAHs by EPA Method SW8310
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- Nitrate/nitrite as nitrogen by EPA Method 300.0
- Total phosphorous by EPA Method 365.2.

The downgradient sediment sample will also be analyzed for dioxins/furans by EPA Method SW8290.

Surface water samples will be analyzed for the following compounds:

- Total and dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- PAHs by EPA Method SW8310
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; total dissolved solids (TDS) by EPA Method 160.1; and TSS by EPA Method 160.2)
- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

2.4.1.9 South Valley Groundwater and Seeps/Springs.

Three borings for possible temporary monitoring well installations will be advanced in the South Valley, upgradient of the Demolition Sites and Flare Site (TW-10), immediately downgradient of the Flare Site (TW-11), and downgradient of the McAllister Drive Land Bridge (TW-12), respectively (see Figure 2.2-3 of RI/FS Work Plan). At these locations, groundwater is anticipated to be close to the ground surface due to the proximity of the Wetlands.

Groundwater samples will be analyzed for the following compounds:

- VOCs by EPA Method SW8260B
- PAHs by EPA Method SW8310
- Dissolved CAM 17 metals, plus aluminum, calcium, iron, manganese, magnesium, potassium, and sodium, by EPA Methods SW6010B, SW7470A, and SW7471A
- Explosives, including nitroglycerin and PETN, by EPA Method SW8330
- General water chemistry (chloride, nitrate/nitrite, sulphate, and orthophosphate by EPA Method 300.0; total phosphorous by EPA Method 365.2; total organic carbon by EPA Method 415.1; TDS by EPA Method 160.1; and TSS by EPA Method 160.2)
- Field parameters (temperature by EPA Method 170.1, pH by EPA Method 150.1, electrical conductivity by EPA Method 120.1, and turbidity by EPA Method 180.1).

Three potential seeps/springs (SPS-1 through SPS-3), situated along the north sideslope of the South Valley, will be inspected to see if there is any seep water present from which a surface seep sample can be collected (see Figure 2.1-3 of the RI/FS Work Plan). Surface seep samples will be analyzed for the compounds previously listed.

2.4.1.10 Field Mapping.

To supplement existing geological data, the Project Site will be walked to identify any outcrops and, in particular, any exposures in the graded ridge area between the North Valley and South Valley. The outcrops will be mapped, including but not limited to lithology, and if bedrock is exposed, preferential bedding planes or fracture patterns. Field mapping will be conducted by a California state-certified geologist.

2.4.2 Description of OE Removal Action

The OE removal action will include the removal of all OE on site. The following sections describe the activities associated with implementation of the removal action.

The removal of OE from the Project Site will consist of a multi-step approach including mobilization and surface preparation, fence removal/installation, geophysical investigation and mapping, anomaly excavation, and OE disposal. The follow-up quality assurance(QA)/quality control (QC) steps will include geophysical rescreening, remapping, and, if necessary, further anomaly excavation activities. These tasks are summarized in the following subsections. The proposed project schedule for completion of the removal action is in the OE Work Plan.

2.4.2.1 Mobilization and Surface Preparation.

Mobilization and surface preparation will include:

- Mobilization of vegetation removal crews, OE clearance crews, geophysical investigation crews, support staff, and management personnel
- Clearance of vegetation
- Location and marking of 200-foot by 200-foot search grids
- Surface clearance of all OE-related objects.

Mobilization of management personnel, support staff, vegetation removal crews, geophysical investigation crews, and OE clearance crews will be staggered based on task start dates. A Command Post will be established consisting of two temporary office trailers and one storage annex to be situated near the corner of Piercy and McAllister drives. The management staff will consist of a PM, Senior Ordnance and Explosives Supervisor (SUXOS), and Field Team Leader (FTL)/Site Safety Officer (SSO). Roles and responsibilities of these personnel are described in Chapter 3.0.

In order to geophysically map the site, the area will be cleared of vegetation to a height of 6 inches or less. The majority of the vegetation will be removed by mechanical means either with a brush hog or a flailing machine pulled behind a track-mounted dozer. Approximately 15 percent of the site cannot be accessed by mechanical equipment and will be cleared by personnel using gas-powered weed cutters.

Following vegetation removal, survey crews will establish a 200-foot by 200-foot grid pattern on the entire site using corner stakes to establish grid corners. The grid system will allow geophysical and OE clearance crews to accurately track

their progress as they locate and clear OE, OE scrap, and metallic surface debris from the site.

Once the grid system is established, OE crews will conduct a surface clearance to locate and dispose of OE, OE scrap, and metallic surface debris.

A safety analysis will be performed to determine the appropriate OE disposal or treatment location. In all cases, OE disposal operations will be performed by safely detonating or treating the items using proven and approved engineering controls to control/minimize hazards of blast and fragmentation. All OE scrap and metallic surface debris will be picked up, deposited in a collection vehicle, and transported to a designated on-site holding area where it will be recorded, certified as inert, segregated, and stored in secure roll offs with locking tops awaiting final disposal to a local scrap metal dealer.

2.4.2.2 Geophysical Investigation and Mapping.

Geophysical investigation and mapping activities include:

- Geophysical data collection
- Geophysical data processing
- Preparation of anomaly maps and dig sheets
- Reacquisition and marking of anomalies.

After the area has been surface cleared of OE, OE scrap, and metallic surface debris, geophysical crews will begin collecting subsurface anomaly data from each grid. The majority of the site will be mapped using a multisensor towed array detection system (MTADS) (Figure 2-5). The array will be pulled by a track-mounted tractor. Where the towed array cannot be used (mainly in the steeper terrain at the site), a dual-sensor hand-towed or man-carried, portable geophysical array will be used. These systems locate anomalies by using EM energy (Figure 2-6 and 2-7). Anomalies are digitally recorded, along with the precise location, using a global positioning system (GPS). Approximately 70 percent of the site will be mapped with towed array equipment; 30 percent of the site will be mapped with portable equipment.

The geophysical data collected in the field will be processed and analyzed to identify all potential anomalies (metallic items). A geophysicist will prepare dig sheets showing the location and unique identification number for each anomaly identified, and will provide color maps to the reacquisition crews.

Using the dig sheets, reacquisition field crews will mark each anomaly in the field with a colored pin flag for identification by OE clearance crews.

2.4.2.3 Ordnance and Explosives Subsurface Clearance.

OE subsurface clearance includes excavation and identification of geophysical anomalies and removal and disposal of anomalies.

OE clearance crews will excavate and identify each anomaly marked with a colored pin flag by the reacquisition survey crew. Each marked location will be excavated to uncover and identify the source of the anomaly. Once the anomaly is identified as OE, OE scrap, or metallic surface debris, it will be removed or disposed of. A QC team consisting of an OE QC officer and a geophysicist will verify that all anomaly sources have been removed from each grid.

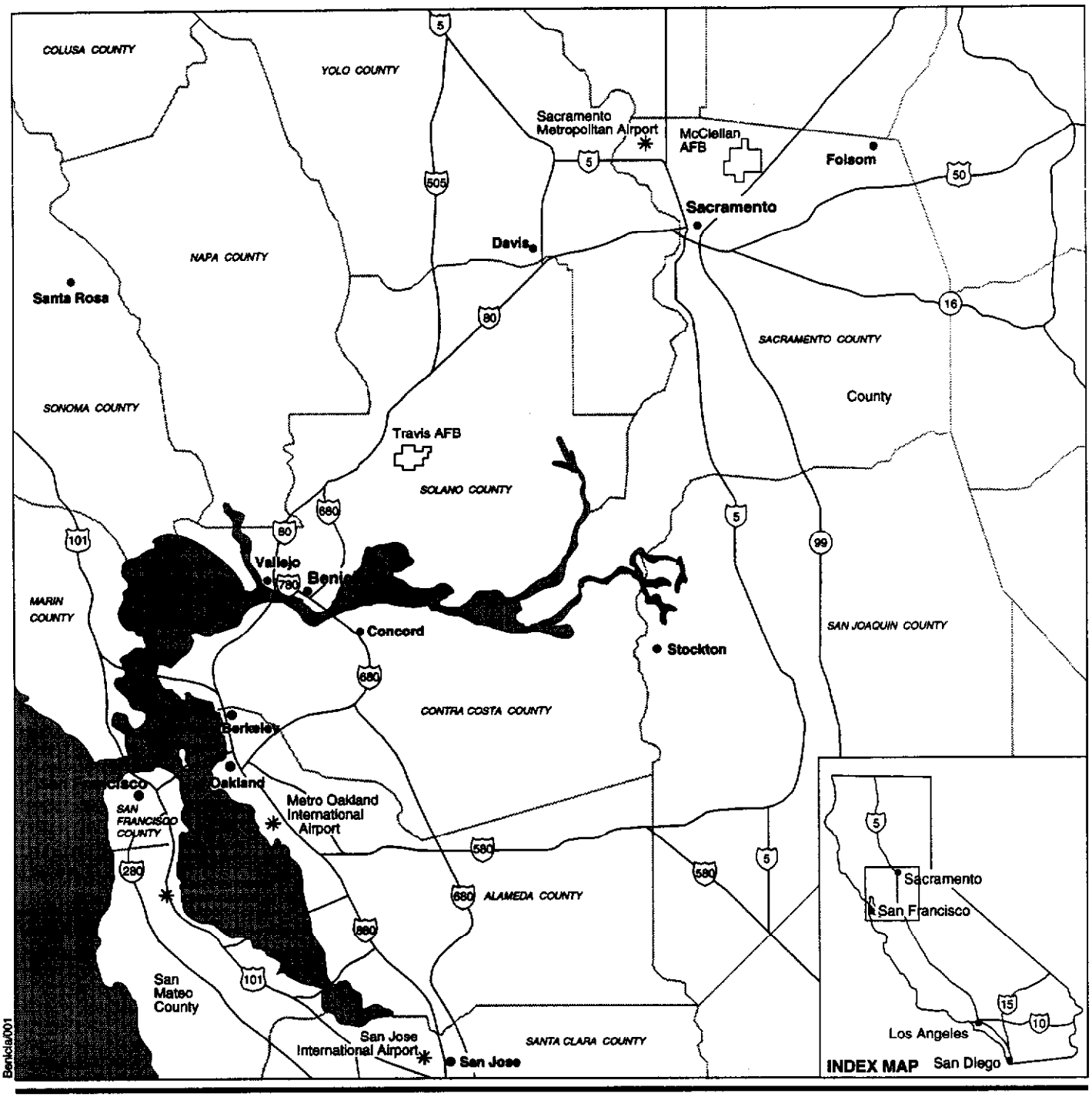
Strict safety protocols will be followed at all times during the excavation of all anomalies. Specific procedures are provided in Chapter 6.0, Ordnance and Explosives Operations. The safety procedures will include the enforcement of a Public Withdrawal Distance (PWD) during the excavation of anomalies and disposal of OE.

Public Withdrawal Areas (PWAs) will be established for the entire site. Residences within the PWA will need to be vacant during OE excavation activities, but residents will be able to return to their homes at the end of each work day. It is anticipated that occupants of residences along the rim of the South Valley will need to be temporarily vacated at some point during removal activities. The PWA for this area and a typical evacuation area are shown in Figure 2-8. An individual residence within a PWA should not have to be evacuated for more than 3 days. There are no businesses within the current expected PWA. Sandbag enclosures or other appropriate engineering controls will be used in order to reduce the PWD of any item detonated in place and to reduce noise associated with detonations. Detonations will be conducted during normal business hours to minimize disturbance to residences and businesses. Unless absolutely necessary, detonations will not occur during days of low cloud cover or temperature inversions, which could amplify noise associated with detonations and adversely affect local residences.

2.4.3 Description of Non-OE Remedial Action

TBD

This document will be amended upon completion of RI/FS Report.



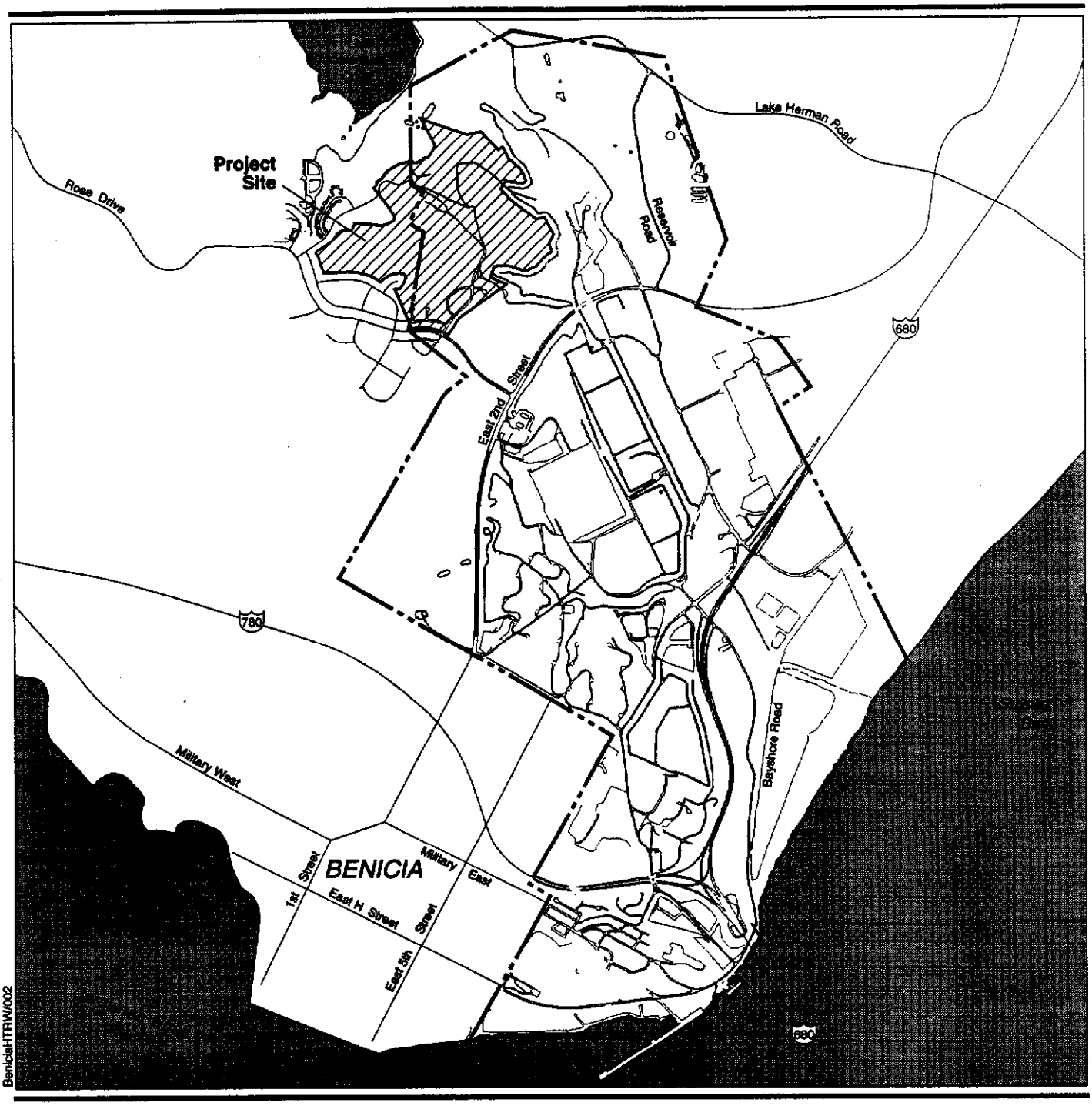
EXPLANATION

- ✱ Airports
- (99) California State Highway
- (101) U.S. Highway
- (280) Interstate Highway
- —— County Boundary

0 3.5 7 14 Miles

Regional Map

Figure 2-1



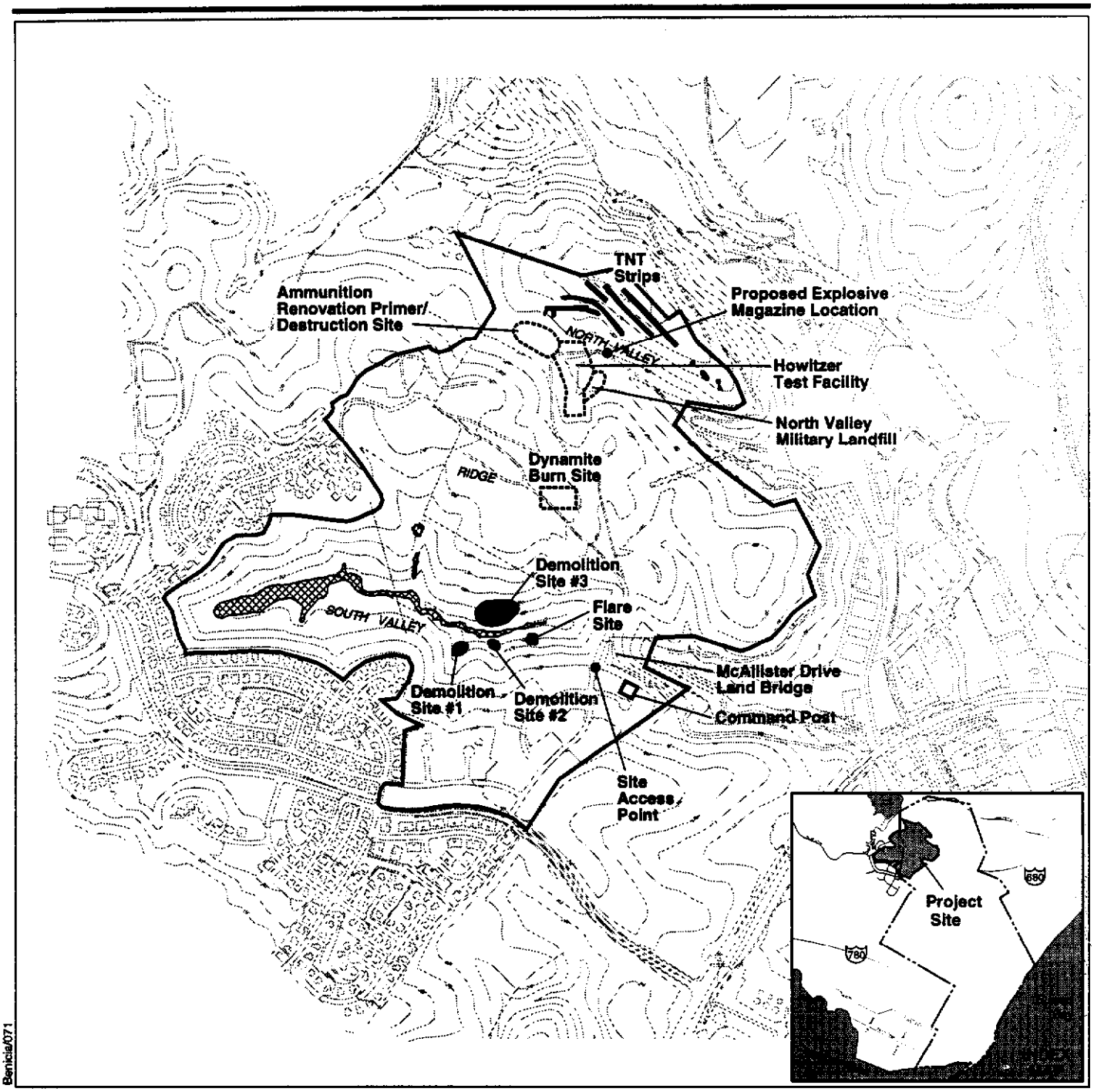
EXPLANATION

- 680 Interstate Highway
- Former Benicia Arsenal Boundary (estimated)
- Project Site

0 .125 .25 .5 Mile

Project Site Location Map

Figure 2-2



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EXPLANATION

Project Site Boundary

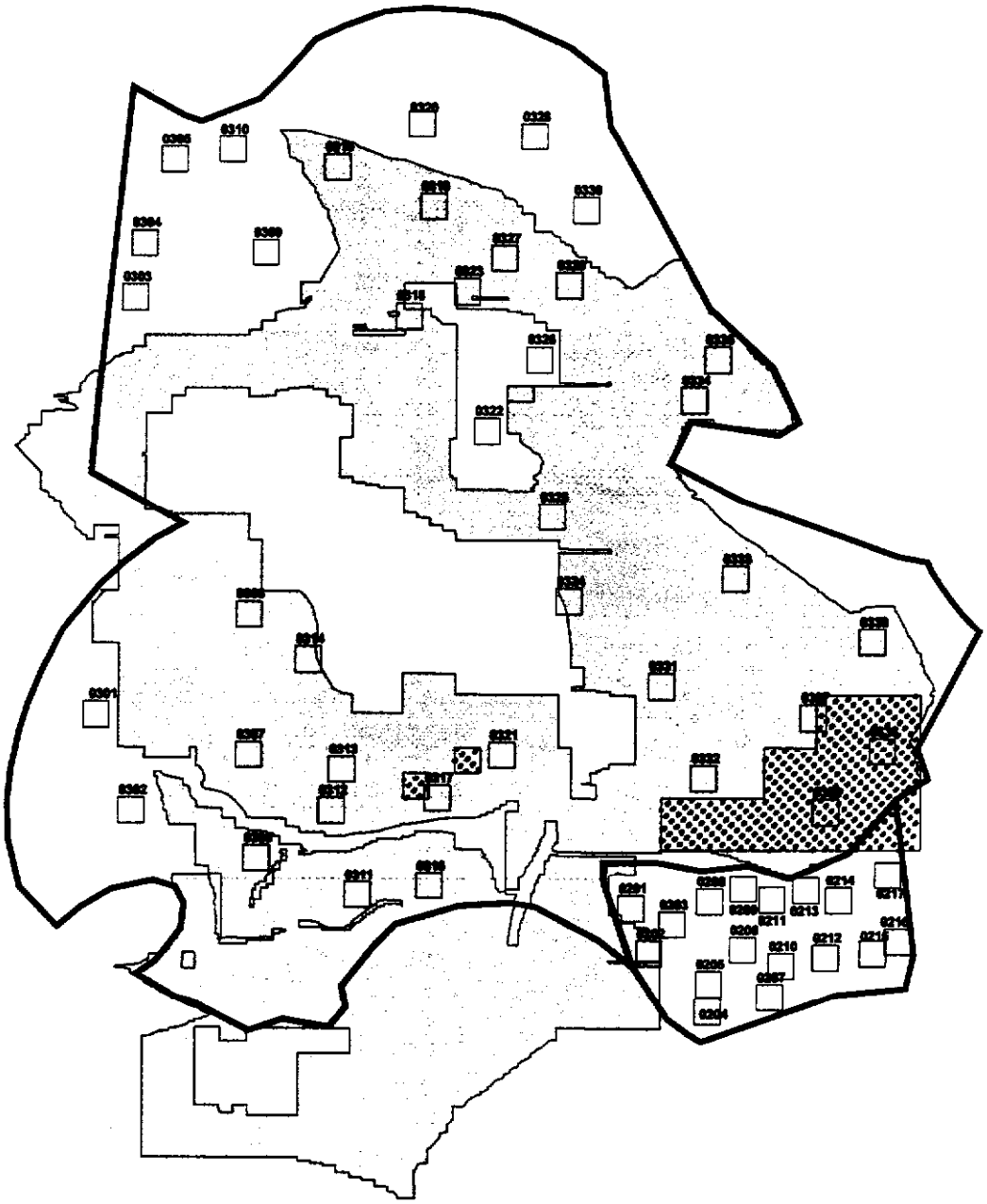
South Valley Wetlands

Project Site Map

0 250 500 1000 Feet

Note: Contour interval equals 25 feet.

Figure 2-3



EXPLANATION

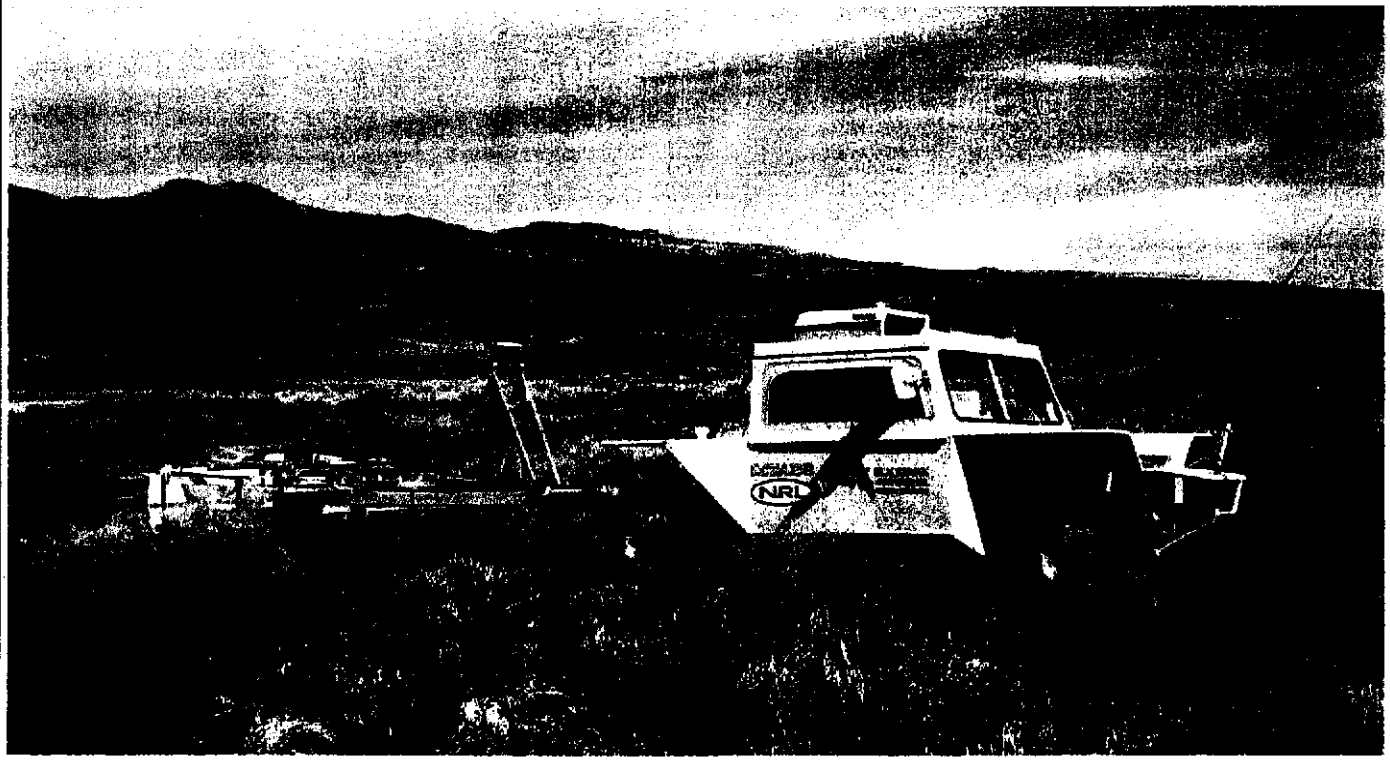
- Previously Mapped Area
- Previously Cleared Area
- Sector Boundary

0.07 0 0.07 0.14 Miles

N

Previously Mapped and Cleared Areas

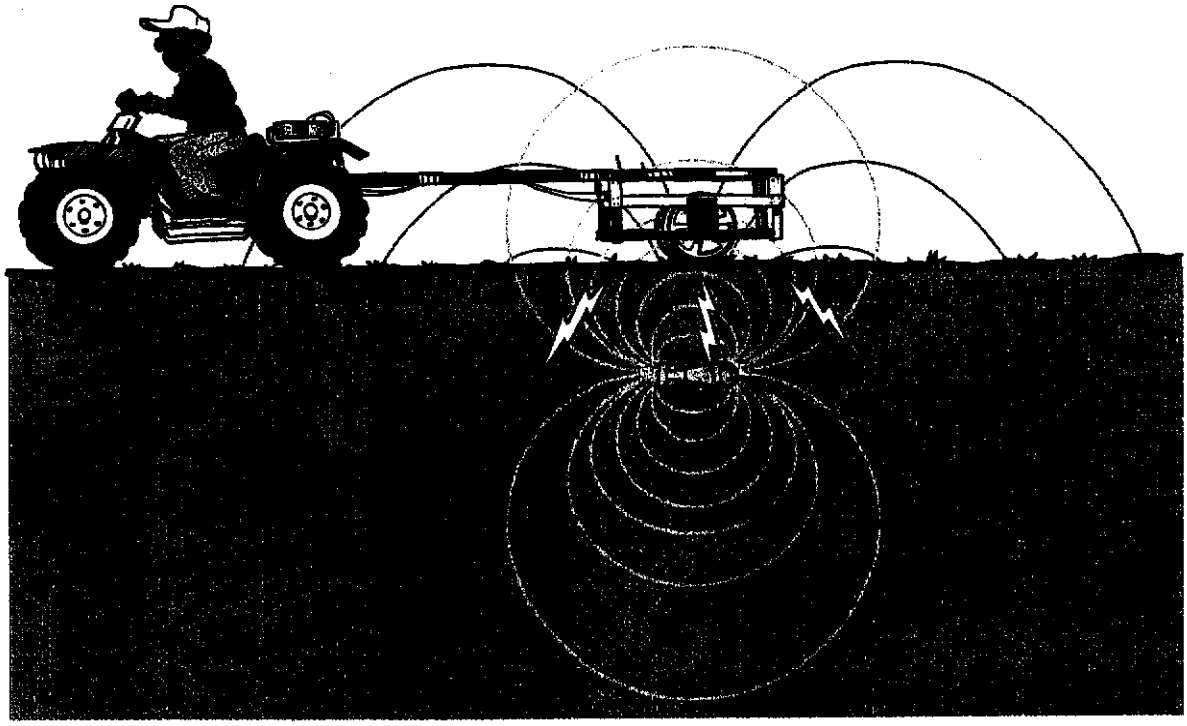
Figure 2-4



Benicia/040

Multisensor Towed Array Geophysical System (MTADS)

Figure 2-5

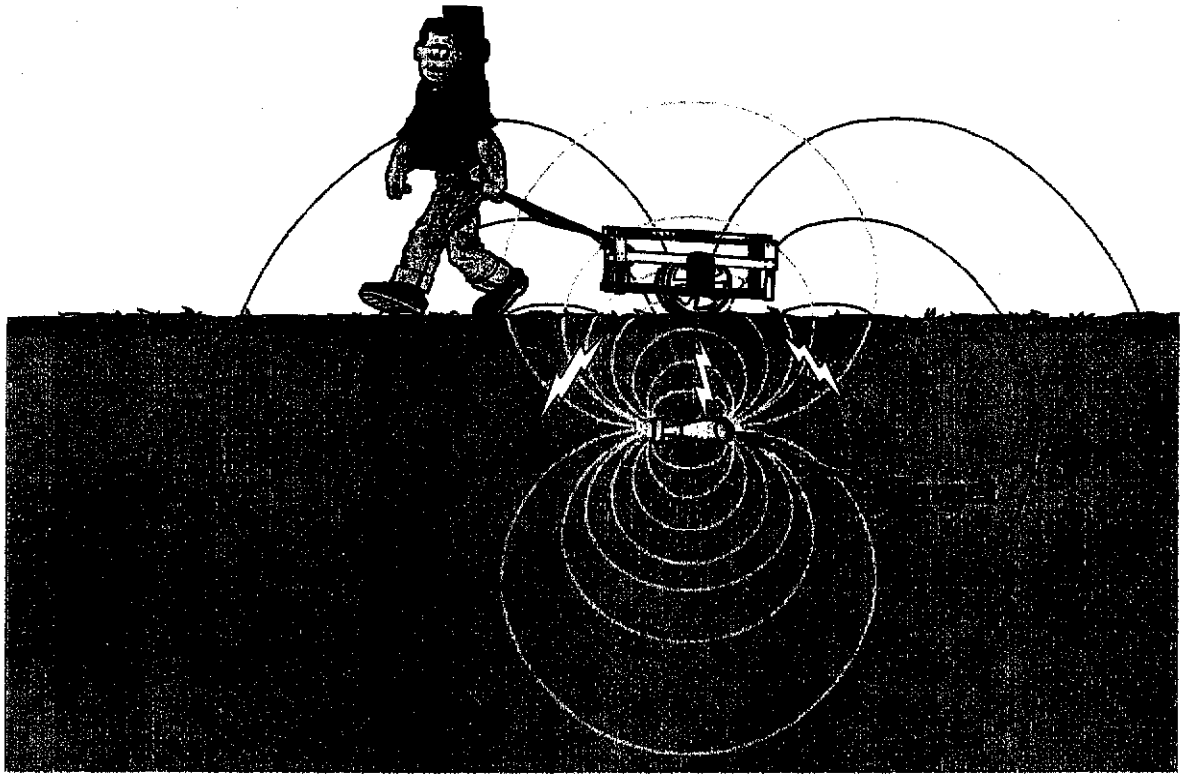


Electromagnetic methods rely on the ability of metal items to conduct electricity that is forced into the ground better than the surrounding soil and rock.

Benicia/037

Geophysical Mapping Using Electromagnetic Method - Vehicle Towed

Figure 2-6

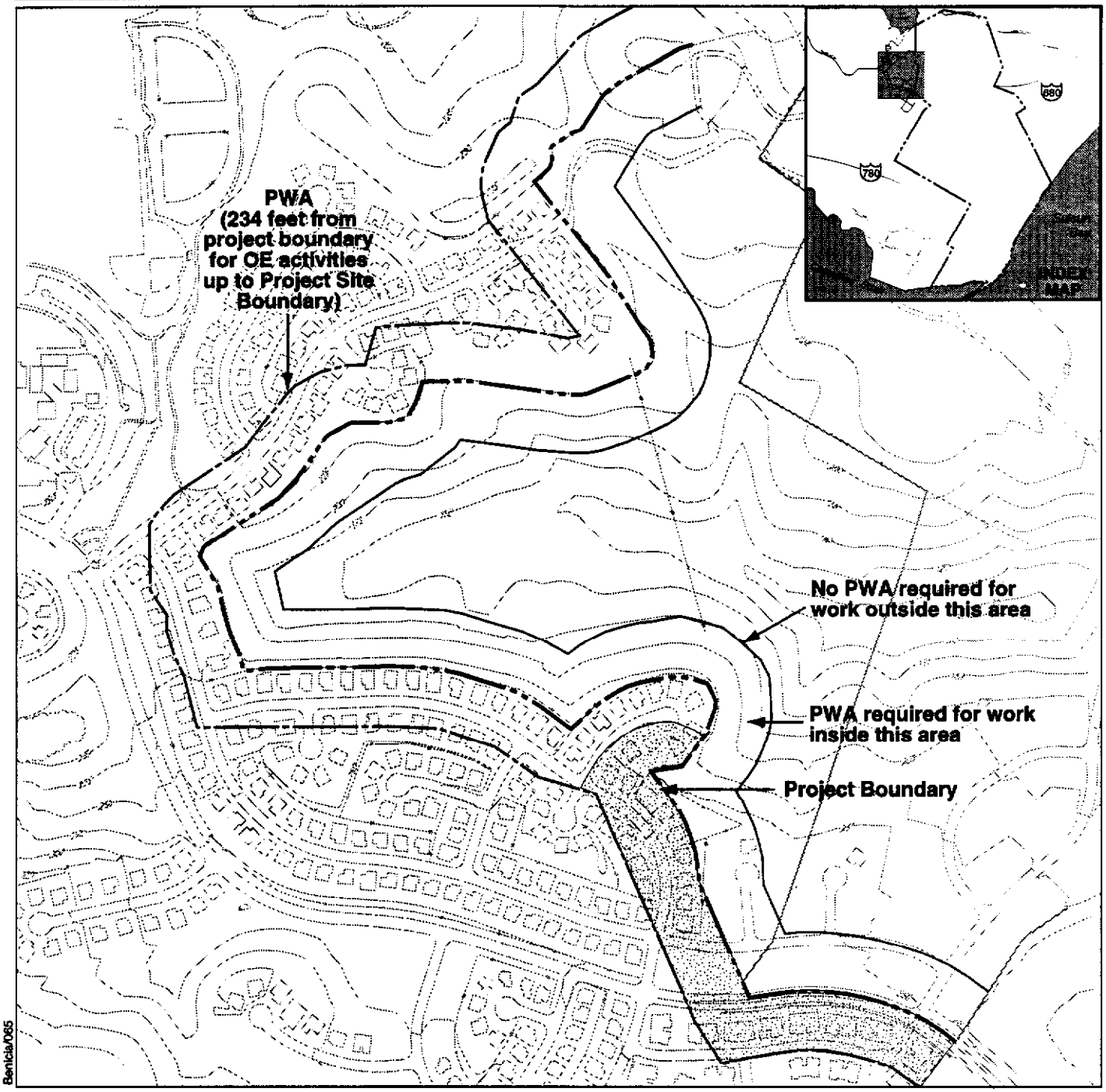


Electromagnetic methods rely on the ability of metal items to conduct electricity that is forced into the ground better than the surrounding soil and rock.

Benicia/069

Geophysical Mapping Using Electromagnetic Method - Personnel Towed

Figure 2-7



EXPLANATION

- Project Boundary
- Public Withdrawal Area (234 feet from project boundary)
- Typical Daily Evacuation Area

Typical Public Withdrawal Area (PWA)

0 125 250 500 Feet

Figure 2-8

Table 2-1. Contaminants of Concern by Location and Concentration Range
Page 1 of 2

Contaminant	Site	State	Low	High
2,4,6-Trinitrotoluene	TNT Strips	Solid	2 mg/kg	380,000 mg/kg
Antimony	Flare Site	Solid	2.2 mg/kg	1,470 mg/kg
Arsenic	TNT Strips	Solid	13.6 mg/kg	23 mg/kg
	Howitzer Test Facility	Solid	13 mg/kg	17 mg/kg
	Ammunition Renovation/Primer Destruction Site	Solid	13 mg/kg	16 mg/kg
	Flare Site	Solid	9.9 mg/kg	18 mg/kg
	Demolition Site #1	Solid	14.7 mg/kg	18 mg/kg
	Demolition Site #2	Solid	13 mg/kg	17 mg/kg
	Demolition Site #3	Solid	11 mg/kg	19.1 mg/kg
	Wetlands	Dissolved Solid	15 mg/kg	15 mg/kg
Barium	Flare Site	Solid	190 mg/kg	76,600 mg/kg
Copper	Flare Site	Solid	67 mg/kg	24,200 mg/kg
Iron	TNT Strips	Solid	25,000 mg/kg	50,000 mg/kg
	Howitzer Test Facility	Solid	36,000 mg/kg	47,000 mg/kg
	Ammunition Renovation/Primer Destruction Site	Solid	38,000 mg/kg	44,000 mg/kg
	Flare Site	Solid	43,000 mg/kg	66,000 mg/kg
	Demolition Site #1	Solid	42,000 mg/kg	48,000 mg/kg
	Demolition Site #2	Solid	36,000 mg/kg	47,500 mg/kg

Table 2-1. Contaminants of Concern by Location and Concentration Range
Page 2 of 2

Contaminant	Site	State	Low	High
	Demolition Site #3	Solid	40,000 mg/kg	48,000 mg/kg
	Wetlands	Dissolved Solid	44,000 mg/kg	44,000 mg/kg
Lead	Flare Site	Solid	11 mg/kg	46,000 mg/kg
Manganese	TNT Strips	Solid	290 mg/kg	1,900 mg/kg
benzo(a)pyrene	Ammunition Renovation/Primer Destruction Site	Solid	0.11 mg/kg	0.11 mg/kg
2,3,7,8-tetrachlorodibenzo-p-dioxin	Flare Site	Solid	1.5 pg/g	1.5 pg/g
total hexachlorinated dibenzo-p-dioxins	Flare Site	Solid	110 pg/g	110 pg/g

mg/kg = milligrams per kilogram
pg/g = picograms per gram
TNT = trinitrotoluene

3.0 HEALTH AND SAFETY RESPONSIBILITIES

Project Site activities will be performed by Earth Tech and subcontractor personnel. The following assignments of health and safety-related responsibilities have been designated accordingly. Resumes of the project health and safety organization have been included in Appendix D. The organizational structure for this SSHP is shown on Figure 3-1.

3.1 ALL EARTH TECH PERSONNEL

Each person is responsible for his/her own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to his/her supervisor and/or the FTL/SSO. All personnel are responsible for continuous adherence to these health and safety procedures during the performance of their work. No person may work in a manner that conflicts with the letter or intent of safety and environmental precautions expressed in these procedures. After due warnings, Earth Tech will dismiss from the site any person who violates safety procedures. Earth Tech employees are subject to progressive discipline and may be terminated for blatant or continued violations. All on-site personnel will be trained in accordance with requirements specified in this document.

3.2 PROJECT ENGINEER

The Project Engineer (PE) is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this SSHP. The PE will confer with the designated HSO on all matters affecting health and safety. Other responsibilities include:

- Requiring a prompt and thorough investigation of all accidents
- Scheduling an Accident Review Board within 10 days of an injury involving a Workers' Compensation claim or OSHA recordability, or any accident with more than a $500 loss.

3.3 PROJECT MANAGER (MR. BRIAN WEITH)

The PM has overall management authority for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The PM will confer with the designated HSO on all matters affecting health and safety. Other health and safety-related duties of the PM include:

- Reading and becoming familiar with this SSHP
- Requiring a prompt and thorough investigation of all accidents

- Scheduling an Accident Review Board within 10 days of an injury involving a workers' compensation claim or OSHA recordability, or any accident with more than a $500 loss

- Providing day-to-day management of site work activities.

The PM is responsible for notifying all federal, state and local government and community organizations as specified in the associated Work Plan. The Exxon plant is a minimum of 1,125 feet from the project site boundaries. The PM will notify the Exxon Health & Safety Department prior to initiating site activities and provide contact numbers for Exxon to use in the event of an accident at the refinery site.

3.4 CERTIFIED INDUSTRIAL HYGIENIST

The designated Certified Industrial Hygienist (CIH) will be responsible for overseeing all aspects of the site safety program as related to the presence of on-site environmental contaminants, and for preparing any site-specific safety guidance documents or addenda related to their presence. The CIH does not report to the Project Manager, and is separately accountable to Earth Tech senior management for site health and safety. The CIH's other responsibilities include:

- General health and safety program administration

- Conducting project health and safety audits as warranted

- Developing site-specific employee/community emergency response plans, as required, based on expected hazards

- Determining the level of personnel protection required

- Updating equipment or procedures based on information obtained during site operations

- Establishing air monitoring parameters based on expected contaminants, as required.

3.5 HEALTH AND SAFETY OFFICER (MR. JOHN MOORE)

The designated HSO is responsible for overseeing all aspects of the site safety program and for preparing the SSHP, site-specific safety guidance documents, or addenda to this plan. The HSO does not report to the PM and is separately accountable to Earth Tech senior management for site health and safety. The HSO will act as the sole contact to all regulatory agencies on matters of safety and health. The HSO's other responsibilities include:

- General health and safety program administration

- Conducting daily project health and safety inspections

- Developing site-specific employee/community emergency response plans, as required, based on expected hazards
- Determining the level of personal protection required
- Updating equipment or procedures based on information obtained during site operations
- Establishing air monitoring parameters, as required, based on expected contaminants.

3.6 FIELD TEAM LEADER/SITE SAFETY OFFICER (MR. RICHARD BURZINSKI)

The FTL will also serve as the SSO and is responsible for performing the routine duties for health and safety, and will coordinate any necessary assistance from the designated HSO. The FTL/SSO will administer this SSHP and the applicable site-specific safety guidance document. Additional FTL/SSO responsibilities include:

- Reading and becoming familiar with this SSHP
- Enforcing the requirements of this SSHP and other applicable safety requirements
- Stopping work, if necessary, to prevent injury or illness and ensure personal and environmental health and safety
- Determining evacuation routes, and establishing/posting local emergency contact telephone numbers
- Ensuring that all applicable site personnel and visitors have received the proper training and medical monitoring before entering any controlled areas
- Presenting any tailgate safety meeting and maintaining appropriate training documentation/attendance records
- Implementing air monitoring according to directives in this SSHP
- Implementing changes in health and safety procedures as directed by the HSO and/or approved addenda to this SSHP.

3.7 ORDNANCE AND EXPLOSIVES SAFETY MANAGER (MR. GREG PETERSON)

The Ordnance and Explosives Safety Manager (OESM) will be appointed by the PM to be principally responsible for execution of all OE operations for field activities. The OESM will have knowledge of all requirements mandated by OSHA, the USACE, EPA, 8 CCR, and Earth Tech's Corporate Environmental, Health and Safety Program. The OESM will be directly responsible to the PM.

The OESM is responsible for the implementation of the SSHP and will provide overall direction of the project OE functions for field activities. The OESM, or his/her designee, will interface with the FTL/SSO on OE safety functions of the project and will coordinate activities with the PM. In addition, the OESM will, as necessary, perform audits, surveillance, document reviews, and other OE safety functions as required to determine the continued effectiveness of the SSHP. The OESM will, as necessary, audit compliance with the SSHP and will perform OE safety reviews of selected project tasks. Other responsibilities will include, but will not be limited to:

- Developing and implementing corrective action plans to eliminate or mitigate hazards associated with OE
- Providing the OE safety portions of training sessions or briefings for site and visitor personnel
- Ensuring the proper use of personal protective equipment (PPE)
- Ensuring that all OE-related site operations are conducted in accordance with this document and with other relevant safety and health regulations and standards.

3.8 SENIOR UXO SUPERVISOR

The SUXOS will manage the on-site manpower and equipment necessary to safely conduct the OE portion of the site operations, as well as the safety and health responsibilities listed below:

- Review and become familiar with the project plans, and ensure that all OE safety concerns are adequately addressed and controlled
- Provide the OE safety portion of any training sessions or safety briefings
- Ensure that all OE-related site operations are conducted in accordance with this document and all other relevant safety and health regulations and standards
- Directly interface with, and relay safety and health concerns to, the Earth Tech FTL/SSO.

3.9 OE SUPERVISOR

The OE Supervisor assigned to this project will be responsible for implementing and enforcing the OE safety and health requirements of this SSHP with his/her team.

3.10 OE SPECIALIST

The OE Specialists assigned to this project will have the responsibility for safely conducting site operations as directed by the OE Supervisor or SUXOS. The OE Specialists will also comply with this SSHP. The OE Specialists will immediately report the observance of any conditions that may present a known or potential hazard to site personnel.

3.11 SUBCONTRACTORS

Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required PPE. All on-site employees of each subcontractor must meet the training and medical monitoring requirements set forth in this SSHP. Work operations performed by these subcontractors will be under the control of Earth Tech, who is responsible for oversight of work activities to ensure that all requirements specified in this SSHP are observed. Each subcontractor is expected to operate in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled.

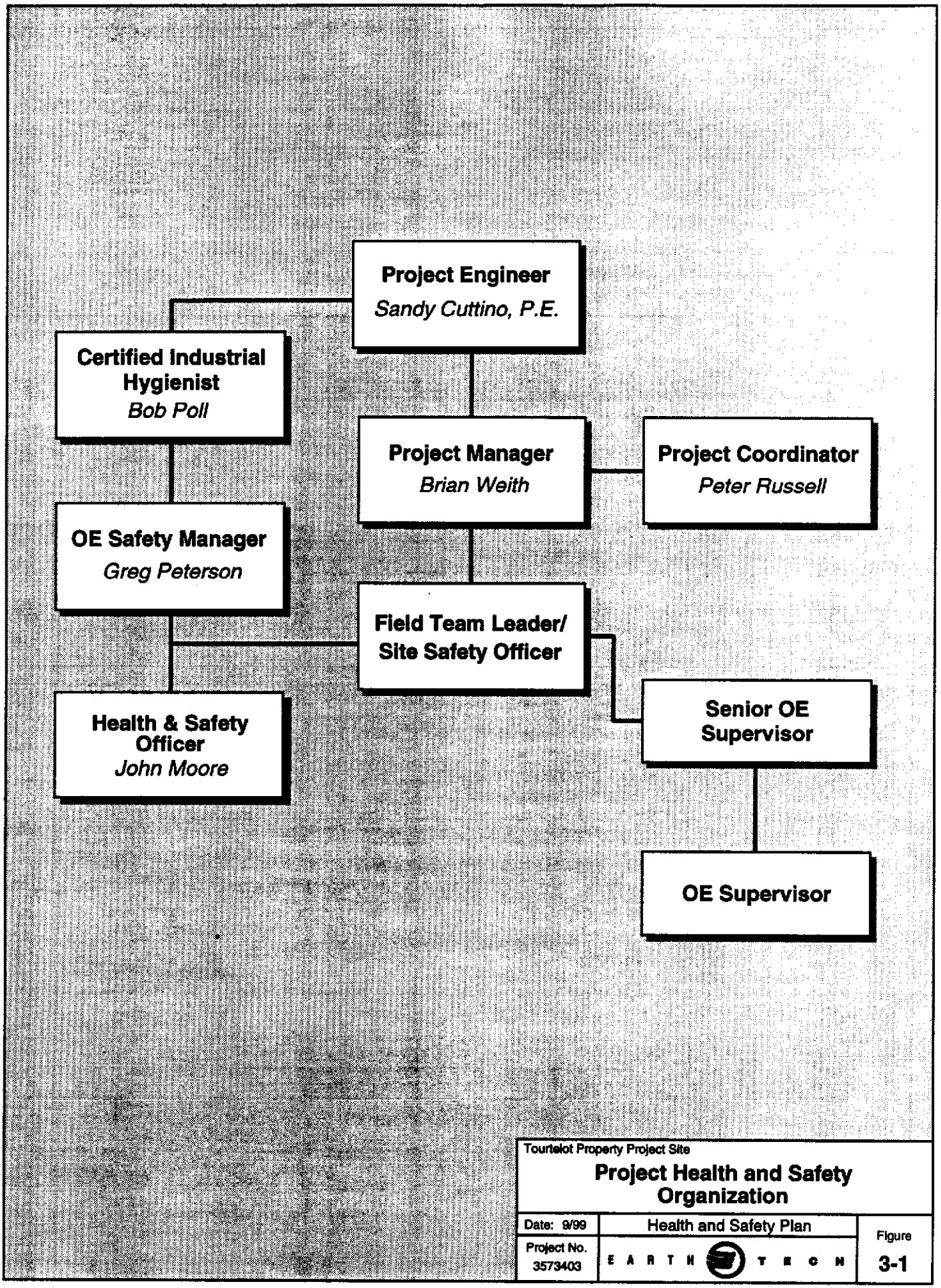
Hazards not listed in this SSHP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech PM or SSO prior to commencement of work operations. The FTL/SSO or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner. Procedures to mitigate hazards not listed must be approved by Earth Tech, USACE, and DTSC.

Appendix E provides Earth Tech's *General Safety Rules for Contractors*, which will be observed by all subcontractor organizations.

3.12 ON-SITE PERSONNEL AND VISITORS

All personnel working for Earth Tech and its subcontractors and all visitors to active exclusion zones or controlled areas are required to read and acknowledge their understanding of this SSHP. All personnel are expected to abide by the requirements of this SSHP and cooperate with site supervision to ensure a safe and healthful work site. Any personnel that are not members of the Earth Tech project team or members of the subcontractor team will be considered a visitor. Visitors to the site will comply with the training and general requirements listed below. The Earth Tech FTL/SSO and SUXOS will be notified of the nature and duration of the visit. Personnel must immediately report any of the following to the PM.

- Accidents and injuries, regardless of severity
- Unexpected or uncontrolled releases of any hazardous substances
- Any symptoms of exposure to a hazardous substance
- Any unsafe or malfunctioning equipment
- Any changes to site conditions that may affect the health or safety of project personnel.
- When any non-OE-qualified personnel are in a designated OE area, all OE operations shall cease until the visitor has departed the area.
- If an unauthorized visitor attempts to enter a work area, all OE and non-OE work in that area shall cease and the Earth Tech FTL/SSO will be notified immediately.



Tourtelot Property Project Site

Project Health and Safety Organization

Date: 9/99	Health and Safety Plan	Figure
Project No. 3573403	EARTH TECH	3-1

Benicia/066

4.0 GENERAL HEALTH AND SAFETY PROGRAMS

All Earth Tech and subcontractor personnel performing work in controlled areas of the Project Site will be qualified as Hazardous Waste Operations and Emergency Response (HAZWOPER) workers. Accordingly, the requirements outlined in the following subsections will apply for all personnel performing any controlled-area work operations.

4.1 MEDICAL SCREENING AND HEALTH SURVEILLANCE

All Earth Tech and subcontractor personnel will have completed an HAZWOPER physical exam in accordance with the requirements of Earth Tech Health and Safety Procedure HS601, Medical Surveillance (Appendix F), which conforms to the requirements of 8 CCR Section 5192(f). Each person's most current exam will have been completed within the previous 365 days, and based on those exam results, each person will be medically authorized to perform HAZWOPER activities and wear approved respiratory protection by an occupational physician. The minimum medical screening will include a complete physical examination and may also and additional tests (e.g., CBC with Differential, chest X-rays, Nitrogen/nitrate) as deemed necessary by the physician. A Pulmonary Function Test will be performed for all personnel who may be required to utilize respiratory protection.

4.2 TRAINING REQUIREMENTS

All personnel on site will meet the following training requirements.

4.2.1 General Training Requirements

All field personnel and visitors involved with site activities will have completed the necessary HAZWOPER training requirements as specified in Earth Tech Health and Safety Procedure HS301, HAZWOPER Training and Refresher (Appendix G), which conforms to the provisions established in 8 CCR Section 5192(e)(2) and (e)(3) (40-hour or 24-hour initial training), 8 CCR Section 5192(e)(8) (annual refresher training), and 8 CCR Section 5192(e)(4) (supervisor training). General and daily site workers engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of off-site instruction, and a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor.

Workers on site only occasionally for a specific limited task (such as, but not limited to, land surveying, fence installation/removal, or geophysical surveying) and who are unlikely to be exposed over Permissible Exposure Limits (PELs) and published exposure levels shall receive a minimum of 24 hours of off-site instruction, and the minimum of 1 day actual field experience under the direct supervision of a trained, experienced supervisor. Proof of training will be

maintained on site for all personnel. Outlines of 40-hour Hazardous Waste Operations, CPR/First Aid, and Explosive Ordnance Disposal (EOD) (UXO) Training are included in Appendix H.

4.2.2 Initial Orientation Training

Prior to the start of on-site activities, all Earth Tech and subcontractor personnel will attend a site safety/orientation briefing, to be conducted by the FTL/SSO. This training will address all elements of the site health and safety program (as presented in this SSHP and referenced Earth Tech and regulatory health and safety requirements). This training will also include instruction in:

- Toxic and physical hazards associated with identified environmental contaminants of concern
- Anticipated exposure hazards (as determined based on analysis of work operations and site contaminant concentrations)
- Requirements and rationale used in the selection of safety equipment
- On-site monitoring procedures
- Decontamination procedures
- Care and use of selected PPE
- Emergency Notification and Response Procedures.

The training content and a list of all attendees will be documented and maintained with the project files.

Worker personnel initially assigned to the site after work operations have commenced will be provided with orientation training by the FTL/SSO that will address the above requirements. All visitors to the site (personnel not assigned to work on site) will be provided with an abbreviated version of this training, along with specific orientation as to the hazards present on site at the time of the visit and any applicable safety requirements (e.g., escorts).

4.2.3 Tailgate Safety Briefings

A tailgate safety briefing will be conducted at the start of each work day. The FTL/SSO will conduct the tailgate safety briefings and will review and discuss the health and safety issues associated with the day's planned work activities, problems encountered, and modifications to existing procedures. Documentation of the tailgate safety briefings will be accomplished by using the Tailgate Safety Briefing Sign-in Log, a copy of which is included in Appendix I. The FTL/SSO will maintain copies of all tailgate safety briefing sign-in logs in the project files. All

field personnel associated with each day's project activities are required to attend these meetings.

4.2.4 Hazard Communication Training

Section 5.2 provides information concerning environmental contaminants that are expected to be encountered during the planned work operations. Material Safety Data Sheets (MSDSs) for contaminants of concern are in Appendix J. In addition, any organization wishing to bring any hazardous material onto any Earth Tech-controlled work site must first provide a copy of the item's MSDS to the FTL/SSO for approval and filing (the FTL/SSO will maintain copies of all MSDSs on site). In accordance with the requirements of 8 CCR Section 5194, all personnel will be briefed on the hazards of any chemical product they use and will be aware of and have access to all MSDSs.

4.3 GENERAL SITE SAFETY RULES

The following general requirements apply to all on-site activities (including work occurring outside controlled work areas).

4.3.1 Smoking, Eating, and Drinking

Smoking, eating, and drinking will not be permitted except in specifically designated areas of the site, which shall be outside any designated exclusion zones or other designated work areas. Field workers will perform proper decontamination procedures when leaving an exclusion zone prior to eating or drinking. Consumption of alcoholic beverages is prohibited everywhere on the Project Site.

4.3.2 Site Awareness

Site personnel will be familiar with the physical characteristics and requirements of the work site, including ongoing activities of other personnel at the Project Site, that may affect their work area. Personnel will also be aware of:

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

The number of personnel and equipment in work areas should be minimized, consistent with site operations.

4.3.3 Buddy System

All on-site personnel will operate using the two-man concept (buddy system). All personnel will operate in teams of two or more (a single-man entry into any controlled work area is prohibited); team members will maintain visual contact with

each other at all times. Team members must observe each other and should be alert for signs of heat stress or toxic exposure.

4.3.4 Response to Distress

Anyone exhibiting distress symptoms should be taken immediately to the nearest medical facility, and steps should be taken to relieve the distress during transportation.

4.3.5 Fire Prevention

Open flames, smoking, and other sources of ignition are not authorized at any designated fieldwork area. Smoking will be permitted only in designated areas. Prior to commencement of the field investigation, Earth Tech will notify the appropriate local fire agencies and departments of specific work areas and activities.

4.3.6 Housekeeping

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

4.3.7 Personal Hygiene

At a minimum, an adequate supply of personal hygiene equipment will be available for use by site personnel. Personal hygiene items will include the following:

Water Supply

A water supply meeting the following requirements will be utilized:

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

Nonpotable Water. Nonpotable water may be used for handwashing and cleaning activities but will not be used for drinking purposes.

Toilet Facilities

A toilet facility will be provided for use by site personnel. If access is available, existing site toilet facilities will meet this requirement. If access to the toilet facilities is not available, portable toilet facilities will be provided by a subcontractor. The subcontractor will be responsible for maintenance and cleaning of portable toilets on a regular schedule. A minimum of two portable toilets will be provided on site. If on-site personnel exceeds 20 persons, additional portable toilets will be provided in accordance with Table 4-1.

Washing Facilities

Employees will be provided with washing facilities (e.g., buckets with water and Alconox) at each work location. Water and hand soap (or a similar substance) will be used by each employee upon exiting any controlled work area, prior to breaks, and at the end of daily work activities.

4.3.8 Drum Handling

Where containers of a capacity greater than 10 gallons are used for containerizing chemical products or waste materials, their handling will be accomplished in accordance with the following:

- When not in use, drums/containers will be covered with a tight-fitting lid.
- At the conclusion of each work shift, all drums/containers will be placed in the designated waste storage area. This area will be identified prior to the start of work activities and properly indicated on site plans/diagrams. Information pertaining to the location of storage areas and their contents will be properly conveyed to all personnel and appropriately annotated in the site logs.
- Mechanical or powered drum handling equipment will be used to move drums/containers. Manual handling of the drums leads to musculo-skeletal injuries and will be avoided to the extent possible.

4.3.9 Spill Response

Spill Prevention

All vessels containing liquid waste will be secondary contained in a container capable of holding 110 percent of the contents of the primary container, excepting the secondary containment for 55-gallon drums, which will be a container holding four drums that can contain 90 gallons. These vessels will include purged groundwater and decontamination water in 5-gallon buckets or 55-gallon drums.

Spill Control

In the event that spill prevention is unsuccessful, spill and discharge containment/ control procedures will be implemented. These procedures address groundwater purge waste and decontamination procedure waste, as well as drum and container handling, opening, sampling, shipping, and transport. Spill control material, such as absorbent paper and solids (vermiculite, or other noncombustible absorbent), drums (55-gallon U.S. Department of Transportation 17-E or 17-H), shovels, brooms, and personal PPE to clean up spills will be available with each field crew. The material used to contain the spill will be placed in Department of Transportation-approved waste containers and will be characterized and properly disposed of. If the spill or discharge is reportable and/or human health or the environment are threatened, the National Response Center, the DTSC, and the USACE will be notified as soon as possible.

Spill Control Measures

If a spill occurs, the following actions be taken by Earth Tech:

- Notify the Site Safety Coordinator immediately.
- Take immediate measures to control and contain the spill within the site boundaries including the following actions:
  - Isolate and contain hazardous spill areas
  - Deny entry to unauthorized personnel
  - Do not allow anyone to touch spilled material
  - Stay upwind; keep out of low areas
  - Keep combustibles away from the spilled material
  - Use water spray to reduce vapors and dust, as needed
  - Take samples for analysis to determine that cleanup is adequate
  - Other actions, as needed.

Solid Spills. Earth Tech will remove and place contaminated materials into dry containers and cover. The container is to be labeled as to its contents and disposed of appropriately.

Liquid Spills. The contractor will absorb all liquid spills with sand, clean fill, or noncombustible absorbent material and dispose of the absorbent/spill mixture in the manner specified under decontamination material disposal.

Discharges

For liquid discharges, Earth Tech will immediately identify the source point of discharge and take measures to eliminate further spills. The discharged material will be absorbed with sand, clean fill, or noncombustible absorbent material and disposed of in the manner specified under decontamination material disposal. If a discharge occurs of any material that is stored in drums or holding tanks occurs, the following actions will be taken by Earth Tech to reduce potential migration to adjacent properties:

- Notify the FTL/SSO.
- Take immediate measures to control the discharge within the site boundaries or beyond the site boundaries, if necessary. These will include the following actions:
  - Contain and eliminate the discharge, if possible
  - Remove or retrieve any discharged liquids, if possible
  - Isolate the hazardous area and deny entry to unauthorized personnel
  - Other actions, as needed.

