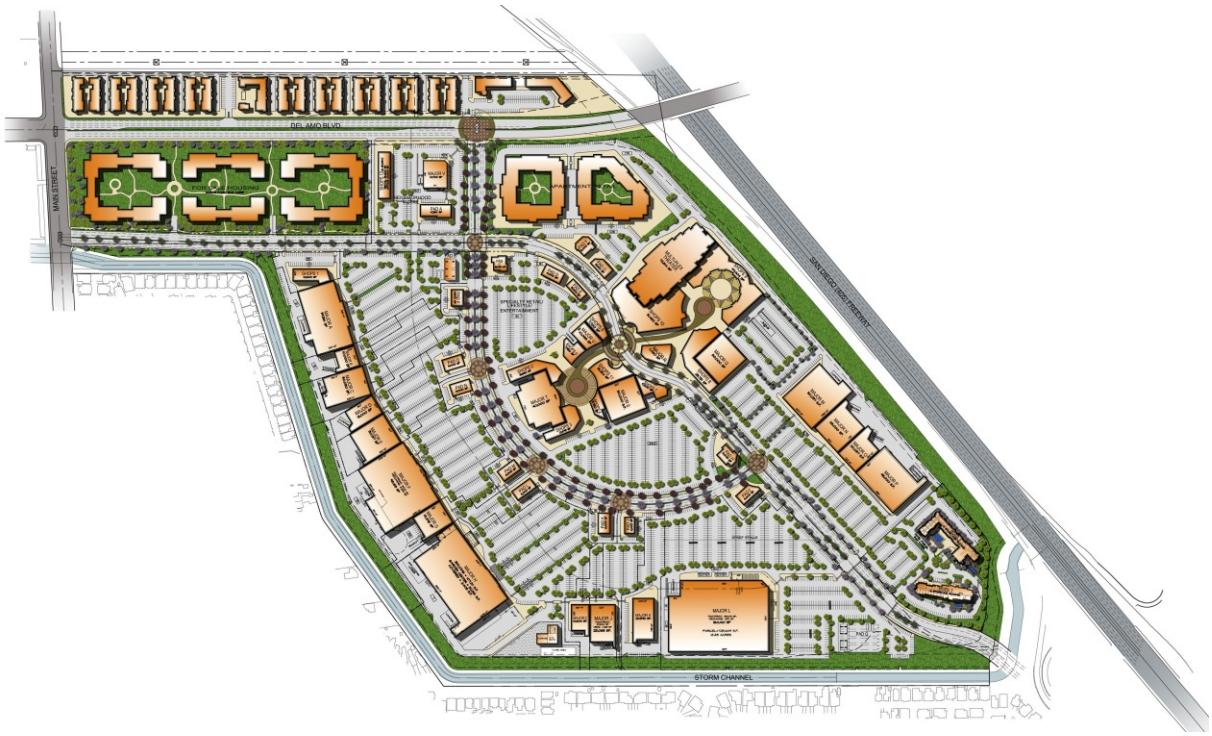
AVALON AT SOUTH BAY PROJECT

Site Health and Safety Plan



For

Avalon at South Bay
(Formerly Carson Marketplace)
Carson, California

February 15, 2008

Prepared by:

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SITE HEALTH AND SAFETY PLAN

FOR

AVALON AT SOUTH BAY
(FORMERLY CARSON MARKETPLACE)
20300 MAIN STREET
CARSON, CA

Prepared for:

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FEBRUARY 15, 2008

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ABBREVIATIONS AND ACRONYMS

° C	degrees Celsius
° F	degrees Fahrenheit
AHA	activity hazard analysis
ANSI	American National Standards Institute
BRA	Baseline Risk Assessment
Cal-OSHA	California Occupational Health and Safety Administration
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CO	carbon monoxide
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
dBA	decibels, A-scale
DDC	deep dynamic compaction
DTSC	Department of Toxic Substances Control
ERP	Emergency Response Plan
EZ	exclusion zone
FID	flame ionization detector
GFCI	ground fault circuit interrupter
H&S	health and safety
H_2S	hydrogen sulfide
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSO	Health and Safety Officer
LAZ	limited access zone
LEL	lower explosive limit
LLDPE	linear low density polyethylene
LOTO	Lock out/Tag out
mg/m^3	milligrams per cubic meter
mph	miles per hour
MSDS	Material Safety Data Sheet
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
O_2	oxygen
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl

ABBREVIATIONS AND ACRONYMS (Continued)

PEL	permissible exposure level
PID	photoionization detector
POV	privately owned vehicle
PPE	personal protective equipment
ppm	parts per million
QA/QC	quality assurance/quality control
RAP	Remedial Action Plan
SCBA	self-contained breathing apparatus
SEL	site exposure limit
SHSP	Site Safety and Health Plan
SOP	standard operating procedure
SSC	site safety coordinator
SWP	Safe Work Practices
SZ	support zone
TLV®	threshold limit value
TWA	time weighted average
USA – DigAlert	Underground Services Alert – DigAlert
UXO	unexploded ordnance

SECTION 1.0 INTRODUCTION

This Site Health and Safety Plan (SHSP or Plan) applies to the Avalon at South Bay development project (Project), which was previously named Carson Marketplace. This proposed brownsfield restoration project involves the development of the former Cal Compact landfill into multiple land uses, including commercial, recreation, entertainment, big-box retail stores, restaurants, hotels, and residential. Because the Project involves excavation and other disturbance of a landfill, it is governed by South Coast Air Quality Management District (AQMD) Rule 1150. A brief description of the site, Project purpose and scope, site history, Plan purpose and scope, and Plan organization and order is provided in the following sections.

1.1 Site Description and Scope

Carson Marketplace, LLC (Developer) has proposed to develop the Project. The proposed Project site comprises approximately 168 acres of land located at 20300 Main Street in Carson, California. The property is bounded on the east/northeast by the San Diego Freeway (I-405), on the north by Del Amo Boulevard, on the west by Main Street and single family residences and mobile home development, and on the south by single family residences and mobile home development (Figure 1-1). A strip of vacant land to the north across Del Amo Boulevard, which comprises 11 acres, is also within the overall scope of the Project. This portion of the property was not part of the former landfill and the development activities planned for it are, therefore, not covered by Rule 1150 and not included in the provisions of this Plan.

The former Cal Compact landfill consists of five separate landfill cells numbered A1 through A5 separated by the site boundaries on the outer perimeter and by two interior roadways on the interior perimeter (Lenardo Drive and Stamps Drive). A Los Angeles County Flood Control channel (Torrance Lateral) is located adjacent to the south and west sides of the Project site and serves to separate the Project site from the adjacent residential neighborhood (Figure 1-2).

This Project involves the development of the former Cal Compact landfill into the following land uses: neighborhood commercial, regional commercial, commercial recreation/entertainment, big-box retail stores, restaurants, hotels, and residential (Figure 1-3). The construction phases of this Project will begin with mass grading of the former landfill area and removal of some of the clean soil covering the landfill cells. This will be done to establish a uniform grade and minimize the thickness of clean soil cover overlying the refuse material so that compaction of the landfill cells may commence. Clean soil removed in the grading process will be temporarily stockpiled onsite until it is reused. Compaction of refuse will be done using deep dynamic compaction (DDC) to consolidate the refuse and soil below future parking and open areas to minimize future settling. The refuse under future building locations will not be compacted. Once all compaction is complete, a landfill gas collection system with horizontal collection wells throughout the site and vertical gas collection wells below future building locations will be installed. This gas collection system will be connected to a gas flare treatment system

with a landfill operations center which will have controls and integral monitoring to detect any leakage or system failure. The landfill cells and gas collection system will then have a multi-component landfill cap installed. The first layer of this cap will be the installation of a continuous layer of linear low density polyethylene (LLDPE) geomembrane which will serve as the primary impermeable layer of the cap system. This LLDPE geomembrane will then have drainage strips installed on top of it that will direct water off of the landfill cap so that it does not accumulate. These drainage strips will be covered by a geotextile fabric layer to prevent the accumulation of silt and eventual clogging of the drainage system. This layer will then be covered with clean soil.

All future buildings will be supported on driven piles. Piles will be driven through the refuse until competent native soil is reached. Pile caps will be installed and the concrete building slabs will be poured on top. The LLDPE geomembrane will be sealed to the pile caps where they penetrate it using an expansion boot to allow expansion and movement while remaining sealed.

A building protection system will be installed below all building locations to serve as a backup in case of landfill cap or primary gas collection system failure. This system will include the installation of a membrane attached to the underside of the concrete slab. The space between this membrane and the LLDPE geomembrane will have a passive gas venting system installed and will also include methane detection sensors to provide notification of system failure. All buildings will be built aboveground.

The Project will also include the installation of a groundwater extraction and treatment system along the southern boundary of the Project site to contain and treat impacted groundwater underlying the Project. Some refuse materials in the landfill cells may need to be excavated and moved to facilitate the installation of site utilities and the landfill gas collection system. Tetra Tech is the environmental engineer and general contractor responsible for the design and installation of these remedial systems. Tetra Tech is not, however, responsible for the design and installation of the driven piles, pile caps, and building slabs that make up the building foundations.

1.2 Site History

Land use of the property prior to landfill operations was primarily agricultural, including grazing, dairy, feedlot, and cropland (Brown & Root 1995a). Prior to the 1930s, the land immediately surrounding the property was also used primarily for agriculture, with some limited residential development. During the 1940s, industry was introduced to the area and residential areas also became more extensive. The current light industry, commercial, and residential mix of land uses was fully developed by the 1970s (Brown & Root 1995a).

Between 1959 and 1964, the property was used as a Class II landfill and is currently covered by a layer of soil that varies from 4 to 32 feet in thickness. According to Los Angeles County records, Cal Compact, Inc. (Cal Compact), a California corporation, was

issued an industrial waste disposal permit on July 17, 1959, which authorized Cal Compact to operate a Class II landfill on the property (Brown & Root 1995b). Landfill operations began on this property in April 1959 and continued until February 1965. The landfill operations consisted of the placement and cover of wastes in excavated trenches. All wastes were placed in trenches that were excavated adjacent to the interior haul roads. The haul road locations have remained unchanged throughout the time the landfill was in operation and are underlain by native soil materials (Brown & Root 1995b).

The landfill was permitted to accept both municipal solid waste and specified industrial liquid wastes. During the life of the landfill, approximately 6 million cubic yards of solid municipal waste and 6.3 million gallons of industrial liquid waste were received at the landfill (Brown & Root 1995c). Available records indicate that over 65 percent of the liquid wastes were drilling fluids that consisted primarily of water and clay mixtures, with minor heavy metal additives and oily residue. Other wastes received included solvents, oils, sludges, heavy metals, paint sludges, and inorganic salts.

On March 18, 1988, Remediation Action Order Number HSA87/88-040 was issued, requiring investigation of contamination at the landfill site and preparation of a remedial action plan (RAP). A RAP was prepared and approved by the Department of Toxic Substances Control (DTSC) in 1995. The objective is to develop the Project for mixed uses that benefit the surrounding community. At the same time, the RAP will be implemented to protect human health and the environment during construction and after the Project development is complete and operating.

1.3 Purpose and Scope of Plan

This SHSP applies to activities of the all contractors on site and their personnel performing activities associated with the compaction of landfill materials and cover soil in future open areas and parking lots by DDC methods; mass grading and landfill material relocation; installation of site utilities; construction and installation of the landfill cap, gas collection system, and treatment system; and the installation of the building protective systems to integrate with the landfill cap, gas collection system, building slabs, and building vertical construction. This Plan also covers the installation of approximately 6,400 pilings for building pads, because pilings will penetrate the liners and the landfill waste and must be constructed in coordination with Tetra Tech's landfill protective system. This Plan meets the requirements of 29 Code of Federal Regulations (CFR) 1910.120 and California Occupations Health and Safety Administration (Cal-OSHA), 8 California Code of Regulations (CCR) 5192 for health and safety plans at hazardous waste sites. Personnel of the DTSC and their contractors, or other regulatory agencies with jurisdiction over activities onsite, operate under their own health and safety plans. Tetra Tech and Developer personnel and their subcontractors will review a copy of the SHSP prior to starting activities at the site. All personnel, before entering the site to conduct work, will sign an acknowledgment statement that they have read the Plan and will abide by it. The Health and Safety Officer (HSO) will maintain a copy on-site of the SHSP and all signed acknowledgment forms which document training in this Plan. Tetra

Tech will review and revise this Plan whenever there are changes to personnel assignments, facility design, systems, or equipment and procedures.

Section 11.0, the Emergency Response Plan (ERP), is bound separately as a "stand-alone" document for ease of use during an emergency. The ERP also has a special distribution that includes state and local emergency response agencies (see Section 11.2 of the ERP).

1.4 Plan Maintenance

This SHSP may be modified, as appropriate, in light of actual site conditions, or to reflect new information gleaned from a procedural failure or a post-incident critique and assessment. Revisions to the SHSP shall be distributed to affected parties through site personnel safety meetings. Modifications/revisions to the SHSP must be approved by the Project Manager and HSO, along with acceptance by DTSC, prior to implementation.

When and if additional activities and improvements to operating systems are planned for the site, the SHSP shall be revised to include these activities, including appropriate SOPs.

SECTION 2.0 KEY PERSONNEL AND ORGANIZATION

Project personnel consist of the Developer, Tetra Tech and their subcontractors, and Snyder Langston and their subcontractors. Site personnel must implement this SHSP and site procedures that are used to execute work in a safe manner.

2.1 Carson Marketplace, LLC

Carson Marketplace, LLC. is the Site owner, and through Tetra Tech, Inc. and Snyder Langston and their respective subcontractors, is responsible for the overall implementation of site work.

2.2 Tetra Tech, Inc. Project Manager

The Tetra Tech Project Manager communicates with the Developer representative(s) and serves as the primary point of contact. Responsibilities include overseeing the overall project direction and site safety as well as enforcing safe work practices. The Project Manager may authorize or delegate responsibility of some tasks to other individuals over the course of the project. For purposes of this Plan, the term "Project Manager" is used as a general term and is meant to include both the Project Manager and any duly designated representatives.

2.3 Health and Safety Officer

The HSO implements and enforces the project safety program at the Site. The HSO confirms personnel are fit for duty, coordinates emergency medical care, conducts safety inspections, and inspects health and safety equipment. The HSO maintains safety equipment or arranges for the maintenance of the safety equipment, performs or delegates performance of air monitoring, provides site orientation safety training, and conducts or assists in daily safety meetings. The HSO is responsible for the following:

- Ordering the immediate shut-down of site activities in the case of medical emergency or unsafe practice.
- Ensuring protective clothing and equipment are properly stored, used, and maintained.
- Ensuring personnel monitoring is ongoing and in compliance with technical requirements and procedures.
- Keeping a safety log book regarding site activities (The log records information related to daily safety meeting, training, air monitoring, first aid administered, visits of personnel other than site personnel and subcontractors, and any incidents of a health and safety nature.);
- Reviewing incidents and reports;

- Maintaining logs, reports and records of daily safety meetings, activity hazard analyses (AHAs), training logs, medical certifications, safety inspections, monitoring results, OSHA 300, postings required by regulation or contractor, this SHSP, and change approvals to SHSP; and
- Maintaining this contact with the Tetra Tech Health and Safety Manager, a Certified Industrial Hygienist (CIH), on at least a weekly basis.

The HSO may authorize or delegate responsibility of some tasks to other individuals over the course of the project. For purposes of this Plan, the term "Health and Safety Officer" is used as a general term and is meant to include both the HSO and any duly designated representatives.

2.4 Site Personnel

Although Tetra Tech and Snyder Langston are responsible for providing a safe work place, site personnel are responsible for their own safety and the safety of others. Site personnel will use equipment in a safe and responsible manner. Site personnel and subcontractors will follow the policies of this SHSP. Additional policies may be required of site personnel and subcontractors that are not specifically designated herein. For example, the Tetra Tech work rules and other policies and practices as specified in project documents, memoranda or other written material are informally provided to site personnel.

Site personnel must promptly report any unsafe condition, injury, incident, and safety infraction to a supervisor, the Project Manager, or the HSO, so treatment can be obtained and/or corrective action taken.

2.5 Visitors

Regulatory and agency personnel conduct activities under health and safety plans independent of this SHSP. These personnel are responsible for their own personal protective equipment (PPE). Other visitors must be accompanied by project or contractor staff who have security clearance to provide escort and are aware of current site operational hazards. The HSO will determine whether visitors must comply with training and medical surveillance requirements on a case-by-case basis. Visitors will not be allowed in exclusion zones (EZs) unless they meet training and medical surveillance requirements. Visitors entering EZs must provide their own PPE.

SECTION 3.0 HAZARD ANALYSIS AND SAFE WORK PRACTICES

Activities conducted at the site present a variety of chemical, environmental, and physical hazards. Personnel exposure to hazards depends upon specific work activities, weather conditions, levels of protection used, and personnel work habits. Methods to control hazards include training, engineering controls, safe work practices, PPE, air monitoring, medical surveillance, site inspections, supervision, and hazard analysis of specific work tasks. The HSO or designee will conduct daily "tailgate" safety meetings at the start of each day as well as when specific work activities require additional training. All site personnel are required to attend these safety meetings. In the event that personnel are unable to attend the morning briefing, the HSO will conduct a separate briefing with these personnel before they will be allowed to begin work. At these meetings, the HSO will discuss the potential chemical, physical, and environmental hazards for the work and preventive safety measures. The daily "tailgate" safety meeting will be documented with a sign-in sheet that will be signed by all in attendance. The sign-in sheet will also document the topics discussed at the meeting. Copies of the "tailgate" safety meeting sign-in sheets will be maintained onsite by the HSO. The HSO, in cooperation with the supervisors and workers, develops AHAs for each activity or task.

3.1 Activity Hazard Analyses

The AHA identifies the sequence of work, specific hazards anticipated, and control measures to be implemented to minimize or eliminate each hazard. The analysis augments daily safety meetings and heightens safety awareness on the job. The HSO will document the pre-task briefing and may incorporate it with the daily safety meeting. Before an activity starts, the Construction Superintendent will review the AHA with the personnel assigned to the activity. A sign-in sheet documents this meeting, and the HSO will maintain meeting minutes. The HSO, managers, and supervisors develop AHAs as construction and other site activities are planned for execution. AHAs are task-specific and may address routine and non-routine tasks. The HSO maintains and updates AHAs. Completed AHAs and future AHAs are provided in Attachment 3 of this SHSP.

3.2 Chemical Hazards

The project site has various chemical hazards. These include chemicals found in the landfill trash and debris, groundwater, and landfill gas, soil, and liquids. During construction and other site activities, personnel acquire and use other materials such as diesel fuel, oils and other petroleum products, paints, cleaners, glues, etc. The HSO, or designee, will maintain a Material Safety Data Sheet (MSDS) for chemicals, materials, or products on site, as discussed in Section 3.3, Hazard Communication. The actual amount of potential exposure varies with the frequency and volume of use. The HSO bases levels of protection and air monitoring requirements on the information provided in the MSDSs, analytical data, and site conditions. Tetra Tech protective equipment requirements, combined with requirements to wash arms, face, and hands before eating or smoking should prevent or minimize exposure.

Several site assessments have been performed to determine the types of contaminants found in the landfill, cover soil, and groundwater beneath the landfill. Chemical contaminants found in the landfill can volatilize or off-gas. Table 3-1 lists the known maximum concentrations of chemicals of primary concern. The Cal-OSHA permissible exposure limit is also listed. Maximum concentrations of these chemicals were found in various samples and did not predominate consistently throughout all of the soil. Therefore, exposure to these chemicals as found in the soil cover material is not expected to present a significant hazard to workers provided that dust control measures are implemented and workers wash their arms, face, and hands before eating or smoking.

However, workers who will work with the refuse or handle materials that penetrate through the refuse may be exposed to the contaminants of concern or even other contaminants that may not have been identified due to their limited quantity or non-uniform dispersal throughout the site. Work in this case must require more monitoring of workers and additional personal protection as will be described further in this Plan.

Another chemical, methane gas, will be found throughout the Site as cover material is removed or as the refuse is penetrated. The gas is a simple chemical asphyxiate; however in the open environment it does not present that hazard. A greater hazard is the physical property associated with the gas. The gas is extremely flammable and presents a physical hazard that will be described later in this Plan.

3.3 Hazard Communication

The purpose of a Hazard Communication or Employee Right-To-Know program is to ensure that the hazards of chemicals located at the site are communicated according to 29 CFR 1926.59 and 8 CCR 5194 to Site personnel and subcontractors.

Site hazard communication includes the following:

- Container Labeling—personnel will ensure that drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. Incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.
- MSDSs—There will be an MSDS on site for each hazardous chemical used or known to be on site.
- Information and Training—Training site personnel on chemical hazards is accomplished through formal safety training conducted annually and informal safety meetings. The HSO communicates project-specific chemical hazards to site personnel through an initial site orientation meeting and during daily safety meetings or AHA meetings.

