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DRAFT HEALTH AND SAFETY PLAN FOR REMEDIAL INVESTIGATION FEASIBILITY  
STUDY NAS FORT WORTH TX  
6/1/1993  
LAW ENGINEERING AND ENVIRONMENTAL

147000



**NAVAL AIR STATION  
FORT WORTH JRB  
CARSWELL FIELD  
TEXAS**

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**ADMINISTRATIVE RECORD  
COVER SHEET**

AR File Number 147

11-3517-0111.01

**INSTALLATION RESTORATION PROGRAM (IRP)  
REMEDIAL INVESTIGATION / FEASIBILITY STUDY**

**HEALTH AND SAFETY PLAN**

Carswell Air Force Base, Fort Worth, Texas

Law Environmental, Inc.  
Kennesaw, Georgia 30144

June 1993

Draft



PREPARED FOR

7TH SUPPORT GROUP  
7TH CIVIL ENGINEERING SQUADRON  
ENVIRONMENTAL MANAGEMENT FLIGHT  
CARSWELL AIR FORCE BASE, TEXAS 76127

UNITED STATES AIR FORCE  
HUMAN SYSTEMS DIVISION (AFSC)  
AIR FORCE CENTER FOR ENVIRONMENTAL  
EXCELLENCE (AFCEE/ESB)  
BROOKS AIR FORCE BASE, TEXAS 78235-5328



June 4, 1993

Air Force Center for Environmental Excellence  
AFCEE/ESB  
Building 624 West  
Brooks Air Force Base, TX 78235-5328

Attention: Chris Hobbins (Team Chief)

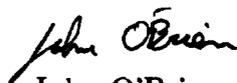
Subject: Carswell Air Force Base  
Draft Health and Safety Plan  
Contract No. F33615-90-D-4008  
Delivery Order No. 0011  
Law Project No. 11-3517-0111

Dear Mr. Hobbins:

Law Environmental, Inc., Government Services Division is pleased to submit the enclosed five copies of the Draft Health and Safety Plan to the Air Force Center for Environmental Excellence (AFCEE) for review and comment.

If you have questions or comments, please contact us at (404) 499-6800.

Sincerely,

  
John O'Brien  
Project Manager

  
for Winifred H. Curley, Ph.D.  
Principal

11-3517-0111.01

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DRAFT HEALTH AND SAFETY PLAN  
FOR  
CARSWELL AFB  
FORT WORTH, TEXAS 76127-5000

JUNE 1993

Prepared by:

Law Environmental, Inc.  
114 TownPark Drive  
Kennesaw, Georgia 30144

CONTRACTOR CONTRACT NO. F33615-90-D-4008

DELIVERY ORDER NO. 0011

Base Closure Restoration Division (AFCEE/ESB)  
Mr. Chris Hobbins AFCEE/ESB  
Team Chief

Human Systems Center (HSC/PKV)  
Environmental Contracting Division  
Brooks Air Force Base, Texas 78235-5328

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## 1.0 GENERAL SITE SAFETY AND HEALTH PLAN

### 1.1 PURPOSE OF SITE SAFETY AND HEALTH PLAN

The health and safety of site personnel and the public is a primary concern during investigations at potential hazardous waste sites. Thus, a comprehensive, carefully managed, and thoroughly documented Site Safety and Health Plan (SSHP) is crucial for successful project completion. This SSHP presents the conditions and hazardous substances known or anticipated to be present at Carswell Air Force Base (Carswell AFB) to be addressed by current site investigations. This SSHP will be used by Law Environmental, Inc. (Law) to identify and mitigate potential site and task-specific hazards, and select appropriate health and safety protective measures to be instituted for operations to be undertaken during this site investigation.

This document has been developed based on available background information pertaining to the sites. The document describes the field implementation of the SSHP, specific personnel responsibilities and training requirements, protective equipment, site operating procedures, emergency contingency procedures and medical monitoring. Its flexibility allows unanticipated site-specific conditions to be addressed to ensure adequate and suitable protection of site workers.

The SSHP will be bound with other pertinent information and used by the Site Safety Officer (SSO) as a field reference manual for safety, health and emergency response procedures. This SSHP contains information pertinent to general conditions at Carswell AFB, and addresses individual sites. The SSHPs contain site-specific information pertaining to health and safety procedures to be implemented for each site. The site-specific procedures will be discussed with all site personnel and made

available for review through the Site Manager to ensure sufficient awareness of potential hazardous conditions and safety procedures at the Carswell facility.

### 1.2 SCOPE OF HEALTH AND SAFETY PLAN

The SSHP addresses all phases of field operations at the site, including:

- Responsibilities of key site safety and health personnel
- Work practices and standard operating procedures
- Hazard identification and assessment, including chemical, physical and biological hazards
- Establishment of work zones (Exclusion Zone, Contamination Reduction Zone, Decontamination Zone, Support Zone)
- Level of personal protective equipment and clothing required in each zone during each task
- Exposure monitoring/air sampling procedures
- Heat/cold stress monitoring
- Entry and exit routes
- Decontamination procedures
- Response procedures for accidents and emergencies
- Medical surveillance
- Training requirements for workers and on-site training
- Recordkeeping requirements

### 1.3 REGULATORY AUTHORITY

All on-site activities shall be conducted in accordance with applicable Occupational Safety and Health Administration (OSHA) and other federal, state and local regulations, including the following:

29 CFR § 1910.120	Hazardous Waste Operations and Emergency Response.
29 CFR § 1910.134	Respiratory Protection
29 CFR § 1910.1028	Benzene Standard
29 CFR § 1910	All Other Applicable Regulations
29 CFR § 1926	All Other Applicable Regulations
40 CFR § 61, Subpart A	National Emissions Standard for Hazardous Air Pollutants

## 2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

This section presents a general description of Carswell AFB and on-site tasks associated with field investigations.

### 2.1 BASE DESCRIPTION

Following is information regarding the location and history of Carswell AFB.

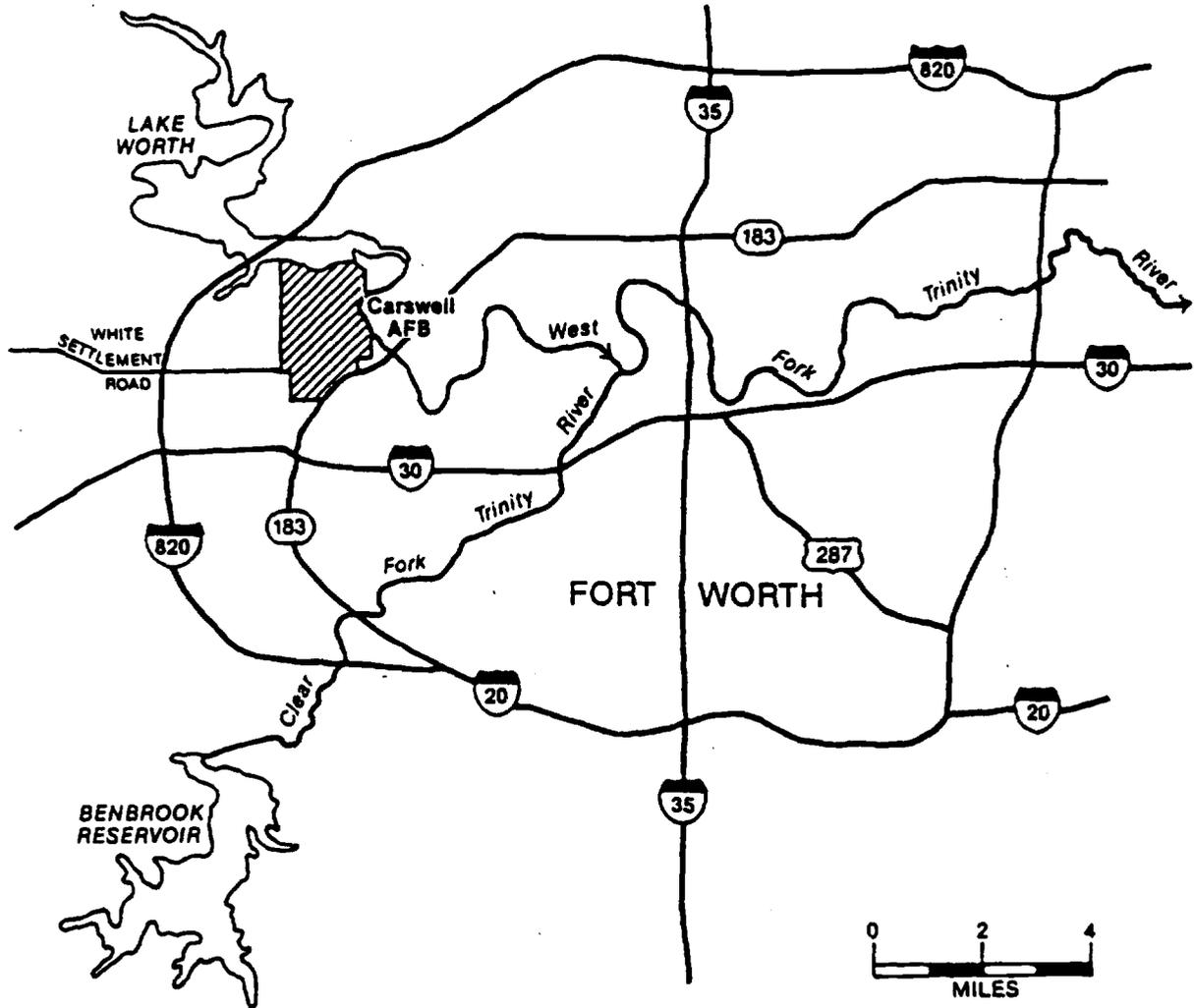
#### 2.1.1 Location of Carswell Air Force Base

Carswell AFB is located six miles west of Fort Worth in Tarrant County, Texas. The base is bordered by Lake Worth to the north, the West Fork of the Trinity River and the community of Westworth to the east and southeast, and Air Force Plant 4 to the west (Figure 2-1).

Unnamed Stream (SD-13) - Unnamed Stream is a small tributary that emerges from an underground oil/water separator and enters the West Fork of the Trinity River, or Farmer's Branch. The stream and the separator are located south of the communications building and immediately south of the fenced civil engineering storage yard. The oil/water separator is connected to a french drain system which was reportedly built in 1965 to intercept hydrocarbon products leaking from the POL Tank Farm into sewer pipes. The location of the french drain has been determined by subsurface investigation by base engineering personnel, but is not documented in available base records. Unnamed Stream is perennial, receiving flow from ground water entering the french drain and discharging from the separator.

POL Tank Farm (ST-14) - The POL Tank Farm is located along Knights Lake Road, near the Carswell AFB main gate. The site is occupied

# LOCATION MAP OF CARSWELL AFB CARSWELL AFB, FORT WORTH, TEXAS



by three above-ground fuel storage tanks. Three additional tanks were formerly located at this site, but have been dismantled. During the early 1960s, fuel was discovered in the ground at this area and downgradient of the site. The french drain system described above was installed downgradient to collect the released fuel. The french drain discharges through the oil/water separator at the Unnamed Stream (SD13). At the time, the leaking underground pipes were reportedly located and replaced. No other fuel releases were reported after 1965, but the french drain system continues to collect residual hydrocarbon constituents which are discharged through the oil/water separator.

## 2.2 ON-SITE TASKS TO BE PERFORMED

On-site tasks associated with field investigations at the Carswell AFB will vary with each site and are described in detail in the Work Plan and subsequent sections of this document. Activities to be performed at the sites may be categorized as either intrusive or non-intrusive. In general, intrusive activities, such as the installation of monitoring wells, may involve direct contact with contaminated media; therefore, the potential for exposure to hazardous materials is increased. Non-intrusive activities, such as the geophysical survey, tend to pose a lower potential for worker exposure to chemical hazards because these activities will involve minimal contact with contaminated media.

### 3.0 HAZARD ASSESSMENT/RISK ANALYSIS

The hazards associated with field investigations are unique to each site and are discussed in detail in the Work Plan and Sections 16.0 and 17.0 of this document. This section provides a general description of potential hazards anticipated during the work at Carswell AFB.

#### 3.1 HAZARD IDENTIFICATION

The chemical, physical, and biological hazards associated with site activities are discussed in this section. Chemical hazards may arise from worker exposure to excessive levels of toxic contaminants potentially present in the environmental media at the sites. The chemical hazards are discussed in Sections 16.0 and 17.0 (site-specific portion) of the Health and Safety Plan (HSP). The physical characteristics, regulatory exposure limits, and health hazards associated with representative chemicals are provided in Tables in site-specific sections.

Physical hazards that workers at Carswell AFB may encounter are due to the physical stresses that the environmental elements (e.g., temperature, humidity, proximity to heavy machinery, etc.) may exert upon the worker's body. Biological hazards refer to plants, animals, and infectious agents that may present a potential risk to the health and well-being of workers at the site (NSC, 1988).

##### 3.1.1 Physical Hazards

Potential physical hazards that may be encountered during work at Carswell AFB include the following:

- Oxygen-deficient atmospheres and/or areas subject to accumulation of toxic or flammable contaminants, which have a limited means of egress in confined spaces;

- Heat or cold stress, depending on season of work;
- Physical/electrical hazards associated with working in the vicinity of overhead power lines and/or underground utilities;
- Physical hazards associated with the use of heavy equipment such as backhoes and drilling rigs;
- Physical hazards associated with working in limited spaces;
- Physical hazards associated with working in remote areas and areas of dense vegetation, such as brush and brambles;
- Physical hazards associated with sampling surface water areas (i.e., slipping, falling, drowning).

### 3.1.2 Biological Hazards

Potential biological hazards that may be encountered during work as Carswell AFB include the following:

- Contact with poisonous plants and animals (snakes).
- Contact with insects such as mosquitos, ticks, bees, wasps, hornets, chiggers, etc.
- Personnel should be alert when working near cool and shaded areas. Packaged materials, stored clothing, steel casing, etc., also provide favorable "hiding" places for snakes and insects.

### 3.2 CHEMICAL INDICATORS OF HAZARD

In the site-specific plans, one or more chemicals will be identified as the chemical indicators of hazard for that site. In this section, the process for selecting the indicator chemicals is identified. The chemical indicators of hazard are chosen on the basis of OSHA regulatory guidelines. Chemicals with the most stringent Permissible Exposure Limits (PELs) are chosen as indicator chemicals because measures taken to mitigate inhalation and dermal exposures to these chemicals should provide adequate and appropriate protection against toxic chemicals of the same chemical group. Chemicals which provide a corrosive or reactive danger are also identified in the site-specific plans. Personal protective equipment (PPE) and clothing will be used to minimize exposure to the indicator chemicals at each site.

### 3.3 EXPOSURE STANDARDS AND GUIDELINES

This section outlines the regulatory protective exposure standards and guidelines for chemicals of concern at the Carswell AFB. The most stringent standard or guideline for a chemical will be applied to provide adequate protection for the workers.

#### 3.3.1 Regulatory Protective Exposure Standards

Permissible Exposure Limits (PELs) are the OSHA regulatory standards (enforceable by law) for personnel protection from exposure to hazardous chemicals. The OSHA PEL is usually weighted over an eight-hour work day period to represent the exposure over the average work day which occurs during a forty-hour work week. PELs are the airborne concentration (over specified time periods) of a chemical to which nearly all workers may be exposed, day after day, without adverse effects.

### 3.3.2 Non-Regulatory Protective Exposure Guidelines

Non-regulatory guidelines for occupational exposure to chemicals are threshold limit values (TLVs). TLVs are analogous to OSHA's PELs, but, as guidance, are not enforceable legal standards. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and are usually time-weighted over an average eight-hour work day per 40-hour work week.

### 3.4 ACTION LEVELS

This section describes the criteria upon which:

- PPE will be selected, upgraded or downgraded;
- work practice controls will be used;
- emergency evacuation of on-site personnel will be implemented; and
- prevention and/or minimization of public exposures to hazards created by site activities will be accomplished.