Notification of Spills and Discharges

If a spill occurs and people or the environment are threatened, Earth Tech will immediately notify the FTL/SSO and implement spill and discharge control. The Hazardous Waste Manifest will be signed by authorized personnel of the client. A Spill Report will be provided to the FTL/SSO no later than 7 days after the initial report, which will include but be limited to:

- Description of the material spilled including identify, quantity, and a copy of the waste disposal manifest
  - Exact time and location of the spill and description of the area involved
  - Containment procedures utilized
  - Description of the cleanup procedures employed at the site, including disposal of spill residue.

Determination if the spill is reported to the U.S. EPA and/or state and the date upon which the report to the appropriate agency was made, as well as the name of the agency representative who accepted the report. The client will be responsible for making the determination of whether or not a report to regulatory agencies is necessary; however, Earth Tech may be required to file the report.

4.3.10 Heat Stress Prevention.

Heat stress can be a significant field site hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

Workers should be encouraged to immediately report any difficulties or heat-related problems that they may experience or observe in fellow workers. Supervisors should use such information to alter the work-break schedule to accommodate such problems. During breaks, workers should be encouraged to drink plenty of water or other liquids to replace lost fluids and to help cool off. Should any worker exhibit signs of severe heat distress, such as profuse sweating, extreme confusion and irritability, or pale, clammy skin, that worker should be relieved of all duties at once and made to rest in a cool location and drink plenty of water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) should be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (e.g., clothing removal, wet the skin, air conditioning). Severe heat stress (heat stroke) is a life threatening condition that must be treated by competent medical authority.

Heat Stress Monitoring

The prevention of heat stress-related accidents/illnesses is best performed through continuous observation of employees and routine heat stress awareness training activities. Heat stress monitoring can be accomplished using one of the techniques discussed below.

Any results obtained from monitoring techniques should be used as guidance only. To properly mitigate the effects of heat stress, it is necessary to establish a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of such work breaks must be determined by the individual work location supervisor based upon factors such as the ambient temperature and sunshine, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used. While heat stress measurement techniques provide guidance in optimizing this routine, breaks must always be sufficient to prevent workers from manifesting symptoms of heat stress regardless of monitoring results. Heat stress monitoring procedures are found in Section 7.3.

Heat-Related Illnesses

The following guidance can be used in the identification and treatment of heat related illness.

Heat Stress. The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.

> **First Aid**: Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. If an air conditioned spot is available this is an ideal break location. Once the victim shows improvement he/she may resume working, however the work pace should be moderated to prevent recurrence of the symptoms.

Heat Exhaustion. Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, with clammy skin, and he or she may perspire profusely. The pulse is weak and fast, breathing is shallow. He or she may faint unless they lie down.

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

Heat Stroke. This is the most serious of heat illness, and represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105 degrees (°)-110° Fahrenheit (F). As the victim progresses toward heat stroke symptoms such as headache, dizziness, nausea, oppression can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.

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

medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility.

Skin Hazards

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments. Protect exposed skin with an appropriate sun-screen. A sun-screen with a sun protection factor (SPF) of 15 or greater is recommended for a full day in the sun. Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water repellent barrier cream such as Kerodex 71.

4.3.11 Cold Stress

Cold injury (frostnip, frostbite, and hypothermia) may impair a person's ability to work. Low temperatures and wind chill factors should be considered. Adverse and cold climatic conditions are important considerations in planning and conducting site operations. Ambient temperature effects can include physical discomfort, reduced efficiency, personal injury, and increased accident probability.

4.3.11.1 Control Measures.

Dead air space between the warm body and clothing and the outside air is essential. Clothing is worn to keep body warmth in and cold out. Usually, no one type of clothing is best for all weather conditions. Denim is relatively loose woven, and not only allows water to penetrate, but permits wind to blow away the body heat that should remain trapped between the body and clothing. Duck or goose down is good for stopping wind, but is of little use when wet. Plastic or closely woven nylon is good protection from wind and rain, but offers little insulation against cold.

Many layers of relatively light clothing with an outer shell of windproof material maintain body temperature much better than a single, heavy outer garment worn over ordinary indoor clothing. The more air cells each of these clothing layers has, the more efficiently the body is insulated against heat loss. It is essential that clothing allow some venting of perspiration because wet skin will freeze more rapidly than dry skin. Use all feasible means to keep as dry as possible. Make full use of windbreaks, and avoid exposing skin to the direct effects of wind. The need to wear layers of special clothing may make the wearer very clumsy in performing many routine work procedures. Increased body dimensions must also be considered if tight spaces are encountered. Ensure water consumption is adequate and encouraged. Fluid intake is often neglected in cold weather.

To guard against potential cold stress hazards that could impair ability to work or cause cold injuries, field personnel are advised to

- Wear appropriate cold weather clothing in multiple layers that can be removed as needed

- Carefully schedule work and rest periods to warm the body
- Familiarize themselves with available warm shelters that can be used during breaks
- Use the buddy system to monitor workers' physical condition.

Hypothermia. Hypothermia is the significant loss of body heat. It is a potential hazard whenever cold weather operations are conducted. Hypothermia can be prevented by wearing insulated garments in layers. Chills, pale or cold skin, muscle rigidity, depressed heart rate, and/or disorientation may be signs of early hypothermia.

There are degrees of hypothermia characterized as "moderate" and "severe." A victim suffering from moderate hypothermia may exhibit the signs listed below; the victim will often be conscious but confused. Severe hypothermia is characterized by extremely cold skin; loss of consciousness; faint pulse; and shallow, infrequent, or apparently absent respiration. If the condition is not properly treated, death can result. The onset of severe shivering signals danger to personnel. Any worker who is shivering severely will immediately be moved to a warmer environment.

Signs of hypothermia:

- Severe shivering
- Abnormal behavior
- Slowing of movements
- Stumbling
- Weakness
- Repeated falling
- Inability to walk
- Collapse
- Stupor
- Unconsciousness.

Personnel will be removed from exposure to cold upon the onset of any symptoms associated with hypothermia. Additional emergency procedures include:

- Seek immediate expert help.
- Reduce handling to a minimum. Do not rub or massage the victim.
- Prevent further body heat loss by covering the victim lightly with blankets. Plastic may be used for further insulation. Do not cover the victim's face.
- If the victim is still conscious, administer hot drinks. Encourage activity, such as walking while wrapped in a blanket. Do not administer any form of sedative, tranquilizer, or analgesic (pain

reliever), because these may cause heat loss and elevate a moderate case of hypothermia to a severe case.

Chilblain. Chilblain is an inflammation of the hands and feet caused by exposure of the extremities to cold, moist environments. It is characterized by recurrent, localized itching, swelling, and painful inflammation of the fingers, toes, or ears produced by mild frostbite. Such a sequence produces severe spasms accompanied by pain. Insulated gloves and footwear are essential in preventing injury to hands and feet. Treatment for chilblain is similar to those measures discussed for frostbite.

4.4 LIGHTING

At a minimum, all portions of each work location will be sufficiently lit so that all surfaces are illuminated at 10-foot candle strength or greater. Since work activities are expected to be conducted exclusively outdoors and during daylight hours, the need for supplemental lighting is not anticipated.

4.5 ACCIDENT OR INCIDENT REPORTS

The following procedures meet all requirements of Earth Tech Policy EHS101, *Injury, Illness and Near Miss Reporting*. Any accident/incident involving Earth Tech or subcontractor personnel that occurs on the Project Site will be promptly reported to the FTL/SSO or the PM, who will notify the HSO. If any Earth Tech employee is injured and requires medical treatment Earth Tech's Workers Compensation Insurer, Sedgwick CMS (877-261-8926) will also be notified. The Site Supervisor will initiate a written report, using the ***Supervisor's Report of Incident*** form found in Appendix I. The Site Supervisor will complete the first two sections of this form, and forward to the Project Manager. The PM must complete Section 3 of the form and forward to the HSO within 24 hours of the incident.

The HSO will review the documentation, and will assist in the performance of any necessary accident investigation or other follow-up. The PM will ensure that the recommendations resulting from any investigation are implemented without delay.

4.6 VISITOR CLEARANCES

Visitors will not be allowed within any controlled work area unless they comply with the health and safety requirements of this SSHP and can demonstrate an acceptable need for entry into the work area. All visitors (including the site owner or the owner's representative, regulatory agency representatives, or Earth Tech clients) desiring to enter any controlled work area must observe the following procedures:

- A written confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this SSHP. Verbal confirmation is acceptable provided such confirmation is made by

an officer or other authorized representative of the visitor's organization.

- Each visitor will be briefed on the hazards associated with the site activities being performed and must acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.

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

5.0 HAZARD ASSESSMENT

Planned activities for the site can be divided into four primary categories:

- Site delineation
- Environmental sampling
- OE identification and removal
- HTRW Remediation.

Several individual work tasks are associated with each of these categories, the hazards of which are analyzed below and in Appendix K.

Potential hazards associated with the overall work activities include, but are not limited to:

- Explosive hazards due to OE.
- Explosive hazards due to soils containing explosive compounds in excess of 10 percent.
- Exposure to environmental contaminants (metals, PAHs, and dioxins/furans). Table 2-1 provides the contaminants of concern by location and concentration range. Volatile chemicals are not anticipated to be found on this site.
- Hazardous noise (from heavy equipment).
- Slip, trip, and fall hazards.
- Heat stress, especially when wearing chemically protective clothing.
- Biological hazards from animals, insects, and plants.
- Cleaning and decontamination of equipment.

Note: Soil containing TNT in excess of 10 percent is considered to be OE in accordance with ER-1110-1-8153. Personnel should avoid contact with soils in excess of 10 percent TNT. Spark, flame, and heat-producing items and activities are not permitted in these areas. Sampling boring or drilling in the TNT Strips will not be performed until the soil has been wetted with distilled water.

Note: The PM or FTL/SSO will inform all personnel prior to entering the Project Site of the potential health effects associated with the use of the medication "Viagra" on a site with explosive constituents. Personnel using the medication Viagra are required to wear Modified Level D PPE at all times while on site. Health

hazards due to dermal absorption of explosives while taking Viagra can cause severe illness and death. All personnel are required to wear at least Modified Level D PPE while performing sampling activities to prevent contact with explosive constituents.

Note: Soil containing TNT in excess of 10 percent cannot be shipped. Soil in excess of 10 percent must be treated on site to reduce TNT content.

5.1 TASK HAZARD ANALYSES

The following is a description of the hazards determined to be associated with each identified work task to be performed. In evaluating the site conditions (on-site contamination) and the potential impact on personnel performing this work, it was determined that of the possible related exposure modes, skin contact and skin absorption is of primary concern, ingestion and inhalation are determined to be of only secondary concern. To prevent inhalation hazards, dust control measures will be used as necessary for all sampling, removal, and remedial activities. Additionally, dust VOC, and combustible monitoring will be performed in accordance with the requirements specified in Section 7.1.

In evaluating the task hazards, it is anticipated that site personnel, wearing the required PPE, will not come into direct contact with significant amounts of contaminated soil or water that would present a skin contact hazard. Task hazard analyses (THAs) designed to meet USACE and DTSC requirements are presented in Appendix K.

Grid staking, fence installation and removal, soil and water sampling, well boring, or drilling will be performed with an OE escort leading the subcontractor. Vegetation removal will be conducted under the direction of a OE escort, or by a OE qualified individual.

In the event of inclement weather (rain or snow), the FTL/SSO will determine when field operations must cease. In the event of an electrical storm within 5 miles of the project site, all activities will cease and all field personnel will report to the Command Post for further instruction.

Manual OE excavations will be performed by OE-qualified persons only. Mechanical OE excavations will be performed by a heavy equipment operator under the direction of an OE-qualified person.

5.1.1 Site Reconnaissance

This work includes delineation and staking of work area boundaries, identification of subsurface structure locations, and similar work. Because site reconnaissance is a nonintrusive activity, it provides little potential for the release or contact with contaminated materials, and OE. An OE escort will lead the vegetation removal

operation in accordance with the OE Safety and Health Program requirements (Appendix B).

The primary hazards associated with this work are the potential for encountering OE, and slip, trip, and fall hazards due to the presence of unprepared walking surfaces. Other hazards that may be encountered include heat stress and sunburn. To protect against these hazards, the following requirements should be met:

- Do not touch, move, or disturb any material or equipment that is unidentifiable.
- Watch carefully where you walk. Do not step in shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Carefully choose your footholds when crossing rocky, vegetation-covered, uneven, or loose ground surfaces.
- Stay within site of your buddy.

5.1.2 Vegetation Removal

Prior to field activities, it will be necessary to remove surface vegetation across the site. This will be accomplished using both manual methods (hand-held, gas-powered tools) and by mechanical means (dozer-towed flailing machine). The Project Site will be cleared of vegetation to a height of 6 inches or less. The majority of the vegetation will be removed by mechanical means, either with a brush hog or a flailing machine pulled behind a track-mounted dozer. OE personnel will be required to escort the vegetation removal teams during this task in accordance with OE avoidance (Appendix B). Areas that cannot be accessed by mechanical equipment will be cleared by crews using gas-powered weed cutters (equipped with spark suppression systems). Because vegetation removal is a nonintrusive activity, it provides little potential for the release or contact with contaminated materials or OE. The primary hazards associated with this activity include the potential for contacting OE, eye and skin hazards from flying objects from the cutting of vegetation, noise, and slip, trip, and fall hazards due to unprepared walking surfaces. The use of powered cutting equipment also presents some danger to the operators due to the sharp cutting surfaces, and some power equipment may present a noise exposure hazard. Only experienced operators shall be permitted to operate powered equipment. Use of leather work gloves and eye protection (and hearing protection where necessary) will be required of personnel performing vegetation removal activities. Other hazards include weather-related hazards and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (safety goggles, hearing protection, chaps, and leather palm working gloves).

5.1.3 Fence Removal and Installation

The fencing subcontractor will remove and replace all fencing in concert with the geophysical mapping teams. The OE escort will be required for replacement of fencing. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Install fence posts only where the OE escort has determined the location to be free of anomalies.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (Level D).

5.1.4 Location and Marking of Search Grids

Surveyors will install semipermanent markers (36-inch survey stakes) in lines at 200-foot intervals. OE personnel will be required to escort the surveyors during this task in accordance with OE avoidance (Appendix B). The OE escorts will visually check the surface along the paths the surveyors use to transit the property for OE and check the subsurface area (using Schonstedt magnetometers) where the stakes will be driven for anomalies. The location of anomalies will be avoided by a safe distance (24-36 inches) during installation of survey stakes. OE located during visual sweeps will be marked and reported to the SUXOS and PM for recording and disposal disposition. The primary hazards associated with this activity are associated with potential OE contact. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Install markers only after the OE escort has determined the location to be free of anomalies.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (Level D).

5.1.5 OE Surface Clearance

Once grids have been established throughout the Project Site, an OE surface clearance will be conducted. OE crews will use hand-held Schonstedt magnetometers and visual search methods to clear the area of OE, OE scrap, and metallic surface debris that would be a hazard to the mapping crews and to sanitize the site of significant surface anomalies for the subsurface mapping. All OE scrap and metallic debris larger than 1 inch by 2 inch will be removed. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Only OE personnel will perform this activity.

- Do not touch any potential OE. All potential OE will be flagged for the Disposal Team.

- Install flags only after the location has been determined to be free of anomalies.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Wear appropriate PPE (Level D).

5.1.6 Geophysical Detection, Mapping, and Anomaly Reacquisition

The primary hazards of the nonintrusive geophysical detection are associated with the possible presence of OE, and detonation of OE items due to the interaction of electronic fusing devices with electromagnetic fields produced by geophysical instruments, and the installation of flags. To prevent this, all use of geophysical instrumentation will be in accordance with Section 6.7.1 guidelines and Appendix L.

Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Watch carefully where you walk. Do not step in shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Install flags only after the location has been determined to be free of anomalies.

- Wear appropriate PPE.

5.1.7 Borehole Drilling

Hollow-stem auger or direct push techniques will be used for the installation of boreholes and groundwater monitoring wells (only direct push methods will be used in the TNT Strips). To prevent sparks or heat due to friction during the drilling operations within the TNT Strips, the ground will be kept moist with water. This will eliminate the potential for an explosive event during soil boring and sampling.

The use of these drilling techniques presents several potential hazards to personnel. There is the potential for personnel to be exposed to the potential site contaminants via skin contact and/or inhalation (concentrations of contaminants may exceed the applicable PELs). To protect against exposure, personnel will utilize PPE as specified in the following paragraphs, and will conduct monitoring for airborne contaminant concentrations. Air monitoring will be in accordance with Chapter 7.0.

Drilling operations can produce hazardous noise levels (in excess of 85 A-weighted sound level [dBA]), and personnel are required to utilize hearing protection inside any controlled work area whenever drilling occurs. Spinning augers can catch loose clothing. Lifting of heavy equipment and materials (e.g., bentonite bags) can cause severe injury unless proper lifting practices are used. Elevated drill rig masts present the potential for overhead hazards, requiring hardhats be worn at all times.

In the TNT Strips, all sampling equipment will be grounded. All plastic sampling equipment will be conductive and grounded. Sample containers are polypropylene sleeves and are chemically compatible with TNT. Additionally, all sample containers must be sealed with a polypropylene cap that is slid/pushed onto the sample sleeve (screw-top sampling jars will not be used within the area of the TNT Strips or for samples suspected of containing TNT concentrations greater than 5 percent based on previous investigation sampling and analytical results).

The primary hazards associated with this activity are associated with potential OE contact. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Perform drilling or boring only after the OE escort has determined the location to be free of anomalies.

- OE anomaly detection to be performed in accordance with Appendix B.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (Level D).

Additional requirements for drilling equipment setup and operation are presented in Appendix M and will be complied with at all times during the performance of drilling activities.

5.1.8 Groundwater Monitoring Well Installation and Development

During well construction, there is the potential for some contact with contaminated groundwater, which can present potential skin contact and inhalation hazards.

During groundwater monitoring well development, personnel will be required to handle significant quantities of potentially contaminated groundwater. This presents potential skin contact and inhalation hazards. Personnel will be required to wear Modified Level D PPE to protect against this hazard. In addition, sealed monitoring wells can accumulate organic vapors. Upon opening any monitoring well that has been sealed for more than 24 hours, personnel will allow the well to vent for at least 5 minutes, followed by monitoring to determine if an explosion hazard is present (see Section 7.1). Work will not proceed until explosivity levels are less than 10 percent of the Lower Explosive Limit (LEL).

The primary hazards associated with this activity are associated with potential OE contact. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Perform drilling or boring only after the OE escort has determined the location to be free of anomalies.

- OE anomaly detection to be performed in accordance with Appendix B.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (Level D).

5.1.9 Surface and Groundwater Sampling

During surface and groundwater sample collection, personnel will be required to handle potentially contaminated groundwater. This presents potential skin contact hazards. Personnel will be required to wear the PPE specified as follows to protect against this hazard. To provide further protection, personnel will use the Modified Level D PPE (Section 8.2).

Upon opening any monitoring well that has been sealed for more than 24 hours, personnel will allow the well to vent for at least 5 minutes, followed by monitoring to determine if an explosion hazard is present (see Section 7.1). Work will not proceed until explosivity levels are less than 10 percent of the LEL. Additional air monitoring will be in accordance with the requirements found in Section 7.1.

The primary hazards associated with this activity are associated with potential OE contact. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Perform sampling only after the OE escort has determined the location to be free of anomalies.

- OE anomaly detection to be performed in accordance with Appendix B.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.

- Wear appropriate PPE (Level D).

5.1.10 OE Investigation and Clearance

Subsurface OE activities will involve manual and mechanical excavation. Manual excavation will be performed using shovels, screw drivers, and other digging implements. The excavations will be performed in 6-inch lifts. The soil and the attached vegetation will be removed and placed on polyethylene sheeting. In the event that heavy equipment is required for excavation, equipment operators and ground personnel must exercise caution due to the physical hazards associated with this equipment and its use where OE exists. In the event that the RI/FS or previous HTRW investigations for the specific excavation area have proven the soil to be unsuitable for backfill, the materials will be covered with polyethylene sheeting for non-OE remedial action. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include noise, slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- All excavations will be performed in accordance with standard OE excavation procedures outlined in the OE Work Plan.
- All excavations will be performed by OE personnel with the exception of heavy equipment excavation that will be performed under the direction of the OE Supervisor.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Modified Level D).

5.1.11 OE Scrap and Metallic Debris Disposal

During operations, OE scrap and metallic debris that are free of explosive contamination will be placed at the southwestern corner of each grid adjacent to the grid stake. The scrap collected during field activities will be stored in a lockable storage shelter that will be locked at the close of each business day. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- All OE scrap and metallic debris will be inspected by the SUXOS prior to leaving the grid.
- All scrap and metallic debris handling will be performed by OE personnel.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Wear appropriate PPE (Level D).

5.1.12 OE Identification and Disposal

Upon finding a potential OE item, the Disposal Team will positively identify the item. The Disposal team will determine if the item is safe to move. Safe to move and blown-in-place (BIP) items will be handled in accordance with the OE Work Plan. Prior to handling OE, a PWD will be enforced. The primary hazards associated with this activity include contact with OE, explosives handling, fragmentation, lifting, and sharp metal objects hazards. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- All OE will be identified by the Disposal Team and confirmed by the SUXOS prior to moving or BIP.

- The PWD will be established and residential evacuations will be administered as necessary.

- All work will be performed by OE personnel only.

- All non-OE personnel will be outside of the PWD during all activities.

- Disposal activities will be performed in accordance with the OE Work Plan.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Wear appropriate PPE (Level D).

5.1.13 Equipment Decontamination

Equipment used in the excavations will require decontamination prior to leaving the Project Site. Only portions of the equipment contacting subsurface soils will require cleaning, which can be accomplished using physical removal methods including brush removal, wiping, and/or use of a steam cleaner unit.

Since no significant contamination is expected in the topmost soils, this task presents no significant inhalation or skin exposure hazards. However, personnel should be trained in the use of the steam cleaner, which has exposed, hot

surfaces during use. The pressurized hot water stream can cause significant physical and thermal injury if sprayed on exposed skin; consequently, personnel not involved in clean-up should not be present in any work area where a steam cleaner is in use.

To provide further protection, personnel will use the Level D ensemble (Section 8.1), modified by the use of a face shield and chemically protective nitrile gloves.

5.1.14 Management/Handling of Derived Waste

Work activities will generate decontamination fluids, waste PPE and decontamination materials, and excess sediment. Waste will be containerized and placed into drums. Handling of waste presents a minimal potential for skin contact; inhalation is not expected to present a hazard.

5.1.15 Unanticipated Work Activities

Where work activities are identified that are not addressed in this SSHP, appropriate safety documentation and procedures will be implemented. Prior to initiation of work activities, any subcontractor organization tasked with performance of such work will submit a work procedure document that presents appropriate safety procedures applicable to the specific work activities to be undertaken. Submitted safety procedures will be reviewed for adequacy and compliance with applicable regulatory requirements and the requirements presented in this SSHP. Work will not be initiated until this review is completed and any identified deficiencies corrected.

5.2 ENVIRONMENTAL CONTAMINANT HAZARDS

As identified in existing site documentation, there are four distinct classes of environmental contaminants at the Project Site:

- PAHs
- Heavy metals (primarily)
- Explosive compounds (TNT)
- Dioxins.

There is very limited potential for encountering significantly contaminated soils during this work while wearing the required PPE. The known COCs are:

- TNT
- Antimony (Flare Area only)
- Arsenic
- Barium (Flare Area only)
- Copper (Flare Area only)

- Iron
- Lead (Flare Area only)
- Manganese
- Benzo(a)pyrene (Ammunition Renovation/Primer Destruction Area)
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (Flare Area only)
- Total hexachlorinated dibenzo-p-dioxins (Flare Area only).

This document will be amended if additional COCs are identified by the RI/FS or other sampling activities.

The following is a discussion of the site-specific conditions and corresponding hazards associated with the identified contaminant types.

5.2.1 Polyaromatic Hydrocarbons

- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(d,e,f)phenanthrene
- Benzo(a)pyrene
- Chrysene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Phenanthrene.

These are PAHs, and in the pure state, they are yellowish, crystalline solids. These chemicals are found in coal tar and in products of incomplete combustion. They have varying degrees of potency for causing cancer, with benzo(a)pyrene being among the most potent. These PAHs are evaluated collectively as coal tar pitch volatiles. Coal tar pitch volatiles may cause photosensitization and a rash where sunlight strikes the skin. Exposure may also cause cancer of lungs, skin, bladder, or kidneys. Benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3-cd)pyrene have been identified as carcinogenic. Polyaromatic compounds are formed when petroleum fuels are burned in a smoky flame.

5.2.2 Heavy Metals

As a group, the heavy metals (which at the Project Site include antimony, arsenic, barium, copper, iron, lead, and manganese) are toxic to a number of organs and organ systems in the body including the liver, kidneys, blood-forming organs (which are primarily in the bones), and the central nervous system (CNS). Acute exposure to metals can produce symptoms such as stomach distress and vomiting, mental confusion and sluggishness, heart palpitations, breathing

difficulties, and renal (kidney) failure. Chronic exposure can be characterized by deterioration in function of the liver and kidneys, CNS degradation, and abnormal changes in blood cell counts (especially in white blood cells).

It is not anticipated that significant metals contamination will be encountered during this project with the exception of the Flare Site. The Flare Site has significantly higher metal levels than the remainder of the site. If metals are present, the primary routes of exposure will be through contact with contaminated soils and groundwater (i.e., entry through open wounds or ingestion). Preventing this route of exposure necessitates the use of dust control measures and appropriate protective clothing and decontamination procedures. Inhalation is of secondary concern, since required dust control measures should adequately control any potential exposures. Dust monitoring will be performed during all activities on site that disturb the soil. Dust monitoring requirements for the Flare Site and TNT Strips are addressed in Chapter 7. Increased awareness to dust, dust control measures, and personal hygiene are required during soil disturbing operations at the Flare Site and TNT Strips. Dust control measures include using a water truck and spraying the ground as necessary.

5.2.3 Explosive Compounds

TNT is the only explosive on site above the PRG. TNT is an explosive compound that exhibits relatively stable properties when handled correctly. It has a low sensitivity to impact and friction; therefore, it is commonly used as a military and industrial explosive. TNT has similar effects of other nitro-compounds. Long-term exposure to TNT may result in irritation to the gastrointestinal tract. Other indications of exposure to TNT include toxic jaundice, aplastic anemia, methaemoglobaimea (effects of oxygen deficiency), and cataract formation. Exposure routes for TNT are absorption, ingestion, and inhalation, with skin absorption being the primary cause for concern. Dermatitis is not a common illness associated with TNT exposure; however, indications are evident by orange staining of the hands, arms, and face. Papular eruption and reddening of exposed skin has also been observed as a symptom of prolonged skin exposure. The Threshold Limit Value (TLV) is 0.1 milligram per cubic meter (mg/m^3) by the American Conference of Governmental Industrial Hygienists (ACGIH), while federal OSHA has established the PEL for TNT at 0.5 mg/m^3. Both agencies have applied a "skin" notation to the exposure limits, indicating that dermal exposure is a significant potential hazard.

Protection against skin exposure can be provided by the use of chemically protective gloves and other clothing.

Note: The PM or FTL/SSO will inform all personnel prior to entering the Project Site of the potential health effects associated with the use of the medication "Viagra" on a site with explosive constituents. Health hazards due to dermal absorption of explosives while taking Viagra can cause severe illness and death. All personnel have the right to upgrade their PPE to protect themselves from the

increased risk posed by their health condition in combination with exposure to the site contaminants.

5.2.4 Dioxins

Dioxin is an abbreviation for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). It is one member of a "family" of chemical compounds with an identical carbon-oxygen framework. Therefore the term dioxin will be used in this document to describe all isomers.

Dioxin was discovered as a by-product in the manufacture of trichlrophenol, an intermediate chemical in the manufacturing process for some pesticides. It does not occur in a pure form in nature. Dioxin displays high toxicity to some experimental animals. Toxicology studies of the effects of dioxins on test animals indicate that the toxicity is not the same for each possible isomer. Those isomers that contain chlorine in the 2,3,7, and/or 8 positions are more toxic than when hydrogen is attached to those positions.

Pure 2,3,7,8-TCDD (isolated in a laboratory) is a white, micro-crystalline solid which looks like table salt and is insoluble in water and very slight soluble in some organic solvents. It has been proven that there is a natural background level of dioxins in the environment due to low temperature combustion events of materials containing carbon and chlorine.

Protection against skin exposure can be provided by the use of chemically protective gloves and other clothing.

6.0 ACTIVITY-SPECIFIC HEALTH AND SAFETY PROCEDURES

The following safety procedures will apply to work operations as specified in the task hazard analyses presented in Section 5.1.

6.1 SLIPS, TRIPS, AND FALLS, AND PROTRUDING OBJECTS

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

6.2 HAZARDOUS NOISE SAFETY

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

Earth Tech has compiled noise monitoring data indicating that work locations within 25 feet of operating heavy equipment (e.g., earthworking equipment) can result in exposure to hazardous levels of noise (levels greater than 85 decibel, dBA). Accordingly, all personnel are required to use hearing protection (e.g., ear plugs, ear muffs) within 25 feet of any operating piece of heavy equipment.

The HSO may also choose to monitor employee exposure to hazardous noise levels as part of Earth Tech's Hearing Conservation Program.

6.3 HEAVY MACHINERY

The use of heavy machinery (i.e., earth working equipment) in areas where unprotected personnel are operating warrants special attention on the part of all personnel. Operators should ensure that equipment is working properly and is being run in a safe manner and should be aware of the location of unprotected personnel at all times while operating this machinery to avoid serious accidents.

6.4 HAND AND PORTABLE POWER TOOL SAFETY

The use of hand tools during field operations is a potential source of accidents. Portable power tools (e.g., chainsaws) are not anticipated to be utilized frequently during field activities. However, a fundamental program of using the right tool in a correct manner, together with proper maintenance and storage, is necessary to prevent personal injury and property damage. The following procedures should be observed:

- Access to hand-held and portable power tools should be controlled to prevent use by unauthorized personnel.

- Appropriate PPE should be used by personnel using safety features (e.g., guards). Guards are not to be removed or rendered inoperative unless written permission is obtained from the HSO.

- The Earth Tech FTL/SSO should establish and conduct periodic inspections of hand and portable power tools used at the site.

- The Earth Tech FTL/SSO should remove from use any damaged, worn, or improper tool.

6.5 OPERATION OF AN ALL-TERRAIN VEHICLE

The following requirements will be observed during the operation of a 4-wheel-drive all-terrain vehicle (ATV):

- The vehicle should only be operated by personnel approved by the PM, and only after they have read the operator's manual.

- Protective glasses, gloves, and appropriate footwear should be worn by all occupants during ATV operations, as well as appropriate clothing to protect operator(s) from the weather.

- A observer should accompany the driver during the off-road (i.e., off-pavement) operation of the ATV. The driver should monitor the vehicle's forward progress, while the observer should monitor for any hazards the vehicle may encounter.

- No passengers, other than the observer, should be allowed to ride on the vehicle.

- The ATV should be fitted with a fire extinguisher and first aid kit.

- No ATV refueling should be conducted within designated fieldwork areas.

- The ATV should be operated only during daylight hours.

- ATV operators should be in radio communication at all times with the command post and other personnel working within designated fieldwork areas.

The ATV will stay on designated trails/roads at all times, unless authorized appropriate off-trail safety briefings are conducted.

6.6 UNDERGROUND UTILITIES

Various forms of underground utility lines or pipes may be encountered during intrusive work activities. Underground Service Alert (USA) will be contacted by the Project Manager at least 48 hours prior to the start of intrusive operations.

Should intrusive operations cause equipment to come into contact with utility lines, the FTL/SSO and the HSO will be notified immediately, and a Supervisor's Report of Incident will be completed. Work will be suspended until the appropriate actions can be taken for the particular situations assessed.

There are no overhead lines at the site that will affect the activities to be performed; therefore, overhead lines are not addressed in this SSHP.

6.7 DUST SUPPRESSION

In order to minimize potential releases of dust during site activities, it may be necessary to employ positive dust suppression techniques. In general, this will require the use of water to keep exposed soil surfaces wet and to prevent blowing dust. Water can be applied using hoses or portable sprayers. Specific procedures can be determined based upon the amount of dust being generated, results of air monitoring in the work area, and site conditions. If mitigation measures are found to be inadequate, the FTL/SSO will halt on-site operations until effective control can be achieved or require respiratory protection.

6.8 ELECTROMAGNETIC EMISSIONS SAFETY

Electronic fusing devices used in many types of ordnance devices are sensitive to emissions of electromagnetic radiation (EMR). Since many of the communication devices and investigation equipment employed on site emit or generate EMR, there is the potential for use of these devices to cause accidental detonation of OE, which may be present on site. To prevent this, the following procedures will be followed:

- An assessment of the safe separation distance (SSD) associated with each transmitter unit (e.g., radios, cellular telephones) will be conducted using the Hazards of Electromagnetic Radiation to Ordnance (HERO) methodology found in Appendix L.

Any device with an SSD greater than 4 feet will not be permitted for use on site until a complete characterization of on-site OE has been permitted. Once characterization has been completed, devices with SSDs exceeding 4 feet can be used at distances greater than the calculated SSD from any identified OE items/areas. **No device will be operated at a distance closer than its SSD from any identified OE.**

- SSD calculations will be performed on site by the SSC for all emission sources. All use of geophysical instrumentation on the site will be in accordance with Section 6.7.1 guidelines.

Note: There is no indication or evidence from site records or sub-surface sampling activities that HERO sensitive OE were ever stored, fired, or disposed of by detonation on the Tourtelot Property. These findings are consistent for the time period that the arsenal was operating.

6.9 ORDNANCE AND EXPLOSIVES SAFETY FOR SITE INVESTIGATION ACTIVITIES

OE items present hazards if encountered in subsurface areas during excavations. The fundamental policy to be observed regarding OE is:

DO NOT TOUCH, HANDLE, OR OTHERWISE DISTURB ANY OE ITEM UNLESS SPECIFICALLY AUTHORIZED BY THE PM AND SUXOS.

In addition, use the following information to minimize the hazards to personnel from OE.

6.9.1 Ordnance and Explosives Safety for Geophysical Investigation

Many types of geophysical instrumentation emit or produce EMR, which can interact with electronic fuses found on OE and cause accidental detonation. Accordingly, all use of geophysics devices on site must conform to the following requirements:

Use of ground-penetrating radar (GPR) devices is prohibited in areas where OE is suspected.

The use of TDEM and fixed domain electromagnetic (FDEM) devices is prohibited for identified trash piles and similar structures where the presence of OE is suspected.

An analysis of the SSD required for the EMR emissions associated with each allowable device will be accomplished using the HERO methodology found in Appendix L.

Approved geophysical equipment (the instrument, its electronics, data processor, and battery pack) will not be placed on the ground during operation. The minimum aboveground height at which any device can be operated is the device's calculated SSD, or 3 feet, if no SSD is available.

6.9.2 Ordnance and Explosives in Surface Areas

All personnel must be briefed concerning the potential for OE in surface areas and any known identifying characteristics of OE items. When moving about the site, personnel should remain alert for any OE items that might be present. Each work

site should be thoroughly checked for the presence of OE before any other activities commence. In the event that any OE item is observed or expected, the following requirements will be observed:

- Personnel should note the location of the OE item and alert all other personnel in the area to its presence.

- Any work operations occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.

- Under no circumstances will any non-OE-qualified Earth Tech or subcontractor employee attempt to move or otherwise handle any OE/suspected OE item. COLLECTION OF "SOUVENIRS" IS PROHIBITED.

The FTL/SSO will be alerted to the location of the suspected item.

6.9.3 OE Hazards

6.9.3.1 OE Hazards.

OE at the site increases the potential of exposing both site personnel and the general public to explosive environments and conditions. The risk of personnel exposure to OE during site operations will be high since previous site investigations have indicated the potential presence of OE. In addition, the required tasking of the subcontractor to explosively dispose of any hazardous OE will expose OE personnel to the additional hazards associated with the handling of demolition supplies and demolition operations. The hazards associated with OE exposure and demolition operations include the possibility of personnel injury or death caused by explosion, fire, fragmentation, or over-pressurization. These hazards may result if OE are not properly located, identified, transported, or handled. Extreme caution and adherence to safety procedures must be exercised to minimize the hazards associated with the demolition operations used for disposal of OE. While there are no "hazard-free" procedures for the handling of OE and explosives, maximum safety will be achieved through strict adherence to operational plans, application of relevant safety procedures, and effective supervision of site operations. The procedures that will be used to safely excavate, identify, and dispose of OE found during site operations are outlined in this SSHP and Chapter 6.0 of the OE Work Plan.

6.9.3.2 General OE Safety Measures.

Operations involving the potential for exposure to OE hazards shall only be conducted by, or under the supervision of, appropriately trained OE personnel. Non-OE-qualified personnel will be allowed to operate in an OE area only when escorted and directly observed by a OE-qualified technician. For the purpose of these safety measures, an OE area is defined as an area that has not been

cleared of surface OE hazards and where the potential exists for encountering OE. The general safety measures listed below will be strictly followed during all OE operations:

- Before driving stakes or marker posts into the ground, a magnetometer check of that point will be performed by OE personnel to ensure the location is free of anomalies/OE.

- All personnel will require an escort to enter an OE area until that area has been surveyed and cleared of OE hazards by OE personnel.

- Once an area has been surveyed for OE and identified as free of such hazards by OE personnel other personnel may perform duties in the area unescorted, but must be escorted to and from that area if access is through non-cleared areas.

- Only OE-qualified personnel will be allowed in the work areas while conducting OE operations. All other personnel will be located a safe distance (the PWD) from the area of operation.

- All personnel will immediately notify the nearest OE technician if a potential OE item is found. The item will not be disturbed or touched by unqualified personnel.

- Subsurface survey equipment will be tested daily and operated in accordance with the manufacturer's requirements.

6.9.3.3 Weapons Agents - Chemical.

It has been determined that the identified fieldwork areas should not contain chemical warfare material (CWM). If site personnel identify any items potentially containing CWM, field operations will cease, the subject area will be marked accordingly, all personnel will exit the area upwind, and the local military EOD unit will be notified immediately. OE personnel will secure the area from public access until relieved by local military EOD representatives. Fieldwork will not resume until it has been determined safe to do so.

6.9.4 Excavating and Trenching

Investigations at designated fieldwork areas could require the excavation of soils deeper than 4 feet to determine the identity of a geophysical anomaly. If excavations deeper than 4 feet are required, they will be conducted in accordance with the following requirements. Earth Tech or their excavation subcontractor will obtain a Cal/OSHA permit prior to excavating beyond 5 feet in accordance with 8 CCR §341.1.

6.9.4.1 Excavation Construction Guidelines.

The following safe operating guidelines will be observed when individuals must enter excavations or trenches greater than 4 feet in depth, in accordance with the requirements of 8 CCR Sections 1539-1547:

- Excavated materials will be stored and retained at least 2 feet from the edge of the excavation. (Note: This procedure should be observed even when excavation/trench entry will not occur.)

- Trees, boulders, and other surface encumbrances that create a hazard will be removed or made safe before excavation is begun.

- All slopes will be excavated to at least the appropriate angle of repose, except for solid rock areas. The determination of the angle of repose and design of the supporting system will be based upon these factors: depth of cut; possible variation in water content of the materials while the excavation is open; anticipated changes from exposure to air, sun, or water, loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources. The angle of repose will be flattened when an excavation encounters wet conditions, silty materials, loose boulders, and areas where erosion occur.

- Materials used for sheeting, sheet piling, cribbing, bracing, and underpinning will be in good, serviceable condition.

- Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.

- Where ramps, walkways, or bridges are used for employees or equipment, they will be designed and constructed by a qualified person in accordance with accepted engineering requirements. When personnel are requested to be in excavations 4 feet or deeper, excavations will be sloped for entrance and egress.

6.9.4.2 Trench Entry Requirements.

These requirements will be enforced whenever personnel are required to enter trenches or excavations:

- Expected hazardous ground movement areas and banks more than 4 feet high will be shored, laid back to a stable slope, or equivalent.

- Sides of trenches in unstable or soft material 4 feet or more in depth will be shored, sheeted, braced, sloped, or equivalent.

- Sides of trenches in hard, compact soil, including embankments, will be shored or otherwise supported when the trench is deeper than 4 feet and 8 feet or more in length.

- Materials used for sheeting, sheet piling, bracing, shoring, and underpinning will be in good, serviceable condition. Care should be taken not to overstress the lumber being used at an excavation.

- Additional precautions by way of shoring and bracing will be taken to prevent slides or cave-ins when excavations are subjected to vibrations.

- When trenches are shored, the standard shoring system will meet the OSHA requirements.

6.9.5 Drilling Activities

All drilling activities will be performed with a OE escort providing OE avoidance support. Prior to beginning drilling operations, the specific drilling location will be checked with a magnetometer for anomalies by the OE escort. If an anomaly is detected the drilling location will be moved a minimum of 1 meter from the anomaly location. When no anomaly is detected, the drilling may begin. Drilling will be performed in 1 foot increments. After each foot of drilling, the drill will be withdrawn and the OE escort will perform down hole magnetometer testing. Provided no anomalies are detected, the drilling may continue for another foot and the process will be repeated. Once the drilling exceeds 4 feet, OE detection will be discontinued. It is expected that the weight of the soil overburden will provide sufficient protection from injury at depth below 4 feet. In the event that any OE item is encountered during drilling, the following procedures will be observed.

6.9.5.1 OE Item Encountered Downhole and Detonation Occurs.

- The work operation will cease **immediately**.

- If injuries have occurred, the Emergency Contingency Plan will be activated (see Chapter 11.0).

- Once any necessary immediate response actions have been completed, the drilling auger will be blocked in place and disconnected from the drill rig. The drill rig will then be withdrawn from the site and the area will be delineated using yellow CAUTION tape.

- The FTL/SSO will be alerted to the situation.

- The drill rig will be thoroughly inspected for damage before being put back into service (see Appendix B).

6.9.5.2 OE Item Believed to be Encountered Downhole but No Detonation Occurs.

- The work operation will cease **immediately**.

If drilling, the drilling auger will be blocked in place and disconnected from the drill rig. The equipment (e.g., drill rig, backhoe) will be withdrawn from the site and the area will be delineated using yellow "CAUTION" tape.

- The FTL/SSO will be alerted to the situation.

6.9.5.3 OE Item Observed in the Spoils.

- The work operation will cease immediately and all personnel will evacuate the area. The equipment (e.g., drill rig, backhoe) will be left in place.

- Any work operations occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.

- Under no circumstances will any Earth Tech or subcontractor employee attempt to move or otherwise handle any OE/suspected OE item. COLLECTION OF "SOUVENIRS" IS PROHIBITED.

- The FTL/SSO will be alerted to the location of the suspected item.

6.10 DANGEROUS PLANTS

Various types of thistle and stinging nettle grow within the designated fieldwork areas. Personnel should avoid these plants if possible. Should work be conducted in areas where these plants are present, standard Level D PPE will reduce, but not eliminate, the risk of injury. In the case of laceration or puncture, simple cleansing of the wound to remove dirt and plant material is usually sufficient. If a thorn or needle remains, seek medical attention to have it excised. Tetanus prophylaxis may be appropriate following removal of deeply imbedded plant fragments.

The most common type of skin trauma, after needle picks, results from contact with plants in the poison ivy family. Personnel should avoid plants in the poison ivy family if possible. Plants within the poison ivy family include poison ivy, poison oak, and poison sumac. Should work be conducted in areas where these plants are present, standard Level D PPE will reduce, but not eliminate, the risk injury.

One or more contacts with the plant may be necessary before an individual becomes sensitized. The severity of the response varies greatly among personnel sensitized to the allergen. The degree of reaction depends on the amount of allergen, the size of the exposure area, and whether the skin is toughened with calluses at the exposure site. Response at the site of contact may be delayed 12 to 48 hours. The first sign of exposure is reddening of the skin, frequently followed by raised welts. The rash is usually limited to the area of contact, but previous reaction sites may flare. During the next 24 hours, blisters containing nonallergenic, clear fluid form, which cannot spread the rash. Some fluid may weep from the blisters. Intense itching is a prominent and consistent feature of allergic-contact dermatitis. Crusting and scaling begin within a few days and, in

the absence of complications or continued exposure, the dermatitis rarely lasts longer than 10 days. Allergic-contact dermatitis affecting eyelids or scrotum is usually expressed as diffuse, raised red blotches. The soles, palms, and hair or scalp are rarely affected.

The best prevention is to avoid contact with the plants. However, if the skin does contact the plant, the dermatitis may be avoided by prompt removal of the allergen. About 10 minutes are required for penetration of the cutaneous by the allergen. Washing the affected area with running water is recommended to remove the allergen, but avoid the use of soap. Soap removes protective skin oils and may cause or hasten penetration of the allergen. Avoid nonpolar solvents, such as alcohol, which may spread the allergen over a wider area. Early application of topical steroids can minimize the severity of the dermatitis. If the face or genitalia is involved, seek professional medical help within 6 hours of exposure.

The allergen may be carried by other objects such as tools or clothing. Personnel should avoid touching the face or genitalia with unwashed hands after possible exposure. Burning poison ivy produces smoke particles that carry the allergen and that may produce extremely severe systemic response.

No barrier creams have been found effective in preventing penetration of the cutaneous by the poison ivy family allergen. Protective clothing that prevents skin contact should be used when there is unavoidable contact or when working in areas where there is a high likelihood of contact.

6.11 DANGEROUS ANIMALS

The Project Site supports some types of dangerous animals (e.g., snakes, stinging insects), and personnel should be alert to their presence. When contact with these animals is made, the following measures should be taken.

6.11.1 Stinging Insects

Avoid disturbing the nest or hive of stinging insects. If bees, wasps, or hornets are disturbed, leave the area. Seek first aid for stings. Individuals with allergic reactions to bee stings should carry a doctor's prescribed bee sting kit.

6.11.2 Biting Insects and Spiders

If mosquitos become a pest, use a commercially available repellent. Spider bites can usually be avoided by carefully observing for spiders when picking up objects or putting hands in enclosed spaces.

- **Black Widows** (*Latrodectus mactans*) are web spiders. The sedentary females may bite if molested. Males move about but do not bite. The Black Widow is found in most warm parts of the world. The bite may go unnoticed and may not hurt. But the subsequent severe abdominal pain from a Black Widow's bite resembles

appendicitis. There is also pain in the muscles and in the soles of the feet, but usually no swelling at the site of the bite. Alternately, the saliva flows freely, then the mouth is dry. The bite victim sweats profusely. The eyelids are swollen. The patient usually recovers after several days. Physicians can relieve the severe pain by injection of calcium gluconate. Antivenom is available. No first aid treatment is available for any spider bite.

The Black Widow spider is recognizable by the following characteristics: The male's abdomen is elongated with white and red markings on sides. The female's abdomen is almost spherical, the lower abdomen is usually marked by two orange to reddish triangles resembling an hourglass. Their habitat is among fallen branches and under objects of many kinds, including furniture, outhouse seats, and trash.

- **Brown Spiders** (*Loxosceles* sp.) commonly live in structures on the floor and behind furniture. Bites occur when a spider rests in clothing or in a towel. There may be no harm at all. In very severe cases, a red zone appears around the bite, then a crust forms and falls off. In any bite from a spider known to be poisonous, it is wise to consult a physician as soon as signs of illness appear.

  The Brown Spider, also known as the Brown Recluse Spider or Violin Spider, is recognizable by the orange-yellow back with dark violin pattern. The base of its legs is orange-yellow, and the rest of its legs are grayish to dark brown. Abdomen is grayish to dark brown with no obvious patterns.

Although work operations are expected to occur in fall/winter, there is still a possibility that ticks or fleas can be encountered in wooded areas. These insects can be present on plants and animals. Human infestation can occur as a result of direct contact. Both types of insects are mobile, and once infesting a human victim, will move to their preferred locations on the body.

Fleas will congregate in the warmer, less accessible parts of the body. The insects, while producing irritation of the skin (itching), are not directly harmful. However, they can serve as vectors (transmitters) for numerous types of diseases. Ticks will move towards the top part of the body (preferably the head), and can embed themselves into the victims skin and withdraw small amounts of blood. Once imbedded, they are extremely difficult to dislodge. As with fleas, ticks do not themselves present a significant danger, however they too can transmit various diseases to their victims.

Protection against infestation can be accomplished by wearing long-sleeved shirts and pants, and by avoiding thickly wooded areas and contact with wild animals. Personnel should also inspect each other after working in wooded areas to spot ticks and fleas before they can become established. If a person does become infested, treatment should be provided by a medical professional. The victim

should proceed promptly (but not on an emergency basis) to a medical treatment facility.

6.11.3 Snakes

In the United States, snake bites rarely kill because effective treatments have been developed. The best defense is understanding where these creatures may be found (i.e., rocks, bushes, logs, in holes, crevices, and abandoned pipes). If poisonous snakes are found on site, all personnel working on site will be issued additional PPE (snake leggings). Never handle dead snakes or attempt to kill snakes. Should a bite occur, first aid should be applied immediately and medical treatment sought.

7.0 MONITORING PROCEDURES

To control exposures to some of the hazards to which personnel may be exposed during site work activities (airborne contaminants, hazardous noise and heat stress) Earth Tech will perform real-time monitoring.

7.1 AIR MONITORING

Intrusive activities such as drilling and trenching activities have the potential to release significant amounts of contaminated dust, as well as volatilized organic compounds. During performance of intrusive activities earth Tech will perform the following monitoring procedures. Monitoring results will be compared with the limits specified in Tables 7-1 and 7-2, and response actions taken as detailed there.

Drilling Activities

1. Breathing Zone and Work Zone Boundary VOC concentrations
2. Breathing Zone and Work Zone Boundary Particulate Matter concentration.

Trenching and Excavating Activities

1. Breathing Zone and Work Zone Boundary VOC concentrations
2. Breathing Zone and Work Zone Boundary Particulate Matter concentration.

Well Construction Activities

1. Breathing Zone and Work Zone Boundary VOC concentrations.

Well Sampling Activities

1. Wellhead explosivity levels (upon opening sealed wells)
2. Breathing Zone and Work Zone Boundary VOC concentrations.

All Other Work Activities

No monitoring required.

7.1.1 WORK AREA (BREATHING ZONE) MONITORING

The exposure hazard to personnel during performance of intrusive activities will be evaluated by use of direct-reading instrumentation to measure contaminant concentrations in the worker breathing zones. When required (see above), measurements will be taken in breathing zone areas of the work site (where workers are present) using the following instrumentation. Results will be compared with the limits specified in Table 7-1.

- VOCs - approved photoionization detector instrument (RAE Systems mini-RAE, Photovac MicroTip, Nu Corp. HNu)
- Particulates - approved laser-scatter aerosol monitor (MIE mini-RAM)
- Explosivity - approved explosion meter (Neotronics ExoTox Model 55, GasTech GX-91).

7.1.2 WORK SPACE BOUNDARY MONITORING

The exposure hazard to members of the public (i.e., anyone outside the Exclusion Zones) during intrusive activities will be evaluated by use of direct-reading instrumentation at the controlled work area boundaries. When required (see above), measurements will be taken in breathing zone areas of the work site (where workers are present) using the following instrumentation. Results will be compared with the limits specified in Table 7-2.

- VOCs - approved photoionization detector instrument (RAE Systems mini-RAE, Photovac MicroTip, Nu Corp. HNu)
- Particulates - approved laser-scatter aerosol monitor (MIE mini-RAM).

7.1.3 PERSONAL SAMPLING

Measurement of employee exposure to chemical contaminants will be performed at the discretion of the HSO. Monitoring techniques will also be determined by the HSO and will conform with applicable OSHA and National Institute of Occupational Safety and Health (NIOSH) sampling methods. No personnel sampling is intended or expected with the exception of dust monitoring.

Samples will be collected by, or under the direction of, a member of the Earth Tech Health and Safety Department. Any analytical laboratory performing analysis of personal samples will be accredited by the American Industrial Hygiene Association (AIHA) and must be a participant in the AIHA Proficiency Analytical Testing (PAT) program.

7.2 NOISE MONITORING

Since high noise sources may be present at the Project Site, the FTL/SSO will perform sound level monitoring during high noise activities. The FTL/SSO will require all personnel working in areas above 85 dBA to wear hearing protection.

The FTL/SSO will also determine the distance from the noise-producing operations at which the sound level is below 50 dBA. The community noise standard for the exterior of residences, schools, and businesses is 50 dBA. If noise levels exceed 50 dBA at residences, schools, or businesses, the FTL/SSO will stop the activity and procedures will be developed to reduce the noise level below 50 dBA.

7.3 HEAT STRESS

Evaluation of heat stress, to determine appropriate work/rest cycles, will be performed whenever field work activities are occurring. The Basic Instrument Measurements Method shown below must be used for personnel using *Level D PPE only*. Where any type of chemically protective clothing (CPC) is in use the Modified Instrument Measurements Method will be used together with the Direct Observation method to provide guidance in appropriate work/rest cycles.

Basic Instrument Measurements Method: This method will only be used to monitor heat stress where workers are not using chemically protective clothing. The Wet Bulb Globe Temperature (WBGT) value will be determined using a WBGT meter (Reuter-Stokes 214 DL or equivalent), and compared with the values shown in Table 7-3 to determine appropriate work/rest cycles.

Modified Instrument Measurements Method: This method will be used whenever personnel use chemically protective clothing. The WBGT value will be determined as above. The measured value will then be compared with the values shown in Table 7-4 to determine the appropriate work/rest cycle.

Direct Observation: This method can be used as a substitute for the Modified Instrument Measurements Method, and can be used whenever personnel use chemically protective clothing.. At the start of the work day each worker's baseline pulse rate will be determined in beats per minute (bpm). Worker pulse rates will then be measured at the beginning and end of each break period. As recommended by the ACGIH each worker's maximum heart rate at the start of any break should be less than [180 minus workers age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes. At the end of each work period all workers heart rates must have returned to within +10 percent of the baseline pulse rate. If any worker's pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be re-measured and the end-of-break criteria again applied.

Table 7-1. Exposure Monitoring Program Action Levels

Parameter	Location and Interval	Measured Concentration	Response
VOCs (PID)	Breathing Zone, at 15 minute intervals during all excavation and intrusive soil sampling and earth moving activities	< 10 ppm	No respiratory protection required.
		10 - 50 ppm (Sustained for more than 5 minutes) or >50 ppm (Instantaneous)	Air Purifying Respirators (w/OV cartridges) required. If Level C has been discontinued contact the FTL/SSO, implement mitigation measures, and upgrade PPE to Level C before continuing work.
		> 50 ppm (Sustained for more than 5 minutes) or >100 ppm (Instantaneous)	Cease work, exit, and contact the FTL/SSO. Work will not continue without approval of the HSO, using Level B PPE
Airborne Dusts outside TNT Strips and Flare Site (mini-RAM)	Breathing Zone, at 15 minute intervals during all excavation activities	< 5 mg/m^3	No respiratory protection required.
		5-15mg/m^3 (Sustained for more than 5 minutes) or > 15 mg/m^3 (Instantaneous)	Air Purifying Respirators (w/N100 cartridges) required. If Level C has been discontinued contact the HSO, implement mitigation measures, and upgrade PPE to Level C before continuing work.
		>15mg/m^3 (Sustained for more than 5 minutes) or > 25 mg/m^3 (Instantaneous)	Cease work, exit, and contact the HSO. Air purifying respirators required for continued work.
Airborne Dusts inside TNT Strips and Flare Site (mini-RAM)	Breathing Zone, at 15 minute intervals during all excavation activities	< 0.3 mg/m^3	No respiratory protection required.
		0.3 – 1.0 mg/m^3 (Sustained for more than 5 minutes) or > 1.0 mg/m^3 (Instantaneous)	Air Purifying Respirators (w/N100 cartridges) required. If Level C has been discontinued contact the HSO, implement mitigation measures, and upgrade PPE to Level C before continuing work.
		> 1.0mg/m^3 (Sustained for more than 5 minutes) or > 2.0 mg/m^3 (Instantaneous)	Cease work, exit, and contact the HSO. Air purifying respirators required for continued work.
Explosivity (Explosive Gas Meter)	Upon opening any well	< 10% LEL	Work can proceed
		> 10% LEL	Allow well to ventilate for an additional 15 minutes and re-test

Note: If both VOC and airborne dust concentrations are sufficient to require respiratory protection air purifying respirators should be equipped with combination OV/N100 cartridges.

Table 7-2. Exclusion Zone Boundary Monitoring Action Levels

Parameter	Location and Interval	Measured Concentration	Response
VOCs (PID)	Exclusion Zone boundary downwind of work locations, at 15 minute intervals during all intrusive activities	< 2 ppm	No action required
		2 –10 ppm	Implement mitigation measures and reduce boundary concentration to < 2 ppm
		> 10 ppm	Cease work, cover all exposed surfaces and contact the HSO
Airborne Dusts Outside TNT Strips and Flare Site (Mini-RAM)	Exclusion Zone boundary downwind of work locations, at 15 minute intervals during all intrusive activities	< 2 mg/m^3	No action required
		2-5 mg/m^3	Implement mitigation measures and reduce boundary concentration to < 2 mg/m^3
		> 5 mg/m^3	Cease work, cover all exposed surfaces and contact the HSO
Airborne Dusts Inside TNT Strips and Flare Site (Mini-RAM)	Exclusion Zone boundary downwind of work locations, at 15 minute intervals during all intrusive activities	< 0.1 mg/m^3	No action required
		0.1-0.5 mg/m^3	Implement mitigation measures and reduce boundary concentration to < 2 mg/m^3
		> 0.5 mg/m^3	Cease work, cover all exposed surfaces and contact the HSO

Table 7-3. WBGT Values for Level D Work/Rest Cycles

Work-Rest Regimen	°F –WBGT		
	Light Work	Moderate Work	Heavy Work
Continuous Work	86	80	77
75% Work – 25% Rest	87	82	78
50% Work – 50% Rest	89	85	82
25% Work – 75% Rest	90	88	86

Re-printed from ACGIH's 1999 Threshold Limit Values for Chemical Substances and Physical Agents

Table 7-4. WBGT Values for CPC Work/Rest Cycles

Work-Rest Regimen	°F –WBGT		
	Light Work	Moderate Work	Heavy Work
Continuous Work	75	69	66
75% Work – 25% Rest	76	71	67
50% Work – 50% Rest	78	74	71
25% Work – 75% Rest	79	77	75

Modified from ACGIH's 1999 Threshold Limit Values for Chemical Substances and Physical Agents

8.0 PROTECTIVE EQUIPMENT ENSEMBLES

The use of protective equipment ensembles specified in the individual task hazard analyses (Appendix K) will conform to the following requirements. The Respirator Training outline is contained in Appendix H.

8.1 LEVEL D

Level D PPE will be the minimum acceptable protective clothing/equipment to be used during site work activities. The Level D ensemble provides limited physical protection from abrasion but no significant skin contact protection for chemical exposure. Level D will be used for all vegetation removal and site reconnaissance activities.

Level D Equipment List

- Long pants and shirt with sleeves
- Hard hat
- Safety glasses
- Safety-toe boots (composite toe leather boots are acceptable for this project)
- Full-face air purifying respirator (available for emergency use) equipped with high-efficiency particulate air (HEPA) (N100) cartridges.

Where there is a desire to provide limited skin protection from chemical hazards, the use of chemically protective gloves can be specified. In such cases, the inner glove will be made of nitrile rubber (N-DEX model gloves or equivalent), and outer gloves will be made from nitrile rubber (Solvex or equivalent gloves).

No emergencies are expected to require the use of respiratory protection. In the unlikely event that dust control measures fail to maintain dust levels below the levels specified in Table 7-1, respiratory protection will be used to evacuate the work area. Dust Monitoring will be performed during all site activities. The HSO will be notified by the FTL/SSO and controls will be evaluated. If the work can be carried out safely with currently available respiratory protection, work may continue. If the respiratory protection is insufficient, additional controls or alternative respirator filters will be considered prior to returning to work. Changes to the respiratory protection filters or methods of control will require approval of the DTSC.

8.2 MODIFIED LEVEL D

The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection. Modified Level D PPE will be used for all field sampling activities.

Modified Level D Equipment List

- Tyvek® disposable outer coveralls, hoods optional
- Nitrile outer gloves (Solvex® or equivalent), taped to outer coveralls
- Nitrile inner gloves (N-DEX only)
- Hard hat
- Safety glasses/faceshield
- Safety-toe boots (composite toe leather boots are acceptable for this project)
- Full-face air purifying respirator (available for emergency use) equipped with particulate matter cartridges (N100 designation).

No emergencies are expected to require the use of respiratory protection. In the unlikely event that airborne contaminant concentrations exceed the levels specified in Table 7-1, the use of respiratory protection will be implemented. Air monitoring will be performed during all site activities. If the respiratory protection is insufficient, additional controls will be considered prior to returning to work. Changes to the respiratory protection requirements or methods of control will require approval of the DTSC.

8.3 LEVEL C

The Level C ensemble provides moderate skin protection against chemical contact, as well as respiratory protection from low to moderate concentrations of airborne contaminants.

Level C Equipment List

- Polyethylene-coated Tyvek™ disposable outer coveralls with hood (hood taped-sealed to respirator)
- Nitrile outer gloves (Solvex or equivalent), taped to outer coveralls

- Nitrile inner gloves (N-DEX only)
- Safety-toe boots (leather boots are acceptable for this project)
- Boot covers (taped to coveralls)
- Full-face air purifying respirator, equipped with particulate matter cartridges (N100 designation).

8.4 LEVEL B AND LEVEL A

The use of Level B or Level A protective equipment will not be required for this project.

8.5 RESPIRATORY PROTECTION

The use of respiratory protection is not anticipated for project-related activities based on specific work conditions. Should the use of respirators become necessary, personnel will inspect their respirators prior to and after each use. Additionally, all used filter cartridges will be discarded at the end of each day. Workers may choose to change out filter cartridges more often as they feel necessary or comfortable.

9.0 SITE AND CONTAMINATION CONTROL

9.1 OVERALL SITE CONTROL

Overall control of the Project Site is the responsibility of Earth Tech. Access to the site will be secured through an entrance gate to the Project Site and will be limited to authorized personnel only.