At a minimum, site personnel will be instructed on the following:

- Chemicals and their hazards in the work area;
- How to prevent exposure to these hazardous chemicals;
- What the company has done to prevent worker exposure to these chemicals;
- Procedures to follow if they are exposed to these chemicals;
- How to read and interpret labels and MSDSs for hazardous substances found on site;
- Emergency spill procedures; and
- Proper storage and labeling.

When new hazardous material is introduced or discovered on site, site personnel will be given information on this material at the daily safety meeting. Project supervisors and superintendents are responsible for ensuring that the MSDS on the new chemical or material is available on site. Subcontractors must provide to the HSO copies of MSDSs for materials they bring on to the site. The HSO will ensure that site personnel have access to MSDSs at all times. At a minimum, MSDSs are maintained at the Site office.

3.4 Environmental Hazards

The HSO discusses the environmental hazards associated with site personnel at the orientation meeting prior to assignment to site tasks. Personnel learn about the symptoms of exposure to certain biological hazards and heat stress.

3.4.1 Heat Stress

With the possible combination of ambient factors such as high air temperature, high relative humidity, low air movement, high radiant heat, and protective clothing, the potential for heat stress is a concern. The potential exists for the following:

- Heat rash,
- Heat cramps,
- Heat exhaustion, and/or
- Heat stroke.

The action level for heat stress is 85°F ambient temperature for personnel who are not wearing impermeable clothing (such as Tyvek® coveralls). For workers wearing impermeable protective clothing, the action level is 70°F. At these temperatures, supervisors, aware of the effects of heat stress on the field crew, will begin heat stress control measures.

Heat stroke, heat cramps, and heat exhaustion are covered in detail during 40-Hour OSHA 29 CFR 1910.120 Hazardous Waste and Operations (HAZWOPER) training. The HSO will train personnel on heat stress symptoms and control measures upon assignment to the Site. In addition, this information is discussed during a safety "tailgate" meeting before each workday where heat is a factor. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather. Water is provided onsite and is available for consumption during work breaks.

Safe Work Practices (SWP) 6-15, Heat Stress (Attachment 1, Tetra Tech, Inc, Programs and Procedures), discusses the symptoms and causes of heat stress as well as prevention and treatment. Workers are encouraged to take rests whenever they feel any adverse effects, especially those effects that may be heat-related. The frequency of breaks may need to be increased as described in this SWP. Cal-OSHA 8 CCR 3395, Heat Illness Prevention requires enough water to provide each employee with one quart per hour to be available on site. The regulation also requires that an area with shade or where an employee may cool down is provided.

3.4.1.1 Heat Stress Monitoring Procedures

Heat stress monitoring procedures require measurement of pulse and body temperature during every break when temperatures exceed action levels.

Pulse Rate Monitoring

Sustained (several minutes) heart rate is in excess of 180 beats per minute (bpm) minus the individual's age in years (180-age), for individuals with normal cardiac performance, or recovery heart rate greater than 110 bmp after a peak work effort.

Take the pulse immediately at the start of the rest period (P1). Take the pulse again 1 minute into the rest period. If any of the following conditions exist, shorten the next work period by a third:

P1 > 110 beats per minute (bpm)

P2 > 90 bpm

P1 - P2 < 10 bpm.

Pulse rates can be taken with an electronic pulse meter, or manually with a stopwatch for 30 seconds.

Body Core Temperature

Obtaining an accurate body core temperature for sustained work can be difficult because the body will start to cool as soon as work is stopped or if protective clothing is removed and evaporation rates are increased. Monitor personnel as soon as possible to obtain an

accurate temperature following the manufacturer's instructions for the particular instrument used.

Take the oral, ear, or temporal temperature immediately at the start of the rest period. If the temperature exceeds 99.5°F (37.5°C) shorten the next work period by a third. Do not return the worker to hot work in semi-permeable or impermeable clothing until the body temperature is less than 99.5°F (37.5°C).Body temperatures may be taken with disposable oral thermometers or infrared ear drum scanners, such as the Thermoscan®. Note: If a Thermoscan® unit is purchased, the Pro Model should be selected. The home model available through drugstores cannot be recalibrated. Temporal infrared thermometers are also available and may be considered to be less intrusive to the workers than oral or ear measurement devices.

3.4.2 Weather

High winds increase airborne dust levels at the site. Dust can cause respiratory problems or injure eyes. Environmental regulations restrict the amount of dust generated. Construction personnel use water trucks to control dust. When wind speeds exceed 25 miles per hour, the Project Manager, or designee, will ensure that dust suppression continues to be effective and assess the affect of the wind on site operations. When wind speeds exceed 35 miles per hour (mph), the Project Manager will stop site construction activities.

Lightning with thunderstorms, although rare in the area, may create explosion or electrical hazards. The Project Manager will stop site outdoor operations whenever lightning is within 3 miles of the site. Significant amounts of rain can cause erosion of the site cover, slippery conditions, and/or unstable slopes and excavations. The Project Manager, or designee, will stop operations affected by the rain, as necessary, especially work on slopes and in excavations, until work in such areas can be safely resumed.

3.4.3 Hearing Conservation Program

In areas where noise levels may exceed a time weighted average (TWA) 8 hours of 85 dBA (decibels, A-scale), hearing protection is available to exposed site personnel and must be used. Additionally, the HSO may conduct sound level monitoring. Posted signs indicate where hearing protection is mandatory. The Tetra Tech hearing conservation program, Health and Safety Program 2-4 (Attachment 1), is in compliance with OSHA regulation, 29 CFR 1910.95 and 8 CCR 5097. Personnel who work around heavy equipment, drill rigs, and pile drivers will wear hearing protection any time the equipment is operating. All of these workers must have baseline audiograms and annual audiograms as required by the regulations, unless it can be proved that at no time do they exceed a TWA without hearing protection.

3.4.4 Biological Hazards

Personnel may encounter the following biological hazards on site although such encounters are not anticipated to pose a significant risk to site personnel:

- Animal bites and insect stings can cause localized swelling, itching, and minor pain that can be handled by first aid treatment.
- Poison oak causes discomfort, irritation, and inflammation of the skin. Personnel will avoid contact with unknown plants.
- The hanta virus is transmitted by rodents found in the southwestern United States, and causes respiratory distress, sometimes with fatal consequences. Transmission of the hanta virus occurs with exposure to rodent droppings.
- Personnel will consider every snake encountered as if it were poisonous.

Personnel will not bring any pets or animals on the Site. Personnel will not feed any birds or other animals on site. Personnel will report any area that has large numbers of bees, hornets, or wasps so that any hive that poses the hazard can be removed.

3.5 Physical Hazards

The AHA for each job task describes protective measures to minimize exposure to the hazards. Physical hazards are the number one cause of accidents on job sites. Physical hazards include the following:

- Confined spaces (potential),
- Deep dynamic compaction,
- Pile driving,
- Drilling work,
- Work in traffic,
- Electricity,
- Equipment operation and traffic,
- Excavation work,
- Work on slopes,
- Falls,
- Hot work,
- Illumination,
- Ladders and scaffolds,
- Pipelines,

- Work with energized equipment,
- Use of tools,
- Utilities,
- Fire, and
- Material handling.

3.6 Heavy Equipment and Vehicle Operations

The use of heavy equipment presents a potential for injury to site personnel. To minimize these hazards, Tetra Tech requires inspection of vehicles and equipment, the use of qualified operators, and safe vehicle operating procedures and traffic control.

3.6.1 Vehicle Inspections

Tetra Tech will only use equipment that is in safe working order. The construction superintendent, vehicle operator, and HSO will inspect vehicles and heavy equipment brought onto the Site. At the time of arrival of the equipment or vehicle, they will inspect structural integrity, cleanliness, operational performance, and proper functioning of safety devices in accordance with the manufacturer's specification. Equipment not conforming to operational and safety requirements will not be put into service until necessary repairs are made and the equipment is re-inspected. Daily and weekly inspections of vehicles and heavy equipment will follow the requirements of the equipment manufacturer. SWP 6-26, Use of Heavy Equipment (Attachment 1), describes added safety requirements. Vehicles will have backup alarms, seat belts (as required by law), brakes, and lights. The operator of equipment that does not comply with manufacturer's specifications during inspection will tag the equipment noting the condition and refer the equipment to their supervisor. The supervisor, equipment operator, and HSO will determine if the equipment must be removed from service immediately.

3.6.2 Operator Qualifications

Operators of equipment and vehicles must be qualified to operate the equipment or vehicle they are operating. Equipment and vehicle operators must possess a valid driver's license. Cal-OSHA regulations require training and certificates of operation for operators of forklifts (industrial trucks) and cranes. The supervisor and HSO will coordinate the qualification of operators of other heavy equipment. The HSO will maintain a list of each operator and the equipment the operator is qualified to operate as well as copies of their certifications documenting equipment operations training.

3.6.3 Equipment and Vehicle Safe Work Practices

Operators, drivers, and passengers must wear seat belts at all times. Drivers and operators must have a valid driver's license and must comply with state, county, and local regulations governing the safe and legal operation of vehicles. The driver is responsible

for ensuring that passengers are seated and properly secured before moving the vehicle. Under no circumstance will personnel ride on fenders, running board, vehicle top, in buckets, on the lift forks of a forklift, on beds of dump trucks, on beds of pickup trucks, or in any other area where a passenger cannot be secured by a properly installed seat belt. Operators of heavy equipment must follow the regulations specific for the type of equipment they are operating. For example, forklift operators must follow the rules of 8 CCR 3664. Operators and drivers will obey signs, postings, and instructions.

Those personnel directly involved with spotting for an operator are typically the personnel allowed on the ground in the vicinity of the heavy equipment. Other personnel will remain a safe distance away from operations. Personnel needing to approach heavy equipment while the equipment is operating will observe the following protocols:

- Make eye contact with the operator (and spotter);
- Signal the operator to cease heavy equipment activity, if applicable; and
- Approach the equipment operator and inform the operator of intentions.

Trucks transporting materials will not be loaded to height greater than 13 feet, 6 inches from the ground surface. Drivers must ensure that materials are secured during transport. Cargo that extends 4 feet or more beyond the end of the truck will be clearly marked with a red cloth not less than 16 inches square. Equipment and vehicles will use headlights from 1 hour before sunset to 1 hour after sunrise.

Prior to moving parked heavy equipment, the operator will visually inspect and walk around the vehicle to ensure that the equipment is in good condition and that there are no personnel on the ground, or objects that could be damaged by vehicle movement. Operators will use hand rails and footholds for mounting and dismounting equipment (3 points of contact). Operators will follow equipment startup procedures described in the equipment operating manual. The operator will keep hauling equipment under positive control at all times. In case of malfunction which impairs the ability to control a piece of equipment, the operators will use hydraulic systems such as blades, ripper, belly pan lowered to the ground, brakes set and shut down equipment until help arrives and repairs are made. Heavy equipment must have booms, forks, buckets, blades, belly pans, and any other similar type part lowered to the ground when the equipment is shut off. Heavy equipment has the right-of-way over other traffic.

When temporarily parked on the landfill, the keys are to remain in the ignition switch, except when the vehicle is being used as a fall protection anchor. When the vehicle is used as a fall protection anchor, the keys are to be removed and in the possession of the person using the fall protection. Contractor and its subcontractors are required to use vehicle chocks, positioned to reduce the potential for rolling when parked, for wheeled vehicles and other equipment as specified by supervisor

3.6.4 Traffic Control

The speed limit for traffic is 15 mph on all areas of the site except the main roads (identified by the HSO) where the speed limit is 25 mph. The HSO or the Project Manager may temporarily change speed limits if required for safe operations and for environmental control of dust emissions. Speed limits apply to heavy equipment as well as any other vehicles. To minimize traffic hazards, specific traffic flow patterns are established each day. These flow patterns are implemented through portable traffic signs, informing personnel in the daily tailgate meetings or over the radio. Construction personnel will use flagmen for traffic control wherever there is heavy traffic, or where there are blind spots and road hazards. The HSO may require flagmen for any unsafe road condition. Privately owned vehicles are not allowed in any area on the Site where heavy equipment operations are being performed. Personal vehicles must be parked in designated parking spaces. Waiver of any parking rules must be authorized by the Project Manager.

During work with utilities and drilling operations, workers may be exposed to street traffic adjacent to the project site. Work on public streets and right of ways requires the use of flag persons who are trained to direct traffic in construction areas. If traffic must be diverted or a single lane must be closed temporarily, workers will place signs, cones, barricades, and other devices as required by the California Manual on Uniform Traffic Control Devices, dated September 26, 2006. Closure of lanes or streets requires coordination with the city that has jurisdiction over the street that is to be controlled. Streets that have traffic controls that remain in place during hours of darkness must have devices that can be seen during these hours. Workers must wear high visibility vests when performing any work.

3.6.5 Site Roads

When the roads are wet from use of water trucks for dust suppression or from rain, the roads are slippery and may pose a driving hazard. There is also a potential for loss of traction, falling or driving off the road, overturning a vehicle, and hazards of materials falling from slopes and spoil banks to areas below them. The HSO or designee will discuss current site road hazards and the status of site roads (e.g., closed, under repair, one way, etc.) at the daily tailgate meetings. Personnel will report unsafe road conditions, when observed, to their supervisor or the HSO.

Operators will not use equipment on slopes steeper than 3H:1V unless operation is consistent with manufacturer's recommendations. Operators will operate equipment with booms, blades, buckets, beds, etc., lowered or in a stable position while on slopes. Operators will use seat belts and equipment will have rollover protection as required by 8 CCR 1596.

3.7 Excavations and Earthwork

An excavation is any removal of earth that results in excavation sidewalls that may lead to unstable ground, hazard of slipping or falling, or poses a hazard to vehicles or equipment. Potential hazards include unstable sidewalls, proximity to heavy equipment, contact with underground lines and overhead electric lines, explosion or fire, exposure to buried refuse, landfill gas emissions or groundwater, and hazards of open excavations including falls and danger to vehicle traffic. Excavation work and trench work will follow the requirements of 8 CCR 1540 and 1541, 29 CFR 1926 Subpart P, and SOP 402 "Excavation and Trenching".

Open excavations 5 feet or greater in depth or that may expose employees to the hazards of moving ground may require shoring, sloping and permitting according to Cal-OSHA. A "Competent Person" will evaluate and approve the stability of excavations prior to entry and during the course of work. Stability determinations, per 8 CCR 1541, include visual analysis and manual testing for the following:

- Classification of soil strength and cohesiveness;
- Evaluation of soil for fissures, sloped bedding, and other potential planes of weakness;
- Evaluation of degree of soil saturation;
- Evidence of previous excavation (which can modify soil strength); and
- Adjacent conditions that may affect slope stability (e.g., equipment vibration, load surcharge due to equipment and soil piles.

The competent person will inspect excavations at the beginning of each day to ensure that any excavation that has been left open is safe to enter. The competent person will inspect each excavation after any rainfall or other incursion of water into an excavation. No one is to enter an excavation deeper than 4 feet without air monitoring and direction from a supervisor.

Personnel will maintain at least a 2 foot distance from the edge of the excavation. Work closer to the edge may require fall protection. If the adjacent conditions such as a slope or a fence require workers to work close to the edge, the HSO will ensure that traffic cones, barrier tape, or any combinations of devices are set up around the excavation during work activities. Workers will place spoil banks and other equipment at least 2 feet from the edge of any excavation.

Whenever possible, excavations will not be left open overnight. Trench plates may be used to cover openings if properly installed and warning signs displayed. Construction personnel will install trench plate (if possible), barricade of cones, barricade tape and fences for excavations left open overnight or left open unattended for more than two days. Construction personnel will check these barricades at least once each morning prior to start of work activities and at the end of the day before dark. As necessary,

construction personnel will use flashing light barricades, reflective markers and signs to demarcate excavations for visibility of the hazard at night.

Excavations greater than 4 feet deep require hazardous atmosphere evaluation, and shoring, benching, or sloping of the side walls is required for benches excavated 5 feet deep or greater.

Excavations require easy access and egress. For excavations, personnel may use ladders or ramps. Trenches which are less than 15 feet wide and 4 feet or deeper require a ladder every 50 feet or less so that no person in a trench is farther than 25 feet from a ladder at any point in the trench.

During the excavation of landfill material, workers must avoid generating any dust. Workers must be aware of the potential to encounter buried containers such as drums and compressed gas cylinders. In the event that containers or cylinders are encountered they must be segregated form the other landfill debris to ensure they are either empty or do not pose a hazard to the workers. This plan requires air monitoring when landfill debris is handled. The Activity Hazard Analysis (AHA) for excavation attached to this plan addresses the hazards and control measures during landfill excavation.

3.8 Slips, Trips, and Falls

During safety and tailgate meetings, the HSO will remind personnel to maintain sure footing on all surfaces. Personnel will always have three points of contact when getting on and off equipment. Personnel will not jump from equipment. Personnel will not run at the Site. Personnel will inspect ladders before each use and follow the rules for ladder use. Safety harnesses with approved lanyards and connecting points are required for any person working 6 feet or more above any surface. This rule also requires a harness for personnel on manlifts. Personnel will wear slip resistant footwear, i.e., work boots with good soles. Where work on slopes requires more sure footing, the HSO may provide additional spikes and establish other safety requirements. Personnel working on slopes steeper than 1.5H:1.0V will use harnesses and safety lines. The HSO will inspect lines and anchor points before personnel will work on the slopes. A supervisor will ensure that openings are covered or barricaded. Personnel will report any trip or fall hazards to their supervisor or the HSO.

3.9 Drilling

Drilling hazards include moving parts, lifting, and carrying heavy and unstable loads, explosion or fire, contact with underground and overhead utilities, and chemical and dust exposure. There may be additional hazards depending on the method used to drill. SWP 6-3, Safe Drilling Practices (Attachment 1), describes safe work procedures. Drillers will place a cover over any boring left unattended. The cover will be heavy gauge steel, or equivalent. The driller will bury the cover at the edges or otherwise secure it so that the cover cannot be readily removed except by using tools. The HSO must approve borings that will be left open 2 weeks or more. An AHA will be prepared and reviewed for each

drilling activity. Beyond the hazards traditionally associated with drilling on this project, another hazard arises from drilling through the refuse. During drilling operations, there is a potential to release landfill gases to encounter wastes that are uncharacterized, and/or potentially ignite methane.

During the installation of wells and groundwater treatment systems, workers will refer to the AHA on drilling and well installation that is attached to this plan for precautions to be followed during these activities as noted in the previous paragraph.

3.10 Grading, Loading, and Hauling

During the preparation of the site, the placement and replacement of cover material soil will be graded or transported between various cells as required by the construction work plan. These operations will require the use of various types of equipment, including graders, bulldozers, excavators, backhoes, front end loaders, dump trucks, and similar equipment. As discussed previously, this heavy equipment must be in good operational condition, inspected daily, and operated by qualified operators. Cover soil has very few areas that have contaminants exceeding cleanup goals, so handling of this material will not require decontamination of the equipment. However, any area where equipment comes in contact with the refuse, the equipment may require decontamination before proceeding into a clean area. Decontamination issues are discussed in Section 9 of this Plan.

3.11 Pile Driving

Pile driving operations must comply with Cal-OSHA 8 CCR 1600-1601. During operations it is important that danger zones are clearly marked and that no personnel are within these zones. During pile driving operations, noise levels are high and hearing protection must be worn. This project requires that piles are driven through landfill refuse. To avoid carrying refuse along with a pile or the event of obstructions, a spud is driven first. A spud is a mandrel, heavy steel pipe or H-pile section driven to provide a pilot hole. The spud is withdrawn and the pile inserted into the hole and driven to the embedment depth. The removed spud can be reused. Because the spud is going through potentially contaminated materials, it is essential that the spud be washed prior to workers coming in contact with the withdrawn spud. If the spud is not visibly dripping liquid wastes and has no solid wastes clinging to it, it can be reused in the next hole to be driven. The main concern is that any waste material adhering to the spud does not further contaminate cover soil or any other materials while being transported to the next hole.

Pile driving is probably the most likely source for emissions of landfill gases and odors. These emissions must be controlled. Various techniques such as the use of a cover shroud may be employed during this operation to minimize releases. It is also possible that significant amounts of methane gas could be released. It is important that the area is well ventilated and that there are no areas, structures, or equipment that could cause these gases to collect and pose a fire or explosion hazard. The breathing zone of workers must be continuously monitored by use of a photoionization detector (PID) during pile driving

activity. The Plan describes air monitoring procedures and action levels in Section 7.0. A flame ionization detector (FID) is required for area monitoring to ensure that any levels of methane gas and other contaminants near ground level are monitored. Also a combustible gas meter is also required to ensure that any levels of potential explosive gases are measured. (This meter will also have a detector for hydrogen sulfide gas and carbon monoxide (CO) gas. These detectors are used for personnel protection and are discussed in Section 7.0 of this Plan.)