Air monitoring/sampling will be performed in accordance with Section 9.0, and the resulting data compared with the action levels described in the SSSHPs and in the following paragraphs. Appropriate actions will be taken as necessary to ensure worker safety and the safety of the public.

#### 3.4.1 Action Levels: Organic Vapor Photoionization Detector and Detector Tubes

Ambient air in the breathing zone will be monitored for organic vapors at least once every 15 minutes during site operations and with every change in task or work location. The organic vapor monitoring instrumentation to be used are described in Section 9.1.

Continuous monitoring will be conducted at locations where vapor buildup is a potential hazard. Since organic vapor monitors provide only qualitative readings, chemical-specific detector tubes (Draeger tubes) will be used in conjunction with organic vapor monitoring during field investigations to monitor for the presence of specific organic vapors. Action levels for organic vapors and chemical detector tubes are presented in the SSSHPs.

#### 3.4.2 Action Levels: Oxygen

Oxygen levels in the breathing zone will be monitored continuously using a portable multi-gas monitor during intrusive activities and during work at locations where vapor accumulation is a potential hazard. Action levels for oxygen are not site-specific and are pertinent for all sites at Carswell AFB. Action levels based on oxygen levels are presented below.

<u>Oxygen Level</u>	<u>Action</u>
19.5 - 23.5%	None; normal oxygen level
<19.5%	Oxygen deficient atmosphere; stop work, notify Site Safety and Health Officer (SSO), ventilate area until normal oxygen levels are present; or upgrade to Level B PPE
>23.5%	Fire/explosion hazard; stop work, ventilate area until normal oxygen levels are present

#### 3.4.3 Action Levels: Combustible Gases

Combustible gas monitoring will be performed continuously during intrusive site activities, using an explosimeter, and at locations where vapor accumulation is possible (i.e., tops of boreholes or excavations), using a portable multi-gas monitor. Action levels

based on Lower Explosive Limit (LEL) readings monitored at the source are as follows:

<u>LEL Level</u>	<u>Action</u>
<10% LEL	None; proceed with work and continue monitoring
10 - 25% LEL	Potential explosion hazard; proceed with caution and monitor LEL levels closely, notify SSO
>25% LEL	Explosion hazard exists; stop work; evacuate site and ventilate area until levels of combustible gases fall below 25% LEL

#### 3.4.4 Action Levels: Hydrogen Sulfide Gas

A portable multi-gas monitor having the capability of detecting hydrogen sulfide (H<sub>2</sub>S) will be used for monitoring during tasks performed at sites with potential for the presence of hydrogen sulfide gas. The toxic effects of hydrogen sulfide gas are of particular concern because H<sub>2</sub>S has poor warning signs for exposure (i.e., is not detected by odor at levels that are subtoxic and rapid olfactory desensitization to H<sub>2</sub>S occurs).

<u>H<sub>2</sub>S Levels</u>	<u>Action</u>
0-5 ppm	Safe level
2-10 ppm	Exposure hazard; stop work; evacuate site, notify site manager, and upgrade to Level B PPE

#### 3.4.5 Action Levels: Dust

Dust levels will be visually monitored in the ambient air within the working zone during all tasks involving disturbance of soils.

If fugitive dust emissions are a potential problem at a site, suppression techniques will be employed when dust is visible and constant in the work environment.

#### 4.0 ACCIDENT PREVENTION

Daily safety and health inspections will be conducted by the SSO to determine if operations are being performed in accordance with this SSHP and OSHA regulations. Personnel will be alert for potentially hazardous situations and symptoms in themselves and others that warn of hazardous conditions and exposures. Safety briefings will be conducted by the SSO to review site-specific hazards and/or changing site conditions so that dangerous situations can be rapidly recognized and appropriate response taken. A site safety meeting with all site personnel will be held prior to the onset of field activities and once a week thereafter. The purpose of the meetings will be to discuss the potential safety and health hazards associated with field activities, and to ensure that standard operating procedures are followed at all times.

Some topics that will be covered in the briefings are as follows:

- Emergency Response Procedures
- Chain of Command
- Standard Operating Procedures
- Slip, trip, and fall prevention
- Symptoms associated with heat or cold stress
- Vehicle, drill rig accidents
- Electrical injuries (shocks)
- Physical injuries (blows, cuts, and impacts)
- Insect/animal hazards
- Good housekeeping practices (accident prevention)
- Use of emergency hand signals

Additional topics will be addressed as warranted by site-specific field activities and conditions.

## 5.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

The responsibilities of personnel for the formulation, implementation and enforcement of the Law Health and Safety Program and this SSHP are presented in this section.

### 5.1 SITE SAFETY OFFICER

The Site Manager will serve as Site Safety and Health Officer, and will be available during field activities at Carswell AFB and will be responsible for the field implementation of the SSHP. These responsibilities are outlined in detail in OSHA 29 CFR 1910.120 and the NIOSH/OSHA/USCG/EPA document "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" (October, 1985). These responsibilities include ensuring the following:

- All site personnel, including subcontractor personnel and authorized visitors, have received the OSHA required 40-hour health, safety, and emergency response training and receive annual 8-hour refresher courses.
- All supervisors on site have received the OSHA required 8-hour supervisory course and are certified in First Aid and CPR by the American Red Cross or an equivalent agency.
- All site personnel have completed the required medical examination and meet the qualification criteria for site work as specified in 29 CFR 1910.120 and ANSI Z-88.2.
- All site personnel, including subcontractor personnel and authorized visitors, have received appropriate site-specific safety and health training prior to site entry.

- All equipment, including safety equipment, is suitable and adequate for its intended use.
- Supervisors and project managers meet at least once monthly to review past activities, to plan ahead for new or changed operations, and to establish safe working procedures and that a written outline of these meetings is kept on file.
- A site safety meeting with all site personnel is conducted prior to commencement of field activities, and at least once weekly thereafter and a written record is maintained which notes the date, time, attendees, subjects discussed and person conducting the meeting.
- Standard Operating Procedures (SOPs) are followed at all times.

## 5.2 MEDICAL CONSULTANT

Dr. David Barnes serves as the medical consultant for Law Environmental's Kennesaw location. He is a board-certified occupational health physician. If immediate health care is needed during site operations or a medical emergency arises, the medical personnel employed at Carswell AFB Hospital (until base closure) or Harris Methodist Hospital will be consulted.

## 6.0 TRAINING REQUIREMENTS

The following minimum hazard training requirements should be met by all on-site personnel, including visitors. The SSO is responsible for briefing field personnel regarding potential contamination that may be encountered at the site, site safety procedures, and the emergency response plan.

### 6.1 TRAINING REQUIREMENTS FOR SITE PERSONNEL

A thorough understanding of the types of hazards most likely to be encountered at hazardous sites and the personal protection measures needed to protect on-site personnel are the first requirements of a complete HSP. This section describes the minimum training that each project team member is required to complete before working on-site.

#### 6.1.1 Comprehensive Training Requirements

All on-site personnel are required to have participated in a 40-hour comprehensive training course that complies with OSHA 29 CFR 1910.120. This training should consist of off-site classroom instruction and field exercises to demonstrate the worker's familiarity with personal protective equipment and potential hazards to which they may be exposed. This initial training includes, but is not necessarily limited to, the following:

- Review of OSHA 29 CFR 1910.120 Regulations
- Chemical Hazards
- Physical Hazards
- Health Hazards
- Compatibility of Chemicals
- Toxicology (Acute Exposure, Chronic Exposure, Carcinogens)

- Medical Surveillance
- First Aid
- Physical Hazards (Radiation, Heat/Cold Stress, Noise)
- Site Control
- Safe Work Practices
  - OSHA Standards
  - Common Work Injuries
  - Common Work-Site Hazards
  - Drum Handling
- Air Monitoring
- Protective Clothing
- Respiratory Protection
- Confined Spaces
- Decontamination
- Contingency and Emergency Planning
- Hands-On Training on SCBAs, PPE, Respirators, Air Monitoring, and Decontamination

In addition to the initial off-site training described above, all general site workers must have a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. Documentation of this experience must be provided by each worker, including subcontractor personnel, prior to the start of work.

#### 6.1.2 Annual Refresher Training

Refresher training is an integral part of training and is also required for all on-site personnel. Site personnel are required to have participated in a minimum of eight hours of refresher training meeting OSHA 29 CFR 1920.120 requirements on an annual basis following completion of the comprehensive training requirements described in Section 6.1.1. Documentation of this experience must be provided by each worker, including subcontractor personnel, prior to the start of work.

### 6.1.3 Supervisor Training Requirements

Minimum training requirements for health and safety team supervisory personnel are described below.

6.1.3.1 Site Manager/ Site Safety Officer - A Site Manager will be designated to implement the on-site training and safety requirements during all site activities at the Carswell AFB sites. The Site Manager is required to satisfy the comprehensive training requirements and annual refresher training requirements described above, and must have at least eight (8) additional hours of specialized training pertaining to hazardous waste site management meeting the requirements of OSHA 29 CFR 1920.120.

### 6.1.4 CPR/First Aid Training Requirements

At a minimum, one individual having current certification in CPR and First Aid procedures by the American Red Cross (or equivalent agency) will be continuously present at each work site during site operations.

### 6.1.5 Site-Specific Training And Safety Briefing

Site-specific training covering site hazards, procedures and the contents of the SSHP will be conducted by the Site Manager for all on-site Law employees, subcontractors and approved visitors prior to site entry or commencement of work. Hazards specific to the site and the tasks to be performed, and specification of the proper initial level of PPE for each task and upgrade PPE will be discussed. Emergency response procedures and contacts will be reviewed. Standard Operating Procedures (SOPs) for activities at the site will be outlined. It will be the responsibility of the Site Manager to ensure that all field personnel are thoroughly familiar with SOPs and the overall chain of command at the site.

#### 6.1.6 Visitor Training

Authorized OSHA-trained visitors entering the work site shall receive a safety briefing from the SSO to inform them of the hazards associated with the site, to explain emergency procedures and inform them of the recommended level of PPE during the visit. With the exception of prescription safety glasses, respirators and safety footwear, Law will provide PPE as needed for site visitors.

#### 6.2 TRAINING RECORDS

Records will be maintained and available for Law personnel working at the site to verify compliance with health and safety training requirements. Records available for review should include the type of training completed (initial, refresher, supervisory and site-specific), the duration, and the dates of training.

## 7.0 PERSONNEL MONITORING AND PROTECTIVE EQUIPMENT

The use of appropriate personal protective equipment (PPE), in conjunction with site entry, safety, and decontamination procedures will reduce the potential for worker exposure to hazardous substances present at the site. A personal protective equipment (PPE) program established in accordance with 29 CFR 1910.120(g)(5) and 29 CFR 1910.134 will be implemented. The level of protection to be used during field work at the Carswell AFB sites will be determined based upon conditions indicated by previous investigations at the site, and actual site conditions encountered and anticipated. Field personnel must be prepared to upgrade their PPE if an unexpectedly hazardous situation is encountered.

It should be noted that the use of PPE can itself create hazards such as heat stress, impaired vision and mobility, and communications difficulties. Equipment and clothing will be selected that provides an adequate level of protection, but avoids, to the maximum extent practicable, potentially adverse effects that can result from overprotection. PPE levels and equipment are described below.

### 7.1 LEVELS OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

Four levels of personal protection (levels B through D) are described in this SSHP. If Level A or B PPE is determined to be required to adequately protect workers, work will be stopped and the AFCEE Project Manager will be notified so that the contract can be modified to allow upgrade necessary to operate at these levels of protection. The following levels of protection may be used on site according to the conditions encountered during field operations. Any variances to the following PPE descriptions are described in the SSHPs.

### 7.1.1 Level D PPE

Level D PPE is considered to be the basic work uniform and is the minimum protection level for property boundary and survey tasks performed at on-site and off-site areas. Level D PPE consists of:

- Distinct work clothing (long-sleeved shirts, long pants)
- Safety glasses
- Hard Hat (when working around heavy equipment or machinery)

Personal use of insect repellent will be allowed only during tasks not involving collection of environmental samples for chemical analyses.

If these tasks require traversing wet or submerged areas, PPE should be upgraded to Modified Level D (described below).

### 7.1.2 Modified Level D PPE

Modified Level D PPE will be the minimum protection level for intrusive work and sampling activities in wet or submerged areas. Level D and Modified Level D PPE provide no respiratory protection and minimal skin protection. The atmosphere must contain at least 19.5 percent oxygen and no greater than 23 percent oxygen and vapor levels must be below the action levels specified in the SSHPs. Modified Level D PPE includes the following clothing and equipment outlined below:

- Safety goggles or glasses
- Hard hat (when working around heavy equipment or machinery)

- Tyvek coveralls or disposable chemical resistant coveralls
- Hip-waders, if field sampling or site activities require working in water or muddy areas
- Chemical resistant gloves, with optional cotton liners (type of gloves to be worn are specified in SSHP)
- Face shield for personnel conducting sampling when splash hazard exists (i.e., monitoring well sampling)
- Ear plugs (as required based on noise level)

To prevent sample contamination, personal use of insect repellents will not be allowed during sampling activities.

#### 7.1.3 Level C PPE

Level C PPE includes the use of a full or half-face air-purifying respirator, and will be used when atmospheric conditions of the indicator chemicals exceed action levels specified in the SSHP, but are below levels Immediately Dangerous to Life and Health (IDLH). Because these respirators do not use supplied air, air purifying respirators will be used only if the atmosphere contains at least 19.5 percent oxygen, but does not contain greater than 23.5 percent oxygen. Atmospheric concentrations of chemicals must not exceed the maximum use concentration levels specified on the respirator cartridges.

All field personnel will be trained in the proper use of their respirators, and will be qualitative fit-tested for their individual respirators. Each individual will conduct a negative and positive pressure check prior to each use. When used properly,

full-face respirators provide a protection factor of 50, and a protection factor of 10 for half-face.

Level C PPE equipment includes the following:

- Full or half-face air-purifying respirator, with combination organic vapor/dust and mist/HEPA filter respirator cartridges
- Tyvek coveralls or disposable chemical resistant coveralls
- Chemical resistant gloves, with optional cotton liners
- Disposable outer boots (optional)
- Hard hats (as required)
- Earplugs (as required)

#### 7.1.4 Level B PPE

If Level B conditions are encountered, as described in the SSHP, site work will be terminated, the AFCEE Project Manager will be notified by the Site Manager/Site Safety Officer. The contract may then be modified to allow upgrades necessary to operate at this level of protection. Level B equipment includes the following:

- Pressure-demand (Positive Pressure) self-contained breathing apparatus (SCBA), NIOSH approved, or NIOSH approved pressure-demand supplied air respirator with 5-minute emergency escape bottle
- Chemically resistant hooded coveralls

- Inner gloves, chemically-resistant
- Outer gloves, chemically-resistant
- Hard hat (as required)
- Disposable outer boots (optional)
- Two-way communication system
- Ear plugs (as required)

Level B can be used only when chemical vapors or gases present cannot be easily absorbed through intact skin or are not harmful to the skin.

## 7.2 RESPIRATORY PROTECTION

In accordance with the requirements of 29 CFR 1910.134, respirators are selected on the basis of hazards to which the worker is exposed. Air-purifying respirators should not be used under the following conditions:

- Oxygen-deficient atmospheres;
- IDLH-level concentrations of site constituents;
- Entry into unventilated or confined area where the exposure conditions have not been characterized;
- Contaminant concentrations are unknown or exceed designated maximum use concentrations for respirators;
- Identified gases or vapors have inadequate warning properties;

- High relative humidity may reduce the protection offered by the chemical sorbent material in the respirator.

#### 7.2.1 Fit Testing

Fit testing procedures are performed to ensure the proper fit of the respirator, and personal comfort of the user. Qualitative fit testing involving a chemical challenge is performed as part of the initial respirator selection process. These methods are contained in 29 CFR 1910.1028 and include isoamyl acetate (banana oil) and irritant fume testing protocols. Fit testing is performed at least every six months, or if physical changes in face structure have occurred or significant weight gain or loss (>20 pounds) has occurred.