9.2 WORK AREA CONTROL

Earth Tech is responsible for properly controlling its work locations to prevent injury to other personnel operating at the site. To ensure that conflicts do not occur, Earth Tech will coordinate daily work activities with the other organizations performing work at the site (if any), and will inform each organization of the hazards and clearance requirements for each work activity so that they can inform/manage their personnel accordingly.

The following requirements describe the work zone control procedures to be implemented with respect to site contamination and investigation activities. Additional OE-related site control measures are specified in the OE Work Plan (Appendix B).

9.2.1 Exclusion Zones

Exclusion zone boundaries will be set such that all physical, noise, and chemical contaminant hazards are fully contained within. Unless otherwise indicated (by specific site or work conditions or by perimeter monitoring results), an area of 35 feet in all directions from each work location will be considered as the boundaries of each exclusion zone. Where feasible, boundaries of each exclusion zone will be designated using cones, yellow "CAUTION" tape, and/or other positive physical/visual barriers. However, it is recognized that during some work operations (i.e., manual excavation), the work pace will preclude use of this equipment. In such instances, visual control of the work area should be adequate due to the limited potential for unexpected entry.

Within each exclusion zone, Earth Tech will have complete control of all operations and personnel. Only Earth Tech-authorized personnel, who must meet the training and medical monitoring requirements specified in Sections 4.1 and 4.2, will be permitted within any exclusion zone. Once an exclusion zone is established, access will be limited to qualified personnel equipped with the proper PPE.

10.0 DECONTAMINATION

All personnel and equipment that comes into contact with contaminated materials must be adequately decontaminated prior to exiting the area.

10.1 PERSONNEL DECONTAMINATION

Decontamination procedures must be carried out on all personnel who have been in contact with contaminated materials. Under no circumstances (except emergency evacuations) will personnel be allowed to leave a controlled work area where contaminants are exposed without performing decontamination.

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

Level D Personnel Decontamination

Where activities are performed in Level D PPE, personnel will perform decontamination using the following guidelines:

- Place tools, instruments, samples, and trash at an appropriate location. The equipment drop area will be clean and dry, and at a minimum, plastic bags will be available for trash. Waste PPE will not be placed in the same containers as general trash.

- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned from equipment, samples, and tools prior to their removal from the exclusion zone areas.

- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.

- Prior to exiting the exclusion zone areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

Modified Level D Personnel Decontamination

Where activities are performed in Modified Level D PPE, personnel will perform decontamination using the following guidelines:

- Place tools, instruments, samples, and trash at an appropriate location. The equipment drop area will be clean and dry, and at a minimum, plastic bags will be available for trash. Waste PPE will not be placed in the same containers as general trash.

- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned from equipment, samples, and tools prior to their removal from the exclusion zone areas.

- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.

- Wash and rinse outer work gloves and boots (boot covers) with soap and water.

- Wash/brush off outer protective coverall (Tyvek®).

- Untaped wrists and ankles.

- Remove outer work gloves and place them in an appropriate container specified for waste PPE.

- Remove outer Tyvek® coveralls and place them in an appropriate container specified for waste PPE.

- Wash, rinse, and remove inner protective gloves and place them in an appropriate container specified for waste PPE.

- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Level C Personnel Decontamination

Where activities are performed in Level C PPE, personnel will perform decontamination using the following guidelines:

- Place tools, instruments, samples, and trash at an appropriate location. These areas will be clean and dry, and at a minimum will contain plastic bags for trash. Waste PPE will not be placed in the same containers as general trash.

- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned from equipment, samples, and tools prior to removal from the exclusion zone areas. Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.

- Wash and rinse outer work gloves and boots (boot covers) with soap and water.

- Wash/brush off outer protective coverall (Tyvek®).

- Untaped wrists and ankles.

- Remove outer work gloves and place them in an appropriate container specified for waste PPE.

- Remove outer Tyvek® coveralls and place them in an appropriate container specified for waste PPE.

- Remove respirator mask (also goggles if worn).

- Wash, rinse and remove inner protective gloves and place them in an appropriate container specified for waste PPE.

- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Respirator Decontamination

If worn, respirators will be decontaminated each day. Taken from the drop area, the masks will be disassembled, the cartridges disposed of, and the rest of the mask will be placed in a cleansing solution. Personnel will inspect their own masks to be sure of proper strap readjustment for correct fit.

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

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

10.2 EQUIPMENT DECONTAMINATION

Equipment that might require decontamination includes heavy equipment, tools, monitoring equipment, sampling equipment, and sample containers; trucks and trailers; and the decontamination equipment itself when the decontamination is closed down. Before entering the site, all equipment will be cleaned to remove grease, oil, encrusted dirt, or other potential contaminants. The following is general guidance for use in determining equipment decontamination procedures:

Tools

Tools will be dropped into a plastic pail, tub, or other container in the exclusion zone. They will be brushed off, rinsed, and transferred into a second pail to be carried to the decontamination station. Generally, tools will be washed with a detergent solution and then rinsed with clean water.

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

Heavy Equipment

Where significant amounts of site soils accumulate on site equipment, cleaning will be accomplished with high-pressure water or a portable high-pressure steam spray followed by a soap and water wash and rinse. Loose material will be removed by brush.

All cleaning water and debris will be collected and sampled to determine proper disposal options.

Monitoring Instruments

Monitoring equipment will be protected as much as possible from contamination. Drape, mask, or otherwise cover as much of the instruments as possible with plastic without hindering the operation of the unit. Many instruments can be placed in a clear plastic bag that allows reading of the scale and operation of the knobs.

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

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

10.3 DISPOSAL OF DECONTAMINATION WASTES

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

10.4 DECONTAMINATION DURING EMERGENCIES

In an emergency situation, the need to respond quickly to an accident or injury must be weighed against the risk to the injured party from chemical exposure. In some cases, the quick removal of contaminated clothing would be less harmful to the individual than expending the time and effort required to properly decontaminate the victim.

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

11.0 EMERGENCY CONTINGENCY PLAN

11.1 GENERAL

There are three types of emergencies that could occur during performance of this project:

- Illness and physical injury
- Catastrophic event at the work site (fire, explosion, earthquake, or chemical)
- Catastrophic event involving site personnel and/or equipment.
- Catastrophic event off the worksite (Exxon).

Although a catastrophic event or severe medical emergency is unlikely to occur during work activities, an emergency contingency plan has been prepared for this project should such a critical situation arise.

The PM is responsible for notifying all Federal, State, and local government organizations as specified in the Work Plan. The Exxon Plant is a minimum of 1,125 feet from the project site boundaries. The Project Manager or FTL/SSO will notify the Exxon Health & Safety Department prior to initiating site activities and provide contact numbers for Exxon to use to contact Earth Tech in the event of an accident at the refinery. Additionally, the PM or FTL/SSO will notify Exxon in the event of an accident or incident on the Tourtelot property.

11.2 RESPONSIBILITIES

11.2.1 Field Team Leader/Site Safety Officer

The FTL/SSO will be the primary contact individual and coordinator of all emergency activities. Responsibilities include:

- Evaluating the severity of the emergency
- Implementing appropriate response action
- Summoning appropriate emergency services (e.g., fire department, ambulance)
- Notifying all site personnel, the HSO, and concerned authorities of the emergency situation.

11.2.2 Other On-Site Personnel

It will be the obligation of the field personnel to inform the FTL/SSO of all emergency situations and to abide by their issued response actions. Special medical problems of field personnel (e.g., allergies to insects, plants, prescription medication) will be reported to the FTL/SSO.

11.3 EMERGENCY EQUIPMENT

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

11.3.1 First Aid Kits

Each work team will have access to a first-aid kit meeting the following requirements:

- First-aid kits in weatherproof containers, approved by Earth Tech's Occupational Physician and meeting all regulatory requirements, will be present at all locations where Earth Tech employees will be working.
- First-aid kits will be available at the job site at all times.
- Use of any item from the first-aid kit will necessitate completion of an Accident/Injury Report. The report will be submitted to the HSO within 1 working day of the incident.
- First-aid kits will be inspected and restocked weekly. An inventory of first-aid supplies sufficient to restock kits on a weekly basis will be maintained.
- Personnel permitted to use first-aid kits will possess a current first-aid provider card.

11.3.2 Eyewash Units

Each work team will have access to an eyewash unit meeting the requirements of ANSI Standard Z358.1-1990, capable of supplying hands-free irrigation for both eyes for at least 15 minutes at a flow rate of at least 0.4 gallon per minute. This unit will be within 50 feet of any work location.

11.3.3 Fire Extinguisher

A fire extinguisher with a minimum rating of 1A:10B:C will be available to each work team, and within 50 feet of any work location. Personnel will be made aware of the location of the nearest fire extinguisher at all times.

11.4 NOTIFICATION AND RECORDKEEPING

Any injury or illness will be immediately reported to the PM, who will implement any immediate corrective actions and report the incident to the HSO. OSHA requires notification within 24 hours, and preferably during the same work shift, in the event of a fatality or severe injury requiring hospitalization. The HSO will make such notifications to OSHA and consequently must receive the information in time to make the notification without penalty.

11.5 RESPONSE ACTIONS - SAFETY EQUIPMENT PROBLEMS

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

- Leaks or tears in protective clothing
- Failure of respiratory protective devices
- Encountering contaminants for which prescribed protective equipment may not be suitable.

11.6 RESPONSE ACTIONS - MEDICAL EMERGENCIES

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

Telephone numbers and locations for the local fire department, hospitals, ambulance service, and other emergency services will be maintained by the FTL/SSO (Figure 11-1; Table 11-1). Information regarding nonemergency medical treatment for on-site injury, on-site illness, or on-site exposure to chemical contaminants will be provided to the hospital by the FTL/SSO. Communication methods available on site will be a hard-line telephone in the Command Post, cellular telephones (carried by FTL/SSO and PM), and hand-held radios.

11.7 RESPONSE ACTIONS – WORKSITE CATASTROPHIC EVENTS

In the event of a catastrophic incident at the worksite:

- Work activities will cease and all project personnel will be evacuated from the work location. The evacuation will proceed in a direction

Table 11-1. Emergency Contacts and Telephone Numbers

Fire Department	911
Fire Department - Non-emergency	745-2424
Ambulance	911
Ambulance - Non-emergency	552-1187
Police	911
Police - Non-emergency	745-3411
Information and Response Organizations	
California Dept. of Health Services (Sacramento)	(916) 445-4171
California Dept. of Fish and Game (Sacramento)	(916) 445-4171
EPA Region IX (San Francisco)	(415) 974-8071
Earth Tech Personnel	
Health and Safety Officer	
John Moore	(512) 951-2000
Project Manager	
Brian Weith	(909) 424-1919
	Pager: (909) 433-8488
Site Safety Coordinator/Field Team Leader	
Richard Burzinski	(408) 232-2800
OE Safety Manager	
Greg Peterson	(909) 424-1919
	Pager: (909) 872-9839

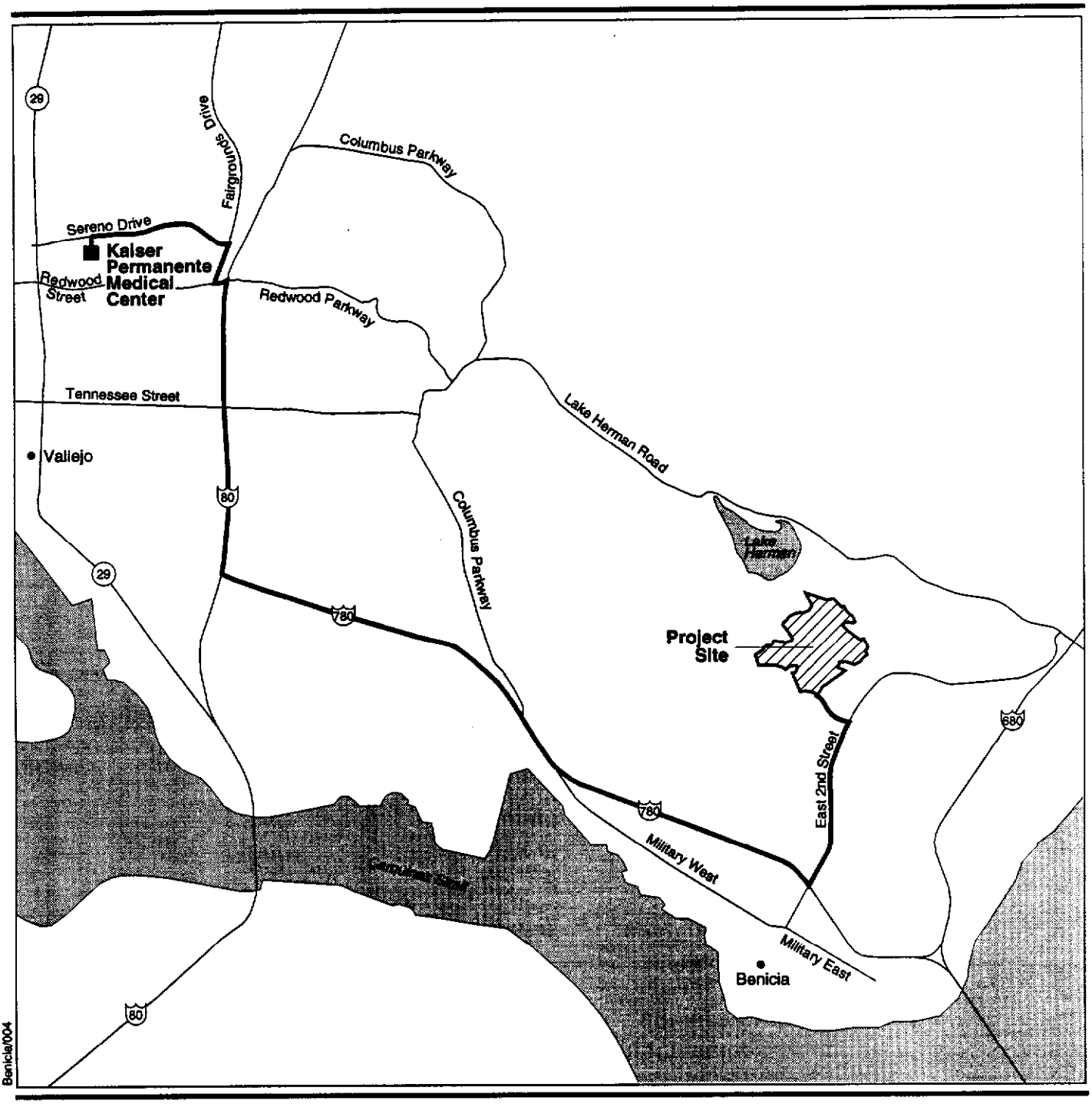
Directions to Hospital

From the site, head south on east 2nd Street to Interstate 780. Proceed west on I-780 to Highway 80. Head north on 80 and exit at Redwood Street. Head west on Redwood and make a right onto Fairgrounds Drive. Proceed north on Fairgrounds Drive to Serrano Drive. Make a left onto Serrano and the hospital will be on the left-hand-side of the street.

SIGNATURE PAGE

I have read and reviewed the SSHP for the Tourtelot Cleanup Project Site. I have been instructed in the contents of this document and understand the information presented. I will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE



EXPLANATION

- (11) State Highway
- (84) Interstate Highway
- Hospital Route

Hospital Location Map

Kaiser Permanente Medical Center
975 Sereno Drive
Vallejo, CA 94589
(707) 648-6200

0 .25 .5 1 Mile

Figure 11-1

12.0 REFERENCES

California Department of Health Services, California Code of Regulations, Title 8.

Earth Tech, 1999. Engineering Evaluation/Cost Analysis, Former Benicia Arsenal, Benicia, California, prepared for U.S. Army Corps of Engineers, Huntsville Division, Ordnance and Explosive Design Center, November.

Jacobs Engineering, 1999. Final Benicia Arsenal Records Research Report, April.

National Institute for Occupational Safety and Health, 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities 85-115.

U.S. Army Corps of Engineers, 1996. Safety and Health Requirements Manual EM 385-1-1.

U.S. Army Corps of Engineers, St Louis District, 1994a. Archives Search Report Findings, Benicia Arsenal, Benicia, Solano County, California, March.

U.S. Army Corps of Engineers, St. Louis District, 1994b. Archives Search Report Conclusions and Recommendations, Benicia Arsenal, Benicia, Solano County, California, March.

29 Code of Federal Regulations Part 1910, Occupational Safety and Health Standards.

150 0 150 300 450 Feet

Scale: 1" = 150'

PLATE 1
Summary of Ordnance Data

Tourtelot Cleanup Project
Benicia, California

29 September 2000

Table A-1 Background Concentrations of Metals in Soil (mg/kg)

Location	Minimum Depth (ft)	Maximum Depth (ft)	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Total Chromium	Cobalt	Copper
B1	0	0.5	9-Nov-92	<2	3	150	<0.1	<0.2	43	20	53
BG1	0	0.5	12-Jan-93	<2	12	110	<0.2	2.4	20	8.2	49
BG2	0	0.5	12-Jan-93	<2	12	140	<0.2	1.5	29	14	42
BG3	0	0.5	12-Jan-93	<2	12	150	<0.2	0.8	28	13	40
BG4	0	0.5	12-Jan-93	<2	12	180	<0.2	1.1	31	16	58
BG4 (Dup)	0	0.5	12-Jan-93	<2	11	170	<0.2	0.9	30	15	54
BG5	0	0.5	12-Jan-93	<2	10	170	<0.2	0.3	34	19	47
BG6	0	2.5	23-Jul-96	<1	3.9	88	0.1	<0.2	68	15	92
BG7	0	2.5	23-Jul-96	<1	8.7	210	0.3	<0.2	30	17	50
BG8	0	1.5	23-Jul-96	<1	1.1	120	<0.1	<0.2	64	17	28
BG9	0	2.5	24-Jul-96	<1	7.1	150	0.3	<0.2	27	18	48
BG10	0	2.5	24-Jul-96	<1	3.6	170	0.4	<0.2	29	19	58
FE-13	0.5	1	24-Mar-94	<1	6	170	0.2	0.2	31	14	43
FE-14	0.5	1	24-Mar-94	NA	12.4	151	1.07	1.56	48.5	20.6	51
SS-AI-01	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	35.5	NA	NA
SS-CI-01	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	75.1	NA	NA
SS-CI-02	0.5	1	9-Oct-91	NA	NA	NA	NA	NA	40.4	NA	NA
			Background Site Range	<1 - <2	3 - 12.4	88 - 210	<0.1 - <1.07	<0.2 - 2.4	20 - 75.1	8.2 - 20.6	28 - 92
			Average	0.8	8.2	152.1	0.2	0.7	39.0	16.1	50.9
			Maximum	<2	12.4	210.0	1.07	2.4	75.1	20.6	92.0
			Western United States Background[1]	<1.0 - 2.6	<1 - 97	70 - 5,000	<1.0 - 15	ND - 11	3.0 - 2,000	<3 - 50	32 - 300

NA = Not analyzed

(1) Source: Dragun and Chiasson, 1991, and Shacklette and Boerngen, 1984

Table A-1. Background Concentrations of Metals in Soil (mg/kg)

Location	Minimum Depth (ft)	Maximum Depth (ft)	Sample Date	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
B1	0	0.5	9-Nov-92	<2	<0.2	31	<2	<0.2	<3	110	84
BG1	0	0.5	12-Jan-93	250	0.7	21	<2	1.4	<3	44	140
BG2	0	0.5	12-Jan-93	94	<0.2	25	<2	0.5	<3	71	100
BG3	0	0.5	12-Jan-93	57	<0.2	23	2	0.3	<3	72	83
BG4	0	0.5	12-Jan-93	68	<0.2	27	<2	0.3	<3	74	110
BG4 (Dup)	0	0.5	12-Jan-93	58	<0.2	26	<2	0.3	<3	71	99
BG5	0	0.5	12-Jan-93	10	<0.2	29	<2	<0.2	7	83	81
BG6	0	2.5	23-Jul-96	6	<0.06	83	<1	0.2	24	72	94
BG7	0	2.5	23-Jul-96	35	<0.06	32	<1	0.3	32	61	71
BG8	0	1.5	23-Jul-96	5	<0.06	56	<1	0.2	26	75	50
BG9	0	2.5	24-Jul-96	8	<0.06	28	<1	0.2	40	69	64
BG10	0	2.5	24-Jul-96	9	<0.06	36	<1	0.2	35	46	73
FE-13	0.5	1	24-Mar-94	26	<0.06	21	<2	0.3	14	87	56
FE-14	0.5	1	24-Mar-94	35.7	NA	46.4	<7.5	NA	<15	76.1	88.8
SS-AI-01	0.5	1	9-Oct-91	33.8	NA	NA	NA	NA	NA	NA	NA
SS-CI-01	0.5	1	9-Oct-91	90.6	NA	NA	NA	NA	NA	NA	NA
SS-CI-02	0.5	1	9-Oct-91	51.6	NA	NA	NA	NA	NA	NA	NA
			Background Site Range	<2 - 250	<0.06 - 0.7	21 - 83	<1 - 2	<0.2 - 1.4	<3 - 40	44 - 110	50 - 140
			Average	49.3	0.1	34.5	1.1	0.3	13.9	72.2	85.3
			Maximum	250	0.7	83.0	2	1.4	40	110	140
			Western United States Background[1]	<10 - 700	<0.01 - 4.6	<5 - 700	<0.1 - 4.3	<0.5 - 5	<0.25 - 10	7.0 - 500	10 - 2,100

NA = Not analyzed

(1) Source: Dragun and Chiasson, 1991, and Shacklette and Boerngen, 1984

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-7		SS-8		SS-9		SS-10	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	651	0.500	907	0.500	1,240	1.00	1,050	1.00
Potassium	mg/kg	1,110	500	1,930	500	2,370	500	1,760	500
Arsenic	mg/kg	17.7	10.0	19.7	10.0	18.6	10.0	20.5	10.0
Barium	mg/kg	253	0.400	250	0.400	307	0.400	319	0.400
Beryllium	mg/kg	0.791	0.100	0.756	0.100	0.888	0.100	0.838	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	39.7	1.00	38.6	1.00	49.2	1.00	38.3	1.00
Cobalt	mg/kg	13.1	0.700	14.9	0.700	17.4	0.700	16.2	0.700
Copper	mg/kg	37.7	1.00	49.1	1.00	57.7	1.00	42.9	1.00
Lead	mg/kg	8.84	7.50	31.8	7.50	23.6	7.50	34.0	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	30.8	3.00	41.0	3.00	53.4	3.00	36.0	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	96.7	1.00	70.2	1.00	74.7	1.00	83.9	1.00
Zinc	mg/kg	57.8	2.00	71.0	2.00	79.0	2.00	63.0	2.00
Nitrate as Nitrogen	mg/kg	1.53	1.00	ND	1.00	1.53	1.00	1.70	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.53	1.00	ND	1.00	1.53	1.00	1.70	1.00
Mercury	mg/kg	ND	0.050	0.12	0.050	0.096	0.050	0.11	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	11.3	0.500	241	2.50	283	2.50	174	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-11		SS-12		SS-13		SS-14	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	834	0.500	1,070	1.00	558	0.500	1,180	1.00
Potassium	mg/kg	2,330	500	2,210	500	987	500	2,170	500
Arsenic	mg/kg	13.0	10.0	21.9	10.0	13.5	10.0	18.7	10.0
Barium	mg/kg	599	0.400	305	0.400	338	0.400	262	0.400
Beryllium	mg/kg	0.769	0.100	0.765	0.100	0.601	0.100	0.953	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	41.3	1.00	39.5	1.00	31.1	1.00	50.1	1.00
Cobalt	mg/kg	13.8	0.700	21.6	0.700	13.7	0.700	16.3	0.700
Copper	mg/kg	46.8	1.00	57.6	1.00	44.9	1.00	53.7	1.00
Lead	mg/kg	10.8	7.50	17.7	7.50	ND	7.50	26.5	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	46.7	3.00	47.4	3.00	34.7	3.00	48.4	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	57.1	1.00	67.6	1.00	64.1	1.00	74.9	1.00
Zinc	mg/kg	67.4	2.00	83.4	2.00	65.5	2.00	71.4	2.00
Nitrate as Nitrogen	mg/kg	6.20	1.00	ND	1.00	ND	1.00	3.14	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	6.20	1.00	ND	1.00	ND	1.00	3.14	1.00
Mercury	mg/kg	ND	0.050	0.064	0.050	ND	0.050	0.075	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	394	5.00	21.0	0.500	56.1	0.500	223	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-15		SS-16		SS-17		SS-18	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	840	0.500	820	0.500	513	0.500	832	0.500
Potassium	mg/kg	1,500	500	2,590	500	1,330	500	2,500	500
Arsenic	mg/kg	18.4	10.0	48.1	10.0	14.0	10.0	13.1	10.0
Barium	mg/kg	182	0.400	163	0.400	176	0.400	286	0.400
Beryllium	mg/kg	0.712	0.100	0.723	0.100	0.698	0.100	0.905	0.100
Cadmium	mg/kg	ND	1.00	1.67	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	34.8	1.00	38.2	1.00	27.6	1.00	47.1	1.00
Cobalt	mg/kg	15.1	0.700	14.0	0.700	11.6	0.700	13.5	0.700
Copper	mg/kg	40.7	1.00	48.2	1.00	38.3	1.00	48.6	1.00
Lead	mg/kg	25.6	7.50	76.3	7.50	28.6	7.50	16.1	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	32.0	3.00	43.0	3.00	27.0	3.00	41.8	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	77.6	1.00	59.9	1.00	61.9	1.00	72.0	1.00
Zinc	mg/kg	64.0	2.00	83.9	2.00	56.7	2.00	63.3	2.00
Nitrate as Nitrogen	mg/kg	2.19	1.00	9.84	1.00	4.15	1.00	2.00	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	2.73	1.00	10.4	1.00	4.15	1.00	2.00	1.00
Mercury	mg/kg	0.093	0.050	1.9	0.043	0.11	0.042	0.092	0.050
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	94.5	0.500	375	2.50	13.2	0.500	108	1.00

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-20		SS-21		SS-30		SS-30*	
	Sample Date	11/20/98		11/20/98		11/20/98		12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	-	-
Manganese	mg/kg	545	0.500	922	0.500	886	0.500	-	-
Potassium	mg/kg	2,240	500	2,150	500	1,660	500	-	-
Arsenic	mg/kg	13.7	10.0	16.5	10.0	16.8	10.0	-	-
Barium	mg/kg	331	0.400	212	0.400	258	0.400	-	-
Beryllium	mg/kg	0.805	0.100	0.793	0.100	0.699	0.100	-	-
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	-	-
Chromium	mg/kg	41.2	1.00	39.5	1.00	31.5	1.00	-	-
Cobalt	mg/kg	12.3	0.700	15.2	0.700	15.1	0.700	-	-
Copper	mg/kg	47.1	1.00	45.4	1.00	39.3	1.00	-	-
Lead	mg/kg	21.4	7.50	20.0	7.50	34.4	7.50	-	-
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	-	-
Nickel	mg/kg	36.5	3.00	41.5	3.00	30.8	3.00	-	-
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Vanadium	mg/kg	70.5	1.00	68.3	1.00	75.9	1.00	-	-
Zinc	mg/kg	65.9	2.00	70.4	2.00	59.6	2.00	-	-
Nitrate as Nitrogen	mg/kg	1.82	1.00	2.76	1.00	4.63	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	1.82	1.00	2.76	1.00	4.63	1.00	-	-
Mercury	mg/kg	0.11	0.043	0.11	0.050	0.121	0.0500	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Phosphate	mg/kg	296	2.50	311	2.50	4.39	0.500	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-31		SS-32		SS-33		SS-33*	
	Sample Date	11/20/98		11/20/98		11/20/98		12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	-	-
Manganese	mg/kg	791	0.500	712	0.500	805	0.500	-	-
Potassium	mg/kg	1,660	500	1,670	500	1,630	500	-	-
Arsenic	mg/kg	15.9	10.0	16.6	10.0	21.1	10.0	-	-
Barium	mg/kg	237	0.400	221	0.400	331	0.400	-	-
Beryllium	mg/kg	0.673	0.100	0.621	0.100	0.933	0.100	-	-
Cadmium	mg/kg	1.18	1.00	1.23	1.00	ND	1.00	-	-
Chromium	mg/kg	30.5	1.00	27.7	1.00	45.8	1.00	-	-
Cobalt	mg/kg	16.0	0.700	15.5	0.700	17.0	0.700	-	-
Copper	mg/kg	46.6	1.00	40.8	1.00	57.1	1.00	-	-
Lead	mg/kg	89.0	7.50	49.2	7.50	12.8	7.50	-	-
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	-	-
Nickel	mg/kg	32.3	3.00	28.1	3.00	45.2	3.00	-	-
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	-	-
Vanadium	mg/kg	66.3	1.00	69.1	1.00	91.1	1.00	-	-
Zinc	mg/kg	70.1	2.00	71.9	2.00	74.0	2.00	-	-
Nitrate as Nitrogen	mg/kg	1.70	1.00	5.34	1.00	1.44	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	1.70	1.00	5.34	1.00	1.44	1.00	-	-
Mercury	mg/kg	0.679	0.0500	0.570	0.0500	0.330	0.0500	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	-	-
Phosphate	mg/kg	191	2.50	287	2.50	18.6	0.500	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-35		SS-36		SS-39		SS-40	
	Sample Date	11/20/96		11/20/96		11/20/96		11/20/96	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	517	0.500	629	0.500	1,320	1.00	599	0.500
Potassium	mg/kg	1,130	500	1,740	500	2,700	500	1,910	500
Arsenic	mg/kg	16.6	10.0	18.1	10.0	20.0	10.0	19.7	10.0
Barium	mg/kg	152	0.400	176	0.400	183	0.400	223	0.400
Beryllium	mg/kg	0.676	0.100	0.759	0.100	0.778	0.100	0.599	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	ND	1.00	ND	1.00
Chromium	mg/kg	33.8	1.00	35.9	1.00	39.6	1.00	26.3	1.00
Cobalt	mg/kg	11.2	0.700	14.3	0.700	16.7	0.700	12.3	0.700
Copper	mg/kg	42.7	1.00	49.5	1.00	52.6	1.00	38.1	1.00
Lead	mg/kg	58.7	7.50	37.3	7.50	51.1	7.50	56.3	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	34.8	3.00	40.5	3.00	44.9	3.00	26.5	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	70.4	1.00	58.7	1.00	59.2	1.00	65.3	1.00
Zinc	mg/kg	58.3	2.00	76.8	2.00	85.4	2.00	71.5	2.00
Nitrate as Nitrogen	mg/kg	1.91	1.00	7.92	1.00	5.22	1.00	3.65	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.91	1.00	8.62	1.00	5.22	1.00	3.65	1.00
Mercury	mg/kg	0.0537	0.0500	0.102	0.0500	0.127	0.0500	0.216	0.0500
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	1.73	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	1.70	0.500	26.2	0.500	283	2.50	7.82	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	SS-41		SS-42		SS-43		SS-44	
	Sample Date	11/20/98		11/20/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	ND	6.00	ND	6.00	ND	6.00
Manganese	mg/kg	904	0.500	943	0.500	1,070	1.00	1,160	1.00
Potassium	mg/kg	1,440	500	1,190	500	1,830	500	1,400	500
Arsenic	mg/kg	11.4	10.0	17.5	10.0	18.3	10.0	13.2	10.0
Barium	mg/kg	307	0.400	372	0.400	245	0.400	183	0.400
Beryllium	mg/kg	0.510	0.100	0.669	0.100	0.766	0.100	0.549	0.100
Cadmium	mg/kg	ND	1.00	ND	1.00	1.21	1.00	1.07	1.00
Chromium	mg/kg	23.7	1.00	28.1	1.00	35.3	1.00	25.1	1.00
Cobalt	mg/kg	13.0	0.700	14.8	0.700	20.4	0.700	19.5	0.700
Copper	mg/kg	29.7	1.00	37.4	1.00	49.1	1.00	31.2	1.00
Lead	mg/kg	26.6	7.50	27.6	7.50	40.1	7.50	37.1	7.50
Molybdenum	mg/kg	ND	2.00	ND	2.00	ND	2.00	ND	2.00
Nickel	mg/kg	23.1	3.00	25.3	3.00	39.0	3.00	22.8	3.00
Selenium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.700	ND	0.700	ND	0.700	ND	0.700
Thallium	mg/kg	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vanadium	mg/kg	57.6	1.00	87.1	1.00	66.4	1.00	56.1	1.00
Zinc	mg/kg	49.5	2.00	63.6	2.00	68.2	2.00	52.9	2.00
Nitrate as Nitrogen	mg/kg	5.63	1.00	3.40	1.00	1.01	1.00	18.4	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	5.63	1.00	3.40	1.00	1.01	1.00	18.4	1.00
Mercury	mg/kg	0.0831	0.0500	0.0982	0.0500	0.238	0.0500	0.151	0.0500
Explosive Compounds									
PETN	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.30	ND	0.30	ND	0.30
Phosphate	mg/kg	15.7	0.500	ND	0.500	204	2.50	11.0	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	FSS-1		FSS-2		FSS-4		FSS-5	
	Sample Date	12/02/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID / Sample Date	FSS-6 12/02/98		FSS-7 12/02/98		FSS-8 12/02/98		FSS-9 12/01/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	ND	1.0	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	FSS-12		FSS-13		FSS-14		FSS-15	
	Sample Date	12/02/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	FSS-16		FSS-17		FSS-18		FSS-19	
	Sample Date	12/02/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-2. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Other Samples	Field Sample ID	FSS-20		FSS-30	
	Sample Date	12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals					
Antimony	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Barium	mg/kg	-	-	-	-
Beryllium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cobalt	mg/kg	-	-	-	-
Copper	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-
Molybdenum	mg/kg	-	-	-	-
Nickel	mg/kg	-	-	-	-
Selenium	mg/kg	-	-	-	-
Silver	mg/kg	-	-	-	-
Thallium	mg/kg	-	-	-	-
Vanadium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Explosive Compounds					
PETN	mg/kg	-	-	-	-
HMX	mg/kg	-	-	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-
Tetryl	mg/kg	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-
Phosphate	mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	SS-1		SS-2		SS-3		SS-4	
	Sample Date	09/09/98		09/09/98		09/09/98		09/09/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Manganese	mg/kg	1,200	5.0	1,500	5.0	690	5.0	890	5.0
Potassium	mg/kg	1,500	10	1,400	10	1,500	10	1,300	10
Arsenic	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Barium	mg/kg	220	0.5	250	0.5	180	0.5	160	0.5
Beryllium	mg/kg	0.89	0.5	1.0	0.5	0.84	0.5	0.85	0.5
Cadmium	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Chromium	mg/kg	41	0.5	44	0.5	34	0.5	37	0.5
Cobalt	mg/kg	12	0.5	15	0.5	11	0.5	7.2	0.5
Copper	mg/kg	54	0.5	54	0.5	37	0.5	35	0.5
Lead	mg/kg	9.1	1.0	9.2	1.0	ND	1.0	ND	1.0
Molybdenum	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Nickel	mg/kg	50	1.0	50	1.0	25	1.0	28	1.0
Selenium	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Silver	mg/kg	ND	0.5	ND	0.5	ND	0.5	ND	0.5
Thallium	mg/kg	ND	5.0	ND	5.0	ND	5.0	ND	5.0
Vanadium	mg/kg	53	0.5	63	0.5	84	0.5	88	0.5
Zinc	mg/kg	79	1.0	65	1.0	62	1.0	60	1.0
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	0.044	0.010	0.041	0.010	0.030	0.010	0.039	0.010
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Cyclonite (RDX)	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
1,3,5-Trinitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
1,3-Dinitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Tetryl	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Nitrobenzene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,4,6-Trinitrotoluene (TNT)	mg/kg	72,400	3,000	12,200	300	4,990	300	49,000	3000
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,4-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2,6-Dinitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
4-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
3-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
2-Nitrotoluene	mg/kg	ND	3,000	ND	300	ND	300	ND	3000
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-3. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	SS-5		SS-6		SS-37		SS-38	
	Sample Date	09/09/98		09/09/98		11/20/98		11/20/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	5.0	ND	5.0	ND	6.00	ND	6.00
Manganese	mg/kg	2100	5.0	1700	5.0	1,090	1.00	1,130	1.00
Potassium	mg/kg	1,800	10	2,400	10	1,780	500	2,110	500
Arsenic	mg/kg	ND	5.0	ND	5.0	13.6	10.00	15.7	10.00
Barium	mg/kg	300	0.5	180	0.5	219	0.400	227	0.400
Beryllium	mg/kg	1.3	0.5	0.90	0.5	0.786	0.100	0.898	0.100
Cadmium	mg/kg	ND	0.5	0.95	0.5	ND	1.00	ND	1.00
Chromium	mg/kg	71	0.6	47	0.5	36.9	1.00	44.1	1.00
Cobalt	mg/kg	27	0.5	15	0.5	15.2	0.700	16.2	0.700
Copper	mg/kg	71	0.5	61	0.5	48.6	1.00	55.3	1.00
Lead	mg/kg	ND	1.0	30	1.0	20.4	7.50	24.8	7.50
Molybdenum	mg/kg	ND	0.5	ND	0.5	ND	2.00	ND	2.00
Nickel	mg/kg	64	1.0	52	1.0	46.2	3.00	51.9	3.00
Selenium	mg/kg	ND	5.0	ND	5.0	ND	10.0	ND	10.0
Silver	mg/kg	ND	0.5	ND	0.5	ND	0.700	ND	0.700
Thallium	mg/kg	ND	5.0	ND	5.0	ND	10.0	ND	10.0
Vanadium	mg/kg	90	0.5	66	0.5	59.2	1.00	68.2	1.00
Zinc	mg/kg	79	1.0	91	1.0	61.3	2.00	69.7	2.00
Nitrate as Nitrogen	mg/kg	-	-	-	-	1.98	1.00	2.66	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	1.98	2.00	2.66	2.00
Mercury	mg/kg	0.024	0.010	0.14	0.010	0.0615	0.0500	0.0630	0.0500
Explosive Compounds									
PETN	mg/kg	-	-	-	-	ND	0.30	ND	0.30
HMX	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Cyclonite (RDX)	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Tetryl	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Nitrobenzene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	738	30	200	30	ND	0.30	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
4-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
3-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
2-Nitrotoluene	mg/kg	ND	30	ND	30	ND	0.30	ND	0.30
Phosphate	mg/kg	-	-	-	-	181	2.50	258	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-3. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-10*		FSS-10		FSS-31		FSS-33	
	Sample Date	12/01/98		12/02/98**/12/08/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	ND	250	-	-	-	-	-	-
HMX	mg/kg	ND	250	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	250	3.1	1.0	-	-	ND	1.0
1,3,5-Trinitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
Tetryl	mg/kg	ND	250	-	-	-	-	-	-
Nitrobenzene	mg/kg	ND	250	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	5400	250	61.55**/2074.35	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	250		-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	ND	250	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-34		FSS-35		FSS-36		FSS-37	
	Sample Date	12/02/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	-	-	-	-
HMX	mg/kg	-	-	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	1.0	ND	1.0	ND	1.0	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	-	-	-	-
Tetryl	mg/kg	-	-	-	-	-	-	-	-
Nitrobenzene	mg/kg	-	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	-	-	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-38		FSS-39		FSS-40*		FSS-40	
	Sample Date	12/02/98		12/02/98		12/01/98		12/03/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	-	-	-	-	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	-	-	-
Barium	mg/kg	-	-	-	-	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	-	-	-
Copper	mg/kg	-	-	-	-	-	-	-	-
Lead	mg/kg	-	-	-	-	-	-	-	-
Molybdenum	mg/kg	-	-	-	-	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	-	-	-
Silver	mg/kg	-	-	-	-	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-	-	-	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	-	-	-	-	ND	0.25	-	-
HMX	mg/kg	-	-	-	-	ND	0.25	-	-
Cyclonite (RDX)	mg/kg	-	-	-	-	ND	0.25	-	-
1,3,5-Trinitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
1,3-Dinitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
Tetryl	mg/kg	-	-	-	-	ND	0.25	-	-
Nitrobenzene	mg/kg	-	-	-	-	ND	0.25	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	1.0	ND	1.0	ND	0.25	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2,4-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2,6-Dinitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
4-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
3-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
2-Nitrotoluene	mg/kg	-	-	-	-	ND	0.25	-	-
Phosphate	mg/kg	-	-	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-3. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strips	Field Sample ID	FSS-41	
	Sample Date	12/03/1996**/12/08/96	
Parameter	**Units**	**Result**	**MDL**
Metals			
Antimony	mg/kg	-	-
Manganese	mg/kg	-	-
Potassium	mg/kg	-	-
Arsenic	mg/kg	-	-
Barium	mg/kg	-	-
Beryllium	mg/kg	-	-
Cadmium	mg/kg	-	-
Chromium	mg/kg	-	-
Cobalt	mg/kg	-	-
Copper	mg/kg	-	-
Lead	mg/kg	-	-
Molybdenum	mg/kg	-	-
Nickel	mg/kg	-	-
Selenium	mg/kg	-	-
Silver	mg/kg	-	-
Thallium	mg/kg	-	-
Vanadium	mg/kg	-	-
Zinc	mg/kg	-	-
Nitrate as Nitrogen	mg/kg	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	-	-
Mercury	mg/kg	-	-
Explosive Compounds			
PETN	mg/kg	-	-
HMX	mg/kg	-	-
Cyclonite (RDX)	mg/kg	3.4	1.0
1,3,5-Trinitrobenzene	mg/kg	-	-
1,3-Dinitrobenzene	mg/kg	-	-
Tetryl	mg/kg	-	-
Nitrobenzene	mg/kg	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	79.565**/79.5	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	-	-
2,4-Dinitrotoluene	mg/kg	-	-
2,6-Dinitrotoluene	mg/kg	-	-
4-Nitrotoluene	mg/kg	-	-
3-Nitrotoluene	mg/kg	-	-
2-Nitrotoluene	mg/kg	-	-
Phosphate	mg/kg	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

* Analysis of FSS-10 and FSS-40 using EPA Method 8330.

** = sample concentration was out of the range of the test method (1 to 30 mg/kg), therefore the sample was re-extracted, diluted and the concentration was re-reported.

Source: SECOR International, Inc.

Table A-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID			TNT-1A-.5	TNT-1A-1	TNT-1A-1.5	TNT-1A-2	TNT-1B-.5	TNT-1B-1	TNT-1B-1.5	TNT-1B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units	MDL								
ALUMINUM	SW6010B	mg/kg	2.91	-	21,000	-	15,000	22,000	21,000	-	17,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	17	-	13	15	14	-	12
BARIUM	SW6010B	mg/kg	0.590	-	330	-	170	220	220	-	200
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.66	-	0.43	0.74	0.62	-	0.49
CADMIUM	SW6010B	mg/kg	0.057	-	0.4	-	0.2	0.12	0.24	-	0.24
CALCIUM	SW6010B	mg/kg	6.41	-	5,100	-	26,000	5,900	6,200	-	30,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	61	-	44	54	52	-	45
COBALT	SW6010B	mg/kg	0.112	-	21	-	13	20	21	-	22
COPPER	SW6010B	mg/kg	0.445	-	74	-	58	71	71	-	72
IRON	SW6010B	mg/kg	1.82	-	50,000	-	38,000	43,000	49,000	-	41,000
LEAD	SW6010B	mg/kg	0.437	-	20	-	9.5	12	11	-	10
MAGNESIUM	SW6010B	mg/kg	7.00	-	6,600	-	7,600	7,200	7,000	-	7,900
MANGANESE	SW6010B	mg/kg	0.164	-	1,200	-	700	1,200	1,700	-	1,800
MERCURY	SW7471A	mg/kg	0.0099	-	0.04	-	0.054	0.025	0.037	-	0.049
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.69	-	0.42	0.74	0.59	-	0.77
NICKEL	SW6010B	mg/kg	0.591	-	66	-	54	65	64	-	66
POTASSIUM	SW6010B	mg/kg	9.91	-	1,800	-	760	1,700	1,500	-	1,100
SELENIUM	SW6010B	mg/kg	0.464	-	0.9	-	0.69	0.98	0.75	-	ND
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	0.12	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	79	-	54	86	62	-	49
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	88	-	55	80	77	-	63
ZINC	SW6010B	mg/kg	0.622	-	94	-	80	88	92	-	95
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	0.0074	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(g,h,I)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	0.0074	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	0.049	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	0.013	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	-	ND	0.061	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	ND	0.049	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	87	-	79	74	110	-	68
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	8,300	-	1,600	750	360	-	8.9
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	5	-	ND	ND	ND	-	ND

Table A-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID			TNT-1A-.5	TNT-1A-1	TNT-1A-1.5	TNT-1A-2	TNT-1B-.5	TNT-1B-1	TNT-1B-1.5	TNT-1B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units	MDL								
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	3.2	2.4	-	1.2
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	ND	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-4. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID		TNT-1C-.5	TNT-1C-1	TNT-1C-1.5	TNT-1C-2	TNT-1C-3.5	TNT-1C-4
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	Method	Units						
ALUMINUM	SW6010B	mg/kg	-	11,000	-	19,000	-	16,000
ANTIMONY	SW6010B	mg/kg	-	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	7.9	-	14	-	14
BARIUM	SW6010B	mg/kg	-	130	-	220	-	190
BERYLLIUM	SW6010B	mg/kg	-	0.29	-	0.55	-	0.34
CADMIUM	SW6010B	mg/kg	-	ND	-	0.15	-	0.34
CALCIUM	SW6010B	mg/kg	-	3,100	-	5,900	-	16,000
CHROMIUM, TOTAL	SW6010B	mg/kg	-	31	-	59	-	48
COBALT	SW6010B	mg/kg	-	11	-	20	-	27
COPPER	SW6010B	mg/kg	-	36	-	68	-	73
IRON	SW6010B	mg/kg	-	25,000	-	45,000	-	45,000
LEAD	SW6010B	mg/kg	-	9.8	-	12	-	13
MAGNESIUM	SW6010B	mg/kg	-	3,600	-	7,100	-	8,000
MANGANESE	SW6010B	mg/kg	-	660	-	1,100	-	3,800
MERCURY	SW7471A	mg/kg	-	0.058	-	0.068	-	0.08
MOLYBDENUM	SW6010B	mg/kg	-	0.26	-	0.61	-	0.51
NICKEL	SW6010B	mg/kg	-	38	-	68	-	110
POTASSIUM	SW6010B	mg/kg	-	1,000	-	1,600	-	800
SELENIUM	SW6010B	mg/kg	-	0.74	-	ND	-	ND
SILVER	SW6010B	mg/kg	-	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	-	ND	-	68	-	57
THALLIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	41	-	72	-	58
ZINC	SW6010B	mg/kg	-	49	-	87	-	94
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	0.01	-	0.015	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	0.025	-	0.027	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	42	-	150	-	32
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	360,000	-	110,000	-	11
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	110	-	ND

Table A-4. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

TNT Strip #1	Field Sample ID		TNT-1C-.5	TNT-1C-1	TNT-1C-1.5	TNT-1C-2	TNT-1C-3.5	TNT-1C-4
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	Method	Units						
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	0.61
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-5. Benicia Tourteiot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID			TNT-2A-.5	TNT-2A-1	TNT-2A-1.5	TNT-2A-2	TNT-2B-.5	TNT-2B-1	TNT-2B-1.5	TNT-2B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
ALUMINUM	SW6010B	mg/kg	2.91	-	17,000	-	17,000	20,000	19,000	-	16,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	15	-	16	15	15	-	12
BARIUM	SW6010B	mg/kg	0.590	-	230	-	270	220	240	-	160
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.49	-	0.49	0.75	0.62	-	0.35
CADMIUM	SW6010B	mg/kg	0.057	-	0.24	-	0.18	0.37	0.37	-	0.2
CALCIUM	SW6010B	mg/kg	6.41	-	4,500	-	5,100	5,000	5,500	-	19,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	53	-	53	54	55	-	48
COBALT	SW6010B	mg/kg	0.112	-	20	-	21	19	21	-	18
COPPER	SW6010B	mg/kg	0.445	-	61	-	65	66	66	-	60
IRON	SW6010B	mg/kg	1.82	-	48,000	-	46,000	44,000	46,000	-	39,000
LEAD	SW6010B	mg/kg	0.437	-	11	-	11	17	12	-	9.5
MAGNESIUM	SW6010B	mg/kg	7.00	-	5,700	-	6,400	5,900	6,200	-	7,500
MANGANESE	SW6010B	mg/kg	0.164	-	1,100	-	1,800	1,100	1,200	-	620
MERCURY	SW7471A	mg/kg	0.0099	-	0.037	-	0.037	0.05	0.025	-	0.071
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.66	-	0.55	0.75	0.5	-	0.35
NICKEL	SW6010B	mg/kg	0.591	-	60	-	65	62	64	-	55
POTASSIUM	SW6010B	mg/kg	9.91	-	1,600	-	1,200	1,600	1,400	-	1,100
SELENIUM	SW6010B	mg/kg	0.464	-	0.77	-	0.65	0.87	ND	-	ND
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	85	-	74	75	75	-	94
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	76	-	75	81	81	-	60
ZINC	SW6010B	mg/kg	0.622	-	78	-	79	75	80	-	78
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	0.0061	-	0.011	ND	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	ND	ND	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	230	-	210	70	140	-	130
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	13,000	-	25,000	190	92,000	-	24
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	-	20	ND	64	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND

Table A-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID			TNT-2A-.5	TNT-2A-1	TNT-2A-1.5	TNT-2A-2	TNT-2B-.5	TNT-2B-1	TNT-2B-1.5	TNT-2B-2
	Sample Date			7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99	7/19/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**								
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	1.4	ND	-	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	ND	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	0.48	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2B-3.5	TNT-2B-4	TNT-2C-.5	TNT-2C-1.0	TNT-2C-1.5	TNT-2C-2.0	TNT-2D-.5	TNT-2D-1	TNT-2D-1.5
	Sample Date		7/19/99	7/19/99	7/20/99	7/20/99	7/20/99	7/20/99	7/19/99	7/19/99	7/19/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0
Parameter	Method	Units									
ALUMINUM	SW6010B	mg/kg	-	16,000	-	20,000	-	22,000	-	17,000	-
ANTIMONY	SW6010B	mg/kg	-	ND	-	1.1	-	ND	-	ND	-
ARSENIC	SW6010B	mg/kg	-	13	-	16	-	16	-	14	-
BARIUM	SW6010B	mg/kg	-	140	-	240	-	270	-	290	-
BERYLLIUM	SW6010B	mg/kg	-	0.34	-	0.61	-	0.62	-	0.72	-
CADMIUM	SW6010B	mg/kg	-	0.22	-	ND	-	ND	-	0.18	-
CALCIUM	SW6010B	mg/kg	-	17,000	-	6,000	-	9,800	-	5,400	-
CHROMIUM, TOTAL	SW6010B	mg/kg	-	53	-	51	-	55	-	52	-
COBALT	SW6010B	mg/kg	-	22	-	20	-	21	-	22	-
COPPER	SW6010B	mg/kg	-	69	-	66	-	67	-	64	-
IRON	SW6010B	mg/kg	-	45,000	-	43,000	-	45,000	-	44,000	-
LEAD	SW6010B	mg/kg	-	10	-	12	-	12	-	11	-
MAGNESIUM	SW6010B	mg/kg	-	8,900	-	7,200	-	7,700	-	5,600	-
MANGANESE	SW6010B	mg/kg	-	820	-	1,200	-	1,500	-	1,000	-
MERCURY	SW7471A	mg/kg	-	0.092	-	0.024	-	0.025	-	0.02	-
MOLYBDENUM	SW6010B	mg/kg	-	0.29	-	0.91	-	0.73	-	0.53	-
NICKEL	SW6010B	mg/kg	-	62	-	62	-	65	-	56	-
POTASSIUM	SW6010B	mg/kg	-	920	-	1,800	-	2,100	-	1,200	-
SELENIUM	SW6010B	mg/kg	-	0.62	-	1.2	-	1.4	-	0.86	-
SILVER	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND	-
SODIUM	SW6010B	mg/kg	-	100	-	94	-	110	-	120	-
THALLIUM	SW6010B	mg/kg	-	ND	-	ND	-	ND	-	ND	-
VANADIUM	SW6010B	mg/kg	-	58	-	76	-	78	-	79	-
ZINC	SW6010B	mg/kg	-	95	-	84	-	86	-	77	-
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
CHRYSENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
FLUORANTHENE	SW8310	mg/kg	-	ND	-	0.012	-	ND	-	ND	-
FLUORENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
PHENANTHRENE	SW8310	mg/kg	-	ND	-	0.018	-	ND	-	ND	-
PYRENE	SW8310	mg/kg	-	ND	-	ND	-	ND	-	ND	-
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	71	-	180	-	210	-	4.1	-
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	180	-	42	-	9,500	-	37	-
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	3.3	-	ND	-	ND	-
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	0.4	-	ND	-	ND	-

Table A-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2B-3.5	TNT-2B-4	TNT-2C-.5	TNT-2C-1.0	TNT-2C-1.5	TNT-2C-2.0	TNT-2D-.5	TNT-2D-1	TNT-2D-1.5
	Sample Date		7/19/99	7/19/99	7/20/99	7/20/99	7/20/99	7/20/99	7/19/99	7/19/99	7/19/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0
Parameter	Method	Units									
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	1.3	-	ND	-	9.1	-
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	5.2	-
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-
NITROGLYCERIN	SW8330	mg/kg	0.33	-	ND	-	ND	-	ND	-	0.39
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg		ND	-	ND	-	ND	-	ND	-
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND
TETRYL	SW8330	mg/kg		ND	-	ND	-	ND	-	ND	-

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-5. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2D-2	TNT-2E-1	TNT-2E-1.5	TNT-2E-2
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99
	Depth		2.0 - 2.5	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**				
ALUMINUM	SW6010B	mg/kg	19,000	19,000	-	19,000
ANTIMONY	SW6010B	mg/kg	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	13	14	-	14
BARIUM	SW6010B	mg/kg	290	250	-	240
BERYLLIUM	SW6010B	mg/kg	0.7	0.59	-	0.6
CADMIUM	SW6010B	mg/kg	0.35	0.35	-	0.24
CALCIUM	SW6010B	mg/kg	5,300	4,600	-	5,500
CHROMIUM, TOTAL	SW6010B	mg/kg	54	53	-	58
COBALT	SW6010B	mg/kg	21	21	-	22
COPPER	SW6010B	mg/kg	63	62	-	67
IRON	SW6010B	mg/kg	51,000	44,000	-	46,000
LEAD	SW6010B	mg/kg	12	18	-	12
MAGNESIUM	SW6010B	mg/kg	6,000	5,600	-	6,900
MANGANESE	SW6010B	mg/kg	1,100	1,500	-	1,400
MERCURY	SW7471A	mg/kg	0.035	0.071	-	0.024
MOLYBDENUM	SW6010B	mg/kg	0.49	0.47	-	0.4
NICKEL	SW6010B	mg/kg	57	62	-	67
POTASSIUM	SW6010B	mg/kg	1,300	1,300	-	1,200
SELENIUM	SW6010B	mg/kg	0.81	ND	-	1.1
SILVER	SW6010B	mg/kg	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	120	59	-	48
THALLIUM	SW6010B	mg/kg	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	81	79	-	81
ZINC	SW6010B	mg/kg	78	78	-	84
ACENAPHTHENE	SW8310	mg/kg	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.0082	0.0094	-	ND
PYRENE	SW8310	mg/kg	ND	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	6.8	0.41	-	1.3
1,3-DINITROBENZENE	SW8330	mg/kg	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	210	11	-	2.5
2,4-DINITROTOLUENE	SW8330	mg/kg	ND	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	ND	ND	-	ND

Table A-5. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #2	Field Sample ID		TNT-2D-2	TNT-2E-1	TNT-2E-1.5	TNT-2E-2
	Sample Date		7/19/99	7/19/99	7/19/99	7/19/99
	Depth		2.0 - 2.5	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**				
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	6	3.1	-	1.7
2-NITROTOLUENE	SW8330	mg/kg	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	3.7	8.7	-	3.1
4-NITROTOLUENE	SW8330	mg/kg	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	-	-	0.24	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	-	-	ND	-
TETRYL	SW8330	mg/kg	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID			TNT-3A-.5	TNT-3A-1.0	TNT-3A-1.5	TNT-3A-2	TNT-3B-.5	TNT-3B-1	TNT-3B-1.5	TNT-3B-1DUP	TNT-3B-2
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	1.0 - 1.5	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**									
ALUMINUM	SW6010B	mg/kg	2.91	-	19,000	-	20,000	-	21,000	-	20,000	21,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	-	0.71	-	ND	-	0.68	0.69
ARSENIC	SW6010B	mg/kg	0.559	-	17	-	15	-	15	-	15	14
BARIUM	SW6010B	mg/kg	0.590	-	240	-	280	-	310	-	260	330
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.36	-	0.49	-	0.49	-	0.5	0.5
CADMIUM	SW6010B	mg/kg	0.057	-	ND	-	ND	-	ND	-	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	-	3,600	-	4,300	-	4,300	-	4,100	5,300
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	44	-	45	-	47	-	45	46
COBALT	SW6010B	mg/kg	0.112	-	17	-	18	-	20	-	19	21
COPPER	SW6010B	mg/kg	0.445	-	51	-	55	-	55	-	54	54
IRON	SW6010B	mg/kg	1.82	-	39,000	-	42,000	-	39,000	-	44,000	46,000
LEAD	SW6010B	mg/kg	0.437	-	26	-	9.3	-	10	-	11	11
MAGNESIUM	SW6010B	mg/kg	7.00	-	6,100	-	6,400	-	7,100	-	6,800	7,100
MANGANESE	SW6010B	mg/kg	0.164	-	1,100	-	1,200	-	1,200	-	1,100	1,900
MERCURY	SW7471A	mg/kg	0.0099	-	0.06	-	0.037	-	0.02	-	0.075	0.014
MOLYBDENUM	SW6010B	mg/kg	0.142	-	1.2	-	1.2	-	0.79	-	0.85	0.85
NICKEL	SW6010B	mg/kg	0.591	-	47	-	55	-	55	-	53	63
POTASSIUM	SW6010B	mg/kg	9.91	-	3,200	-	2,600	-	2,800	-	2,600	2,800
SELENIUM	SW6010B	mg/kg	0.464	-	1.3	-	1.2	-	1.2	-	0.89	1.1
SILVER	SW6010B	mg/kg	0.099	-	ND	-	ND	-	ND	-	ND	ND
SODIUM	SW6010B	mg/kg	23.96	-	78	-	110	-	140	-	130	160
THALLIUM	SW6010B	mg/kg	0.741	-	ND	-	ND	-	ND	-	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	-	84	-	81	-	77	-	75	78
ZINC	SW6010B	mg/kg	0.622	-	79	-	75	-	74	-	75	75
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	-	ND	-	ND	-	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	-	ND	-	ND	-	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	ND	-	ND	-	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	-	ND	-	ND	-	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	-	0.012	-	ND	-	ND	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	-	ND	-	ND	-	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	-	ND	-	ND	-	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	-	ND	-	ND	-	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	-	0.025	-	ND	-	ND	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	-	ND	-	ND	-	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	96	-	120	-	200	-	200	190
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	-	ND	-	ND	-	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	51,000	-	28,000	-	8.2	-	2.5	63
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	-	12	-	1.1	-	1.4	0.25

Table A-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID			TNT-3A-.5	TNT-3A-1.0	TNT-3A-1.5	TNT-3A-2	TNT-3B-.5	TNT-3B-1	TNT-3B-1.5	TNT-3B-1DUP	TNT-3B-2
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	1.0 - 1.5	2.0 - 2.5
Parameter	**Method**	**Units**	**MDL**									
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	-	ND	-	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	ND	-	ND	-	0.98	-	1.3	0.75
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	-	ND	-	ND	-	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	-	ND	-	ND	-	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	ND	-	ND	-	ND	-	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	-	ND	-	ND	-	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	-	ND	-	ND	-	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	-	ND	-	ND	-	ND	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	ND	-	ND	-	ND	-	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	-	ND	-	ND	-	ND	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	ND	-	ND	-	ND	-	-
TETRYL	SW8330	mg/kg	0.237	-	ND	-	ND	-	ND	-	ND	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID		TNT-3B-3.5	TNT-3B-4	TNT-3C-.5	TNT-3C-1	TNT-3C-1.5	TNT-3C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units						
ALUMINUM	SW6010B	mg/kg	-	20,000	21,000	21,000	-	21,000
ANTIMONY	SW6010B	mg/kg	-	ND	ND	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	14	16	15	-	15
BARIUM	SW6010B	mg/kg	-	300	270	300	-	370
BERYLLIUM	SW6010B	mg/kg	-	0.37	0.62	0.63	-	0.62
CADMIUM	SW6010B	mg/kg	-	ND	0.074	ND	-	ND
CALCIUM	SW6010B	mg/kg	-	22,000	3,300	3,900	-	4,500
CHROMIUM, TOTAL	SW6010B	mg/kg	-	43	59	58	-	57
COBALT	SW6010B	mg/kg	-	17	21	23	-	22
COPPER	SW6010B	mg/kg	-	51	68	67	-	65
IRON	SW6010B	mg/kg	-	36,000	46,000	45,000	-	46,000
LEAD	SW6010B	mg/kg	-	9.9	16	11	-	11
MAGNESIUM	SW6010B	mg/kg	-	8,600	7,500	7,200	-	7,100
MANGANESE	SW6010B	mg/kg	-	1,100	1,500	1,400	-	1,500
MERCURY	SW7471A	mg/kg	-	0.099	0.012	0.019	-	0.02
MOLYBDENUM	SW6010B	mg/kg	-	0.86	0.49	0.63	-	0.63
NICKEL	SW6010B	mg/kg	-	52	67	65	-	66
POTASSIUM	SW6010B	mg/kg	-	3,000	1,700	2,000	-	2,000
SELENIUM	SW6010B	mg/kg	-	0.94	0.87	1.2	-	0.71
SILVER	SW6010B	mg/kg	-	ND	ND	ND	-	ND
SODIUM	SW6010B	mg/kg	-	250	87	110	-	160
THALLIUM	SW6010B	mg/kg	-	ND	ND	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	60	87	88	-	87
ZINC	SW6010B	mg/kg	-	75	75	78	-	81
ACENAPHTHENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
PYRENE	SW8310	mg/kg	-	ND	ND	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	150	ND	180	-	210
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	10	16,000	31	-	15
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	11	ND	-	ND