3.12 Deep Dynamic Compaction

Deep dynamic compaction is a technique that requires the dropping of a weighted mass from a height of usually 50 to 60 feet. This technique requires the use of a boom crane to raise and drop the weight. The crane must meet Cal-OSHA requirements for crane construction, maintenance, inspections and qualifications of operators (8 CCR 4884-5049). During operations, clearance from the drop area will be defined by the project manager or technical engineers. This distance must be delineated and all workers must stand clear of the zone during the drop. During the drop workers should stand clear of any structures or materials or supplies that could fall due to the seismic vibration caused by the drop. This operation could cause the landfill to "heave" out in any direction and cause the potential expression of refuse materials or landfills gases, odors, or other contaminant vapors. The area that is exposed will be immediately covered with cover soil. A PID will be used in the breathing zone near any ground workers in this area to monitor for worker exposure as described in Section 7.0.

3.13 Utilities and Lines

Although most of the site was a landfill, there is a possibility for contact with underground utilities. Supervisors and operators will ascertain that there are no underground utilities in the area for proposed earthwork. If the location of utilities cannot be definitively determined prior to starting work, construction activities will advance with extreme care to minimize the possibility of contact with buried utilities. Prior to performing drilling, excavation or other subsurface disturbances offsite, the contractor or subcontractor performing such work will contact Underground Services Alert (USA - DigAlert). Subsurface work will not start until the appropriate utility organizations have located their utility lines and DigAlert has issued an identification number. When initiating subsurface work near utilities, shallow holes, often called potholes, will be excavated with a shovel or by backhoe using extreme caution to probe the area to assure that underground utilities are not present. The operator will proceed with excavation slowly for the first 10 feet or until it is evident that undisturbed ground is encountered.

3.14 Lock Out/Tag Out

Lock Out/Tag Out (LOTO) refers to a step-by-step procedure to ensure that equipment is de-energized or presents no hazard to a worker when the worker must work with that equipment. SWP 6-2, Control of Hazardous Energy Sources (Attachment 1), details the procedures. Proper implementation of the procedures will prevent injury to personnel due

to the release of energy. The HSO will train site personnel on LOTO procedures. LOTO procedures preclude inadvertent activation of mechanical equipment, electrical shock, burns from hot components, releases of liquids, gases or solids, release of hydraulic pressure, etc. Site personnel must follow these procedures.

3.15 Line Breaking

Anytime lines must be cut or removed, safe line breaking procedures must be followed. Line breaking is a procedure which requires the use of LOTO. Workers must drain the lines, install flanges to prevent inadvertent release of material into the lines, use a locking device to prevent the inadvertent activation of a valve which could cause a line to refill, etc. Line breaking procedures and LOTO apply to any type of line—gas or liquid.

3.16 Fire Prevention Program

Site personnel will take the following actions to minimize the potential for starting a fire:

- Store flammable materials such as paints and solvents in approved containers;
- Store flammable materials in an approved storage cabinet;
- Avoid accumulation of combustible products of rubbish, waste and other residues;
- Store oil-soaked rags and material in designated containers with self-closing lids;
- Remove only a day's supply of any flammable material from storage at a time;
- Return flammable material to storage at end of day;
- Smoking, striking of matches, or other sources of ignition are only permitted within designated smoking areas;
- Discard cigarette butts, matches and other similar materials only in approved non-combustible containers;
- Empty trash baskets frequently and at the end of each day;
- Do not store gasoline, flammable solvents, and liquids inside any building unless approved for storage;
- Obtain a hot work permit for any work that is a potential source of ignition such as welding, brazing, torch cutting, grinding, or sawing;
- Keep vegetative growth away from buildings and equipment; and
- Never park vehicles over grasses or other vegetation as the heat from the catalytic converter can cause ignition of the vegetation.

The HSO will train personnel on the use of portable fire extinguishers. The ERP, Section 11 describes fire response activities.

3.17 Hot Work

Hot work is welding, cutting, open flame, grinding or other spark-producing activities. SWP 6-6, Hot Work Safe Practices (Attachment 1), describes procedures to follow when performing this type of work. Hot work requires the completion of a permit prior to starting work. The permit requires the approval of the HSO. Whenever possible, avoid hot work. Substitute methods such as pneumatic cutters for torches, and threaded pipe for welded pipe. In no case is hot work over an open boring allowed. Landfill gas is extremely flammable and under the right conditions can cause explosions. All hot work in landfill areas require testing of the surrounding atmosphere because methane gas is odorless, although odors may indicate a nearby opening that is ventilating landfill gas.

3.18 Confined Space Entry

Confined spaces are any space or area that has limited entry or egress, was not intended for human occupancy, and contains or had contained known hazards. Entry into confined spaces poses potential exposure to high concentrations of toxic materials, explosions, electrical hazards and oxygen deficiency. Tanks, vaults, storm drains, manholes, trenches, and flare shrouds are some examples of confined spaces. Health and Safety Manual 2-5, Confined Space Program (Attachment 1), describes procedures to follow. Confined space entries must comply with 29 CFR 1910.146 and 8 CCR 5156-5159. All personnel who will perform work in a confined space or will serve as the confined space attendant will have specific confined space entry training. The HSO will maintain a list of personnel who have the required training and will keep on-site copies of certificates documenting the training. Confined space entries require pre-planning. Before entry into a confined space, the entry supervisor must:

- Obtain a permit from the HSO;
- Complete the permit;
- Ensure that all entry personnel have proper training;
- Review the permit with HSO; and
- After receiving HSO review and approval, reviews the form and entry requirements and conditions with the standby attendant and the entrants.

After the entry is completed, the entry supervisor will submit a copy of the completed permit entry form to the HSO.

Confined space entries require:

- LOTO procedures;
- Use of ladders and other systems to facilitate entry and egress;
- Testing of atmosphere;
- Use of required PPE;

- Use of safety harnesses and lifelines;
- Use of retrieval system for vertical entries of 5 feet or more;
- Practice of confined space rescue;
- Ventilation systems;
- Lighting; and
- Standby attendant, entry supervisor and a minimum of one entrant. At a minimum, every confined space entry requires three personnel.

3.19 Electrical Safety

Electrical equipment, installations, and facilities will comply with the requirements of 8 CCR, Chapter 4, Subchapter 5 "Electrical Safety Orders," 29 CFR 1926 Subpart K, and NFPA 70 "National Electrical Code." In order to prevent accidents caused by electric shock, the project HSO will inspect all electrical connections on a daily basis. The HSO will shut down and lock out any equipment that is found to have frayed or loose connections until a qualified electrician is contacted and repairs are made. The equipment will be de-energized and tested before any electrical work is done. All equipment will be properly grounded prior to and during all work. In addition, ground fault circuit interrupters (GFCIs) will be installed for each circuit between the power source and tool for all outdoor use. In the event that generators are used to supply power, these generators will contain GFCIs. All GFCIs must be inspected and tested monthly.
Requirements for electrical safety include:

- All electrical wiring and equipment will be listed by a recognized testing laboratory. In California, the usual recognized testing laboratories are Underwriters Laboratory, Canadian Standards Association, and Factory Mutual. There are six other recognized laboratories that are rarely ever seen in the certification of electrical equipment. Some equipment manufactured in foreign countries has other listing certifications. Most foreign certifications are not recognized as meeting the standards in California.
- Live parts of wiring and equipment will be guarded to protect all persons or objects from harm. Uninsulated live wires must be placed at various heights and distances from the ground and from buildings depending on the voltage carried by those lines (Consult the CIH if uninsulated live wires are anticipated).
- Transformer banks and high-voltage equipment will be protected from unauthorized access.
- A qualified electrician will perform all work on electrical power supplies and lines.
- Flexible cords (extension cords) will contain the number of conductors required for service plus a ground wire. Cords will be rated for hard usage (S, SE, SEO, SO, SOO, ST, STO, STOO). Flexible cords are not allowed to pass through doors, windows, or be placed on the ground where they are subject to being run over by

vehicles. If flexible cords must pass through walls, the cords will be protected by bushings or fittings.

- Flexible cords must be inspected on each day of use. No splices or fraying are allowed.
- Flexible cords will not be secured with staples, hung from nails or suspended by pare wire. (Plastic tie straps, commonly used today, are acceptable.)
- All portable lamps must have bulbs protected by a substantial guard and attached to the lamp holder handle.
- All circuit breaker panels and electrical transformers and supply equipment must be labeled as to the voltage contained therein.
- All circuit breaker panels must be labeled as to what each breaker controls.
- All breaker panels and electrical panels must have a cover protecting any live exposed wires.
- At least a 30 inch clearance must be maintained on three sides of all circuit breaker boxes, transformers, and electrical supply equipment so as to provide ready access to the equipment in the event of an emergency. A 36 inch clearance is required for higher voltages, so to assure that adequate clearance is provided, Tetra Tech requires a 36 inch clearance of all breaker boxes, and so forth.
- Circuit breaker boxes that are locked or kept in locked rooms must have a key readily available in the event of an emergency.

3.19.1 Portable Generators

Portable generators are used on many construction sites. Portable generators must meet the requirements for grounding as specified in the National Electrical Code (NEC) National Fire Protection Association 70. NEC 250-6 has certain exemptions for the grounding of portable and vehicle-mounted generators. Refer to the code for additional details. Portable generators will be operated in open air only where there is sufficient ventilation as to prevent accumulation of exhaust gases including CO.

3.19.2 Temporary Wiring

A qualified electrician will design temporary wiring. A qualified engineer will approve the design. The system will be tested as required by the code. Temporary lighting will be protected by guards and will not be suspended by the wire. Exposed empty light sockets and broken bulbs are not permitted. Temporary lighting circuits will be separate from electrical tool circuits. Circuits will be labeled as “LIGHTS ONLY” or “TOOLS ONLY.” Only qualified and authorized persons or electrical subcontractors will install and maintain electrical equipment and facilities. The HSO must approve work by anyone who works on energized circuits. Electricians will follow LOTO procedures. Personnel working with electrical circuits will not wear rings, watches or metallic objects. Workers

will not use metal ladders or uninsulated tools. Work on energized circuits of 440 volts or higher requires a qualified electrician and one other worker.

Cords placed on the ground must be visible, must not interfere with normal foot traffic, and must not present a trip hazard. Cords are never permitted across any road where vehicles may run over the cord. Electrical tools, equipment, connections, etc., in the area of flammable materials or flammable vapors must be explosion-proof.

3.20 Material Handling

Safe manual lifting procedures, the use of material handling equipment, the proper use of hand tools, and safe material handling procedures minimize injuries and accidents. Personnel must know and practice proper lifting techniques. Tetra Tech policy states that workers will not lift more than 50 pounds. Workers must use mechanical equipment for weights over 50 pounds. Workers must obtain help for loads that are difficult to handle due to size or distribution of the weight. Workers who have current or previous back problems or weight lifting restrictions must inform their supervisor anytime the worker believes that a lifting task may cause them injury. Workers must receive training in proper lifting techniques.

Workers must use various types of equipment to aid their lifting of objects greater than 50 pounds. Handcarts, drum dollies, carts, cranes, and forklifts are available. There are special requirements for operators of forklifts and cranes. The HSO will ensure that operators of forklifts and cranes have received training required by regulations. Rules for forklift operations are posted.

Various techniques to handle material and perform work will prevent injury or incidents. Workers who must perform repetitive tasks such as shoveling, hand augering, soil sampling, use of a pick ax, etc., need to vary the task they perform throughout the day. Rotating tasks amongst other workers prevents strain on any one particular muscle group.

The HSO will visually inspect tanker trucks brought on to the site to ensure there are no leaks and that liquid materials can be handled safely. Workers will store materials only in approved containers, in areas designated for material storage or on shelving. Workers will stack material so that it can be easily reached and so that it will not fall. Workers will fuel vehicles and equipment outdoors; ensure that transfers have no spills; ensure that caps or covers have gaskets; and tighten caps or covers so that liquids do not splash or leak out of containers or fuel tanks.

3.21 Hand Tools

Workers will use hand tools only for the purpose intended. For example, wrenches will not be used as hammers. Workers will not use defective tools. They will tag these tools and turn them in to their supervisor. Workers will store tools properly, protect tools from corrosion, maintain tools as required by manufacturer, and pick up tools when the job is complete or at the end of the shift, whichever is sooner.

3.22 Illumination

29 CFR 1910.120(m) and 8 CCR 3317 prescribe lighting requirements for site activities. Night work may require light sources to meet these requirements. Work in confined spaces requires low-voltage lighting or explosion-proof lighting. Light fixtures require guards to prevent damage to bulbs and injuries to site personnel.

3.23 Sanitation

Toilet and hand washing facilities are required by Cal-OSHA 8 CCR 3364 -3366. Separate toilet facilities and showers are provided for females as required by regulations. Hand washing facilities are available throughout the site as required by Cal-OSHA regulations. As described later in this Plan, there must be a drench shower available on the site.

3.24 Subcontractors

Throughout this Plan, references are made to subcontractors. Subcontractors must comply with requirements of this SHSP, as well as the references made to subcontractors herein, including site Safe Work Practices and Tetra Tech Health and Safety Manual programs, and the minimum requirements specified for subcontractors in subcontract documents. Subcontractors, by terms of the procurement contract, are reminded that they must follow Federal, State and local regulations. This includes compliance with health, safety, and environmental regulations.

3.25 Safe Work Practices

Contractor requires its employees and its subcontractors to comply with the Contractor Project Rules. To prevent injuries and adverse health effects, the following general SWP are to be followed when conducting work involving known and unknown site hazards. These SWPs establish a pattern of general precautions and measures for reducing risks associated with hazardous site operations. This list is not inclusive and may be amended as necessary.

- Do not eat, drink, chew gum or tobacco, take medication, or smoke in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. A thorough shower and washing must be conducted as soon as possible if excessive skin contamination occurs.
- Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, or other such areas. Avoid, whenever possible, kneeling on the ground or leaning or sitting on drums, equipment, or the ground. Do not place monitoring equipment on potentially contaminated surfaces.

- Remove beards or facial hair that interferes with a satisfactory qualitative respirator fit test or routine pre-entry positive and negative pressure checks.
- Be familiar with and knowledgeable of and adhere to all instructions in this SHSP. At a minimum, a safety meeting will be held at the start of each project to discuss this SHSP. Additional meetings will be held, as necessary, to address new or continuing safety and health concerns.
- Be aware of the location of the nearest telephone and all emergency telephone numbers.
- Attend a briefing on the anticipated hazards, equipment requirements, SWPs, emergency procedures, and communication methods before going on site.
- Plan and delineate entrance, exit, and emergency escape routes.
- Rehearse unfamiliar operations prior to implementation.
- Use the "buddy system" whenever respiratory protection equipment is in use. Buddies should establish hand signals or other means of emergency communication in case radios break down or are unavailable.
- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity in order to assist each other in case of emergency.
- Minimize the number of personnel and equipment in contaminated areas (such as the exclusion zone). Nonessential vehicles and equipment should remain within the support zone.
- Establish appropriate support, contamination reduction, and exclusion zones.
- Establish appropriate decontamination procedures for leaving the site.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the site safety coordinator (SSC).
- Maintain a portion of the site field logbook as a project safety log. The project safety log will be used to record the names, entry and exit dates, and times on site of all Tetra Tech, subcontractor, and project site visitor personnel; air quality and personal exposure monitoring data; and other information related to safety matters. Form SSC-1, Daily Site Log, may be used to record names of on-site personnel.
- A portable eyewash station should be located in the support zone if chemical splashes to eyes are possible.
- Do not bring matches and lighters in the exclusion zone or contamination reduction zone (CRZ).
- Observe coworkers for signs of toxic exposure and heat or cold stress.
- Inform coworkers of nonvisual effects of illness if you experience them, such as headaches, dizziness, nausea, or blurred vision

- Employees shall be at their place of work at the designated starting time and shall remain at their workstation until the designated quitting time
- If badges are required, workers shall have their identification badges or area access credentials in their possession at all times on the jobsite. Depending on project requirements, employees entering or leaving the jobsite may leave identification badges or access credentials, and shall properly report early quits and late starts both to the responsible Supervisor and to any timekeeper or gate log or security officer
- Privately owned vehicles (POVs) are subject to project rules and regulations when operated on project premises. All drivers and passengers are required to wear seat belts when the vehicle is in motion. A driver must possess a valid driver's license. Traffic signs and markings must be obeyed. On government projects, warrants may be issued to violators
- The maximum speed limit on all haul roads shall be observed and speeds reduced if poor road conditions (wet and slippery) or severe weather (rain, snow, or fog) exist. Maintain a safe distance of at least 200 feet (2-second rule) from the truck or vehicle in front of you and turn on headlights when traveling on a haul road. Do not pass the vehicle or truck in front of you unless “waved-on” by the driver ahead of you.
- Bicycles and motorcycles are considered POVs and can be used on designated roads. Riders must follow all state laws and project requirements and are required to wear helmets where required by law and on project premises. They should also use a high-visibility vest, jersey, or jacket (or attach a high-visibility flag to their bicycle). Bicycles shall be equipped with a headlight and rear reflector for use during darkness
- There shall be no unauthorized use of cell phones, radios, or other electronic audio/visual equipment while working on or off the jobsite. This includes AM/FM radios or CD/tape players that may be installed in vehicles and equipment and that may interfere with their safe operation. Such devices may distract an employee's attention or interfere with an employee's ability to see or hear warnings and instructions essential to the safe conduct of work activities
- Employees shall wear approved hard hats, appropriate eye protection, and steel-toed footwear (approved by the American National Standards Institute [ANSI]). Steel-toed boots (ANSI Z-41) are the approved footwear that must be worn. Composite safety boots are authorized for unexploded ordnance (UXO)/ geophysical operations. Steel-toed sneaker-type shoes are not allowed regardless of OSHA/ANSI approval. Additional safety protective equipment must be worn when and where required. Hearing protection, respirators, and other PPE shall be utilized in designated areas. Traffic vests shall be worn when working within designated high traffic areas.
- Employees who require corrective eyewear (glasses or contact lenses) are responsible for providing such approved corrective eyewear when wearing a respirator in addition to any approved safety eyewear that may be required for

routine construction activity. (All corrective safety eyewear shall conform to ANSI Z87.1 requirements.)

- All employees shall be aware that special precautions or procedures may be appropriate when performing tasks associated with a high potential for loss of life or property. Examples include Confined Space Entry, Excavation, Scaffolding, Critical Lifts and Rigging, Lockout/Tagout, Hot Work, and UXO/Diving/ Explosive operations.
- Rules of Conduct:

  The use, possession, concealment, transportation, promotion, or sale of the following items or substances is prohibited on project premises:

  - Illegal, look-alike, designer drugs and drug paraphernalia;
  - Controlled substances, such as medications, when usage is abused;
  - Valid medications, when not kept in marked prescription bottles;
  - Alcoholic beverages;
  - Unauthorized firearms, weapons, and ammunition;
  - Unauthorized explosives;
  - Stolen property or contraband;
  - Unauthorized cameras or photographic equipment; and
  - Unauthorized recording devices.

Employees who violate this policy will be subject to disciplinary action up to and including termination. Tetra Tech reserves the right to conduct drug and/or alcohol search and screening consistent with company policy.

3.26 Discipline Policies

Site personnel, including subcontractors, must conduct themselves in a professional manner at all times, including compliance with the SHSP and project rules. A basic disciplinary policy applicable to Contractor projects will describe disciplinary policies similar to the following:

- **First Offense**—verbal warning and documentation of verbal reprimand placed in individual's and supervisor's project files.
- **Second Offense**—written warning issued to individual, a copy placed in the individual's and supervisor's project files. Serious violations may result in temporary suspension without pay of up to five days.
- **Third Offense**—considered an indication of continued disregard for health and safety concerns. A third offense will be cause for immediate termination.