Prior to entry into the Exclusion Zone, the respirator user will perform a positive and negative pressure check upon donning the respirator to ensure a tight face-to-facemask seal. Adjustments will be made until a proper fit is achieved. The respirator is not to be used if a proper seal is not achievable. Facial hair such as beards or long sideburns are prohibited, as they interfere with the seal. Contacts are also prohibited.

#### 7.2.2 Respirator Maintenance/Inspection Storage

Air-purifying respirators will be stored and maintained properly and checked before and after each use. Respirators will be dismantled, washed and disinfected after each use. Clean respirators will be stored individually in sealable plastic bags or in their original cartons in a clean, convenient location. Respirators will be inspected before each use for material damage (pliability, deterioration or distortion, cracks, crazing or foginess). Worn or deteriorated parts will be replaced.

Respirator cartridges will be checked to ensure that they are proper for the intended use, the expiration date has not passed, and that they have not been opened or used previously. Based on breakthrough, cartridges should be changed out when chemical odor is noticeable to worker.

## 8.0 MEDICAL SURVEILLANCE

All personnel involved in on-site operations must participate in an ongoing medical surveillance program meeting the requirements of OSHA 29 CFR 1920.120 and ANSI Z-88.2 before working at the site. The medical surveillance protocols and examination results are overseen by a licensed physician who is certified in Occupational Medicine by the American Board of Preventative Medicine, or who, by necessary training and experience, is Board-eligible.

### 8.1 MEDICAL EXAMINATIONS

In consultation with the occupational physician, and based upon probable site conditions, potential occupational exposures and required protective equipment, the minimum content and frequencies of required medical examinations are as follows:

- **Initial Examination** (preliminary to employment) - Determines complete medical history and minimum physical requirements. Tests include vision, hearing, smell, speech, drug screening and urinalysis.
- **Baseline Physical** - Performed prior to potential exposure to hazardous/toxic substances. The baseline examination will establish data to subsequently verify the efficacy of protective measures and to later determine if exposures have adversely affected the worker. The standard biomedical monitoring performed includes a full physical, EKG, chest X-ray, hematology evaluation (including complete blood count, differential and platelet count, hemoglobin and hematocrit, urinalysis, vision screen, executive profile (SMA-22, CBC, thyroid profile), pulmonary function test, audiometry, and proctoscopic examination (at the physician's discretion).

- **Annual Examination** - Same as Baseline Physical, with the exception that the EKG, chest X-ray, audiometry and proctoscopic examinations (male personnel only) are performed at the discretion of the examining physician.
- **Special Medical Surveillance Parameters** - Additional examinations and tests may be performed following exposure to hazardous substances, or if deemed necessary by the examining physician, as indicated by the medical history and/or initial examination results. The evaluation will be repeated as indicated by substandard performance or evidence of particular stress evidenced by injury or time loss due to injury by the worker.
- **Final Examination** - A final examination will be performed for any employee terminating employment.

## 8.2 MEDICAL SURVEILLANCE RECORDS

Records certifying the participation of the worker in the medical surveillance program, the date of the last examination, and name of reviewing occupational physician will be maintained in the employees file for each employee. The written medical opinion from the attending physician as to fitness for site work and wearing respiratory protection is maintained in the employee's files and will be made available upon request for any Law employee. Subcontractor personnel will be required to supply fitness for work certification prior to work on the AOCs.

A medical summary form for each worker (Law and subcontractor personnel) will be maintained on-site in a locked cabinet to facilitate care in case of an emergency. This summary form will contain information such as medications prescribed to employee, drug allergies, etc.

### 8.3 FITNESS FOR WORK CERTIFICATION

At a minimum, each person who wears respiratory protection must meet the requirements of 29 CFR 1910.134.

A written certification from the examining physician is required stating the person is "fit for duty" to wear the required PPE, including air-purifying respirators or SCBA, and perform the required work.

## 9.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Monitoring for the presence of hazardous conditions will be performed during work to prevent personnel exposure to chemical and physical hazards. Information gathered from air monitoring will be used to determine appropriate on-site protective measures and to design appropriate contingency plans and/or control measures which limit the potential for migration of constituents away from the site. Monitoring activities and equipment are described in the following sections.

### 9.1 MONITORING EQUIPMENT, USE, AND LIMITATIONS

Monitoring instruments to be used at the site include the following: a photoionization detector and/or a flame ionization detector; a combination combustible gas/oxygen/hydrogen sulfide indicator; and chemical detector tubes able to quantify specific organic vapor levels (specific tubes are specified in the SSHP). Limitations on the use and application of monitoring instruments will be described in this section of the SSHP. All atmospheric monitoring equipment will be calibrated a minimum of twice daily in accordance with the manufacturer's instructions.

#### 9.1.1 Vapor Monitoring

Monitoring for organic/inorganic vapors will be performed in the breathing zone and/or at the source (as appropriate) to determine appropriate levels of PPE to be used during work. A photoionization detector (PID) or flame ionization detector (FID) will be used in conjunction with chemical-specific detector tubes to detect organic vapor levels.

Atmospheric monitoring measurements obtained are compared with 50% of the OSHA Permissible Exposure Limits (PELs) and/or 50% of the

ACGIH Threshold Limit Values, whichever standard is lower. Site-specific action criteria based on the results of vapor monitoring are specified in the site-specific SSHPs.

9.1.1.1 Photoionization Detector (PID) - The PID is designed for use with interchangeable probes with lamps of different energies (10.2 eV, 9.5 eV, and 11.7 eV). Lamps are selected based on the ionization potential (IP) of suspected contaminants on site; the lamp energy must be equal to or greater than the IP of a compound for the compound to be detected.

The PID is sensitive to many organic and inorganic vapors/gases and therefore, cannot be used as a qualitative instrument in unknown situations. It is strictly quantitative except when the nature of the contamination is known, and the instrument has been calibrated. High humidity decreases the sensitivity of the PID. Atmospheres with concentrations of gases above the upper range of the instrument may cause inconsistent behavior.

9.1.1.2 Flame Ionization Detector (FID) - A portable organic vapor analyzer (OVA) may also be used to detect and measure organic vapors at the Carswell AFB sites.

The OVA measures only organic vapors. Its use in the survey mode in unknown atmospheres is strictly quantitative. The OVA is extremely sensitive to methane; thus, it has limited application in areas where toxic vapors and gases are found with methane because the methane masks the other compounds. Use of the OVA is limited to eight hours due to the hydrogen supply and battery life. Very high grade hydrogen (99.95% pure) is needed for use.

The OVA is factory-calibrated to a methane gas standard. When used at the Carswell AFB, the calibration will be checked before and after use according to the manufacturer's instructions.

### 9.1.2 Oxygen, Hydrogen Sulfide and Combustible Gas Monitoring

A portable triple-gas monitor will be used to monitor the atmosphere for oxygen, hydrogen sulfide, and combustible gases. Oxygen levels are monitored to determine the presence of oxygen-deficient or oxygen-enriched (flammable/explosive) atmospheres. Monitoring for hydrogen sulfide (H<sub>2</sub>S) gas will be performed to determine its presence in ambient air at applicable sites. Combustible gas levels will also be monitored to determine the fire or explosion hazard and actions to be taken in response to these hazards.

The triple-gas meter will be used continuously on sites where there is the potential for vapor buildup during intrusive site activities or the potential for oxygen deficient/oxygen enriched atmospheres. Readings will be taken at the source (i.e., at the tops of boreholes) and in the breathing zone. Air-purifying respirators do not protect against oxygen-deficient atmospheres and should not be used when these conditions are present.

Air-purifying respirators do not provide protection for H<sub>2</sub>S gas, due to its low PEL and poor warning properties. Level B PPE must be used in oxygen-deficient atmospheres and when H<sub>2</sub>S gas levels exceed the action level. Action criteria based on oxygen, H<sub>2</sub>S, and explosive gases are presented in Section 3.6.

### 9.1.3 Chemical-Specific Detector Tubes

Chemical-specific detector tubes will be used to detect and quantify specific organic vapor levels at the sites. Detector tubes indicate the presence of a particular chemical by a color change in the tube's packing material. A prespecified sample volume is drawn through the detector tube at a constant flow rate. If the sample contains the vapor or gas in question, it will react

with the chemical on the packing material, resulting in a color change. Action criteria for organic vapors are site-specific and will be provided in the SSHP.

## 9.2 MONITORING ACTIVITIES

Monitoring for chemical and physical hazards during site activities is a primary component of this SSHP. The monitoring program is described in the following section.

### 9.2.1 Meteorological Monitoring

Meteorological monitoring will be conducted at each site to assess the possibility of varying sample results and to assess the potential for physical hazards (i.e., heat and cold stress). Meteorological information that will be collected includes, but is not limited to, the following:

- temperature
- wind direction
- wind speed

Temperature may affect the performance of the monitoring equipment (see Section 9.1). Wind speed and direction are used to assess possible contaminant migration, and are used to set up the location of exclusion zones, support zones, etc. Wind speed is also used for estimating cold stress to workers at the sites.

### 9.2.2 Noise Monitoring

Unacceptable levels of noise can be expected when working in close proximity to aircraft. It should be assumed that hearing

protection will be required when working within 250 feet of an aircraft which is revving its engines or when working in a fly-over zone at Carswell AFB.

Hearing Protection:

- Expandable foam earplugs will be worn whenever personnel are working in proximity of operational aircraft.
- Minimum Noise Reduction Rating (NRR) for earplugs or muffs  $\geq 25$ .
- Hand signals will be used when noisy conditions exist and/or when hearing protection equipment is used. The hand signals to be used will be discussed and agreed upon by site personnel before continuing work with hearing protection.

9.2.3 Dust Monitoring and Control

When soil contamination exists, the potential exists for inhalation and/or skin exposure to contaminated fugitive dusts resuspended by mechanical disturbance or wind. Prior to performing field activities in dry, dusty areas where particulate matter is likely to be encountered, workers will wet down the area of activity with water in order to decrease dust generation. If the wetting process is expected to result in potentially contaminated runoff, measures to contain runoff should be undertaken. In the event that dust suppression measures are not possible, workers in such areas should wear skin-protecting outer wear (Tyvek, etc.) and air-purifying respirators with appropriate HEPA cartridges.

#### 9.2.4 Logs and Recordkeeping

Instrument calibration information and the results of monitoring should be documented daily in the SSO's field log for each site. An example of the appropriate format is given in Figure 9-1.

#### 9.2.5 Heat and Cold Stress Monitoring

The Site Manager will provide all project personnel with the necessary training and monitoring designed to prevent personnel injury due to heat or cold stress, as dictated by weather conditions. This monitoring shall commence when the ambient environmental temperature exceeds 70°F (for heat stress) or falls below 40°F (for cold stress). In addition, all field personnel will be provided rest breaks. The break areas shall be situated so that personnel may remove the chemical-protective clothing, rest in a protected area, and drink cool or warm fluids (as the weather dictates). Working within protective clothing, such as may be required for this project, places a significant physiological stress upon the worker. For this reason, the personnel and environmental measurements described below will be conducted for those personnel required to wear chemical-protective clothing as a part of this project.

9.2.5.1 Heat Stress Monitoring - Heat stress can be a major hazard for personnel wearing PPE. Depending upon the ambient conditions and the work being performed, onset of heat stress can be rapid.

Early signs of heat stress include heat rash, heat cramps (muscle spasms), discomfort and drowsiness. Continued heat stress can result in heat exhaustion, with symptoms including pale, cool, moist skin, heavy perspiration, dizziness, nausea and fainting.

FIGURE 9-1

# DAILY INSTRUMENT CALIBRATION FORM

CARSWELL AFB, FORT WORTH, TEXAS

SITE LOCATION: \_\_\_\_\_

DATE: \_\_\_\_\_

CALIBRATION PERFORMED BY: \_\_\_\_\_

CALIBRATION STANDARD: \_\_\_\_\_

CONCENTRATION: \_\_\_\_\_

**INSTRUMENT CALIBRATED**  
(specify model)/serial no.

**DATE/  
TIME**

**INSTRUMENT  
READING**

**INITIALS**

**COMMENTS**

Extreme heat stress can result in heat stroke, as body temperature regulation fails and the body temperature rises to critical levels. Symptoms of heat stroke include red, hot, usually dry skin, absence of or reduced perspiration, nausea, dizziness and confusion, strong, rapid pulse and coma. Measures to prevent the occurrence of heat stress consist of avoiding overprotection, training and monitoring of personnel wearing PPE, scheduling of work and rest periods, and frequent replacement of fluids.

During hot working conditions, rest breaks shall be established based upon the results of physiological monitoring combined with environmental factors measured using a Wet Bulb Globe Temperature index (WBGT). WBGT values are calculated using the following equations (ACGIH, 1992-1993):

1. Outdoors with solar load:

$$\text{WBGT} = 0.7\text{NWB} + 0.2\text{GT} + 0.1\text{DB}$$

2. Outdoors with no solar load:

$$\text{WBGT} = 0.7\text{NWB} + 0.3\text{GT}$$

where:      WBGT = Wet Bulb Globe Temperature  
              NWB = Natural Wet Bulb Temperature  
              GT = Globe Temperature

The determination of WBGT will be performed, by the Site Manager, using a heat stress monitor containing a black globe thermometer, a natural wet-bulb thermometer, and a dry-bulb thermometer. The WBGT and the Permissible Heat Exposure Threshold Limit Values provided in Table 9-1, (ACGIH, 1992-1993), will be used to determine the Work-Rest schedule.

If symptoms of heat stress are exhibited by workers, the pulse rate and body temperature will be monitored during all tasks (as deemed appropriate by the Site Manager). Action guidelines are as follows:

TABLE 9-1

**ACGIH PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES**  
**Carswell AFB, Austin, Texas**

WORK/REST REGIMEN	WORK LOAD		
	LIGHT	MODERATE	HEAVY
Continuous Work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% Work 25% Rest (each hour)	87°F (30.6°C)	82°F (28.0°C)	78°F (25.9°C)
50% Work 50% Rest (each hour)	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% Work 75% Rest (each hour)	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)

NOTE: Values are given in °F (and °C) Wet Bulb Globe Temperature. For unacclimatized workers, the permissible heat exposure TLV should be reduced by 2.5°C.

Reference: 1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

**TLV WBGT CORRECTION FACTORS IN °C FOR CLOTHING**

Clothing Type	Clo Value*	WBGT Correction
Summer work uniform	0.6	0
Cotton coveralls	1.0	-2
Winter work uniform	1.4	-4
Water barrier, permeable	1.2	-6

\*Clo: Insulation value of clothing. One clo unit = 5.55 kcal/m<sup>2</sup>/hr of heat exchange by radiation and convection for each °C of temperature difference between the skin and adjusted dry bulb temperature.

Pulse rate: Determine normal resting pulse rate prior to start of work. Monitor pulse rate as soon as possible at beginning of rest period. If the rate exceeds the determined normal resting pulse rate by 40 beats per minute (BPM), shorten the next work period by one-third without changing the rest period. If the pulse rate is greater than 40 BPM above the resting pulse rate at the start of the next rest period, shorten the following work cycle again by one-third. Repeat until pulse rate at beginning of rest period is less than 40 BPM above resting pulse rate.

Body Temperature: Determine the body temperature at the end of the work cycle and before drinking. If the temperature is greater than 99.6° Fahrenheit (37.6° Celsius), shorten the next work cycle by one-third without changing the rest schedule. Repeat. DO NOT permit a worker to wear semipermeable or impermeable clothing when his/her body temperature exceeds 100.6°F (38.1°C).