Table A-6. Benicia Tourtelot Analytical Results for Soil
(Unvalidated Data)

TNT Strip #3	Field Sample ID		TNT-3B-3.5	TNT-3B-4	TNT-3C-.5	TNT-3C-1	TNT-3C-1.5	TNT-3C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		3.5 - 4.0	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**						
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	0.21	12	1.2	-	ND
2-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	9.9	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	ND	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	ND	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.24	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	ND	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	ND	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID			TNT-4A-.5	TNT-4A-1	TNT-4A-2	TNT-4B-.5	TNT-4B-1	TNT-4B-1.5	TNT-4B-2	TNT-4B-3.5	TNT-4B-4
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	Method	Units	MDL									
ALUMINUM	SW6010B	mg/kg	2.91	-	18,000	18,000	19,000	20,000	-	18,000	-	17,000
ANTIMONY	SW6010B	mg/kg	0.502	-	ND	ND	ND	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	0.559	-	15	13	14	14	-	13	-	11
BARIUM	SW6010B	mg/kg	0.590	-	210	190	340	270	-	250	-	230
BERYLLIUM	SW6010B	mg/kg	0.130	-	0.47	0.48	0.62	0.62	-	0.63	-	0.49
CADMIUM	SW6010B	mg/kg	0.057	-	ND	ND	0.1	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	6.41	-	3,200	3,200	3,500	3,600	-	3,900	-	5,500
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	-	51	51	50	51	-	49	-	47
COBALT	SW6010B	mg/kg	0.112	-	25	17	22	21	-	20	-	18
COPPER	SW6010B	mg/kg	0.445	-	54	52	61	57	-	56	-	51
IRON	SW6010B	mg/kg	1.82	-	46,000	45,000	41,000	40,000	-	39,000	-	35,000
LEAD	SW6010B	mg/kg	0.437	-	10	8.7	12	11	-	11	-	11
MAGNESIUM	SW6010B	mg/kg	7.00	-	5,200	5,500	5,400	5,600	-	5,600	-	5,600
MANGANESE	SW6010B	mg/kg	0.164	-	1,300	830	1,500	1,500	-	1,200	-	1,100
MERCURY	SW7471A	mg/kg	0.0099	-	0.036	0.048	0.015	ND	-	ND	-	0.022
MOLYBDENUM	SW6010B	mg/kg	0.142	-	0.9	0.95	0.5	0.74	-	0.55	-	0.61
NICKEL	SW6010B	mg/kg	0.591	-	50	49	59	57	-	56	-	54
POTASSIUM	SW6010B	mg/kg	9.91	-	1,400	1,400	1,600	2,000	-	1,800	-	1,700
SELENIUM	SW6010B	mg/kg	0.464	-	1.7	0.93	0.75	1.2	-	1.1	-	1
SILVER	SW6010B	mg/kg	0.099	-	ND	ND	ND	ND	-	ND	-	ND
SODIUM	SW6010B	mg/kg	23.96	-	100	180	120	200	-	240	-	240
THALLIUM	SW6010B	mg/kg	0.741	-	ND	ND	ND	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	0.156	-	97	87	81	79	-	78	-	66
ZINC	SW6010B	mg/kg	0.622	-	70	69	65	68	-	66	-	65
ACENAPHTHENE	SW8310	mg/kg	0.01	-	ND	ND	ND	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	-	ND	ND	ND	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	-	ND	ND	ND	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	0.005	-	ND	ND	ND	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	0.008	-	ND	ND	ND	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	-	ND	ND	ND	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	0.008	-	ND	ND	ND	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	0.005	-	ND	ND	0.01	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	0.004	-	ND	ND	ND	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	-	5	0.6	200	190	-	160	-	20
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	-	ND	ND	ND	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	-	150	18	52	14	-	660	-	240
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	-	ND	ND	2.4	1.9	-	1.3	-	ND

Table A-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID			TNT-4A-.5	TNT-4A-1	TNT-4A-2	TNT-4B-.5	TNT-4B-1	TNT-4B-1.5	TNT-4B-2	TNT-4B-3.5	TNT-4B-4
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	3.5 - 4.0	4.0 - 4.5
Parameter	Method	Units	MDL									
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	-	ND	ND	ND	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	-	6	5.3	ND	ND	-	1.1	-	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	-	ND	ND	ND	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	-	ND	ND	ND	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	-	5.4	5.3	ND	ND	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	-	ND	ND	ND	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	-	ND	ND	ND	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	0.029	-	ND	ND	ND	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	0.070	ND	-	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	-	ND	ND	ND	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	ND	-	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	0.237	-	ND	ND	ND	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID		TNT-4C-.5	TNT-4C-1	TNT-4C-1.5	TNT-4C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**				
ALUMINUM	SW6010B	mg/kg	-	18,000	-	19,000
ANTIMONY	SW6010B	mg/kg	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	-	14	-	13
BARIUM	SW6010B	mg/kg	-	250	-	130
BERYLLIUM	SW6010B	mg/kg	-	0.59	-	0.35
CADMIUM	SW6010B	mg/kg	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	-	3,900	-	6,600
CHROMIUM, TOTAL	SW6010B	mg/kg	-	51	-	54
COBALT	SW6010B	mg/kg	-	21	-	27
COPPER	SW6010B	mg/kg	-	55	-	71
IRON	SW6010B	mg/kg	-	38,000	-	46,000
LEAD	SW6010B	mg/kg	-	15	-	11
MAGNESIUM	SW6010B	mg/kg	-	5,200	-	9,700
MANGANESE	SW6010B	mg/kg	-	1,400	-	660
MERCURY	SW7471A	mg/kg	-	0.047	-	0.047
MOLYBDENUM	SW6010B	mg/kg	-	0.76	-	0.39
NICKEL	SW6010B	mg/kg	-	58	-	75
POTASSIUM	SW6010B	mg/kg	-	1,700	-	1,300
SELENIUM	SW6010B	mg/kg	-	0.96	-	1.1
SILVER	SW6010B	mg/kg	-	ND	-	ND
SODIUM	SW6010B	mg/kg	-	93	-	110
THALLIUM	SW6010B	mg/kg	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	-	73	-	64
ZINC	SW6010B	mg/kg	-	67	-	100
ACENAPHTHENE	SW8310	mg/kg	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	-	ND	-	ND
FLUORENE	SW8310	mg/kg	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	-	0.019	-	ND
PYRENE	SW8310	mg/kg	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	-	68	-	89
1,3-DINITROBENZENE	SW8330	mg/kg	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	-	20,000	-	2
2,4-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND

Table A-7. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #4	Field Sample ID		TNT-4C-.5	TNT-4C-1	TNT-4C-1.5	TNT-4C-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99
	Depth		0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units				
2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
2-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
4-NITROTOLUENE	SW8330	mg/kg	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	ND	-	ND	-
TETRYL	SW8330	mg/kg	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID			TNT-5ASURFACE	TNT-5A-.5	TNT-5A-1	TNT-5A-1.5	TNT-5A-2	TNT-5B-.5	TNT-5B-1	TNT-5B-1.5	TNT-5B-2	TNT-5C-.5
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0
Parameter	Method	Units	MDL										
ALUMINUM	SW6010B	mg/kg	2.91	16,000	-	17,000	-	17,000	17,000	16,000	-	19,000	-
ANTIMONY	SW6010B	mg/kg	0.502	0.85	-	ND	-	1.1	ND	0.84	-	ND	-
ARSENIC	SW6010B	mg/kg	0.559	13	-	14	-	15	19	16	-	23	-
BARIUM	SW6010B	mg/kg	0.590	230	-	220	-	260	180	160	-	140	-
BERYLLIUM	SW6010B	mg/kg	0.130	0.51	-	0.48	-	0.61	0.36	0.35	-	0.35	-
CADMIUM	SW6010B	mg/kg	0.057	ND	-	ND	-	ND	ND	ND	-	ND	-
CALCIUM	SW6010B	mg/kg	6.41	2,600	-	2,600	-	3,400	3,300	3000	-	3,600	-
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	50	-	50	-	53	43	41	-	47	-
COBALT	SW6010B	mg/kg	0.112	21	-	22	-	21	17	15	-	15	-
COPPER	SW6010B	mg/kg	0.445	58	-	56	-	58	50	44	-	61	-
IRON	SW6010B	mg/kg	1.82	39,000	-	41,000	-	45,000	47,000	46,000	-	41,000	-
LEAD	SW6010B	mg/kg	0.437	11	-	14	-	10	7.3	8.4	-	8.2	-
MAGNESIUM	SW6010B	mg/kg	7.00	4,100	-	4,200	-	5,000	4,700	4,400	-	6,400	-
MANGANESE	SW6010B	mg/kg	0.184	1,300	-	1,300	-	1,500	470	590	-	290	-
MERCURY	SW7471A	mg/kg	0.0099	0.021	-	0.017	-	ND	0.036	0.035	-	0.047	-
MOLYBDENUM	SW6010B	mg/kg	0.142	0.9	-	0.85	-	0.61	1.2	1.2	-	0.84	-
NICKEL	SW6010B	mg/kg	0.591	51	-	54	-	58	38	35	-	50	-
POTASSIUM	SW6010B	mg/kg	9.91	2,100	-	2,000	-	2,100	1,100	1,400	-	1,200	-
SELENIUM	SW6010B	mg/kg	0.464	0.94	-	0.83	-	0.7	1.1	1.1	-	0.76	-
SILVER	SW6010B	mg/kg	0.099	ND	-	ND	-	ND	ND	0.13	-	ND	-
SODIUM	SW6010B	mg/kg	23.96	110	-	140	-	240	60	100	-	110	-
THALLIUM	SW6010B	mg/kg	0.741	ND	-	ND	-	ND	ND	ND	-	ND	-
VANADIUM	SW6010B	mg/kg	0.156	80	-	80	-	81	100	97	-	98	-
ZINC	SW6010B	mg/kg	0.622	66	-	67	-	70	65	64	-	91	-
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.51	-	-	ND	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.29	-	-	ND	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.34	-	-	ND	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.34	-	-	ND	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	ND	-	-	-	-	-	-	-
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	ND	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.30	-	-	ND	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	0.12	-	-	ND	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.067	-	-	ND	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	ND	-	-	-	-	-	-	-
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.99	-	-	ND	-	-	-	-	-	-	-

Table A-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID			TNT-5ASURFACE	TNT-5A-.5	TNT-5A-1	TNT-5A-1.5	TNT-5A-2	TNT-5B-.5	TNT-5B-1	TNT-5B-1.5	TNT-5B-2	TNT-5C-.5
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth			0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0
Parameter	Method	Units	MDL										
OCTACHLORODIBENZOFURAN	SW8290	pg/g	0.5	-	-	ND	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.49	-	-	ND	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	4.3	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	0.94	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	13	-	-	-	-	-	-	-
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	-	ND	-	ND	ND	ND	-	ND	-
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	-	ND	-	ND	ND	ND	-	ND	-
ANTHRACENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-
CHRYSENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	-	ND	-	ND	ND	ND	-	ND	-
FLUORANTHENE	SW8310	mg/kg	0.005	ND	-	ND	-	ND	ND	ND	-	ND	-
FLUORENE	SW8310	mg/kg	0.006	ND	-	ND	-	ND	ND	ND	-	ND	-
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	-	ND	-	ND	ND	ND	-	ND	-
NAPHTHALENE	SW8310	mg/kg	0.006	ND	-	ND	-	ND	ND	ND	-	ND	-
PHENANTHRENE	SW8310	mg/kg	0.005	0.0072	-	ND	-	ND	ND	ND	-	ND	-
PYRENE	SW8310	mg/kg	0.004	ND	-	ND	-	ND	ND	ND	-	ND	-
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	31	-	35	-	180	13	14	-	7.5	-
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	-	ND	-	ND	ND	ND	-	ND	-
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	1,500	-	10,000	-	12	4,200	21,000	-	7,800	-
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	0.93	-	2.5	-	0.55	8.9	15	-	5.4	-
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	-	ND	-	ND	ND	ND	-	ND	-
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	-	1.1	-	ND	3.8	3.9	-	0.82	-
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	-	ND	-	ND	ND	ND	-	ND	-
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	-	ND	-	ND	ND	ND	-	ND	-
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	-	ND	-	ND	ND	ND	-	ND	-
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	-	ND	-	ND	ND	ND	-	ND	-
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	-	ND	-	ND	ND	ND	-	ND	-
NITROBENZENE	SW8330	mg/kg	0.029	ND	-	ND	-	ND	ND	ND	-	ND	-
NITROGLYCERIN	SW8330	mg/kg	0.070	-	0.35	-	0.3	-	ND	-	ND	-	0.6
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	-	ND	-	ND	ND	ND	-	ND	-
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	0.15	-	ND	-	ND	-	ND	-	ND	-	ND
TETRYL	SW8330	mg/kg	0.237	ND	-	ND	-	ND	ND	ND	-	ND	-

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picograms per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation repo

Table A-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID		TNT-5C-1	TNT-5C-1.5	TNT-5C-2	TNT-5D-.5	TNT-5D-1	TNT-5D-1.5	TNT-5D-2	TNT-5E-.5	TNT-5E-1	TNT-5E-1.5	TNT-5E-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**											
ALUMINUM	SW6010B	mg/kg	18000	-	20000	-	20000	-	22000	-	19000	-	18000
ANTIMONY	SW6010B	mg/kg	ND	-	ND	-	0.82	-	ND	-	ND	-	ND
ARSENIC	SW6010B	mg/kg	15	-	12	-	15	-	14	-	12	-	14
BARIUM	SW6010B	mg/kg	250	-	250	-	240	-	260	-	190	-	220
BERYLLIUM	SW6010B	mg/kg	0.49	-	0.5	-	0.59	-	0.59	-	0.55	-	1
CADMIUM	SW6010B	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
CALCIUM	SW6010B	mg/kg	3800	-	4000	-	3000	-	3200	-	2600	-	2800
CHROMIUM, TOTAL	SW6010B	mg/kg	47	-	48	-	59	-	58	-	50	-	54
COBALT	SW6010B	mg/kg	20	-	20	-	24	-	25	-	20	-	22
COPPER	SW6010B	mg/kg	53	-	55	-	62	-	60	-	55	-	56
IRON	SW6010B	mg/kg	43000	-	41000	-	45000	-	45000	-	38000	-	40000
LEAD	SW6010B	mg/kg	9.5	-	9.7	-	12	-	12	-	11	-	13
MAGNESIUM	SW6010B	mg/kg	5300	-	5600	-	4900	-	5000	-	4200	-	4400
MANGANESE	SW6010B	mg/kg	1400	-	1400	-	1500	-	1800	-	1200	-	1500
MERCURY	SW7471A	mg/kg	0.014	-	ND	-	0.018	-	0.015	-	0.033	-	0.023
MOLYBDENUM	SW6010B	mg/kg	0.86	-	0.94	-	0.99	-	0.68	-	0.77	-	1.1
NICKEL	SW6010B	mg/kg	50	-	52	-	64	-	67	-	45	-	61
POTASSIUM	SW6010B	mg/kg	2300	-	2500	-	2400	-	2500	-	1900	-	2200
SELENIUM	SW6010B	mg/kg	0.74	-	0.99	-	1.2	-	0.94	-	0.64	-	1.3
SILVER	SW6010B	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	0.54
SODIUM	SW6010B	mg/kg	140	-	190	-	240	-	350	-	150	-	230
THALLIUM	SW6010B	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
VANADIUM	SW6010B	mg/kg	85	-	84	-	93	-	89	-	79	-	82
ZINC	SW6010B	mg/kg	69	-	68	-	72	-	73	-	60	-	67
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-

Table A-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID		TNT-5C-1	TNT-5C-1.5	TNT-5C-2	TNT-5D-.5	TNT-5D-1	TNT-5D-1.5	TNT-5D-2	TNT-5E-.5	TNT-5E-1	TNT-5E-1.5	TNT-5E-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	**Method**	**Units**											
OCTACHLORODIBENZOFURAN	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	-	-	-	-	-	-	-	-	-	-	-
ACENAPHTHENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
ACENAPHTHYLENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
ANTHRACENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(a)PYRENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
CHRYSENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
FLUORANTHENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
FLUORENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
NAPHTHALENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
PHENANTHRENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
PYRENE	SW8310	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	200	-	190	-	ND	-	0.59	-	ND	-	ND
1,3-DINITROBENZENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	3.1	-	460	-	1.7	-	750	-	1.6	-	0.69
2,4-DINITROTOLUENE	SW8330	mg/kg	2.5	-	1.7	-	ND	-	ND	-	ND	-	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.62	-	ND	-	2.7	-	5.4	-	2.1	-	0.46
2-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
3-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	ND	-	ND	-	2.6	-	3.6	-	2.6	-	0.57
4-NITROTOLUENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
NITROBENZENE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
NITROGLYCERIN	SW8330	mg/kg	-	0.6	-	ND	-	ND	-	ND	-	ND	-
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND
PENTAERYTHRITOL TETRANITRATE	SW8330	mg/kg	-	ND	-	ND	-	ND	-	ND	-	ND	-
TETRYL	SW8330	mg/kg	ND	-	ND	-	ND	-	ND	-	ND	-	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picogram per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation repo

Table A-8. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

TNT Strip #5	Field Sample ID		TNT-5C-1	TNT-5C-1.5	TNT-5C-2	TNT-5D-.5	TNT-5D-1	TNT-5D-1.5	TNT-5D-2	TNT-5E-.5	TNT-5E-1	TNT-5E-1.5	TNT-5E-2
	Sample Date		7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99	7/20/99
	Depth		1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Parameter	Method	Units											

Table A-9. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Howitzer Test Facility	Field Sample ID	SS-19	
	Sample Date	11/20/98	
Parameter	**Units**	**Result**	**MDL**
Metals			
Antimony	mg/kg	ND	6.00
Manganese	mg/kg	917	0.500
Potassium	mg/kg	2,040	500
Arsenic	mg/kg	17.0	10.0
Barium	mg/kg	238	0.400
Beryllium	mg/kg	0.804	0.100
Cadmium	mg/kg	ND	1.00
Chromium	mg/kg	43.1	1.00
Cobalt	mg/kg	16.4	0.700
Copper	mg/kg	48.5	1.00
Lead	mg/kg	16.0	7.50
Molybdenum	mg/kg	ND	2.00
Nickel	mg/kg	48.0	3.00
Selenium	mg/kg	ND	10.0
Silver	mg/kg	ND	0.700
Thallium	mg/kg	ND	10.0
Vanadium	mg/kg	71.6	1.00
Zinc	mg/kg	75.3	2.00
Nitrate as Nitrogen	mg/kg	1.24	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	1.24	1.00
Mercury	mg/kg	ND	0.040
Explosive Compounds			
PETN	mg/kg	ND	0.30
HMX	mg/kg	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30
Tetryl	mg/kg	ND	0.30
Nitrobenzene	mg/kg	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30
Phosphate	mg/kg	10.5	0.500

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-10. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Howitzer Test Facility	Field Sample ID			SP3-1B	SP3-2-B	SP3-3A	SP3-3-A	SP3-4-A
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**					
ALUMINUM	SW6010B	mg/kg	2.91	19,000	18,000	17,000	17,000	13,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	1.1	0.78	ND
ARSENIC	SW6010B	mg/kg	0.559	13	17	13	13	14
BARIUM	SW6010B	mg/kg	0.590	240	200	200	210	190
BERYLLIUM	SW6010B	mg/kg	0.130	0.44	0.34	0.34	0.33	ND
CADMIUM	SW6010B	mg/kg	0.057	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	9,300	8,500	8,200	7,100	6,300
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	43	45	43	41	41
COBALT	SW6010B	mg/kg	0.112	20	19	18	19	17
COPPER	SW6010B	mg/kg	0.445	63	59	61	61	48
IRON	SW6010B	mg/kg	1.82	42,000	47,000	38,000	39,000	36,000
LEAD	SW6010B	mg/kg	0.437	41	12	89	70	120
MAGNESIUM	SW6010B	mg/kg	7.00	8,000	6,700	7,400	7,700	6,000
MANGANESE	SW6010B	mg/kg	0.164	1,100	900	800	1,100	980
MERCURY	SW7471A	mg/kg	0.0069	0.088	0.068	0.1	0.13	0.1
MOLYBDENUM	SW6010B	mg/kg	0.142	0.44	0.71	0.52	0.44	0.44
NICKEL	SW6010B	mg/kg	0.591	56	47	50	58	53
POTASSIUM	SW6010B	mg/kg	9.91	1,500	1,100	1,800	1,600	1,200
SELENIUM	SW6010B	mg/kg	0.464	0.66	1.4	1.2	1	0.89
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	110	210	160	110	100
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	67	87	66	66	70
ZINC	SW6010B	mg/kg	0.622	93	84	82	89	70
ACENAPHTHENE	SW8270	mg/kg	0.0395	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8270	mg/kg	0.0395	ND	ND	ND	ND	ND
ANTHRACENE	SW8270	mg/kg	0.0277	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8270	mg/kg	0.0203	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8270	mg/kg	0.0229	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8270	mg/kg	0.0281	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8270	mg/kg	0.0269	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8270	mg/kg	0.0254	ND	ND	ND	ND	ND
CHRYSENE	SW8270	mg/kg	0.0225	0.077	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8270	mg/kg	0.0297	ND	ND	ND	ND	ND
FLUORANTHENE	SW8270	mg/kg	0.0229	ND	ND	ND	ND	ND
FLUORENE	SW8270	mg/kg	0.0463	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8270	mg/kg	0.0296	ND	ND	ND	ND	ND
NAPHTHALENE	SW8270	mg/kg	0.0480	ND	ND	ND	ND	ND
PHENANTHRENE	SW8270	mg/kg	0.0302	ND	ND	ND	ND	ND
PYRENE	SW8270	mg/kg	0.0197	0.033	ND	ND	ND	ND
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND

Table A-10. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Howitzer Test Facility	Field Sample ID			SP3-1B	SP3-2-B	SP3-3A	SP3-3-A	SP3-4-A
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**					
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Ea
Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-11. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID / Sample Date		FSS-32 / 12/02/98	
Parameter		**Units**	**Result**	**MDL**
Metals				
Antimony		mg/kg	-	-
Manganese		mg/kg	-	-
Potassium		mg/kg	-	-
Arsenic		mg/kg	-	-
Barium		mg/kg	-	-
Beryllium		mg/kg	-	-
Cadmium		mg/kg	-	-
Chromium		mg/kg	-	-
Cobalt		mg/kg	-	-
Copper		mg/kg	-	-
Lead		mg/kg	-	-
Molybdenum		mg/kg	-	-
Nickel		mg/kg	-	-
Selenium		mg/kg	-	-
Silver		mg/kg	-	-
Thallium		mg/kg	-	-
Vanadium		mg/kg	-	-
Zinc		mg/kg	-	-
Nitrate as Nitrogen		mg/kg	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-
Mercury		mg/kg	-	-
Explosive Compounds				
PETN		mg/kg	-	-
HMX		mg/kg	-	-
Cyclonite (RDX)		mg/kg	-	-
1,3,5-Trinitrobenzene		mg/kg	-	-
1,3-Dinitrobenzene		mg/kg	-	-
Tetryl		mg/kg	-	-
Nitrobenzene		mg/kg	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-
2,4-Dinitrotoluene		mg/kg	-	-
2,6-Dinitrotoluene		mg/kg	-	-
4-Nitrotoluene		mg/kg	-	-
3-Nitrotoluene		mg/kg	-	-
2-Nitrotoluene		mg/kg	-	-
Phosphate		mg/kg	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Envirogen Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-12. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID			SP1A1	SP1B1	SP2A1	SP2B1	SP3-1B	SP3-2-B
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	Method	Units	MDL						
ALUMINUM	SW6010B	mg/kg	2.91	19,000	19,000	18,000	16,000	19,000	18,000
ANTIMONY	SW6010B	mg/kg	0.502	0.75	ND	0.57	ND	ND	ND
ARSENIC	SW6010B	mg/kg	0.559	16	14	13	13	13	17
BARIUM	SW6010B	mg/kg	0.590	210	180	230	220	240	200
BERYLLIUM	SW6010B	mg/kg	0.130	0.33	0.33	0.45	0.33	0.44	0.34
CADMIUM	SW6010B	mg/kg	0.057	ND	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	8,800	5,000	11,000	10,000	9,300	8,500
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	47	46	41	45	43	45
COBALT	SW6010B	mg/kg	0.112	19	18	19	20	20	19
COPPER	SW6010B	mg/kg	0.445	58	52	56	57	63	59
IRON	SW6010B	mg/kg	1.82	44,000	42,000	39,000	38,000	42,000	47,000
LEAD	SW6010B	mg/kg	0.437	17	19	13	82	41	12
MAGNESIUM	SW6010B	mg/kg	7.00	7,200	6,000	7,300	6,900	8,000	6,700
MANGANESE	SW6010B	mg/kg	0.164	1,100	820	950	990	1,100	900
MERCURY	SW7471A	mg/kg	0.0099	0.055	0.045	0.067	0.067	0.088	0.068
MOLYBDENUM	SW6010B	mg/kg	0.142	0.65	0.6	0.5	0.69	0.44	0.71
NICKEL	SW6010B	mg/kg	0.591	50	46	50	49	56	47
POTASSIUM	SW6010B	mg/kg	9.91	1,600	1,600	1,800	1,400	1,500	1,100
SELENIUM	SW6010B	mg/kg	0.464	0.74	ND	0.73	ND	0.66	1.4
SILVER	SW6010B	mg/kg	0.099	ND	ND	0.11	0.12	ND	ND
SODIUM	SW6010B	mg/kg	23.96	180	140	160	140	110	210
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	81	84	65	64	67	87
ZINC	SW6010B	mg/kg	0.622	85	75	80	99	93	84
ACENAPHTHENE	SW8270	mg/kg	0.0395	-	ND	-	ND	ND	ND
ACENAPHTHYLENE	SW8270	mg/kg	0.0395	-	ND	-	ND	ND	ND
ANTHRACENE	SW8270	mg/kg	0.0277	-	ND	-	ND	ND	ND
BENZO(a)ANTHRACENE	SW8270	mg/kg	0.0203	-	ND	-	0.11	ND	ND
BENZO(a)PYRENE	SW8270	mg/kg	0.0229	-	ND	-	0.11	ND	ND
BENZO(b)FLUORANTHENE	SW8270	mg/kg	0.0281	-	ND	-	0.11	ND	ND
BENZO(g,h,i)PERYLENE	SW8270	mg/kg	0.0269	-	ND	-	0.044	ND	ND
BENZO(k)FLUORANTHENE	SW8270	mg/kg	0.0254	-	ND	-	0.11	ND	ND
CHRYSENE	SW8270	mg/kg	0.0225	-	ND	-	0.11	0.077	ND
DIBENZ(a,h)ANTHRACENE	SW8270	mg/kg	0.0297	-	ND	-	ND	ND	ND
FLUORANTHENE	SW8270	mg/kg	0.0229	-	ND	-	0.11	ND	ND
FLUORENE	SW8270	mg/kg	0.0463	-	ND	-	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8270	mg/kg	0.0296	-	ND	-	0.067	ND	ND
NAPHTHALENE	SW8270	mg/kg	0.0480	-	ND	-	ND	ND	ND
PHENANTHRENE	SW8270	mg/kg	0.0302	-	ND	-	ND	ND	ND
PYRENE	SW8270	mg/kg	0.0197	-	ND	-	0.11	0.033	ND
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND

Table A-12. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Former Ammunition Renovation Area/Primer Destruction Site	Field Sample ID			SP1A1	SP1B1	SP2A1	SP2B1	SP3-1B	SP3-2-B
	Sample Date			7/20/99	7/20/99	7/20/99	7/20/99	7/21/99	7/21/99
	Depth			0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Parameter	**Method**	**Units**	**MDL**						
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	0.0078	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	0.67	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-13. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

Flare Site	Field Sample ID		SS-22		SS-22*		SS-22***	
	Sample Date		11/20/98		11/20/98		12/01/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals								
Antimony		mg/kg	1,470	600	666	48	-	-
Manganese		mg/kg	395	50.0	236	12.0	-	-
Potassium		mg/kg	ND	50,000	-	-	-	-
Arsenic		mg/kg	ND	1,000	9.9**	1.0**	-	-
Barium		mg/kg	74,100	40.0	76,600	160.0	-	-
Beryllium		mg/kg	ND	10.0	ND	4.0	-	-
Cadmium		mg/kg	ND	100	ND	4	-	-
Chromium		mg/kg	185	100	87.5	8	-	-
Cobalt		mg/kg	80.2	70.0	-	-	-	-
Copper		mg/kg	24,200	100	21,200	20	-	-
Lead		mg/kg	46,600	750	42,200/32,000**	40/5,000**	-	-
Molybdenum		mg/kg	ND	200	-	-	-	-
Nickel		mg/kg	ND	300	50.3	32	-	-
Selenium		mg/kg	ND	1,000	ND**	2.5**	-	-
Silver		mg/kg	ND	70.0	ND	8.0	-	-
Thallium		mg/kg	ND	1,000	ND**	2.5**	-	-
Vanadium		mg/kg	ND	100	-	-	-	-
Zinc		mg/kg	4,560	200	3,870	16	-	-
Nitrate as Nitrogen		mg/kg	3.21	1.0	ND	0.25	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	4.56	1.0	1.3	0.25	-	-
Mercury		mg/kg	0.092	0.050	ND**	0.10**	-	-
Explosive Compounds								
PETN		mg/kg	ND	0.30	ND	0.50	-	-
HMX		mg/kg	ND	0.30	ND	0.25	-	-
Cyclonite (RDX)		mg/kg	ND	0.30	ND	0.25	-	-
1,3,5-Trinitrobenzene		mg/kg	ND	0.30	ND	0.25	-	-
1,3-Dinitrobenzene		mg/kg	ND	0.30	ND	0.25	-	-
Tetryl		mg/kg	ND	0.30	ND	0.25	-	-
Nitrobenzene		mg/kg	ND	0.30	ND	0.25	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	0.30	ND	0.25	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
2,4-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
2,6-Dinitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
4-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
3-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
2-Nitrotoluene		mg/kg	ND	0.30	ND	0.25	-	-
Phosphate		mg/kg	17.1	0.500	18.1	10.0	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Sample SS-22.

** Samples analyzed using EPA Method 7000 series.

***Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-13. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Flare Site	Field Sample ID		FSS-21		FSS-29	
	Sample Date		12/02/98		12/02/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals						
Antimony		mg/kg	-	-	-	-
Manganese		mg/kg	-	-	-	-
Potassium		mg/kg	-	-	-	-
Arsenic		mg/kg	-	-	-	-
Barium		mg/kg	-	-	-	-
Beryllium		mg/kg	-	-	-	-
Cadmium		mg/kg	-	-	-	-
Chromium		mg/kg	-	-	-	-
Cobalt		mg/kg	-	-	-	-
Copper		mg/kg	-	-	-	-
Lead		mg/kg	-	-	-	-
Molybdenum		mg/kg	-	-	-	-
Nickel		mg/kg	-	-	-	-
Selenium		mg/kg	-	-	-	-
Silver		mg/kg	-	-	-	-
Thallium		mg/kg	-	-	-	-
Vanadium		mg/kg	-	-	-	-
Zinc		mg/kg	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-
Mercury		mg/kg	-	-	-	-
Explosive Compounds						
PETN		mg/kg	-	-	-	-
HMX		mg/kg	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	2.6	1.0
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-
Tetryl		mg/kg	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-
Phosphate		mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Sample SS-02.

** Samples analyzed using EPA Method 7000 series.

***Sample analyzed using Enviro Soil Test System, Rapid Field Screen for TNT and RDX.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using Enviro Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-14. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Flare Site	Field Sample ID			FA1-.5	FA1-1	FA1-2	FA2-1	FA2-2	FA3-.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0
Parameter	**Method**	**Units**	**MDL**						
ALUMINUM	SW6010B	mg/kg	2.91	23,000	18,000	17,000	17,000	18,000	31,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	ND	2.3	2.2	150
ARSENIC	SW6010B	mg/kg	0.559	16	14	16	15	13	18
BARIUM	SW6010B	mg/kg	0.590	190	190	190	290	220	3,400
BERYLLIUM	SW6010B	mg/kg	0.130	0.45	0.44	0.46	0.47	0.44	0.22
CADMIUM	SW6010B	mg/kg	0.057	0.091	ND	ND	0.12	ND	1.6
CALCIUM	SW6010B	mg/kg	6.41	4,700	4,900	4,300	4,000	4,100	3,800
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	54	45	48	45	51	110
COBALT	SW6010B	mg/kg	0.112	20	20	21	20	18	20
COPPER	SW6010B	mg/kg	0.445	69	67	77	100	100	8100
IRON	SW6010B	mg/kg	1.82	47,000	43,000	48,000	48,000	43,000	66,000
LEAD	SW6010B	mg/kg	0.437	11	29	21	110	110	7600
MAGNESIUM	SW6010B	mg/kg	7.00	7,500	7,100	7,300	7,400	8,300	11,000
MANGANESE	SW6010B	mg/kg	0.164	820	900	460	830	610	1100
MERCURY	SW7471A	mg/kg	0.0099	0.26	0.22	0.41	0.59	0.26	0.25
MOLYBDENUM	SW6010B	mg/kg	0.142	0.66	0.66	0.58	0.7	0.56	4.5
NICKEL	SW6010B	mg/kg	0.591	53	52	56	52	57	98
POTASSIUM	SW6010B	mg/kg	9.91	1,400	1,400	1,500	1,500	1,200	2,100
SELENIUM	SW6010B	mg/kg	0.464	1.1	1.1	1.2	1	1.1	1.1
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	0.11	0.89
SODIUM	SW6010B	mg/kg	23.96	100	110	100	93	110	220
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	79	75	74	83	71	66
ZINC	SW6010B	mg/kg	0.622	91	100	100	270	240	2,000
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	-	-	-	34
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	36
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	3.4
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.51	-	-	-	-	-	2.7
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.29	-	-	-	-	-	37
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.35	-	-	-	-	-	6.3
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	13
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	SW8290	pg/g	0.34	-	-	-	-	-	9.1
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.34	-	-	-	-	-	0
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.25	-	-	-	-	-	4.2
1,2,3,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.25	-	-	-	-	-	13
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	-	-	-	20
2,3,4,7,8-PENTACHLORODIBENZOFURAN	SW8290	pg/g	0.35	-	-	-	-	-	26
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.30	-	-	-	-	-	1.5
2,3,7,8-TETRACHLORODIBENZOFURAN	SW8290	pg/g	0.12	-	-	-	-	-	19
HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.067	-	-	-	-	-	76
HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	57
HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	110
HEXACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	140
OCTACHLORODIBENZO-p-DIOXIN	SW8290	pg/g	0.99	-	-	-	-	-	69

Table A-14. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Flare Site	Field Sample ID			FA1-.5	FA1-1	FA1-2	FA2-1	FA2-2	FA3-.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	1.0 - 1.5	2.0 - 2.5	0.5 - 1.0
Parameter	**Method**	**Units**	**MDL**						
OCTACHLORODIBENZOFURAN	SW8290	pg/g	0.5	-	-	-	-	-	9.9
PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.49	-	-	-	-	-	83
PENTACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	310
TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	60
TETRACHLORINATED DIBENZOFURANS, (TOTAL)	SW8290	pg/g	0.0	-	-	-	-	-	490
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

- = not analyzed

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

pg/g = picograms per gram

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-15. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

Demolition Site #1	Field Sample ID	SS-24		FSS-24	
	Sample Date	11/20/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals					
Antimony	mg/kg	ND	6.00	-	-
Manganese	mg/kg	759	0.500	-	-
Potassium	mg/kg	1,770	500	-	-
Arsenic	mg/kg	14.7	10.0	-	-
Barium	mg/kg	173	0.400	-	-
Beryllium	mg/kg	0.778	0.100	-	-
Cadmium	mg/kg	ND	1.00	-	-
Chromium	mg/kg	46.4	1.00	-	-
Cobalt	mg/kg	14.6	0.700	-	-
Copper	mg/kg	48.9	1.00	-	-
Lead	mg/kg	12.7	7.50	-	-
Molybdenum	mg/kg	ND	2.00	-	-
Nickel	mg/kg	48.6	3.00	-	-
Selenium	mg/kg	ND	10.0	-	-
Silver	mg/kg	ND	0.700	-	-
Thallium	mg/kg	ND	10.0	-	-
Vanadium	mg/kg	63.0	1.00	-	-
Zinc	mg/kg	97.9	2.00	-	-
Nitrate as Nitrogen	mg/kg	9.16	1.00	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	9.16	1.00	-	-
Mercury	mg/kg	0.12	0.500	-	-
Explosive Compounds					
PETN	mg/kg	ND	0.30	-	-
HMX	mg/kg	ND	0.30	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	-	-
Tetryl	mg/kg	ND	0.30	-	-
Nitrobenzene	mg/kg	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-
4-Nitrotoluene	mg/kg	ND	0.30	-	-
3-Nitrotoluene	mg/kg	ND	0.30	-	-
2-Nitrotoluene	mg/kg	ND	0.30	-	-
Phosphate	mg/kg	360	5.00	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-15. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #1	Field Sample ID		FSS-25		FSS-26		FSS-27	
	Sample Date		12/02/98		12/02/98		12/02/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals								
Antimony		mg/kg	-	-	-	-	-	-
Manganese		mg/kg	-	-	-	-	-	-
Potassium		mg/kg	-	-	-	-	-	-
Arsenic		mg/kg	-	-	-	-	-	-
Barium		mg/kg	-	-	-	-	-	-
Beryllium		mg/kg	-	-	-	-	-	-
Cadmium		mg/kg	-	-	-	-	-	-
Chromium		mg/kg	-	-	-	-	-	-
Cobalt		mg/kg	-	-	-	-	-	-
Copper		mg/kg	-	-	-	-	-	-
Lead		mg/kg	-	-	-	-	-	-
Molybdenum		mg/kg	-	-	-	-	-	-
Nickel		mg/kg	-	-	-	-	-	-
Selenium		mg/kg	-	-	-	-	-	-
Silver		mg/kg	-	-	-	-	-	-
Thallium		mg/kg	-	-	-	-	-	-
Vanadium		mg/kg	-	-	-	-	-	-
Zinc		mg/kg	-	-	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-	-	-
Mercury		mg/kg	-	-	-	-	-	-
Explosive Compounds								
PETN		mg/kg	-	-	-	-	-	-
HMX		mg/kg	-	-	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	1.4	1.0	-	-
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-	-	-
Tetryl		mg/kg	-	-	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-	-	-
Phosphate		mg/kg	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-16. Benicia Tourteiot Analytical Results for Soil (Unvalidated Data)

Demolition Site #1	Field Sample ID			DA1-1-1	DA1-1-2	DA1-1-4	DA1-2 -.5	DA1-2-1	DA1-2-2	DA1-2-3.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	3.5 - 4.0
Parameter	**Method**	**Units**	**MDL**							
ALUMINUM	SW6010B	mg/kg	2.91	20,000	20,000	20,000	21,000	19,000	17,000	20,000
ANTIMONY	SW6010B	mg/kg	0.502	1.2	1.3	ND	ND	ND	2	0.66
ARSENIC	SW6010B	mg/kg	0.559	18	17	16	16	16	17	16
BARIUM	SW6010B	mg/kg	0.590	280	310	320	180	170	200	220
BERYLLIUM	SW6010B	mg/kg	0.130	0.46	0.47	0.49	0.34	0.33	0.34	0.46
CADMIUM	SW6010B	mg/kg	0.057	0.35	0.35	ND	0.22	0.21	0.45	ND
CALCIUM	SW6010B	mg/kg	6.41	4,500	4,300	4,300	3,700	3,800	3,800	4,100
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	51	50	52	55	51	51	52
COBALT	SW6010B	mg/kg	0.112	17	22	21	17	19	20	19
COPPER	SW6010B	mg/kg	0.445	99	85	69	59	59	88	75
IRON	SW6010B	mg/kg	1.82	48,000	43,000	47,000	46,000	42,000	46,000	45,000
LEAD	SW6010B	mg/kg	0.437	37	36	11	16	14	48	20
MAGNESIUM	SW6010B	mg/kg	7.00	7,500	7,000	7,900	7,900	8,000	7,200	7,400
MANGANESE	SW6010B	mg/kg	0.164	660	1,300	1,000	860	870	850	850
MERCURY	SW7471A	mg/kg	0.0099	0.12	0.081	0.049	0.067	0.078	0.18	0.046
MOLYBDENUM	SW6010B	mg/kg	0.142	0.86	0.62	0.64	0.67	0.85	0.96	0.84
NICKEL	SW6010B	mg/kg	0.591	52	57	58	54	56	55	58
POTASSIUM	SW6010B	mg/kg	9.91	2,400	2,800	1,700	1,600	1,700	1,900	2,300
SELENIUM	SW6010B	mg/kg	0.464	1.5	1.6	2	1	1.7	1.5	1.5
SILVER	SW6010B	mg/kg	0.099	ND	ND	ND	ND	0.13	0.21	ND
SODIUM	SW6010B	mg/kg	23.96	200	170	210	110	180	200	230
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	79	78	79	77	71	74	77
ZINC	SW6010B	mg/kg	0.622	120	130	91	86	90	110	92
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND	ND

Table A-16. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #1	Field Sample ID			DA1-1-1	DA1-1-2	DA1-1-4	DA1-2 -.5	DA1-2-1	DA1-2-2	DA1-2-3.5
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	3.5 - 4.0
Parameter	**Method**	**Units**	**MDL**							
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-17. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #2	Field Sample ID	SS-23		FSS-22		FSS-23		FSS-28	
	Sample Date	11/20/98		12/02/98		12/02/98		12/02/98	
Parameter	**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals									
Antimony	mg/kg	ND	6.00	-	-	-	-	-	-
Manganese	mg/kg	928	0.500	-	-	-	-	-	-
Potassium	mg/kg	2,260	500	-	-	-	-	-	-
Arsenic	mg/kg	16.8	10.0	-	-	-	-	-	-
Barium	mg/kg	206	0.400	-	-	-	-	-	-
Beryllium	mg/kg	0.821	0.100	-	-	-	-	-	-
Cadmium	mg/kg	ND	1.00	-	-	-	-	-	-
Chromium	mg/kg	50.4	1.00	-	-	-	-	-	-
Cobalt	mg/kg	20.6	0.700	-	-	-	-	-	-
Copper	mg/kg	55.1	1.00	-	-	-	-	-	-
Lead	mg/kg	25.8	7.50	-	-	-	-	-	-
Molybdenum	mg/kg	ND	2.00	-	-	-	-	-	-
Nickel	mg/kg	52.4	3.00	-	-	-	-	-	-
Selenium	mg/kg	ND	10.0	-	-	-	-	-	-
Silver	mg/kg	ND	0.700	-	-	-	-	-	-
Thallium	mg/kg	ND	10.0	-	-	-	-	-	-
Vanadium	mg/kg	71.1	1.00	-	-	-	-	-	-
Zinc	mg/kg	86.3	2.00	-	-	-	-	-	-
Nitrate as Nitrogen	mg/kg	11.6	1.00	-	-	-	-	-	-
Nitrate/Nitrite as Nitrogen	mg/kg	11.6	1.00	-	-	-	-	-	-
Mercury	mg/kg	0.21	0.050	-	-	-	-	-	-
Explosive Compounds									
PETN	mg/kg	ND	0.30	-	-	-	-	-	-
HMX	mg/kg	ND	0.30	-	-	-	-	-	-
Cyclonite (RDX)	mg/kg	ND	0.30	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
Tetryl	mg/kg	ND	0.30	-	-	-	-	-	-
Nitrobenzene	mg/kg	ND	0.30	-	-	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	1.0	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
4-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
3-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
2-Nitrotoluene	mg/kg	ND	0.30	-	-	-	-	-	-
Phosphate	mg/kg	307	2.50	-	-	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

Notes regarding FSS samples:

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-18. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #2	Field Sample ID			DA2-1-1	DA2-1-2	DA2-1-3.75	DA2-2-1	DA2-2-2	DA2-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	3.75 - 4.25	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**						
ALUMINUM	SW6010B	mg/kg	2.91	20,500	20,000	21,000	23,000	22,000	15,000
ANTIMONY	SW6010B	mg/kg	0.502	1.25	1	ND	ND	ND	0.78
ARSENIC	SW6010B	mg/kg	0.559	17	16	15	15.5	17	13
BARIUM	SW6010B	mg/kg	0.590	235	230	200	225	190	170
BERYLLIUM	SW6010B	mg/kg	0.130	0.53	0.48	0.49	0.525	0.46	0.35
CADMIUM	SW6010B	mg/kg	0.057	0.235	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	4,200	3,900	4,100	4,350	4,400	21,000
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	53	48	49	56	52	41
COBALT	SW6010B	mg/kg	0.112	23	20	20	19.5	18	16
COPPER	SW6010B	mg/kg	0.445	65.5	62	60	64	64	51
IRON	SW6010B	mg/kg	1.82	43,500	43,000	46,000	47,500	44,000	36,000
LEAD	SW6010B	mg/kg	0.437	23	11	11	14.5	31	14
MAGNESIUM	SW6010B	mg/kg	7.00	7,400	7,400	7,400	7,450	6,800	8,400
MANGANESE	SW6010B	mg/kg	0.164	1,250	1,100	1,000	855	830	840
MERCURY	SW7471A	mg/kg	0.0099	0.0845	0.036	0.037	0.064	0.1	0.069
MOLYBDENUM	SW6010B	mg/kg	0.142	0.74	0.8	0.82	0.81	0.68	0.58
NICKEL	SW6010B	mg/kg	0.591	62	54	52	57	54	49
POTASSIUM	SW6010B	mg/kg	9.91	2,500	2,900	1,900	2,000	2,400	1,500
SELENIUM	SW6010B	mg/kg	0.464	1.55	1.3	0.99	1.2	2.3	0.74
SILVER	SW6010B	mg/kg	0.089	ND	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	175	170	120	230	230	230
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	77	78	79	86.5	81	60
ZINC	SW6010B	mg/kg	0.622	91	84	80	103.5	91	71
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND

Table A-18. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #2	Field Sample ID			DA2-1-1	DA2-1-2	DA2-1-3.75	DA2-2-1	DA2-2-2	DA2-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	3.75 - 4.25	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**						
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID	SS-25		SS-25*		SS-26	
	Sample Date	11/20/98		11/20/98		11/20/98	
Parameter	Units	Result	MDL	Result	MDL	Result	MDL
Metals							
Antimony	mg/kg	ND	6.00	-	-	ND	6.00
Manganese	mg/kg	589	0.500	-	-	735	0.500
Potassium	mg/kg	1,040	500	-	-	1,250	500
Arsenic	mg/kg	13.4	10.0	-	-	19.1	10.0
Barium	mg/kg	158	0.400	-	-	183	0.400
Beryllium	mg/kg	0.547	0.100	-	-	0.637	0.100
Cadmium	mg/kg	ND	1.00	-	-	ND	1.00
Chromium	mg/kg	26.4	1.00	-	-	38.1	1.00
Cobalt	mg/kg	13.7	0.700	-	-	13.8	0.700
Copper	mg/kg	44.8	1.00	-	-	49.9	1.00
Lead	mg/kg	24.9	7.50	-	-	12.9	7.50
Molybdenum	mg/kg	ND	2.00	-	-	ND	2.00
Nickel	mg/kg	24.6	3.00	-	-	34.0	3.00
Selenium	mg/kg	ND	10.0	-	-	ND	10.0
Silver	mg/kg	ND	0.700	-	-	ND	0.700
Thallium	mg/kg	ND	10.0	-	-	ND	10.0
Vanadium	mg/kg	67.6	1.00	-	-	76.2	1.00
Zinc	mg/kg	90.0	2.00	-	-	72.7	2.00
Nitrate as Nitrogen	mg/kg	3.00	1.00	-	-	ND	1.00
Nitrate/Nitrite as Nitrogen	mg/kg	3.75	1.00	-	-	ND	1.00
Mercury	mg/kg	0.90	0.050	-	-	0.39	0.043
Explosive Compounds							
PETN	mg/kg	ND	0.30	-	-	ND	0.30
HMX	mg/kg	ND	0.30	ND	0.25	ND	0.30
Cyclonite (RDX)	mg/kg	ND	0.30	ND	0.25	ND	0.30
1,3,5-Trinitrobenzene	mg/kg	ND	0.30	ND	0.25	ND	0.30
1,3-Dinitrobenzene	mg/kg	ND	0.30	ND	0.25	ND	0.30
Tetryl	mg/kg	ND	0.30	ND	0.25	ND	0.30
Nitrobenzene	mg/kg	ND	0.30	ND	0.25	ND	0.30
2,4,6-Trinitrotoluene (TNT)	mg/kg	ND	0.30	ND	0.25	ND	0.30
4-Amino-2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
2-Amino-4,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
2,4-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
2,6-Dinitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
4-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
3-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
2-Nitrotoluene	mg/kg	ND	0.30	ND	0.25	ND	0.30
Phosphate	mg/kg	255	5.00	-	-	214	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 6 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-25 and SS-26.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID		SS-26**		SS-27		SS-27**		SS-28	
	Sample Date		12/01/98		11/20/98		12/01/98		11/20/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals										
Antimony		mg/kg	-	-	ND	6.00	-	-	ND	6.00
Manganese		mg/kg	-	-	614	0.500	-	-	448	0.500
Potassium		mg/kg	-	-	1,420	500	-	-	881	500
Arsenic		mg/kg	-	-	16.3	10.0	-	-	16.7	10.0
Barium		mg/kg	-	-	197	0.400	-	-	182	0.400
Beryllium		mg/kg	-	-	0.650	0.100	-	-	0.599	0.100
Cadmium		mg/kg	-	-	ND	1.00	-	-	ND	1.00
Chromium		mg/kg	-	-	28.4	1.00	-	-	27.8	1.00
Cobalt		mg/kg	-	-	23.1	0.700	-	-	13.5	0.700
Copper		mg/kg	-	-	59.1	1.00	-	-	44.6	1.00
Lead		mg/kg	-	-	27.4	7.50	-	-	12.7	7.50
Molybdenum		mg/kg	-	-	ND	2.00	-	-	ND	2.00
Nickel		mg/kg	-	-	31.8	3.00	-	-	27.0	3.00
Selenium		mg/kg	-	-	ND	10.0	-	-	ND	10.0
Silver		mg/kg	-	-	ND	0.700	-	-	ND	0.700
Thallium		mg/kg	-	-	ND	10.0	-	-	ND	10.0
Vanadium		mg/kg	-	-	78.6	1.00	-	-	77.2	1.00
Zinc		mg/kg	-	-	74.8	2.00	-	-	64.5	2.00
Nitrate as Nitrogen		mg/kg	-	-	4.13	1.00	-	-	ND	1.00
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	4.13	1.00	-	-	ND	1.00
Mercury		mg/kg	-	-	0.861	0.200	-	-	0.455	0.050
Explosive Compounds										
PETN		mg/kg	-	-	ND	0.30	-	-	ND	0.30
HMX		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Cyclonite (RDX)		mg/kg	-	-	ND	0.30	-	-	ND	0.30
1,3,5-Trinitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
1,3-Dinitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Tetryl		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Nitrobenzene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	0.30	ND	1.0	ND	0.30
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,4-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2,6-Dinitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
4-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
3-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
2-Nitrotoluene		mg/kg	-	-	ND	0.30	-	-	ND	0.30
Phosphate		mg/kg	-	-	44.1	0.500	-	-	149	2.50

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-26 and SS-28.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-19. Benicia Tourteiot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID		SS-28*		SS-28**		SS-29		SS-29**	
	Sample Date		11/20/98		12/01/98		11/20/99		12/01/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**	**Result**	**MDL**
Metals										
Antimony		mg/kg	-	-	-	-	ND	6.00	-	-
Manganese		mg/kg	-	-	-	-	662	0.500	-	-
Potassium		mg/kg	-	-	-	-	1,560	500	-	-
Arsenic		mg/kg	-	-	-	-	17.2	10.0	-	-
Barium		mg/kg	-	-	-	-	190	0.400	-	-
Beryllium		mg/kg	-	-	-	-	0.650	0.100	-	-
Cadmium		mg/kg	-	-	-	-	ND	1.00	-	-
Chromium		mg/kg	-	-	-	-	32.1	1.00	-	-
Cobalt		mg/kg	-	-	-	-	14.7	0.700	-	-
Copper		mg/kg	-	-	-	-	53.3	1.00	-	-
Lead		mg/kg	-	-	-	-	28.6	7.50	-	-
Molybdenum		mg/kg	-	-	-	-	ND	2.00	-	-
Nickel		mg/kg	-	-	-	-	30.5	3.00	-	-
Selenium		mg/kg	-	-	-	-	ND	10.0	-	-
Silver		mg/kg	-	-	-	-	ND	0.700	-	-
Thallium		mg/kg	-	-	-	-	ND	10.0	-	-
Vanadium		mg/kg	-	-	-	-	73.1	1.00	-	-
Zinc		mg/kg	-	-	-	-	80.1	2.00	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-	4.50	1.00	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-	4.50	1.00	-	-
Mercury		mg/kg	-	-	-	-	2.17	0.200	-	-
Explosive Compounds										
PETN		mg/kg	-	-	-	-	ND	0.30	-	-
HMX		mg/kg	ND	0.25	-	-	ND	0.30	-	-
Cyclonite (RDX)		mg/kg	ND	0.25	-	-	ND	0.30	-	-
1,3,5-Trinitrobenzene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
1,3-Dinitrobenzene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
Tetryl		mg/kg	ND	0.25	-	-	ND	0.30	-	-
Nitrobenzene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	0.25	ND	1.0	ND	0.30	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,4-Dinitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
2,6-Dinitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
4-Nitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
3-Nitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
2-Nitrotoluene		mg/kg	ND	0.25	-	-	ND	0.30	-	-
Phosphate		mg/kg	-	-	-	-	233	2.50	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-28 and SS-29.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-19. Benicia Tourtelot Analytical Results of Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID		FSS-3		FSS-11	
	Sample Date		12/02/98		12/02/98	
Parameter		**Units**	**Result**	**MDL**	**Result**	**MDL**
Metals						
Antimony		mg/kg	-	-	-	-
Manganese		mg/kg	-	-	-	-
Potassium		mg/kg	-	-	-	-
Arsenic		mg/kg	-	-	-	-
Barium		mg/kg	-	-	-	-
Beryllium		mg/kg	-	-	-	-
Cadmium		mg/kg	-	-	-	-
Chromium		mg/kg	-	-	-	-
Cobalt		mg/kg	-	-	-	-
Copper		mg/kg	-	-	-	-
Lead		mg/kg	-	-	-	-
Molybdenum		mg/kg	-	-	-	-
Nickel		mg/kg	-	-	-	-
Selenium		mg/kg	-	-	-	-
Silver		mg/kg	-	-	-	-
Thallium		mg/kg	-	-	-	-
Vanadium		mg/kg	-	-	-	-
Zinc		mg/kg	-	-	-	-
Nitrate as Nitrogen		mg/kg	-	-	-	-
Nitrate/Nitrite as Nitrogen		mg/kg	-	-	-	-
Mercury		mg/kg	-	-	-	-
Explosive Compounds						
PETN		mg/kg	-	-	-	-
HMX		mg/kg	-	-	-	-
Cyclonite (RDX)		mg/kg	-	-	-	-
1,3,5-Trinitrobenzene		mg/kg	-	-	-	-
1,3-Dinitrobenzene		mg/kg	-	-	-	-
Tetryl		mg/kg	-	-	-	-
Nitrobenzene		mg/kg	-	-	-	-
2,4,6-Trinitrotoluene (TNT)		mg/kg	ND	1.0	ND	1.0
4-Amino-2,6-Dinitrotoluene		mg/kg	-	-	-	-
2-Amino-4,6-Dinitrotoluene		mg/kg	-	-	-	-
2,4-Dinitrotoluene		mg/kg	-	-	-	-
2,6-Dinitrotoluene		mg/kg	-	-	-	-
4-Nitrotoluene		mg/kg	-	-	-	-
3-Nitrotoluene		mg/kg	-	-	-	-
2-Nitrotoluene		mg/kg	-	-	-	-
Phosphate		mg/kg	-	-	-	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/kg = milligrams per kilogram

MDL = Method Detection Limit

ND = not detected above the method reporting limit

Notes regarding SS samples:

SS = soil sample

Samples collected from depths ranging from 2 to 5 inches below the ground surface.

Metals were analyzed for using EPA Method 6000 series.

Explosive compounds were analyzed for using EPA Method 8330.

*Second analysis of Samples SS-25 and SS-26.

**Sample analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

FSS = field screening soil sample

Soil samples not air dried

FSS analyzed using EnSys Soil Test System, Rapid Field Screen for TNT and RDX.

Source: SECOR International, Inc.

Table A-20. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID			DA3-1-1	DA3-1-2	DA3-1-4	DA3-2-.5	DA3-2-1	DA3-2-2	DA3-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	Method	Units	MDL							
ALUMINUM	SW6010B	mg/kg	2.91	13,000	13,000	16,000	14,000	15,000	15,000	18,000
ANTIMONY	SW6010B	mg/kg	0.502	ND	ND	ND	ND	ND	ND	ND
ARSENIC	SW6010B	mg/kg	0.559	13	14	11	15	14	14	14
BARIUM	SW6010B	mg/kg	0.590	180	180	130	250	240	230	250
BERYLLIUM	SW6010B	mg/kg	0.130	0.17	0.16	ND	0.33	0.33	0.22	ND
CADMIUM	SW6010B	mg/kg	0.057	ND	0.12	ND	ND	ND	ND	ND
CALCIUM	SW6010B	mg/kg	6.41	2,400	2,900	2,400	2,600	2,700	3,000	3,100
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	31	34	29	41	41	40	40
COBALT	SW6010B	mg/kg	0.112	18	18	24	18	17	17	15
COPPER	SW6010B	mg/kg	0.445	42	64	37	41	39	50	30
IRON	SW6010B	mg/kg	1.82	40,000	42,000	43,000	45,000	41,000	42,000	48,000
LEAD	SW6010B	mg/kg	0.437	6.7	16	3.2	7.5	7.5	17	4.7
MAGNESIUM	SW6010B	mg/kg	7.00	3,600	4,100	5,700	3,400	3,500	4,400	6,100
MANGANESE	SW6010B	mg/kg	0.164	660	680	190	1,100	1,100	920	350
MERCURY	SW7471A	mg/kg	0.0099	1.8	2.1	0.02	0.044	0.076	0.65	0.046
MOLYBDENUM	SW6010B	mg/kg	0.142	0.37	0.7	0.32	0.44	0.44	0.43	0.34
NICKEL	SW6010B	mg/kg	0.591	23	28	22	33	33	35	31
POTASSIUM	SW6010B	mg/kg	9.91	1,300	1,300	450	1,500	1,400	1,300	800
SELENIUM	SW6010B	mg/kg	0.464	1.3	1.2	0.95	1.1	1.1	1.1	1.1
SILVER	SW6010B	mg/kg	0.099	ND	0.18	ND	ND	ND	ND	ND
SODIUM	SW6010B	mg/kg	23.96	83	71	140	55	44	86	110
THALLIUM	SW6010B	mg/kg	0.741	ND	ND	ND	ND	ND	ND	ND
VANADIUM	SW6010B	mg/kg	0.156	92	89	91	97	97	92	110
ZINC	SW6010B	mg/kg	0.622	55	74	66	55	58	75	66
ACENAPHTHENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
FLUORENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND
PYRENE	SW8310	mg/kg	0.004	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND	ND	ND	ND	ND	ND	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND	ND	ND	ND	ND	ND	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND	ND	ND	ND	ND	ND	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND	ND	ND	ND	ND	ND	ND

Table A-20. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Demolition Site #3	Field Sample ID			DA3-1-1	DA3-1-2	DA3-1-4	DA3-2-.5	DA3-2-1	DA3-2-2	DA3-2-4
	Sample Date			7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99	7/21/99
	Depth			1.0 - 1.5	2.0 - 2.5	4.0 - 4.5	0.5 - 1.0	1.0 - 1.5	2.0 - 2.5	4.0 - 4.5
Parameter	**Method**	**Units**	**MDL**							
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND	ND	ND	ND	ND	ND	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND	ND	ND	ND	ND	ND	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND	ND	ND	ND	ND	ND	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND	ND	ND	ND	ND	ND	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND	ND	ND	ND	ND	ND	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND	ND	ND	ND	ND	ND	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND	ND	ND	ND	ND	ND	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.129	ND	ND	ND	ND	ND	ND	ND
TETRYL	SW8330	mg/kg	0.237	ND	ND	ND	ND	ND	ND	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

Table A-21. Benicia Tourtelot Analytical Results for Water (Unvalidated Data)

Wetlands (Water Samples)	Field Sample ID / Sample Date		WS-1 12/04/98	WS-1 12/10/98	WS-2 12/04/98	WS-2 12/10/98
Parameter	**Units**	**MDL**				
Metals						
Antimony	mg/L	60.0	ND	ND	ND	ND
Manganese	mg/L	5.00	377	25.9	22.6	ND
Potassium	mg/L	5000	ND	ND	ND	ND
Arsenic	mg/L	100	ND	ND	ND	ND
Barium	mg/L	4.00	82.3	56.1	12.3	9.24
Beryllium	mg/L	1.00	ND	ND	ND	ND
Cadmium	mg/L	10.0	ND	ND	ND	ND
Chromium	mg/L	10.0	ND	ND	ND	ND
Cobalt	mg/L	7.00	ND	ND	ND	ND
Copper	mg/L	10.0	17.8	ND	11.8	ND
Lead	mg/L	75.0	ND	ND	ND	ND
Molybdenum	mg/L	20.0	ND	ND	ND	ND
Nickel	mg/L	30.0	ND	ND	ND	ND
Selenium	mg/L	100	ND	ND	ND	ND
Silver	mg/L	7.00	ND	ND	ND	ND
Thallium	mg/L	100	ND	ND	ND	ND
Vanadium	mg/L	10.0	11.1	ND	ND	ND
Zinc	mg/L	20.0	33.6	28.9	61.5	26.0
Nitrate as Nitrogen	mg/L	100	ND	-	338	-
Nitrate/Nitrite as Nitrogen	mg/L	100	ND	-	338	-
Mercury	mg/L	0.20	ND	ND	ND	ND
Explosive Compounds						
PETN	mg/L	1.50	ND	-	ND	-
HMX	mg/L	1.50	ND	-	ND	-
Cyclonite (RDX)	mg/L	1.50	ND	-	ND	-
1,3,5-Trinitrobenzene	mg/L	1.50	ND	-	ND	-
1,3-Dinitrobenzene	mg/L	1.50	ND	-	ND	-
Tetryl	mg/L	1.50	ND	-	ND	-
Nitrobenzene	mg/L	1.50	ND	-	ND	-
2,4,6-Trinitrotoluene (TNT)	mg/L	1.50	ND	-	ND	-
4-Amino-2,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2-Amino-4,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2,4-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
2,6-Dinitrotoluene	mg/L	1.50	ND	-	ND	-
4-Nitrotoluene	mg/L	1.50	ND	-	ND	-
3-Nitrotoluene	mg/L	1.50	ND	-	ND	-
2-Nitrotoluene	mg/L	1.50	ND	-	ND	-
Phosphate	mg/L	50.0	85.3	-	95.4	-

Notes:

This data was collected by SECOR International, Inc. and has not been verified or validated by Earth Tech.