These disciplinary measures are at the discretion of management and depend on the severity of the violation. Infractions which in the opinion of Contractor cause immediate threat or serious harm or death to site personnel may result in the immediate termination. Examples of infractions which may result in termination are:

1. Inciting, encouraging, or participating in any strike, walkout, slowdown, picket, sympathy strike, or any other work disruption or stoppage in violation of any applicable project labor agreement.
2. Unauthorized possession of government, project, or another person's property or services, or theft of the same.
3. Altering, damaging, or mutilating government, project, or other person's property.
4. Violating security rules.
5. Reporting or wearing a badge for other employees or other identification misrepresentation.
6. Making or stating false claims or falsifying reports or records.
7. Refusing to submit to a search.
8. Refusing to submit to drug and alcohol screening or testing or other similar inspections.
9. Possessing or using alcoholic beverages, controlled substances, or unauthorized weapons on any project.
10. Reporting to work late or failure to report to work without proper notification to immediate supervision.
11 Using or possessing keys or other devices used for lock opening without specific permission.
12. Sleeping during working hours.
13. Improperly using, or failing to use, toilet facilities.
14. Failing or refusing to perform assigned work as directed.
15. Fighting.
16. Negligence resulting in an infraction of health and safety or project rules or requirements.
17. Taking unauthorized work breaks.
18. Engaging in horseplay of any kind.
19. Engaging in gambling or the sponsoring of raffles.
20. Failing to inform immediate Supervisor upon leaving either a work area or the project.
21. Not using trash receptacles or otherwise creating unsanitary conditions.
22. Smoking, using tobacco, or eating in prohibited areas.

23. Unauthorized cooking on the project.
24. Unauthorized selling of food, beverages, or other items on the project.
25. Failing to display an identification badge or area access credentials in the proper manner and in a conspicuous place.
26. Violating health and safety rules or requirements.
27. Stopping work early at lunch, breaks, or quitting time.
28. Starting work late in the morning or after breaks or lunch.
29. Sexual, racial, or any other illegal or prohibited form of harassment.
30. Creating a work environment hostile to identification and correction of safety or quality concerns.
31. Failure to report the use of prescription drugs.
32. Failure to report equipment or material damage.
33. Failure to report an accident or incident.
34. Displaying pornographic, sexually explicit, or otherwise offensive photographs, calendars, or other actions that may be legally objectionable to other individuals or groups.
35. Unauthorized absence from work/assignment without reasonable cause or proper supervisory notification.
36. Unauthorized use of phone, including personal cell phones, fax, computing, or printing equipment.
37. Unauthorized release of Tetra Tech, Client, or project information to any outside party including news agencies and regulatory agencies. Any requests for information by outside parties shall be referred to your supervisor and the Project Manager, and shall be processed in accordance with Tetra Tech's contract with our Client.
38. Making false, slanderous, defamatory, or libelous statements about Tetra Tech, or the Client, and their employees. This is not to be construed as limiting any of your rights to contact any level of Tetra Tech management or to use the Compliance Hotline to report your concerns of any nature.
39. Inappropriate language, including unwanted, deliberate, repeated, or unsolicited profane, abusive, vulgar, obscene, or insulting language, is prohibited and will not be tolerated.

The above is not an all-inclusive list. If you are unsure what may constitute unacceptable employee conduct and/or rule violation, ask your supervisor.

Subcontractors are held to the same standards, but Contractor may require a subcontractor to remove personnel from the site at the discretion of the Contractor Project Manager.

3.27 Inspections

The HSO and project supervisors will inspect the site and work areas daily. Once each week the site supervisors will inspect their area(s) of responsibility. During this inspection they will observe and document site conditions and work practices. They will document the inspection using the "Project Weekly Inspection" form and turn in this form to the HSO at the end of each week. The HSO will keep the forms on file. The report identifies the date, time, site conditions and operations, personnel conducting inspection, findings and recommended corrective actions. The Project Manager and the HSO will reviews these forms weekly to see if further action is needed.

Once each month, the Project Manager will conduct an inspection accompanied by the HSO. The form used to document this inspection will be the same as that used for the weekly inspections. A senior Contract Health and Safety Professional (CIH or Certified Safety Professional) will conduct a formal inspection of site periodically, at least quarterly, and as requested by the Tetra Tech Project Manager.

3.28 Recordkeeping

3.28.1 Medical Records

Medical records relating to physical examinations and treatment of injury shall be maintained by each employee's primary employer in accordance with the requirements of 29 CFR 1910.20 and 8 CCR 5192. The HSO will maintain only copies of the employees' medical certificate from their company medical provider that states the employees' fitness to perform work under the HAZWOPER regulations and also states that the employees' are qualified to wear a respirator. Copies of records related to treatment of injuries related to work at the site will also be maintained by Tetra Tech for purposes of documenting any worker's compensation claims and for OSHA 300 recordkeeping.

3.28.1.1 Confidentiality of Personal Medical Records

All records will be kept in a locked file cabinet in the HSO office. Only the HSO shall have access to these files, except as prescribed by federal and state regulations.

Employee Access to Personal Medical and Exposure Records
Employees shall be notified annually of their right to access their personal medical record in accordance with 29 CFR 1910.20 and 8 CCR 3204.

Only an employee or his/her designated representative may gain access to the employee's individual personal medical and exposure record. Requests for access shall be made in writing to the HSO. Access shall be granted within 15 days of an individual employee's written request, except in the case of required medical treatment or a medical emergency for which immediate access will be given.

3.28.2 Exposure Monitoring Records

Employee exposure monitoring data shall be recorded on a monitoring record form by the HSO and kept on file as part of the onsite project file and the employee's personnel file. Calibration and sampling data shall be recorded in the air monitoring logbook maintained at the site by the HSO. Monitoring data in excess of SELs or PELs for any employee shall be forwarded to their confidential medical file and their corporate medical provider. Exposure monitoring results shall be disclosed to personnel and be available for review by personnel in accordance with applicable regulations. After any personal air sampling event, the employee will be notified in writing within 5 days of the receipt of the results of that testing event.

3.28.3 Personal Protective Equipment Inspection Reports

Respiratory protection equipment shall be inspected in accordance with regulations and the Tetra Tech PPE program, Health and Safety Manual, 2-7 (Attachment 1). The HSO shall conduct periodic inspections and record results on the PPE inspection form.

3.28.4 Respiratory Protection Program Fit Testing

Documentation of qualitative fit testing of cartridge respirators shall be maintained for each employee who receives cartridge respirators. This fit test shall be conducted annually by the HSO. Documentation shall be maintained onsite as part of the project files and the employee's health and safety file. Respirator training shall be documented as part of the 40-hour and 8-hour training requirement.

3.28.5 Weekly Safety Meetings and Daily Tailgate Safety Meetings

Weekly safety meetings and daily tailgate safety meetings shall be recorded on a form for each meeting and maintained onsite by the HSO in the project files.

3.28.6 Emergency Reports

All emergency incidents shall be documented by the HSO on an Incident Report & Investigation form which shall be maintained onsite as part of the project files. This form shall be completed by the HSO within 24 hours of an incident or as soon as sufficient data on which to base a report has been obtained.

3.28.7 Accident Reports

Accident reports shall be maintained for personnel injuries and/or property damage using the Incident Report and Investigation Form (AR-1). This form shall be filled out and submitted to the corporate office by the HSO within 24 hours of an accident or as soon as sufficient data on which to base a report has been obtained. Copies of these reports shall be kept onsite in confidential files. All injuries, no matter how minor, shall be reported to a supervisor in order to assure the paperwork is completed in a timely manner. Timely

reports are important so that conditions resulting in accidents can be investigated and constructive responses can be expedited.

3.28.8 Monthly Report of Accidents, Illness, Injuries, and Unusual Events, and OSHA 300 Forms

An OSHA 300 log of occupational injuries and illnesses shall be maintained for each employer. This log must be current within six days of an accident. This log from the previous year shall be maintained on site by the HSO and posted at the site during the months of February through the end of April.

3.28.9 Employer's First Report of Injury

The first report shall be filed by each employer for each injury which occurs in the course of employment. This is a standardized form that shall be filed by the corporate office with the worker's compensation insurance carrier and a copy shall be maintained on site by the HSO. This form serves as support for the OSHA 300 log and shall be kept with the accident report form described above. Both the employer's first report and OSHA 300 log shall be made available to an OSHA inspector, if requested during an inspection.

3.28.10 Confined Space Entry Permit

Documentation of confined space entry procedures shall be maintained for each entry. The checklists for training and entry procedures shall be signed by the HSO or his designee PRIOR to entry. The checklists shall be kept on site as part of the project files and must be maintained for 1 year.

3.28.11 Other Forms and Records

The HSO will maintain other forms and records such as:

- Emergency Notification Data Form;
- Training Summary Form;
- Employee Site Orientation Form;
- Visitor Access Form;
- Acknowledgment of Receipt of Safety, Health, and Emergency Response Plan Training;
- Safety Equipment Checkout/Inspection Log;
- Employee Information Request;
- Incident Reports; and
- Employee Medical Data Sheets

SECTION 4.0 TRAINING

This section states the specific training requirements for the project consistent with 29 CFR 1910.120(e) and 8 CCR 5192.

4.1 Hazardous Waste Operations Safety Training

29 CFR 1910.120 and Cal-OSHA 8 CCR 5192 states that personnel who enter an area covered under the regulation must have a minimum of 40 hours training and three days supervised field experience. Personnel must have eight hour annual refresher training to maintain currency in Hazardous Waste Operations and Emergency Response (HAZWOPER) as prescribed by this regulation. Furthermore, supervisors must have an eight hour Supervisors Health and Safety Management Course. Some personnel as defined by the regulation may require 24 hours of training. The HSO maintains certificates of training for site personnel and ensures that they receive refresher training.

4.2 Site-Specific Pre-Job Safety Orientation

Personnel entering the work areas of the site receive training in the provisions of this SHSP and sign the SHSP Acknowledgment. The HSO or designee conducts a site safety orientation meeting discussing the following topics:

- Names of personnel responsible for site safety;
- Names of CPR and First Aid trained personnel;
- Health and safety hazards on site;
- Personal protective equipment (use and care);
- Location of safety equipment such as fire extinguishers;
- Site standard operating procedures and SWRs;
- Work zones and site control measures;
- Hazard communication program includes discussion of MSDSs for materials on site;
- Emergency and spill response and contingency plan;
- Hot work procedures; and
- Confined Space Entry Procedures

The HSO documents attendance at this meeting.

4.3 Daily and Periodic Safety Training

The HSO or designee participates in daily "Tailgate" safety meetings at the beginning of the day where potential health and safety problems are discussed. The HSO or designee holds "Phase Safety" briefings prior to the commencement of a new task where task specific risks, precautions and the Hazard Analyses are discussed. Attendance is mandatory for anyone that will enter a limited access zone (LAZ) or exclusion zone (EZ) during the day. The HSO documents attendance at these meetings.

4.4 First Aid and Cardiopulmonary Resuscitation Training

Contractor procedures require that a minimum of two personnel current in first aid and cardiopulmonary resuscitation (CPR) certification are available on site within five minutes travel time to a site work area. To cover the large area of this site, the HSO arranges for the training of a sufficient number of personnel to ensure adequate site coverage. These personnel also receive training in Blood Borne Pathogens as required by 8 CCR 5193 and 29 CFR 1910.1030. The HSO maintains a list of Contractor personnel current in CPR and First Aid.

4.5 Subcontractors

Subcontractors must meet the same requirements for training as site personnel. Contractors and subcontractors present on site must be represented at the daily safety meeting for each day they are on site. A supervisor must be present or contractor personnel on site must be present. If only the supervisor attends the daily safety meeting, the supervisor must provide the information from the meeting to any workers in his/her firm on site that day and the supervisor must provide documentation to the HSO that these personnel have received that information. Acceptable documentation is a tailgate safety meeting attendance sheet.

4.6 Support Personnel (Office)

Personnel who work in offices located in support areas and who will not enter LAZ or EZ, will receive a 4-hour site specific training to include:

- Site history;
- Chemical and physical hazards of the landfill;
- Site personnel requirements;
- Tour of site in a vehicle; and
- Emergency procedures and other information required to meet Injury and Illness Prevention Program requirements.

4.7 Specific Training

As needed, site personnel will receive specific training required for their occupation and tasks performed. The HSO identifies specific training requirements as required by OSHA regulations or by Contractor safety procedures. Often, this training is part of the training and review of the AHAs or is part of a daily safety meeting. The HSO arranges for this training and ensures that the person conducting the training documents the completion of the training. The HSO maintains a training file for each Contractor employee. Specific training includes but is not limited to:

- Equipment operation;
- Instrument operation;
- Hazardous materials transportation;
- Lockout/tagout;
- Confined space;
- Hot work;
- Excavation safety;
- Competent person (for each of the specific requirements specified in regulations);
- Chemicals with specific OSHA standards: benzene, vinyl chloride, inorganic arsenic, lead, etc.;
- Community relations;
- Hazard Communication (MSDS);
- Crane Operators' Training Certificate; and
- Industrial Truck (Forklift) Operators' Training Certificate

SECTION 5.0 PERSONAL PROTECTIVE EQUIPMENT

Work activities in a LAZ or EZ require site personnel to wear appropriate PPE. Personnel must wear appropriate protective equipment when activities involve exposure to hazards that cannot be adequately or feasibly controlled by engineering or administrative controls. Personnel must wear respiratory protection when activities are known or suspected to result in atmospheric concentrations in excess of PELs or threshold limit values (TLVs) for dusts, mists, fumes, vapors or gases. The EPA describes various levels of protection as follows:

- Level A—Used when the greatest level of skin, eye, and respiratory protection is needed and consists of a totally encapsulating suit with supplied breathing air.
- Level B—Used when the highest level of respiratory protection is needed but a lesser level (than Level A encapsulating suit) of skin protection is required.
- Level C—Used when criteria for using air purifying respirators are met and a lesser level of skin protection is required.
- Level D—Used only as a work uniform and in an area without respiratory hazards.

The site requires the use of Level D for most site activities in an LAZ or EZ. Some activities at the site may require the use of Level C. Only very rare circumstances may require the use of Level B. The use of Level A is not expected or anticipated.

5.1 General Site PPE Requirements

A LAZ or EZ requires the following minimum PPE requirements:

- Level D
  - Coveralls or clothing appropriate for tasks;
  - Safety glasses or chemical splash goggles;
  - Hard hat;
  - Steel-toe boots; and
  - Ear plugs, in areas with noise levels above 85 dBA.

The HSO will upgrade or downgrade levels of protection based on action levels from direct reading instruments, a change in site conditions, or findings from investigations. Table 5-1 summarizes PPE requirements for specific activities.

Visitors authorized to access the LAZ typically will wear safety boots or site coveralls, a hard hat, and safety glasses with side shields. The HSO may change these requirements based on the nature of the visit. The HSO may issue hard hats and safety glasses to visitors.

5.2 Level C

Tasks which present respiratory hazards and may present skin hazards require Level C protection which includes:

- Full-face air purifying respirator with cartridges specified by the HSO;
- Chemical-resistant clothing (e.g., coveralls, chemical splash suits, overall and long sleeve jacket);
- Inner and outer chemical-resistant gloves;
- Chemical-resistant boots with steel toe;
- Safety glasses or chemical splash goggles;
- Hard hat; and
- Other items specified by the HSO such as boot covers, face shields, ear plugs, radios.

This project has some tasks that may require Level C protection. These tasks require the establishment of an EZ. At this time, tasks associated with pile driving, drilling, and direct contact with refuse may require Level C protection.

5.3 Level B

Tasks with potential for respiratory hazard or reduced oxygen will require the use of Level B PPE. The HSO maintains a small supply of PPE for Level B, which includes the following:

- Pressure demand full-face SCBA or supplied air (line) with escape bottle;
- Chemical-resistant clothing;
- Hard hat;
- Inner and outer chemical-resistant gloves;
- Chemical-resistant boots with steel toe; and
- Two-way radio.

5.4 Air Purifying Respirators

It is not expected that the use of air purifying respirators will be needed in the completion of the project. However, if respirator use is needed, the Respiratory Protection Program, Health and Safety Manual 2-6, describes the corporate respiratory protection program. Respirators must have NIOSH certification required by 29 CFR 1910.134 and 8 CCR 5144. The HSO will ensure that individuals who wear respirators receive fit-testing at least once each year, maintain a record of that testing and a certification from a physician that the individuals can wear respirators and have received annual training, are wearing

respirators properly and care for their respirators per the procedure. The HSO selects the cartridges for the respirator. A cartridge change schedule based on the volatile organic contaminants of primary concern with the lowest PELs, vinyl chloride and benzene will be calculated and determined by the project CIH based on the presumption that either contaminant does not exceed 10% of the total PID or FID reading in the breathing zone. This calculation must be done prior to wearing respirators and cannot be determined within this Plan since there are various brands of respirators and the calculations also require knowledge of the temperature and humidity. The selected cartridge will be a combination organic vapor/acid gas/P100 cartridge. On this site, personnel will discard cartridges at the end of each work shift or when the change schedule requires, whichever occurs first. For contaminants related to dust only, a P100 cartridge will be used and will be discarded at the end of each day. However, this Plan requires that dusts are suppressed and controlled so use of this cartridge also requires other PPE to be used as shown in Table 5-1.

5.5 Supplied Air Respirators

If supplied air respirators are required for use on this project, the project CIH will be contacted.

5.6 Training

Prior to wearing PPE or respiratory protection, the HSO verifies that site personnel who wear PPE or respirators have received training. The HSO instructs site personnel on the specific PPE they wear. Those site personnel who may wear respiratory protection receive specific training for the brand of respirator they wear. Since Level B requires significant PPE, only selected individuals will receive training on the use of supplied air respirators. The HSO maintains a list of personnel and the training they have received.

SECTION 6.0 MEDICAL SURVEILLANCE

Tetra Tech employees and all contractors and subcontractors must participate in a medical and health monitoring program. This program includes a complete physical and medical history when the employee starts work and continues on a regular basis. Subcontractor employees will participate in a medical surveillance program and documentation will be required on site. The requirements for this program are specified in 29 CFR 1910.120 and 8 CCR 5192.

6.1 Certification and Medical Records

Upon completion of the medical examination and history, a local medical provider sends examination results to a corporate medical consultant for review and completion of the medical certification. The consultant maintains the medical record. The consultant sends a copy of the medical certification form to the employee and a copy to the HSO at the site. The medical provider should send a copy of the medical examination to the employee for the employee's personal medical records. There are no medical records kept on site. The HSO maintains a file for each employee that includes the medical certification of each employee. The medical provider must also complete a form stating that the employee can wear a respirator and a copy of this form is also maintained by the HSO.

6.2 Industrial Hygiene Monitoring

During the course of the project, the HSO conducts monitoring of the workplace to assess the potential for exposure to contaminants. This monitoring may include the use of direct reading instruments or personal air sampling pumps. Whenever the HSO conducts personal air sampling, the HSO places the results of such sampling into the employee file and sends a copy to the corporate office for inclusion in the employee's medical records. If results of monitoring by either direct reading instrument or personal air sampling indicate that the employee may have been exposed above permissible limits, the HSO will schedule an examination for that employee with the local medical provider. The medical provider may ask that the employee have additional lab tests to assess the employee. Also, during phases of the project where analytical data show there is a potential for exposure to contaminants for which there are biological tests, the HSO may schedule baseline examinations so that each employee who works with the material may be evaluated after the work is completed. Monitoring conducted on subcontractor activities will be given to their management for employee notification and documentation. Refer to Section 7 for information on sampling.

6.3 Medications

Contractor employees taking over-the-counter or prescription medication will inform the HSO. The HSO will review this as necessary with the local medical provider to ensure that no employee works if the medication affects his/her ability to work safely. The HSO will keep this information confidential in the employee's file.

6.4 Subcontractors and Visitors

Subcontractors who work in the LAZ or the EZ must provide a medical certification form from their company physician that meets the same requirements as for Tetra Tech personnel. This form must indicate the fitness of the individual to wear PPE and a respirator and whether there are any work restrictions. The HSO will allow visitors who have no potential exposure to contaminants and who have no need to wear PPE or a respirator to enter the site provided that the visitor is not on site for more than three consecutive days and that the visitor is escorted and does not enter exclusion zones.

6.5 Drug Testing

Drug testing may be performed at any time based on requirements of the Human Resources Substance Abuse Policy (Attachment 1).

SECTION 7.0 MONITORING

To ensure a safe working environment and to validate the selection of personal protective equipment, trained personnel will use various types of monitoring techniques and equipment. The CMP monitoring program uses direct reading instruments and air sampling devices that collect samples requiring laboratory analysis. The monitoring program has three components including:

- Site control monitoring: site operations personnel monitor air sampling stations that have been established for environmental monitoring to determine if any contaminants or dusts leave the site;
- Work area monitoring: to evaluate potential exposures in particular areas or for specific tasks; and
- Personal monitoring: to evaluate potential exposures to specific individuals for specific tasks or for specific type of work (e.g., operator, laborer, engineer, etc.).

7.1 Background

The soil cover on the site has only a few areas where contaminant levels are higher than background. Yet these levels are very low and do not pose an occupational exposure risk provided dust levels are minimized through dust suppression and workers are wearing the required PPE and do not directly contact any of the soil in the areas that have an elevated reading. If they come in contact, bushing off work clothing to avoid generating dust and washing of hands and face will minimize exposure risk. In any case, there is not an inhalation hazard unless dust levels are above 5 milligrams per cubic meter (mg/m^3) which are a high amount of dust that should have been controlled. The major concern for respiratory exposure is from work activities that involve drilling or driving piles through the landfill refuse. When these tasks are performed it is possible for landfill gases and other vapors to be released to the work environment. In order to validate that employees are protected properly through engineering controls or PPE the air monitoring program is used when these tasks are performed.