9.2.5.2 Cold Stress - Cold injury (frostbite and hypothermia) and impaired ability to work are dangers at low temperatures and when the wind-chill factor is low. Prolonged exposure to cold air with a high wind chill factor or immersion in cold water can produce hypothermia at temperatures well above freezing. Symptoms of cold stress include pain in the extremities and severe shivering. A marked reduction in body temperature reduces mental alertness and the ability to make rational decisions and may result in loss of consciousness with potentially fatal consequences. Cold exhaustion is another potential adverse effect which can occur with strenuous field operations during cold weather. Measures to prevent cold stress and injury include ensuring that workers are appropriately dressed to prevent exposure to cold so that their deep core temperature does not fall below 98.6°F (36°C); providing warm

shelter for workers; monitoring the physical condition of workers; and implementing a work/rest schedule to allow workers to replenish liquids and calories.

Permissible cold exposure TLVs for work where dry clothing is worn are shown in Table 9-2.

TABLE 9-2

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)  
Carswell Air Force Base, Texas

Wind Speed in mph	ACTUAL THERMOMETER READING (F)									
	50	40	30	20	10	0	-10	-20	-30	-40
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
(Wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER			INCREASING DANGER			GREAT DANGER			
	In < hr with dry skin. Maximum danger of false sense of security.			Danger from freezing of exposed flesh within one minute.			Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.									

\* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

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## 10.0 STANDARD OPERATING PROCEDURES/ ENGINEERING CONTROLS AND WORK PRACTICES

The following procedures will be used during the Remedial Investigation at Carswell AFB to protect the health and safety of on-site personnel.

### 10.1 GENERAL SITE RULES/OPERATING PROCEDURES

- Hand signals will be established to maintain communications when noisy conditions are present (see Section 12.3 for standard hand signals). These signals will be reviewed by the SSO prior to the start of work each day.
- Any facial hair which interferes with the face to face-piece seal of the respirator will not be permitted on personnel required to wear such equipment. Contact lenses will not be allowed to be worn in conjunction with the use of respiratory protection. Arrangements should be made by the SSO prior to site mobilization to obtain spectacle kits for those who may need them.
- Procedures for entering and leaving the Exclusion Zone will be planned and reviewed by the SSO prior to entering the site.
- No personnel will be admitted to the site without proper safety equipment and training. Law is not responsible for providing visitors with training or PPE. Authorized visitors will be briefed by the SSO regarding the SSHP and emergency procedures before entering work areas.

- All personnel will be required to comply with the safety procedures established in this document and the SSSHPs. Any person who does not comply with safety policy, as established by the SSO, will be immediately dismissed from the site.
  
- Any medical emergency supersedes routine safety and decontamination requirements. If an employee experiences a life-threatening accident or illness, decontamination is not necessary prior to medical treatment or transport to a medical facility if the decontamination process will aggravate the injury or delay life-saving treatment. Figure 10-1 is an example of a decision aid for determining if emergency decontamination is necessary (NIOSH/OSHA/USCG/EPA, 1985).
  
- Portable generators/welders shall have an effective ground rod installed and bonded.
  
- Illumination levels, in the general work area, must average no less than five-foot candles.

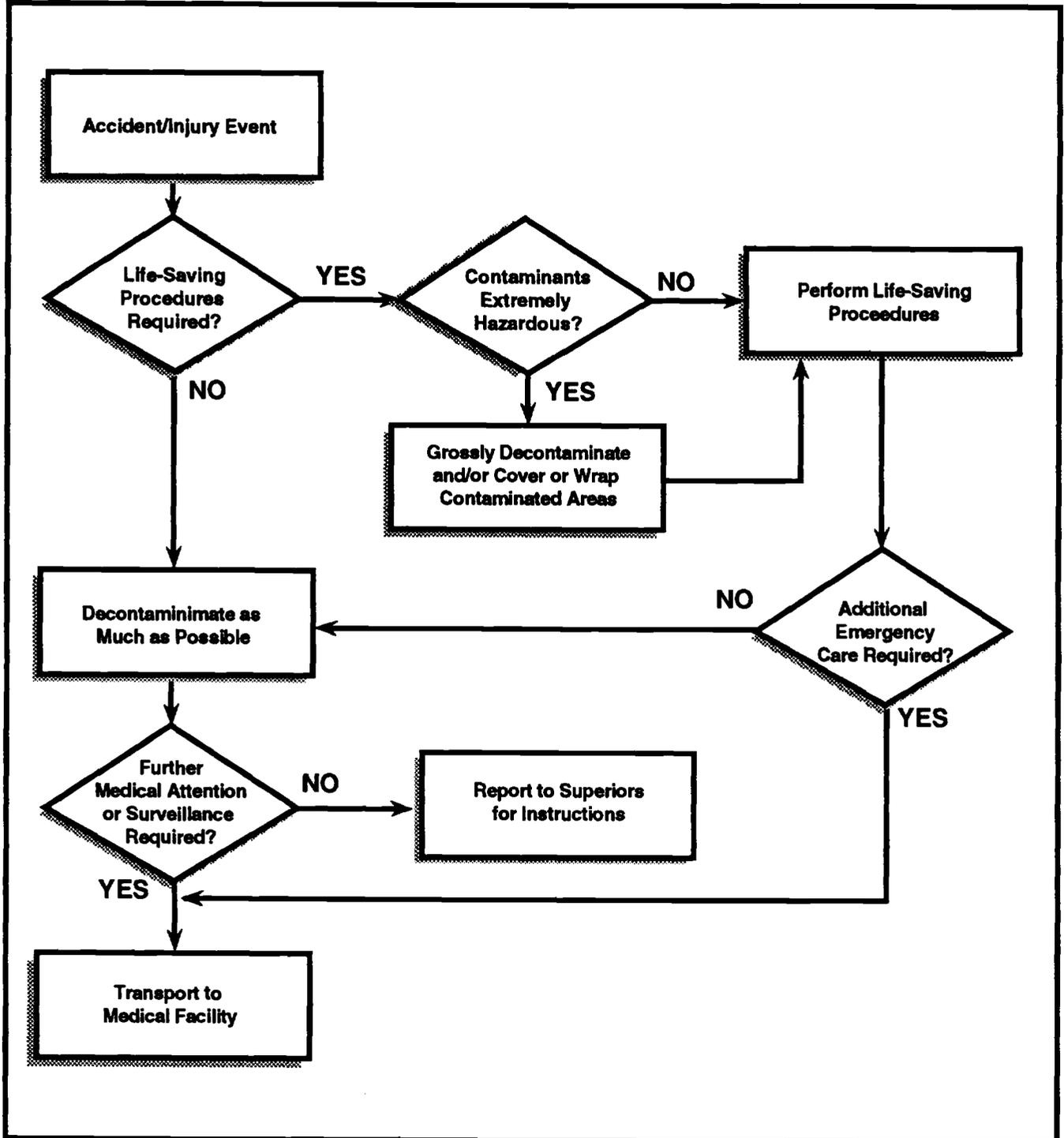
#### 10.1.1 Buddy System

- A buddy system will be used at all times when working at Carswell AFB. Work teams will be established prior to site entry by the Site Manager. The buddy will provide his/her partner with assistance; observe his/her partner for signs of chemical, physical, or biological exposure; periodically check the integrity of his/her partners PPE; and notify the SSO if emergency help is needed.
  
- During site operations, each worker will consider himself/herself as a safety backup to his/her partner.

FIGURE 10-1

# DECISION AID FOR EMERGENCY DECONTAMINATION

CARSWELL AFB, FORT WORTH, TEXAS



Source: NIOSH / OSHA / USCG / EPA, 1985 .  
Occupational Safety and Health Guidance Manual  
for Hazardous Waste Site Activities. USDHHS.

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Arrangements will be made with off-site personnel to provide emergency assistance prior to site entry and commencement of work. All personnel will be made aware of dangerous situations that may develop in the course of work and response actions to be taken to prevent accidents and respond to emergencies.

Visual contact will be maintained between buddies in the Exclusion Zone at all times.

#### 10.1.2 Eating, Drinking, Smoking

Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of hazardous material is prohibited in the Exclusion Zone, Contamination Reduction Zone (CRZ), and Decontamination Zone. A rest area in which eating/drinking/smoking will be permitted will be established in a clean area in the Support Zone.

#### 10.1.3 Use of Alcohol and Drugs

The use of illegal drugs is prohibited at the site. Prescription drug use will be permitted if approved by the medical consultant prior to the start of work. Alcoholic beverage intake is prohibited at all Carswell AFB locations and during the work day at any location.

#### 10.2 SITE ENTRY PROCEDURES

Before entering the work site, all field personnel will review site-specific information and work procedures for:

- Expected hazards;
- Special conditions such as natural disasters or multiple person injuries;
- Procedures related to proper performance of task;
- Hand/Horn signals;
- Decontamination facility location and procedures;
- Locations of telephones and emergency equipment;
- Emergency medical information, including hospital location;
- Level(s) of initial PPE required and action levels for upgrade;
- Location of supplies and equipment; and
- Condition and functioning of safety gear and equipment.

The following equipment will be used at the site or be available for issue, depending on site-specific conditions:

- Standard Tyvek or chemical resistant coveralls and coverall hoods
- Hard hats
- Goggles or Safety Glasses
- Chemical-resistant gloves, latex gloves, cotton underliner gloves

- Steel-toed neoprene safety boots meeting ANSI Z41.1 standards
- Disposable outer boot covers
- Face shields
- Full-face, air-purifying respirator with combination cartridges suitable for organic vapors, dusts, mists
- Emergency Eyewash
- First Aid Kit(s)
- Field Standard Operating Procedures and Safety References
- Plastic bags to keep spare equipment clean

Backup equipment and spares will be maintained, including, but not necessarily limited to:

- Duct tape
- Respirator wipes or isopropyl alcohol swabs
- Disinfectant spray for boots and gloves
- Trash containers, plastic bags and drop cloths
- Decontamination supplies (tubs, brushes, decontamination solutions)
- Paper towels

- Extra PPE supplies
- Extra air monitoring supplies

Set up buddy system and work teams prior to entering site. If any person develops any physical discomfort, such as lightheadedness, the worker must stop work, notify his buddy, return to the designated contamination reduction zone and report to the SSO.

### 10.3 SITE ACTIVITIES

This section describes activities to be performed on site at Carswell AFB.

#### 10.3.1 Material Handling Procedures

Material handling will be performed in accordance with the requirements of 29 CFR 1910.120. Drums and containers will meet the DOT, OSHA, and EPA regulations for the materials that they are to contain.

#### 10.3.2 Drilling and Well Installation

In addition to those previously described, the following safety and operating procedures should be followed at all times during drilling and well installation operations:

- Underground utilities (i.e., sewer, water, gas, electric, fuel) will be located and locations marked prior to starting any excavation work.
- Equipment furnished for use on the site is to be maintained in safe operating condition and be operated by

qualified operators. Any cranes, pressure vessels, and large earth-moving equipment will have valid certificates and logs of inspection and maintenance. All equipment used on-site will be inspected daily at the start of each work shift.

- Portable electric tools shall be protected with ground fault circuit interrupters.
- Hand tools are to be kept clean and serviceable and shall be neatly arranged. Non-sparking tools should be used in areas where explosive chemicals were manufactured or stored.
- Worn or otherwise defective tools will be immediately repaired and/or replaced.
- Adequate provisions will be made to prevent pipe, drill collars, drill stems, or similar round material from accidentally rolling off a storage rack.
- Personnel will not be permitted on, or on the ground adjacent to, a vehicle on which pipe, or similar round material, is loaded, where they would be in danger of such material rolling off the vehicle, unless one or more of the following precautions have been taken:
  - a. The pipe or similar round material on the vehicle is secured with binder chains or similar devices.
  - b. An adequate number of stakes of sufficient height and strength are in the vehicle bed or bolsters.
  - c. The skids for rolling or skidding the pipe or similar round material to or from the vehicle are securely in place.

- In using chains, avoid sudden or abrupt application of loads. Take up slack slowly and see that every link in the chain seats properly.
- Where toxic materials are used, only authorized personnel will handle the materials, and safety equipment should be specified and used.
- All drilling operations will be monitored, either by area testing or personnel testing, for organics and inorganics (hydrogen sulfide. In addition, the combustible gases will be monitored. If elevated readings are encountered above action levels, appropriate action must be taken to provide personnel with appropriate protection.

### 10.3.3 Safe Working Distances From Power Lines

Safe working distances of drill rigs/heavy equipment from power lines are indicated below (USACE, 1977).

- When operating near high voltage power lines:

<u>Normal Voltage (phase-to-phase)</u>	<u>Minimum Required Clearance</u>
< 50 kV	10 ft. (3.05 m)
50 to 100 kV	12 ft. (3.66 m)
101 to 200 kV	15 ft. (4.60 m)
201 to 300 kV	20 ft. (6.10 m)
301 to 500 kV	25 ft. (7.62 m)
501 to 750 kV	35 ft. (10.67 m)
751 to 1000 kV	45 ft. (13.72 m)

- While in transit with no load and boom or mast lowered:

<u>Normal Voltage (phase-to-phase)</u>	<u>Minimum Required Clearance</u>
< 50 kV	4 ft. (1.22 m)
50 to 345 kV	10 ft. (3.05 m)
> 345 kV	16 ft. (4.87 m)

#### 10.3.4 Machine Guarding

The following requirements for machine guarding will be followed:

- All self-propelled construction equipment, whether moving alone or in combination, will be equipped with a reverse signal alarm. The alarm should operate automatically upon commencement of backward motion and continue throughout the duration of backward motion.
- All reciprocating, rotating or moving parts should be guarded when exposed to contact by persons or when they would otherwise create a hazard.
- All equipment hot surfaces, including exhaust pipes, should be guarded or insulated to prevent personnel injury or fire.
- Protection against the elements, falling or flying objects, swinging loads and similar physical hazards will be provided for operators of all machinery equipment.
- Getting on or off any equipment while in motion is prohibited.

#### 10.3.5 Fall Protection

The activities to take place at Carswell AFB will not take place over water, machinery, dangerous operations or more than 25 feet above ground surface. Safety nets will not be required during work at the site.

#### 10.3.6 Illumination

Supplemental illumination will not be needed for most of the work at Carswell AFB, as the work will be taking place out-of-doors during daylight hours. If entry into confined spaces is to take place, or work is to continue after sunset, artificial lighting will be necessary [per 29 CFR 1910.120(m)]. Where artificial light is used, it will be intrinsically safe and maintained until all personnel have exited the area.

#### 10.3.7 Sanitation

Sanitation facilities, including potable water and washing facilities, will be available in the Support Zone [per 29 CFR 1910.120 (n)].

## 11.0 SITE CONTROL MEASURES

Delineation of work zones, communications procedures, and site access procedures implemented at Carswell AFB are discussed in this section.

### 11.1 SITE ACCESS AND SECURITY

A check-in and check-out system will be used so that there is a written record of all personnel, including visitors, in each work zone at all times. This information may be recorded in the field log book.

### 11.2 WORK ZONES

Each site will be divided into three zones, based on the potential for exposure to hazardous conditions and activities to be performed:

- Exclusion Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

#### 11.2.1 Exclusion Zone

The Exclusion Zone is the area of greatest contamination and presents the highest potential for worker exposure to hazardous conditions. The Exclusion Zone includes all active work areas. The outer boundary of the Exclusion Zone will be clearly marked, and access will be restricted to personnel performing tasks at the site. Personnel entering the Exclusion Zone must wear the mandated

level of PPE designated for the task to be performed and upgrade PPE as conditions warrant. The determination of the boundaries of the Exclusion Zone will be specific for each site.

#### 11.2.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) serves as a transition area between the Exclusion Zone and Support Area. Personnel and equipment decontamination facilities will be located in the CRZ.

#### 11.2.3 Support Zone

The Support Zone serves as a clean control area. This area serves as the safety center where the following safety equipment can be obtained:

- Fire extinguishers
- First Aid Kit
- Emergency Eye Wash
- Emergency Oxygen Unit (as appropriate)
- Emergency SCBA equipment (as appropriate)
- Ice

The Support Zone includes a changing area for personnel to change into street clothes after decontamination, a break area where food and beverages can be consumed, and equipment storage and maintenance areas.

### 11.3 SITE COMMUNICATIONS

Emergency telephone numbers and reporting instructions for emergency response, ambulance, physician, hospital, fire and police

will be conspicuously posted at the work site. All field personnel are briefed concerning emergency response procedures and chain of command during emergencies.