- = not analyzed

mg/L = micrograms per liter

ND = not detected above the method reporting limit

MDL = Method Detection Limit

Metals were analyzed for using EPA Method 6000/7000 Series.

Nitrate/Nitrite were analyzed for using EPA Method 353.2.

Total Phosphate was analyzed for using EPA Method 365.2.

Explosive compounds were analyzed for using EPA Method 8330.

Source: SECOR International, Inc.

Table A-22. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Wetlands (Sediment Sample)	Field Sample ID			WET-1B
	Sample Date			7/21/99
	Depth			0 - 0.5
Parameter	**Method**	**Units**	**MDL**	
ALUMINUM	SW6010B	mg/kg	2.91	18,000
ANTIMONY	SW6010B	mg/kg	0.502	ND
ARSENIC	SW6010B	mg/kg	0.559	15
BARIUM	SW6010B	mg/kg	0.590	250
BERYLLIUM	SW6010B	mg/kg	0.130	0.35
CADMIUM	SW6010B	mg/kg	0.057	0.35
CALCIUM	SW6010B	mg/kg	6.41	4,700
CHROMIUM, TOTAL	SW6010B	mg/kg	0.162	45
COBALT	SW6010B	mg/kg	0.112	18
COPPER	SW6010B	mg/kg	0.445	120
IRON	SW6010B	mg/kg	1.82	44,000
LEAD	SW6010B	mg/kg	0.437	35
MAGNESIUM	SW6010B	mg/kg	7.00	6,200
MANGANESE	SW6010B	mg/kg	0.164	810
MERCURY	SW7471A	mg/kg	0.0099	1.3
MOLYBDENUM	SW6010B	mg/kg	0.142	0.69
NICKEL	SW6010B	mg/kg	0.591	45
POTASSIUM	SW6010B	mg/kg	9.91	2,100
SELENIUM	SW6010B	mg/kg	0.464	1
SILVER	SW6010B	mg/kg	0.099	ND
SODIUM	SW6010B	mg/kg	23.96	120
THALLIUM	SW6010B	mg/kg	0.741	ND
VANADIUM	SW6010B	mg/kg	0.156	85
ZINC	SW6010B	mg/kg	0.622	160
ACENAPHTHENE	SW8310	mg/kg	0.01	ND
ACENAPHTHYLENE	SW8310	mg/kg	0.01	ND
ANTHRACENE	SW8310	mg/kg	0.004	ND
BENZO(a)ANTHRACENE	SW8310	mg/kg	0.004	ND
BENZO(a)PYRENE	SW8310	mg/kg	0.005	ND
BENZO(b)FLUORANTHENE	SW8310	mg/kg	0.005	ND
BENZO(g,h,i)PERYLENE	SW8310	mg/kg	0.004	ND
BENZO(k)FLUORANTHENE	SW8310	mg/kg	0.003	ND
CHRYSENE	SW8310	mg/kg	0.003	ND
DIBENZ(a,h)ANTHRACENE	SW8310	mg/kg	0.002	ND
FLUORANTHENE	SW8310	mg/kg	0.005	ND
FLUORENE	SW8310	mg/kg	0.008	ND
INDENO(1,2,3-c,d)PYRENE	SW8310	mg/kg	0.003	ND
NAPHTHALENE	SW8310	mg/kg	0.008	ND
PHENANTHRENE	SW8310	mg/kg	0.005	ND
PYRENE	SW8310	mg/kg	0.004	ND
1,3,5-TRINITROBENZENE	SW8330	mg/kg	0.083	ND
1,3-DINITROBENZENE	SW8330	mg/kg	0.041	ND
2,4,6-TRINITROTOLUENE	SW8330	mg/kg	0.090	ND
2,4-DINITROTOLUENE	SW8330	mg/kg	0.064	ND

Table A-22. Benicia Tourtelot Analytical Results for Soil (Unvalidated Data)

Wetlands (Sediment Sample)	Field Sample ID			WET-1B
	Sample Date			7/21/99
	Depth			0 - 0.5
Parameter	**Method**	**Units**	**MDL**	
2,6-DINITROTOLUENE	SW8330	mg/kg	0.044	ND
2-AMINO-4,6-DINITROTOLUENE	SW8330	mg/kg	0.023	ND
2-NITROTOLUENE	SW8330	mg/kg	0.028	ND
3-NITROTOLUENE	SW8330	mg/kg	0.043	ND
4-AMINO-2,6-DINITROTOLUENE	SW8330	mg/kg	0.022	ND
4-NITROTOLUENE	SW8330	mg/kg	0.044	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.036	ND
NITROBENZENE	SW8330	mg/kg	0.029	ND
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE	SW8330	mg/kg	0.070	ND
TETRYL	SW8330	mg/kg	0.129	ND

Notes:

Sample results reported on a dry weight basis.

MDL = Method Detection Limit

mg/kg = milligrams per kilogram

ND= not detected above MDL

This data is preliminary, as received from the analytical laboratory, and has not been verified or validated by Earth Tech. This data will be validated and verified for presentation in the final remedial investigation report.

OE SAFETY AND HEALTH PROGRAM
OE AVOIDANCE
RI/FS TOURTELOT CLEANUP PROJECT
BENICIA, CALIFORNIA

1.0 General

Ordnance and explosives avoidance escort services will be provided in support of the non-OE field sampling activity to be performed on the Project Site. The fieldwork is expected to commence in Spring 2000.

All work will be conducted in accordance with the Site Specific Safety and Health Plan. All personnel engaged in the work are required to read and understand all pertinent sections of this document prior to commencing any work at the Project Site. Because the work may be in areas contaminated with ordnance explosives (OE), all activities shall be conducted in full compliance with CEHNC, USACE, DA, DOD and the DTSC requirements regarding personnel, equipment and procedures.

The work will be performed in substantial compliance with CERCLA (Section 104) and the National Contingency Plan (Sections 300.120(c) and 300.400(e)). The provisions of 29 CFR 1910.120 shall apply to all actions taken at this site. Additionally, the Occupational Safety and Health Administration (OSHA) requires all employers performing on-site activities to develop and maintain an ongoing written Safety and Health Program in compliance with OSHA Standard 29 CFR 1910.120(b) and 29 CFR 1926.65(b). The program, including updates, shall be made available upon request.

2.0 Specific Requirements

This task will comprise providing OE technicians/escorts to:

- Visually sweep the sampling areas before personnel and equipment enter
- Escort the vegetation removal activities
- Sweep the specific path to field sampling locations and the specific sampling location prior to the ground being broken.

The OE technician/escort will lead all activities and personnel in areas of the field not previously surface cleared. The OE escort will visually and mechanically (with the aid of a Schonstedt magnetometer) inspect the path to be traversed by personnel and equipment before allowing personnel or equipment access. All personnel and equipment are required to follow the path designated by the OE escort. At a minimum, the path will be twice the width of the widest vehicle. The boundaries of the approach path will be clearly marked with white pin flags to prevent personnel from straying into uncleared areas. The OE escort will survey the proposed sampling locations or other areas in which limited intrusive activities are planned with a hand-held magnetometer. If an anomaly is detected, the planned intrusive location will be moved a safe distance away (24-36 inches), and the procedure will be repeated until an anomaly-free area has been found.

The OE escort will provide down hole anomaly detection during all drilling and boring operations. If an anomaly is detected, the drilling location will be moved a minimum of 36 inches from the anomaly location. When no anomaly is detected, the drilling may begin. Drilling will be performed in 1-foot increments. After each foot of drilling, the drill will be withdrawn, and the OE escort will perform down-hole magnetometer testing. Provided no anomalies are detected, the drilling may continue for another foot and the process will be repeated. Once the drilling exceeds 4 feet, OE detection will be discontinued. It is expected that the weight of the soil overburden will provide sufficient protection from injury at a depth below 4 feet. In the event that any OE item is encountered during drilling, the following procedures will be observed.

If OE is encountered, it will be marked with a pin flag for disposal at a later date. The PM and FTL/SSO will be notified of the OE encountered and the location. The pin flag will be placed a safe distance from the OE item (24-36 inches). During field operations, where the Contractor does not have OE disposition capabilities on site, the PM and FTL/SSO will contact Travis AFB EOD. Travis AFB EOD personnel will

determine the appropriate disposition method and dispose of the OE item. During field operations where the Contractor has on-site OE disposition capabilities, the OE clearance crew will determine the appropriate disposition method and dispose of the OE item. All field sampling personnel and equipment will be kept clear of the OE items.

A detailed accounting of all OE found shall be maintained by the PM. OE locations shall be identified using pin flags and paint. Pin flags will be constructed of non-conductive plastic or fiberglass. Conductive metal pin flags are prohibited.

3.0 Data Tracking

The progress of field activities will be recorded in bound field notebooks and maps (one for each OE Supervisor onsite) detailing activities and providing an accounting of all OE found during avoidance activities.

4.0 Schedule

The work is planned to begin in Spring 2000 and complete within 15 work days.

5.0 Personnel Qualifications

The Earth Tech shall submit resume(s) for personnel that will be onsite to perform the fieldwork (with alternates, as necessary). All OE personnel will be graduates of the U.S. Navy EOD Course, Indian Head, Maryland.

6.0 Assumptions

- Two (2) escorts will provide OE avoidance for field teams each day. A Senior OE Supervisor will be responsible for all OE-related work activities.
- Because this will be an OE avoidance-only activity, OE personnel are not limited to a 40-hour work-week. All other safety requirements will be met.

7.0 Equipment Requirements

Earth Tech is responsible for providing instrumentation and equipment. Earth Tech will maintain all equipment in good working order and provide routine and preventative maintenance. The OE avoidance will be performed with the aid of a Schonstedt Magnetometer.

8.0 Applicable Codes

All work shall be in accordance with the requirements of regulatory agencies and all federal regulations, including but not limited to:

- United States Environmental Protection Agency
- United States Occupational Safety and Health Administration Regulation 29 CFR 1910.120, and 8CCR 5192
- United States Fish and Wildlife
- United States Department of Transportation
- Department of Toxic Substance Control

- State Division of Wildlife
- State Department of Health and Welfare.

9.0 Records

Accurate records of all work shall be maintained in a daily field logbook or on daily field activities. The information to be recorded in the field logbook shall be consistent with the work described above.

10.0 Health and Safety

All activities at the site shall be in compliance with this SSHP, as approved by the DTSC for this task. The anticipated health and safety requirements for this project entail only standard practices required for modified Level D protection (as described by OSHA Hazardous Waste Operation regulations). Prior to commencement of Work at the Project Site, all field personnel shall be required to attend a project health and safety meeting and shall be required to sign a statement that they have received, read, and are familiar with the project SSHP, and agree to follow procedures outlined in the plan. Following the initial health and safety meeting, the field personnel shall attend daily health and safety meetings prior to the start of work each day.

Note: Soil containing TNT in excess of 10% is considered to be OE in accordance with ER-1110-1-8153. Personnel should avoid contact with soils in excess of 10% TNT. Spark, flame, and heat producing items and activities are not permitted in areas these areas.

Note: The PM or FTL/SSO will inform all personnel prior to entering the Project Site of the potential health effects associated with the use of the medication "Viagra" on a site with explosive constituents. Health hazards due to dermal absorption of explosives while taking Viagra can cause severe illness and death. All personnel have the right to upgrade their PPE to protect themselves from the increased risk posed by their health condition in combination with exposure to the site contaminants.

Note: Soil containing TNT in excess of 10% cannot be shipped. Laboratory analysis of soil in excess of 10% must be performed on site or performed after remediation activities to eliminate or reduce TNT content

11.0 Controls

OSHA requirements pertaining to construction/excavation equipment, materials handling, appliances, wiring and other construction aids shall be observed. OSHA requirements shall govern where mandatory; otherwise, compliance will be with the most stringent applicable requirements.

EARTH TECH	PROCEDURE NO. HS203
	DATE December 5, 1995
STANDARD PROCEDURE	SUPERSEDES February 7, 1995
SUBJECT ACCIDENT REPORTING, INVESTIGATION, AND REVIEW	APPROVED Steven L. Scott

1.0 PURPOSE AND POLICY

1.1 Purpose

This procedure prescribes the requirements for incident reporting, investigation, and review. Key requirements include:

- All injuries, vehicle accidents, and significant near miss incidents must be reported and investigated promptly, to determine root cause and prescribe corrective action.
- OSHA-Recordable injuries and illnesses and chargeable vehicle accidents must be reviewed by the Accident Review Board. The Accident Review Board report is submitted and approved through the chain of management to the President.
- All incidents involving a fatality, multiple injuries, major injury, or major property damage shall be immediately reported to the Group President, Division Vice President, Corporate Environmental Health and Safety Director, and General Counsel.
- All Departments/Sections must submit *Supervisor's Report of Incident* to Environmental Health and Safety within 24 hours of the injury. (Reports of incidents where no injury occurred are not as time-critical.)

1.2 Policy

It is the policy of EARTH TECH that all accidents resulting in injury or property loss and significant near miss incidents be reported, investigated, and evaluated for the benefit of improving the management of the Company.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Director, Environmental Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Chargeable Vehicle Accident. Any at-fault vehicle accident meeting any one of the following criteria:

1. Any individual sustains an OSHA-recordable injury as a result of the accident
2. An individual other than an employee of EARTH TECH is a party in the accident
3. Property owned by a person or entity other than EARTH TECH is damaged
4. When only EARTH TECH employees, EARTH TECH owned or leased (not rented) vehicles, and EARTH TECH property is involved and damage exceeds $1000.00.

Company. EARTH TECH, Inc.

Department/Section/Location Manager. The business unit manager of the involved organization. Various parts of the Company are organized in different ways. Small offices sometimes have a section or department number that is the same as the location code. In these small offices, the department or section manager is also the location manager and is also known as the business unit manager. In other small offices, the office is viewed as the branch of a larger department or section. In these cases, the location manager is not the section or department manager. Some of the larger offices hold many sections and departments. The location manager may be a staff manager with no line management responsibility. Regardless of the organization, the intent in this procedure is the Department/Section/Location Manager is at a management level equal to or above the program manager or the project manager.

EHS. Environmental Health and Safety

EHS Professional. A person certified by the American Board of Industrial Hygiene or the Board of Certified Safety Professionals who works to prevent injury or illness.

EHS Staff. A person whose primary work assignment is to prevent injury or illness.

Lost Workday Injury. Cases which involve days away from work or days of restricted work activity or both. Days away from work are: the number of workdays (consecutive or not), excluding the date of injury, the employee would have worked, but could not because of occupational injury or illness; and/or the number of workdays (consecutive or not), excluding the date of injury, on which, because of injury or illness:

1. The employee was assigned to another job on a temporary basis
2. The employee worked at a permanent job less than full time
3. The employee worked at a permanently-assigned job, but could not perform all duties normally connected with it.

Major Injury/Illness. When an employee is hospitalized for more than observation, the injury or illness is considered major.

Major Property Damage. Major property damage has occurred when preliminary loss estimates exceed $5000.

Near Miss Incident. Any incident where no injury occurred, but where the potential for injury existed. A significant near miss incident is an incident in which tragedy is narrowly averted.

OSHA Recordable Injury. All work-related deaths and illnesses, and those work-related injuries which result in:

1. Loss of consciousness
2. Restriction of work or motion
3. Transfer to another job
4. Require medical treatment beyond first aid (see Attachment 6 in Section 8.0).

5.0 PROCEDURE

5.1 Accident/Injury/Near Miss Report.

All incidents involving a fatality, major injury or illness, or major property damage shall be reported to the Group President, Division Vice President, Corporate Environmental Health and Safety (EHS) Director, General Counsel and the Regional/Divisional EHS Manager as soon as possible, but not later than the close of business on the day of the incident. The Corporate EHS Office will notify the EARTH TECH Medical Director to arrange prompt follow-up with the treating physician regarding lost or restricted workday incidents,

5.1.1 Employee

Reports all injuries, illnesses, accidents, and near miss incidents having the potential for injury to his/her supervisor immediately.

5.1.2 Supervisor

- Arranges appropriate medical care via the EARTH TECH clinic, emergency room, 911, or on site first aid provider, as appropriate.
- Immediately notifies the responsible EHS Professional.
- Completes Form HS203-F1 *Supervisor's Report of Incident* (Attachment 2) as soon as possible, but no later than 24 hours after the incident, and forwards to Manager.
- If employees are injured, notifies the Regional Human Resources Representative to initiate the workers' compensation process.

- Immediately notifies General Counsel and Corporate EHS Director in the event of a fatality or multiple serious injuries.

- Any supervisor with first-hand knowledge of an accident or injury, but preferably the supervisor directly responsible for the involved employees, may accomplish the required reporting.

5.1.3 Manager

- The Department/Section or Program Manager reviews the *Supervisor's Report of Incident*, adds comments, concurrence, clarification, or recommendations to achieve correction, signs in the Manager's block and forwards the form to the Environmental Health and Safety Department within 24 hours of the accident.

- Ensures a copy of the *Supervisor's Report of Incident* for each incident is forwarded to Corporate EHS Director in a timely way so that the OSHA Form 200 *Log of Injuries and Illnesses* is current and accurate. OSHA considers violations of their recordkeeping regulations to be willful with penalties as high as $70,000 for each infraction.

5.1.4 Environmental Health and Safety Professional

- Ensures necessary information regarding the incident is recorded and reported.

- Reviews, evaluates, and comments on the *Supervisor's Report of Incident*.

5.1.5 Regional/Division EHS Manager

- Serves as EHS Professional when no other EHS Professional is assigned to the organization which sustained the incident.

- Expedites incident reporting by the Supervisor.

- Assists Manager to evaluate processes, procedures, and actions which led to the incident.

- Expedites timely reporting of the incident and coordinates notification to all appropriate levels of management.

5.1.6 Corporate EHS Director

- Classifies the incident and records on the *OSHA Form 200 Log of Injuries and Illnesses* or equivalent form. Attachment 6 includes Injury/Illness Classification Guidelines.

- In the case of a fatality or multiple serious injuries involving five (5) or more employees, confers with General Counsel and CEO, and notifies the OSHA District Office nearest the site of the occurrence on the same business day as the accident, if possible, but in no case longer than 24 hours after the accident.

- Notifies the EARTH TECH Medical Director to arrange prompt follow-up with the treating physician regarding lost or restricted workday incidents

5.2 **Accident/Injury Investigation.**
All injuries, illnesses, property damage accidents, and significant near miss incidents shall be investigated. The level of effort expended for the accident investigation is commensurate with the actual or potential seriousness of the injuries, illnesses, or property damage.

The investigation shall be started immediately after the occurrence and completed as soon as possible, generally within 3-5 days after the occurrence. A written report (optional sample form provided as Attachment 3) is submitted to the Department/Section Manager, with a copy to the Regional/Division EHS Manager and the Corporate EHS Department.

5.2.1 **Supervisor**

- Take control of investigation once immediate medical care for injured personnel has been accomplished.
- Obtain assistance from the operations/discipline manager, health and safety professional, and others as appropriate, to conduct investigation.
- Collect the facts about the accident, including a descriptive narrative of the conditions which led to the accident.
- Describe and document how the accident occurred. Include sketches, photos, and any relevant documentation.
- Obtain in addition to the above information, reports from external sources, such as police, insurance carriers, testing laboratories, etc. These reports should be obtained as soon as they become available and included in the investigation report.
- List witnesses and collect written statements when possible.
- Identify and discuss the causative factors.
- Identify the unsafe act or unsafe condition that existed at the time of the accident.
- Identify systematic and management deficiencies.
- List the corrective actions to be taken to prevent re-occurrence of this type of accident, the responsible person, and the date by which action is to be completed.

5.2.2 **Operations Manager.** Provides appropriate manpower to assist in the investigation.

5.2.3 **Discipline Manager.** Provides appropriate manpower to assist in the investigation.

5.2.4 **Regional/Division Environmental Health and Safety Manager.**

- Provides guidance to Supervisor to ensure proper conduct of investigation.
- Provides appropriate manpower to assist in the investigation.

5.3 **Accident Review Board.**

Management review of accidents is the key to prevention of future incidents, and is a key part of each managers responsibility to implement effective health and safety practice.

5.3.1 **When to Convene**

Each Department/Section/Location Manager who experiences an accident classified as an OSHA recordable, or a chargeable vehicle accident shall convene an accident review board. The actions of the Accident Review Board are more effective the sooner the Board convenes after an accident, providing the involved managers and discipline leaders are available. Convening the Board within 10 days of the incident is a good guideline when practical. The purpose of the board is to review the information gathered for each accident and take appropriate action to prevent recurrence of the accident. Identified action items shall be assigned to appropriate individuals with a schedule of completion. These action items will be tracked, with reports sent to the Group President and/or the Division Vice President as appropriate.

5.3.2 **Composition of Board**

The Accident Review Board shall be composed of the appropriate members of management and staff, depending on the seriousness of the accident and the management actions likely to be taken to prevent recurrence. Typical Accident Review Boards usually include the Department or Section or Location Manager, the operations or discipline manager and an EHS Staff. When appropriate, a representative of other internal sources of expertise may be requested to sit on the Board.

Accidents which result in actual or potential significant adverse action against the Company shall include a member of the Corporate staff to be included on the Accident Review Board. Accidents resulting in third party fatality, serious injury, or major property loss would be considered to have a significant adverse impact on the Company.

5.3.3 **Conduct of Review**

The Accident Review Board shall meet with the employee having the accident and his/her supervisor to conduct a detailed review of the accident. The

Accident Review Board examines the documents such as HS203-F1 *Supervisor's Report of Incident*, HS203-F2 *Accident/Injury Investigation*, OSHA Form 101, worker's compensation insurance reports, or police reports to determine the cause and to prevent future accidents. Additional information regarding the accident may be needed and should be added to the record. Note that it is not acceptable to discipline an employee for having an accident. However, when the investigation determines that the accident resulted from a violation of company policy on the employee's part, the employee should be subject to disciplinary action according to EARTH TECH's progressive discipline system.

5.3.4 Accident Review Board Report

The completed Accident Review Board Report Form (Attachment 6) shall be reviewed and signed by the following progression (as appropriate):

- Department/Section/Location Manager
- Regional/Division Environmental Health and Safety Manager
- Division Vice President
- Group President

The Group President will then forward the original to the President of EARTH TECH, with a copies to General Counsel and Corporate EHS Director. The Corporate EHS Director distributes a summary to all EHS Managers.

5.4 Monthly Loss Report.

5.4.1 Regional/Division Environmental Health and Safety Manager.

- Completes and distributes copies of Form HS203-F3 *Monthly Loss Report* (Attachment 5) to Corporate EHS, Group President/Division Vice President, and Department/Section Manager.
- Includes a copy of Form HS203-F1 *Supervisor's Report of Incident* for each incident with the *Monthly Loss Report*.

5.4.2 Regional Human Resources.

- Provides a copy of each workers' compensation claim to Corporate Environmental Health and Safety.
- Provides a copy of the quarterly loss report from the workers' compensation insurance carrier to Corporate Environmental Health and Safety.

5.4.3 Corporate Environmental Health and Safety.

- Provides a copy of the *OSHA Form 200 Log of Injuries and Illnesses* or equivalent form to each location each month.

- Provides copy of Form HS203-F1 *Supervisor's Report of Incident* to Human Resources

6.0 EXCEPTION PROVISIONS

None permitted.

7.0 CROSS REFERENCES

HS105 Record Keeping and Statistical Reports
HS603 Occupational Injury and Illness

8.0 FORMS AND CHECKLISTS

Attachment 1: Responsibility Matrix
Attachment 2: Form HS203-F1 *Supervisor's Report of Incident*
Attachment 3: Form HS203-F2 *Accident/Injury Investigation*
Attachment 4: Form HS203-F3 *Accident Review Board Report*
Attachment 5: Form HS203-F4 *Monthly Loss Report*
Attachment 6: Injury/Illness Classification Guidelines

RESPONSIBILITY MATRIX

Action	Procedure Section	Injured Employee	Employee's Supervisor	Manager	Project/ Location EHS Rep	Regional/ Division EHS Manager	Corporate EHS Director
Reports injury, illness, incident	5.1.1	X	X				
Arrange medical care	5.1.2		X				
File reports	5.1.3		X	X	X	X	
Investigates accident	5.2		X		X		
Notifies OSHA, Medical Director	5.1.5						X
Conducts Accident Review Board	5.3			X			
Submits Monthly Loss Report	5.4		X	X	X	X	
Provides notification to HR	5.4		X				X

Supervisor's Report of Incident

EARTH TECH

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

Injured's name		S.S.No.	Sex	Birthdate
Home address		City	State	Zip
Job Title	Section	Hire date	Hourly wage	Phone
Property Damaged				Value
Vehicle		☐ Chargeable ☐ Non-chargeable ☐ Not at Fault ☐ DOT		

Supervisor

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

Manager

Comments on incident and corrective action		
Manager Print name	Signature	Date

Environmental Health and Safety

Concur with action taken? ☐Yes ☐No Remarks:		
OSHA classification ☐ Incident only ☐ First aid ☐ No lost work days ☐ Lost work days ☐ Restricted activity ☐ fatality		
Days away from work	Days of restricted work	Total days charged
EHS Professional Print name	Signature	Date

This report contains information protected by the Privacy Act

Accident/Injury Investigation

Must be completed within 72 hours

EARTH TECH

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

   Employee Name _____

   Supervisor Name _____

   Job Number/Name _____

   Location of Accident/Injury _____

2. Accident/Injury Classification

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

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

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

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

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

7. Witnesses (Attach statements or indicate why unavailable)

8. Investigated by _____ _____ _____
   Print Name Signature Date

   Manager _____ _____ _____
   Print Name Signature Date

Attach additional pages if needed.

Accident Review Board

EARTH TECH

The Board

Date of Board	Location
Board Member	Board Member
Board Member	Board Member

The Accident

Accident Date	Type
Report Complete: Yes No	Investigation Complete Yes No
Employee Name	Employee Signature
Employee Name	Employee Signature
Supervisor Name	Supervisor Signature
Supervisor Name	Supervisor Signature
Cause of Accident	
Action by Board	

Acceptance and Approval

ACCEPTED Employee Signature	ACCEPTED Supervisor Signature
APPROVED EHS Manager	REJECTED FOR
APPROVED Department/Section Manager	REJECTED FOR
APPROVED Division Manager/Group President	REJECTED FOR

Monthly Loss Report

EARTH TECH

Reporting Period: _____

Report Covers (Group, Division, or Region): _____

Occupational Injuries and Illnesses

Department/Section Name	Dept/Sec. Number	First Aid	OSHA Recordable	Lost Workday Cases	Total Cases

Summary of Occupational Injuries and Illnesses

Employee Name	Dept/Sec. Number	Date of Injury/Illness	Number of Days Lost	Number of Days of Restriction	Description

Summary of Vehicle and General Liability/Property Damage Accidents

Employee Name	Dept/Sec. Number	Date of Accident	Vehicle Identification	Third Party (Y or N)	Description

Report completed by: _____ Date: _____

Distribution:

- Corporate EHS
- Group President/Division Manager
- Department/Section Manager

Injury/Illness Classification Guide

MEDICAL TREATMENT

The following are generally considered medical treatment. Work-related injuries that receive this type of treatment are considered OSHA-recordable.

- Treatment of infection
- Application of antiseptics during second or subsequent visit to medical care provider
- Treatment of second or third degree burns
- Application of sutures, stitches, or butterflies in lieu of sutures
- Removal of foreign body imbedded in eye
- Removal of foreign body from wound, if procedure is complicated because of depth of imbedment, size, or location
- Use of prescription medications, except single dose administered on first visit for minor pain or discomfort
- Hypodermic injection, excluding tetanus booster given for prophylaxis
- Use of hot or cold soaking therapy during second or subsequent visit to medical care provider
- Cutting away dead skin or tissue, surgical debridement
- Application of heat therapy during second or subsequent visit to medical care provider
- Use of whirlpool bath therapy during second or subsequent visit to medical care provider
- Positive x-ray diagnosis, including fractures, broken bones, herniation, etc.
- Treatment for an amputation involving loss of bone or function
- Admission to a hospital or equivalent medical care facility for treatment

FIRST AID TREATMENT

The following are generally considered first aid treatment. Work-related injuries that receive only first aid treatment and that do not result in lost time or restricted work activity are usually not OSHA recordable. An injury or illness that results in loss of consciousness, time away from work on days following the day of occurrence, restriction of work or motion, or transfer to another job is always OSHA-recordable.

- Application of antiseptics during first visit to medical care provider
- Treatment of first degree burns
- Application of bandages during any visit to medical care provider
- Use of elastic bandages during first visit to medical care provider
- Removal of foreign bodies not imbedded in eye, if only irrigation is required
- Removal of foreign bodies from wound, if procedure is not complicated, for example, if removal is by tweezers or other simple technique
- Use of non-prescription medications and administration of single dose of prescription medication for the relief of minor pain or discomfort
- Soaking therapy on initial visit to medical care provider or removal of bandages by soaking
- Application of hot or cold compresses during first visit to medical care provider
- Application of heat therapy during first visit to medical care provider
- Use of whirlpool bath therapy during first visit to medical care provider
- Negative x-ray diagnosis
- Observation of injury during visit to medical care provider
- Tetanus booster injection given for prophylaxis

EARTH TECH	PROCEDURE NO. HS401
	DATE February 1, 1996
STANDARD PROCEDURE	SUPERSEDES New
SUBJECT HAZARD COMMUNICATION	APPROVED Steven L. Scott

1.0 PURPOSE, POLICY, AND SUMMARY

1.1 Purpose

This procedure presents a program and a system whereby every employee has access to and receives the information about the materials that he/she is working with so that he/she may protect against the hazards presented by the materials.

1.2 Policy

It is the policy of EARTH TECH that every employee shall have the knowledge of the materials that he/she is working with so that he/she will take adequate precautions to prevent harm to him/herself, the community and the environment.

1.3 Summary

This Hazard Communication Program applies to products and commodities which are known to be present in the work place in such a manner that employees may be harmed by an exposure under normal conditions of use or in a reasonably foreseeable emergency resulting from work place operations. This Hazard Communication Program does not apply to articles, food, cosmetics, radioactive materials or waste/hazardous waste. The Hazard Communication Program contains the following elements:

- A person designated to be responsible for the Hazard Communication Program
- An inventory of all products and commodities that are at the workplace in the form of liquids, compressed gasses, powders, granules, pastes, gels, etc.
- Material Safety Data Sheets (MSDS) for all hazardous materials in the workplace
- Training for all employees who work with hazardous materials
- Procedure to ensure all containers of hazardous materials are properly labeled
- Procedure to access and protect proprietary and trade secret information
- Procedure to protect visitors to the workplace

- Procedures for multi-employer work sites
- A written program.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Director, Environmental Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Article. A manufactured item:

(1) Which is formed to a specific shape or design during manufacture;

(2) Which has end use function(s) dependent in whole or in part upon it shape or design during end use; and

(3) Which does not release, or otherwise result in exposure to, a hazardous substance under normal conditions of use or in a reasonably foreseeable emergency resulting from workplace operations.

Blasting Agent. Any material or mixture consisting of a fuel and oxidizer, intended for blasting not otherwise classified as an explosive, provided that the finished product, as mixed and packaged for shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

CAS number. The unique identification number assigned by the Chemical Abstracts Service to specific chemical substances.

Chemical name. The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the substance for the purpose of conducting a hazard evaluation.

Combustible liquid. Any liquid having a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Common name. Any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a substance other than by its chemical name.

Compressed gas. Compressed gas means:

(A) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or

(B) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or

(C) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

Container. Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, tank truck, or the like that contains a hazardous substance. For purposes of this section, pipes or piping systems are not considered to be containers.

Designated representative. Any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

Distributor. A business, other than a manufacturer or importer, which supplies hazardous substances to other distributors or to employers.

Emergency. Any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which may or does result in a release of a hazardous substance into the workplace.

Employee. Every person who is required or directed by any employer, to engage in any employment, or to go to work or be at any time in any place of employment.

Employer. Employer means EARTH TECH, Inc.

Explosive. A substance that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure or Exposed. Any situation arising from work operation where an employee may ingest, inhale, absorb through the skin or eyes, or otherwise come into contract with a hazardous substance.

Flammable. A substance that falls into one of the following categories:

(A) **Aerosol, flammable.** An aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(B) **Gas, flammable.**

1. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent of volume or less; or

2. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;

(C) **Liquid, flammable.** Any liquid having a flashpoint below 100°F (37.8 C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(D) **Solid, flammable.** A solid, other than a blasting agent or explosive as defined above, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint. The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(A) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100°F (37.8°C), that do not have a tendency to form a surface film under test; or

(B) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that have a tendency to form a surface film under test; or

(C) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazard warning. Any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the health hazards and physical hazards of the substance(s) in the container(s).

Hazardous substance. Any substance which is a physical hazard or a health hazard.

Health hazard. A substance for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes substances which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a substance is to be considered hazardous for purposes of this standard.

Identity. Any chemical or common name which is indicated on the material safety data sheet (MSDS) for the substance. The identity used shall permit cross references to be made among the required list of hazardous substances, the label and the MSDS.

Immediate use. The hazardous substance will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Importer. The first business with employees within the Customs Territory of the United States which receives hazardous substances produced in other countries for the purpose of supplying them to distributors or purchasers within the United States.

Label. Any written, printed, or graphic material displayed on or affixed to containers of hazardous substances.

Manufacturer. A person who produces, synthesizes, extracts, or otherwise makes a hazardous substance.

Material safety data sheet (MSDS). Written or printed material concerning a hazardous substance which is prepared in accordance with section 29 CFR 1910.1200(g).

Mixture. Any solution or intimate admixture of two or more substances, at least one of which is present as a hazardous substance, which do not react chemically with each other.

MSDS means Material Safety Data Sheet, a presentation by the manufacturer of information about the product or commodity prepared in accordance with 29 CFR 1910.1200(g).

NIOSH. The National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services.

Organic peroxide. An organic compound that contains the bivalent-O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer. A substance other than a blasting agent or explosive as defined above, that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard. A substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Produce. To manufacture, process, formulate, repackage, or relabel.

Pyrophoric. A substance that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below.

Responsible party. Someone who can provide additional information on the hazardous substance and appropriate emergency procedures, if necessary.

Specific chemical identity. The chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

Substance. Any element, chemical compound or mixture of elements and/or compounds.

Trade secret. Any confidential formula, pattern, process, device, information, or compilation of information which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it. A trade secret shall not include chemical identity information which is readily discoverable through qualitative analysis. Appendix D sets out the criteria to be used in evaluating trade secrets.

Unstable (reactive). A substance which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Use. To package, handle, react, or transfer.

Visitor. Any person, including clients, subcontractors, and fellow EARTH TECH employees, who enter the work area, but are not regularly assigned to the work area.

Water-reactive. A substance that reacts with water to release a gas that is either flammable or presents a health hazard.

Work area. A room or defined space in a workplace where hazardous substances are produced or used, and where employees are present.

Workplace. Any place, and the premises appurtenant thereto, where employment is carried on.

5.0 PROCEDURE

5.1 Responsible Person

5.1.1 Business Unit Manager

Appoints a person, usually the Health and Safety Representative, to be responsible for implementing this Hazard Communication Procedure within the office/shop/lab.

5.1.2 Program Manager

Appoints a person within the program to be responsible for implementing this Hazard Communication Procedure within the program.

5.1.3 Project Manager

Appoints a person within the project, usually the Site Safety Officer, to be responsible for implementing this Hazard Communication Procedure on the project.

5.2 Inventory

5.2.1 Project Inventory

The Project Manager coordinates with the writer of the health and safety plan (HASP) to ensure the HASP contains a list of the hazardous substances (products and commodities) that will be used on the project. The inventory of hazardous substances lists each substance using an identity that is referenced on the appropriate material safety data sheet.

Project employees report to the Project Manager every hazardous material found at the project site which is not on the list of hazardous substances.

5.2.2 Office/Shop/Lab Inventory

The Responsible Person for each office/shop/lab prepares list of hazardous substances used in the office/shop/lab.

Office/shop/lab employees report to the Responsible Person every hazardous material found in the office/shop/lab which is not on the list of hazardous substances.

5.3 Material Safety Data Sheets

5.3.1 Project MSDS File

The Project Manager coordinates with the writer of the health and safety plan (HASP) to ensure the HASP contains a material safety data sheet (MSDS) for each hazardous substance listed.

5.3.2 Office/Shop/Lab MSDS File

The Responsible Person for each office/shop/lab maintains the MSDS file or binder. The Responsible Person requests an MSDS from suppliers and manufacturers to ensure that the MSDS file or binder has an MSDS for each hazardous substance on the inventory. A sample letter to request an MSDS is shown in Attachment 2.

5.3.3 New Information

Whenever a new or revised material safety data sheet is received, such information shall be provided to employees on a timely basis not to exceed 30 days after receipt, if the new information indicates significantly increased risks to, or measures necessary to protect, employee health as compared to those stated on a material safety data sheet previously provided.

5.4 Training

5.4.1 HAZWOPER Training

All HAZWOPER training, including the 40-hour initial training and the 8-hour annual refresher training, includes Hazard Communication training.

5.4.2 Accident Prevention Training

All accident prevention training, injury and illness prevention program training, and safety awareness training includes Hazard Communication training.

5.4.3 Hazard Communication Course Content

Hazard Communication training shall address the following topics:

(A) The elements and requirements of the OSHA hazard communication standard.

(B) Tasks and operations where hazardous substances are present.

(C) The location and availability of the written hazard communication program, including the list(s) of hazardous substances and material safety data sheets.

(D) The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.

(E) The physical and health hazards of the substances in the work area, and the measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

(F) The project or shop specific details of the hazard communication program, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

(G) Information regarding hazardous substances to which they may be exposed, according to the provisions of the OSHA hazard communication standard.

(H) Information for their physician or collective bargaining agent to receive regarding hazardous substances to which the employee may be exposed according to provisions of this section;

(I) Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

5.5 Labels

5.5.1 User

Each user shall ensure that each container of hazardous substances in the workplace is labeled, tagged, or marked with the following information:

(A) Identity of the hazardous substance(s) contained therein; and

(B) Appropriate hazard warnings.

5.5.2 Receiving

Employees receiving shipments of hazardous substances shall not accept the shipment, but return it to the shipper, if the containers are not properly labeled with the following information:

(A) Identity of the hazardous substance(s);

(B) Appropriate hazard warnings; and

(C) Name and address of the manufacturer, importer, or other responsible party.

Exception to labeling requirement: For solid metal (such as a steel beam or a metal casting) that is not exempted as an article due to its downstream use, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes. The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment. This exception to requiring labels on every container of hazardous substances is only for the solid metal itself and does not apply to hazardous substances used

conjunction with, or known to be present with, the metal and to which the employees handling the metal may be exposed (for example, cutting fluids or lubricants).

5.6 Trade Secrets

5.6.1 Non-Emergency Access to Trade Secret Information

Each Responsible Person who obtains a material safety data sheet which claims trade secret information forwards a copy of that MSDS to the Corporate Medical Director. The Corporate Medical Director will submit a written request to the supplier explaining the that the information is needed for the following reasons:

(A) To assess the hazards of the substances to which employees will be exposed;

(B) To guide appropriate sampling of the workplace atmosphere to determine employee exposure levels;

(C) To conduct pre-assignment or periodic medical surveillance of exposed employees;

(D) To provide medical treatment to exposed employees;

(E) To guide the selection of appropriate personal protective equipment for exposed employees;

(F) To guide the development of appropriate engineering controls or other protective measures for exposed employees; and,

(G) To conduct studies to determine the health effects of exposure.

The request includes an agreement to protect the confidentiality of the disclosed information with assurance that the trade secret information will not be used for any purpose other than the health needs asserted.

The Medical Director will provide such information as necessary to conduct an industrial hygiene evaluation of employee exposures to the cognizant EHS Professional. If this involves releasing trade secret information, the EHS Professional signs a nondisclosure agreement before receiving such information.

Employees working with materials protected by trade secret have access to the MSDS which does not have protected information.

5.6.2 Emergency Access to Trade Secret Information

Emergency access to trade secret information is provided through the Corporate Medical Director. Where a physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous substance is necessary for

emergency or first-aid treatment, the Corporate Medical Director shall request the manufacturer, importer, or other supplier immediately disclose the specific chemical identity of a trade secret substance, regardless of the existence of a written statement of need or a confidentiality agreement. The manufacturer, importer, or other supplier may require a written statement of need and confidentiality agreement, in accordance with the provisions of OSHA's Hazard Communication standard as soon as circumstances permit.

5.7 Visitors

5.7.1 Escorted Visitors

Visitors to the work area who have not received a hazard communication briefing on the hazardous substances present in the work area must be escorted the entire time they are in the work area to ensure that they are not harmed by the hazardous substances.

5.7.2 Unescorted Visitors

The supervisor must ensure all visitors who enter the work area unescorted receive a hazard communication briefing before encountering any of the hazardous substances in the work area.

5.7.3 Multiemployer Worksites

In multi-employer workplaces, any employer bringing hazardous substances into the work area shall inform all the employers sharing the same work area of the hazardous substances to which their employees may be exposed while performing their work, and any suggestions for appropriate protective measures, and shall provide the following:

(A) Material safety data sheets

(B) Any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,

(C) The labeling system used in the workplace.

5.8 Written Program

5.8.1 Hazard Communication in Health and Safety Plans

Health and Safety Plans (HASP) written for HAZWOPER projects contain all the elements of the Hazard Communication Program. Material safety data sheets for hazardous substances which are brought to the project site are included in an appendix to the HASP. See HS209.

5.8.2 Hazard Communication in Injury and Illness Prevention Programs

The Injury and Illness Prevention Program (IIPP) contains all the elements of the Hazard Communication Program. The hazardous substance inventory and MSDS a

maintained in appendices to the IIPP. See HS201.

5.8.3 **Location Specific Hazard Communication Programs**
Each EARTH TECH location where hazardous substances are present that does not have a Hazard Communication Program provided by paragraph 5.8.1 or 5.8.2 above, shall develop a hazard communication in accordance with OSHA's hazard communication regulation, this procedure, and HS157 Location-Specific Work Rules. The location-specific hazard communication program must be in writing and contain all the elements of a hazard communication program as shown in paragraph 1.3.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with established variance procedures. See HS109.

7.0 CROSS REFERENCES

HS157 Location-Specific Work Rules
HS201 Injury and Illness Prevention Program
HS209 Health and Safety Plans

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix
Attachment 2: Sample Request Letter

RESPONSIBILITY MATRIX

Action	Procedure Section	Department/ Section Managers	Project Manager	Responsible Person	Regional/ Division EHS Manager	Corporate Medical Director	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1						X
Designate Responsible Person	5.1	X	X				
Develop and maintain inventory of hazardous substances	5.2		X	X			
Maintain MSDS file	5.3			X			
Provide training	5.4				X		
Ensure labels on containers	5.5	X	X	X	X		
Access trade secret information	5.6					X	
Protect visitors	5.7	X	X				

SAMPLE REQUEST LETTER

Date

Supplier/Manufacturer
Address
City, State Zip

Gentlemen:

OHSA's Hazard Communication regulation requires manufacturers and importers of hazardous substances to prepare and provide material safety data sheets (MSDS). The same regulation requires employers to have MSDS in their workplaces for all hazardous substances.

We currently purchase the following products from you:

1. _____

2. _____

etc.

Please send a completed MSDS for each of the above listed products, or a statement that the product is exempt from the OSHA Hazard Communication regulation.

Very truly yours,

EARTH TECH, Inc.

EARTH TECH	PROCEDURE NO. HS501
	DATE April 22, 1996
STANDARD PROCEDURE	SUPERSEDES December 17, 1995
SUBJECT PERSONAL PROTECTIVE EQUIPMENT	APPROVED Diane C. Creel

1.0 PURPOSE AND POLICY

1.1 Purpose

Wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact, EARTH TECH shall provide protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers.

1.2 Policy

It is the policy of EARTH TECH to assess the hazards of every workplace, mitigate those hazards through practical engineering and work practice controls, and provide personal protective equipment to protect employees from residual hazards. EARTH TECH will reimburse the actual cost of personal protective equipment up to $150 per year per employee for such personal items as footwear and prescription safety glasses. Other items of PPE of a less personal nature, such as hard hats, traffic vests, etc., will be purchased with department operating funds.

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3.0 RESPONSIBILITY MATRIX

3.1 **Procedure Responsibility.** The Corporate Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 **Action/Approval Responsibilities.** The Responsibility Matrix is shown in Attachment 1 to Section 8.

4.0 DEFINITIONS

The following definitions apply to all requirements of this procedure:

EHS. Environmental Health and Safety

EHS Professional. Environmental Health and Safety Professional, an individual assigned to the Environmental Health and Safety Department who is certified in the practice of either industrial hygiene (CIH) or safety (CSP), or any other individual designated by the Environmental Health and Safety Department Manager.

EHS Staff. A person whose primary work assignment is to prevent injury or illness. A Site Safety Officer is an EHS Staff.

Field Personnel. Field personnel include any employee who performs field work as part of his/her assigned duties.

Field Work. Any work activity occurring outside of an office setting.

HASP. Health and Safety Plan, the site-specific document written in accordance with HS209.

PPE. Personal Protective Equipment, devices worn by the worker to protect against hazards in the environment.

SOW. Statement of Work, a document to describe the work to be performed.

5.0 TEXT

5.1 General

The goal is to prevent harm to the body from hazards in the work environment. The preferred method is to eliminate the source of the hazard. When this is not possible, the next line of defense is stopping, capturing, or containing the hazard at its source. The next fall back is to intercept the hazard along its path to the worker. The last resort is shielding the person with personal protective equipment.

5.1.1 Hazard Determination

Every operation, activity, and task is evaluated by management to determine hazards and potential hazards that may be present that would necessitate the use of personal protective equipment (PPE).

Where hazards derive from exposure to chemical substances, managers seek the assistance of an Environmental Health and Safety (EHS) Professional.

5.1.2 Hierarchy of Controls.

Engineering and work practice controls are used to eliminate the hazard or stop, contain, or capture at the source or intercept it along its path to the worker. When feasible, these controls are preferred to burdening the worker with PPE. Administrative controls are control measures to limit the duration of exposure to the hazard. Generally, administrative controls are not acceptable to control inhalation or direct skin hazards, except when no other control technology is feasible or effective. With the exception of administrative controls to prevent heat-, cold-, or radiation- related illness, the use of administrative controls requires the approval of the Corporate EHS Director.

5.1.3 Routes of Entry.

Various types of PPE are used to prevent the entry of chemical and biological substances through

- Inhalation
- Absorption through intact skin
- Ingestion
- Penetration through break in skin (injection).

5.1.4 Selection

The selection of PPE is based on the hazards identified in the workplace hazard assessment and the activities that will be performed while using the PPE. To assure adequate protection, the selected PPE meets ANSI requirements where standards have been published, such as foot, eye, and head protection, and NIOSH or MSHA requirements for respiratory protection. Corporate EHS maintains comprehensive data to aid in the selection of PPE.

5.1.5 Training

Every worker who is required to use PPE receives training provided by his/her supervisor, with assistance from EHS Professional when requested, which covers the following topics:

- When is PPE necessary
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE
- The limitations of PPE
- The proper care, maintenance, useful life, and disposal of the PPE.

5.1.6 Maintenance of PPE

After each use, employees inspect all PPE that will be used again. Any item needing maintenance or repair will be identified and removed from service until the maintenance or repair has been completed and the item verified fit for use. Maintenance and repair will use only replacement parts approved by the manufacturer and be conducted in a manner consistent with manufacturer's instructions. Maintenance and repair will restore PPE to a condition meeting original certification (NIOSH, MSHA, ANSI, etc.) or the item will be discarded as not reparable or beyond economical repair.

5.1.7 Loss of protection.

The major reason for loss of protection from PPE results from non-use. Other factors influencing loss of protection include contamination of the PPE, penetration (i.e., rips, tears, holes, etc.), and permeation through the materials of construction. There are many factors influencing non-use of PPE. Because using PPE is generally less comfortable than not using PPE, workers need to be motivated to use it. Through education and training, workers need to recognize the need for PPE and understand the benefits of using it. Acceptance of PPE is aided by providing sizes and styles that improve fit and comfort. The PPE must be selected with full consideration for the task to be performed while using it.

Non-use of PPE becomes more of a problem when the PPE is not stored in a readily accessible location, handy to the work. No one likes to use PPE that is not clean, dry, and protected from

deterioration. PPE that is difficult to put on or take off will be avoided. To reduce this as an influence for non-use, ease of donning and doffing must be a consideration in the selection of PPE.

5.2 PPE Program Responsibilities

5.2.1 Supervisor of Field Personnel.

- Coordinates with Project/Response Managers to determine the necessary and appropriate personal protective equipment to be permanently assigned to his/her employees.
- Ensures that his/her employees have all appropriate personal protective equipment.
- Conducts periodic inspections of his/her employees' personal protective equipment to ensure it is properly maintained and ready for use.
- Coordinates with Project Manager when conditions require change in PPE or additional training.

5.2.2 Project/Response Manager.

- Ensures that project documents, such as statements of work, health and safety plans, or accident prevention plans, clearly state the required PPE to be used on the project.
- Verifies that personnel assigned to project have completed the appropriate training for the PPE required for the project and maintains copy of training certificate in project file.
- Ensures that personnel working on the project have and use the PPE specified for the assigned tasks.

5.2.3 Environmental Health and Safety Professional.

- Determines hazards through review of Statement of Work (SOW), Work Plan, or other project documents or site visit.
- Ensures workplace hazard assessment has been completed. In accordance with 29 CFR 1910.132, there must be a written certification of the workplace hazard assessment. The form HS501-F1 *Workplace Hazard Assessment* as shown in Attachment 2 in Section 8 of this procedure provides a convenient means to certify the workplace hazard assessment.
- Selects PPE to provide adequate protection for identified hazards. PPE must be compatible with intended activities.
- Communicates selection via project documents (HASP, etc.) to project personnel.

- During the performance of field inspections in accordance with HS205, inspects company and employee owned PPE to assure the adequacy, maintenance, and sanitation of such equipment.
- Audits the use of PPE to assure adequacy and proper use of such equipment.
- Conducts annual evaluation to determine where PPE programs can be improved.

5.2.4 **Field Personnel.**

- Ensures he/she has all the required PPE for the work assignment. Coordinates with Supervisor to obtain any item that he/she is lacking.
- Ensure PPE fits properly.
- Maintains permanently assigned PPE in sanitary and reliable condition.
- Inspects all PPE that will be used again after each use.
- Repairs or replaces PPE when worn, damaged, or missing.
- Ensures defective and damaged PPE is removed from service.
- Facilitates timely replacement of worn, depleted, and missing items of permanently assigned personal protective equipment to assure reliable operation.
- Properly disposes of all single-use PPE after each use.

6.0 EXCEPTION PROVISIONS

Exceptions to this procedure must be approved by the responsible Environmental Health and Safety Manager with notification to Corporate EHS Director.

7.0 CROSS REFERENCE

HS201 Injury and Illness Prevention Program
HS205 Safety Inspections and Audits
HS503 Respiratory Protection
HS505 Eye Protection
HS507 Foot Protection
HS509 Hand Protection
HS511 Body Protection
HS513 Supplied Air Respirators, including SCBA
29 CFR 1910.132 Personal Protective Equipment

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Supervisor	Project Manager	EHS Professional	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1					X
Hazard assessment and determination of need for PPE	5.1		X		X	
Selection of PPE	5.1.5				X	
Issuance of PPE	5.2.1		X	X		
Training	5.1.6					
Maintenance of PPE	5.1.7	X				
PPE program evaluation	5.2.3				X	

EARTH TECH

WORKPLACE HAZARD ASSESSMENT

I. WORKPLACE IDENTIFICATION

PROJECT NAME	PROJECT NUMBER
LOCATION	
PROJECT MANAGER	
OPERATION/ACTIVITY/TASK DESCRIPTION	

II. REFERENCE AND SOURCES USED FOR HAZARD ASSESSMENT

STATEMENT OF WORK	☐
WORK PLAN	☐
HEALTH AND SAFETY PLAN	☐
SITE VISIT	☐
OTHER	☐

III. CERTIFICATION

I certify that a hazard assessment was performed in accordance with 29 CFR 1910.132 on the workplace here identified on this date.

NAME	SIGNATURE

MINIMUM STANDARDS OF PERSONAL PROTECTIVE APPAREL

The following are minimum standards of apparel, personal protective equipment, and dress for field activities.

1. Field work not involving chemical or physical hazards; activities not at industrial, manufacturing, or construction locations:

    - Shirt with sleeves
    - Pants, full length
    - Footwear, closed-toe

2. Field work involving equipment, such as drill rigs, field work at construction sites, activities at industrial sites, and activities at manufacturing locations requires, in addition to the above, the following personal protective items:

    - Hard hat (May be optional in industrial and manufacturing settings depending on conditions)
    - Safety toe footwear
    - Safety glasses, cover goggles, or faceshield

3. Where exposure or potential exposure to chemical hazards exist, personal protective equipment shall be selected and used which is appropriate for the work to be done and which will provide adequate protection for the chemical hazard. Chemical protective PPE includes respirators, gloves, aprons, coveralls, overalls, boots, boot covers, etc.

4. Where noise hazards exist or are likely, hearing protectors shall be selected and worn. Hearing protectors shall be selected to be compatible with the rest of the required PPE and the activities to be performed.

5. Where physical hazards exist, such as hot surfaces, sharp objects, vibrating tools, extremely cold surfaces, etc., the personal protective equipment shall be selected and used that is appropriate to hazard, provides adequate protection, and is compatible with the rest of the protective apparel

6. Not acceptable for any field work are the following:

    - Dress, skirt, kilt
    - Tank tops, halter tops, topless, shirtless
    - Slippers, sandals, thongs, flip-flops, go-aheads, "Tijuana specials"
    - Shorts, cut-offs, bathing suit

7. Exceptions to these minimum standards requires the approval of an EHS Professional.

EARTH TECH	PROCEDURE NO. HS505
	DATE April 22, 1996
STANDARD PROCEDURE	SUPERSEDES New
SUBJECT EYE PROTECTION	APPROVED Diane C. Creel

1.0 PURPOSE AND POLICY

1.1 Purpose

Sight is the most cherished of the human senses. The protection of our ability to see requires protecting the eyes and face from injury by physical and chemical agents or by radiation. This procedure defines the EARTH TECH vision conservation program.

1.2 Policy

It is the policy of EARTH TECH to assess workplace hazards and provide protective eyewear appropriate to the hazard. The costs associated with obtaining prescription safety spectacles are reimbursable to the employee as part of each individual's personal allowance of $150 per year for personal protective equipment. (See HS501.)

EARTH TECH reimburses the actual cost of prescription safety spectacles up to a limit of $150 per year per employee for such personal items as footwear and prescription safety glasses. Non-prescription eye and face protection which is of a less personal nature is provided with department operating funds.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is shown in Attachment 1 to Section 8.

4.0 DEFINITIONS

The following definitions apply to all requirements of this procedure:

EHS. Environmental Health and Safety

EHS Professional. Environmental Health and Safety Professional, an individual assigned to the Environmental Health and Safety Department who is certified in the practice of either industrial hygiene (CIH) or safety (CSP), or any other individual designated by the Environmental Health and Safety Department Manager.

EHS Staff. A person whose primary work assignment is to prevent injury or illness. A Site Safety Officer is an EHS Staff.

Field Personnel. Field personnel include any employee who performs field work as part of his/her assigned duties.

Field Work. Any work activity occurring outside of an office setting.

HASP. Health and Safety Plan, the site-specific document written in accordance with HS209.

PPE. Personal Protective Equipment, devices worn by the worker to protect against hazards in the environment.

SOW. Statement of Work, a document to describe the work to be performed.

5.0 PROCEDURE

5.1 General

Employees working in locations where there is a risk of receiving eye injuries such as punctures, abrasions, contusions, or burns as a result of contact with flying particles, hazardous substances, projections or injurious light rays which are inherent in the work or environment, shall be safeguard by means of face or eye protection.

5.1.1 Hazard Determination

Every operation, activity, and task is evaluated by management to determine the need for eye and/or face protection. (See HS201 and HS501.)

Where hazards are of an ergonomic nature, managers seek the assistance of an Environmental Health and Safety (EHS) Professional.

5.1.2 Prescription Eyewear

Where eye protection is required and vision correction is required, such eye protection shall be provided as follows:

(1) Safety spectacles with suitable corrected lenses, or
(2) Safety goggles designed to fit over spectacles, or
(3) Protective goggles with corrective lenses mounted behind the protective lenses.

Contact lenses shall not be worn in working environments having harmful exposure to hydrophilic airborne contaminants, such as formaldehyde or hydrogen chloride.

5.1.3 Maintenance of PPE

Protective eyewear shall be maintained clean and sanitary. The optical quality of the eyewear is as important as the physical protection. Lenses shall be cleaned in a manner to preserve the optical quality. Generally, this means using non-abrasive cleaners. Depending on the degree of soiling, if

rinsing in potable water is insufficient to restore the cleanliness, use a nonabrasive face or dishwashing soap. Cracked, chipped, or scratch lenses must be replaced when the optical quality is degraded or the physical integrity is impaired. Straps, frames, and other parts of the eye protection must be maintained as well.

5.2 Selection

The selection of appropriate eye protection is based on the hazards identified in the workplace hazard assessment and the activities that will be performed.

5.2.1 Mechanical Hazards.

When operating or working near power or hand tools which may produce flying particles, punctures, abrasions, contusions, or mechanical penetration, safety glasses shall be worn which meet the requirements of American National Standard, Practice for Occupational and Educational Eye and Face Protection, Z87.1-1989 for industrial safety eyewear.

When more than one worker in an area is doing eye hazardous work as depicted in the preceding paragraph, all workers in the area shall use eye protection with side protection. Permanent or detachable side protectors (e.g. clip-on or slide-on side shields) are acceptable.

Where there are no hazards of penetrating particles, where workers are not using tools as depicted above, ordinary spectacles meeting the standards for streetwear are sufficient eye protection.

5.2.2 Splash and Liquid Hazards.

Faceshields provide the best protection for splash hazards and shall be used to protect the eyes and face when performing tasks with significant splash hazards, such as pressure washing, cleaning parts with strong and/or hot caustic or acid, working on systems containing hot or strong caustic or acid.

Where there is only minor risk of splash from hot or strong caustic or acid, or when working with cryogenic liquids, a chemical splash cover goggle may be substituted for a faceshield.

5.2.3 Radiant Energy Hazards

Eyes shall be protected from radiant energy hazards, including sunlight reflected off water, snow, or sand, by eyewear of a suitable shade. Protective eyewear for solar radiation, electric arc welding, and ultra-high temperature torches shall protect against ultraviolet radiation as well as visible radiation.

5.3 Vision Conservation Program Responsibilities

5.3.1 Supervisor of Field Personnel.

- Determines the need for and selects the appropriate eye protection.

- Coordinates with Section Manager to ensure the adequate quantities of plano safety glasses and other required eye protection are on hand. Orders additional supplies with department operating funds when necessary.

- Ensures that his/her employees have at a minimum safety glasses.

- Provides plano (non-prescription) safety glasses to those employees who do not wear prescription eyewear.

- Ensures those employees who wear corrective lenses obtain safety glasses meeting ANSI Z87.1-1989 Practice for Occupational and Educational Eye and Face Protection.

- Observes his/her employees to ensure their wearing of eye protection when required.

5.3.2 Project/Response Manager.

- Ensures that project documents, such as statements of work, health and safety plans, or accident prevention plans, clearly identify eye protection requirements.

- Ensures that personnel working on the project have and use the specified eye protection for the assigned tasks.

5.3.3 Section Manager.

- Ensures that adequate supplies of plano safety glasses are available.

- Approves reimbursement of employee purchased prescription safety glasses within the EARTH TECH allowance for employee purchased safety equipment.

5.3.3 Environmental Health and Safety Professional.

- Determines hazards through review of Statement of Work (SOW), Work Plan, or other project documents or site visit.

- Ensures workplace hazard assessment has been completed in accordance with HS501.

5.3.4 Field Personnel.

- If corrective lenses are not needed, obtains from supervisor plano safety glasses.

- If corrective lenses are needed, obtains current ophthalmic prescription at his/her own expense and orders industrial safety glasses from any retail optician.

- Submits receipt with expense claim for reimbursement for the industrial safety glasses. EARTH TECH allows reimbursement of the full price of prescription safety glasses and other

personal protective equipment up to $150 per year. Employee expenditures for prescription safety glasses and other personal protective equipment exceeding $150 per year will not be reimbursed.

- Maintains eye protection in a manner that preserves the optical quality and the safety integrity.

6.0 EXCEPTION PROVISIONS

Exceptions to this procedure must be approved by Environmental Health and Safety Manager with notification to Corporate EHS Director.