The HSO will conduct monitoring to ensure that each site worker is adequately protected. Site monitoring and sampling may include personal air sampling, real-time air monitoring, perimeter monitoring, noise monitoring, and heat stress monitoring.

The HSO will have experience using the required monitoring or sampling equipment. The Project CIH will ensure that each HSO is qualified to operate all assigned instruments. The HSO shall ensure that each piece of equipment is properly maintained and calibrated.

Personal sampling requirements are based on potential airborne hazards and OSHA requirements. Personal sampling methods will be in accordance with NIOSH methods, OSHA instructions, or good industrial hygiene practice when established methods are not

available or feasible. A laboratory accredited by the American Industrial Hygiene Association will conduct all laboratory analysis of industrial hygiene samples. Results will be compared to the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs or Cal-OSHA Permissible Exposure Limits, whichever is more stringent. Results will be communicated to employees in accordance with OSHA requirements. All exposure records will be kept in accordance with 29 CFR, Part 1910.20 (8 CCR Section 3204).

Real-time air monitoring will be used, as appropriate, to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection needed on site. Real-time monitoring may be necessary for airborne hazards such as flammable vapors, specific target compounds, organic vapors, and dust. All instruments (both real-time and TWA) shall be calibrated according to the manufacturers' recommendations. All equipment shall be calibrated before and after use. A calibration log shall be kept to record all calibrations.

7.2 Direct Reading Instruments

7.2.1 Photoionization Detector and Flame Ionization Detector

A PID and a FID will be used to determine the presence and concentration of organic vapors. Contaminants such as halogenated hydrocarbons and benzene are detectable with a PID. However, the FID can detect chemicals that a PID cannot, primarily methane gas which is very often found on the site. This project requires that both types of instruments are available for use.

Instrument:	PID and FID
Action Level:	10 parts per million (ppm) in breathing zone. 1 ppm at perimeter.
Action:	Level C respiratory protection. Notify CIH.

7.2.2 Multisensor Gas Meter

A multisensor gas meter will be used to screen for the presence of flammable vapors, carbon monoxide (CO), hydrogen sulfide (H_2S), and oxygen (O_2). The oxygen senor will determine (O_2)-deficient and O_2-enriched atmospheres. If flammable vapors are at ten percent lower explosive limit (LEL) or greater, work will cease and the area will be ventilated. If O_2 levels below 20.8 percent or above 22 percent are encountered, personnel will leave the area and the area will be ventilated.

Instrument:	Multisensor Gas Meter
Action Level:	10 percent $\geq$ LEL, <20.8 percent O_2 or >22 percent O_2
Action:	Stop work, allow area to ventilate. Notify CIH.

Sensor:	Hydrogen Sulfide
Action Level:	5 ppm. At no time can level exceed 20 ppm 1 ppm or detectable odor at perimeter
Action:	Stop work, ventilate, and notify CIH.
Sensor:	Carbon Monoxide
Action Level:	10 ppm
Action:	Stop work, ventilate, and notify CIH.

7.2.3 Dust Monitor

A MiniRAM® Aerosol Monitor, Model PDM-3 or equivalent instrument will be used to measure respirable airborne particulates between 0.1 to 10 micrometers in size. The MiniRAM will be used as an indicator of total ambient dust in the work area and will monitor when additional dust control is required. Worst case scenarios can be assessed for the purpose of establishing a total dust action level by utilizing half of the TLVs as the action level for respirable dust. (***Note***: there are no direct reading total dust monitors. Total dust can only be determined gravimetrically. Visual observation of dust clouds that cannot be seen through would be a good indicator of dust exceeding action levels for total dust. The action level shown below for respirable dust is probably a more sensitive indicator. One study had shown that respirable dust comprises about 40 percent of total dust. Making that assumption of an action level of 1.5 mg/m^3 for respirable dust would establish an equivalent level of 3.75 mg/m^3 for total dust which is well below the OSHA action level of 5 mg/m^3 for total dust.)

Instrument:	MiniRAM Aerosol Monitor, Model PDM-3 or equivalent.
Action Level:	1.5 mg/m^3 for general site areas. 0.5 mg/m^3 for perimeter. (level chosen to minimize overall permissible dust release from site)
Action:	Implement dust control procedures.

If dust cannot be reduced below the specified concentration, respiratory protection will be required which will consist of a full-face, air-purifying respirator and combination organic vapor/acid gas/P-100 cartridges. If dust is heavily contaminated, as measured by analysis of samples collected in the first phase of this project, it may be necessary to wear respiratory protection even if the respirable dust levels are below the action level.

7.2.4 Noise Monitoring

A noise survey meter will be used to measure the noise levels in the work area as needed. The results will be recorded in the logbook. Site workers will adhere to the Hearing Conservation Program. Workers will use hearing protective plugs or muffs whenever levels are greater than 85 decibels, A-scale (dBA). Levels consistently over 85 dBA will

be reported to the CIH to determine if additional monitoring with dosimetry equipment will be conducted and additional noise controls will be instituted.

7.3 Personal Air Monitoring

This project has the potential to expose workers to PCBs, lead, other metals, and volatile and semi-volatile organic compounds. Since there are no direct reading instruments for the specific contaminants of concern, personal air samples will be collected while workers are performing tasks selected by the CIH to establish whether these tasks can potentially expose workers above action levels. Personal air samples require the use of a calibrated sampling pump and a sample train that includes tubing and sample collection media. The HSO will follow the guideline for sample collection as specified in the NIOSH Manual of Analytical Methods, 4th Edition.

7.4 Monitoring Strategy

Background levels will be measured with the PID and the FID, the multisensor gas meter, the dust meter, and the noise survey meter before any work commences at each worksite or sampling point. The PID or the FID will be used to measure for organic vapors during sampling and during the progress of all work. Continuous monitoring will be performed during drilling, pile driving or any work that penetrates the refuse. Area samples as well as breathing zone samples will be taken.

The multisensor gas meter will be used when odors or unexpected materials are found, and when there is any hot work. The combustible gas monitor must be used whenever there is any opening or intrusion into the landfill to determine if explosive or flammable gases are being released.

The dust meter will be used during activities where dust may be raised.

Noise monitoring will be performed prior to starting work activity where noise levels require measurement.

Personal air samples will be collected during initial landfill intrusion activities on workers near the ground and where breathing zone measurements indicate a potential for exposure above the action levels for the direct reading instruments. The sampling will be done during the first time each of these tasks are performed and when directed by the CIH. Additional sampling may be required based on the analytical results of the initial sampling and as described in the industrial hygiene monitoring program below.

7.5 Quality Assurance/Quality Control

Adherence to a proper quality assurance/quality control (QA/QC) plan is essential for a meaningful air sampling effort. The major concerns of a QA/QC plan are calibration of equipment and document control.

7.5.1 Calibration and Maintenance Procedures

All direct reading instruments will be calibrated daily, or before and after each use according to the manufacturer's recommended procedures. Calibration records will be kept detailing date, time, span gas or other standard, and the name of the person performing the calibration. The calibration gas for the PID is usually isobutylene. The FID is usually calibrated with methane. The SHSS will ensure that the instrument is kept clean and will follow manufacturer's directions for keeping the lamp clean. The SHSS will perform no other maintenance procedures unless approved by the CIH.

The calibration gas for the LEL is usually a methane/air or a hexane/air mixture. O2 is calibrated against normal air in a clean environment. A low-O2 calibration gas can be used for calibrating the response of the O2 sensor. Often, 100 percent nitrogen is used to "zero" the O2 sensor. The H2S sensor and the CO sensor are calibrated by using a calibration gas. Typically, methane, low-O2, H2S and CO are available in a single gas cylinder to use for calibration of multisensor gas meters. For the purposes of this Plan, calibration of the multisensor gas meter means a daily field check with known calibration gases. The reading on the instrument must be within three percent of the stated value of the gas. If it is not, then formal calibration of the instrument must follow the manufacturer's calibration procedure.

There is no field calibration for the dust meter except to perform a zero check daily. Factory calibration of the dust meter must have been performed within the last year as documented by paperwork or a tag that comes with the instrument. The operating instructions for the meter should be followed to assure that the instrument is zeroed properly.

Calibration of personal air sampling pumps must be traceable to a National Institute of Standards and Technology method for determination of sample volume. The pumps must be calibrated both pre- and post-sampling. Flow rate must be within 5 percent of the pre-sample flow rate. Refer to the NIOSH manual for details of calibration.

7.5.2 Documentation

Strict adherence to document and data control procedures is essential for good QA/QC. Data and calibration records must be accounted for and retrievable at all times. Types of documents that are essential include notes, logbooks, maps, data sheets, and reports. Forms required for this will be available for use on the project site. The completed forms must be placed in the project files. Copies of all field data reports and personal sampling records will be sent to the CIH for review.

7.6 Industrial Hygiene Monitoring Program

The Industrial Hygiene Monitoring Program is a sampling strategy for evaluation of workplace contaminants and workplace stresses due to physical agents. The program follows guidelines established by the National Institute for Occupational Safety and

Health (NIOSH), Occupational Exposure Sampling Strategy Manual, DHEW (NIOSH) Publication 77-173. The Industrial Hygiene Monitoring Program sampling strategy supports Cal-OSHA requirements for selection of PPE and protection of site personnel. The program provides an assessment of the quality of the air environment in which site personnel work, an evaluation of the workplace for contaminants within work areas and areas designated as "clean," an evaluation of the workplace for noise to ascertain that current hearing conservation program requirements are adequate. The essential elements of the program are an air monitoring program, a work place environmental sampling program, a noise monitoring program and a breathing air sampling program. Table 7-1 describes the strategy to be implemented on this project through all tasks where there is intrusion into the landfill. Once intrusive activities cease, additional personal air sampling should not be necessary.

SECTION 8.0 SITE CONTROL

A Site Access and Security Plan (SASP) provides details for site control. The main gate, staffed by security personnel, is the main access to the site. Visitors register and obtain a badge. Visitors require escort by personnel assigned to the Site. Site personnel, upon arrival, obtain their badges from site security at the main gate. Security maintains records of personnel entering or leaving the Site. This record facilitates accounting for personnel on the site during an emergency. The Site has three designated zones to control access as detailed in the following sections:

8.1 Support Zone

The support zone includes the main entrance security gate and contractor and office trailers.

8.2 Limited Access Zone

A LAZ is any area not classified as an SZ and not designated as an exclusion zone. Only individuals who meet the requirements of 8 CCR 5192 for training and medical clearance can enter this area because of a potential for exposure to toxic substances. Decontamination areas located at the site are areas where contamination can be removed from equipment or personnel.

8.3 Exclusion Zone

An EZ designates an area of special concern due to known contamination or potential contamination. EZ will be set up whenever respiratory protection (based on air monitoring, not on discretionary use) is required. Areas where there is active excavation, grading, removal of cover material, handling of refuse, dynamic deep compaction, active drilling or pile driving are all exclusion zone areas. The zone is established at minimum safe distances for the activity. The HSO and the construction managers will determine this distance based on the type of activity. For example, deep dynamic compaction and pile driving have danger zones in which no personnel are to enter. These zones must be delineated with either barricade tape, cones, snow fence, or other types of barricades.

8.4 Contamination Reduction Zone

Any area that has contaminants must also have a contamination reduction zone (CRZ) where contaminants can be removed before anyone or a piece of equipment leaves the area, Decontamination procedures described in this Plan are performed in this area, which is between the EZ and the LAZ.

8.5 Communications

The following equipment and procedures will be used for communication at the Site.

8.5.1 Mobile Telephone

A cellular telephone will be maintained in the office trailer located in the SZ and in the project's support vehicle(s) for routine and emergency communications.

8.5.2 Buddy System

The buddy system will be employed during on-site work activities. Two workers must always work in sight of each other. No worker should ever work alone.

8.5.3 Hand Signals

Field operations personnel shall employ hand signals in order to communicate emergency information and to assist in the operation of loud mechanized equipment. The hand signals will be taught to all field personnel prior to commencement of field operations and shall be reviewed during the daily on-site safety briefings.

These signals are very important when working with any equipment. Typical hand signals are the following:

Signal	Meaning
Hand gripping throat	Out of air, cannot breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	OK, I'm all right, I understand
Thumbs down	No, negative

8.5.4 Emergency Signals

In the event of a fire, explosion, or major emergency, a portable air horn will be used to signal the site workers and field crew of an emergency condition. One continuous, 15-second blast on the air horn will signal a site evacuation and subsequent assembly at the designated assembly area.

SECTION 9.0 DECONTAMINATION

Decontamination procedures are necessary to prevent personnel exposure to chemicals and to prevent the transport of contaminants outside of the Site.

9.1 Vehicle and Heavy Equipment Decontamination

Vehicles that enter an EZ must be decontaminated upon leaving the zone. Vehicles working in other zones may require washing and rinsing to remove buildup of soil and to permit easier maintenance of equipment. Supervisors and the HSO will inspect equipment at least once each week to assess cleaning requirements. The operator of the equipment will drive the equipment or vehicle to a decontamination pad. At the pad, the operator or other assigned person will perform gross decontamination by scraping off excess mud and debris. If accumulations of mud are significant, the operator or assigned person will use a pressure washer or a steam cleaner to remove accumulations. If a vehicle becomes contaminated, the driver of a light vehicle will use the same pad to wash off the vehicle.

9.2 Tools and Instrument Decontamination

Personnel will decontaminate tools at the decontamination pad by washing off the tools in that area. Contaminated tools may be wrapped in plastic during transport to the area to avoid contamination of equipment or personnel. In some cases, depending on the contaminant, it may not be possible to remove the contaminant. In these cases, personnel must contact the HSO to discuss decontamination options. Instruments used in exclusion zones require decontamination by wiping the outer cases of the instruments with a decontamination solution. The decontamination of tools and sampling equipment is done as follows: scrub using Alconox® or Liquinox® solution; rinse with potable water; rinse with de-ionized water or equivalent; and, allow equipment to air dry before use. It is better to protect instrument before going into an exclusion area by wrapping the instrument with plastic. This minimizes the decontamination necessary when leaving the zone. The user of the instrument discards the plastic wrap in a contaminated debris container.

9.3 Personal Protective Equipment Decontamination

Personnel will wash boots, gloves and hard hats with soapy water, rinse with clear water and store the equipment in a designated area on site. Staff stationed in the office trailers may store this decontaminated equipment in their offices. Personnel will remove heavy accumulation of material on boots and other equipment at the EZ or LAZ. Personnel will deposit disposable PPE in the designated container for disposal at the exit from the CRZ. Personnel will immediately wash hands upon leaving the CRZ. Site personnel will clean their own respirators after each use. Use alcohol wipes or a quaternary ammonium window cleaner (e.g. Windex®) to remove light soiling. If the respirator is continuously used, then each week the site personnel will wash the respirator in a sanitizing solution,

rinse it in clear water and air dry it. Site personnel will store their respirators in clean plastic bags.

9.4 Temporary Decontamination Stations

The HSO may set up temporary decontamination stations in areas near exclusion zones. There are different ways the stations may be set up, but they have the same purpose to control the spread of contamination from the exclusion zone and to protect site personnel. These stations usually consist of the following:

- Sheets of plastic or other chemically resistant material on which the decontamination process occurs. Contaminated equipment and personnel wearing PPE enter this area to begin the decontamination process.
- Containers for disposal of contaminated materials and PPE and collection of decontamination liquids.
- Tubs, wading pools, or shallow bermed areas into which site personnel or equipment enter and where the site personnel wash equipment or wash their outer PPE before removing the PPE. The collected liquids are pumped into containers for disposal.
- Wash and rinse solutions, brushes, towels.
- Portable showers, sinks, privacy curtains, etc.

9.5 Decontamination Waste Disposal

Waste water is collected for analysis and disposal. Disposal must follow regulations of waste according to the hazard class of the waste.

SECTION 10.0 SPILL CONTAINMENT

During construction activities, equipment operators may uncover contaminated solid debris and containers of liquids. Liquids and contaminated solids require a managed containment policy as outlined in the Storm Water Pollution Protection Plan.

10.1 Storage

On-site storage of bulk hazardous liquids (tanks or drums) requires prior approval of the Project Manager. Bulk fuel or oil storage tanks must be located in lined and diked areas that provide secondary containment capacity for the entire volume of the largest single container in the containment area plus freeboard.

10.2 Materials Transfer

Personnel will not pump any fuel or oil unattended. The HSO or designee will supervise transfer operations. The HSO or designee will inspect each transport vehicle to ensure that it is empty and clean when it arrives on site. Similarly, the HSO or designee will inspect other types of containers brought on site to ensure they are clean and contain no hazardous materials when they arrive on site.

10.3 Spill Management

A person causing a spill or noticing a spill will immediately report the spill to a supervisor. The supervisor will immediately contact the Project Manager or the HSO. Section 11.13 of the ERP discusses specific procedures for spill reporting and cleanup.

SECTION 11.0 EMERGENCY RESPONSE PLAN

The ERP is located in a separately bound document. It is incorporated herein by reference.

TABLES

TABLE 3-1 Page 1 of 3

CHEMICALS AND EXPOSURE LIMITS

Chemical Compounds (Regulated Constituent)	MC[1]	PEL[3]
Metals		
Antimony	1.67	0.5
Arsenic	**18**	0.01
Barium	1,580	10
Beryllium	1.13	.0002
Cadmium	3.23	0.005
Chromium, Total	178	0.5
Cobalt	35	0.020
Copper	369	1
Lead	281	0.05
Mercury	0.355	0.025
Molybdenum	29	10
Nickel	191	1
Selenium	15.6	0.2
Silver	0.776	0.01
Thallium	0.49	0.1 (soluble)
Vanadium	117	0.05 (V_20_5), respirable dust
Zinc	505	10 (as oxide dust)
Chlorinated Pesticides		
4,4'-DDD	0.316	NL
4,4'-DDE	2.3	NL
4,4'-DDT	0.86	1
alpha-Chlordane	0.0577	NL
Chlordane	0.0202	0.5
Dieldrin	0.0146	5
Endosulfan II	0.00285	NL
Endosulfan sulfate	0.00548	0.1
Endrin	0.00146	0.1
Endrin aldehyde	0.00964	NL
gamma-Chlordane	0.0646	NL
Heptachlor	0.0174	0.05
Heptachlor epoxide	0.00105	0.05 TLV
Sum of Chlordane Isomers	0.122	NL
Polychlorinated biphenyls		
Aroclor-1016	0.63	1.0
Aroclor-1248	**3**	0.5
Aroclor-1254[1]	**1.3**	0.5
Aroclor-1260	**4.71**	0.5
Aroclor-1262	**9.38**	0.5
Volatile Organic Compounds		
1,1,2,2-Tetrachloroethane	0.0027	4170
1,2,4-Trichlorobenzene	0.0025	40

TABLE 3-1 Page 2 of 3

CHEMICALS AND EXPOSURE LIMITS

Chemical Compounds (Regulated Constituent)	MC[1]	PEL[3]
1,2,4-Trimethylbenzene	**12**	125
1,2-Dichlorobenzene	4.3	150
1,2-Dichloropropane	0.00066	350
1,3,5-Trimethylbenzene	3.7	125
1,3-Dichlorobenzene	0.0013	150
1,4-Dichlorobenzene	0.047	60
2-Butanone (methyl ethyl ketone)	0.16	590
2-Chlorotoluene	0.0003	250
4-Chlorotoluene	0.00017	NL
4-Methyl-2-Pentanone	0.07	205
Acetone	0.947	1200
Benzene	0.1	1 ppm
Carbon disulfide	1.2	12
Chlorobenzene	0.037	46
Chloroethane (Ethyl chloride)	0.00058	264
cis-1,2-Dichloroethene	0.16	790
Dichlorodifluoromethane	0.00059	4950
Ethylbenzene	**120**	435
Isopropylbenzene	3.7	245
m,p-Xylene	2.2	435
Methylene chloride	**22**	87
Methyl-t-Butyl Ether (MTBE)	0.0034	144
Naphthalene	**4.7**	50
n-Butylbenzene	13	NL
n-Propylbenzene	9.2	NL
o-Xylene	0.45	435
p-Isopropyltoluene	4.4	NL
sec-Butylbenzene	11	NL
Styrene	0.026	215
tert-Butylbenzene	0.012	NL
Tetrachloroethene	0.015	170
Toluene	0.082	188
trans-1,2-Dichloroethene	0.0012	790
Trichloroethene	0.011	135
Trichlorofluoromethane	0.00099	5600
Vinyl chloride	0.012	1 ppm
Semi-volatile Organic Compounds		
1,4-Dichlorobenzene	0.3	60
3/4-Methylphenol	0.34	22
4-Nitrophenol	0.13	NL
Benzo (a) Pyrene	0.446	*
Benzo (g,h,i) Perylene	0.399	*

TABLE 3-1 Page 3 of 3

CHEMICALS AND EXPOSURE LIMITS

Chemical Compounds (Regulated Constituent)	MC[1]	PEL[3]
Benzo (k) Fluoranthene	0.36	*
Benzo(a)anthracene	0.437	*
Benzo(b)fluoranthene	0.357	*
bis(2-Ethylhexyl)phthalate	4.3	*
Butyl benzyl phthalate	0.283	*
Chrysene	0.566	*
Fluoranthene	1.26	*
Indeno(1,2,3-cd)pyrene	0.37	*
Naphthalene	0.25	50
N-Nitrosodiphenylamine	1	NL
Phenanthrene	6.13	8
Phenol	1.4	19
Pyrene	1.15	*
Pyridine	0.34	15
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	0.6	*
Acenaphthylene	6.1	*
Anthracene	2.4	*
Benzo (a) Pyrene	**1.7**	*****
Benzo (b and k) Fluoranthenes	0.18	*
Benzo (g,h,i) Perylene	1.2	*
Benzo (k) Fluoranthene	2	*
Benzo(a)anthracene	0.373	*
Benzo(b)fluoranthene	0.416	*
Chrysene	0.746	*
Dibenz (a,h) Anthracene	0.72	*
Fluoranthene	1.54	*
Fluorene	0.26	*
Indeno(1,2,3-cd)pyrene	0.444	*
Naphthalene	**4.7**	50
Phenanthrene	38	*
Pyrene	1.56	*

Notes:

ppm – parts per million

1 – MC = Maximum Concentration determined in site soil (not the refuse) in mg/kg

2 – I = Inhalation; G = Ingestion; A = Skin absorption; C = Skin or eye contact.