An internal communication system consisting of hand signals as well as voice communications will be adopted by field personnel when noisy conditions exist at the site or PPE precludes verbal communication. The choice and use of hand signals will be coordinated during on-site safety briefings. Sample hand signals are presented below.

<u>HAND SIGNAL</u>	<u>MEANING</u>
Hands on top of head	Need assistance
Grip partner's wrist or place both hands around partner's arm	Leave area immediately
Thumbs up	OK; I'm alright
Thumbs down	No; Negative
Hand gripping throat	Cannot breathe; out of air
Pointed finger on extended arm	Look in that direction
Wave hands over head from side to side	Attention; Standby for next signal
Swing hand from direction of person receiving signal to directly overhead and through in a circle	Come here

A system of horn signals can be developed for communicating with personnel in work areas from the Contamination Reduction Zone or Support Zone. Examples of horn signals are presented below. Additional signals can be developed as necessary.

<u>SIGNAL</u>	<u>MEANING</u>
Three short blasts	Caution, or look here
Long blast	Leave work zone area

## 12.0 PERSONAL HYGIENE AND DECONTAMINATION

The purpose of decontamination is to remove or neutralize contaminants that have accumulated on personnel and equipment. Decontamination protects workers from hazardous substances that may contaminate and eventually permeate protective clothing and other equipment used on site. It also minimizes the transfer of contaminants to clean areas and protects the community by preventing uncontrolled transportation of contaminants off site. All personnel will complete appropriate decontamination prior to leaving the site in a manner that is responsive to actual site conditions. A personnel decontamination area will be set up at an appropriate location specified by the SSO. The decontamination process will consist of a series of procedures performed in a specific sequence. Each procedure is performed at a separate station in order to prevent cross-contamination.

### 12.1 DECONTAMINATION FACILITIES

A drop cloth constructed of polyethylene sheeting will be laid out in area initially.

A detergent solution will be adequate to remove the chemical constituents identified at the sites. Wash tubs containing dilute detergent decontamination solution and soft-bristle brushes will be used to clean reusable personal protective clothing and boots. Following the detergent wash, equipment will be rinsed at least once using clean, potable water. Decontamination solutions and rinse waters will be drummed and disposed of in a manner consistent with the handling of hazardous wastes.

Trash receptacles will provided for all disposable items. The receptacles will be conventional trash cans lined with heavy duty polyethylene trash bags.

Personal hygiene primarily entails washing and is not strictly considered decontamination. Each individual should conduct proper personal hygiene, which includes washing of hands, face and any exposed skin for 3 to 5 minutes prior to eating, drinking, smoking and leaving the site. It is recommended that each person shower at the end of each work day. Routine showering facilities will not be provided in the Support Zone. OSHA 29 CFR 1910.120 requires that shower facilities be provided only when remediation exceeding six months in duration is performed on site.

## 12.2 DECONTAMINATION EQUIPMENT AND SUPPLIES

Supplies that will be available for personnel decontamination procedures include:

- Tubs for washing and rinsing equipment
- Detergent (i.e., Alconox)
- Scrub brushes (soft bristle)
- Potable water source (to be provided by Carswell AFB)
- Drying rack for equipment drying
- Aluminum foil for wrapping clean equipment
- Respirator wipes and bags for clean respirator storage
- Paper towels
- Trash receptacles and polyethylene bags
- Hand soap
- Receptacle(s) for storage of decontamination liquid wastes pending disposal
- Drop cloths (polyethylene sheeting)

## 12.3 DECONTAMINATION PROCEDURES

This section describes the personnel decontamination procedures to be implemented at Carswell AFB for specific levels of PPE.

### 12.3.1 Level D Decontamination

A minimum decontamination for Level D site work consists of cleaning and removal of boots and gloves, changing into street shoes before leaving the site, and washing hands and face.

### 12.3.2 Level C Decontamination

The decontamination layout depicted in Figure 12-1 will be adjusted to accommodate actual site conditions. Decontamination procedures for Level C include the following:

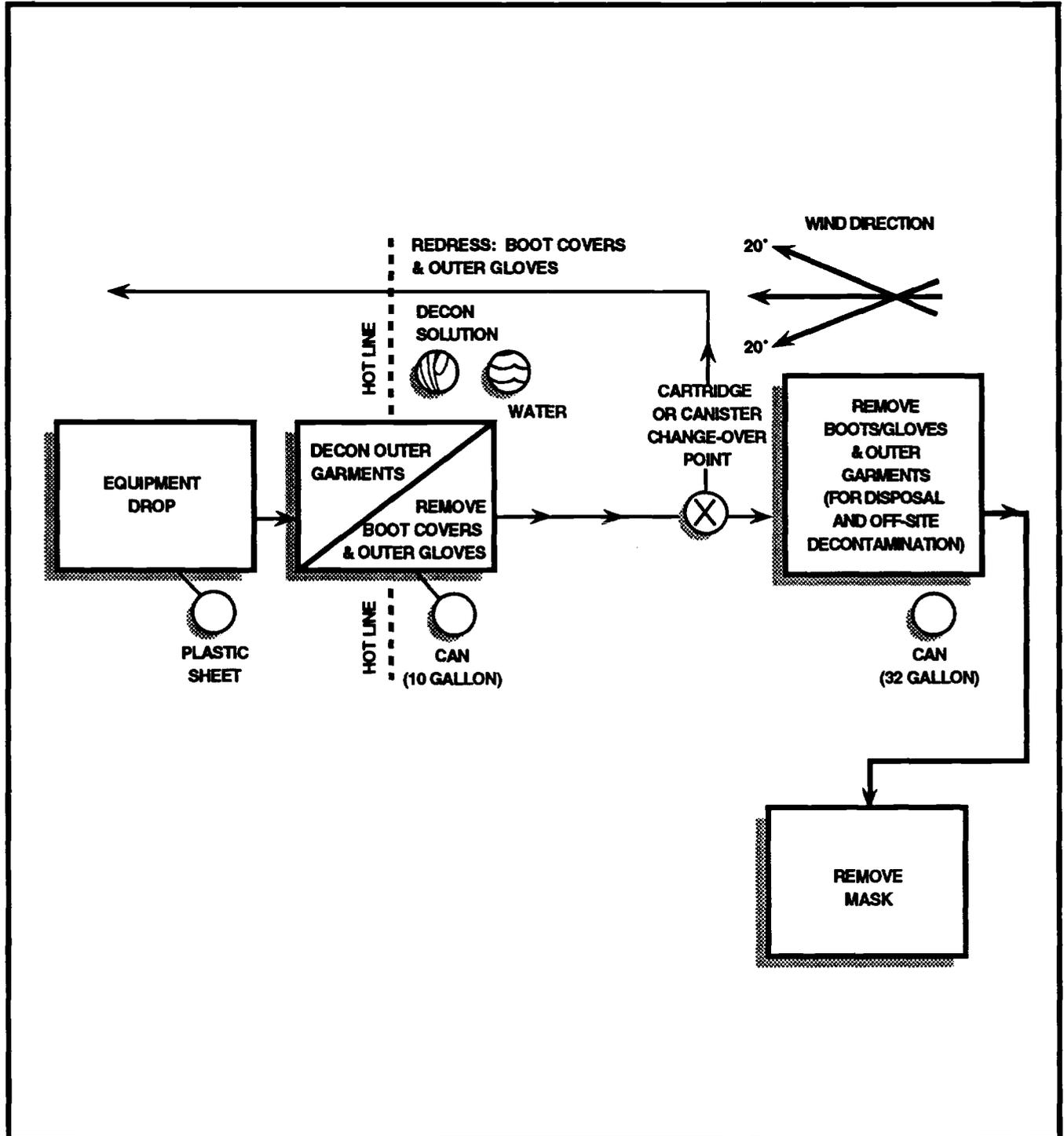
#### First Drop Site

- Field equipment is placed at the first drop site for later decontamination.
- Boot covers and gloves are washed with detergent solution and rinsed in clean, potable water.
- Boot covers and outer gloves are removed. Boots and/or safety suit (nondisposable) are washed with a detergent solution and rinse with clean, potable water.
- Disposable clothing is removed and discarded into the trash receptacle.

#### Second Drop Site

- Nondisposable inner gloves, hard hats, and boots are removed and deposited at a second drop site.

FIGURE 12-1  
**DECONTAMINATION LAYOUT**  
**LEVEL C PROTECTION**  
CARSWELL AFB, FORT WORTH, TEXAS



### Third Drop Site

- Respirators are removed, washed, swabbed down with respirator wipes and bagged for storage. Used respirator cartridges are removed and disposed. Respirators are left at the third drop site for cleaning. A disinfectant solution (i.e., CIDEX) will be used on a regular basis to disinfect the respirators. (Note: Personnel with respiratory tract infections, however minor they may seem, should disinfect their respirators at least weekly).
- Street shoes can be put on. All personnel will thoroughly wash face and hands before exiting the site.

### 12.3.3 Level B Decontamination

The decontamination layout depicted in Figure 12-2 will be adjusted to accommodate actual site conditions. Decontamination procedures for Level B include the following:

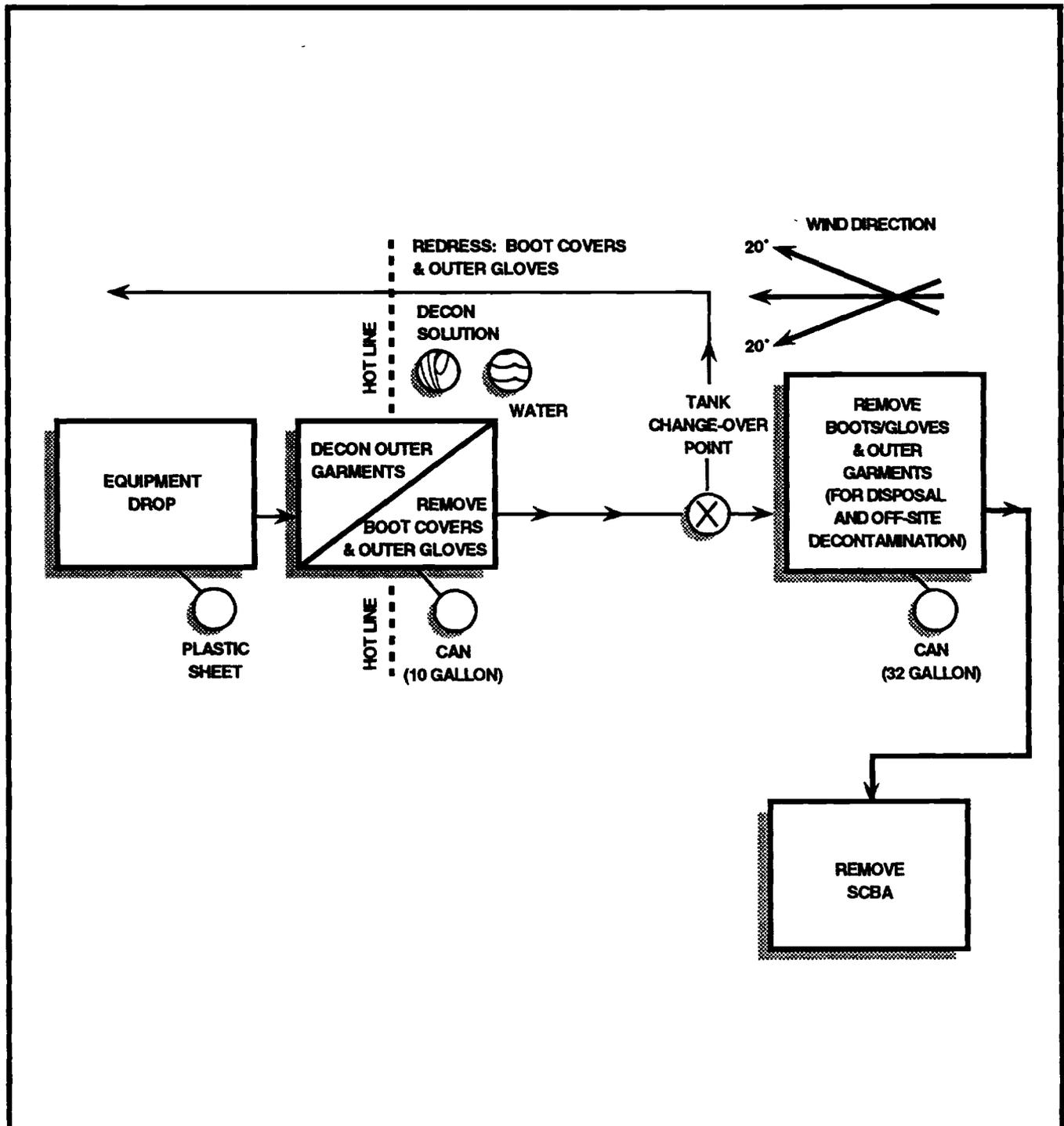
#### First Drop Site

- Field equipment is placed at the first drop site for later decontamination.
- Nondisposable boots/boot covers, gloves and outer garments are washed with detergent solution and rinsed in clean water.

#### Second Drop Site

- Boot covers and outer gloves are removed and disposed at second drop location. Boots and/or safety suit (nondisposable) is washed.

FIGURE 12-2  
**DECONTAMINATION LAYOUT**  
**LEVEL B PROTECTION**  
CARSWELL AFB, FORT WORTH, TEXAS



Third Drop Site

- For site exit, clothing, boots, inner gloves and hard hats are removed and deposited at a third drop site. SCBA equipment is removed and segregated for decontamination. Street shoes can be put on. All personnel are to thoroughly wash face and hands before exiting the site.
- For SCBA tank change-out, SCBA tank can be replaced following decontamination of outer garments and removal of contaminated boot covers and outer gloves. Redress, including clean boot covers and outer gloves is performed following tank change. Return to work site.

Note: An occasional CIDEX or Clorox wash of inside of boots is recommended to alleviate odor problems. A thorough rinse is required after such use.

12.4 EQUIPMENT DECONTAMINATION PROCEDURES

Heavy equipment will be decontaminated after use to prevent cross-contamination of sites and transport of contaminants off site. Equipment requiring decontamination during remedial investigation activities at Carswell AFB includes drilling and excavation equipment. This equipment will be cleaned using a high-pressure water washer and steam cleaner when it shows signs of gross contamination and prior to leaving the site. One or more areas for heavy equipment decontamination and maintenance will be designated by Carswell AFB. All equipment will be decontaminated prior to maintenance or leaving the site.

## 13.0 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The following emergency equipment will be available on-site at all times during field operations.

### 13.1 FIRE EXTINGUISHERS

Because of the possibility of fire and explosion at the sites, portable fire extinguishers (ABC-type) meeting the standards of the National Fire Protection Association (NFPA 10) will be readily available (within 100 feet) to field personnel during all on-site work. A fire extinguisher will also be present on each drill rig. Foam, dry chemical or CO<sub>2</sub> type extinguishers are to be inspected for proper charge, pressure and physical integrity before field operations begin and after each use. All personnel will review the use of fire extinguishers before commencing work at the site.

### 13.2 FIRST AID KITS

Industrial first aid kits with sufficient supplies will be readily available within the Support Zone. The first aid kit containers will be weatherproof. At a minimum, first aid kits will be provided in the ratio of one per 25 persons or less. Smaller kits can be kept in the clean areas and with field crews. The contents of the first aid kit(s) will be checked by the SSO before being sent out to the job site, and rechecked at least once weekly and immediately after each emergency to ensure that expended items are replaced.

### 13.3 EMERGENCY AIR HORN

An air horn for use in signaling in the case of emergencies will be located in the Exclusion Zone and Support Zone. The air horn will

be of sufficient loudness to be audible above operating machinery and/or aircraft. Horn signals and their meanings will be established and reviewed prior to site entry (refer to Section 12.3 for sample horn signals).