7.0 CROSS REFERENCE

HS201 Accident Prevention Program
HS209 Health and Safety Plans
HS501 Personal Protective Equipment

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Supervisor	Section/ Project Manager	EHS Professional	Corporate EHS Director
Issuance, revision and maintenance of this procedure	3.1					X
Determination of need for eye protection	5.3.1		X			
Selection of eye protection	5.3.1		X		X	
Issuance of eye protection	5.3.1		X			
Ensuring supplies are on hand	5.3.3			X		
Maintenance of PPE	5.3.4	X				
PPE program evaluation	5.3.3				X	

BRIAN D. WEITH — Project Manager

EDUCATION

B.S., Geology, Colorado State University, Fort Collins, 1985

TRAINING

EMS First Aid and CPR Training
NEPA Executive Overview Workshop
OSHA 8-Hour HAZWOPER Refresher Course
OSHA 40-Hour HAZWOPER Training Course
OSAH 8-Hour HAZWOPER Supervisor Training Course

PROFESSIONAL SUMMARY

Mr. Weith has over 10 years of experience in the investigation of all phases of unexploded ordnance/ordnance and explosives (UXO/OE) sites, geophysical surveys, geotechnical surveys, groundwater studies, and hazardous waste sites. He has been responsible for project planning, field implementation, supervision of personnel, quality control, and evaluation of field data for various projects throughout the western U.S. For the past 4 years, he has worked continuously on various programs for the U.S. Army Corps of Engineers (USACE), including UXO/OE engineering evaluation/cost analysis (EE/CA) investigations for the Former Buckley Bombing Range, Former Baywood Park Training Area and the Umatilla Chemical Depot Ammunition Demolition Activity Area, project manager for hazardous waste site investigations at the Defense Distribution Depot, Atchison Facility and the Defense Distribution Depot, Ogden. He has been involved with the Air Force Base Realignment and Closure (BRAC) program for 3 years as the Principal Investigator for all issues relating to geology and hydrology. For the past 10 years, he has been involved with geophysical, geotechnical and hydrological surveys of various sites. His broad background of experience has allowed him to gain a working knowledge of all phases of a variety of subsurface investigations and several sets of state and local regulations. The following is an overview of relevant project management experience.

- **Former Benicia Arsenal, Benicia, California.** Project manager for an EE/CA investigation to assess the risk UXO may present to the public. The project has high visibility with the public and an aggressive schedule to meet critical milestones for planned residential development on a portion of the property. The EE/CA investigation included developing a work plan, field investigation, coordinating with local residents, businessmen, and local governmental agencies, and producing a final EE/CA report that will document the findings of the field investigation, evaluate alternatives, and provide recommendations for risk management actions.

- **Former Buckley Bombing Range, Colorado.** Project Manager for an EE/CA investigation of the Former Buckley Bombing Range to assess the risk UXO may present to the public. The project had high visibility with the public and an aggressive schedule to meet critical milestones agreed upon between the state of Colorado and the USACE. The EE/CA investigation was phased between three investigative zones that were based on public need with multiple tasks to be accomplished within each zone. The project faced many technical challenges that had to be addressed in order to meet the critical milestones.

- **Defense Distribution Depot Ogden, Utah.** Project Manager for a hazardous waste site investigation. Several aboveground and underground storage tanks were investigated for possible leaks and releases of hazardous materials into the surrounding environment. The project included preparation of a Work Plan, Sampling Analysis Plan, and Quality Control

- Plan, field investigation of the sites, and preparation of an engineering report presenting the results of the investigation.

- **Defense Distribution Depot Oklahoma City, Oklahoma – Atchison Facility, Kansas.** Project Manager for a hazardous waste site investigation. The facility consisted of two large caves and outside support facilities that were used for the storage of various surplus items for Department of Defense. The project included preparation of a Work Plan, Sampling Analysis Plan, and Quality Control Plan, field investigation of the sites, and preparation of an engineering report presenting the results of the investigation. The project presented unique challenges because of the accessibility problems the caves presented for sampling equipment.

- **Former Baywood Park Training Area, California.** Deputy Manager for an EE/CA investigation of the Former Baywood Park Training Area to assess the risk UXO may present to the public. As deputy manager for the site, Mr. Weith was responsible for assisting the project manager in producing the work plan, managing field operations, tracking data, and producing the EE/CA report. The project presented several challenges concerning the protection of cultural and biological resources within the investigative area.

- **Closure of Abandoned Wells at Former Norton AFB, California.** Project Manager for overseeing the proper closure of historic agricultural wells, base production wells, and homestead wells at the Former Norton AFB. The project involved locating, abandoning, and documenting the closure of nearly 60 wells on the base. The process included overdrilling and/or drilling out the inside of old abandoned wells at the base. Once the field work was complete, detailed records of closure procedures were filed with the state and presented in a report.

EMPLOYMENT HISTORY

1994-present	Earth Tech, Project Geologist II
1989-1994	GeoSoils, Inc., Staff Geologist

CITIZENSHIP

United States

RICHARD A. BURZINSKI, REA, RG — Site Safety Coordinator/Field Team Leader

EDUCATION

BA, 1978, Geology, California State University, Sacramento, California

PROFESSIONAL CERTIFICATIONS AND REGISTRATIONS

Registered Geologist: California No. 5674, 1993
Certified Hydrogeologist: California No. 552, 1997
Registered Environmental Assessor: California No. 2642, 1991

AREAS OF EXPERTISE

Soil and groundwater contamination - Remedial Investigations/Feasibility Studies
Soil and groundwater remediation system design and implementation
Development of groundwater resources for mining, municipal and domestic concerns
Aquifer testing, hydrogeologic interpretation, aquifer characterization and groundwater flow modeling
Underground storage tank removal
California Senate Bill SB2004 requirements
Litigation support and deposition
Geotechnical and geophysical data collection and interpretation
Phase I environmental audits/preliminary site assessments for real estate transactions
Project cost estimates, proposal writing, project development and management
Class I, II and III disposal work

EXPERIENCE

Mr. Burzinski has over 18 years of experience in environmental and engineering geology, and hydrogeology. Mr. Burzinski serves as project manager and senior hydrogeologist in connection with selected projects. He is principally involved in project development, direct implementation or oversight, and project fruition with respect to soil and groundwater contamination investigation, aquifer characterization and remediation and all aspects of corrective action. Additional expertise includes all aspects of hydrogeologic and groundwater resource studies. Mr. Burzinski is trained according to OSHA Hazardous Waste Operations and Emergency Response Standards (29 CFR 1910.120). The following is a summary of recent experience related to water supply development, and soil and groundwater contamination investigations and compliance monitoring or remediation.

PROGRAM MANAGEMENT

Santa Clara Valley Transportation Authority Contract #950185, On-Call Environmental Services, San Jose, California. As the project and program manager for SCTVA Contract #950185 on-call environmental services, Mr. Burzinski ensured a rapid, high quality and cost effective response to the tasks which arose in this on-call services project. The scope included environmental services prior to and during construction of the Light Rail Extension from Great America Parkway in Santa Clara to Castro Street in Mountain View. In addition to managing the program, Mr. Burzinski performed major portions of the site assessment, investigation, remedial alternatives analysis and construction support activities. The following brief descriptions are indicative of the work conducted within this contract.

- ***1135 N. Mathilda Well Closures.*** Under SCVWD permit, abandoned 6 groundwater monitoring wells as part of Moffett Spur Light Rail Project.

- ***3331 N. 1st St. Geotechnical Pavement Evaluation.*** Geotechnical evaluation of parking lot pavement failures.

- ***860 West San Carlos Street UST Removal and Soil Treatment.*** Oversaw UST Tank removal, collected samples from the excavation and subsequently overexcavated pit. Conducted on-site

treatment of the lead impacted ex-situ soil with Pozzalonic ash, thus cost-effectively disposed as cover material at a Class II Landfill.

- ***Don Pedro Chaboya Bus Maintenance Facility Asbestos Investigation.*** Conducted Asbestos investigation of coving in work areas.

- ***Don Pedro Chaboya Bus Maintenance Facility Asbestos Remediation.*** Conducted Asbestos investigation and remediation of coving and back panels in restrooms.

- ***Don Pedro Chaboya Bus Maintenance Facility Regulatory Compliance Issues.*** Submitted letter request to RWQCB for reduction in groundwater monitoring and quarterly sampling requirements of site remediation system.

- ***Evelyn Station Underpass Geotechnical Soil Boring.*** Advanced soil boring to 85 feet depth at location of Evelyn Station Bridge Underpass to Joint Powers Board Rail Lines to determine hydrogeological and geotechnical considerations during construction.

- ***Highway 237 & Gold Street Wetland Mitigation.*** Investigated, sampled, analyzed, and interpreted results of fill material; resulting in the reclassification as concrete rubble construction material, thereby providing a significant cost saving for disposal of the material.

- ***Moffett Park Auto Repair Center Asbestos Survey.*** Conducted pre-demolition asbestos survey to determine take-out volumes for disposal of asbestos waste.

- ***Moffett SP Spur Track Groundwater Sampling.*** Conducted quarterly sampling of 13 wells distributed between Highway 101 and Whisman Avenue.

- ***North Coach Maintenance Division Facility – Hoist Removals.*** Performed confirmatory soil sample collection after hoist removals. Produced required Agency report.

- ***North Coach Maintenance Division Facility - Upgradient Groundwater Investigation.*** Performed groundwater investigation and determined that solvents detected in the shallow aquifer zone under the site were from upgradient source(s).

- ***Ron Cerone Bus Maintenance Facility Bus Wash.*** Emergency mobilization on site to determine genesis of water emanating from cracks in parking lot pavement. Sample collection and analyses to determine source and possible contamination release.

- ***Ron Cerone Bus Maintenance Facility Well Closures.*** Closed 8 groundwater monitoring wells under permit of SCVWD.

- ***State Highway 237 and Fair Oaks Boulevard Emergency Sampling.*** Within 30 minutes of telecommunication, visited Light Rail right-of-way excavation (while crew was standing by) to determine potential problem associated with uncovering of discolored soil and release of hydrocarbon odors. Tested area with OVM and collected soil samples for analyses on 24-hour turn-around.

- ***Tasman Corridor Light Rail Extension, Hydrologic Testing.*** Installed one temporary boring and performed slug tests on one temporary boring and two groundwater monitoring wells to estimate potential water infiltration during construction in a depressed area of the right-of-way. Recommended number of Baker tanks to be used for dewatering during construction.

City of San Francisco Department of Public Works, On-Call Environmental Services Contract, County of San Francisco, California. As the project and program manager for SFDPW Contract #169,098 on-call environmental services, Mr. Burzinski ensured a rapid, high quality and cost effective response to the tasks which arose in this on-call services project. The following brief descriptions are indicative of the work conducted within this contract.

- ***Port Soil Testing.*** Conducted soil sample collection, analyses, and characterization for disposal of 500 cubic yards of lead contaminated soil.

- ***Saint Mary's Square Parking Garage Remediation.*** Produced Corrective Action Plan and designed Soil Vapor Extraction Remediation System for soil and groundwater contamination resulting from past use of previously removed USTs.

- ***San Francisco Hospital Soil Investigation.*** Conducted subsurface investigation, soil sample collection and analyses to determine if 4 USTs could be closed in place.

SITE REMEDIATION

American National Can Company, Site Remediation, National Contract. Project Manager for field work for facility in Oakland, California. Directed remediation of the following: an underground storage tank (UST) previously containing gasoline; a UST previously containing bunker fuel; a UST containing acetone; an area of surface spillage of solvents; and, two areas registered as RCRA storage areas. Areas were closed by overexcavating impacted soils. 4000 tons of petroleum hydrocarbon impacted soil were off-hauled by truck to an in-state Class II landfill, 5500 tons of lead impacted soil were off-hauled by rail to an out-of-state Class I Non-RCRA landfill. 1300 tons of soil from the two RCRA units were off-hauled by truck to an in-state Class I RCRA landfill as listed waste. Regulatory involvement included the Alameda County Department of Environmental Health, the Bay Area Regional Water Quality Control Board, the Bay Area Air Quality Management District, the California EPA Department of Toxic Substances Control, and the City of Oakland Fire Department.

City of San Francisco Department of Public Works, Remediation, San Francisco, California. Produced Corrective Action Plan and designed Soil Vapor Extraction Remediation System for soil and groundwater contamination resulting from past use of previously removed USTs at Saint Mary's Square Parking Garage in San Francisco.

City of San Jose Redevelopment Agency, Soil Remediation, San Jose, California. Managed the excavation, loading, transporting and landfill disposal of over 6,000 cubic yards of petroleum hydrocarbon contaminated soil from the Century Center Parking Lot project.

Department of Defense, Remediation Workplan, Edwards Air Force Base, California. Developed and implemented soil remediation workplan for asphalt and tar impacted soil at Site 279, Edwards AFB, under DO-45.

E.A. Hathaway Company, Site Investigation and Remediation, Santa Clara, California. Investigation and remediation of shallow aquifer contaminated by petroleum fuel leak from USTs. Conducted groundwater extraction and treatment, followed by natural attenuation monitoring, culminating in RWQCB/SCVWD case closure.

Lincoln Property Company, Riverpark Development, Hydrogeologic Investigation, Groundwater Monitoring, and Remediation, San Jose, California. Investigation and remediation of □A□ aquifer and □B□ aquifer chlorinated solvent contamination by soil vapor extraction and groundwater extraction and treatment, respectively. Groundwater was extracted at 250 gpm, aerated, and discharged into the Guadalupe River under NPDES permit.

Nob Hill General Store, Inc., Site Investigation and Remediation, Nob Hill Family Park, Gilroy, California. Investigation, excavation and disposal of 500 yards of metals contaminated soils from unauthorized leach field french drain under oversight of RWQCB - Central Coast Region Clean-up and Abatement Order.

Ran-Rob Tool and Die, Solvent Remediation, Oakland, California. Site characterization resulting in engineered, designed, and installed groundwater extraction and remediation system for chlorinated solvents. Agencies involved were Alameda County Department of Environmental Health (*Workplan for Remediation,*

Site Health and Safety Plan, quarterly reporting) and East Bay Municipal Utility District (permit to discharge treated groundwater to the local POTW, quarterly reporting).

Santa Clara Valley Transportation Authority, Soil Remediation, San Jose, California.
UST removal at 860 West San Carlos Street resulted in stockpiling of lead contaminated soil. Conducted on-site treatment of the lead impacted ex-situ soil with Pozzalonic ash, thus cost-effectively disposed as cover material at a Class II Landfill.

Sierra Constructors and Atkinson Engineering, Site Investigation and Remediation, Stanislaus County, California. Managed all on-site corrective action and remediation activities at 17 areas of fuel/oil contaminated soils. Excavated, and deployed to landfill, approximately 5,800 yards of soil. During the construction of the North Fork Stanislaus River Hydroelectric Project, 17 areas were impacted by site operations during the seven years of the project. Upon completion of remediation activities, a Soil Remedial Activities Report was produced and accepted as site closure by the CVRWQCB.

Stanford University, Soil Remediation, Palo Alto, California. Managed bioremediation of 500 cubic yards of excavated soils from two sites on campus (i.e.; Alvarado Row and Site 525) contaminated with a full range of petroleum hydrocarbons.

Tri-County Sand Blasting, Soil Remediation, Irvine, California. Installed Soil Vapor Extraction (SVE) Remediation System at petroleum LUFT facility in Irvine, consisting of a six well array coupled to an outside burner unit.

SOIL and/or GROUNDWATER CONTAMINATION INVESTIGATION

Al Silver Property, LUFT Subsurface Investigation, Mountain View, California. Managed LUFT subsurface investigation at a muffler shop to define lateral and vertical extent of soil and groundwater contamination from previously removed waste oil UST. Installed three groundwater monitoring wells to 35 feet. Determined site was impacted by Exxon facility upgradient.

A.P.C. International, Subsurface Investigation, San Jose, California. Managed subsurface investigation at Santa's Village in Scotts Valley. Advanced seven borings and constructed one trench. Defined lateral and vertical extent of soil contamination. Produced RI report with recommendations for remediation.

Apple City Investments, Subsurface LUFT Investigation, Watsonville, California. Project Manager for subsurface LUFT investigation at property in Watsonville to define extent of petroleum hydrocarbon contamination in soil and groundwater from previously removed UST. Installed three monitoring wells to 35 feet.

ARCO Mini Mart, LUFT Subsurface Investigation, San Carlos, California. Managed LUFT subsurface investigation at facility at Holly Street in San Carlos. Installed four groundwater monitoring wells and 12 soil borings; performed off-site investigations; performed aquifer tests; provided RI/FS report; produced corrective action plan (CAP).

Boeing Aero Space/NASA Ames Research Center, Soil Sampling, Mountain View, California. Managed soil sampling at Moffett Field NAS to determine extent of contamination of inorganic lead from paint in shallow soils. Collected shallow soil samples from over 200 locations.

Catering by Andre', LUFT Subsurface Investigation, Oakland, California. Managed LUFT subsurface investigation at 434 25th Street to define lateral and vertical extent of soil and groundwater contamination from historically removed UST. Installed three groundwater monitoring wells to 20 feet and 6 soil borings to 13 feet. Conducted quarterly monitoring.

Chrysler Corporation, Phase II Investigation, National Contract. Advanced 11 borings to the first encounter of groundwater and conducted Phase II subsurface soil and groundwater investigation of Recognized Environmental Conditions determined from previous Phase I ESA at Fireside Dodge in Modesto, California.

Chrysler Corporation, Phase II Investigation, National Contract. Advanced 6 borings to the first encounter of groundwater and conducted Phase II subsurface soil and groundwater investigation of Recognized Environmental Conditions determined from previous Phase I ESA at Timberline Dodge in Portland, Oregon.

Chrysler Corporation, Phase II Investigation, National Contract. Advanced 3 borings to the first encounter of groundwater and conducted Phase II subsurface soil and groundwater investigation of Recognized Environmental Conditions determined from previous Phase I ESA at Tonkin Dodge in Portland, Oregon.

City of Benecia/Ford Motor Company/Granite Management Company, Remedial Investigation/Feasibility Study, Tourtelot Property, Benecia Arsenal, Benecia, California. Subsurface soil and groundwater investigation of former military site and dumping ground where the arsenal tested, stored, and distributed military ordinance for over a century. Purpose of investigation (and subsequent remediation) is to allow developer to build 426 homes on the site. Investigation included trenching, hand auguring and subsurface soil sampling, seismic survey of depth to bedrock, surface soil and surface water sample collection, and groundwater monitoring well installation and groundwater sampling. Contaminants of concern were polynuclear aromatic hydrocarbons, metals, explosives, dioxin, nitroglycerine, and petroleum hydrocarbons. Major safety issue was unexploded ordinance.

City of San Jose Redevelopment Agency, High Technology Museum Site Subsurface Investigation. Groundwater contamination investigation at Guadalupe River Park Zone "B" west area; Children's Discovery Museum site. Installed three monitoring wells to 35' depth.

Coherent, Inc., Subsurface Investigation, Palo Alto, California. Managed subsurface investigation of solvent contamination at 5,100 Patrick Henry Drive in Santa Clara, California. Installed four groundwater monitoring wells and six soil borings to define vertical and lateral extent of soil and groundwater contamination.

Cord Associates, Groundwater Investigation, San Jose, California. Installed 6 groundwater monitoring wells to 20 feet to investigate subsurface conditions at "closed" LUST site at historic Stoffer Chemical Plant in San Jose.

Empire Waste Management, LUFT Subsurface Investigation, Santa Rosa, California. Managed LUFT subsurface investigation at recycling facility and administrative offices at 3400 Standish Avenue to define lateral and vertical extent of soil and groundwater contamination from previously removed USTs. Installed eight groundwater monitoring wells to 25 feet. Performed interim remediation and achieved case closure.

Empire Waste Management, Sensitive Receptor Survey, Santa Rosa, California. Conducted Sensitive Receptor Survey at surrounding vicinity of administrative offices at 3400 Standish Avenue in compliance with Sonoma County Department of Health Services in response to request for case closure of this LUFT site.

Gilroy Unified School District, Subsurface Investigation, Gilroy, California. Conducted subsurface investigation at transportation yard to explore possibility of soil and groundwater contamination from waste oil UST. Installed one 80 foot deep monitoring well.

Golden Rain Foundation, LUFT Subsurface Investigation, Rossmoor, California. Managed LUFT subsurface investigation to define lateral and vertical extent of potential soil and groundwater contamination from in-situ USTs at administrative buildings. Installed 10 soil borings to the first encounter of groundwater and 10 soil vapor probes to 8 feet.

Jim & Shirley Tibbs Property, LUFT Subsurface Investigation, Mountain View, California. Managed LUFT subsurface investigation at 980 Yuba Drive to define lateral and vertical extent of soil and groundwater contamination. Installed four groundwater monitoring wells to 80 feet and 3 soil borings to 40 feet. Achieved SCVWD case closure.

Kayo Oil Company, LUFT Investigation, California. Conducted subsurface investigation of Jet Gas Station in La Habra to determine existence of contamination from leaking product lines of USTs. Installed five monitoring wells to 40 feet.

Lincoln Property Company, Site Investigation, San Jose, California. Managed installation of 120-foot deep monitoring well into "C" aquifer at site, at intersection of Park Avenue and the Guadalupe River, by reverse air rotary, to determine if site solvent contamination had matriculated to deeper potable water supply aquifer; sampled groundwater and produced report.

Northern Trust of California, LUFT Subsurface Investigation, San Jose, California. Managed LUFT subsurface investigation at intersection of 10th Street and 13th Street in San Jose to define lateral and vertical extent of soil and groundwater contamination. Installed four groundwater monitoring wells to 40 feet and 3 soil borings to 25 feet. Conducted step-drawdown test, and constant discharge test at 5 gpm, to determine aquifer parameters. Conducted soil vapor extraction feasibility study.

Parlex Corporation, Soil Sampling, National Contract. Managed soil sampling at Dynaflex (computer board manufacturer) to determine existence/non-existence of soil contamination beneath concrete slab of wet processing area of facility in San Jose, California. Hand augured to 4.5 feet at four locations and collected shallow soil samples for volatile organics, semi-volatile organics, and metals.

Pleunte, et. al.; Law Offices, LUFT Subsurface Investigation, Mountain View, California. Managed LUFT subsurface investigation to define lateral and vertical extent of soil and groundwater contamination at 1001 N. Rengstorff. Installed six groundwater monitoring wells to 25 feet and 8 soil borings to 16 feet.

Radian International, LUST Investigations, California. As subconsultant to Radian, delineated extent of soil and groundwater contamination at 15 sites at Tracy Army Depot in Tracy and 15 sites at Sharpe Army Depot near Stockton, under the direction of the Army Corps of Engineers.

RAS Capital Corporation, Subsurface Investigation, California. Conducted subsurface investigation at a site in Benecia. Scope involved the preliminary determination of site contamination based on visual inspection of site, hand auguring at four locations, and soil chemical analyses.

Rusconi, Foster, Thomas, Van Keulen and Pipal - Attorneys (Rutherford Property), Site Investigation Fuel Leak, Morgan Hill, California. Investigation to define lateral and vertical extent of soil and groundwater contamination, at end of Tenant Avenue, due to LUST; under oversight of RWQCB - Central Coast. Installed five monitoring wells to 25' depth.

San Francisco International Airport (Contract 3183), Subsurface Investigation, San Francisco, California. Managed field work of $500,000 contract. Subsurface investigation of numerous sites at San Francisco International Airport involved hand auguring, soil boring advancement, soil and groundwater sample collection, soil gas survey of jet fuel pipeline, and analysis for metals, solvents, petroleum hydrocarbons and PCBs.

Stanford University, LUFT Subsurface Investigation, Palo Alto, California. Managed subsurface investigation to define lateral and vertical extent of soil contamination from ground surface waste oil degradation at Site 525. Defined extent and excavated impacted soils for ex-situ bioremediation.

Stapleton-Spence Packing Company, LUFT Investigation, San Jose, California. Site investigation at 7th Street facility for determination of extent of soil and groundwater contamination due to previously removed UST. Installed five monitoring wells to 25' depth.

Susan Gwynn/Nancy Stoverud Property, LUFT Subsurface Investigation, Palo Alto, California. Managed LUFT subsurface investigation at 830 E. Charleston Avenue to define lateral and vertical extent of soil and groundwater contamination. Installed three groundwater monitoring wells to 25 feet and 14 soil borings to 14 feet. Conducted quarterly monitoring. Produced Corrective Action Plan.

U.C. Berkeley, LUFT Subsurface Investigation, Berkeley, California. Managed LUFT subsurface investigation to define lateral and vertical extent of soil and groundwater contamination at administrative

offices at 2000 Carleton Street in Berkeley. Installed three groundwater monitoring wells to 20 feet and 3 soil borings to 10 feet.

Valley Waste Management, Phase II Investigation, Walnut Creek, California. Advanced 5 wells and 4 soil borings and conducted Phase II soil and groundwater investigation at Walnut Creek facility as post LUST case closure investigation.

Waste Management of Alameda County, LUFT Subsurface Investigation, California. Managed LUFT subsurface investigation at 3050 W. Winton Ave. in Hayward to define lateral and vertical extent of soil and groundwater contamination from previously removed USTs. Installed three groundwater monitoring wells to 35 feet and 16 soil borings to 20 feet. Conducted quarterly monitoring. Achieved case closure.

Wilbur Properties, LUFT Subsurface Investigation, Palo Alto, California. Managed LUFT subsurface investigation at 780 High Street to define lateral and vertical extent of soil and groundwater contamination resulting from both solvents and petroleum hydrocarbons from previously removed USTs. Installed four groundwater monitoring wells to 45 feet and 4 soil borings to 30 feet.

WOLCO Oil Company, Subsurface LUFT Investigation, San Jose, California. Managed subsurface LUFT investigation at its facility in San Jose to determine the presence or absence of contamination from existing USTs. Installed five soil borings to 10 feet and four monitoring wells to 20 feet.

REGULATORY PERMITTING

Adobe Corporation, Permitting, San Jose, California. Prepared *National Pollutant Discharge Elimination System (NPDES)* permit for Adobe Corporate Headquarters in San Jose.

City of San Jose Redevelopment Agency, Permitting, San Jose, California. Prepared the Site "A" property *National Pollutant Discharge Elimination System (NPDES)* permit.

County of Santa Clara Roads and Airports, Compliance Monitoring and Reporting, Palo Alto, California. Conducted POTW and NPDES compliance monitoring and reporting of Oregon Expressway underpass Pump Station discharges in Palo Alto.

Empire Waste Management, Permitting, Santa Rosa, California. Prepared the Santa Rosa facility *Spill Prevention Control and Countermeasures (SPCC) Plan.*

Nelcor Puritan Bennet, Permitting, National Contract. Prepared the Richmond facility *Stormwater Pollution Prevention Plan (SPPP).*

Oakland Children's Hospital, Federal Compliance, Oakland, California. Set up waste accumulation satellite stations at 29 individual testing laboratories associated with the hospital.

UNDERGROUND STORAGE TANK (UST) REMOVAL

American National Can Company, UST Removal, California. Managed removal one underground storage tank (UST) previously containing gasoline, one UST previously containing bunker fuel, and one UST containing acetone from a site in Oakland. The acetone UST was characterized as a RCRA listed waste.

Chem Central Western Division, UST Removals, National Contract. Emptied, made inert, and removed 40 USTs from tank farm at facility in Hayward. Collected confirmatory soil samples. USTs previously contained virgin RCRA product including MEK, toluene, xylene.

City of Redwood City, UST Removal, Redwood City, California. Oversight of removal of 10,000-gallon, fiberglass, double-walled UST and associated pipelines and dispenser island at administrative offices, collected confirmatory samples, and produced closure report. The UST and associated piping was certified as a non-RCRA hazardous waste solid following its removal and was transported to a facility in Richmond, California for disposal.

City of San Jose Redevelopment Agency, UST Removal, San Jose, California. Oversight of removal of UST at United Artist Theater site in downtown San Jose, collected confirmatory samples, and produced closure report.

Randell Graham, UST Removal, Bonny Doon, California. Oversight of removal of 500 gallon UST at private residence in Bonny Doon, collected confirmatory samples, and produced closure report.

Santa Clara Valley Transportation Authority, UST Removal, San Jose, California. Oversaw UST Tank removal at 860 West San Carlos Street. Collected samples from the excavation and subsequently overexcavated pit.

Susan Gwynn/Nancy Stoverud, UST Removals, California. Oversight of removal of tank farm consisting of 4 USTs at 830 Charleston Road in Palo Alto, collected confirmatory samples, and produced closure report.

Terminix International, UST Removal, National Contract. Oversight of removal of 5,000-gallon UST and associated pipelines at facility in Oakland, collected confirmatory samples, and produced closure report.

Waste Management of Alameda County, UST Removal, Oakland, California. Removed, from the main headquarters in Oakland, UST previously containing a wastewater and diesel/gasoline mixture, and transported off-site as a non-RCRA hazardous waste solid for recycling at Erickson's Richmond, California facility. Based on analytical chemical results of confirmatory soil samples collected, case closure was received from Alameda County Department of Health Services.

PHASE I ENVIRONMENTAL SITE ASSESSMENT – ASTM STANDARD

3M Company, Phase I ESA, National Contract. Conducted Phase I Environmental Site Assessment of facility on Otterson Drive in Chico, California preliminary to vacating the property.

Adobe Corporation, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment of Adobe Corporate Headquarters at Adobe I-Adobe II Complex in San Jose preliminary to refinancing of expansion.

Apple Computer, Phase I ESAs, Santa Clara, California. Conducted Phase I Environmental Site Assessments at two facilities in Santa Clara preliminary to Client entering into lease renewal agreements.

Chrysler Corporation, Phase I ESA, National Contract. Conducted Phase I ESA at Fireside Dodge in Modesto, California, preliminary to dealership change-of-ownership.

Chrysler Corporation, Phase I ESA, National Contract. Conducted Phase I ESA at Crown Chevrolet in Dublin, California, preliminary to dealership change-of-ownership.

City of San Francisco, Phase I ESAs, San Francisco International Airport, California. Conducted Phase I Environmental Site Assessments at Plot 52, Lot DD, and Millbrae Viewing Lot as part of airport expansion.

City of San Jose Redevelopment Agency, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment of 4-block area near Park and Gifford preliminary to property purchase.

City of San Jose Redevelopment Agency, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment at 35 and 43 E. Santa Clara Street preliminary to property purchase.

City of San Jose Redevelopment Agency, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment of 62-68 S. 2nd Street preliminary to property purchase.

City of San Jose Redevelopment Agency, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment of 27 S. 1st Street preliminary to property purchase.

City of San Jose Redevelopment Agency, Phase I ESA, San Jose, California. Conducted Phase I Environmental Site Assessment of 3-block strip of Bellevue Avenue Corridor preliminary to property purchase.

DLR Group of Nebraska, Phase I ESA, California. Conducted Phase I Environmental Site Assessment at area in Mendota, California preliminary to property purchase and construction of prison facility.

GE Capital Supply, Phase I ESA, National Contract. Conducted Phase I Environmental Site Assessment of facility on Lindbergh Avenue in Livermore, California preliminary to property purchase.

Nelcor Puritan Bennett, Phase I ESA, National Contract. Conducted Phase I Environmental Site Assessment at facility in Hayward preliminary to property purchase.

Rockwell Semiconductor, Phase I ESA, Santa Clara, California. Conducted Phase I Environmental Site Assessments at one facility in Santa Clara preliminary to Client vacating lease.

Valley Waste Management, Phase I ESA, Walnut Creek, California. Conducted Phase I Environmental Site Assessment at Walnut Creek facility as post LUST case closure investigation.

GROUNDWATER WELL CLOSURE

Apple Computer, Well Closures, California. Managed the closures, under permit from Napa County Department of Health Services, of three 35 foot deep groundwater monitoring wells at Apple's Napa Data Center at 2500 Corporate Drive in Napa.

City of Redwood City, Well Closures, Redwood City, California. Managed the well closure, under permit from San Mateo County Department of Health Services, of three 25 foot deep and three 45 foot deep groundwater monitoring wells at the Jefferson Street Parking Structure.

City of San Jose Redevelopment Agency, Well Closure, San Jose, California. Managed the well closures, under permit from SCVWD, of two 25 foot deep wells at San Jose Repertory Theater.

Santa Clara Valley Transportation Authority, Well Closures, San Jose, California. Under SCVWD permit, abandoned 6 groundwater monitoring wells at 1135 N. Mathilda as part of Moffett Spur Light Rail Project.

Santa Clara Valley Transportation Authority, Well Closures, San Jose, California. Closed 8 groundwater monitoring wells at Ron Cerone Bus Maintenance Facility under permit of SCVWD.

Waste Management of Alameda County, Well Closure, California. Managed the pump removal and well closure, under permit from Zone 7 Water District, of one 650 foot deep (i.e.; Newark Aquifer), old agricultural well at 3050 W. Winton Ave. in Hayward.

GEOTECHNICAL INVESTIGATION

Failure Analysis Associates, Palo Alto, California. Trained and supervised FAA personnel in conducting tracer test at private residence to determine direction of water penetration in shallow soils, using fluorescein dye.

Fantozzi Company of Cupertino, Geological and Geotechnical Investigation, California. Conducted field mapping, trenching, and borehole logging and generated geologic portions of report for Bay Area Teleport Facility, Niles Canyon.

Santa Clara Valley Transportation Authority, San Jose, California. Advanced soil boring to 85 feet depth at location of Evelyn Station Bridge Underpass to Joint Powers Board Rail Lines to determine hydrogeological and geotechnical considerations during construction.

Victory Outreach Church, Feasibility Study, San Jose, California. Conducted study, using Kirkee's Method, to determine if soils at Santa Clara County property had permeability suitable for construction of a septic tank and leach field.

WATER RESOURCES DEVELOPMENT

City of Palo Alto, Water Resources Development, Palo Alto, California. Managed installation of 10-inch diameter Duck Pond water supply well by mud rotary method to 220 feet deep. Conducted step-drawdown test, and constant discharge test at 80 gpm for 24 hours. Rated well and sized pump.

City of San Jose Redevelopment Agency, Water Resources Investigation, San Jose, California. Installed borings and performed slug tests at Lots 2 & 4 to estimate potential water infiltration during construction for subterranean portion of proposed parking garage.

City of San Jose Redevelopment Agency, Water Resources Development, San Jose, California. Conducted initial study of water availability and quality for industrial development site at Monterey Road and State Highway 85 in San Jose.

Cyprus Mines Corporation of Colorado, Water Resources Development, Bruno Creek, Idaho. Field mapping. Drilled 500 foot water supply production well. Conducted step-drawdown test, and constant discharge test at 4,000 gpm for 7 days. Monitored 11 observation points during pumping.

Cyprus Mines Corporation of Colorado, Water Resources Development, Thompson Creek, Idaho. Field mapping. Drilled to 1,300 feet and intersected molybdenite bearing quartz monzonite intrusive of Idaho Batholith. Conducted step-drawdown test, and constant discharge test at 150 gpm for 72 hours. Produced report on Water Supply Exploration Drilling Program - Thompson Creek Project (Idaho) - Buckskin Creek Area.

Cyprus Mines Corporation of Colorado, Water Resources Development, Idaho. Managed field office for Thompson Creek Project. Developed water supply for Crusherman Plant, Concentrator Plant, and 700 person man-camp. Man-camp water supply well rated at 250 gpm. Conducted geothermal research near Challis, Idaho.

Cyprus Mines Corporation of Colorado, Water Resources Development, Idaho. Conducted field mapping, drilling to depths of 700', aquifer testing and production of report titled "Groundwater Exploration Drilling and Testing Program - Thompson Creek Project, Bruno Creek Area."

Cyprus Mines Corporation of Colorado, Water Resources Development, Idaho. Conducted drilling of water supply production well to 1,178'. Conducted step drawdown and constant discharge test. Tested well at 4,000 gpm for eight days. Monitored 11 observation points during pumping. Produced report titled "Production Well No. 1 - Construction and Testing - Thompson Creek Project."

Department of Defense, North Muroc Hydrogeologic Study, Edwards Air Force Base, California. Supervised the borehole advancement and 3-well nested, stainless steel construction at two groundwater monitoring well locations at Edwards AFB northern boundary under DO-42. Total depth of each hole was 500 feet; both by mud rotary; one continuously sampled using wire line sampler.

Environmental Management Consultants, EIR, Monterey, California. Responsible for the hydrogeologic contribution to an EIR for Hilltop Properties in Watsonville, California.

Greegan & D'Angelo, Water Resources Investigation, Pleasanton, California. Produced hydrogeologic, groundwater supply assessment, and environmental contamination assessment portions of pre-purchase site assessment report for Hayes Valley.

San Jose State University, Water Resources Development, San Jose, California. Managed construction of 12-inch diameter potable water supply well by mud rotary method to 660 feet deep. Well is located on campus. Conducted step-drawdown test, and constant discharge test at 1,200 gpm for 24 hours. Interpreted borehole geophysical logs. Rated well and sized pump.

United Technologies Chemical Division, Water Resources Development, Coyote Facility, San Jose, California. Managed installation of 10-inch diameter, 200 gpm, fire control groundwater supply well by cable tool method to 150-foot deep. Conducted step-drawdown test, and constant discharge test at 150 gpm for 36 hours. Rated well and sized pump.

PROFESSIONAL MEMBERSHIPS

Groundwater Resources Association of California

PRESENTATIONS, PUBLICATIONS, AND AWARDS

Presentations

Seminar on Geotechnical and Geoenvironmental Exploration, San Jose, California, August 8, 1985. *Using Electrical Resistivity to Differentiate Zones of Varying Total Dissolved Solids (TDS) in Groundwater.*

Awards

National Science Foundation Grant, 1977. Received grant to conduct geothermal research in Nevada under the guidance of the United States Geological Survey (USGS) out of Menlo Park, California.

University of Wisconsin; Extension; Department of Engineering and Applied Science; Educational Achievement; Groundwater Quality Protection, March 22-24, 1982.

STEVEN P. CLAY — Senior Project Manager-CWM Safety Specialist

EDUCATION

B.S., Chemical Engineering
Certified Industrial hygienist
14 years of Industrial Hygiene experience
Certified Safety Professional
11 years as Project Manager
7 years experience on UXO/CWM Projects

Years Experience with Proposing Firm: 14 years of Industrial Hygiene consulting service, 11 years of Project Management experience, 7 years engineering consultant on UXO and CWM projects

Educational Information (Degrees, years of completion, and specialization):

- B.S., University of Tulsa, 1985, Chemical Engineering
- Graduate Studies, Oklahoma State University, 1985-86, Organic Chemistry

PROFESSIONAL TRAINING

Hazardous Waste Operations Site Health & Safety (40 hour course)
Hazardous Waste Operations Site Health & Safety Supervisor (8 hour course)
Chemical Protection Practical Use in Hazardous Waste Operations and Emergency Response
Occupational and Environmental Air Monitoring at Hazardous Waste Sites
Developing Site-Specific Safety and Health Plans for Hazardous Waste Site Operation
Fundamentals of Indoor Air Quality

Active Registration (Year First Registered & Discipline):

- Certified Industrial Hygienist (CIH), Certified in Comprehensive Practice, Certificate No. 5696, 12/92
- Certified Safety Professional (CSP), Certified in Comprehensive Practice, Certificate No. 15261, 01/98

Health & Safety Training (Course(s) & Date(s) of Completion):

- 8-Hour OSHA 29 CFR 1910.120(e)(4) Refresher – 06/98
- 40-Hour OSHA CFR 1910.120(e)(3) – 01/91 & 02/95

8-Hour Supervisor OSHA CFR 1910.120(e)(3) – 01/91 & 02/95

EXPERIENCE AND QUALIFICATIONS

Mr. Clay has 10 years of project management and technical services experience. Mr. Clay has been providing engineering project design and management for UXO and Chemical Warfare Materiel projects for over 5 years. He has been developing and enforcing site specific safety and health plans for ordnance/ explosive waste and chemical warfare material sites throughout the U.S. for 7 years. Mr. Clay performs direct project management for CWM and Ordnance projects. Responsibilities include management, planning, financial control, subcontractor management and coordination. Specific responsibilities include the management and technical design of UXO, demining, and CWM projects. Experienced in management and design of UXO/CWM programs (including Non-Stockpile Support Services, Small Burials, U.S. Army Corps of Engineers – Huntsville CONUS, and many confidential international client contracts).

Civilian Experience:

1999 - Present **Project Manager/ CWM Safety Specialist,** Earth Tech, Inc. Colton, CA. Provides project management, engineering design, and Health & Safety Program/Plan development for UXO and Chemical Warfare Materiel cleanup projects. Specific responsibilities include the management and technical design of UXO and CWM projects including planning, financial control, and coordination.

1992 - 1999 **Manager of Industrial Hygiene and Safety,** UXB International, Inc., Ashburn, VA. Provides engineering project management on all UXO and CWM projects requiring specialized control measures. Responsible for the direct management of Site Safety and Health Officers at all UXB OEW, CWM, or HTRW project sites. Responsibilities include management, planning, financial control, and coordination. Specific responsibilities include the management and technical design of UXO, demining, and CWM projects. Experienced in management and design of all UXB UXO/CWM programs (including Non-Stockpile Support Services, Small Burials, U.S. Army Corps of Engineers – Huntsville CONUS, and many confidential international client contracts). Position requires complete technical and management coordination of all of UXB's projects. Key interface between design and work prosecution. Provides technical guidance to the UXB President, senior management, and Technical Design Engineering Group regarding specialized control measures, industrial hygiene and health & safety issues.

The Senior Project Manager - Maui Technical Office - responsible for directing work activities as outlined in the contract and the associated task orders for UXO, historic preservation, construction, environmental operations and related actions. Duties include ensuring that the statement of work and the individual task orders and their inclusive project plans and specifications can be implemented within schedule and budget; recommending and justifying modifications; developing or modifying methods of tracking materials and resources; coordinating subcontractor work; and complying with health and safety procedures, the Regulatory Framework and Site Protection Plan requirements.

1990 - 1998 **Vice President, Senior Project Manager,** Clay, Sovich Environmental, Inc., Manassas, VA. Responsibilities include management, planning, financial control, and coordination of all aspects of Clay, Sovich Environmental (CSE). Specific responsibilities include the management and technical design of Environmental Remediation Projects, UXO, and CWM projects. A list of UXO & CWM projects is included in *Scientific And Technical Accomplishments*. Position requires complete technical and management coordination of all of CSE projects. Responsible for establishing corporate policy to include development and supervision of employee training programs. Responsible for the management of up to 20 projects simultaneously and all field personnel. As an environmental engineering consultant and project manager, developed remediation work plans and site-specific safety & health plans (SSHP), and Site Specific Health & Emergency Response Plans (SHERP) for varied site activities, such as ammunition plants, buried ordnance removal and chemical weapons removal. Also hazardous communication plans and hazardous waste disposal plans for individual sites and specialized conditions. Performed Phase I Environmental Assessments in Virginia and Texas. The assessments included review of National Priority List (NPL),

Comprehensive Environmental Response Compensation Liability Information System (CERCLIS), Toxic Release Inventory (TRI), Resource Conservation and Recovery Act (RCRA), Underground Storage Tank (UST), and Leaking Underground Storage Tank (LUST) records and state water control board files. Federal file information was confirmed by interviews with the U.S. Environmental Protection Agency (EPA) regional managers.

Performed asbestos building inspections and assessments for the Virginia Department of Transportation to the Virginia Museum of Fine Arts, to the Medical College of Virginia, as well as numerous commercial clients. The inspections were performed in strict compliance with all Federal (AHERA and National Emissions Standards Hazardous Air Pollutants (NESHAP)), state, and local requirements for projects requiring renovation, demolition, or refinancing.

Provided asbestos, lead, and polychlorinated biphenyl (PCB) abatements, including remediation design and oversight. Additional responsibilities included air monitoring and subsequent analysis, development of remediation specifications, as well as project coordination involving the building owner, the removal contractor, and other trades.

Provided indoor air quality assessments and assessment design and air testing, designed remediation action to alleviate harmful conditions. Projects ranged from military installations (Pentagon), schools, industrial, and commercial sites. Additional responsibilities included air monitoring and subsequent analysis, development of safety and health plans, as well as project coordination.

1988 - 1990 **Senior Environmental Engineer, Asbestos Division Manager,** Espey, Huston and Associates, Inc., Falls Church, VA. As division manager for the asbestos department, Provided management of 6 person department. Performed project management on all asbestos, lead, and PCB remediation and inspection projects on the east coast Responsibilities include management, planning, financial control, and coordination. Led asbestos survey project of 15 shopping centers throughout Virginia, Maryland, Pennsylvania, and New Jersey, involving approximately 5 million square feet, in three months. Developed abatement and orchestrated all abatement activities. Also performed oversight and air monitoring on a variety of abatement projects, ranging from manufacturing plants to retail stores.

1986 - 1988 **Project Manager,** Kaselaan & D'Angelo Associates, Inc., Haddon Heights, NJ. Performed asbestos survey for Massachusetts Bay Transit Authority on all buildings and subway tunnels, as well as performed survey of Gateway Towers in Pittsburgh, Pennsylvania. Performed abatement oversight on a long term project in St. Louis and started and managed the St. Louis Branch office. Responsibilities included management, planning, financial considerations, and coordination performing all inspections, conducting weekly meetings between the building owner and the abatement contractor, and ensuring compliance with all job specifications by the contractor.

Scientific and Technical Accomplishments

Safety Health and Environmental Response Plans/Site Specific Safety and Health Plans: Former Raritan Arsenal, New Jersey (Chemical Warfare and Munitions Clean-up); Twin Cities Army Ammunition Plant (Chemical Warfare and Munitions Clean-up); Spring Valley, Washington, D.C. (Chemical Warfare and Munitions Clean-up); Sioux Army Depot (Munitions Clean-up); Fort Ord, California (Munitions Clean-up); Camp Forrest (Munitions Clean-up); Former Morgan Depot, Sayreville, NJ (Munitions Clean-up); Camp Claybome (Munitions Clean-up); Baywood Park (Munitions Clean-up); Southwest Proving Grounds (Munitions Clean-up); Tooelle Army Depot (Munitions Clean-up); Umatilla Army Depot (Munitions Clean-up); Former Black Hills Arsenal (Chemical Warfare and Munitions Clean-up); Rocky Mountain Arsenal (Munitions Clean-up); Fort Wingate (Munitions Clean-up); Castner Range at Fort Bliss (Munitions Clean-up); Radford Army Ammunition Plant (Ammonia Tank Clean-up), Jefferson Proving Ground (Munitions Clean-up), Former Ogden Depot, Ogden, UT (Chemical Warfare and Munitions), Bellows AFS, Oahu, HI (Munitions Clean-up), Deseret Chemical Depot (Ton Container Testing), Pine Bluff Arsenal (Ton Container Testing)

GREGORY J. PETERSON — OE Safety Manager

CAREER OBJECTIVE: UXO Program Management, with an aggressive company involved with UXO Recovery, Demolition Operations and, or training individuals to conduct such operations.

Proven leader, with outstanding supervisory, and managerial, skills.
Problem solver, who works very well under pressure.
Team builder, and team player with great communication ability.

EDUCATION

Evaluated, 90 Credit Hours at various Colleges and Military experience by New York Regencies University External Degree Program, 1995
Senior Leadership Training in TQL, July 1993
Graduate, Naval Instructor Training, 4 Sep 1981
Navy Leadership/Management Education and Training, August 1981
Naval Instructor Training/Curriculum Development Course, July 1981
Graduate, Basic EOD School, 22 Jul 1977
Navy EOD Course Phase II, Land/Underwater Ordnance, July 1977
Explosive Ordnance Technologists, 1977, Charles County Community College, La Plata MD
Graduate, Second Class Dive School, Feb 1975
EOD Course Phase I, Chemical/Biological Weapons, July 1976
Graduate, Lake Crystal High School, Lake Crystal, MN 56055

HEALTH AND SAFETY TRAINING

All safety training has been on the job, Mr. Peterson served as Safety Officer at the command level for 8.5 years, managing Command Safety Programs.
Medic First Aid/CPR, June 1997
40-hour OSHA HAZWOPER course (29 CFR 1910.120), June 1997
8-hour OSHA HAZWOPER course, June 1998
8-hour OSHA HAZWOPER Supervisor course June 1998
CPR 1 First Aid current though June 1999

EXPERIENCE AND ACCOMPLISHMENTS

MILITARY:

May 1996 - May 1997: Operations Officer/COMEODGRU ONE
April 1994 - April 1996: Readiness/Training Officer/COMEODGRU ONE
April 1992 - March 1994: Executive Officer/EODTEU ONE
June 1989 - April 1992: Operational/Readiness Officer/COMEODGRU TWO
November 1985 - June 1989: Officer in Charge/EODGRU TWO DET BERMUDA
November 1983 - October 1985: Curriculum Standards Dept Head/EODTEU ONE
October 1982 - November 1983: Officer in Charge/shipboard unit/EODMU ONE
September 1981 - June 1982: EOD instructor/NAVSCOLEOD
May 1979 - July 1981: Leading Petty Officer/EODGRU TWO DET GTMO BAY CUBA
July 1977 - May 1979: Reported to COMEODGRU TWO from NAVSCOLEOD

PROFESSIONAL SUMMARY

Mr. Peterson graduated from Naval School Explosive Ordnance Disposal and has amassed 22.7 years of well rounded experience in all areas of EOD/UXO clearance and demolition range operations at the field and management levels. He has 2.7 years of civilian UXO experience in team supervision and program management and 20 years of experience in military EOD programs. He has 3 years of military field experience as a Senior EOD Technician directly supervising EOD teams, over 5 years of hands on range operations experience performing UXO operations, and 8 of his 14 years as a Master EOD Technician have been spent directly supervising complex, multi team EOD/UXO operations from priming the shot to managing complete projects. This experience includes all aspects of; planning, logistics supervision, safety, training, and execution of operations with a perfect safety record. Mr. Peterson has never been removed from an EOD/UXO position for unsatisfactory performance, safety reliability, personal reliability, or cause of any kind. His background provides expertise in:

SUMMARY OF QUALIFICATIONS: 2.7 years of civilian UXO experience in team supervision/program management, and 25 years of distinguished Naval service. Ten enlisted and fifteen as a Naval Officer achieving the rank of Lieutenant Commander. Twenty of those years have been spent working in the field of Explosive Ordnance Disposal(EOD) in a wide variety of positions from, Team Member, Demolition Range Safety Supervisor, Diving Supervisor, Free Fall Jump Master and Instructor, EOD Instructor for U.S. and foreign students, Officer in Charge of Shipboard and Shore Detachments, Quality Control and Safety Officer for all east coast EOD assets, Executive Officer of an EOD Training Unit, Quality Control and Operations Officer for all west coast EOD assets.

- Present: Ordnance Explosives Tech. Director, Earth Tech Inc.
- Logistics and transportation of personnel, material and equipment to include, explosives, fuels, vehicles, and boats throughout the U.S. and remote overseas locations to conduct EOD/UXO operations during fleet wide exercises and contractor job sites.
- The planning, execution and control of all Pacific Fleet EOD/UXO range activity to include; detection, clearance, disposal, and training for operations, and fleet wide exercises.
- The direct management/supervision of large numbers of personnel and multiple subordinate commands assigned to both Atlantic and Pacific Fleet EOD forces.
- Years of experience managing Command Safety Programs, to include Explosive Safety, and Quality Control Programs used to monitor EOD/UXO training and operations at the Command and Group levels.
- Five years of direct explosive allowance management, magazine management, and transportation and storage of UXO recovered during off base UXO responses.

PROJECTS HIGHLIGHTING HIS EXPERIENCE ARE LISTED BELOW

CIVILIAN:

- **Earth Tech Inc. 1999 to present:** Ordnance/Explosive Technical Director.
- **American Technologies Inc. OES Division (1998/1999):** UXO Team Leader. Working as a Team Leader on the Ft. Irwin range clearance project.

- **BioGenesis Pacific Inc. (1997):** Mr. Peterson was hired to develop, organize and manage a UXO capability for BPI for the purpose of conducting UXO operations in support of a USAF bombing range clearance operation. This contract was completed on time and with a 4.0 USAF approval rating, on a 4.0 scale. This project required the surface clearance of 2,600 acres of bombing range target area. During this clearance over 15,000 dud ordnance items were safely disposed of on site, and over 500 ton of ordnance/target scrap was gathered, inspected, certified safe to ship, and removed from the range. Mr. Peterson conducted this project with a team of 8 UXO personnel, 2 Equipment Operators, 16 Range Techs., and 1 on site field Office Manager.

- **Human Factors Applications, Inc. (1997):** As a UXO Team Leader, Conducted UXO remediation of several former ordnance impact areas for the U.S. Navy at NAS Miramar to clear the way for the construction of new facilities. This project included surface and subsurface remediation action.

- **Lockheed Martian Idaho Tech Co. (1997):** As UXO Team Leader Mr. Peterson was responsible for the health and safety of a six person team engaged in UXO remediation of several former explosive test sites located at the Idaho National Engineering laboratory. Using a systematic grid layout with visual and geophysical searches we safely removed live UXO rounds and several hundred pounds of bulk high explosives.

MILITARY:

- **Explosive Ordnance Disposal Group ONE (1996-1997):** Mr. Peterson was hand selected to serve as Staff Operations Officer to re-organize the department, and the overall deployment strategy for Pacific Fleet EOD. He directed the employment of 34, 7 man EOD Detachments, and 8 subordinate commands to cover all EOD/UXO requirements for the Pacific Fleet. Coordinated and managed Pacific Fleet EOD participation in five fleet level training exercises, to include the management of all logistics, (movement of large numbers of personnel, several short tons of equipment and managed exercise re-supply by sea and air), and provided Quality Control personnel to evaluate EOD performance during the course of each drill during exercises.

- **Explosive Ordnance Disposal Group ONE (1994-1996):** As Assistant Chief inspector Mr. Peterson was directly responsible for the administration of Pacific Fleet EOD Training/Readiness, and Administrative Quality Control programs. As Officer in Charge of 8 Quality Control Evaluators, he monitored the Readiness/Training and administrative effectiveness of 8 subordinate commands and their detachments in the following areas; Command Safety Program, Hazardous Material Handling/Stowage Program, Ammunition/Explosives Handling and Certification Program, Personnel/Physical Security Programs, all Supply and Material Records, and all Vehicle/Material Maintenance Records were reviewed. At the completion of each review Mr. Peterson would draft a formal report to COMEODGRU ONE outlining the findings, and recommend a course of action to correct any deficiencies found. He also, coordinated and facilitated all of the Commanders' staff level meetings, and the Chief of Naval Operations sponsored Executive Steering Committee meetings, maintaining the minutes, and drafting required correspondence.

- **Explosive Ordnance Disposal Training and Evaluation ONE (1992-1994):** As the Executive Officer Mr. Peterson was responsible for all command administrative functions, financial/materiel management of over $3.5m in funds equipment annually, management of 52 personnel, (38 EOD Technicians and 13 support personnel), Director of the commands NAVOSH and Explosive Safety programs, passing all fleet level and navy wide inspections with a perfect score. Directly responsible for the Quality Control of all Pacific Fleet advanced training during his tour to include; 1484 diving

- **Explosive Ordnance Disposal Training and Evaluation ONE (1992-1994):** cont. operations, 74 demolition operations using live explosives, and 1843 premeditated parachute jumps, with a perfect safety record, while providing advanced EOD training to 34 (seven man) EOD Detachments. Managed the implementation of a High Risk Safety Training Program throughout the commands

training curricula, greatly improving the safety factor for students as well as instructors and supervised the development of four new training curriculums which greatly improved EODs ability to respond and support the fleet.

- **Explosive Ordnance Disposal Group TWO (1989-1992):** Mr. Peterson, as the Quality Control Advisor to the Commander, directed operations involving the location, neutralization, render safe, and exploitation of U.S. and foreign nuclear, chemical, conventional ordnance, demolition, dive, and parachute operations for the propose of evaluating the ability of Atlantic Fleet EOD units to safely and successfully conduct EOD/UXO range operations. He also, developed special chemical weapons briefings for all Atlantic Fleet EOD personnel preparing for EOD/UXO operations during Desert Shield, and was responsible for developing numerous underwater ordnance clean up contingency plans for strategic harbors in support of Desert Storm. Served as EODGRU TWO Atlantic Fleet Safety Officer. During his tour, EODGRU TWO and all subordinate commands had perfect safety records, and passed all NAVOSH inspections with zero discrepancies.

- **Explosive Ordnance Disposal Group TWO Detachment Bermuda (1985-1989):** Provided emergency and routine diving, demolition, and UXO render safe services to NATO military forces. As detachment Safety Officer, Mr. Peterson developed, implemented, and managed a NAVOSH program involving surface and underwater explosive operations, diving operations, air operations; small arms training, ammunition and explosives use. Detachment Dive and Demolition Supervisor. Conducted monthly demolition operations for the Bermuda Regiment and the U.S. Marine Corns Marine Barracks Company and, provided the same units advanced demolition training.

- **AGMJ4C U.S. Navy Target Drone Recovery Project 1986:** Mr. Peterson, as Officer in Charge of the project, recovered four drones at a cost savings to the Government of over 800,000 dollars. The drones were lost on the target range at NAS Roosevelt Roads, PR and were recovered as they passed by the island of Bermuda in the gulf stream. He accomplished this by providing numerous training and identification lectures to the islands main fishing fleet. This proved to be very successful as three of the four drones were sighted and reported to the U.S. Navy by the fleet.

- **Explosive Ordnance Disposal Training and Evaluation Unit ONE (1983-1985):** As curriculum Instructional Standards Dept. Head Mr. Peterson was responsible for all curriculum development and maintenance, also he implemented/managed a Quality Control program that allowed the command to ensure its instructors were properly trained and instructional output was maintained at a quantifiable level throughout the command. Command Physical and Personnel Security Officer and Safety Officer.

- **Explosive Ordnance Disposal Mobile Unit ONE. Detachment USS MOUNT HOOD (1982-1983):** During this period, Mr. Peterson was Officer in Charge of the detachment where he directly provided and performed crisis and routine diving, demolition and render safe services support to U.S. and Allied military forces, and civil government agencies.

- **WWII UXO Recover Project for the U.S. Trust Territories 1982:** Mr. Peterson, as Officer in Charge, developed Standard Operating Procedures that enabled himself, his detachment, and 15 non EOD personnel to remove over 4 tons of Japanese WWII UXO from various Southern Pacific Islands. This was extremely dangerous as 80% of the ordnance was armed and approximately the same percentage was exuding picric acid. This project was completed under very remote conditions without incident. Detachment Dive and Demolition Range Control Officer.

- **Makua Impact Area Target Renovation and Demolition Operations Project (1982-1983):** As Demolition Range Control Officer, Mr. Peterson was responsible for all operations on the range to include; transport of personnel, equipment, and explosives to and from the impact area, training of all personnel on the range, control of all demolition operations on the range, and responsible for over all safety of the operation. The project consisted of conducting UXO recovery and routine demolition

operations monthly at Makua impact area to maintain impact target area sanitation, and to conduct command demolition operations for both training, and disposal of retrograde ordnance.

- **Masirah Beach Head Logistic Project for Battle Group Operations (1983):** Mr. Peterson volunteered to assist the USS MOUNT HOOD as Officer in Charge of the Masirah Beach Head Logistic operation. He was responsible for ensuring the smooth and on-time movement of passengers, mail, and cargo between the air head site, Diego Garcia, and the two carrier battle groups that the USS MOUNT HOOD was primary support platform for. As a result of Mr. Peterson's outstanding performance, a beach head detachment of 29 personnel, and 4 heavy forklifts, off loaded seventeen C141 cargo aircraft, setting impressive cargo handling records, safely, and without incident.

- **Special Operations Project NORPAC Operations (1983):** Mr. Peterson and his detachment were hand selected for this, at the time, highly classified project due to the detachment's outstanding reputation and their above average physical conditioning. Long hours were spent, just days after completing a 6-month deployment, preparing for this project. It was necessary for the detachment to spend long hours in briefing rooms, and equal time was spent training for rough water boat operations. This project required that Mr. Peterson's detachment be ready to launch its boat on 5 minutes notification 24 hours a day in extremely hazardous conditions in the Northern Pacific and Arctic Oceans. Mr. Peterson prepared the detachment well as they were very successful in their mission, and conducted several launch, and recoveries in heavy seas without incident to personnel or equipment. They also, recovered several free floating objects from the oceans that were very beneficial to the U.S. intelligence community.

- **Naval School Explosive Ordnance Disposal (1981-1982):** In this position Mr. Peterson served as a Basic EOD Instructor responsible for classroom and practical instruction in; aircraft hazards (cads, carts, injection seats); bombs and bomb fuses, (foreign and domestic); and missiles, (foreign and domestic). Directed classes of 25 personnel in classroom instruction and field operations, and was directly responsible for their safety while on the range using explosive render safe procedures during practical exercises.

- **Explosive Ordnance Disposal Group TWO Detachment Guantanamo Bay Cuba (1979-1981):** During this tour Mr. Peterson was responsible for unit training, demolition, and range recovery operations. He was directly responsible for and destroyed over 39 tons of live anti tank and anti personnel mines during mine field maintenance operations, and 120 tons of UXO during maintenance and upkeep operations on 7 major ordnance impact areas. As demolition supervisor he was responsible for the direction of all range operations at the detachment and supervision of 3 EOD personnel and up to 10 minefield maintenance personnel from the Marine Corns at any given time. Personnel on many occasions were divided into multi teams of two to cover different ranges and target areas. On the average, 3 days a week were spent on the ranges, and he responded for another four or five calls per week for misfires on the Law Rocket, Hand Grenade and Mortar Ranges. Mr. Peterson was also the detachments Ammunition and Explosive Manager, responsible for the safe stowage, transportation, and security of all detachment's ammunition, explosives, and retrograde ordnance.

- **GTMO 20MM Ammunition Range Remediation Project (1981):** Mr. Peterson acted as the Range Control Officer and was responsible for remediation of the 20MM demolition range at GTMO. During the course of this project over 50,000 rounds

- **GTMO 20MM Ammunition Range Remediation Project (1981) cont:** of live 20MM ammunition were recovered from a 5 acre area, and safely disposed of properly without incident.

- **GTMO Hazardous Material Neutralization Project (1980):** On this project Mr. Peterson acted as Safety Officer during the neutralization of 2,300 pounds of industrial chemicals. The operation was meticulously planned, and conducted safely without incident.