3 – PEL= Cal OSHA Permissible Exposure Limit in mg/m^3 – milligrams per cubic meter (Where no limit is established the TLV® - Threshold Limit Value of the most current ACGIH publication will be used, and if there is no published TLV, the PEL will be listed as NL for no level established.

. * These chemicals are classed together as coal tar pitch volatiles - the PEL is 0.2 mg/m^3 (total)

TABLE 5-1

PERSONAL PROTECTIVE EQUIPMENT MATRIX

Task	EPA Level	Respiratory Protection	Head	Hand	Clothing	Boots	Face	Eye	Hearing	Additional
Site setup, surveys (land, geophysical)	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek® coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Reflective safety vests
Clearing of vegetation	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek® coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Fall protection for work above 6-foot level. Reflective safety vests.
Grading, excavation, Deep Dynamic Compaction, no contact with refuse	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek® coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Reflective safety vests
Grading, excavation, Deep Dynamic Compaction Contact with refuse, release of vapors or gases	C	Full face respirator with combination cartridges if air in breathing zone is >10 ppm but less than 20 ppm and work must continue in area	Hard hat	Leather work gloves, as needed, PVC or neoprene gloves if refuse must be touched by hands, inner glove nitrile	Tyvek® coveralls when working near refuse. If contact must be made with wet refuse, PVC rain suit over Tyvek required	Steel-toe boots with neoprene or rubber boot covers	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Fall protection for work above 6-foot level. Reflective safety vests.

TABLE 5-1

PERSONAL PROTECTIVE EQUIPMENT MATRIX

Task	EPA Level	Respiratory Protection	Head	Hand	Clothing	Boots	Face	Eye	Hearing	Additional
Well drilling, pile driving - no vapor releases, no contact with refuse, or equipment that has been in contact with refuse	C	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek® coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Reflective safety vests
Well drilling, pile driving - breathing zone air is >10 ppm but less than 20 ppm, contact with refuse, or equipment that has been in contact with refuse	C	Full face respirator with combination cartridges if air in breathing zone is >10 ppm but less than 20 ppm and work must continue in area	Hard hat	Leather work gloves, as needed, PVC or neoprene gloves if refuse or contaminated equipment must be touched by hands, inner glove nitrile	Tyvek® coveralls when working near refuse or contaminated equipment. If contact must be made with wet refuse or equipment , PVC rain suit over Tyvek required	Steel-toe boots with neoprene or rubber boot covers	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Fall protection for work above 6-foot level. Reflective safety vests.

Rationale:

Cover material has a very low risk for workers to exceed PEL levels as long as appropriate hygiene is followed. Washing hands and wearing long sleeve shirt and pants Dust control and suppression is expected.

Dry refuse has some potential to increase risk of exposure. Dust control and suppression is essential. The level of PPE and following hygiene practices will minimize exposure.

Wet refuse and handling contaminated wet equipment has the highest potential for dermal exposure and requires a higher level of personal protection.

TABLE 7-1 Page 1 of 2

INDUSTRIAL HYGIENE MONITORING PROGRAM

CARSON MARKETPLACE

Reference	NIOSH Occupational Exposure Sampling Strategy Manual NIOSH Publication 77-173

Discussion

The purpose of an IH monitoring program is to ensure that worker protection is sufficient to protect workers who have the greatest potential for exposure to air contaminants. At the Avalon at South Bay project the workers at greatest risk of exposure are workers who work with equipment that penetrates the refuse or are near operations that penetrate refuse. The second greatest risks for exposure are workers who work on the ground or near the surface of the landfill. This monitoring program presumes that dust control methods will minimize exposures of the latter group of workers.

Chapter 3 of the referenced manual uses a strategy of identifying workers at greatest risk and those workers who are not at the same level of risk. This strategy then requires those workers at greatest risk to have more frequent monitoring than the other workers. This strategy also presumes that workers are not routinely exposed to air contaminants on a frequent basis due to releases of vapors and gases from the landfill. If such releases are frequent and require workers to wear respiratory protection then regular air sampling exceeding this monitoring plan would be necessary. The project CIH would modify the sampling strategy to accomplish this. Once all intrusive activities are completed risk levels decrease so frequency of sampling events will be quarterly

Workers by Category	**Risk Category**	**Frequency**
Equipment Operators	2	quarterly
Ground workers (laborers)	1	monthly
Drillers and Pile Drivers Operators	2	quarterly
Drillers Helpers and Pile Drivers ground personnel	1	monthly
Liner placement workers	2	quarterly
Technicians, Engineers and Supervisors	3	annually

Types of Samples to be Collected	
Total dust (TD)	Metals (M)
Volatile Organics (O)	Polychlorinated biphenyl (PCB)

TABLE 7-1

INDUSTRIAL HYGIENE MONITORING PROGRAM

CARSON MARKETPLACE

Number of Samples to be Collected

The number of samples to be collected for each risk category is dependent on the total number of workers in each category. One method suggested by the referenced manual is to take the square root of the total number of workers in each category. For example, if there are 14 workers in risk category 2, then 3.73 workers rounded to a whole number of 4 should be sampled each quarter. The type of sample to be selected is dependent on the worker activity at time of sampling. If workers are not working in the vicinity of wells, deep dynamic compaction or piles or pile driving, then samples for total dust, metals, and/or PCBs would be collected. If the workers are working near any area where there is landfill intrusive activities it would be appropriate to also include the collection of volatile organics personal air samples. The CIH will determine for each worker in each risk classification as to the appropriate personal air samples to collect.

(The CIH will develop a collection matrix and add it to this table once the actual numbers of workers are known on site.)

Analytical Methods

All samples collected will be collected as specified in the 4th Edition of the NIOSH Manual of Analytical Methods. All samples will be sent to an AIHA (American Industrial Hygiene Association) certified laboratory. The methods to be used are as follows:

Analyte	**Method**
Total Dust	0500
Metals	7300
Volatile Organics	1500/1501/1003
PCB	5503

FIGURES

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AVALON AT SOUTH BAY

Vicinity Map

Feb. 2008	TETRA TECH	Figure 1-1

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AVALON AT SOUTH BAY

Site Map

Feb. 2008	TETRA TECH	Figure 1-2

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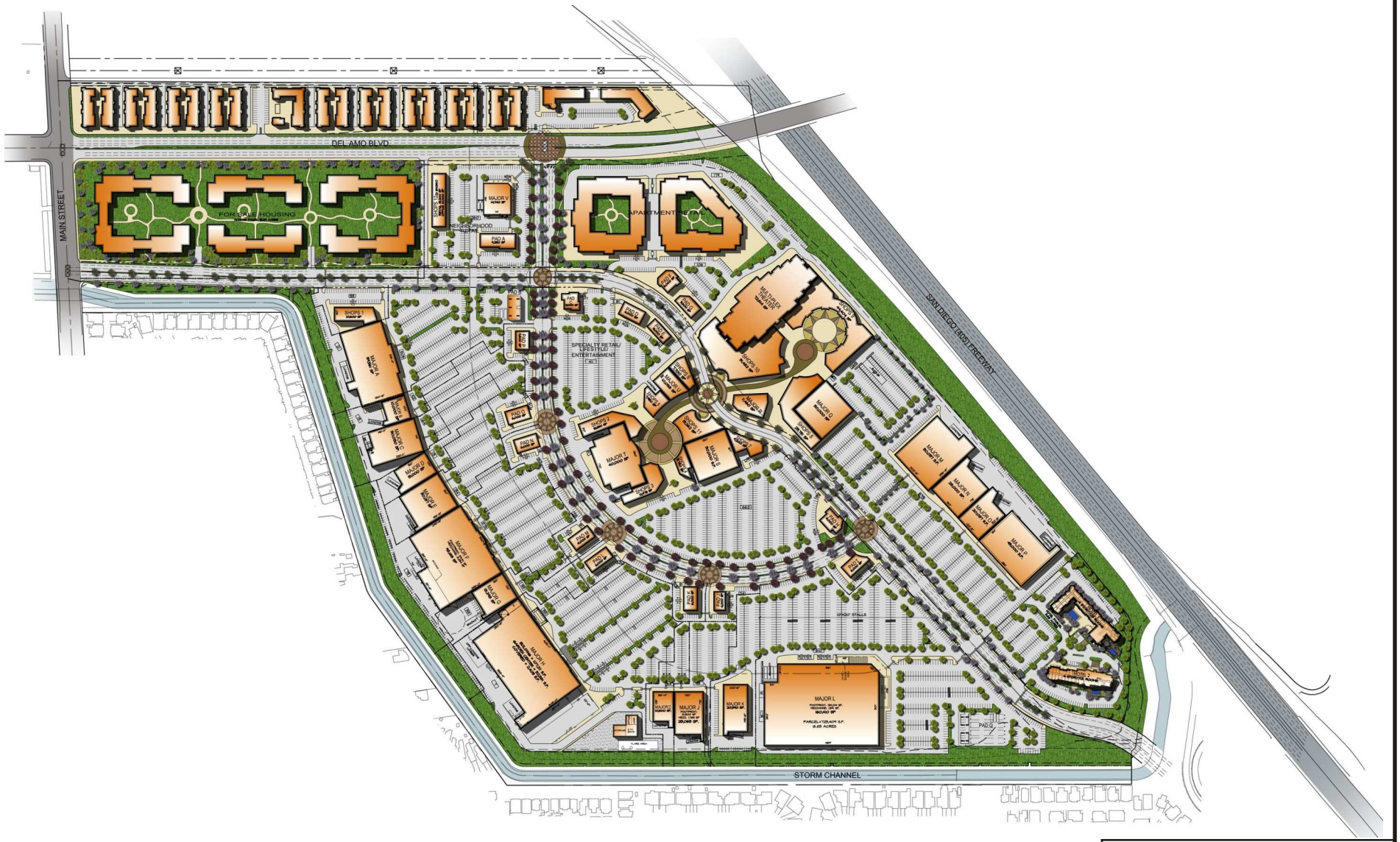

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Development Plan Date: September 17, 2007

AVALON AT SOUTH BAY

Development Plan

Feb. 2008	TETRA TECH	Figure 1-3

ATTACHMENT 1

TETRA TECH CORPORATE HEALTH AND SAFETY PROGRAMS AND SAFE WORK PRACTICES

TETRA TECH, INC.
HAZARD COMMUNICATION PROGRAM

The hazard communication program was developed to protect the right of Tetra Tech, Inc. (Tetra Tech), employees and subcontractors to access information on the chemical and physical hazards of materials they use in their work. Specifically, this written hazard communication program defines the measures to communicate these hazards and ensure that Tetra Tech employees and subcontractors are informed of chemical hazards in accordance with the requirements outlined in Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.1200, the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. The OSHA standard applies to all work places where personnel are occupationally exposed to hazardous chemicals. In addition, to ensure employee rights, this hazard communication program shall be available upon request to employees and their representatives. The hazard communication program does not apply to hazardous wastes but does apply to all hazardous materials, such as acids and caustics, used in sample preparation and to cleaning solvents brought onto and used at a work site. The responsibilities and elements associated with the hazard communication program are discussed below.

1.0 HAZARD COMMUNICATION PROGRAM RESPONSIBILITIES

Corporate Health and Safety Manager (CHSM): The CHSM shall ensure compliance with the requirements identified in this hazard communication program by conducting annual regional and subsidiary audits. The CHSM shall also act as a resource to regions and subsidiaries regarding hazard communication compliance issues.

Regional Health and Safety Representative (RHSR) and Subsidiary Health and Safety Representative (SHSR): The RHSRs and SHSRs shall ensure that all offices within their region or organization are familiar with the hazard communication program and that its program elements are implemented at each office.

Operations Manager: All operations managers shall support an effective hazard communication program within their office or area. Operations managers may elect to delegate the day-to-day administration of the hazard communication program to the office health and safety representative (OHSR).

Office Health and Safety Representative (OHSR): The OHSR, upon assignment by the operations manager, shall implement the hazard communication program within his or her office. Specifically, the OHSR shall perform the following duties:

- Communicate program requirements to employees included in the Health and Safety Program or required to implement program requirements off site
- Provide for the necessary hazard communication training
- Maintain chemical inventories and material safety data sheet (MSDS) files within their respective office

Project Manager: Project manager shall ensure that all hazard communication program requirements have been identified and addressed within site-specific health and safety plans (HASP) for their projects. This task may include, but is not limited to, the following:

- Identification of work tasks (routine and nonroutine) and performance of an associated hazard analysis
- Completion of a chemical inventory for the project
- Procurement of MSDSs for chemicals used exclusively for the project
- Labeling of containers used on site for hazardous materials
- Identification of any additional hazard communication training requirements

Site Safety Coordinator (SSC): The SSC shall be the main point of contact for hazard communication program compliance during on-site phases of project operations. The SSC shall have the following duties:

- Maintain current chemical inventories and MSDS files for the project
- Ensure compliance with container labeling requirements
- Identify new chemicals brought on site that present new hazards requiring additional training then add information to chemical inventory and MSDS files

2.0 HAZARD COMMUNICATION PROGRAM ELEMENTS

The following program elements describe how the criteria specified by the OSHA Hazard Communication Standard shall be implemented and maintained. Program elements include the following:

- Hazard determination
- Hazardous chemical inventory
- Labeling and containers
- Material Safety Data Sheets
- Employee training
- Subcontractors

Each of these elements is described below.

2.1 HAZARD DETERMINATION

In most cases, the determination of chemical hazards will be based on information provided by the chemical's manufacturer. In situations where this is not possible, a hazard determination shall be conducted by Tetra Tech based on the criteria established in Appendices A and B of the hazard communication standard of 29 CFR, Part 1910.1200.

Additionally, the chemicals listed in the following resources are to be considered hazardous and shall fall under the scope of this hazard communication program:

- 29 CFR, Part 1910, Subpart Z, "Toxic and Hazardous Substances," OSHA
- *Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment,* American Conference of Governmental Industrial Hygienists (ACGIH), latest edition
- *Annual Report on Carcinogens,* National Toxicology Program (NTP), latest edition
- International Agency for Research on Cancer (IARC) *Monographs,* latest edition

It is important to note that some chemicals not specifically defined as hazardous and regulated under the OSHA Hazard Communication Standard are subject to the State of California Health

and Safety Code "Safe Drinking Water and Toxic Enforcement Act" (Proposition 65). As necessary, Tetra Tech will provide the appropriate warnings for these chemicals as required by California Code of Regulations, Title 22, Section 12601(c). The warning may consist of a label on the container or a sign in the work area where the exposure may occur.

Chemical mixtures are defined as any combination of two or more chemicals if the combination is not in whole or in part the result of a chemical reaction. If a chemical mixture has not been tested as a whole to determine whether the mixture is hazardous, then the mixture shall be assumed to present the same health hazards as each component that makes up 1 percent or greater of the mixture by weight or volume. A mixture will be considered potentially carcinogenic if it contains a carcinogenic component at a concentration of 0.1 percent or greater.

If evidence indicates that a component in a mixture at a concentration of less than 1 percent (or, in the case of carcinogens, less than 0.1 percent) could be released at a concentration that exceeds an established OSHA permissible exposure limit or ACGIH threshold limit value or that could present a health risk to employees at the released concentration, the mixture is assumed to present the same hazard as that component.

If the mixture has not been tested as a whole to determine whether the mixture presents a physical hazard (such as combustible or explosive), Tetra Tech will use whatever scientifically valid data are available to evaluate the physical hazard potential of the mixture.

2.2 HAZARDOUS CHEMICAL INVENTORY

For each field project, the project manager will develop and maintain a current list of hazardous materials (hazardous chemical inventory) brought on site. Ideally, the list will be contained within or attached to the HASP. The existence and location of these documents shall be communicated to all employees and subcontractors prior to start of project. Small quantities of hazardous chemicals may also be present at Tetra Tech offices and storage areas. For purposes of this program or as required by the OSHA Hazard Communication Standard, chemicals and consumer products not used in the same manner, duration, or frequency intended by consumers shall be included on the hazardous chemical inventory. A list of hazardous chemicals present in the office or storage area shall be maintained by the OHSR of each Tetra Tech and subsidiary office.

2.3 LABELING AND CONTAINERS

When a chemical is received from a manufacturer or distributor, the employee responsible for its receipt will verify that the container is properly labeled with the following information:

- The contents
- Appropriate hazard warning(s) [as listed on the MSDS(s)]
- Name and address of the chemical manufacturer

All chemicals associated with a project should be stored, dispensed from, or otherwise used in their original containers. The use of secondary containers should be avoided. However, secondary containers may be used when the chemical will be immediately used by the employee that made the transfer. Container labeling is not required for secondary immediate uses.

All original labels, warnings, and other printed information must be maintained intact and plainly visible at all times. Original labels shall not be defaced. Hazardous materials will not be allowed on a project site if they are not in the original or approved containers or if the containers are unlabeled or improperly labeled. When stationary process containers, such as tanks that cannot be moved, are used on a project, Tetra Tech may elect to use signs, placards, operating procedures, or other such written materials instead of affixing labels to individual stationary containers as long as the required label information is conveyed. If written materials are used, then this information shall be readily available to employees in the area.

2.4 MATERIAL SAFETY DATA SHEETS

All chemicals brought on or used at a work site must be accompanied by MSDSs provided by the manufacturer. Chemicals will not be permitted at the work site without MSDSs. Whenever a chemical is purchased, it is the responsibility of the individual in charge of the purchase to obtain a current and complete MSDS as part of the order. A written request will be made for an MSDS if one is not received. If an MSDS is still not received after the original written request, a second request will be made in writing or by telephone. If the supplier refuses to provide an MSDS, the local OSHA office will be contacted for further assistance. If a supplier MSDS is not readily available, a generic MSDS can be used instead.

Once received, the MSDS shall be reviewed and evaluated by the purchaser and the SSC for completeness and to determine if the new chemical will pose any new or significant risks that require additional hazard communication training.

A copy of each MSDS will be maintained in the project file and included in the site-specific HASP. Employees will have unhindered access to the MSDSs at all times.

In addition, prior to beginning work, subcontractors will be required to provide the project manager with a list of all chemicals that they will use and an MSDS for each chemical. The OHSR or SSC will evaluate the MSDSs and list of chemicals to determine if the chemicals used pose any new or significant risks to Tetra Tech employees. Additional training will be provided, if required.

Each MSDS shall contain, at a minimum, the following information:

- Name of the product on the label
- Chemical and common names of each ingredient if the product is a mixture
- Physical and chemical characteristics of the chemical
- Physical hazards of the chemical
- Health hazards of the chemical
- Primary routes of exposure
- OSHA permissible exposure limits, ACGIH threshold limit values, and any other exposure limit used or recommended by the chemical manufacturer or importer
- Whether the hazardous chemical is listed in the NTP *Annual Report on Carcinogens* or has been found to be a potential carcinogen in the IARC *Monographs* or by OSHA
- Precautions for safe handling
- Exposure control measures
- Emergency and first aid procedures
- Date of MSDS preparation or the last date of the last revision

- The name, address, and telephone number of the chemical manufacturer or importer, or of someone who can provide additional information on the chemical and appropriate emergency procedures, if necessary

If no information is available for any given category on the MSDS, the chemical manufacturer is required to mark the MSDS to indicate that no applicable information was found. Blanks are not allowed.