#### 13.4 SPILL CONTROL MATERIALS AND EQUIPMENT

Absorbent material, shovels, polyethylene sheeting, and overpack containers will be available for containing materials that may be spilled during site operations.

## 14.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

In order to effectively handle emergency situations, planning is essential. An emergency response and contingency plan will be implemented in accordance with 29 CFR 1910.120 which includes measures to prevent accidents and emergencies and to limit the adverse impact of these incidents when they occur. Specific aspects of emergency planning are discussed below.

### 14.1 PRE-EMERGENCY PLANNING

This section contains information pertaining to the planning for site emergencies before their occurrence.

#### 14.1.1 Notification of Emergency Response Authorities

Local fire/police/rescue authorities and nearby hospital personnel will be contacted and briefed prior to site entry or work regarding the scope of the study and hazardous chemicals and conditions that may be encountered at the site by personnel that pose potential emergency situations, to ascertain their response capabilities and to obtain a response commitment. In addition, off-site emergency personnel will be informed about site emergency procedures and decontamination procedures.

#### 14.1.2 Training

All field personnel will be briefed by the SSO prior to site entry concerning personnel and equipment which will be available and summoned during an emergency and concerning their responsibilities during an emergency situation. Personnel will be briefed on evacuation routes, assembly points, and the person to report to

when an alarm sounds. Visitors will be briefed on basic emergency procedures such as decontamination, emergency signals, and evacuation routes.

Personnel who are assigned specific emergency responsibilities will be thoroughly trained in their duties. This training will include the emergency response chain of command, available off-site support, how/where to call for help, what information to provide to emergency response agencies, location and use of emergency equipment, and emergency evacuation while wearing PPE.

#### 14.1.3 Emergency Communications

A system of communicating emergency situations to on-site personnel should be included in the contingency plan. The communication program will describe audible signals (i.e., air horn signals) to be used during an emergency, as well as hand signals to be used when noisy conditions exist. Signals used will be brief and exact and limited in number so that they are easily remembered. Communications devices (i.e., flags, lights, walkie-talkie, radio, mobile phone) appropriate to site-specific conditions will be used.

#### 14.1.4 Emergency Recognition

The Site Manager will brief personnel about potential hazards before site entry so that each individual will be alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures.

#### 14.1.5 Regulatory Notification Requirements

In the event of a significant chemical release at a site, the Site Manager will notify the Carswell AFB Emergency Response

Coordinator, who will notify the National Response Center (NRC) (see Table 14-1 for telephone number). The NRC will activate federal response actions under the National Contingency Plan to promote the coordination and direction of federal and state response systems.

#### 14.2 PERSONNEL ROLES AND LINES OF AUTHORITY

All individuals and teams who will participate in emergency response, and their particular roles will be identified in the plan. All personnel will be briefed concerning their own responsibilities in an emergency, as well the names of those in authority and the extent of that authority. Changes in the contingency plan in response to new or changing site conditions, new information or personnel changes will be reviewed periodically. Emergency contacts and telephone numbers are provided in Table 14-1.

#### 14.3 POSTED INSTRUCTIONS AND EMERGENCY CONTACTS

This section lists emergency contacts, the location of emergency instructions, and shows the nearest medical facilities for emergency treatment.

##### 14.3.1 Instructions

Instructions on actions for personnel to take in an emergency will be posted at each work site. All field personnel will be briefed concerning the personnel and equipment which will be summoned during an emergency situation which requires hospitalization.

TABLE 14-1

**EMERGENCY TELEPHONE NUMBERS**  
**Carswell Air Force Base, Fort Worth, Texas**

---

<b><u>Hospitals:</u></b>	Harris Methodist Hospital 1301 Pennsylvania Avenue Fort Worth, Texas 76104 (817) 882-2000
<b><u>Ambulance:</u></b>	911
<b><u>Police:</u></b>	911
<b><u>Fire Department:</u></b>	911
<b>Environmental Response Team/Spill Control:</b>	
<b>Law Environmental, Inc. Government Services Branch:</b>	Kennesaw, Georgia (404) 499-6800
<b>Project Manager</b>	<b>John O'Brien</b>
<b>Office:</b>	(404) 499-6886
<b>Home:</b>	(404) 975-1023
<b>Site Manager/Health and Safety Officer</b>	<b>John Monger</b>
<b>Office:</b>	(214) 934-0800
<b>Home:</b>	(817) 861-6066
<b>Health and Safety Contact</b>	<b>Cindy Kahout</b>
<b>Office:</b>	(404) 499-6724
<b>Home:</b>	(404) 885-9235
<b>Project Principal</b>	<b>Wini Curley</b>
<b>Office</b>	(404) 499-6885
<b>Home</b>	(404) 992-8460

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### 14.3.2 Emergency Contacts

The names and phone numbers of all emergency response personnel (ambulance, physician, fire hospital, police) will be conspicuously posted at each work site. This information is also presented in Table 14-1.

### 14.3.3 Hospital

To access Harris Methodist Hospital, travel I-30 east to the Summit Avenue exit (approximately 2 miles). Turn right onto Summit Avenue and then turn left onto Pennsylvania Avenue. The hospital will be on the right-hand side of Pennsylvania Avenue (see Figure 14-1).

## 14.4 EMERGENCY RECOGNITION AND PREVENTION

Personnel should be alert for potentially hazardous situations and symptoms in themselves and others that warn of hazardous conditions and exposures. (Refer to Sections 3.0 and 9.0 for symptoms of chemical exposure and heat/cold stress.) Safety briefings will be conducted to review site-specific hazards and/or changing conditions so that dangerous situations can be rapidly recognized and appropriate response taken.

## 14.5 SITE EVACUATION

There are three stages of site evacuation, based upon the hazard posed by the incident:

1. Withdrawal from the immediate work area
2. Evacuation of site
3. Evacuation of potentially affected facilities in vicinity

FIGURE 14-1

# ROUTE TO HOSPITAL

CARSWELL AIR FORCE BASE, TEXAS



CARSWELL AIR FORCE BASE

MAIN GATE

PUMPHREY DR

183

ROARING SPRINGS RD



I-30

SUMMIT AVE

PENNSYLVANIA AVE

HARRIS METHODIST  
HOSPITAL



147081

(NOT TO SCALE)

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#### 14.5.1 Withdrawal from Work Area

Withdrawal to a safe upwind location outside the Exclusion Zone will be required should any of the following occur:

- Concentrations of volatile organics, combustible gases or toxic gases exceed action guidelines. Work will be temporarily stopped until concentrations fall below the action levels, or PPE upgrade will be implemented in accordance with the guidelines presented in Section 7.0.
- If an incident such as a containable fire or minor accident occurs, field operations will resume after appropriate response is completed and the site manager has cleared the site.
- Equipment malfunctions.

#### 14.5.2 Site Evacuation

The work site should be evacuated under the following conditions:

- Levels of contaminants are detected in excess of action guidelines.
- The oxygen content measured by an oxygen level monitor drops below 19.5 percent in the ambient breathing zone or the oxygen content in the air rises above 22 percent (explosive atmosphere) for two consecutive minutes.
- A major accident or injury occurs.
- Fire and/or explosion occurs.

#### 14.5.3 Evacuation of Facilities in Vicinity of Site

The Site Manager is responsible for determining if circumstances exist for adversely affecting areas or facilities surrounding the site, and should always assume worst-case conditions until conditions are demonstrated to be otherwise.

If air concentrations of vapors exceed the work area site action levels contained in earlier sections, monitoring will be performed at the edge of the Exclusion Zone and Contamination Reduction Zone to be protective of personnel in nearby areas and/or buildings. If action levels are encountered at these locations, measurements should be performed at the edges of nearby buildings. If action levels are encountered at the edges of nearby buildings, the buildings should be evacuated. Under such circumstances, the Site Manager will convey this information immediately to the Carswell AFB Emergency Response Coordinator for further action.

#### 14.5.4 Site Security and Control During Emergencies

The buddy system must be adhered to during response to emergencies. Control checkpoints through which all personnel entering or exiting the site must pass will be designated to maintain a record of personnel present in the emergency area. Written records of the names and affiliation of off-site personnel, status, time of entry/exit, areas to be entered, team or "buddy", task being performed, PPE (air time left if SCBA), and rescue and response equipment will be maintained during emergency response.

#### 14.6 MEDICAL EMERGENCY RESPONSE AND DECONTAMINATION

Depending upon the severity of the injury, first aid treatment may be given at the site by trained and certified personnel.

Additional assistance from emergency medical technicians may be required at the site, and/or the victim may require transport to the hospital for treatment.

The Site Manager/Safety Officer should be notified immediately by the SSO of the medical emergency situation and provide him/her with the following information:

- Location of victim
- Nature of emergency
- Whether victim is conscious

After being notified of the medical emergency, the Site Manager should determine whether the victim requires assistance from the Emergency Medical Team (EMT). Actions required depend upon the seriousness of the emergency. If a life-threatening condition exists, the EMT should be called immediately. The Site Manager will meet or appoint a person to meet the EMT when it arrives and lead it to the victim.

When possible, normal decontamination procedures should be followed. In life-threatening situations, care must begin WITHOUT considering decontamination. Outside protective clothing can be removed if it will not delay or aggravate the victim's condition.

#### 14.7 FIRE

The potential for fire is possible when dealing with flammable materials during activities at the site. The local and facility fire departments will be alerted to the nature and location of any field investigation activities to take place at the site. The following preventative procedures will be followed during site activities:

- Before work is started in an area, the Site Manager/Site Safety Officer will review fire prevention and response procedures and identify personnel assembly points and site evacuation procedures.
- Potential sources of ignition will be identified and kept away from areas in which potentially flammable materials will be encountered.
- Air monitoring will be performed during subsurface operations or operations in confined spaces using combustible gas, oxygen level indicators and organic vapor monitoring equipment.
- Field personnel will be briefed on action levels for combustible gases and oxygen prior to starting work at a site.
- No smoking signs will be conspicuously posted at the work site.
- Fire extinguishers will be kept readily available (within 100 feet) of the work site.

The following procedures for responding to a fire will be followed during work at the site:

- The buddy system must be adhered to during response to a fire. Work teams must exit the work area together if evacuation is necessary.
- All personnel in the immediate work area should be alerted to the presence of a fire. Personnel will disconnect all electrical equipment in use at the site and move other equipment, if possible, away from the fire.

- Field personnel are not trained firefighters and should not attempt to combat fires that can not be quickly contained with the available fire extinguishers.
- If there is any doubt that a fire cannot be quickly contained and extinguished with available fire extinguishers, personnel must sound the fire alarm and proceed to the designated assembly point.
- When a small fire has been extinguished, the SSO must be informed of the incident.

In the event of a fire that cannot be rapidly extinguished using available equipment, the following personnel will be contacted immediately:

- Personnel in the immediate work area.
- Fire Department
- Contracting Officer

#### 14.8 EMERGENCY FOLLOW-UP RESPONSE

The following actions will be taken prior to the resumption of normal site activities:

- The Site Manager will notify appropriate government agencies, as required.
- All equipment and supplies will be restocked and damaged equipment replaced or repaired.
- The SSO and/or Site Manager will review all aspects of the contingency plan according to new site conditions and lessons learned from the emergency response.

- Personnel will be briefed on revisions to the contingency plan and emergency procedures and other information pertinent to future emergency response activities.

This section describes the logs, reports and recordkeeping required to document the safety procedures of the GSSHP and SSSHPs.

### 15.1 TRAINING AND DOCUMENTATION

The following training logs, and records will be developed and maintained by the site manager and will become part of the permanent record.

#### Prior to Work

- List of site personnel and training/experience
- 40-hour OSHA training certificates
- 8-hour supervisor training certificates
- CPR/first aid training certificates
- Certification of fitness to work
- Medical Background Summary Sheet

#### During Work

- Site-specific training and safety briefings logs
- Visitors training records

In addition to maintaining logs the following records will be maintained and kept as part of the permanent record.

- Meteorological data logs
- Equipment calibration logs
- Daily safety inspections
- Daily exposure monitoring logs
- Employee and visitor register

### 16.1 CONTAMINANT CHARACTERIZATION

Heavy metals, petroleum products from diesel fuel , fuel oil, and gasoline are the primary constituents of concern at these sites. Lead from leaded gasoline may also be present in this area. Table 16-1 presents the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Time Weighted Average (OSHA PEL-TWA), American Conference of Governmental Industrial Hygienists Threshold Limit Values (ACGIH TLVs), odor thresholds, ionization potential, and symptoms of exposure for each chemical of concern.

### 16.2 TASK-SPECIFIC HAZARDS

A description of anticipated potential hazards and an evaluation of these hazards is presented in the following subsections.

#### 16.2.1 Potential Hazards

Potential hazards that may be associated with field activities at this site include the following:

- Personnel exposure to organic and inorganic chemicals via inhalation, incidental ingestion of soils, and/or skin contact
- Explosion and/or flammability of contaminants
- Biological hazards (snakes, mosquitoes, ticks)
- Heat or cold stress, depending on season

TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
POL Tank Farm  
Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
<b>CLASS: PETROLEUM FUEL CONSTITUENTS</b>								
Benzene	1 5 [ST]	10 [A2]	3000	7.9/1.3	4.68	73	9.24	Acute: Irritation of eyes, nose, or respiratory system, giddiness, headache, nausea, staggered gait, fatigue, anorexia, lassitude, dermatitis Chronic: Bone marrow depression, carcinogen
Coal tar pitch volatiles (PAHs)	0.2 mg/m <sup>3</sup> [Ca]	0.2 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	VA	VA	VA	VA	Acute: Dermatitis, bronchitis Chronic: Lung, skin, urinary tract cancers
Ethyl benzene	100 125 [ST]	100 125 [ST]	2000	6.7/1.0	2.3	84	8.76	Acute: Irritation of eyes, mucous membrane, headache, dermatitis, narcosis, coma Chronic: Liver and kidney damage
Naphthalene	10 15 [ST]	10	500	5.9/0.9	0.084	NA	8.12	Acute: Eye and skin irritant, nausea, vomiting, headache, confusion, sweating, abdominal pain, jaundice, kidney damage Chronic: Kidney damage, cataracts
Toluene	100 150 [ST]	100 150 [ST]	2000	7.1/1.2	2.9	94	8.82	Acute: Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis Chronic: CNS effects, brain dysfunction, liver and kidney damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

Ca : Carcinogen (NIOSH)

NC : Noncombustible solid or liquid

FMP : 5 minute maximum peak in any two hours

CP : Combustible in dust or powdered form

NE : No evidence found for the existence of an IDLH (NIOSH)

NA : Not Available

ND/NR : Not relevant

Ukn : Unknown

VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
NIOSH, Pocket Guide to Chemical Hazards, 1990.  
OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 POL Tank Farm  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%)		Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
				LEL (%)	UEL (%)				
Xylene (o-,m-,p-isomers)	100	100	1000	7.0/	1.1	1.1	NA (o)	8.56 (o)	Acute: Dizziness, excitement, drowsiness, incoordination, staggering gait, irritation of eyes, nose, or throat, eye disorders, anorexia, nausea, vomiting, abdominal pain, dermatitis Chronic: Lung and liver effects
	150 [ST]	150 [ST]		1.1 (o)		99 (m)	99 (m)	8.54 (m)	
				1.0 (m)		NA (p)	NA (p)	8.44 (p)	
Total Petroleum Hydrocarbons (as gasoline)	300	300	NA	NA/NA	0.25		NR	NR	Acute: Irritation of upper respiratory tract, depression of central nervous system, irregular heartbeat, irritation of mucous membrane Chronic: Ukn
	500 [ST]	500 [ST]							
<b>CLASS: METALS/INORGANICS</b>									
Aluminum (dust)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	NE	NC/NC	ND		NR	NR	Acute: Dermatitis, eczema, conjunctivitis, mucus membrane/upper respiratory irritation Chronic: Pneumoconiosis, Alzheimer's disease, dialysis dementia
Antimony	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>	NA/NA	ND		NR	NA	Acute: Skin and eye irritant, nausea, vomiting, death after large oral doses Chronic: Pulmonary edema, EKG changes, red blood cell changes, hypertension

NE: No evidence found for the existence of an IDLH (NIOSH)

NOTES: B: Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C: Ceiling limit

ST: Short term exposure limit

skin: Recognized as having potential for dermal absorption

A2: Suspected human carcinogen (ACGIH)

Ca: Carcinogen (NIOSH)

NC: Noncombustible solid or liquid

FMP: 5 minute maximum peak in any two hours

CP: Combustible in dust or powdered form

NA: Not Available

ND/NR: Not relevant

Ukn: Unknown

VA: Varies according to compound

\*: Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\*: H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP: National Council on Radiation Protection

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.