- **GTMO Anti Tank Armed Fuze Removal Project 1979:** As Range Safety Officer, and Project Manager, Mr. Peterson developed a procedure that would allow the remote removal of 25 armed anti tank fuzes via a modified tape and line procedure. The removal was at the request of an Explosive Safety Review Board. After removal the fuzes were tested for deterioration because of prolonged field application in the mine fields at the Guantanamo Naval Base. This project was initiated after a fuze that was armed for many years detonated as it was turned to the safe position by Mine Field Maintenance Personnel. This project was completed without incident.

- **Explosive Ordnance Disposal Group TWO (1977-1979):** Reported from Naval School Explosive Ordnance Disposal July 1977. Mr. Peterson served as a shipboard detachment Leading Petty Officer providing and performing crisis and routine diving, demolition and render safe services support to U.S. and Allied military forces, and civil government agencies.

- **Putnam FL. Bombing Range Clearance Project (1977-1978):** As an EOD Team Leader, Mr. Peterson was involved on a project where 120,000 ordnance items were removed and 150,000 cubic yards of earth stripped sanitized and replaced to successfully complete the surface and subsurface UXO clearance to a depth of 18 inches. This operation was conducted without incident.

- **Fort Manroe Inner Moat Clearance Project (1978):** As an EOD Team Leader, Mr. Peterson assisted in the UXO clearance of the inner moat surrounding the old fort at Fort Monroe, Va. Over 22,000 UXO items were recovered safely in harsh working conditions, without incident.

- **Dam Neck Lake Clearance Project 1978:** EOD Team Leader, and Project Explosive Manager, responsible for the safe stowage, transportation, and security of explosives, and retrograde ordnance. 10,000 ordnance items were safely removed, stored, and later properly destroyed.

- **As a Member of the Mobile Team at COMEODGRU TWO 1977:** Provided services to the Marine Corps as a Demolition Range Safety Officer for beach landing operations, routinely supervising from 60 to 100 Marines, both officer, and enlisted during monthly training operations at Little Creek Va. During this operation Mr. Peterson was responsible for planting demolition charges at various intervals on a given landing area, and using controlled detonation of the charges to add realism, as the Marine Corns conducted beach landings. All operations were conducted safely and without incident.

ROBERT M. POLL, C.I.H, C.S.P. — Western Region Health and Safety Manager

EDUCATION

B.S., Nuclear Engineering, Rensselaer Polytechnic Institute, New York, 1985

REGISTRATIONS/ACCREDITATIONS

Certified Industrial Hygienist, 1993, #6017
Certified Safety Professional, 1994, #12314

TECHNICAL TRAINING

Applied Health Physics, Oakridge Associated Universities, May 87
Bioenvironmental Engineering School, Brooks AFB, TX, March to June 1986
40-hour Hazardous Waste Operations,
8-hour Hazardous Waste Operations Supervisor Training
8-hour Hazardous Waste Operations Refresher Training
Instructor for OSHA 40-hour, 8-hour Supervisor Training and 8-hour Refresher Training
First Aid and CPR Training

PROFESSIONAL SUMMARY

Mr. Poll manages Health and Safety Services for the Western Region of Earth Tech's Consulting Engineering practice. In this capacity, he is responsible for providing industrial hygiene and indoor air quality consulting services, development and presentation of hazardous materials and safety training programs, management of Earth Tech Health and Safety Programs, and review and approval of project health and safety plans and procedures. He provides these services for both public sector and commercial clients.

Prior to joining Earth Tech, Mr. Poll served as a project manager for an environmental consulting firm, where he was responsible for various air pollution monitoring and permitting activities for a variety of clients. Mr. Poll also served for 4 years as a Bioenvironmental Engineer in the U.S. Air Force, where his duties involved the management of a comprehensive base industrial hygiene program and participation in the coordination of base environmental activities.

PROJECT EXPERIENCE

- **Health & Safety Program for Site Investigations, Edwards AFB, California.** Developed and implemented a comprehensive health and safety program to meet stringent requirements imposed by the U.S. Air Force. Areas addressed included health and safety aspects related to exposure to a wide variety of petroleum-based fuels, chlorinated solvents, heavy metals, and rocket fuels. Tasks covered in this program include drilling, trenching and excavating, tank removal, contaminant sampling, and soil vapor studies. Areas of evaluation include landfills and flightline areas. Responsible for oversight and audit.

- **Health & Safety Program for Treatability Study, Norton AFB, California.** Responsible for management of the health and safety program implemented during a treatability study at Norton AFB involving groundwater contaminated with chlorinated solvents. Scope of work addressed in the program included installation of groundwater intake wells and return wells, installation of a treatment system (including site construction activities), system start-up and testing, and monitoring well installation to evaluate system effectiveness. Safety issues encountered included chemical exposure, electrical safety, trenching and shoring, use of cranes and other overhead hazards, and confined space entry.

- **Health & Safety Issues, Environmental Assessments (EAs), Federal Government.** These projects involve analysis and risk assessment for health and safety, and air quality issues created by proposed aerospace research and development programs. Projects include U.S. Army Kwajalein Atoll Extended Test Range EA; U.S. Army, Kawaii Test Facility, Mountain Top EA; Theater Missile Defense Extended Test Range EIS (programmatic).

- **Industrial Hygiene Investigations. Federal Aviation Administration Facilities, Southwest Region.** Serve as Principal Industrial Hygienist for the Occupational Safety and Health Assessment Program (OSHCAP) conducted on behalf of the Federal Aviation Administration. Under OSHCAP, an assessment of all FAA facilities in the Southwest Region is being accomplished to determine compliance with federal, state and local occupational safety and health regulations. Instances of non-compliance are identified, and suggested corrective actions and resource impacts are provided.

- **Health & Safety Plan for Site Remediation, Former Refinery, Carson, California.** Reviewed and modified existing Health and Safety Plan to meet updated regulatory requirements related to remediation of existing site contamination. Plan as finalized addresses all aspects of chemical and construction safety to be encountered during soil excavation, treatment, and restoration of a 70+-acre former refinery site. Managed the team responsible for providing on-site health and safety oversight of all operations and several dozen personnel to ensure compliance with regulatory requirements and plan specifications.

- **Safety Expert, UST project.** Served as safety expert for a project involving removal and site investigation of more than 40 underground storage tanks containing a variety of fuels and organic solvents.

- **Health Investigation, Commercial Client.** Conducted an investigation of a workplace where employees reported unusual illnesses. Workers attributed these problems to the workspace. The investigation examined relevant air quality, microbial and physical parameters, and established that the cause of the health problems could not be attributed to the workspace.

- **Health & Safety Issues for Joint DOE/U.S. Air Force EIS.** Served as Health and Safety Principal Investigator on a $500,000 EIS supporting testing of Space Nuclear Thermal Propulsion equipment. This support consisted primarily of analyzing the potential radiological hazards associated with operational and accident-case releases from an experimental nuclear reactor system, and transportation of nuclear materials.

- **Health & Safety Expert, DOD Missile Launch Programs (ASAT, ERINT) EISs/EAs.** Served as expert on health and safety, hazardous materials, and air quality for a variety of EISs/EAs. Responsible for evaluation and documentation of health and safety problems associated with these programs, assessment of air quality impacts, and evaluations of hazardous materials/hazardous waste streams. Special considerations included risk determinations created by transport and use of rocket fuels (solid and liquid), and examination of pre-launch build-up and preparation of launch and payload vehicles.

- **Health & Safety Plans for Geophysical Investigations, Metro Rail Project, Los Angeles, California.** Developed health and safety plans for all phases of Earth Tech's Metro Rail support operations. Plans addressed specific issues related to health and safety during drilling and other geophysical investigations that occurred in contaminated or potentially contaminated soils. Responsible for ensuring proper implementation of plan requirements and institution of audits as necessary to document field procedure compliance.

- **Industrial Hygiene Evaluation, Commercial Client.** Managed three people in a comprehensive industrial hygiene evaluation of a sporting equipment manufacturing plant. Evaluation included identification of all potential worker health hazards, personal exposure sampling, engineering control equipment evaluation, noise exposure assessment, and establishment of a worker lead exposure prevention program (complete with medical examination).

- **EA Issues Analysis, Space Launch Program.** Responsible for air quality, hazardous waste, and health and safety issues analysis during the preparation of the EA for the Medium Launch Vehicle III (MLV III). This document was used to support selection decisions for this next-generation space launch program.

- **Health & Safety Program, DOE Research Site, Davis, California.** Served as Health and Safety Manager for project involving decontamination and decommissioning of facilities contaminated with a wide variety of radionuclides; excavation and cleanup of abandoned radioactive and chemical waste disposal sites; and investigation and cleanup of groundwater. Responsibilities encompassed all aspects of radiological and chemical monitoring and safety, dosimetry, radiological survey and decontamination procedures, and risk assessment.

- **Health & Safety Field Procedures, Port Hueneme, California.** Developed health and safety field procedures for implementation during site investigation operations at Port Hueneme Naval Station. Investigations included both drilling and excavation operations at a landfill site where various military agents, including defoliant agents and fuels, had been buried. Due to the potentially hazardous nature of the site contaminants, field operations were possible only through the use of supplied-air respiratory protection and stringent protective clothing requirements.

- **Health & Safety Program Management Support for Various Commercial Clients.** Union Carbide, Texaco (various sites), Manville Sales Corporation, Plessey Microsciences, May Centers, Century Pipeline, Glenville Landfill, McFarland-Delano Landfill, Mitsubishi Motors, Calabassas Landfill, U.S. Gypsum, Alpha Therapeutics, ARCO, Chevron, Lyndell Petrochemical.

EMPLOYMENT HISTORY

1990-present	Earth Tech, Health and Safety Manager
1989-1990	TRC Environmental Consultants, Inc., Environmental Engineer
1985-1989	U.S. Air Force, Vandenberg Air Force Base, Bioenvironmental Engineer

PROFESSIONAL ORGANIZATIONS

Air and Waste Management Association
American Academy of Industrial Hygiene
American Board of Industrial Hygiene
American Conference of Governmental Industrial Hygienists
American Industrial Hygiene Association
American Society of Safety Engineers
Health and Physics Society

CITIZENSHIP

United States

SECURITY CLEARANCE

Secret

JOHNATHAN R. MOORE, CSP — Health and Safety Professional

EDUCATION

Bioenvironmental Engineering, Brooks Air Force Base, Texas, School of Aerospace Medicine, 1985

REGISTRATIONS/CERTIFICATIONS

Certified Safety Professional, 1994, #13037

TECHNICAL TRAINING

40-Hour Hazardous Waste Operations and Emergency Response (29 CFR 1910.120), 1989
Supervisor, Hazardous Waste Operations and Emergency Response, (29 CFR 1910.120), 1990
Permit-Required Confined Spaces (29 CFR 1910.146), 1993

PROFESSIONAL SUMMARY

Johnathan Moore has more than 12 years of experience providing industrial hygiene and environmental health and safety oversight for government and commercial programs. Mr. Moore served in the United States Air Force as a Bioenvironmental Engineering Specialist in which he was responsible for pollution prevention evaluations, industrial hygiene assessments, waste management programs and hazardous waste emergency response activities. While at Earth Tech, Mr. Moore is responsible for environmental health and safety support for remedial investigation activities and large-scale remediation projects. Additionally, Mr. Moore is responsible for providing environmental and health and safety consulting services to commercial and governmental clients.

PROFESSIONAL EXPERIENCE

- **Lockheed Burbank B-1 Plant Remedial Construction, Burbank, California.** Project Safety/Waste Management Manager for fast-track project to design, construct, and operate a large 6,000-scfm soil vapor extraction (SVE) system for site cleanup. A unique aspect of this construction project is that Earth Tech is building the SVE system almost entirely underground to accommodate future development efforts at the site. Subsurface components include: approximately 10 miles of pipe for the vents and connecting manifolds, six complex subterranean vaults for the remote control and utility rooms, several slant vents, and associated utilities. Safety and health issues addressed at the site include construction activities for a large-scale SVE treatment system, residual surface and subsurface contaminants, and management of multi-contractor work operations.

- **Former Golden Eagle Refinery Remediation Project, LASMO Oil and Gas, Inc., Carson, California.** Provided health and safety/industrial hygiene and waste management services during the former Golden Eagle Refinery remediation project involving the excavation, removal, bioremediation, vapor-extraction and replacement of more than 1,000,000 cubic yards of hydrocarbon-contaminated soil. Work activities were conducted in environments exceeding IDLH conditions. Comprehensive involvement included project health and safety oversight for all employees, subcontractor, and regulatory personnel and operations during all work phases (excavations, dust suppression [development and implementation of SCAQMD Rule 403 Fugitive Dust Emissions Control Plan], waste hauling, confined space entry, underground storage tank removals, well installation, development, testing and sampling, import soils placement, treatment cell construction, vapor extraction line installation, etc.). Served as project industrial hygienist managing air monitoring program to assess personal and perimeter airborne contaminant levels. Due to the nature of the hazards and the close proximity of offsite public housing, successfully administered controls for reducing offsite emissions of hydrogen sulfide and sulfur dioxide that were being generated during intrusive site characterization activities. Served as a direct liaison between regulatory agencies, project personnel, and the surrounding community.

- **Health and Safety Support, RI/FS, Remedial Design, and Remedial Construction, Johns-Manville Plant Site, California.** Provided industrial hygiene/health and safety oversight during a RI/FS, design, and construction management project for excavation, removal, and replacement of more than 100,000 cubic yards of asbestos-contaminated soils and debris at a state Superfund site. Project included clearing and grubbing, excavating erosion, and dust control; removal of asbestos and calcium silicate containing soils; import and topsoil placement; lining and grading operations; personnel and equipment area design and construction; confined space entry; well development and sampling; and UST removal. Performed personnel and perimeter air monitoring and analyzed meteorologic data.

- **Asbestos-contaminated Soils Remediation, Manville Sales Corporation, Carson, California.** Project involved RI/FS, RAP, remedial design, and construction management for excavation, removal, and replacement of more than 100,000 cubic yards of contaminated soil and waste. Performed oversight for project health and safety including clearing and grubbing, excavation, erosion, and dust control; removal of asbestos and calcium silicate-containing soils and debris; import and topsoil placement; lining and grading operations; personnel and equipment area design and construction; confined space entry; well development and sampling; and underground storage tank removal. Industrial hygiene responsibilities included performance of personnel and perimeter air monitoring and analysis of meteorologic data. Approximately 1,600 air samples were collected during this remediation to evaluate offsite airborne asbestos concentrations.

- **McColl Site Characterization, G.P.I./U.S. E.P.A., McColl California State Superfund Site, Fullerton, California.** Provided industrial hygiene/health and safety and technical support during characterization of a California State Superfund site contaminated with various jet fuel refinery wastes. Performed industrial hygiene, health and safety, and work activities in environments exceeding IDLH conditions. Due to the nature of the hazards and the close proximity of offsite public housing, successfully administered controls for reducing offsite emissions of hydrogen sulfide and sulfur dioxide which were being generated during intrusive site characterization activities.

- **RI/FS, U.S. Air Force Center for Environmental Excellence, Edwards AFB, California.** Project involved RI/FS and removal of approximately 200 underground fuel storage tanks containing a variety of conventional and exotic fuels, including hypergolic rocket fuels presenting imminent exposure hazards to personnel located throughout the Air Force Flight Test Control Area (AFFTC). Provided Industrial Hygiene support by developing and implementing health and safety practices and procedures to be used during all phases of site investigations. Acted as direct liaison between Base Medical/Occupational Health Authorities and corporate offices. Predicted potential occupational exposures to numerous airborne contaminants and developed and implemented appropriate industrial hygiene monitoring program to evaluate employee exposures. On-site guidance and management resulted in zero accidents during the completion of all removal operations.

- **Sewage Treatment Facility Monitoring, U.S. Air Force, R.A.F. Bentwaters, United Kingdom.** Involved in the detection and evaluation of wastewater effluent from a sewer treatment facility. Supervised the monthly monitoring of sewer treatment facility effluents. Performed visual inspections of sewer treatment facility as well as collecting 24-hour composite samples of effluents using an ISCO wastewater composite sampler. Prepared various effluent samples for analysis at a local laboratory. Conducted trend analysis of sample results and input data into a computer data management system.

- **Emergency Water Supply Monitoring, U.S. Air Force, R.A.F. Bentwaters, United Kingdom.** Conducted weekly inspection of on-base emergency water supply storage facilities. Verified the integrity of existing protective measures constructed to prevent possible water supply contamination. Performed monthly sampling of the water supply system using grab sample techniques. Prepared and shipped samples for analysis to USAF/OEHL Weisbaden Air Base, Germany.

- **Oil and Water Separator Surveys, U.S. Air Force, R.A.F. Bentwaters, United Kingdom.** Responsible for performing monthly visual inspections and necessary monitoring of base oil and water separators for contaminants such as waste jet fuels, hydraulic fluids, and oils. Collected samples of separator effluent using an ISCO waste water composite sampler to track times of contaminant introduction into the drainage system.

PROFESSIONAL ORGANIZATIONS

American Industrial Hygiene Association
American Conference of Governmental Industrial Hygienists
Board of Certified Safety Professionals

PREVIOUS EMPLOYERS

Clayton Environmental Consultants, Associate Industrial Hygienist, 12/88 - 8/89
U.S. Air Force, Bioenvironmental Engineering Specialist, 11/84 - 11/88

CITIZENSHIP

U.S.A.

OFFICE LOCATION

Long Beach, California

GENERAL SAFETY RULES FOR CONTRACTORS

Introduction

The rules and requirements contained in this attachment have been written for the guidance of Contractors who are performing work under contract with Earth Tech. This booklet prescribes general requirements. Additional specific rules may be necessary to ensure the safety of workers on a particular job. The Contractor, working in collaboration with the Earth Tech representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with all Earth Tech, regulatory, and insurance requirements and those of our clients. Earth Tech health and safety professionals are available to assist.

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

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

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

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

General Safety Rules and Requirements

Accident Reporting

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

Alcohol, Firearms, etc.

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

Approvals

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

- Working on existing pipelines or equipment
- Entering tanks or closed vessels
- Entering any designated high-hazard areas
- Using torches, electrodes, electronic motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source
- Closing walkways, roads, or restricting traffic
- Starting excavations
- Removing tanks from excavations
- Backfilling excavations
- Using utilities such as steam, water, compressed air, or electricity
- Sandblasting, spray painting, or guniting
- Storing flammable materials such as gasoline, oil, paints, oxygen cylinders, etc.
- Walking or working on roofs of buildings or equipment
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces
- Operating cranes or similar equipment near overhead power lines or pipelines
- Opening cutting through firewalls or berms
- Fueling or repairing Contractor operating equipment on Earth Tech property or job sites.

Security

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

Speed Limits

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

Vehicle Safety

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

Safe Work Practices

Communication

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

Confined Space Entry

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

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

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

Isolation. All input lines which discharged into the confined space shall be disconnected and capped or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited. However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable provided that dangerous air contaminants are not introduced by such venting. Isolation valves shall be locked closed, vent or drain valves shall be locked open, and the key shall be kept by that person performing the job.

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

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

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

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

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

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

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

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

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

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

Compressed Gas Cylinders

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

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

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

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

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

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

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

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

Cranes, Hoists, and Other Heavy Equipment

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

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

Cutting or Welding

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

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

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

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Earth Tech Representative.
- Contractor shall provide his own calibrated combustible gas meter or other instruments for checking areas before hot work.
- Documentation of calibration shall be submitted to the Earth Tech Representative for review by the Earth Tech Health and Safety Section.
- Contractor is responsible for all testing and monitoring required by applicable regulations and to assure work place safety.

- Earth Tech shall have the right, not the responsibility, to perform additional testing. Earth Tech testing shall not be in lieu of Contractor's requirements.

- In the event of a bona fide emergency, such as emergency spill response work, and where the Contractor warrants that he cannot conduct the required testing, Earth Tech may upon written agreement then conduct all tests necessary to assure safety and regulatory compliance. The Contractor shall cosign the "hot work" permit form when tests are conducted by Earth Tech personnel.

- Contractor shall provide his own fire extinguisher(s) for welding and cutting, as designated by the Earth Tech Representative.

Electrical Safety

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

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

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

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

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

Emergency Equipment

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

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

Excavations and Trenches

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

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

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

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

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

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

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

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

- Battery-lighted barricades shall be used as follows:

  (1) A minimum of two battery-lighted barricades shall be used at corners, one on each side of the barricade.

  (2) At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.

  (3) Where trenches parallel roadway, distance between battery-lighted

barricades shall not exceed 40 feet unless this requirement conflicts with Item (1), above, and additional units are required.

(4) All battery-lighted units shall be serviced as necessary to ensure equipment is operating.

- Caution tape shall be stretched securely between barricades. The caution tape shall be at least 3/4-inch-wide and shall be yellow or yellow and black and may have the words "CAUTION - DO NOT ENTER."

- Barricaded sections immediately adjacent to where pedestrians cross trenches shall be arranged to direct pedestrians to the walkway or bridge.

Encroachment. Use of other trench excavating equipment, or storage of equipment or supplies within a distance equal to the depth of the trench, will not be permitted without approval by the Earth Tech Representative.

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

- Handrails shall consist of intermediate and top rails on both sides of the bridge. The top rail shall be between 42 and 45 inches above the walking surface and be capable of withstanding a lateral force of 200 pounds against the center of the top rail.

- All surfaces which a person could reasonably contact should be sufficiently free of splinters, nails, or protrusions which may cause injury.

- All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Earth Grading Activity

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

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

- Provide notice to the grading contractor

- Identify location of test pit

- Request the cooperation through the completion of the tests and document accordingly.

- A flag must be affixed to any vehicle driving in an earth grading activity area and hazard warning lights shall be operated.

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

Hazard Warning Lights. Every over-the-road vehicle operating in the area of earthmoving equipment activity must operate the hazard warning flashers at all times.

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

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

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

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

Fire Prevention

Earth Tech Representative, or his designee, is authorized to correct any condition which he may

consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Foreman in regard to fire hazards without waiting for the Earth Tech Representative.

Floor Openings

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

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

High-Hazard Areas

Although this list may not be all inclusive, there are certain areas and operations at Earth Tech facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, the Contractor is required to check with the Earth Tech Representative for a review of the safety and health rules which apply before entering any of the following areas:

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

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

Housekeeping

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

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

Ladders

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

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

Medical Service and First Aid

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

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

Mobile Cranes

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

Overhead Work

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

Personal Protective Clothing and Equipment

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

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

- Drilling, chipping, grinding, wire brushing

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

Photographs

Only Earth Tech photographers, with permission from DIPEF, are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Earth Tech Representative.

Power Tools

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

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

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

Fall Protection

Appropriate fall protection, such as safety harness and lanyard, must be worn when worker is exposed to falling more than 6 feet. Lanyard or lifeline must be tied off to appropriate structure capable of supporting five times the weight of the person (nominal 1,000 pounds).

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

Salamanders

- "Hot work" authorization must be obtained from the Earth Tech Representative before using a salamander.
- Salamanders must be a Factory Mutual or Underwriters Laboratories-approved type.
- Position salamanders away from all combustible material to reduce the possibility of uncontrolled fire.
- Guard salamanders from traffic to prevent them from being overturned.

Scaffolds

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

- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting at least four times the maximum intended load without failure.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.

- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.

- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.

- All scaffolds, boatswain's (bosun's) chairs, and other work access platforms shall conform to the requirements set forth in the federal OSHA Regulations for Construction (29 CFR 1926.451) except where the specifications in ANSI A10.8 7 or state or local regulations are more rigorous.

Smoking and Open Flames

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

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.

- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.

- Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.

- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside the buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.

- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.

- Material Safety Data sheets, for materials used by the Contractor, shall be maintained by the Contractor, and a copy provided to the Earth Tech Representative.

Tarpaulins

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

Tools

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

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

Transporting Material and Equipment

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

- Tools, materials, and equipment must not be left unattended in access ways.

- Tools, material, and equipment shall not be removed from the job site without permission of the Earth Tech Representative.

Walking and Work Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.

- Drainage mats, platforms, or false floors should be used where wet processes are performed.

- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.

- Permanent aisles or passageways shall be marked.

- Floor holes shall be protected by covers that eave no openings of more than one inch wide.

- Floor openings into which persons can accidentally walk shall be guarded by standard railing and toeboards.

- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.

- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers,

barricades, etc. wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

Regulatory References

(a) *Standard Operating Safety Guides*, USEPA, November 1984

(b) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH 85-115, 1985

(c) Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (USDOL/OSHA), with special attention to Section .120, Hazardous Waste Operations and Emergency Response

(d) Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (USDOL/OSHA), with special attention to Section 1926.65, Hazardous Waste Operations and Emergency Response

(e) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 7, (commencing with Section 3200) General Industry Safety Orders (Cal/OSHA), with special attention to Section 5192, Hazardous Waste Operations and Emergency Response

(f) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 4, (commencing with Section 1500) Construction Safety Orders (Cal/OSHA)

(g) Title 22 of the California Code of Regulations, Division 4, Chapter 30 (commencing with Section 66000) Environmental Health Standards for the Management of Hazardous Waste (California Environmental Protection Agency, Department of Toxic Substances Control)

(h) Title 22 of the California Code of Regulations, Division 2, Chapter 3, (commencing with Section 12000) Safe Drinking Water and Toxic Enforcement Act Regulations (California Health and Welfare Agency)

(i) National Oil and Hazardous Substances Contingency Plan

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

EARTH TECH	PROCEDURE NO. HS601
	DATE November 3, 1995
STANDARD PROCEDURE	SUPERSEDES New
SUBJECT MEDICAL SURVEILLANCE	APPROVED Steven L. Scott

1.0 PURPOSE AND POLICY

1.1 Purpose

The medical surveillance program ensures that employees are physically fit to perform their assigned duties and that exposures to chemical and physical agents has not compromised their health. The medical surveillance program is designed to monitor the effectiveness of health and safety programs.

The medical surveillance program consists of baseline (initial), periodic (annual or biennial), special, exposure-specific examinations, and exit medical examinations. In addition to ensuring the fitness of workers for demanding assignments and tracking the effects of exposures, the medical surveillance program satisfies regulatory requirements.

1.2 Policy

It is the policy of EARTH TECH that each employee whose work assignments involves potential or actual exposure to harmful agents participate in a medical surveillance program.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Light Duty. Light Duty Work is defined as a temporary alternate job assignment other than the employee's normal duties, in response to physical activity restrictions established by an EARTH TECH contract physician or clinic.

Medical Director. The Medical Director is a physician, board certified in occupational medicine, employed by the Medical Services Contractor. The Medical Director manages the services provided by the Medical Services Contractor and provides guidance on medical matters to EARTH TECH.

Medical Services Contractor. The Medical Services Contractor manages all occupational medical services, including medical surveillance programs, substance abuse prevention programs, and care for workers with occupational injuries or illness.

Physical Activity Restriction. To prevent aggravation of an existing condition, the Medical Director recommends a physical activity restriction to limit exposure to a chemical or class of chemicals, such as hepatotoxins; a physical agent, such as temperatures above 26°C WBGT; or an activity, such as lifting in excess of 10 kg.

Safety-Critical. A task or position is designated as safety-critical when the task or position is such that malfeasance or incompetence would endanger the lives of others. Examples, but not a complete list, of positions that have been designated safety-critical by federal and state regulations are

- Drivers of commercial vehicles
- Workers on pipelines carrying fuels or toxic or corrosive substances
- Workers at nuclear power plants
- Operators of cranes of more than 6,000 pounds capacity
- Aircraft pilots

5.0 TEXT

5.1 Classes of Medical Examinations

5.1.1 Baseline/Preplacement/Preemployment

The baseline medical examination is used to identify physical capabilities and medical limitations that may have an impact on the candidate's ability to perform in the position for which he/she is being considered and to provide a baseline against which periodic or project-specific monitoring can be compared. The baseline medical examination is used to determine the suitability of an existing employee for a new assignment (preplacement) or a candidate's suitability to be hired (preemployment).

5.1.2 Periodic/Annual/Biennial

The periodic medical examination is used to evaluate an employee's continued fitness for duty and to assess any impact occupational exposures may have on his/her health status. The periodic examination includes an update to the medical and work history, results of any occupational exposure assessments, and a detailed medical examination tailored to the job description.

The Medical Director determines the frequency of the periodic medical examinations based on regulatory requirements, the position held by the employee, and the level of exposures to physical, chemical and biological agents.

5.1.3 Exposure/Activity/Project-Specific

The exposure-specific examination consists of specific medical tests to assess the impact of occupational exposures associated with a specific activity or project. The Medical Director will require an exposure-specific examination when he/she has reason to believe occupational exposures are impacting or may be impacting the health of an employee, or when he/she receives a recommendation from the Regional EHS Manager. Clients may recommend exposure-specific examinations for persons working on their projects. A client recommendation for an exposure-specific examination will be forwarded to the Regional EHS Manager who will evaluate the request, and if appropriate, forward the recommendation to the Medical Director. The Medical Director will determine the frequency of the exposure-specific medical examinations for each individual employee designated to participate based on sound medical practice and regulatory requirements.

5.1.4 Exit/Termination

An exit medical examination is given when an employee leaves the medical surveillance program, either because of termination of employment with EARTH TECH or because of reassignment to a position not designated to participate in the medical surveillance program. The exit examination assesses any impact occupational exposures may have on his/her health status.

5.2 Participating Employees

5.2.1 Required Participation

Participation in the medical surveillance program is required for employees who are or may be

- Exposed to substances at or above permissible exposure levels (PEL) for 30 or more days per year
- Required to wear a respirator for 30 or more days per year
- Exposed above PEL in accidents or emergency situations
- Working on sites covered by any of the following regulations:
  - 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
  - 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
  - 29 CFR 1926.62 Lead
  - 29 CFR 1926.1101 Asbestos
  - 29 CFR 1926.1118 Inorganic Arsenic
  - 29 CFR 1926.1127 Cadmium
  - 29 CFR 1926.1128 Benzene
- Driving a commercial vehicle
- Performing safety-critical tasks

5.2.2 Directed Participation

The Medical Director or the Corporate EHS Director may designate other employees to participate in a medical surveillance program with the concurrence of the other.

5.2.3 Mandatory Participation

All employees designated to participate in the medical surveillance program are required to do so as a condition of employment. Only employees who fall within the above listed categories will be included in the medical surveillance program

5.3 Entry Into the Medical Surveillance Program

5.3.1 Manager

Each Manager evaluates the duties of each employee and prospective employee reporting to him/her. If the duties meets the criteria for required participation in the medical surveillance program (see Section 5.1), then the employee must be enrolled in the medical surveillance program.

Candidates for positions which require medical surveillance may not be hired until satisfactory completion of the baseline (pre-employment) medical examination.

The Manager is responsible for providing the Medical Services Contractor with the following:

- Description of the employee's duties
- Description of actual and potential exposures to chemical, physical, and biological agents and results of measurements when available
- Description of personal protective equipment used or which may be used
- Information from previous examinations which may not be readily available.

5.3.2 Employee

When designated to participate in the medical surveillance program, the employee completes and signs the following documents:

- Medical and Work History Questionnaire
- Medical Records release form for medical records from previous examinations
- Medical Records release authorizing EARTH TECH to receive the results of the examination.

5.3.3 Regional EHS Manager

The Regional EHS Manager reviews employee assignments with Managers in his/her region to ensure all employee who should be participating in the medical surveillance program have been enrolled. The Regional EHS Manager provides such assistance as may be required to ensure all required information is provided to the Medical Director.

5.3.4 Corporate EHS Director

To ensure the appropriate medical examination and tests, the Corporate EHS Director provides the Medical Services Contractor with the following references:

- A copy of the medical program
- A copy of each regulation requiring the examination, including:
  - 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
  - 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
  - 29 CFR 1926.62 Lead
  - 29 CFR 1926.1101 Asbestos
  - 29 CFR 1926.1118 Inorganic Arsenic
  - 29 CFR 1926.1127 Cadmium
  - 29 CFR 1926.1128 Benzene
- Where appropriate, a copy of the corresponding state regulations

5.4 Scheduling Preemployment Medical Examination

5.4.1 Human Resources Representative

The Human Resources Representative coordinating the hire will provide the candidate with a baseline medical and work history questionnaire and determine from the candidate the geographical preference for the medical examination. The Human Resources Representative will contact the Medical Services Contractor to obtain the name, address, telephone number and contact person of the contract medical clinic which best suits the geographic preference of the candidate. The Human Resources Representative will coordinate the scheduling of the examination and ensure the scheduling information is provided to the Medical Services Contractor.

5.4.2 Hiring Manager

The hiring Manager informs the candidate that the offer of employment is contingent on the candidate being physically and medically capable of performing the duties of the position for which he/she is being hired. The Manager may not make the final offer until the medical examination is successfully completed and the medical clearance certificate has been received.

5.4.3. Regional EHS Manager

The Regional EHS Manager provides such assistance as is necessary to ensure the job description for the position being filled adequately describes the physical, chemical, and biological stresses of the position, and the PPE used or which may be used, including respiratory protection. The Regional EHS Manager provides

all necessary assistance to ensure that required and appropriate information is provided with the request and authorization for medical examination.

The Regional EHS Manager provides assistance to the hiring Manager to interpret physical activity restrictions if such restrictions are noted on the medical clearance certificate.

5.5 Scheduling Periodic and Exposure-Specific Medical Examinations

5.5.1 Medical Services Contractor

The Medical Services Contractor provides notification to the employee 60 to 30 days before the periodic or exposure-specific medical examination is due. This notification is in the form of a letter or fax to the office of record.

The Medical Services Contractor provides notification of delinquent medical examinations to the Manager, the Regional EHS Manager, and the Corporate EHS Director.

5.5.2 Manager

The Manager ensures the notification of examination due is forwarded to the employee in a timely way.

The Manager arranges the work assignment so that the employee is available to take the medical examination before the expiration of the medical clearance certificate.

The Manager removes the employee from the assignment if the employee has not completed the medical examination before the expiration of the medical clearance certificate.

5.5.3 Regional EHS Manager

The Regional EHS Manager ensures that all exposure assessments appropriate to the employee have been appropriately annotated to show the applicability to the employee and forwarded to the Medical Services Contractor.

The Regional EHS Manager ensures employees on delinquent medical examination list have been removed from designated assignments.

5.6 Scheduling Exit Medical Examinations

5.6.1 Human Resources Representative

Upon notification of termination or impending termination, the Human Resources Representative notifies the Medical Services Contractor to arrange for exit medical examination. The Human Resources Representative ensures terminating and reassigned employees who decline the opportunity to take an exit medical examination sign the waiver.

5.6.2 Manager

Upon notification of termination or reassignment, the Manager contacts the Human Resources Representative.

The Manager releases the terminating or reassigned employee from duties as necessary to complete the exit medical examination.

5.6.3 Regional EHS Manager

The Regional EHS Manager provides such assistance as needed to ensure terminating and reassigned employees are offered the opportunity to take an exit medical examination.

5.7 Medical Records

Medical records must be preserved and protected in accordance with 29 CFR 1910.20 for the duration of employment plus 30 years. Medical records contain information that is protected by the Privacy Act. To meet the obligations of preserving the medical records and protecting the information they contain, EARTH TECH has arranged for the Medical Services Contractor to manage the medical records.

5.7.1 Access to Records

An employee or designated representative may request to review his/her medical and exposure records. Such a request must be in writing, and signed and dated. The Regional EHS Manager will forward the request to the Medical Services Contractor who will provide the employee with a copy of the medical record.

The Medical Services Contractor will supply the copy within 15 days after the request has been submitted by the employee or designated representative. If the copy cannot be supplied within the allotted time, a request for extension will be submitted to the cognizant OSHA office.

5.7.2 Quality Control and Quality Assurance

The Medical Services Contractor performs quality control checks on all medical records to ensure examining physicians appropriately record the findings of the examination and tests.

The Corporate EHS Director has access to all medical records to perform quality assurance checks to ensure proper recording and preservation.

5.8 Reports

5.8.1 Report of Examination

The Medical Services Contractor provides the employee with a confidential report of findings of the examination and a medical clearance certificate. EARTH TECH recommends the employee preserve the medical clearance certificate in a safe place and carry copies of the medical clearance certificate to provide to project managers and clients.

The Medical Services Contractor provides Regional EHS Manager with a copy of the medical clearance certificate.

5.8.2 Examinations Due Report

The Medical Services Contractor produces a list by organization code of employees due to be examined 30 to 60 days before the expiration of their medical clearance certificate. This list is provided to Regional EHS Managers. The Regional EHS Manager ensures each Manager is notified of the employees in his/her charge due examinations so that he/she can schedule appropriately.

The Medical Services Contractor notifies each employee by letter or fax to the office of record 60 to 30 days before the periodic or exposure-specific medical examination is due.

5.8.3 Delinquent Examinations Report

The Medical Services Contractor distributes a report of delinquent medical examinations to the Manager, the Regional EHS Manager, and the Corporate EHS Director.

When an employee's name appears on the delinquent examination report for two consecutive months, the Corporate EHS Director in coordination with the Regional EHS Manager brings this to the attention of the Division Vice President for resolution.

5.8.4. Physical Activity Restriction Report

The Regional EHS Manager maintains a list of employees with physical activity restrictions. The Regional EHS Manager provides each Manager and Project/Location EHS Representative in his/her region with a list of the employees with physical activity restrictions assigned to to their project/location.

The Regional EHS Manager audits locations and projects from time to time to ensure employees with physical activity restrictions are not exceeding their limitations. Evidence of an employee exceeding his/her physical activity restriction is brought to the attention of the Department Manager and the employee's Manager/Supervisor for resolution.

5.8.5 Annual Reports

The Medical Services Contractor provides annual reports of utilization, medical trends, and statistical analyses. These reports are prepared to improve the service, reverse unfavorable trends, and reduce the cost of the medical surveillance program.

5.9 Cost Accounting

The Medical Services Contractor submits invoices directly to Corporate Accounts Payable. Each examination and service provided is coded with the organization code of the employee examined or receiving the service. The cost of medical surveillance is borne by the organizations with employees participating in the program.

6.0 EXCEPTION PROVISIONS

None permitted.

If an office elects not to use the Medical Services Contractor, the examination will be repeated by the Medical Services Contractor at additional cost to the organization.

7.0 CROSS REFERENCE

HS603 Occupational Injury and Illness

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix
Attachment 2: Medical Services Contractor
Attachment 3: Form HSF601-F1 Authorization For Medical Examination
Attachment 4: Form HSF601-F2 Notification of Physical Activity Restriction

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Manager	Project/ Location EHS Rep	Regional/ Division EHS Manager	Corporate EHS Manager
Determining applicability of medical surveillance program	5.3.1		X			
Enrolling in medical surveillance program	5.3	X	X		X	
Scheduling initial examination	5.4		X			
Scheduling periodic examinations	5.5	X				
Scheduling exit examination	5.6		X			
Responding to delinquent examinations	5.8.3	X	X		X	X
Advise Operations about *Physical Activity Restriction*	5.3.3			X	X	

MEDICAL SERVICES CONTRACTOR

EMR, Inc.
4360 Chamblee Dunwoody Road, Suite 202
Atlanta, Georgia 30341

(404) 455-0818
(800) 229-3674
FAX (404) 457-1429

R. Burt Prater, MD
Chairman, CEO

Randall K. Hindman
President

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Evelyn Cuckler
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Kim Alcorn
Medical Network Services Administrative Asst.

RECORDS MANAGEMENT

David Goodman
Records Management

ACCOUNTING

Laurie Leimkuehler
Staff Accountant

Sherie Dunagan
Staff Accountant

EMR — Medical Management Solutions Through Information Technology

EARTH TECH

AUTHORIZATION FOR MEDICAL EXAMINATION

To be faxed to EMR at least 48-hours prior to exam

Part I - Site Information

Program Coordinator requesting exam: _____

Coordinator's phone #: _____ FAX #: _____

Location (city/state): _____ EMR Site Code: _____

Earth Tech Organizational Code: _____

Part II - Medical Evaluation Required

- ☐ Pre-placement
- ☐ EKG
- ☐ Drug Screen ONLY this visit (EMR Collection Kit)
- ☐ Drug Screen in addition to exam at this visit
- ☐ Examinee requires or will require DOT Certification
- ☐ Additional testing required this visit _____
- ☐ Employee
- ☐ Chest X-ray
- ☐ Non-Nida Drug Screen
- ☐ NIDA Split Specimen Drug Screen
- ☐ Random NIDA Split Specimen Drug Screen (11D1)
- ☐ RUSH
- ☐ Tetanus
- ☐ Breath Alcohol

Type of Exam Requested		Type of Exam Requested	
Field	☐ Baseline (15F) ☐ Annual (25F) ☐ Exit (35Fe)	Combo Field/Asbestos	☐ Baseline (15H) ☐ Annual (25H) ☐ Exit (35He)
Field/DOT	☐ Baseline (15D) ☐ Annual (25D) ☐ Exit (35De)	Field Biennial	☐ Baseline (15B) ☐ Biennial (25B) ☐ Exit (35Be)

Part III - Facility Scheduling Information

Name of Facility to be used: _____

Location of Facility _____

Date of Exam: _____ Facility A#: _____

Part IV - Examinee Information

Name (print): _____ ☐ Male ☐ Female

Social Security #: _____ Date of Birth: _____

Home Address: _____
Street Address

_____
City State Zip

I authorize the release of any medical information necessary to determine my medical or physical condition concerning my application for employment, or ongoing employment, with this company. I further authorize EMR to release the results of this medical information to the designated individuals at this company.

_____
Examinee's Signature Date

Fax this Authorization Form to EMR at (770) 455-0914

Questions? Call EMR at (800) 229-3674

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EARTH TECH

NOTIFICATION OF PHYSICAL ACTIVITY RESTRICTION

Employee Name	Employee SS No.	
Job Title	Dept/Sect.	Location

TO MANAGER/SUPERVISOR _____:

- ***Physical Activity Restriction***
  The employee identified above has a medical condition for which the limitations described below are prescribed. Please ensure his/her work assignments are consistent with the limitation. If the limitations are inconsistent with his/her normal duties, please find a light duty work assignment.

  - ☐ No reaching above shoulder
  - ☐ No pushing or pulling
  - ☐ No climbing of stairs or ladders
  - ☐ No operating or working around moving machinery/driving
  - ☐ No lifting over _____ pounds
  - ☐ No repetitive waist bending
  - ☐ No kneeling or squatting
  - ☐ No exposure to hepatotoxic chemicals
  - ☐ No exposure to extreme cold or extreme heat
  - ☐ _____

  _____

  _____

  Duration of Physical Activity Restriction: _____

- ***Light Duty Work***
  If the employee is unable to perform his/her normal duties with the above physical activity restriction, please notify the Regional Environmental Health and Safety Manager. EARTH TECH provides light duty work assignments whenever possible for employees with physical activity restrictions.

- ***Medically Unable to Work***
  If the employee is unable to be placed in any assignment consistent with his/her physical activity restrictions as described above, please notify the Regional Environmental Health and Safety Manager. EARTH TECH assists employees unable to work due to injury or illness in obtaining needed medical care and other benefits available to them.

  Regional EHS Manager: _____ Phone: _____

CURRENT EMPLOYEE LISTING

Name (Last, First)	Date of Birth	Social Security Number	Exposure Category	Loc. Code	Org. Code	Date of Last Medical Exam

Exposure Categories
Field (HAZWOPER)
Combo (Field & Asbestos)
Field & Lead
Field & DOT (Commercial Drivers License)

EHS CONTACT LISTING

Loc. Code	Org. Code	Address	Telephone	Facsimile	Primary Contact	Secondary Contact

EARTH TECH	PROCEDURE NO. HS301
	DATE June 13, 1996
STANDARD PROCEDURE	SUPERSEDES New
SUBJECT HAZWOPER TRAINING AND REFRESHER	APPROVED James L. Unmack James L. Unmack

1.0 PURPOSE AND POLICY

1.1 Purpose

To establish the EARTH TECH policy for HAZWOPER training, defining who must be trained and how training will be accomplished.

1.2 Policy

It is the policy of EARTH TECH that all employees who have occasion to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) shall receive training meeting the requirements of 29 CFR 1910.120(e).

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2.0. TABLE OF CONTENTS 1

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility.

The Corporate Director, Health and Safety, is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities.

The Responsibility Matrix can be found as Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Hazardous Waste. Hazardous waste means a waste or combination of wastes as defined by 40 CFR 261.3 and 49 CFR 171.8.

Hazardous Waste Operation. Hazardous waste operation means any clean up operation or corrective action at a hazardous waste site.

Hazardous Waste Site. A hazardous waste site is any site where clean up or corrective action is required by a governmental body, whether federal, state, or local, involving hazardous waste. Hazardous waste sites include, but are not limited to, sites on the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and government identified sites before the initial investigation determines the presence or absence of hazardous waste. Hazardous waste sites also include sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq.) and treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations, where clean-up operations or corrective actions are conducted, and sites where voluntary clean-up operations are conducted involving hazardous substances or hazardous waste.

HAZWOPER. Hazardous Waste Operations and Emergency Response, as applied to hazardous waste operations.

HAZWOPER Worker. A person who works on hazardous waste operation.

5.0 PROCEDURE

Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

5.1 Business Unit Managers

- Ensure that all employees who are or will be assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) receive training meeting the requirements of 29 CFR 1910.120(e).

- Schedule or provide for safety and health training meeting the requirements of 29 CFR 1910.120(e).

- Provide adequate facilities for in-house training to meet the needs of the scheduled training.

- Ensure that Project Managers, Response Managers, Construction Managers, and Supervisors of HAZWOPER workers receive 8 hours of hazardous waste operations supervisor training in accordance with 29 CFR 1910.120(e)(4).

5.2 Project, Response, Construction Managers

- Ensure that each of their employees who is assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) receive a minimum of 40 hours of instruction off the site before being dispatched to the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

- Ensure that onsite employees who manage or supervise HAZWOPER workers receive 8 hours of hazardous waste operations supervisor training in accordance with 29 CFR 1910.120(e)(4).

- Ensure that each of their employees who is assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site receives eight hours of refresher training annually.

- Schedule work assignments to allow timely completion of refresher training in accordance with 29 CFR 1910.120(e)(8).

5.3 HAZWOPER Employees

- Attend initial 40 hours of health and safety training for hazardous waste site workers before working on a hazardous waste site or supervising hazardous waste operations.

- Obtain and document a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. See Attachment 2 to document field experience.

- Attend 8-hour HAZWOPER Refresher training no longer than 365 days from their last HAZWOPER training. If more than 24 months have passed since the last HAZWOPER training, the initial 40-hour training must be repeated.

- Provide copies of their 40-hour HAZWOPER training certificate and their most recent 8-hour HAZWOPER Refresher training certificate to the location Health and Safety Coordinator and to the Project/Response/Construction Manager.

5.4 Health and Safety Coordinators

- Keep a copy of each HAZWOPER training certificate received by employees assigned to the business unit.

- Remind HAZWOPER employees when due to take HAZWOPER refresher training in time to avoid expiration of HAZWOPER training certification.

- Coordinate with Business Unit Managers to schedule HAZWOPER training courses.

- Coordinate with Health and Safety Department to schedule in-house HAZWOPER refresher training.

5.5 Health and Safety Department

- Provides trainers for in-house HAZWOPER refresher training when resources are available.

- Assists Health and Safety Coordinator to schedule out-sourced training.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with established procedures. See HS109.

7.0 CROSS REFERENCE

None

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix
Attachment 2: References
Attachment 3: Field Experience Documentation

RESPONSIBILITY MATRIX

Action	Procedure Section	Business Unit Manager	PM, RM, CM	HS Coordinator	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1				X
Facilities for training	5.1	X			
Enforcement of training requirements	5.2		X		
Maintenance of training records	5.4			X	

PM Project Manager
RM Response Manager
CM Construction Manager
HS Health and Safety
EHS Environmental Health and Safety

REFERENCES

29 CFR 1910.120 Hazardous Waste Operations and Emergency Response

29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

42 U.S.C. 6901 et seq. Resource Conservation and Recovery Act of 1976

40 CFR 261.3 Definition of Hazardous Waste

40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

49 CFR 171.8 Definitions and Abbreviations

The Earth Technology Corporation

FIELD EXPERIENCE DOCUMENTATION

NAME: _____

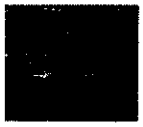
Title 29 of the Code of Federal Regulations, Part 1910.120(e)(3) requires general site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards to receive a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor following a minimum of 40 hours of initial instruction off the site. This *on-the-job training* is documented as follows:

DATE	PROJECT	SUPERVISOR'S SIGNATURE

_____

Employee's Signature Date

Training Links:



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Training at the

Explosive Ordnance Disposal School

We are a Navy managed command located at Eglin Air Force Base, Florida and Indian Head Maryland, that is jointly staffed by over 300 Army, Marine Corps, Navy, and Air Force personnel. Each year approximately 325 U.S. Soldiers, Sailors, Marines, and Airman graduate from the seven month (12 for Navy) basic course. Also, over 100 non-U.S. students graduate each year and over 63 countries have EOD technicians who have been trained at this school. U.S. graduates from this school are currently performing EOD missions in places such as Bosnia, Laos, Cambodia, Korea, the Arabian Gulf, on board ships and U.S. bases throughout the world.

Currently EOD training is broken down into two phases.

Phase I consists of eleven (11) weeks of "basic level" EOD training at NAVSCOLEOD DET, Eglin Air Force Base, Florida. Eglin Air Force Base is located in Florida's north west panhandle.

Phase II consists of fifteen (15) weeks of "advanced" level EOD training at Naval Ordnance Station, Indian Head, Maryland. Naval Ordnance Station, Indian Head is located about 45 miles south of Washington DC. Training at Indian Head, Maryland is scheduled to consolidate with training at Eglin AFB, Florida sometimes late in 1998.

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Phase I Training at

Explosive Ordnance Disposal School Detachment

Prior to starting training students will be given a one day indoctrination into the school. All aspects of the school are covered, giving each student an overview of the school, what they can expect as well as what is expected of them. Phase I training at NAVSCOLEOD Detachment is broken down into four (4) training divisions.

Training begins in the CORE Division. This division is 18 days long and covers a variety of subjects from basic safety to EOD operations and planning.

Students then enter the Demolition Division were in 15 days they will learn about basic demolition materials, explosive safety, and disposal techniques.

The next division is the Tools and Methods Division. Students will spend 11 days learning about EOD special tools and procedures, to include explosively actuated tools and ordnance locators.

As they enter the last division, which is the Biological and Chemical Division, they will be expected to put together what they have learned in the first three divisions and apply that during these last 11 days. This training provides basic information in biological/chemical materials, clothing, as well as related procedures. It also places the students in a EOD scenario while operating in a simulated chemical/biological environment.

Upon successful completion students then head north to Phase II training. This will be 15 weeks of training at Naval School, Explosive Ordnance Disposal, Indian Head, Maryland.

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"The First Division"

Training Links: **CORE Division**

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CORE Division provides the backbone of skills and knowledge upon which Explosive Ordnance Disposal (EOD) is built. During the course of 18 training days, a student would be immersed in the basic principles of electricity, physics, fuze functioning and ordnance identification. Students would also be trained in the use of the automated EOD publications systems. After the first 13 days of classroom instruction, the student will conduct and be evaluated on the application of these *core* skills in an outdoor environment. This environmental laboratory would require the student to approach a suspected item, make some preliminary evaluations, research, and positively identify the suspected munition, while observing safety during the whole evolution.

Routinely CORE Division is considered by most students to be the hardest division at NAVSCOLEOD. It is important that the student learn the safeties and fundamental theories first, before learning how to "save the world".

Yearning for excitement, most students look forward to the "blow and go" demonstrations of explosives in the Demolition Division, the second stop at Phase I.

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"The Second Division, It's a Blast"

Training Links: **Demo Division**

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Welcome to the world of the *demolition* division. It is better known as "DEMO". Demo training last 15 days. This block of instruction begins with extensive classroom training in explosive safety, an essential element of any EOD operation.

The training provides a summary of the history of explosives, and expands into Explosives, and Explosives Effects (EEE) such as blast and fragmentation, and details explosive storage, handling and transportation requirements. From that base of information, demolition materials and their designated use become the heart of the Demo division.

After 5 intensive days in the classroom the student progresses to the practical application of electric, non-electric, and radio firing systems. This prepares trainees for disposal operations, i.e., disposal by detonation and disposal by burning. They will also learn Shaped Charges and Special Explosives. The remaining 10 days will be spent in practical application and testing.

There are 5 tests in this division, but tests alone do not determine whether students successfully complete the Demolition division. Lack of concentration, casualness, inappropriate attitude or unsafe acts will eliminate them from this "High Risk" training before ever reaching the first test. This is a fun division but requires a serious approach.

Upon successful completion of this "It's a Blast" division, students will be moving on to the third division of Phase I the Tools and Methods division.

"The Third Division"

Training Links:

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Tools and Methods Division

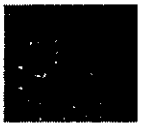
Welcome to the Tools and Methods Division. During this eleven day block of instruction students will be exposed to a variety of EOD specific tools and techniques recognized by Explosive Ordnance Disposal technicians around the world. This division is primarily a "hands on" training evolution. There will be some classroom sessions necessary to expose trainees to the basic information needed to complete the practical exercises. Students will learn about non-magnetic tools and the roles they play when working on ordnance items. There will be classroom instruction on ordnance locators as well as practical applications and testing. Upon successful completion of ordnance locator training students will be able to located buried unexploded ordnance and mines.

Students will receive classroom training on manual remote procedures designed to accomplish render safe procedures on hazardous fuzed munitions. After several days of practicing these procedures they will be expected to pass practical tests on the various methods.

Training will also be received on explosively acuated EOD tools. These tools are powered by special .50 caliber cartridges and are designed to perform render safe procedures on unexploded ordnance with hazardous fuzes.

Final passage from the TMD division will be a written comprehensive test covering all of the information covered while in this division. Upon successful completion of this division students will move on to the Biological and Chemical Division, the final training division here at Phase I.

Phase II Links:



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Phase II Training at

Explosive Ordnance Disposal School, Indian Head, Maryland

Phase II consists of fifteen (15) weeks of "advanced" level EOD training at Naval Ordnance Station, Indian Head, Maryland. Naval Ordnance Station, Indian Head is located about 45 miles south of Washington DC. Training at Indian Head, Maryland is scheduled to consolidate with training at Eglin AFB, Florida sometimes late in 1998.

Before commencing training students will be given a two day indoctrination into the school. All aspects of the school are covered, giving each student an overview of the school, what they can expect as well as what is expected of them. Phase II training at NAVSCOLEOD is broken down into four divisions for surface students, Ground Ordnance, Air Ordnance, Improvised Explosive Devices, and Nuclear Weapons. Navy students attend a fifth division, Underwater Ordnance and Operations.

Phase I

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Phase II...

Ground Ordnance

Learning in Phase II begins in the Ground Ordnance Division. This division consists of 18 days of instruction and both classroom and practical testing in all aspects of emergency EOD response involving grenades, land mines, rockets, and projectiles. Focus has shifted from Phase I to where students are expected to perform EOD procedures on individual ordnance items, vice the methodology and techniques taught during the Core phase of training. This holds true for the remaining areas in Phase II as well.

Air Ordnance

Home | Welcome Aboard | History | Training | The Future | USA | USMC | USN | USAF

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05/04/99 20:27:56

Phase II Links:

Home...

IED Division...

Nuclear Weapons...

Underwater...

Ground Ordnance...

Phase II...

Air Ordnance

After completion of Ground successful students will progress to the Air Ordnance Division where they will spend the next 30 class-days learning the intricacies of air dropped munitions and associated devices. Classroom and practical training includes "Aircraft Explosive Hazards", "Guided Missiles", "Bombs and Bomb Fuzes", and "Dispensers and Payloads".

IED Division

Home | Welcome Aboard | History | Training | The Future | USA | USMC | USN | USAF

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Phase II Links:

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Air Ordnance...

Phase II...

Improvised Explosive Devices

Students then move on to the Improvised Explosive Devices (IEDs) Division. The next 9 class-days are spent studying improvised explosive device construction, effects, render safe, and disposal. Search techniques as well as methods of exploitation are also covered.

Nuclear Weapons Division

Home | Welcome Aboard | History | Training | The Future | USA | USMC | USN | USAF

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Nuclear Weapons

The last division for surface students is the Nuclear Ordnance Division. A 21 class-day curriculum includes studying and testing on various aspects of nuclear physics, weapon design and effects, and EOD emergency response procedures. Also included is contamination detection, personnel protection, and contamination control. After completion of this division, surface students graduate and receive their "crab"! Navy students move on to their next block of instruction.

Underwater

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Phase II...

Underwater

Instruction in the last division for Navy students takes place in the Underwater Ordnance Division. Here Navy students spend their last 62 training days learning all the intricacies of locating, rendering safe, exploitation, and disposal of all types of underwater ordnance including mines, torpedoes, limpet mines, and other miscellaneous devices. Practical problems involving use of SCUBA equipment and instruction in MK 16 influence ordnance diving techniques are included.

Phase II

Home | Welcome Aboard | History | Training | The Future | USA | USMC | USN | USAF

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40 HOUR HAZWOPER
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EMS SAFETY SERVICES
FIRST AID/CPR

Scene Assessment
Bloodborne Pathogens
Primary Assessment/Child Partial Obstruction Airway
Child Complete Obstruction Airway
Recovery Position/Child CPR
Infant CPR
Infant Obstructed Airway
Vital Signs
Bleeding
Shock
Illness Assessment
Illness Assessment Check Sheet
Injury Assessment
Injury Assessment Check Sheet
Head and Neck Injuries
One Person Log Roll
Fractures
Burns
Eye Injuries/Seizures
Poisoning
Heat and Cold Emergencies
Cold Emergencies
Diabetes
Asthma
Always Consult Pediatrician If:
Get Help Immediately If:
Exam Questions
Skills Performance Checklist
EMS Safety Services Student Agreement
Course Evaluation'

Paul Lepore - Captain/Paramedic

Book Design by AJ Graphics/Huntington Beach, CA

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EMS Safety Services, Inc.
800-215-9555 Fax 714-8442-6889

RESPIRATOR TRAINING PROGRAM

I. Experienced personnel (Certified Industrial Hygienists) will train Earth Tech employees in the appropriate use of respiratory protective equipment. Minimum training, shall include the following:

A. Identification of respiratory hazards (site specific);
B. The consequences of improper utilization of respiratory protective equipment;
C. The relationship between engineering and administrative controls and the application of respiratory protection;
D. Instruction in the selection, use, sanitary care, maintenance, proper storage, and limitations of each applicable respirator type; and
E. An explanation of the medical surveillance program as it relates to the use of respiratory protective equipment.

II. Experienced personnel will properly fit test Earth Tech employees to ensure that they can properly wear a respirator. The fit test will provide:

A. An opportunity to handle the respirator and to wear it in a safe atmosphere for an adequate period of time to ensure that the wearer is familiar with the operational characteristics of the respirator; and
B. An opportunity to wear the respirator in a test atmosphere (such as atmospheres generated by smoke tubes or isoamyl acetate) to demonstrate that the respirator protects the worker.

III. Trainers will also instruct Earth Tech employees of situations where a respirator will be needed and the decisions to be made such as:

A. Instructions in how to recognize and cope with emergency situations requiring respiratory protection;
B. An explanation of the requirement for a self-contained breathing device for work in unknown concentrations and IDLH atmospheres, and for fire fighting;
C. Equipment donning and doffing procedures; and
D. Selection of proper cartridges based on site-specific contaminants.

IV. Earth Tech employees will be made aware of the limitations of respirators such as:

A. An explanation of the requirements for maintenance of the respirator gas-tight seal, including beard and facial hair policies, and the policy prohibiting the use of contact lenses while wearing respirators; and
B. Employee respirator training will be required on a minimum annual basis and will be documented in writing. Copies of training records will be retained at the division office.

EARTH TECH

Site Safety Meetings
Tourtelot Cleanup Project
Tailgate Safety Briefing Sign-in Log

Date: _____ **Time:** _____

Briefing Conducted By:	Signature:	Company Name:

This sign-in log documents the tailgate safety briefing conducted in accordance with 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" as well as other applicable regulatory requirements. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily or as required.

TOPICS COVERED:

☐ General PPE usage	☐ Decontamination Procedures	☐ Emergency Procedures
☐ Respiratory Protection	☐ Smoking Eating and Drinking	☐ Existing Work Zones
☐ Hearing Conservation	☐ Slips, Trips, and Falls	☐ Lockout/Tagout
☐ Personal Hygiene	☐ Heat and Cold Stress	☐ Excavation/Confined Spaces
☐ Exposure Guidelines	☐ Site Control	☐ New Work Procedures

Personnel Sign-in List

Printed Name	Signature	Company Name

Supervisor's Report of Incident

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

This is an official document to be initiated by the injured employee's Supervisor. Please answer all questions completely. Fax to your Region's EHS Manager within 24 hours of the injury. See reverse side for instructions.