2.5 EMPLOYEE TRAINING

The project manager or designee will provide information and training to employees upon assignment to a job task involving the use of hazardous materials and whenever a new material posing new physical or health hazards is introduced.

General information and training will be provided in the initial 40-hour health and safety training class and refresher training classes as required under 29 CFR 1910.120. Information conveyed to employees during training will include the following:

- Requirements of the hazard communication standard in 29 CFR 1910.1200
- The types of operations in an employee's work zone that involve hazardous materials
- The location of copies of the hazard communication program, MSDSs, and the chemical inventory
- Methods and observations that may be used to detect the presence or release of a hazardous material in the work area (such as monitoring conducted by the employer, continuous monitoring devices, or visual appearance or odor of hazardous materials being released)
- Recognition of signs and symptoms that may indicate exposure to hazards such as dizziness, nausea, skin rash, and other symptoms
- Signs and symptoms of chemical exposure
- Physical and health hazards associated with materials in the work area
- Protective measures, including specific procedures such as appropriate work practices, emergency procedures, and use of personal protective equipment (PPE), that Tetra Tech has implemented to protect employees from exposure to hazardous materials
- Details of the hazard communication program developed by Tetra Tech, including an explanation of the labeling system and MSDSs and how employees can obtain and use the appropriate hazard information

- How to read and use MSDSs
- When to include MSDSs in site-specific HASPs

2.6 SUBCONTRACTORS

Tetra Tech shall provide subcontractors at a work site with a copy of the site-specific HASP. The HASP shall include the following hazard communication information:

- Hazard analysis of work tasks
- Chemical hazards anticipated at the site
- Recommended PPE
- Air monitoring instruments to be used for site hazards
- Information on the major chemical hazards in the form of MSDSs or a chemical hazard information table

Tetra Tech will make available to subcontractors copies of MSDSs, by including all of them in the HASP, for each hazardous chemical brought on site by Tetra Tech that the subcontractor may be exposed to while working on site. Subcontractors will be informed of any precautionary measures that need to be taken to protect their employees using hazardous materials brought on site by Tetra Tech during the site's normal operating conditions and during potential emergency situations.

Tetra Tech will inform subcontractors of the hazardous materials labeling system used on site. Each subcontractor will be required to have its own hazard communication program in accordance with 29 CFR 1910.1200 and applicable state and local regulations. An MSDS is also required for each hazardous material a subcontractor brings to the site.

TETRA TECH, INC.
INCIDENT REPORTING AND INVESTIGATION PROGRAM

1.0 Introduction

Accepted loss control theory explains that for every major incident resulting in serious physical harm or large loss, there are several preceding minor incidents with limited impact and even more frequent near miss events with little or no significant damage. By focusing on the causes of the more frequent minor or near miss incidents, it is possible to reduce the probability that a major loss will occur.

Tetra Tech's goal of zero incident performance is based on this theory. When incidents are reported, and their cause understood and corrective measures taken - then serious or major injuries or losses will be prevented. Emphasis on incident reporting and investigation will result in a safer work environment.

This incident investigation program establishes procedures for the reporting and investigation of all incidents. This program satisfies, in part, the recording, reporting and employee participation requirements specified in Title 29 of the *Code of Federal Regulations* (CFR), Part 1904.

2.0 Policy Statement

All incidents including near-miss incidents involving Tetra Tech personnel or Tetra Tech subcontractors under Tetra Tech's immediate direction shall be reported and investigated. Investigations shall be conducted in a timely manner and provide an accurate and substantiated account of how and why the incident occurred and what corrective actions have been identified to address the investigation findings. Information gathered from the investigation shall be used by management to improve conditions to prevent future occurrence of the incident or similar incidents.

3.0 Scope

The incident reporting and investigation program shall apply to all operating units within Tetra Tech.

4.0 Responsibilities

Executive Management

Tetra Tech Management has the overall responsibility for the effective implementation and maintenance of this program. This includes assuring the necessary resources are provided and that line managers and employees are held accountable for their responsibilities under this program. Executive management will also participate in executive reviews of all major incidents as well as monitor enterprise incident metrics.

Line Management
Line Managers shall ensure that program requirements have been addressed for all areas and employees they manage, including communicating program requirements to their employees, ensuring that complete and thorough incident investigations are conducted and that corrective actions identified as the result of an incident investigation are documented, corrected and verified as complete.

Employees
Employees are responsible for performing their job duties in a manner that is compliant with the requirements of this program. Employees are responsible to report all unsafe conditions or acts and immediately report any work related incident to supervisory personnel

Health and Safety Personnel
Health and Safety Personnel are responsible for providing overall direction for the program and ensuring that all program elements are implemented at the individual operating units. They will serve as a contact for incident reporting for the operating unit and act as a resource in conducting incident investigations. Health and Safety personnel are responsible for completing the classification and documentation of all incident investigation data, reviewing investigation effectiveness, communicating lessons learned from completed incident investigations and other related issues to assure program effectiveness.

Human Resources and Workers Compensation Personnel
HR and/or WC personnel shall support the recordkeeping and reporting requirements as established by this program. Human Resources will assist in coordinating post accident drug and alcohol screening should incident circumstances or client requirements warrant testing.

5.0 Definitions

Definitions related to this program are provided below.

First Aid
Specific treatment that can be rendered by a first aid responder at the location where the injury occurred or by a physician or health care professional. Examples of first aid treatment include, but are not limited to:

- Cleansing, flushing or soaking wounds on the skin surface
- Using wound coverings such as bandages, gauze pads, steri-strips or butterfly bandages
- Administering tetanus immunizations
- Using temporary immobilization devices such as a sling or splint while transporting
- Using hot or cold therapy

A complete list of first aid treatment as defined by OSHA is found in 29 CFR **1904.7(b)(5)(ii)**

Hazardous Substance
Any substance that results or may result in adverse effects on the health or safety of an exposed employee

Incident
An incident is defined as "an undesired event which results or could have resulted in harm to people, or loss/damage to property, production, or the environment." Some examples of incidents are as follows:

- Work-related injury or illness
- Suspected hazardous substance exposure over the allowable exposure limit
- Automobile or vehicle-related incidents
- Significant property or equipment damage
- An unplanned fire or explosion
- An unplanned spill or release (including air releases) to the environment
- A permit or permit equivalent exceedance
- Unexpected contact with damage to aboveground or below ground utilities

A near miss incident is described as an undesired event or workplace condition which under slightly different circumstances had a reasonable probability of resulting in one of the outcomes described above. Some examples of near miss incidents are as follows:

- Tools falling from overhead work near workers below
- Unexpected contact without damage to aboveground or below ground utilities
- Discovery of an unknown and potentially hazardous material, or anomaly
- Discovery of confirmed or potential Munitions and Explosives of Concern or Recovered Chemical Warfare Materiel (RCWM) that may present a hazard

Injury or Illness
An injury or illness is an abnormal condition or disorder. Injuries includes such cases as, but not limited to, a cut, fracture, sprain, amputation or insect bite. Illnesses include both acute and chronic illnesses, such as, but not limited to, skin disease or disorder, respiratory conditions, poisoning or hearing loss.

Major Incident
A major incident is defined as the following:

- Results in a fatality
- Results in the hospitalization of one or more employees
- Specific treatment for the injury is rendered by a health care professional and results in permanent total, permanent partial disability or temporary total disability
- Significant property or equipment damage has occurred.

Minor Incident
A minor incident is defined as the following:

- Specific treatment for the injury is rendered by a first aid provider or health care professional either at the location of injury or at a local medical provider and the employee is treated and released
- Lost time, restricted duty or job transfer incident without permanent total or partial disability or temporary total disability

- Minimal property or equipment damage

Medical Treatment
Medical treatment includes managing and caring for a patient by a physician or health care professional for the purpose of combating disease or disorder. The following are some examples of medical treatment:

- Prescription medication
- Sutures
- Application of a rigid means of support
- Hospitalization for medical treatment

Overexposure
Exposure to a hazardous substance that results in signs or symptoms indicative of an adverse effect or reaction.

Root Cause Analysis
An investigative approach designed to identify the most basic causative factors of why and how an incident occurred.

Work Related Injury or Illness
An injury or illness is considered work related if an event or exposure in the work environment caused, contributed and in some cases significantly aggravated a pre-existing condition.

6.0 Program Elements

The following sections describe the various program elements that comprise the Tetra Tech Incident Reporting and Investigation Program. Elements include incident notification and reporting procedures, incident response and investigation, incident recording, employee participation and program evaluation.

6.1 Incident Notification and Reporting

All incidents involving Tetra Tech employees or subcontractors under the immediate direction and control of Tetra Tech personnel must be immediately reported to supervisory personnel such as the office or field supervisor or project manager or site safety coordinator. In addition, the office health and safety representative (OHSR) must be notified. The OHSR must then report the incident to the health and safety representative (HSR) of the operating unit. In the event of a major incident or an incident resulting in injury or illness, the initial notification must be made within one hour.

In the event of a major incident, the Corporate Health and Safety Director (CHSD) must be notified within one hour.

All reported incidents must be documented on the Tetra Tech Incident Report Form (Form IR) found in Vol. III of the enterprise H&S Manual. This report serves as the initial record of the incident and should be completed by the end of the work shift but no later than 24 hours after the incident. All sections of the IR Form must be completed and the form signed by the parties indicated on the form.

Supplemental incident reports (Forms IR-A through Form IR –C) may be required depending upon the type of incident that has occurred. An incident may fall into multiple incident categories; in those cases the IR form applicable for each category must be completed. All supplemental reports must be completed within 72 hours of the incident.

All completed forms must be forwarded to the HSR for review for content and completeness. Incomplete, inaccurate, or poorly compiled reports will be returned to the supervisor with comments for correction.

All Incident Report forms are provided in Appendix A of this document or can be downloaded from the Tetra Tech Intranet. Blank IR Forms should also be included in site specific health and safety plans for availability in the field. Additional sheets can be used as necessary to completely answer the questions on the forms. Any questions related to completing the form should be directed to the operating unit HSR.

6.1.1 Injury or Illness

In the event of an injury or illness, supervisory personnel such as the office or field supervisor or project manager or site safety coordinator should immediately institute emergency procedures as outlined in the site-specific HASP or other established emergency response procedures. The first priority is to arrange for first aid and off-site medical treatment if necessary.

The individual receiving the initial report must then notify the local Office Health and Safety Representative and Unit Health and Safety Representative within one hour of the injury or illness. This “golden” hour affords Tetra Tech the opportunity to utilize incident intervention services provided by the enterprise medical director. The unit HSR shall determine if the case warrants intervention and shall activate these services as appropriate.

After receiving notice of the incident and documenting the incident on the IR Form, the responsible supervisor or manager must arrange for an incident investigation. Incident investigations will be conducted and documented using Incident Report Form IR- A “Injury or Illness Report”. Injuries or illnesses that occur during travel status at projects, meetings, seminars or courses must be investigated using these forms.

The office or field supervisor or project manager or site safety coordinator along with the affected individual will complete the appropriate forms. If the individual is hospitalized and unavailable, coworkers and witnesses will be consulted.

Following completion, Form IR-A must be forwarded to the HSR for review. The HSR will review the investigation, provide comments and return a copy to the originator along with any guidance as appropriate.

For incidents involving an injury or illness requiring treatment by a physician or a health care professional, a copy of Forms IR and IR-A must be provided to the individual responsible for worker's compensation insurance claims processing and the human resources contact within the operating unit.

A copy of the completed forms should also be maintained in the project file if applicable.

Completed IR-A forms must be submitted to the HSR within 72 hours of occurrence. Copies of the completed IR and IR-A forms must be provided to the OHSR, HR and workers compensation contact within 72 hours in order to meet worker's compensation claim reporting requirements if necessary. Together, the IR and IR-A forms are considered the equivalent of the OSHA required Form 301, "Injury and Illness Incident Report" therefore, it is extremely important to complete all sections of both forms.

If a root cause analysis is required, the results of that analysis must be forwarded to the HSR and attached to the IR Form when the RCA process has been completed.

6.1.2 Near Miss

For reports of near-miss incidents, only Form IR shall be completed. If a root cause analysis is required, the results of that analysis must be forwarded to the HSR and attached to the IR Form when the RCA process has been completed.

6.1.3 Property or Equipment Damage, Fire, Spill or Release

In cases where an incident results in property or equipment damage, fire, explosion, spill or release, Form IR-B "Damage, Fire, Spill or Release" shall be completed by the responsible management representative and submitted to the OHSR and HSR within 72 hours of the incident. If a root cause analysis is required, the results of that analysis must be forwarded to the HSR and attached to the IR Form when the RCA process has been completed.

Any additional reports generated as a result of the incident shall be attached to the IR and IR-B forms and placed in project or office files as applicable.

6.1.4 Motor Vehicle

If the incident involved a motor vehicle incident, then Form IR-C "Motor Vehicle" must be completed. If a root cause analysis is required, the results of that analysis must be forwarded to the HSR and attached to the IR Form when the RCA process has been completed. All incident forms related to motor vehicle incidents must be completed within 72 hours.

Corresponding police reports should be obtained and attached to the IR and IR-C Forms

6.1.5 Subcontractor Employees

If the incident involved a subcontractor employee under the direct supervision of a Tetra Tech employee, an investigation must be conducted and documented on Form IR along with any supplemental incident report forms as required by the type of incident.

It is important to investigate the circumstances in cases of subcontractor incidents that occur while under the direction of Tetra Tech personnel in order to focus on the adequacy of the hazard assessment utilized for predicting, preventing, and responding to the incident rather than simply emphasizing a particular unsafe act.

Copies of the completed reports for subcontractor personnel must be forwarded to the HSR within 72 hours. If a root cause analysis is required, the results of that analysis must be forwarded to the HSR and attached to the IR Form when the RCA process has been completed.

The subcontractor's investigation report must be requested and attached to the applicable IR forms and placed in project or office files as applicable.

6.1.6 Supporting Incident Report Forms

Human Resources and Workers Compensation

For any incident that will result in a workers compensation claim, the HR/WC contact must complete Form IR - HR/WC. This form allows the individual filing the claim to have information readily available that will be requested by the workers compensation insurance carrier. This completed report does not need to be maintained in the H&S or project files but should remain in personnel files where confidentiality of personal employee information can be maintained.

Health and Safety

For all reported incidents, the operating unit HSR must complete Form IR-H&S. The main purpose of this form is to classify and record the incident for tracking, analysis and reporting purposes. The data recorded on this form will be maintained in the corporate database system. This form is to be completed as soon as the requested information is available. The operating unit HSR is responsible for ensuring that all supplemental reports relating to one incident are compiled and maintained together in company records.

6.2 Incident Response and Investigation

Immediate response actions, investigation objectives and root cause analysis procedures are discussed below.

6.2.1 Immediate Response Actions

In the event of an incident, the office or field supervisor, or project manager or site safety coordinator must ensure that appropriate immediate response measures have been taken. These include:

- Removing or rescuing injured or exposed employees and ensuring appropriate medical treatment is provided.
- Stopping all activity until a determination can be made that current conditions do not present a potential serious threat to personnel
- Accounting for all site employees
- Implementing measures to identify and address any hazardous condition
- Addressing “safe return to work” measures as applicable

Incident Response Checklists for both minor and major incidents have been developed and are found in Appendix B of this document or can be downloaded from the Tetra Tech Intranet These checklists outline the initial and secondary response actions and provide a summary of the types of information that must be collected as part of an effective investigation.

6.2.2 Investigation Objectives

All incidents shall be investigated in enough detail to provide the necessary facts about when, how and why the incident occurred. The goal of the investigation is to obtain accurate and objective information regarding the event. Tetra Tech has implemented a Root Cause Analysis (RCA) investigative approach as a method to truly evaluate and understand the details and facts of the incident in order to prevent recurrence and protect workers, property and the environment in addition to using resources where they would have the most benefit.

Timing is critical in any incident investigation as key facts can be forgotten or distorted, witness recollection may be affected by others and evidence can be damaged or lost. If subcontractors are involved they may not be inclined to cooperate once a contract expires. Therefore investigations must be started immediately and properly coordinated.

6.2.3 Root Cause Analysis “5 Whys”

The preferred type of RCA to be followed during an incident investigation is a less structured RCA technique termed the “5 Why Process”. By following a singular logic path and asking why at least five times, the investigator will most likely get to the root cause level of why an incident occurred.

Root Cause Analysis Worksheets have been developed to assist an investigator in this process. RCA worksheets are found in Appendix C of this document or can be downloaded from the Tetra Tech Intranet. This work sheet identifies several areas of inquiry that must be evaluated in an investigation. The areas of inquiry include factors related to personnel, management, tasks, tools/material/equipment and the work environment. Once an area of inquiry has been identified as a potential concern, the 5

Why Process must be applied to each and documented on the worksheet. Completed worksheets must be attached to the original incident report when required.

6.2.4 Corrective Actions

Corrective actions must be established for each root cause identified in the investigation and documented on a Corrective Action Plan. Corrective actions must address all immediate and root causes of the incident in order to prevent recurrence. They must be specific actions assigned to individuals with the authority for implementation along with an expected completion date. Most importantly, each corrective action established must be verified that it has been properly implemented and has effectively addressed the causes of the incident.

The corrective action tracking form can be found in the Root Cause Analysis Worksheet in Appendix C.

The supervisor, project manager or office manager is responsible for ensuring that corrective actions are implemented; however, the corrective actions should be discussed with the operating unit HSR regarding their feasibility and effectiveness prior to implementation.

6.2.5 RCA Levels and Triggers

A two level approach to RCA has been established. The following triggers will determine the level of RCA required for the incident and must be indicated on the IR report completed for the incident. Additional documentation of the completed RCA must be attached to the original IR Form.

Level One

A Level 1 RCA is conducted by individuals with experience or training in root cause analysis techniques. The team will conduct or direct documentation reviews, site investigation, witness and affected employee interviews, and identify corrective actions. A Level 1 RCA may require travel to the site. The make up of the RCA team will depend on the circumstances of the incident and may draw upon experts from within the organization to provide technical assistance if necessary. The Corporate H&S Director is the central point of contact for selecting RCA team members and activating a Level 1 RCA.

The following events will trigger a Level 1 RCA:

- Work related fatality
- Hospitalization of one or more employee for a single event
- Property damage in excess of $75,000
- When requested by senior management

Level Two
A Level 2 RCA is self performed within the operating unit by supervisory personnel with assistance of the operating unit HSR. Level 2 RCA shall utilize the 5 Why RCA methodology and document the findings on the tools provided.

The following events will trigger a Level 2 RCA:

- OSHA recordable lost time incident
- Near miss incident that could have triggered a Level 1 RCA
- When requested by senior management

6.2.6 Lessons Learned

Lessons learned from investigating incidents help identify improvement areas and prevent similar situations from occurring in the future. Once an investigation is completed it is the responsibility of the operating unit HSR to review findings and determine if a Lessons Learned communication is warranted. As appropriate, the HSR will communicate the results of the investigation and any lessons learned to others within the operating unit under similar conditions or operations. The HSR may utilize the lessons learned section of Form IR – H&S or its equivalent to communicate this information. All Lessons Learned communications must be provided to the Corporate H&S Director. The CHSD shall be responsible for distributing lessons learned communications within the enterprise as applicable.

6.3 Incident Recordkeeping

6.3.1 OSHA Recordkeeping

OSHA Recordable Injuries and Illnesses
Injuries and illnesses defined as recordable by OSHA (for example, incidents involving days away, job restrictions or medical treatment beyond basic first aid) must be recorded on OSHA Form 300, "Log of Work-Related Injuries and Illnesses". Details on OSHA recordkeeping criteria are presented in Document Control Number 1-4, "Recordkeeping and Reporting Requirements". The operating unit HSR shall determine whether the injury or illness is recordable according to OSHA recordkeeping requirements.

OSHA Reportable Injuries and Illnesses
In accordance with 29 CFR 1904.39, Tetra Tech must report to OSHA any incident involving a fatality or resulting in the in-patient hospitalization of three or more employees within 8 hours after the occurrence. Certain states may have more stringent notification requirements. This report must be made to the nearest area office of OSHA either by phone or in person. The operating unit HSR and CHSD should be immediately notified of the event and will coordinate responses and contact with the agencies involved.

6.3.2 Record Retention

All incident reports and OSHA injury and illness records must be maintained at the operating unit level for at least five years after the end of the calendar year in which the incident occurred.