ATSDR, Toxicological Profiles for Constituents, 1987-1991.

ACGIH, Threshold Limit Values, 1991-1992.

NIOSH, Pocket Guide to Chemical Hazards, 1990.

OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

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TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 POL Tank Farm  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Arsenic	0.01 mg/m <sup>3</sup> [Ca]	0.2 mg/m <sup>3</sup> [Ca]	100 mg/m <sup>3</sup>	CP/CP	ND	NR	NR	Acute: Nasal septum ulceration, dermatitis, respiratory irritation, GI disturbances Chronic: Peripheral neuritis, hyperpigmentation of skin, carcinogen
Barium (soluble compounds)	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	1100 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Upper respiratory tract irritation, gastroenteritis, muscle spasms, slow pulse, extra-systoles, hypokalemia, eye and skin irritant, skin burns Chronic: Hypertension
Beryllium	0.002 mg/m <sup>3</sup> 0.005 mg/m <sup>3</sup> [C]	0.002 mg/m <sup>3</sup> [A2]	10 mg/m <sup>3</sup>	CP/CP	ND	NR	NR	Acute: Respiratory symptoms, weakness, fatigue, weight loss Chronic: Pneumonitis, beryllosis, carcinogen
Cadmium	0.2 mg/m <sup>3</sup> 0.6 mg/m <sup>3</sup> [C] [Ca]	0.05 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Pulmonary edema, dyspnea, cough, tight chest, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea Chronic: Lung fibrosis, emphysema, proteinuria, mild anemia, carcinogen

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

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NA : Not Available

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Ukn : Unknown

VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

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REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
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 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 POL Tank Farm  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Chromium	1 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	NE	NC/NC	ND	NR	NR	Acute: Sneezing, throat irritation, bronchial spasm, skin ulcers, GI irritation, nausea, vomiting, severe diarrhea, hemorrhage (oral form) Chronic: Nasal perforation, chronic inflammation of respiratory tract, lung cancer
Copper (dusts)	1 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	NE	CP/CP	ND	NR	NR	Acute: Irritation of mucous membranes in nose and pharynx, nasal perforation, eye irritation, metallic taste, dermatitis, metal fume fever Chronic: NA
Iron	10 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	NE	NC/NC	ND	NR	NR	Acute: Oral-GI distress, liver damage Chronic: Benign pneumoconiosis
Lead	0.05 mg/m <sup>3</sup>	0.15 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Weakness, lassitude, insomnolence, facial pallor, anorexia, low weight, constipation, abdominal pain, colic, anemia, irritation of eyes, hypotension Chronic: Malnutrition, gingival lead line, tremor, paralysis of wrist or ankles, brain disorder, nerve disorder

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

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Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 POL Tank Farm  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Manganese, dust and compounds	5 mg/m <sup>3</sup> [C]	5 mg/m <sup>3</sup>	NE	NA/NA	ND	NR	NR	Acute: Lung irritation, cough Chronic: Manganism (neurological disease), symptoms are weakness, lethargy, speech disturbances, clumsy gait, hallucinations, psychosis, muscle rigidity
Mercury (compounds)	0.01 mg/m <sup>3</sup> 0.03 mg/m <sup>3</sup> [ST] [skin]	0.01 mg/m <sup>3</sup> 0.03 mg/m <sup>3</sup> [ST] [skin]	10 mg/m <sup>3</sup>	NR/NR	ND	NR	NR	Acute: Incoordination, vision, hearing disturbance, spastic, jerky, dizziness, salivation, lacrimation, nausea, vomiting, diarrhea, constipation, skin burns, emotional distress Chronic: In animals: decreased weight gain, kidney damage
Nickel (dust and compounds)	0.1 mg/m <sup>3</sup> (sol) 1 mg/m <sup>3</sup> (insol)	0.1 mg/m <sup>3</sup> (sol) 1 mg/m <sup>3</sup> (insol)	NA	NC/NC	ND	NR	NR	Acute: Headache, vertigo, nausea, vomiting, gastric pain, substernal pain, cough, cyanosis, weakness, leukocytosis, delirium, convulsion Chronic: Lung lesions, asthmatic disease, immune system changes, lung and nasal cancers
Selenium, and compounds	0.2 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>	Ukn	NA/NA	ND	NR	NA	Acute: Lung and eye irritation, pallor, irritability, giddiness, GI effects Chronic: Pulmonary edema, possible liver and kidney damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

Ca : Carcinogen (NIOSH)

NC : Noncombustible solid or liquid

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CP : Combustible in dust or powdered form

NE : No evidence found for the existence of an IDLH (NIOSH)

NA : Not Available

ND/NR : Not relevant

Ukn : Unknown

VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 16-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
POL Tank Farm  
Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Strontium	NA	NA	NA	NA/NA	ND	NR	NA	Acute: Oral-arrhythmias, cardiac arrest, concentration in bone tissue Chronic: Bone cancer
Silver (dust and compounds)	0.01 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup> (dust) 0.01 mg/m <sup>3</sup> (sol)	NA	NC/NC	ND	NR	NR	Acute: Blue-gray eyes, nasal septum, throat, skin, irritation of skin or ulceration, gastrointestinal disturbance Chronic: Ukn
Vanadium (dust)	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	70 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Eye irritation, green tongue, metallic taste, eczema, cough, fine rales, wheezing, bronchitis, dyspnea, throat irritation Chronic: Possible CNS effects
Zinc (as ZnO dust)	10 mg/m <sup>3</sup> (total) 5 mg/m <sup>3</sup> (respirable)	10 mg/m <sup>3</sup>	NA	NA/NA	ND	NR	NR	Acute: Metal fume fever, GI distress Chronic: Alveolar tissue damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)  
C : Ceiling limit  
ST : Short term exposure limit  
skin : Recognized as having potential for dermal absorption  
A2 : Suspected human carcinogen (ACGIH)  
Ca : Carcinogen (NIOSH)  
NC : Noncombustible solid or liquid  
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NE : No evidence found for the existence of an IDLH (NIOSH)  
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REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
NIOSH, Pocket Guide to Chemical Hazards, 1990.  
OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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- Drilling near overhead utility lines or subsurface utilities
- Excessive noise level from aircraft or drilling equipment

#### 16.2.2 Hazard Evaluation

Intrusive activities taking place at this site will increase the potential for exposure to hazardous materials via contaminated soil or ground-water contact. These activities include:

- HydroPunch
- Ground-water sampling
- Soil sampling

Non-intrusive activities are anticipated to have a lower or non-existent potential for exposure to hazards because, unlike the intrusive activities listed above, there will be little or no contact with contaminated soil and water. These activities include:

- Geophysical surveys

#### 16.3 CHEMICAL INDICATORS OF HAZARD

Chemical indicators of hazard were selected from the primary constituents of concern at the site based on toxic and hazardous properties. The chemicals that have the greatest potential to cause adverse health effects at the lowest concentrations were selected as indicators in order to establish the most protective action level guidelines during field investigations. Exposure monitoring for the presence of these chemicals will be conducted during all intrusive investigative activities at this site.

Action guidelines for each chemical have been established based on regulatory or guideline exposure limits, or on toxic properties (where exposure limits are not available). These action guidelines will also protect workers from the other constituents anticipated to be encountered at the site.

The chemicals selected to serve as indicators of airborne organic vapor hazards at this site are:

- Benzene
- Toluene
- Dust hazards are discussed in Section 16.5.2

#### 16.4 PERSONNEL PROTECTIVE EQUIPMENT

Level D protection will be used initially during non-intrusive field activities, and Modified Level D will be used initially during intrusive field activities covered by this plan. PPE will be upgraded to Level C and/or Level B, as warranted by the monitoring of site conditions during work, according to the action levels for monitoring equipment described in Section 3.0. Modified Level D: Viton/nitrile gloves and Tyvek coveralls.

#### 16.5 AIR MONITORING

Table 16-2 lists the monitoring equipment, tasks, and action guidelines to be used when measuring combustible gases, oxygen and organic vapors during site activities. Combustible gas and oxygen levels will be measured at the tops of boreholes, monitoring wells, and organic vapors in the breathing zone of the worker nearest to the borehole during intrusive activities.

TABLE 16-2

**AIR MONITORING EQUIPMENT CRITERIA FOR  
FIELD INVESTIGATION ACTIVITIES  
POL Tank Farm  
Carswell Air Force Base, Texas**

<b>TASKS TO BE PERFORMED</b>	<b>TYPE OF ACTIVITY</b>	<b>MONITORING EQUIPMENT</b>
Geophysical Survey	Non-Intrusive	None
Soil Borings	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*
Monitoring Well Installation	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*
Ground-Water Sampling	Intrusive	Combustible Gas Indicator O <sub>2</sub> meter
Monitoring Well Development, In-Situ Permeability Testing, and Sampling	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*
Soil Sampling	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*
HydroPunch	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*

\* See Section 16.5.1

#### 16.5.1 Air Monitoring Equipment and Action Guidelines

The monitoring equipment includes a combustible gas indicator, oxygen monitor, photoionization detector (PID), and detector tubes. Action levels for the monitoring equipment are presented in Table 16-3.

A 10.2 eV lamp will be used in the PID and the span control will be set at 9.8 (benzene equivalent). Action levels for the PID are designed to be used in conjunction with the benzene detector tubes (Draeger tubes) and are based on half of the lowest TWA PEL or TLV of the suspected contaminants. Readings for the Draeger tubes and for the PID are referenced to above background and reflect those sustained for >5 seconds in the breathing zone. If action levels requiring the use of Draeger tubes are reached, Draeger tube monitoring shall be performed every 15 minutes until PID concentrations fall below action levels.

#### 16.5.2 Dust Control

**There is a potential for skin and/or inhalation exposure to dusts that may be contaminated with lead from leaded gasoline at this site.** Therefore, prior to performing field activities in dry, dusty areas at this site, workers will wet down the area of activity with water in order to decrease the potential for dust inhalation. In the event that this is not possible, personnel must wear Level C protection, including full-face air-purifying respirators with HEPA cartridges when intrusive activity produces dusty conditions. The presence of visible dust emissions will be the criterion upon which PPE upgrade or dust suppression measures will be implemented.

TABLE 16-3

**MONITORING EQUIPMENT AND ACTION GUIDELINES**  
**POL Tank Farm**  
**Carswell Air Force Base, Texas**

EQUIPMENT:	* OXYGEN MONITOR <sup>(a)(b)</sup>		COMBUSTIBLE GAS INDICATOR <sup>(a)</sup> (EXPLOSIMETER)		PHOTOIONIZATION METER (PID) AND CHEMICAL-SPECIFIC DETECTOR TUBES <sup>(c)</sup>		
	Oxygen Level	Action	LEL Levels	Action	PID Levels (ppm)	Draeger Tube Benzene Levels (ppm)	Action
	19.5-23.5%	Normal Oxygen Level	0-10%	No explosion hazard	0-1		Modified Level D
	> 23.5%	Fire/Explosion hazard; Stop tasks, evacuate site; notify Site Manager	10-25%	Potential explosion hazard; notify Site Manager	1-50	and 0-0.5	Modified Level D; begin monitoring for benzene (with 0.5/a Draeger tube) every 15 min.
	< 19.5%	Oxygen deficient; Stop tasks, evacuate site; notify Site Manager; upgrade to Level B	> 25%	Explosive hazard exists; stop tasks; evacuate site; notify Site Manager	50-250	or 1-25	Level C
					> 250	or > 25	Stop work; notify COE regarding need to upgrade to Level B

- (a) Monitoring to be conducted at top of borehole
- (b) Used in conjunction with combustible gas indicator to confirm combustible gas indicator function
- (c) Monitoring to be conducted in breathing zone of worker nearest to borehole; concentrations sustained for 5 min. above background.

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## 17.0 UNNAMED STREAM

### 17.1 CONTAMINANT CHARACTERIZATION

Heavy metals, solvents, petroleum products from diesel fuel , fuel oil, and gasoline are the primary constituents of concern at these sites. Lead from leaded gasoline may also be present in this area. Table 17-1 presents the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits, Time Weighted Average (OSHA PEL-TWA), American Conference of Governmental Industrial Hygienists Threshold Limit Values (ACGIH TLVs), odor thresholds, ionization potentials, and symptoms of exposure for each chemical of concern.

### 17.2 TASK-SPECIFIC HAZARDS

A description of anticipated potential hazards and an evaluation of these hazards is presented in the following subsections.

#### 17.2.1 Potential Hazards

Potential hazards that may be associated with field activities at this site include the following:

- Personnel exposure to organic and inorganic chemicals via inhalation, incidental ingestion of soils, and/or skin contact
- Explosion and/or flammability of contaminants
- Biological hazards (snakes, mosquitoes, ticks)
- Heat or cold stress, depending on season

TABLE 17-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 Unnamed Stream  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
<b>CLASS: PETROLEUM FUEL CONSTITUENTS</b>								
Benzene	1 5 [ST]	10 [A2]	3000	7.9/1.3	4.68	73	9.24	Acute: Irritation of eyes, nose, or respiratory system, giddiness, headache, nausea, staggered gait, fatigue, anorexia, lassitude, dermatitis Chronic: Bone marrow depression, carcinogen
Coal tar pitch volatiles (PAHs)	0.2 mg/m <sup>3</sup> [Ca]	0.2 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	VA	VA	VA	VA	Acute: Dermatitis, bronchitis Chronic: Lung, skin, urinary tract cancers
Ethyl benzene	100 125 [ST]	100 125 [ST]	2000	6.7/1.0	2.3	84	8.76	Acute: Irritation of eyes, mucous membrane, headache, dermatitis, narcosis, coma Chronic: Liver and kidney damage
Naphthalene	10 15 [ST]	10	500	5.9/0.9	0.084	NA	8.12	Acute: Eye and skin irritant, nausea, vomiting, headache, confusion, sweating, abdominal pain, jaundice, kidney damage Chronic: Kidney damage, cataracts
Toluene	100 150 [ST]	100 150 [ST]	2000	7.1/1.2	2.9	94	8.82	Acute: Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis Chronic: CNS effects, brain dysfunction, liver and kidney damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)  
 C : Ceiling limit  
 ST : Short term exposure limit  
 skin : Recognized as having potential for dermal absorption  
 A2 : Suspected human carcinogen (ACGIH)  
 Ca : Carcinogen (NIOSH)  
 NC : Noncombustible solid or liquid  
 FMP : 5 minute maximum peak in any two hours  
 CP : Combustible in dust or powdered form

NE : No evidence found for the existence of an IDLH (NIOSH)  
 NA : Not Available  
 ND/NR : Not relevant  
 Ukn : Unknown  
 VA : Varies according to compound  
 \* : Noncombustible liquid; however the vapor will burn  
 \*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F  
 \*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 17-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 Unnamed Stream  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Xylene (o-,m-,p-isomers)	100 150 (ST)	100 150 (ST)	1000	7.0 / 1.1 (o) 1.0 (m) 1.1 (p)	1.1	NA (o) 99 (m) NA (p)	8.56 (o) 8.54 (m) 8.44 (p)	Acute: Dizziness, excitement, drowsiness, incoordination, staggering gait, irritation of eyes, nose, or throat, eye disorders, anorexia, nausea, vomiting, abdominal pain, dermatitis Chronic: Lung and liver effects
Total Petroleum Hydrocarbons (as gasoline)	300 500 (ST)	300 500 (ST)	NA	NA/NA	0.25	NR	NR	Acute: Irritation of upper respiratory tract, depression of central nervous system, irregular heartbeat, irritation of mucous membrane Chronic: Ukn
<b>CLASS: METALS/INORGANICS</b>								
Aluminum (dust)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	NE	NC/NC	ND	NR	NR	Acute: Dermatitis, eczema, conjunctivitis, mucous membrane/upper respiratory irritation Chronic: Pneumoconiosis, Alzheimer's disease, dialysis dementia
Antimony	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	80 mg/m <sup>3</sup>	NA/NA	ND	NR	NA	Acute: Skin and eye irritant, nausea, vomiting, death after large oral doses Chronic: Pulmonary edema, EKG changes, red blood cell changes, hypertension