Section 1: Employee (Must complete each item or processing delays will occur) - Print Clearly

SCMS Claim#: _____ WC Location Code: _____

SCMS: (877)261-8926

Employee Data		S.S. No.	Sex	Birth Date
Injured's Name		Home Phone	Marital Status	No. Dependents
Home Address		City	State	Zip Code
Job Title	Dept No.	Office Location/Address		
Injury Illness Vehicle Injury Near Miss			Hire Date	Hourly Wage

Section 2: Supervisor (Must complete each item or processing delays will occur) - Print Clearly

Date of Incident	Time	Date Reported	To Whom
Client Name	Job Assignment at Time of Incident		Time Shift Began
Exact Location & Address of Incident		Did injured leave work? Yes No When?	
Has injured returned to work? Yes No		Did employee miss a regularly scheduled shift? Yes No	
Doctor/Hospital Name		Address of Hosp.	
Witness Name		Statements Attached Yes No	
Nature of Injury		Body Part	
Medical Treatment Received			
Describe Incident			
What caused the incident?			
Corrective Action(s) to Prevent Future Occurrence:			
Supervisor/Foreman (Print Name)	Signature	Date	Telephone

Section 3: Manager

Comments on incident and corrective action			
Manager (Print Name)	Signature	Date	Telephone

Section 4: Environmental, Health and Safety

Concur with action taken? Yes No Remarks:			
OSHA Recordable No Pending Yes - Type : Incident only First aid Medical Fatality Lost work days _____ Days of restricted activity _____			
EHS Professional (Print Name)	Signature	Date	Telephone

This report contains information protected by the Privacy Act

Supervisor's Report of Incident
Instructions For Completion

The following types of incidents must be reported using this form:

1. Occupational Injury or Illness (includes first aid only, medical treatment, hospitalization, fatality)
2. Vehicle Accident Injuries
3. Near Miss (incident where employee(s) could have been injured)

INSTRUCTIONS

Immediate:

1. Employees must report such incidents to their Supervisor **immediately**.
2. The Supervisor must complete **Sections 1 and 2, Employee Data and the Supervisor Section** of the SRI. Incomplete items will delay timely processing. Any work-related injury or illness that requires medical treatment or care will require notifying SCMS at 877-261-8926.
3. The Supervisor must verbally notify his/her Manager, who in turn must sign **Section 3, Manager**, of the SRI. To avoid delaying SRI process, a separate copy of the SRI with the Manager's signature can be faxed within 3 days to the REHSM.
4. The Supervisor must verbally notify his/her REHSM with a follow-up SRI faxed within 24 hours (see below for fax numbers). The REHSM will review and complete **Section 4, Environmental Health and Safety,** and fax the SRI to the WCA at 804-515-8313.
5. For near-miss situations that could have resulted in an injury to an employee, the Supervisor must notify his/her Manager (see item 3 above) and the REHSM with a follow-up SRI faxed within 24 hours.

PRIMARY CONTACTS

East REHSM: Dale Prokopchak, CIH, CSP
Telephone: 804-515-8556
Fax: 804-515-8313
Pager: 877-830-1981

WCA:
Telephone: 804-515-8557
Fax: 804-515-8313

Midwest REHSM: Jeff Grant, CIH
Telephone: 616-940-4426
Fax: 616-940-4396
Cell Phone: 734-516-5232

West REHSM: Bob Poll, CIH, CSP
Telephone: 562-951-2242
Fax: 562-495-9257
Cell Phone: 562-884-1414

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International Chemical Safety Cards

2,4,6-TRINITROTOLUENE

ICSC: 0967

2,4,6-TRINITROTOLUENE
2-Methyl-1,3,5-trinitrobenzene
alpha-Trinitrotoluol
TNT
$C_7H_5N_3O_6/C_6H_2(CH_3)(NO_2)_3$
Molecular mass: 227.1

CAS # 118-96-7
RTECS # XU0175000
ICSC # 0967
UN # 0209
EC # 609-008-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Explosive.	NO open flames, NO sparks, and NO smoking.	Water in large amounts. Do not attempt to extinguish large fire, evacuate area.
EXPLOSION	Risk of fire and explosion upon rapid heating or strong shock.	Do NOT expose to friction or shock. Do not expose to heat.	In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION	Abdominal cramps. Blue lips or finger nails. Blue skin. Cough. Headache. Laboured breathing. Vomiting. Symptoms may be delayed (see Notes).	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• SKIN	MAY BE ABSORBED! Redness. Pain (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• EYES	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	(further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Wear protective gloves when inducing vomiting.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Wet spilled material before picking it up, do not attempt to sweep up dry material. Do NOT wash away	Fireproof. Separated from combustible and reducing substances, heavy metals and initiator explosives. Tightly closed. Cool. Dry.	Unbreakable packaging; put breakable packaging into closed unbreakable container. E symbol

into sewer. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: self-contained breathing apparatus).		T symbol R: 2-23/24/25-33 S: 35-44 UN Hazard Class: 1.1D

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0967

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

2,4,6-TRINITROTOLUENE

ICSC: 0967

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** May explosively decompose on shock, friction, or concussion. Upon heating, toxic fumes are formed. Reacts violently with reducing agents causing fire and explosion hazard. Reacts with heavy metals. Explodes on heating to 240°C. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (skin) (ACGIH 1991-1992). PDK not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes, the skin, and the respiratory tract. The substance may cause effects on the blood , resulting in hemolysis, formation of methaemoglobin. Exposure may result in death. The effects may be delayed (see Notes). Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the liver, blood and eyes , resulting in jaundice, anaemia, cataract.
PHYSICAL PROPERTIES	Boiling point (decomposes): 240°C Melting point: 80.1°C Relative density (water = 1): 1.65 Solubility in water: none	Vapour pressure, Pa at 20°C: <0.1 Relative vapour density (air = 1): 7.85 Octanol/water partition coefficient as log Pow: 1.60
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to aquatic organisms.	

NOTES

Combustion in a confined space may turn into detonation. Depending on the degree of exposure, periodic medical examination is indicated. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home. Tolite, Tritol, Trotyl, Entsufon are trade names.

Transport Emergency Card: TEC (R)-10G03
NFPA Code: H 2; F 4; R 4;

ADDITIONAL INFORMATION

ICSC: 0967 **2,4,6-TRINITROTOLUENE**

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WATLOW GORDON -- IRON-JPX JP
MATERIAL SAFETY DATA SHEET
NSN: 343900F053034
Manufacturer's CAGE: 93768
Part No. Indicator: A
Part Number/Trade Name: IRON-JPX JP

General Information

Company's Name: WATLOW GORDON
Company's Street: 5710 KENOSHA ST
Company's P. O. Box: 500
Company's City: RICHMOND
Company's State: IL
Company's Country: US
Company's Zip Code: 60071-5000
Company's Emerg Ph #: 815-678-2211
Company's Info Ph #: 815-678-2211
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 21MAY96
Safety Data Review Date: 25MAR97
MSDS Preparer's Name: ALAN HAMACKA
Preparer's Company: WATLOW GORDON
Preparer's St Or P. O. Box: 5710 KENOSHA ST
Preparer's City: RICHMOND
Preparer's State: IL
Preparer's Zip Code: 60071-5000
MSDS Serial Number: CDQYF

Ingredients/Identity Information

Proprietary: NO
Ingredient: RED IRON OXIDE/IRON (III) OXIDE/FERRIC OXIDE/YELLOW FERRIC OXIDE/YELLOW IRON OXIDE/IRON OXIDE PIGMENT
Ingredient Sequence Number: 01
Percent: 99
NIOSH (RTECS) Number: NO7400000
CAS Number: 1309-37-1
OSHA PEL: 10 MG/CUM
ACGIH TLV: 5 MG/CUM (FE)

Physical/Chemical Characteristics

Fire and Explosion Hazard Data

Flash Point: NONFLAMMABLE
Unusual Fire And Expl Hazrds: SPARKS FROM GRINDING/WELDING MAY IGNITE FLAMMABLE/COMBUSTIBLE MATERIALS.

Reactivity Data

Stability: YES
Hazardous Decomp Products: METAL DUST/FUMES
Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: IRRITATION TO THE NOSE, EYES, THROAT/SKIN. CHRONIC EXPOSURE MAY CAUSE SEVERE LUNG DISEASES, LUNG FIBROSIS, PNEUMOCONIOSIS/NEUROLOGICAL DAMAGE. SKIN SENSITIVITY MAY ALSO OCCUR.
Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: DISCOMFORT, IRRITATION, NAUSEA, TIGHTNESS OF CHEST, DIZZINESS, WATERING OF EYES, HEADACHES, DIFFICULTY IN BREATHING, COUGHING, CHEST PAINS.
Med Cond Aggravated By Exp: THOSE HAVING PRE-EXISTING CONDITIONS/OTHER OCCUPATIONAL ILLNESSES BECAUSE OF THE WIDE VARIATION IN INDIVIDUAL SUSCEPTIBILITES.
Emergency/First Aid Proc: INHALATION: MOVE TO FRESH AIR. SKIN: WASH W/ SOAP & WATER. EYES: IMMEDIATELY WASH W/LARGE AMOUNTS OF WATER, WASH FOR 15 MINS. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Waste Disposal Method: GRINDING PARTICLES/DUSTS/WELDING FUMES/CHEMICAL CLEANING SOLUTIONS MUST BE DISPOSED OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS.
Other Precautions: ARC/SPARK GENERATED WHEN WELDING/BURNING COULD BE A SOURCE OF IGNITION FOR COMBUSTIBLE & FLAMMABLE MATERIALS.

Control Measures

Respiratory Protection: REQUIRED WHEN EXPOSED TO LEVELS THAT EXCEED THOSE ESTABLISHED BY OSHA WHEN GRINDING/WELDING. USE NIOSH APPROVED RESPIRATORS.
Ventilation: REQUIRED.
Protective Gloves: NIOSH APPROVED
Eye Protection: FACE SHIELDS
Other Protective Equipment: PROTECTIVE CLOTHING WHEN REQUIRED.

Transportation Data

Disposal Data

Label Data

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD METAL

MSDS Number: L2347 — *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes: J.T. Baker: 2256, 2266 Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None

Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:
POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:
Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:
Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:
Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:
Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For lead, metal and inorganic dusts and fumes, as Pb: -OSHA Permissible Exposure Limit (PEL): 0.05 mg/m3 (TWA) For lead, elemental and inorganic compounds, as Pb: -ACGIH Threshold Limit Value (TLV): 0.05 mg/m3 (TWA), A3 animal carcinogen ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information). For lead, inorganic: -NIOSH Recommended Exposure Limit

(REL): 0.1 mg/m3 (TWA)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

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9. Physical and Chemical Properties

Appearance:
Small, white to blue-gray metallic shot or granules.

Odor:
Odorless.

Solubility:
Insoluble in water.

Density:
11.34

pH:
No information found.

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
1740C (3164F)

Melting Point:
327.5C (622F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
1.77 @ 1000C (1832F)

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981).

Carcinogenicity:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

```
--------\Cancer Lists\-----------------------------------------------------
                                          ---NTP Carcinogen---
```

Ingredient	Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.

Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Lead (7439-92-1)	10	No	No

```
Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Prop 65:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: No information found.
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 3 **Flammability:** 1 **Reactivity:** 0

Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:
Do not get in eyes, on skin, or on clothing. Do not breathe dust. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.

Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its

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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-[illegible]

National Response in Canada
CANUTEC: 613-[illegible]

Outside U.S. and Canada
Chemtrec: 202-[illegible]-7915

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Manganese, 1000 (u)g/mL (0.10% w/v)

MSDS Number: M0678 --- *Effective Date: 09/08/97*

1. Product Identification

Synonyms: None
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Mn and HNO3 in H2O
Product Codes: 6933

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Manganese	7439-96-5	< 1%	No
Nitric Acid	7697-37-2	1 - 2%	Yes
Water	7732-18-5	97 - 98%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
Explosion:
Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for

details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Odorless.
Solubility:
Complete (100%)
Specific Gravity:
ca. 1.0
pH:
1.0 (0.1M HNO3)
% Volatiles by volume @ 21C (70F):
ca. 99
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
Essentially the same as water.
Vapor Pressure (mm Hg):
Essentially the same as water.
Evaporation Rate (BuAc=1):
Essentially the same as water.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat and incompatibles.

---

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Manganese (7439-96-5)	No	No	None
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Manganese (7439-96-5)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Manganese (7439-96-5)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Manganese (7439-96-5)	No	No	Yes	No
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Manganese (7439-96-5)	1	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: No information found.
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Antimony

MSDS Number: A7152 --- *Effective Date: 09/08/97*

1. Product Identification

Synonyms: Stibium, C.I. 77050
CAS No.: 7440-36-0
Molecular Weight: 121.75
Chemical Formula: Sb
Product Codes: 0848

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Antimony	7440-36-0	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF INHALED. CAUSES IRRITATION.
TARGET ORGAN(S): Respiratory system, cardiovascular system, eyes, skin.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Is harmful may be fatal.
Ingestion:
None identified.
Skin Contact:
Prolonged contact may cause dermatitis.
Eye Contact:
None identified.
Chronic Exposure:
Kidney damage, liver damage.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.
Ingestion:
If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact:
In case of contact, flush skin with water.
Eye Contact:
In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
Can be an explosion hazard, especially when heated.
Fire Extinguishing Media:
Use extinguishing media appropriate for surrounding fire.
Special Information:
No information found.

6. Accidental Release Measures

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

7. Handling and Storage

Keep container tightly closed. Store in secure poison area. Keep product out of light.

Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
0.5 mg/m3 (TWA)

-ACGIH Threshold Limit Value (TLV):
0.5 mg/m3 (TWA)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Silvery-white metal.
Odor:
No information found.
Solubility:
Negligible (< 0.1%)
Specific Gravity:
6.68
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1635C (2975F)
Melting Point:
630C (1166F)
Vapor Density (Air=1):
4.2
Vapor Pressure (mm Hg):

Not applicable.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
No information found.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents, strong acids, halogen acids, chlorine, fluorine.
Conditions to Avoid:
Heat, Light.

11. Toxicological Information

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Antimony (7440-36-0)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Antimony (7440-36-0)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Antimony (7440-36-0)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Antimony (7440-36-0)	No	No	Yes	Antimony com

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Antimony (7440-36-0)	5000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF INHALED. CAUSES IRRITATION.
TARGET ORGAN(S): Respiratory system, cardiovascular system, eyes, skin.
Label Precautions:
Avoid contact with eyes, skin, clothing.
Do not breathe dust. Keep in tightly closed container. Use with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Please reduce your browser font size for better viewing and printing.

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-[illegible]

National Response in Canada
CANUTEC: 613-[illegible]

Outside U.S. and Canada
Chemtrec: 202-463-7818

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ARSENIC, 1000 ug/ml (0.10% w/v)

MSDS Number: A7440 --- *Effective Date: 11/06/97*

1. Product Identification

Synonyms: None
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: mostly water
Product Codes: 6919

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Arsenic Trioxide	1327-53-3	< 1%	Yes
Hydrogen Chloride	7647-01-0	1 - 2%	Yes
Water	7732-18-5	> 97%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. CANCER HAZARD. CONTAINS INORGANIC ARSENIC WHICH CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure. MAY CAUSE LIVER AND KIDNEY DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate

Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Health hazards given on this data sheet apply to concentrated (5 - 37%) solutions of hydrochloric acid. Hazards of this product are expected to be reduced. Degree of hazard for these reduced concentrations is not currently addressed in the available literature.

Inhalation:
Symptoms are expected to be less severe than exposure to higher concentrations of hydrochloric acid, where symptoms may include irritation to the respiratory tract.
Ingestion:
Symptoms are expected to be less severe than exposure to higher concentrations of hydrochloric acid, where symptoms may include burning sensation, vomiting and diarrhea. Arsenic is highly toxic! May cause burning in esophagus, vomiting, and bloody diarrhea. Symptoms of cold and clammy skin, low blood pressure, weakness, headache, cramps, convulsions, and coma may follow. May cause damage to liver and kidneys. A suspected fetal toxin. Death may occur from circulatory failure. Estimated lethal dose 120 milligrams.
Skin Contact:
Symptoms are expected to be less severe than exposure to higher concentrations of hydrochloric acid, where symptoms may include irritation, redness, pain and burns.
Eye Contact:
Splashes cause irritation. Symptoms are expected to be less severe than exposure to higher concentrations of hydrochloric acid, where symptoms may include severe burns and eye damage.
Chronic Exposure:
Arsenic on repeated or prolonged skin contact may cause bronzing of the skin, edema, dermatitis, and lesions. Repeated or prolonged inhalation of dust may cause damage to the nasal septum. Chronic exposure from inhalation or ingestion may cause hair and weight loss, a garlic odor to the breath and perspiration, excessive salivation and perspiration, central nervous system damage, hepatitis, gastrointestinal disturbances, cardiovascular damage, and kidney and liver damage. Arsenic compounds are known human carcinogens and may be teratogenic based on effects in laboratory animals.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

First aid procedures given apply to concentrated solutions. Exposures to dilute solutions may not require these extensive first aid procedures.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse. Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to this substance.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
If emesis if unsuccessful after two doses of Ipecac, consider gastric lavage. Monitor urine arsenic level. Alkalization of urine may help prevent disposition of red cell breakdown products in renal tubular cells. If acute exposure is significant, maintain high urine output and monitor volume status, preferably with central venous pressure line. Abdominal X-rays should be done routinely for all ingestions. Chelation therapy with BAL, followed by n-penicillamine is recommended, but specific dosing guidelines are not clearly established.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. May react with metals or heat to release flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Water or water spray. Neutralize with soda ash or slaked lime.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(tm) or TEAM(tm) 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect from freezing. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Hydrochloric acid:
- OSHA Permissible Exposure Limit (PEL):
5 ppm (Ceiling)
- ACGIH Threshold Limit Value (TLV):
5 ppm (STEL/Ceiling)

For Inorganic Arsenic compounds (as As):
- OSHA Permissible Exposure Limit (PEL):
10 (u)g/m3 (TWA), 5 (u)g/m3(Action Level), cancer hazard.
- ACGIH Threshold Limit Value (TLV):
0.01 mg/m3 (TWA), A1, confirmed human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face respirator with an acid gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Any area where inorganic arsenic is stored, handled, used, etc., must be established as a 'Regulated Area' with controlled access, limited to authorized persons. Containers of inorganic arsenic and Regulated Areas must be labeled to show a CANCER SUSPECT AGENT is present. Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing arsenic or lead compounds are handled, processed, or stored.

See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (arsenic: 29 CFR 1910 .1018; lead: 29 CFR 1910.1025).

9. Physical and Chemical Properties

Appearance:
Clear, colorless solution.
Odor:
Odorless.
Solubility:
Infinitely soluble.
Specific Gravity:
ca. 1
pH:
No information found.
% Volatiles by volume @ 21C (70F):
> 99
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
Essentially the same as water. Not applicable.
Vapor Pressure (mm Hg):
Essentially the same as water.
Evaporation Rate (BuAc=1):
Essentially the same as water.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas. Emits toxic fumes of arsenic when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight, incompatibles.

11. Toxicological Information

Toxicological Data:

Hydrochloric acid: Inhalation rat LC50: 3124 ppm/1H; Oral rabbit LD50: 900 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector. Arsenic trioxide: oral rat LD50: 14.6 mg/kg; investigated as a mutagen, tumorigen, reproductive effector.
Carcinogenicity:
For arsenic and inorganic arsenic compounds:
Regulated by OSHA as a carcinogen.
EPA / IRIS classification: Group A - Known human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Arsenic Trioxide (1327-53-3)	Yes	No	1
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
For Hydrochloric Acid (Concentrated Solutions):
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
For Hydrochloric Acid (Concentrated Solutions):
This material may be toxic to aquatic life. LC50 Shrimp: 100-300 ppm/48-hr/salt water; LC100 trout: 10 mg/l/24-hr; TLm mosquito fish: 282 ppm/96-hr.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8

UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (HYDROGEN CHLORIDE)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Arsenic Trioxide (1327-53-3)	Yes	Yes	Yes	Yes
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Arsenic Trioxide (1327-53-3)	Yes	Yes	No	Yes
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Arsenic Trioxide (1327-53-3)	1	100*	No	Arsenic comp
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Arsenic Trioxide (1327-53-3)	1	P012	No
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: No information found.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products

Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. CANCER HAZARD. CONTAINS INORGANIC ARSENIC WHICH CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure. MAY CAUSE LIVER AND KIDNEY DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer:
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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

BARIUM, 1,000 UG/ML OR 10,000 UG/ML

MSDS Number: B0334 --- *Effective Date: 02/12/98*

1. Product Identification

Synonyms: None
CAS No.: Not applicable to mixtures.
Molecular Weight: 137.33
Chemical Formula: Ba
Product Codes: 5705, 5719

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Barium Nitrate	10022-31-8	< 2%	Yes
Nitric Acid	7697-37-2	< 4%	Yes
Water	7732-18-5	> 94%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The health effects from exposure to diluted forms of this chemical are not well documented. They are expected to be less severe than those for concentrated forms which are referenced in the descriptions below.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
Explosion:
Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
If involved in a fire, use water spray.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(tm) or TEAM(tm) 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

For Soluble Barium Compounds:
OSHA Permissible Exposure Limit (PEL):
0.5 mg (Ba)/m3
ACGIH Threshold Limit Value (TLV):
0.5 mg (Ba)/m3

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Odorless.
Solubility:
Infinitely soluble.
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
> 99
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
Not applicable.
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat, incompatibles.

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector. For Barium Nitrate: Oral rat LD50: 355 mg/kg. Irritation Data: Skin rabbit 500 mg/24H mild. Eye rabbit 100 mg/24H severe.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Barium Nitrate (10022-31-8)	No	No	None
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.

(NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 100ML

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 100ML

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 100ML

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Barium Nitrate (10022-31-8)	Yes	Yes	Yes	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Barium Nitrate (10022-31-8)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Barium Nitrate (10022-31-8)	No	No	No	Barium compo
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Barium Nitrate (10022-31-8)	No	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No

Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: No information found.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Industrial chemical.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3, 5, 7, 8, 10, 13, 16.
Disclaimer:
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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: [illegible]
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Copper, 1000 (u)g/mL (0.10% w/v)

MSDS Number: C5166 — *Effective Date: 09/08/97*

1. Product Identification

Synonyms: None
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Cu and HNO3 in H2O
Product Codes: 6928

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Copper	7440-50-8	< 1%	No
Nitric Acid	7697-37-2	1 - 2%	Yes
Water	7732-18-5	97 - 98%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Nitric Acid Component:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
Explosion:
Nitric Acid Component: Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(tm) acid neutralizer is recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures

below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Canister-type respirators using sorbents are ineffective.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, blue liquid.

Odor:
Odorless.

Solubility:
Completely soluble in water.

Specific Gravity:
No information found.

pH:
1.0 (0.1M HNO3)

% Volatiles by volume @ 21C (70F):
ca. 99

Boiling Point:
ca. 100C (ca. 212F)

Melting Point:
ca. 0C (ca. 32F)

Vapor Density (Air=1):
Essentially the same as water.

Vapor Pressure (mm Hg):
Essentially the same as water.

Evaporation Rate (BuAc=1):
Essentially the same as water.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes, hydrogen nitrate and copper fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with

most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat and incompatibles.

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Copper (7440-50-8)	No	No	None
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Copper (7440-50-8)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Copper (7440-50-8)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Copper (7440-50-8)	No	No	Yes	No
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Copper (7440-50-8)	5000	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: No information found.
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.

Revision Information:

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

GAF CHEMICALS -- MICROPOWDER IRON GRADE S-SERIES - METALLIC IRON
MATERIAL SAFETY DATA SHEET
NSN: 681000F024648
Manufacturer's CAGE: 46575
Part No. Indicator: A
Part Number/Trade Name: MICROPOWDER IRON GRADE S-SERIES

General Information

Item Name: METALLIC IRON
Company's Name: GAF CHEMICALS CORPORATION
Company's Street: 1361 ALPS ROAD
Company's City: WAYNE
Company's State: NJ
Company's Country: US
Company's Zip Code: 07470
Company's Emerg Ph #: (800) 228-5635 EXT. 016
Company's Info Ph #: (201) 628-3000
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01MAY91
Safety Data Review Date: 24SEP92
Preparer's Company: GAF CHEMICALS CORPORATION
Preparer's St Or P. O. Box: 1361 ALPS ROAD
Preparer's City: WAYNE
Preparer's State: NJ
Preparer's Zip Code: 07470
MSDS Serial Number: BNYCM

Ingredients/Identity Information

Proprietary: NO
Ingredient: IRON
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: NO4565500
CAS Number: 7439-89-6

Physical/Chemical Characteristics

Appearance And Odor: UNIFORM POWDER, 3-6 MICRONS DIAMETER
Boiling Point: 4982F
Melting Point: 2795F
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Extinguishing Media: CO2
Unusual Fire And Expl Hazrds: STRONG HEAT/SPARKS WILL INITIATE RAPID OXIDATION. W/SUFFICIENT AIR, WILL SPONTANEOUSLY GLOW DULL RED & IGNITE COMBUSTIBLES. DUSTING IN AIR IS EXPLOSION HAZARD.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, FLAME, MOISTURE
Materials To Avoid: ACIDS, STRONG OXIDIZING AGENTS, CHLORINE TRIFLUORIDE, FLUORINE, NITROGEN DIOXIDE, IRON
Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: ORAL (RAT) LD50: 30,000 MG/KG
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: EYES: RUST RINGS IN CORNEA, IRRITATION,

HYPEREMIA OF CONJUNCTIVA & INFLAMMATION. SKIN: IRRITATION & DERMATITIS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: EYES: RUST RINGS IN CORNEA, IRRITATION, HYPEREMIA OF CONJUNCTIVA & INFLAMMATION. SKIN: IRRITATION & DERMATITIS.
Emergency/First Aid Proc: EYES: FLUSH W/PLENTY OF WATER. SKIN: WASH AFTER EXPOSURE. INGESTION: INDUCE VOMITING BY DRINKING TWO GLASSES OR WATER & STICKING FINGER DOWN THROAT. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SCOOP UP. FLUSH SPILL AREA W/WATER.
Waste Disposal Method: DISPOSE OF W/SOLID WASTE ACCORDING TO FEDERAL, STATE & LOCAL REGULATIONS.
Precautions-Handling/Storing: USE W/ADEQUATE VENTILATION.
Other Precautions: MAINTENANCE: WASH EQUIPMENT THOROUGHLY W/STEAM OR WARM WATER. CHECK FOR FLAMMABLES W/EXPLOSION METER & OXYGEN LEVEL W/OXYGEN METER. FOLLOW GOOD SAFETY PRACTICES BEFORE ENTERING EQUIPMENT.

Control Measures

Respiratory Protection: DUST MASK WHERE DUSTING CANNOT BE AVOIDED.
Ventilation: ADEQUATE
Eye Protection: SAFETY GLASSES

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 24SEP92
Label Date: 10AUG92
Label Status: F
Common Name: MICROPOWDER IRON GRADE S-SERIES
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Slight: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-Slight: X
Special Hazard Precautions: EYES: RUST RINGS IN CORNEA, IRRITATION, HYPEREMIA OF CONJUNCTIVA & INFLAMMATION. SKIN: IRRITATION & DERMATITIS.
Protect Eye: Y
Protect Respiratory: Y
Label Name: GAF CHEMICALS CORPORATION
Label Street: 1361 ALPS ROAD
Label City: WAYNE
Label State: NJ
Label Zip Code: 07470
Label Country: US
Label Emergency Number: (800) 228-5635 EXT. 016
Year Procured: UNK

ALDRICH CHEMICAL -- BENZO (A) PYRENE, 98%, B1008-0
MATERIAL SAFETY DATA SHEET
NSN: 681000N065303
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: BENZO (A) PYRENE, 98%, B1008-0

General Information

Company's Name: ALDRICH CHEMICAL CO INC
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 05JAN95
Safety Data Review Date: 23OCT95
MSDS Serial Number: BZRGR

Ingredients/Identity Information

Proprietary: NO
Ingredient: BENZO(A)PYRENE (CERCLA)
Ingredient Sequence Number: 01
Percent: 98
NIOSH (RTECS) Number: DJ3675000
CAS Number: 50-32-8
OSHA PEL: 0.2 MG/M3
ACGIH TLV: A2

Physical/Chemical Characteristics

Appearance And Odor: YELLOW GREEN POWDER.
Boiling Point: 923F,495C
Melting Point: >351F,>177C

Fire and Explosion Hazard Data

Extinguishing Media: WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: OXIDIZING AGENTS.
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE:HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. SKIN LUNGS. TO THE BEST OF MANUFACTURER'S KNOWLEDGE, THE CHEMICAL, PHYSICAL

& TOX PROPERTIES HAVE NOT BEEN THORO INVESTIGATED.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: BENZO (A) PYRENE:IARC MONO, SUPP, VOL 7, PG 56, 1987:GROUP 2A. NTP 7TH ANNUAL RPT ON CARCINS. 1994:ANTIC TO BE (SUP DAT)
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES:FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SKIN:FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGESTION:WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUTE AREA. WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. WEAR DISPOSABLE COVERALLS AND DISCARD THEM AFTER USE. SWEEP UP, PLACE IN BAG & HOLD FOR WASTE DISP. VENT AREA & WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.
Precautions-Handling/Storing: DO NOT BREATHE DUST. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. CARCINOGEN. MUTAGEN. TERATOGEN. KEEP TIGHTLY CLOSED. STORE IN A COOL, DRY PLACE.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

Control Measures

Respiratory Protection: WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: USE ONLY IN A CHEMICAL FUME HOOD.
Protective Gloves: CHEMICAL-RESISTANT GLOVES.
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: ANSI APPROVED EMERGENCY EYE WASH AND DELUGE SHOWER (FP N). OTHER PROTECTIVE CLOTHING.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: EXPLAN OF CARCIN: CARCINOGEN. ANIMAL:SKIN, LUNG, LIVER.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 23OCT95
Label Status: G
Common Name: BENZO (A) PYRENE, 98%, B1008-0
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: TOXIC. ACUTE:HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. CHRONIC:CANCER HAZARD. CONTAINS BENZO(A)PYRENE WHICH IS LISTED AS AN ANIMAL LUNG, SKIN AND LIVER CARCINOGEN (FP N). MAY ALTER GENETIC MATERIAL. TERATOGEN. TARGET ORGAN(S):SKIN, LUNGS. TO THE BEST OF MANUFACTURER'S KNOWLEDGE, THE CHEMICAL, PHYSICAL & TOX PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Site Recon, Land Surveys, Mapping **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Walk the site Check equipment Load equipment Set transit Set control points Locate grid corners Set stakes and monuments Enter data into GIS	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Lifting hazards Repetitive motion injury	Must be escorted by EOD-trained personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of work station within limits of available equipment Take 5-minute break each hour

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
GPS, stakes, hammer approved metal detector[a] Hand-held radios Transit, pole, rod, chain, PC Level D PPE (see Section 8.1)	Daily check on source with approved metal detector[a]. Ensure total station is stable and level. Stay within sight of buddy. Ensure that electrical equipment is properly grounded.	HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP Knowledgeable, familiar, and trained with equipment and ergonomic recommendations

Note: (a) As demonstrated at geophysical equipment test plot.

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity Subsurface Utility Clearance **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Contact utility companies Inspect site Conduct magnetometer sweep	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Lifting hazards	Employees of utility service provider must be escorted by OE-qualified personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Magnetometer, stakes, hammer Level D PPE (see Section 8.1)	Daily check of magnetometer using buried source Stay within sight of buddy	Graduate of EOD School In accordance with (IAW) state and local laws HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Remove and Install Fencing **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Remove fencing and fence posts Install fence posts and fencing Inspect fence installation locations	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Lifting hazards	Employees of utility service provider must be escorted by OE-qualified personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Schonstedt magnetometer, fence posts, fencing, post hole digger, slide hammer, Standard Level D PPE (see Section 8.1)	Daily check of magnetometer using buried source Stay within sight of buddy	Site-specific training 24-hour HAZWOPER training Review and comply with SSHP Graduate of U.S. Navy EOD School for Escorts

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Surface Preparation/Sweep **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Visually inspect ground Inspect ground with Schonstedt magnetometer Remove all OE scrap and metallic debris Flag all suspected OE	OE Weather-related Hazards: wind, rain, sun, heat, cold Walking surfaces: unimproved land, sand, rocks, gravel, mud Dangerous plants and animals: poison oak, snakes, arthropods Lifting hazards	Must be OE-qualified Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Schonstedt magnetometer, pin flags, debris bags, Level D PPE (see Section 8.1)	Daily check of Schonstedt magnetometer using buried source Stay within sweep lanes and/or sight of buddy	Graduate of U.S. Navy EOD School Site-specific training 40-hour HAZWOPER training Review and comply with SSHP

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Removal of Vegetation **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Use hand tools to clear vegetation Use power tools to clear vegetation	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: cactus, livestock Power Tools	Must be escorted by OE-qualified personnel U.S. EPA Level D PPE Apply OE safety concepts and basic considerations Proper footing Have first-aid kits and fire extinguishers Use flagging system to mark OE Use eye protection Trained personnel only

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand tools, power equipment, Level D PPE (see Section 8.1)	Daily equipment inspection	Experience with the hand/power tools HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Geophysical Investigation **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Conduct magnetometer or electromagnetic sweep of OE grid	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Lifting hazards	U.S. EPA Level D PPE Apply OE safety concepts and basic considerations Proper footing Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use flagging system to mark OE Use eye protection

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Magnetometers or EM61[a], Level D PPE (see Section 8.1)	Daily check of geophysical equipment using buried source	HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP

Note: (a) As demonstrated at geophysical equipment test plot.

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Drilling **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Operate Drill Rig Operate Direct Push Equipment	OE Exposure to site contaminants Hazardous Noise Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	U.S. EPA Modified Level D PPE Apply OE safety concepts and basic considerations Proper footing and footwear Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use flagging system to mark OE Use eye protection Monitor for VOCs and Particulates in breathing zones and at work zone boundaries

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Drill Rig Modified Level D PPE (see Section 8.2)	Daily serviceability of drill rig Daily instrument checks	Graduate U.S. Navy EOD School 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity Well Installation **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Operate Drill Rig	Exposure to Site Contaminants Hazardous Noise Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	U.S. EPA Modified Level D PPE Proper footing and footwear Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use eye protection Monitor for VOCs and particulates in breathing zones and at work zone boundaries

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Drill Rig Modified Level D PPE (see Section 8.2)	Daily serviceability of drill rig Daily instrument checks	Graduate U.S. Navy EOD School 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity Well Sampling **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Open Well Purge Well Collect Sample	Exposure to Site Contaminants Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	U.S. EPA Level D PPE with chemically protective gloves Proper footing and footwear Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use eye protection Monitor wells for explosivity upon opening

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Level D PPE (see Section 8.2), modified by use of chemically protective gloves	Daily instrument checks	Graduate U.S. Navy EOD School 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity Soil Sampling **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Collect Sample Manually Seal Sample	Exposure to Site Contaminants (skin contact only) Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	U.S. EPA Level D PPE with chemically protective gloves Proper footing and footwear Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use eye protection

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Level D PPE (see Section 8.2), modified by use of chemically protective gloves	Daily instrument checks	Graduate U.S. Navy EOD School 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity OE Excavation **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Excavate ferrous metal contacts Possible use of heavy equipment	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	U.S. EPA Level D PPE Apply OE safety concepts and basic considerations Proper footing and footwear Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use flagging system to mark OE Use eye protection while excavating

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Shovels, backhoe, Schonstedt magnetometer, Level D PPE (see Section 8.1)	Daily serviceability of shovels Daily instrument checks Daily instrument checks of backhoe	Graduate U.S. Navy EOD School 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity Backfill Excavation **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Return excavated soil to opening Compact with feet and shovel	Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Rakes, shovels, Level D PPE (see Section 8.1)	Daily serviceability of shovels/rakes	HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP Train people in use of tools

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity OE Handling and Disposal **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Explosives handling Disposal by detonation	Explosives OE Noise Fragmentation Accidental detonation Slip, trip, and fall Lifting hazards Heat and cold stress Poison oak, snakes, arthropods	U.S. EPA Level D PPE Apply OE safety concepts and basic considerations Proper footing and footwear Remove obstacles on disposal site Use security to deny access to site Know heat and cold stress warning signs and proper action Use TM60 series for specific OE Have first-aid kits and fire extinguishers Educate personnel to stay beyond fragmentation distancefrom disposal site Conduct operations and safety briefing prior to beginning operation

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Demolition equipment Electrical firing system Hand tools Level D PPE (see Section 8.1)	Ensure demolition equipment and hand tools are serviceable - to be inspected daily prior to use	Graduate U.S. Navy EOD School 40-hour HAZWOPER and refresher Site-specific training Review and comply with SSHP Training people in use of tools

Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Inert Ordnance/OE Scrap Recovery **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Picking up scrap Loading onto truck Transport	Lifting heavy objects Vehicle accident Cut hazard Vehicle fire Lifting hazards (lifting overhead) Bending and stooping	Inspect vehicle for suitability to travel over terrain Use proper lifting techniques Use only qualified drivers Have appropriate first-aid kits, fire extinguishers Properly secure load for transport

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Vehicle with rate load capacity of 1/2 ton or greater, suitable for off-road travel Level D PPE (see Section 8.1)	IAW Department of Transportation requirements per 49 CFR	IAW with Department of Transportation, state, and local laws 40-hour HAZWOPER initial training Site-specific training Review and comply with SSHP

HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE

On-site use of devices which emit electromagnetic radiation (EMR) presents a significant hazard due to the susceptibility of electro-explosive devices (EED) to accidental detonation by EMR. EMR-emitting devices include many of the common types of communication equipment and navigation aids regularly employed on site (e.g., cellular telephones, two-way radios, etc.). While curtailment in use of these devices is preferable, some on-site activities are required. Accordingly, the ordnance and explosives (OE) hazard distance (referred to as the safe separation distance SSD) must be determined for each device which emits or produces EMR.

The Safe Separation Distance Formulae Table below, presents the formulas used to calculate SSD, based on the emission frequency of the EMR and the following parameters:

D = SSD (in feet)
F = EMR frequency (in megahertz [MHz])
P = EMR output power (in watts)
G = absolute (numerical) power gain ratio of the transmitting antenna (unitless)[1]

Safe Separation Distance Formulae Table

Frequency Range	SSD Formula
$f < 0.02$ MHz	$D = 0.093 \times (PG)^{0.5}$
$0.02 \text{ MHz} < f < 0.1$ MHz	$D = 4.63f \times (PG)^{0.5}$
$0.1 \text{ MHz} \leq f < 2.0$ MHz	$D = 18f \times (PG)^{0.5}$
$2.0 \text{ MHz} \leq f < 32$ MHz	$D = 90 \times (PG)^{0.5}$
$32 \text{ MHz} < f < 1000$ MHz	$D = 1200/f \times (PG)^{0.5}$

The following rules should be observed when calculating SSDs:

Rule 1: Where emissions occur over a range of frequencies the SSD will be determined for the highest and lowest frequency in the range, and the greater value accepted as the SSD for the device.

Rule 2: If the device can be manually set to operate at different frequencies a separate distance can be calculated for each operating frequency. If frequencies can be changed automatically the set of available frequencies should be treated as a range and analyzed per Rule 1.

Calculated SSDs for each device should be recorded on an SSD Log established for the site. The information should also be affixed to each device so that it is readily identifiable by device operators.

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[1] If antenna gain is expressed in decibels (dB), the absolute gain can be calculated using the following formula:

$$G = 10^{(G_{db}/10)}$$

STANDARD OPERATING PROCEDURES FOR DECONTAMINATION OF SOIL SAMPLING EQUIPMENT

The soil sampling equipment will be decontaminated after every sample is collected using the following method:

1. Wash with Alconox™ water solution.

2. Rinse with potable water.

3. Rinse with Type II reagent grade water or equivalent water.

4. Rinse with pesticide-grade methanol.

5. Rinse with pesticide-grade hexane.

6. Allow sampling equipment to air dry prior to further use. If the equipment will not be used immediately, it will be wrapped in oil-free aluminum foil and sealed in a plastic bag for storage.

The Type II reagent grade water noted above will be supplied by Earth Tech Inc. and will be certified by the manufacturer or by an analytical data to meet the specifications of ASTM D 1193-77. If another source of water is used, it will be analyzed by a laboratory and shown to be free of analytes of interest or other contaminants.

Rinse solutions will be disposed of in a designated DOT-approved 55-gallon drum. Used stainless steel liners will be rinsed and held for later decontamination.

STANDARD OPERATING PROCEDURES FOR DECONTAMINATION OF WATER SAMPLING EQUIPMENT

All sampling equipment and apparatus, including internal components, will be thoroughly decontaminated prior to use and between sample points to avoid cross contamination. All equipment used for water sampling will be decontaminated as follows:

1. Wash with a non-phosphate detergent-water solution;
2. Rinse with potable water;
3. Rinse with Type II reagent grade water or equivalent water;
4. Rinse with pesticide-grade methanol;
5. Rinse with pesticide-grade hexane; and
6. Air dry.

Ample time will be given for evaporation of solvents and for the equipment to dry prior to reuse. Analytical data or manufacturer's certification which verifies the quality of Type II reagent grade water or equivalent water will be provided. Sampling equipment used to collect samples for organic analysis will not be allowed to come into contact with any type of plastic, such as plastic storage bags. Solvents used to decontaminate sampling equipment will be stored in glass or Teflon™ containers. Sampling equipment that is not readily decontaminated will be discarded after each use. Discarded materials, including decontamination solutions, will be accumulated and stored in appropriate receptacles for proper disposal. The actual disposal of the decontamination materials will be in accordance with directions from the AFFTC/EM POC.

Purge equipment, including bailers and pumps, will be decontaminated by flushing/pumping an Alconox™-water solution, potable water, then Type II reagent grade water or equivalent water through the components. The pumps will be disassembled as far as possible (down to the check valve) steam cleaned with a hot water and Alconox™ solution and then rinsed with hot water. The pump will be reassembled, submerged in an Alconox™-water mixture, and allowed to pump 20 to 30 gallons through its components. The pump will then be steam cleaned again and 20 to 30 gallons of tap water will be pumped through the components. The exterior of the pump inlet hose will be steam cleaned. Non-disposable bailers, but not pumps, will then be rinsed with pesticide-grade methanol followed by a pesticide-grade hexane rinse, and allowed to air dry. If dedicated polyethylene tubing is utilized for purging activities, the exterior of the pump will be cleaned with an Alconox™ water mixture and rinsed with deionized water.

If a rig is used to handle equipment during purging or sampling, any grease that may contact equipment going into the well must be removed with an Alconox™ solution, after which the rig will be steam cleaned and rinsed with potable water.

STANDARD OPERATING PROCEDURES FOR RESPIRATOR FIT TESTING

Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if its fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions as a growth of beard, sideburns, facial scarring or the temple or nose piece on a set of eyeglasses may prevent proper sealing. Also any dental changes or cosmetic surgery may seriously affect the fit of the facepiece. If an individual has a weight gain or loss of twenty or more pounds, he or she must be fit tested again to ensure a proper seal. The respirator shall be checked by the wearer each time the respirator is donned. Fit testing shall be documented using the Qualitative Respirator Fit Test Form presented in Attachment I.

Earth Tech personnel using air-purifying respirators shall be fit-tested using both isoamyl acetate and smoke irritant methods within this section.

1. **Isoamyl Acetate Fit Test Procedures**

3.1 Pre-exposure – Prior to testing, the test subject will be exposed to a varied concentration of isoamyl acetate to assure that he/she can detect the odor.

3.2 Donning the Respirator – The wearer dons the respirator in the normal manner.

3.3 Positive Pressure Test – The wearer covers the exhalation valve(s) with the palm of the hand and exhales. A positive pressure should be formed inside the facepiece with no leakdown during a ten (10) second period.

3.4 Negative Pressure Test – The wearer covers the inhalation opening on the filter, cartridge, or canister and attempts to inhale. A negative pressure should be created inside the facepiece with no leakdown for a period of ten (10) seconds.

3.5 Test Enclosure – The wearer enters a test enclosure (plastic bag, test tent, etc.) which is to become contaminated with the isoamyl acetate.

3.6 Exposure – A saturated cloth, stencil brush, or ampule is passed close to the respirator sealing surfaces. Care should be taken to avoid touching the skin of the respirator wearer. The person administering the test should wear rubber gloves.

- If the wearer smells banana oil, he returns to clean air and readjusts the facepiece and/or adjusts the head straps without unduly tightening them.

- The wearer repeats the second step. If he does not smell banana oil, he is assumed to have satisfactory fit. If he smells the vapor, an attempt should

be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried.

- During the test, the employee should perform movements that approximate a normal working situation. These may include:

  - Normal breathing.

  - Deep breathing, as during heavy exertion (this should not be done long enough to cause hyperventilation symptoms).

  - Side-to-side and up-and-down movements should be exaggerated, and should approximate those that take place on the job.

  - Talking. This most easily accomplished by asking the wearer to recite something familiar or by reading a prepared test loudly enough to be understood by someone standing nearby.

  - Additional exercises may be added depending upon the situation.

  Note: Respirators equipped with <u>organic vapor cartridges</u> must be used for this fit test method.

2. **<u>Irritant Smoke Fit Test Procedures</u>**

2.1 <u>Donning the Equipment</u> – The wearer puts on the respirator in the normal manner, taking care not to tighten the head straps uncomfortably.

2.2 <u>Positive Pressure Test</u> – The wearer covers the exhalation valve(s) with the palm of the hand and exhales. A positive pressure should be formed inside the facepiece with no leakdown during a ten (10) second period.

2.3 <u>Negative Pressure Test</u> – The wearer covers the inhalation opening on the filter, cartridge, or canister and attempts to inhale. A negative pressure should be created inside the facepiece with no leakdown during a period of ten (10) seconds.

2.4 <u>Prepare Test Material</u> – both ends of a ventilation smoke tube are broken. Once end of the tube is connected to a two-way positive pressure aspirator bulb while the other end has a 2" to 3" length of plastic tubing attached. The test smoke is generated by squeezing the aspirator bulb.

2.5 <u>Test Enclosure</u> – The wearer enters a test enclosure (plastic bag, test tent, etc.) which is to become contaminated with the irritant smoke.

2.6 Contaminant Exposure – The smoke will be generated by aiming the end of the smoke tube with the plastic near the sealing surface of the respirator. Issue 8 to 10 puffs of smoke per exercise while the wearer is instructed to execute:

- Normal breathing.
- Deep breathing, as during heavy exertion (this should not be done long enough to cause hyperventilation symptoms).
- Side-to-side and up-and-down movements should be exaggerated, and should approximate those that take place on the job.
- Talking. This is most easily accomplished by asking the wearer to recite something familiar or by reading a prepared text loudly enough to be understood by someone standing nearby.
- Additional exercises may be added depending upon the situation.

Note: Respirators equipped with high efficiency filters must be used for this test. If a half-mask respirator is being tested, the test employee shall be instructed to wear goggles at all times during this test.

3. Field Fit Check Procedures

3.1 Positive Pressure Test – The wearer covers the exhalation valve(s) with the palm of the hand and exhales. A positive pressure should be formed inside the facepiece with no leakdown during a ten (10) second period.

3.2 Negative Pressure Test – The wearer covers the inhalation opening of the filter, cartridge, or canister and attempts to inhale. A negative pressure should be created inside the facepiece with no leakdown for a period of ten (10) seconds.

STANDARD OPERATING PROCEDURES FOR DECONTAMINATION OF EQUIPMENT

The soil sampling equipment will be decontaminated after every sample is collected using the following method:

1. Wash with Alconox™ water solution.

2. Rinse with potable water.

3. Rinse with Type II reagent grade water or equivalent water.

4. Rinse with pesticide-grade methanol.

5. Allow sampling equipment to air dry prior to further use. If the equipment will not be used immediately, it will be wrapped in oil-free aluminum foil and sealed in a plastic bag for storage.

The Type II reagent grade water noted above will be supplied by Earth Tech Inc. and will be certified by the manufacturer or by an analytical data to meet the specifications of ASTM D 1193-77. If another source of water is used, it will be analyzed by a laboratory and shown to be free of analytes of interest or other contaminants.

Rinse solutions will be disposed of in a designated DOT-approved 55-gallon drum. Used stainless steel liners will be rinsed and held for later decontamination.

STANDARD OPERATING PROCEDURES FOR MINIRAM CALIBRATION

Although every MINIRAM has been factory-calibrated using a representative dust, the user may wish to change the calibration constant of the instrument for a specific type of aerosol. Such calibration should be performed by obtaining a concurrent filter collection (e.g., by means of a personal filter sampler), sampling from the same environment within which the MINIRAM is placed. The average concentration obtained by the MINIRAM (i.e., TWA reading) at the end of the test should be compared with the filter-gravimetric-determined concentration. The ratio of the two concentration values can be used to correct the MINIRAM calibration. The comparison should be replicated several times (to minimize) errors to obtain an average ratio.

To change the MINIRAM calibration proceed as follows:

1. Place MINIRAM in a clean environment (e.g. air conditioned office).

2. Remove batter pack (follow procedure of section 7.0).

3. Disconnect battery connector (remember that all stored data will thus be lost/erased from MINIRAM memory).

4. While leaving batter pack lying next to MINIRAM, re-connect the two units (i.e., plug connector).

5. Immediately observe MINIRAM display. It will be performing a slow segment-by-segment display checkout. As soon as it displays ".00," press OFF, thus interrupting the initial automatic zero check of the MINIRAM. Wait until the display indicates "OFF" and then press MEAS and wait approximately 36 seconds.

6. Observe a 10-second readings (typically in the range of 1 to 3 mg/m3) and record manually a few consecutive readings. Calculate the average of these values.

7. Identify small potentiometer screw (visible through an opening in the foil shield of the MINIRAM) opposite the digital output jack. Adjust this potentiometer, using a fine screw driver, until the average MINIRAM reading is increased or decreased (with respect to the averaged obtained in step 6) by the desired ratio (e.g. as determined by previous gravimetric comparison runs).

8. Shut off MINIRAM, reposition and secure battery pack, and re-zero instrument as usual. All subsequent concentration readings are now corrected by the desired ratio.

STANDARD OPERATING PROCEDURES FOR RIG START-UP

INTRODUCTION

Most accidents involving machine operation and maintenance can be avoided by following basic rules and precautions. Read and understand all the safety messages in this annual and the safety signs on the machine before you operate or service the machine. See your supervisor if you have any questions,

In addition to the training you receive from your supervisor, read this manual completely to make sure you understand the characteristics of speed, stability, and steering of this machine.

BEFORE OPERATION

Avoid loose-fitting clothing, loose or uncovered hair, jewelry, and loose personal articles that may become caught in machinery.

Use protective equipment such as hard hats, steel-toe boots, gloves, reflective vests, and hearing protection when operating or working around machinery. Know and use the equipment that is required before you start the job.

Be prepared for emergencies. Always have a first aid kit and fire extinguisher with you and know how to use them.

Know the hand signals used on your job. See instructions in the SSHP for your project for specific information on hand signals.

Check that doors, guards, and covers are installed correctly and closed.

Foreign material or grease on the steps and handrails can cause accidents. Keep the steps and hand rails clean.

Before you operate at night, check that all lamps illuminate.

Know the rules, laws, and safety equipment necessary for transporting this machine on a road or highway.

Always face the machine and use the handrails and steps when getting on. Do not rush.

Before you start each day, walk around the machine and check for oil or fluid leaks. Replace all broken or missing parts and do the required lubrication and maintenance as shown in this manual. Clean all trash and debris from the machine.

Remove all loose objects from the operator's area and the machine. Loose objects can jam controls and cause accidents.

Engine exhaust fumes can cause death. If you operate the machine in an enclosed area, ensure adequate ventilation to replace the exhaust fumes with fresh air.

Make sure all persons are away from the machine and give a warning before you start the engine.

MACHINE OPERATION

Check all controls in a clear area and make sure the machine is operating correctly.

Do not allow other persons to ride on the machine. Other persons may fall or cause an accident.

Contact with overhead power lines can cause severe electrical burns or death from electrocution. Make sure there is adequate clearance between the machine and overhead power lines or other overhead obstructions.

Electrical cables, gas pipes, water pipes, sewers, or other underground utilities or objects can cause injury or death. Learn the location of underground hazards before you operate the machine.

If this machine rolls over, you can be injured or killed. You must take into account weather, road, slope, and other physical conditions to determine if safe operation of the machine is possible.

Stay away from hazardous areas such as ditches, overhead obstructions, and steep slopes. Always walk around the work area and look for hazards before you start.

Be alert and always know the location of other workers in the area. Keep all other persons completely away from your machine. Injury or death can result if you do not follow these instructions.

Operate the machine controls from the operator's seat only.

Keep the sampling unit low when moving around the work area.

BURN PREVENTION

Battery acid causes severe burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Flush any area of external contact with sulfuric acid with water. If taken internally, drink large quantities of water or milk, followed with beaten egg or vegetable oil. Call the doctor immediately (see SSHP for emergency telephone numbers for your project). If sulfuric acid contacts eyes, flush with water for 15 minutes and get prompt medical attention,

When battery electrolyte is frozen, the battery can explode if you try to charge the battery or if you try to jump-start and run the engine. To prevent the battery electrolyte from

freezing, try to keep the battery at full charge. If you do not follow these instructions, you or others in the area can be injured.

Hot coolant can spray out when the radiator cap is removed. To remove the radiator cap, let the system cool, turn to the first notch, wait until pressure is released, then remove the cap,

FIRE OR EXPLOSION PREVENTION

Sparks or flame can cause the hydrogen gas in a battery to explode. To prevent an explosion, do the following:

> When disconnecting the battery cables, disconnect the negative cable first; when connecting the battery cables, connect the negative cable last.
>
> When connecting jumper cables to start an engine, use the procedure specified in this manual under Operating Instructions, Booster Battery Connection.
>
> Do not short circuit the battery posts with metal items.
>
> Do not weld, grind, or smoke near a battery.

Sparks from the electrical system or engine exhaust can cause an explosion and fire. Before you operate this machine in an area with flammable dust or vapors, use good ventilation to remove the dust or vapors before starting the engine.

Engine fuel can cause an explosion or fire. Do not fill the fuel tank with the engine running, if you are near an open fire, or if you are welding or smoking.

Use nonflammable cleaning solvent to clean parts.

A fire can cause injury or death. Always have a fire extinguisher near or on the machine. Make sure the fire extinguisher is serviced according to the manufacturer's instructions.

If a fire extinguisher has been used, always recharge or replace the fire extinguisher before operating the machine.

Remove all trash and debris from the machine each day, making especially sure the engine and exhaust areas are free of trash and debris.

If you weld, grind, or use a cutting torch on the machine, always remove the starting fluid container from the machine. Use compressed air to remove any ether fumes from the area.

Starting fluid can cause injury or death. Do not breathe starting fluid vapors. Wear face protection when you remove or install a starting fluid container or when you use an aerosol spray starting fluid.

If the machine has an oil, fuel, or hydraulic fluid leak, always repair the leak and clean the area before operating.

Keep the cooling system clean and maintain the correct coolant level.

Make sure that you do not store oily rags or other flammable materials on the machine.

Check the electrical system for loose connections or frayed insulation. Repair or replace the loose or damaged parts.

Before welding or using a torch on the machine, clean the area to be repaired.

MAINTENANCE

Before you service the machine, put a "Do Not Operate" tag on the instrument panel.

Improper service or repair can cause injury or death. The machine may only be serviced by Precision's mechanic or by personnel specifically authorized by the Operations Manager.

If you must service this machine with the engine running, have another person help you. Do not leave the operator's seat with the engine running.

Metal chips or debris can cause eye injury. Always wear eye or face protection when you use a hammer on this machine. Use a hammer with a soft face, such as brass, to drive hardened pins.

Hydraulic fluid or grease injected into your skin can cause severe injury or death. Keep your hands and body away from any pressurized leak. If fluid is injected into your skin, see a doctor immediately.

When you service this machine, always wear face or eye protection and safety shoes.

SAFETY DECALS

Injury or death can result if you cannot read a safety decal or if a safety decal is missing. Replace any missing or damaged safety decal and keep all safety decals clean.

Make sure you can read safety decals and all instruction decals. Check these decals daily before starting work. Clean the decals if the decals are obstructed with dirt.

When you clean the decals, use only a cloth, water, and soap. Do not use solvent or gasoline.

HAND SIGNALS

You and your helper must use hand signals for communication when operating the machine. Before you start, make sure that you understand the signals that will be used.

MAINTENANCE

Precision's mechanic performs machine service and maintenance. You are required to complete a daily sampling rig inspection form to assist in identifying and correcting any mechanical problems with your sampling rig.

INSTRUMENTS AND CONTROLS

Instrument Panel

Fuel gauge

This gauge is illuminated to indicate the amount of fuel in the fuel tank when the key switch is in the ON position. Symbols indicate a full fuel tank or an empty fuel tank.

Systems Normal Indicator Lamp

This lamp illuminates and stays illuminated during machine operation until one or more of the following conditions occur: (1) low engine oil pressure; (2) high hydraulic fluid temperature; (3) low alternator output; (4) system voltage below 11 volts; or (5 high engine coolant temperature.

Hydraulic Filter Warning Lamp

Lamp illuminates when the engine is started and the hydraulic fluid is cold, or when the engine is running and the hydraulic filter is in need of service. If the lamp is illuminated after 15 minutes of machine operation, or if the lamp illuminates during machine operation, stop the engine and service the hydraulic filter. If this lamp illuminates, the systems normal indicator lamp will stay illuminated and the warning alarm will not actuate.

Engine Oil Pressure Warning Lamp

This lamp illuminates when the engine is running and the engine temperature is too low. Then, the warning alarm will actuate and the systems normal indicator lamp will stop illuminating. Stop the engine and check for the problem.

Battery Warning Lamp

This lamp illuminates when the battery voltage falls below 11 volts. The systems normal indicator lamp will stop illuminating.

Hour Meter

Show the total hours of engine operations in hours and tenths of an hour. Use the hour meter to measure the time between the maintenance intervals.

Seat Belt Warning Lamp

This lamp reminds you to fasten your seat belt.

Hydraulic Temperature Warning Lamp
Lamp illuminates when the engine is running and the hydraulic fluid temperature is too high. The warning alarm will actuate and the systems normal indicator lamp will stop illuminating. Stop the machine and check for the problem.

Alternator Warning Lamp
This lamp illuminates when the engine is running and there is a problem with the alternator. The warning alarm will actuate and the systems normal indicator lamp stops illuminating. Make sure the engine speed is at full throttle to check this warning lamp. Stop the machine and check the alternator charging system.

Air Filter Warning Lamp
This warning lamp illuminates when the engine is running and the air filter requires service.

NOTE: If you have corrected a problem, the warning lights will stop illuminating, the warning alarm will stop actuating, and the systems normal indicator lamp will illuminate.

Key Switch
The key switch has four positions: ACC, OFF, ON, and START. The ACC (accessory) position energizes the horn and lights. The OFF position is used to stop the engine and de-energize the electrical system. The ON position energizes the electrical system and is the normal position of the key when the engine is running. The START position is used to actuate the starter motor to start the engine.

Light Switch

Pull the light switch knob to illuminate the lights. Push the knob in to turn the lights off,

Engine Hand Throttle
Push the engine hand throttle completely forward for maximum engine speed. Pull rearward to decrease the speed. It is recommended that you run the engine at full throttle when you operate this machine.

Horn Button
Push the horn button to actuate the horn.

Operator's Seat
Move the lever on the left side of the seat bottom to slide the seat forward or backward. Release the lever to hold the seat in position.

Operator Protection Bars
The operator protection bars have two positions: UP and DOWN. When UP the lifter arm control is held in neutral position and the parking latch is applied. When the bars are down, the lift arm control is free to move and the parking latch is released. To release the

operator protection bars from the DOWN position, pull back both release levers and move the bars to the UP position.

Steering Controls
Push both steering controls forward to move the machine forward. Pull both steering controls rearward to move the machine in reverse. Move the controls forward a short distance for maximum power and slow speed. Move the control completely forward for maximum speed.

Seat Belt
Always fasten the seat belt and pull down the operator protection bars before you start the engine. Always stop the engine before you release the operator protection bars and seat belt.

ENGINE OPERATION

Walk Around Inspection
Each day, before you start the engine, check for leaks under the machine. Check tires for damage and wear. Check for broken, damaged, loose, or missing parts; replace, tighten, or adjust as required before you operate the machine.

Clean all debris from the machine, especially around the engine area. Clean or replace any safety or instruction decal that cannot be read. Clean the handrails, step, and operator's compartment.

Starting the Engine
Adjust the seat and fasten the seat belt. Pull both operator protection bars down. Warn all persons in the area that you are going to start the engine. Push the throttle forward about 1 inch. Turn the key switch to the ON position. All warning lamps will illuminate for 2 seconds. Turn the key switch to the START position. Release the key as soon as the engine starts.

If the engine starts and then stops, do not actuate the starter motor again until the starter stops turning. Do not operate the starter motor for more than 15 seconds at one time. Let the starter motor cool for 3 minutes before you actuate the starter motor again. While the starter motor is engaged, white or black smoke must be seen at the exhaust pipe. If no smoke is seen, check the fuel supply.

After the engine starts, check the instruments to make sure the indications are correct. Run the engine at about 1/4 throttle until the engine coolant is warm.

Do not run the engine at idle speed for long periods. This can cause low operating temperatures. Low operating temperatures can cause acids and deposits in the engine oil. It is recommended that you run the engine at full throttle when operating conditions permit and when safe.

Parking the Machine and Stopping the Engine
Park on level ground and lower the sampling unit to the ground. If the machine has been running at full load, run the engine at no load half-speed for 2-3 minutes before shutting off. This procedure will cool the engine parts evenly. Turn the key to the OFF position to stop the engine. Remove the key, release the operator protection bars, and release the seat belt. Always use the handrails and steps when leaving the cab. The parking latch is engaged automatically.

Booster Battery Connection (Jump Starting)
WARNING: Wrong jumper cable connections or shorting across the starter terminals can cause the machine to suddenly move out of control. You can be injured or killed. Use the correct method described here to connect jumper cables to this machine.

WARNING: Batteries contain acid and explosive gas. Explosion can result from sparks, flares, or wrong cable connections. To connect the jumper cables correctly, follow these instructions. Failure to follow these instructions can cause serious injury or death.

Two persons are required for this procedure. Make sure that you and the person making the connections are wearing face protection.

Remove the floor plate. Sit in the operator's seat and have the other person make the connections. Make sure the jumper battery is 12 volts. If using another machine for power, make sure the two machines do not touch. Connect the positive (+) battery terminal. Connect the negative (-) jumper cable to a good frame ground away from the battery. Start the engine and have the other person disconnect the negative (-) jumper cable first and the positive (+) jumper cable last. Install the floor plate.

MACHINE OPERATION
Before you operate the machine, check the steering control levers, instruments, warning lamps, engine throttle, and equipment hydraulic controls. Also, check the operator protection bars are in the UP position, the parking latch is engaged, and the loader control levers are held in the neutral position.

If you know there is a malfunction, a missing part, or a part that needs adjustment, stop the machine and correct the problem.

Set the engine speed at full throttle, and control the machine speed with the steering control levers.

Keep all machine movements smooth.

TRANSPORTING THE MACHINE
Before you put the machine on a trailer or truck, make sure the ramp and parking surface is free of all oil, grease, ice, etc.