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

- C : Ceiling limit
- ST : Short term exposure limit
- skin : Recognized as having potential for dermal absorption
- A2 : Suspected human carcinogen (ACGIH)
- Ca : Carcinogen (NIOSH)
- NC : Noncombustible solid or liquid
- FMP : 5 minute maximum peak in any two hours
- CP : Combustible in dust or powdered form

NE : No evidence found for the existence of an IDLH (NIOSH)  
 NA : Not Available  
 ND/NR : Not relevant  
 Ukn : Unknown  
 VA : Varies according to compound  
 \* : Noncombustible liquid; however the vapor will burn  
 \*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F  
 \*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.  
 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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TABLE 17-1

**IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN**  
**Unnamed Stream**  
**Carswell Air Force Base, Texas**

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%)/LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Arsenic	0.01 mg/m <sup>3</sup> [Ca]	0.2 mg/m <sup>3</sup> [Ca]	100 mg/m <sup>3</sup>	CP/CP	ND	NR	NR	Acute: Nasal septum ulceration, dermatitis, respiratory irritation, GI disturbances Chronic: Peripheral neuritis, hyperpigmentation of skin, carcinogen
Barium (soluble compounds)	0.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	1100 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Upper respiratory tract irritation, gastroenteritis, muscle spasms, slow pulse, extrasystoles, hypokalemia, eye and skin irritant, skin burns Chronic: Hypertension
Beryllium	0.002 mg/m <sup>3</sup> 0.005 mg/m <sup>3</sup> [C]	0.002 mg/m <sup>3</sup> [A2]	10 mg/m <sup>3</sup>	CP/CP	ND	NR	NR	Acute: Respiratory symptoms, weakness, fatigue, weight loss Chronic: Pneumonitis, beryllosis, carcinogen
Cadmium	0.2 mg/m <sup>3</sup> 0.6 mg/m <sup>3</sup> [C] [Ca]	0.05 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Pulmonary edema, dyspnea, cough, tight chest, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea Chronic: Lung fibrosis, emphysema, proteinuria, mild anemia, carcinogen

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

Ca : Carcinogen (NIOSH)

NC : Noncombustible solid or liquid

FMP : 5 minute maximum peak in any two hours

CP : Combustible in dust or powdered form

NE : No evidence found for the existence of an IDLH (NIOSH)

NA : Not Available

ND/NR : Not relevant

Ukn : Unknown

VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
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 ATSDR, Toxicological Profiles for Constituents, 1987-1991.

TABLE 17-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 Unnamed Stream  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)(B)	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Chromium	1 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	NE	NC/NC	ND	NR	NR	Acute: Sneezing, throat irritation, bronchial spasm, skin ulcers, GI irritation, nausea, vomiting, severe diarrhea, hemorrhage (oral form) Chronic: Nasal perforation, chronic inflammation of respiratory tract, lung cancer
Copper (dusts)	1 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	NE	CP/CP	ND	NR	NR	Acute: Irritation of mucous membranes in nose and pharynx, nasal perforation, eye irritation, metallic taste, dermatitis, metal fume fever Chronic: NA
Iron	10 mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	NE	NC/NC	ND	NR	NR	Acute: Oral-GI distress, liver damage Chronic: Benign pneumoconiosis
Lead	0.05 mg/m <sup>3</sup>	0.15 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Weakness, lassitude, insomnolence, facial pallor, anorexia, low weight, constipation, abdominal pain, colic, anemia, irritation of eyes, hypotension Chronic: Malnutrition, gingival lead line, tremor, paralysis of wrist or ankles, brain disorder, nerve disorder

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

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 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

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TABLE 17-1

**IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN**  
**Unnamed Stream**  
**Carswell Air Force Base, Texas**

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)(B)	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Manganese, dust and compounds	5 mg/m <sup>3</sup> [C]	5 mg/m <sup>3</sup>	NE	NA/NA	ND	NR	NR	Acute: Lung irritation, cough Chronic: Manganism (neurological disease), symptoms are weakness, lethargy, speech disturbances, clumsy gait, hallucinations, psychosis, muscle rigidity
Mercury (compounds)	0.01 mg/m <sup>3</sup> 0.03 mg/m <sup>3</sup> [ST] [skin]	0.01 mg/m <sup>3</sup> 0.03 mg/m <sup>3</sup> [ST] [skin]	10 mg/m <sup>3</sup>	NR/NR	ND	NR	NR	Acute: Incoordination, vision, hearing disturbance, spastic, jerky, dizziness, salivation, lacrimation, nausea, vomiting, diarrhea, constipation, skin burns, emotional distress Chronic: In animals: decreased weight gain, kidney damage
Nickel (dust and compounds)	0.1 mg/m <sup>3</sup> (sol) 1 mg/m <sup>3</sup> (insol)	0.1 mg/m <sup>3</sup> (sol) 1 mg/m <sup>3</sup> (insol)	NA	NC/NC	ND	NR	NR	Acute: Headache, vertigo, nausea, vomiting, gastric pain, substernal pain, cough, cyanosis, weakness, leukocytosis, delirium, convulsion Chronic: Lung lesions, asthmatic disease, immune system changes, lung and nasal cancers
Selenium, and compounds	0.2 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>	Ukn	NA/NA	ND	NR	NA	Acute: Lung and eye irritation, pallor, irritability, giddiness, GI effects Chronic: Pulmonary edema, possible liver and kidney damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

Ca : Carcinogen (NIOSH)

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Ukn : Unknown

VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

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ATSDR, Toxicological Profiles for Constituents, 1987-1991.

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.  
 NIOSH, Pocket Guide to Chemical Hazards, 1990.  
 OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

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TABLE 17-1

IMPORTANT PROPERTIES OF CONSTITUENTS OF CONCERN  
 Unnamed Stream  
 Carswell Air Force Base, Texas

Constituent	OSHA PEL (ppm)	ACGIH TLV (ppm)	IDLH (ppm)	UEL (%) / LEL (%)	Odor Threshold (ppm)	Respirator Cartridge Breakthrough Time (min)[B]	Ionization Potential (eV)	Health Hazards (Acute/Chronic)
Strontium	NA	NA	NA	NA/NA	ND	NR	NA	Acute: Oral-arrhythmias, cardiac arrest, concentration in bone tissue Chronic: Bone cancer
Silver (dust and compounds)	0.01 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup> (dust) 0.01 mg/m <sup>3</sup> (sol)	NA	NC/NC	ND	NR	NR	Acute: Blue-gray eyes, nasal septum, throat, skin, irritation of skin or ulceration, gastrointestinal disturbance Chronic: Ukn
Vanadium (dust)	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	70 mg/m <sup>3</sup>	NC/NC	ND	NR	NR	Acute: Eye irritation, green tongue, metallic taste, eczema, cough, fine rales, wheezing, bronchitis, dyspnea, throat irritation Chronic: Possible CNS effects
Zinc (as ZnO dust)	10 mg/m <sup>3</sup> (total) 5 mg/m <sup>3</sup> (respirable)	10 mg/m <sup>3</sup>	NA	NA/NA	ND	NR	NR	Acute: Metal fume fever, GI distress Chronic: Alveolar tissue damage

NOTES: B : Time to reach 1% breakthrough (tested at 1000 ppm, 50% relative humidity, 22°C, and 53 L/min)

C : Ceiling limit

ST : Short term exposure limit

skin : Recognized as having potential for dermal absorption

A2 : Suspected human carcinogen (ACGIH)

Ca : Carcinogen (NIOSH)

NC : Noncombustible solid or liquid

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NE : No evidence found for the existence of an IDLH (NIOSH)

NA : Not Available

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VA : Varies according to compound

\* : Noncombustible liquid; however the vapor will burn

\*\* : Noncombustible liquid at ordinary temperatures, but the gaseous form will ignite and burn weakly at 1256° F

\*\*\* : H<sub>2</sub>S strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis; some persons are congenitally unable to smell H<sub>2</sub>S.

NCRP : National Council on Radiation Protection

REFERENCES: ACGIH, Threshold Limit Values, 1991-1992.

NIOSH, Pocket Guide to Chemical Hazards, 1990.

OSHA, Permissible Exposure Limits, 29 CFR 1910.1000.

Sittig, Hazardous and Toxic Effects of Industrial Chemicals, 1979.

ATSDR, Toxicological Profiles for Constituents, 1987-1991.

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- Drilling near overhead utility lines or subsurface utilities
- Excessive noise level from aircraft or drilling equipment

#### 17.2.2 Hazard Evaluation

Intrusive activities taking place at this site will increase the potential for exposure to hazardous materials via contaminated soil or ground-water contact. These activities include:

- Soil borings
- Monitoring well installation
- Surface water sampling
- Sediment sampling

Non-intrusive activities are anticipated to have a lower or non-existent potential for exposure to hazards because, unlike the intrusive activities listed above, there will be little or no contact with contaminated soil and water. These activities include:

- Geophysical surveys

#### 17.3 CHEMICAL INDICATORS OF HAZARD

Chemical indicators of hazard were selected from the primary constituents of concern at the site based on toxic and hazardous properties. The chemicals that have the greatest potential to cause adverse health effects at the lowest concentrations were selected as indicators in order to establish the most protective action level guidelines during field investigations. Exposure

monitoring for the presence of these chemicals will be conducted during all intrusive investigative activities at this site.

Action guidelines for each chemical have been established based on regulatory or guideline exposure limits, or on toxic properties (where exposure limits are not available). These action guidelines will also protect workers from the other constituents anticipated to be encountered at the site.

The chemicals selected to serve as indicators of airborne organic vapor hazards at this site are:

- Benzene
- Toluene
- Dust hazards are discussed in Section 17.5.2

#### 17.4 PERSONNEL PROTECTIVE EQUIPMENT

Level D protection will be used initially during non-intrusive field activities, and Modified Level D will be used initially during intrusive field activities covered by this plan. PPE will be upgraded to Level C and/or Level B, as warranted by the monitoring of site conditions during work, according to the action levels for monitoring equipment described in Section 7.0. Modified Level D: Viton/nitrile gloves, Tyvek coveralls.

#### 17.5 AIR MONITORING

Table 17-2 lists the monitoring equipment, tasks, and action guidelines to be used when measuring combustible gases, oxygen and organic vapors during site activities. Combustible gas and oxygen levels will be measured at the tops of boreholes, monitoring wells, and organic vapors in the breathing zone of the worker nearest to the borehole.

TABLE 17-2

**AIR MONITORING EQUIPMENT CRITERIA FOR  
FIELD INVESTIGATION ACTIVITIES  
Unnamed Stream  
Carswell Air Force Base, Texas**

TASKS TO BE PERFORMED	TYPE OF ACTIVITY	MONITORING EQUIPMENT
Geophysical Survey	Non-Intrusive	None
Surface Water Sampling	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*
Sediment Sampling	Intrusive	Combustible Gas Indicator Oxygen Meter PID/Draeger Tubes*

\* See Section 17.5.1

### 17.5.1 Air Monitoring Equipment and Action Guidelines

The monitoring equipment includes a combustible gas indicator, oxygen monitor, photoionization detector (PID), and detector tubes. Action levels for the monitoring equipment are presented in Table 17-3.

A 10.2 eV lamp will be used in the PID and the span control will be set at 9.8 (benzene equivalent). Action levels for the PID are designed to be used in conjunction with the benzene detector tubes (Draeger tubes) and are based on half of the lowest TWA PEL or TLV of the suspected contaminants. Readings for the Draeger tubes and for the PID are referenced to above background and reflect those sustained for >5 seconds in the breathing zone. If action levels requiring the use of Draeger tubes are reached, Draeger tube monitoring shall be performed every 15 minutes until PID concentrations fall below action levels.

### 17.5.2 Dust Control

There is a potential for skin and/or inhalation exposure to dusts that may be contaminated with lead from leaded gasoline at this site. Therefore, prior to performing field activities in dry, dusty areas at this site, workers will wet down the area of activity with water in order to decrease the potential for dust inhalation. In the event that this is not possible, personnel must wear Level C protection, including full-face air-purifying respirators with HEPA cartridges when intrusive activity produces dusty conditions. The presence of visible dust emissions will be the criterion upon which PPE upgrade or dust suppression measures will be implemented.

TABLE 17-3

**MONITORING EQUIPMENT AND ACTION GUIDELINES**

Unnamed Stream  
Carswell Air Force Base, Texas

EQUIPMENT:	* OXYGEN MONITOR <sup>(a)(b)</sup>		COMBUSTIBLE GAS INDICATOR <sup>(a)</sup> (EXPLOSIMETER)		PHOTOIONIZATION METER (PID) AND CHEMICAL-SPECIFIC DETECTOR TUBES <sup>(c)</sup>		
	Oxygen Level	Action	LEL Levels	Action	PID Levels (ppm)	Draeger Tube Benzene Levels (ppm)	Action
	19.5-23.5%	Normal Oxygen Level	0-10%	No explosion hazard	0-1		Modified Level D
	>23.5%	Fire/Explosion hazard; Stop tasks, evacuate site; notify Site Manager	10-25%	Potential explosion hazard; notify Site Manager	1-50	and 0-0.5	Modified Level D; begin monitoring for benzene (with 0.5/a Draeger tube) every 15 min.
	<19.5%	Oxygen deficient; Stop tasks, evacuate site; notify Site Manager; upgrade to Level B	>25%	Explosive hazard exists; stop tasks; evacuate site; notify Site Manager	50-250	or 1-25	Level C
					>250	or >25	Stop work; notify COE regarding need to upgrade to Level B

(a) Monitoring to be conducted at top of borehole

(b) Used in conjunction with combustible gas indicator to confirm combustible gas indicator function

(c) Monitoring to be conducted in breathing zone of worker nearest to borehole; concentrations sustained for 5 min. above background.

## 18.0 REFERENCES

- American Conference of Governmental Industrial Hygienists (ACGIH), 1991. Threshold Limit Values and Biological Exposure Indices for 1992-93. ACGIH, Cincinnati, Ohio.
- ATSDR, 1987-1991. Toxicological Profiles for Constitutents. Agency for Toxic Substances and Disease Registry, Atlanta, Georgia.
- CHRIS, 1985. Chemical Hazard Response Information System, U.S. Coast Guard.
- Klaassen, Curtis D., et al., editors, 1986. Casarett and Doull's Toxicology: The Basic Science of Poisons, third edition. Macmillan Publishing Company. New York, N.Y., 1986.
- Law, 1991. Health and Safety Training for Hazardous Waste Operations: A 40-hr. Course. Law Companies Environmental Group, Environmental Training Center. August 1991.
- NIOSH, 1987. NIOSH Guide to Industrial Respiratory Protection, U.S. Dept. of Health and Human Services.
- NIOSH, 1990. NIOSH Pocket Guide to Chemical Hazards, U.S. Dept. of Health and Human Services.
- NIOSH/OSHA/USCG/EPA, 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. USDHHS.
- NSC, 1988. Fundamentals of Industrial Hygiene, third edition. B.A. Plog, editor. National Safety Council, Chicago, Illinois.

Sittig, M., 1979. Hazardous and Toxic Effects of Industrial Chemicals. Noyes Data Corporation, Park Ridge, New Jersey.

USACE, 1987. Safety and Health Requirements Manual, U.S. Army Corps of Engineers, EM 385-1-1.

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