6.4 Employee Involvement

All Tetra Tech employees are expected to immediately report all incidents including near miss incidents to their supervisor. Reporting of incidents is critical in providing proper medical attention, correcting unsafe conditions, and maintaining an effective incident prevention program.

Employees are also expected to cooperate in incident investigations in order to conduct a thorough investigation.

Employees are instructed in proper reporting procedures through safety training, site specific health and safety plans, company publications and guidance available on the company Intranet site.

Employees have the right to access company injury and illness records in accordance with the provisions outlined in 29 CFR 1904.35.

6.5 Program Evaluation

Evaluation of program compliance and recordkeeping will be completed during audits as described in the Tetra Tech “Health and Safety Audit Program” (Document Control No. 1-3).

Appendices

Appendix A - Incident Reporting and Investigations Forms

Form IR – Incident Report
Form IR – A “Injury or Illness”
Form IR – B “Damage, Fire, Spill or Release”
Form IR – C “Motor Vehicle Incident”

Appendix B - Incident Response Checklists

Minor Incident Response Checklist
Major Incident Response Checklist

Appendix C - Root Cause Analysis Worksheet and Corrective Action Plan

TETRA TECH, INC.
BLOODBORNE PATHOGENS EXPOSURE CONTROL PROGRAM

This exposure control program has been developed in accordance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.1030, the bloodborne pathogens standard. The purpose of this exposure control program is to minimize employee occupational exposure to blood and other infectious body fluids. This program document must be accessible to employees, as well as to Occupational Safety and Health Administration (OSHA) representatives, and shall be included or referenced in site-specific health and safety plans (HASP), as appropriate.

All medical records related to bloodborne pathogen exposure shall be maintained in accordance with 29 CFR 1910.20. Records related to exposure incidents shall be maintained with other medical records for the employee. Training records associated with this standard shall be maintained with other health and safety training records.

Compliance with this standard by regions and subsidiaries shall be evaluated during annual Health and Safety Program audits.

Regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) are responsible for implementation of this program within their respective organizations. The corporate health and safety manager (CHSM) will assist with selection of appropriate personal protective equipment (PPE) and evaluate reported exposure incidents.

The 29 CFR 1910.1030 bloodborne pathogens standard requires that the bloodborne pathogens exposure control program detail the methods of implementation for the various requirements of the standard. The following program elements comply with this requirement.

1.0 PROGRAM APPLICABILITY AND EXPOSURE DETERMINATION

This program applies to all employees who may reasonably be anticipated to have occupational exposure to blood or other potentially infectious materials (OPIM). It is currently anticipated that exposure to potentially infectious material will be limited to trained staff who provide first aid and cardiopulmonary resuscitation (CPR) to coworkers, guests, visitors, or other on-site- personnel.

All job classifications and associated tasks should be investigated to determine which employees may be expected to incur occupational exposure; the determination should be made regardless of frequency and use of PPE. Additional exposure determinations specific to field projects or offices shall be made by the RHSR or SHSR. All identified tasks and controls specific to field project work shall be documented and implemented within the site-specific HASP.

2.0 UNIVERSAL PRECAUTIONS

In 1987, the Centers for Disease Control and Prevention (CDC) published a document recommending that precautions be consistently used for all patients whenever contact with blood and body fluid is possible, regardless of their bloodborne infection status. This recommendation is referred to as universal precautions; it is an approach to infection control. Universal precautions are intended to prevent parenteral, mucous membrane, and nonintact skin exposures of healthcare providers to bloodborne pathogens. According to the concept of universal precautions, all human blood and certain body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), Hepatitis B (HBV), and other bloodborne pathogens.

The proactive use of universal precautions shall be implemented during all first aid activities whenever contact with blood or OPIM may be reasonably anticipated. All blood or OPIM shall be considered infectious regardless of the perceived status of the source individual. Universal precautions should be attained by using engineering controls, work practice controls, and PPE.

3.0 ENGINEERING AND WORK PRACTICE CONTROLS

Whenever possible, engineering and work practice controls shall be implemented to eliminate or minimize employee exposures. Such controls may include, but are not limited to, the following:

- Hand-washing supplies should be available at all field project sites. At a minimum, antiseptic hand cleaner with clean paper towels or antiseptic towellettes will be provided.
- Employees shall be instructed to wash hands and skin with soap and water or flush mucous membranes immediately or as soon as feasible after contact with blood or OPIM.
- No eating, drinking, smoking, cosmetics or lip balm application, or handling of contact lenses is allowed in areas with reasonable likelihood of occupational exposure to blood or OPIM.

- In rare cases where employees may come across waste items contaminated with blood or OPIM, care shall be taken to avoid potential contact.

- Any needles or sharp objects shall be placed in a puncture-resistant, labeled, leak-proof container. Under no conditions shall needles or contaminated sharp objects be bent, sheared, broken, or recapped.

- All waste created during first aid administration, including PPE, shall be disposed of in a sealable waste bag for disposal. All sanitary napkin and tampon disposal receptacles in restroom facilities shall be lined with plastic bags that are removed and replaced daily. Because these items do not meet the definition of regulated waste under the bloodborne pathogens standard and pose minimal risk of exposure, they can be disposed of in the sealed plastic bags in regular waste containers.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Tetra Tech shall provide occupationally exposed employees with appropriate PPE at no cost. PPE may include the following items:

- Gloves
- Protective clothing
- Eye protection such as face shields or masks
- Ventilation devices such as mouthpieces, resuscitation bags, or pocket masks

PPE shall be selected based on the potential exposure to blood or other OPIM. PPE is considered appropriate only if it does not permit blood or OPIM to pass through to or reach the employee's work clothes, street clothes, skin, eyes, mouth, or mucous membranes under normal conditions and for the duration of time it will be used. PPE shall be worn during any first aid response involving blood or OPIM.

Disposable gloves and pocket masks will be included in the standard first aid kit required at all field sites and offices. Gloves shall be worn whenever it is reasonably anticipated that employees will have hand contact with blood, nonintact skin, mucous membranes, or OPIM, and when handling or touching contaminated items or surfaces.

Disposable gloves and mouthpieces will not be washed or decontaminated for reuse and must be replaced when they become contaminated, torn, or punctured, or when their ability to function as a barrier is compromised.

5.0 HOUSEKEEPING

In general, work areas are not expected to be contaminated with blood or OPIM unless in the event of a severe injury. In that case, all surfaces and equipment shall be cleaned and disinfected after contact with blood or OPIM as soon as possible with a diluted bleach solution (concentration ratio 1:10) or other appropriate disinfectant.

If contaminated sharp objects or broken glassware are encountered, these items shall not be picked up by hand. Mechanical means of retrieval (such as use of a broom and dust pan, tongs, or forceps) shall be used. Any reusable bin, pail, can, and similar receptacles that could become contaminated must be inspected and decontaminated with a bleach solution as soon as possible when contamination is visible.

Clothing contaminated with blood or OPIM shall be bagged, labeled, and discarded as regulated waste.

6.0 REGULATED WASTE DISPOSAL

The handling, storage, treatment, and disposal of all regulated waste shall be conducted in accordance with all applicable federal, state, and local regulations. Proper handling of regulated waste is essential to prevent unnecessary exposure to blood and OPIM. Regulated waste includes wastes in which blood or OPIM could be released from pouring, dripping, squeezing, or flaking. Regulated waste must be placed in a red biohazard bag labeled “Biohazardous Waste” or with the international symbol and the word “Biohazard.” Bags must be tied shut and placed in closable, leak-resistant and labeled containers that can prevent leakage during all handling, storage, transport, shipping, and other activities. If the outside of the container becomes contaminated, it must be placed in a secondary container meeting the same specifications.

Nonregulated waste can be disposed of along with regular waste. This waste must be placed in a leak-proof container, closed tightly, and promptly placed into a garbage receptacle.

7.0 HEPATITIS B VACCINATION AND POST-EXPOSURE EVALUATION AND FOLLOW-UP

Tetra Tech shall make available to employees the HBV vaccination series and a post-exposure evaluation and follow-up following an exposure incident. An exposure incident includes a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or OPIM resulting from the performance of an employee's duties. Bloodborne pathogen health hazard information for HBV is presented in the appendix to this program document. The HBV vaccination and post-exposure evaluation and follow-up are discussed below.

7.1 HEPATITIS B VACCINATION

In accordance with the OSHA Directive "Change to OSHA Instruction CPL 3-2.44C" dated July 1, 1992, a pre-exposure HBV vaccination does not have to be offered to employees who are designated only as first aid providers and those whose primary job assignment is not rendering first aid but administering first aid only as a collateral duty to their routine work assignments; however, the HBV vaccination series will be made available to any unvaccinated first aid provider who has rendered assistance in any situation involving the presence of blood or OPIM, regardless of whether an actual exposure incident occurred.

If the employee initially declines the vaccination but decides later to accept, Tetra Tech will provide the vaccination series at that time. If an employee eligible for the vaccination series declines to participate, he or she must sign the "Hepatitis B Vaccine Declination" (Form BBP-1; see Volume III, "Forms").

7.2 POST-EXPOSURE EVALUATION AND FOLLOW-UP

A confidential medical evaluation and follow-up shall be immediately provided to exposed employees following the report of an exposure incident. The post-exposure evaluation and follow-up shall include the following:

- Documentation of the exposure route and exposure incident circumstances
- Identification and documentation of the source individual (unless identification is not feasible or prohibited by law)
- Collection and testing of blood for HBV and HIV serological status

- Post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service
- Counseling
- Evaluation of reported illness

The source individual's blood shall be tested as soon as feasible after consent is obtained to determine and document HBV and HIV infection status. If the source individual is already known to be infected with HBV or HIV, the blood testing need not take place. The test results shall be made available to the exposed employee, and any applicable laws and regulations regarding disclosure of identity and infection status of the source individual will be complied with. Details of the exposure incident investigation shall be documented on the Tetra Tech "Post-Exposure Evaluation" (Form BBP-2, see Volume III, "Forms"). Copies of the completed form shall be forwarded to the RHSR, SHSR, and designated healthcare professional.

Information provided to the healthcare professional and the healthcare professional's written opinion for follow-up are discussed below.

7.2.1 Information Provided to the Healthcare Professional

In the event of an exposure incident, Tetra Tech shall provide the following information to the healthcare professional responsible for the employee's HBV vaccination:

- A copy of 29 CFR 1910.1030
- A description of the exposed employee's duties as they relate to the exposure incident
- Documentation of the routes of exposure and exposure incident circumstances
- Results of source individual's blood testing, if available
- All medical records relevant to the appropriate medical treatment, including vaccination status
- A copy of Form BBP-2, "Post-Exposure Evaluation"

7.2.2 Healthcare Professional's Written Opinion

Tetra Tech employees shall receive a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation. The opinion for HBV vaccination shall be limited to whether the vaccination is indicated and if the employee has received such vaccination. The employee will be informed of the results of the examination. During the evaluation, the employee will also be told about any medical conditions that may result from exposure to blood or OPIM and that may require further evaluation or treatment. All other findings or diagnoses shall remain confidential and shall not be included in the healthcare professional's written opinion.

8.0 INFORMATION AND TRAINING

All Tetra Tech employees with the potential for occupational exposure to blood and OPIM will receive training at the time of initial assignment to tasks during which occupational exposure might occur and at least annually thereafter. The training may be included with other health and safety training. Additional training will be provided when changes in tasks or procedures affect employee exposure potential. The training program shall contain or address the following elements:

- A copy of the 29 CFR 1910.1030 bloodborne pathogens standard, along with an explanation of its contents
- Epidemiology and symptoms of bloodborne diseases
- Modes of transmission of bloodborne pathogens
- Explanation of the Tetra Tech Bloodborne Pathogens Exposure Control Program and means by which the employee can obtain a copy
- Methods for recognizing tasks and other activities that may involve exposure to blood and OPIM
- Use and limitations of exposure prevention or reduction methods, including engineering controls, work practices, and PPE
- PPE types and their proper use, location, removal, handling, decontamination, disposal, and basis for selection
- HBV vaccination efficacy, safety, method of administration, benefits, and that the vaccine and vaccination will be offered free to eligible employees
- Appropriate actions in the event of an emergency involving blood or OPIM

- Procedures to follow in the event of an exposure incident, including method of reporting and medical follow-up that will be made available in accordance with Document Control No. 2-2

- Details of the post-exposure evaluation and follow-up

- Signs and labels and/or color coding regulated waste containers or other containers of blood or OPIM

All training conducted shall be documented and the training records kept for 3 years. An example of a suitable training record is Form BBP-3, "Bloodborne Pathogens Training" (see Volume III, "Forms"). Training documentation shall include the dates of the training, the contents or summary of the training session, names and qualifications of persons conducting the training, and the names of those attending.

TETRA TECH, INC.
BLOODBORNE PATHOGENS EXPOSURE CONTROL PROGRAM

This exposure control program has been developed in accordance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.1030, the bloodborne pathogens standard. The purpose of this exposure control program is to minimize employee occupational exposure to blood and other infectious body fluids. This program document must be accessible to employees, as well as to Occupational Safety and Health Administration (OSHA) representatives, and shall be included or referenced in site-specific health and safety plans (HASP), as appropriate.

All medical records related to bloodborne pathogen exposure shall be maintained in accordance with 29 CFR 1910.20. Records related to exposure incidents shall be maintained with other medical records for the employee. Training records associated with this standard shall be maintained with other health and safety training records.

Compliance with this standard by regions and subsidiaries shall be evaluated during annual Health and Safety Program audits.

Regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) are responsible for implementation of this program within their respective organizations. The corporate health and safety manager (CHSM) will assist with selection of appropriate personal protective equipment (PPE) and evaluate reported exposure incidents.

The 29 CFR 1910.1030 bloodborne pathogens standard requires that the bloodborne pathogens exposure control program detail the methods of implementation for the various requirements of the standard. The following program elements comply with this requirement.

1.0 PROGRAM APPLICABILITY AND EXPOSURE DETERMINATION

This program applies to all employees who may reasonably be anticipated to have occupational exposure to blood or other potentially infectious materials (OPIM). It is currently anticipated that exposure to potentially infectious material will be limited to trained staff who provide first aid and cardiopulmonary resuscitation (CPR) to coworkers, guests, visitors, or other on-site- personnel.

All job classifications and associated tasks should be investigated to determine which employees may be expected to incur occupational exposure; the determination should be made regardless of frequency and use of PPE. Additional exposure determinations specific to field projects or offices shall be made by the RHSR or SHSR. All identified tasks and controls specific to field project work shall be documented and implemented within the site-specific HASP.

2.0 UNIVERSAL PRECAUTIONS

In 1987, the Centers for Disease Control and Prevention (CDC) published a document recommending that precautions be consistently used for all patients whenever contact with blood and body fluid is possible, regardless of their bloodborne infection status. This recommendation is referred to as universal precautions; it is an approach to infection control. Universal precautions are intended to prevent parenteral, mucous membrane, and nonintact skin exposures of healthcare providers to bloodborne pathogens. According to the concept of universal precautions, all human blood and certain body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), Hepatitis B (HBV), and other bloodborne pathogens.

The proactive use of universal precautions shall be implemented during all first aid activities whenever contact with blood or OPIM may be reasonably anticipated. All blood or OPIM shall be considered infectious regardless of the perceived status of the source individual. Universal precautions should be attained by using engineering controls, work practice controls, and PPE.

3.0 ENGINEERING AND WORK PRACTICE CONTROLS

Whenever possible, engineering and work practice controls shall be implemented to eliminate or minimize employee exposures. Such controls may include, but are not limited to, the following:

- Hand-washing supplies should be available at all field project sites. At a minimum, antiseptic hand cleaner with clean paper towels or antiseptic towellettes will be provided.
- Employees shall be instructed to wash hands and skin with soap and water or flush mucous membranes immediately or as soon as feasible after contact with blood or OPIM.
- No eating, drinking, smoking, cosmetics or lip balm application, or handling of contact lenses is allowed in areas with reasonable likelihood of occupational exposure to blood or OPIM.

- In rare cases where employees may come across waste items contaminated with blood or OPIM, care shall be taken to avoid potential contact.

- Any needles or sharp objects shall be placed in a puncture-resistant, labeled, leak-proof container. Under no conditions shall needles or contaminated sharp objects be bent, sheared, broken, or recapped.

- All waste created during first aid administration, including PPE, shall be disposed of in a sealable waste bag for disposal. All sanitary napkin and tampon disposal receptacles in restroom facilities shall be lined with plastic bags that are removed and replaced daily. Because these items do not meet the definition of regulated waste under the bloodborne pathogens standard and pose minimal risk of exposure, they can be disposed of in the sealed plastic bags in regular waste containers.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Tetra Tech shall provide occupationally exposed employees with appropriate PPE at no cost. PPE may include the following items:

- Gloves
- Protective clothing
- Eye protection such as face shields or masks
- Ventilation devices such as mouthpieces, resuscitation bags, or pocket masks

PPE shall be selected based on the potential exposure to blood or other OPIM. PPE is considered appropriate only if it does not permit blood or OPIM to pass through to or reach the employee's work clothes, street clothes, skin, eyes, mouth, or mucous membranes under normal conditions and for the duration of time it will be used. PPE shall be worn during any first aid response involving blood or OPIM.

Disposable gloves and pocket masks will be included in the standard first aid kit required at all field sites and offices. Gloves shall be worn whenever it is reasonably anticipated that employees will have hand contact with blood, nonintact skin, mucous membranes, or OPIM, and when handling or touching contaminated items or surfaces.

Disposable gloves and mouthpieces will not be washed or decontaminated for reuse and must be replaced when they become contaminated, torn, or punctured, or when their ability to function as a barrier is compromised.

5.0 HOUSEKEEPING

In general, work areas are not expected to be contaminated with blood or OPIM unless in the event of a severe injury. In that case, all surfaces and equipment shall be cleaned and disinfected after contact with blood or OPIM as soon as possible with a diluted bleach solution (concentration ratio 1:10) or other appropriate disinfectant.

If contaminated sharp objects or broken glassware are encountered, these items shall not be picked up by hand. Mechanical means of retrieval (such as use of a broom and dust pan, tongs, or forceps) shall be used. Any reusable bin, pail, can, and similar receptacles that could become contaminated must be inspected and decontaminated with a bleach solution as soon as possible when contamination is visible.

Clothing contaminated with blood or OPIM shall be bagged, labeled, and discarded as regulated waste.

6.0 REGULATED WASTE DISPOSAL

The handling, storage, treatment, and disposal of all regulated waste shall be conducted in accordance with all applicable federal, state, and local regulations. Proper handling of regulated waste is essential to prevent unnecessary exposure to blood and OPIM. Regulated waste includes wastes in which blood or OPIM could be released from pouring, dripping, squeezing, or flaking. Regulated waste must be placed in a red biohazard bag labeled “Biohazardous Waste” or with the international symbol and the word “Biohazard.” Bags must be tied shut and placed in closable, leak-resistant and labeled containers that can prevent leakage during all handling, storage, transport, shipping, and other activities. If the outside of the container becomes contaminated, it must be placed in a secondary container meeting the same specifications.

Nonregulated waste can be disposed of along with regular waste. This waste must be placed in a leak-proof container, closed tightly, and promptly placed into a garbage receptacle.

7.0 HEPATITIS B VACCINATION AND POST-EXPOSURE EVALUATION AND FOLLOW-UP

Tetra Tech shall make available to employees the HBV vaccination series and a post-exposure evaluation and follow-up following an exposure incident. An exposure incident includes a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or OPIM resulting from the performance of an employee's duties. Bloodborne pathogen health hazard information for HBV is presented in the appendix to this program document. The HBV vaccination and post-exposure evaluation and follow-up are discussed below.

7.1 HEPATITIS B VACCINATION

In accordance with the OSHA Directive "Change to OSHA Instruction CPL 3-2.44C" dated July 1, 1992, a pre-exposure HBV vaccination does not have to be offered to employees who are designated only as first aid providers and those whose primary job assignment is not rendering first aid but administering first aid only as a collateral duty to their routine work assignments; however, the HBV vaccination series will be made available to any unvaccinated first aid provider who has rendered assistance in any situation involving the presence of blood or OPIM, regardless of whether an actual exposure incident occurred.

If the employee initially declines the vaccination but decides later to accept, Tetra Tech will provide the vaccination series at that time. If an employee eligible for the vaccination series declines to participate, he or she must sign the "Hepatitis B Vaccine Declination" (Form BBP-1; see Volume III, "Forms").

7.2 POST-EXPOSURE EVALUATION AND FOLLOW-UP

A confidential medical evaluation and follow-up shall be immediately provided to exposed employees following the report of an exposure incident. The post-exposure evaluation and follow-up shall include the following:

- Documentation of the exposure route and exposure incident circumstances
- Identification and documentation of the source individual (unless identification is not feasible or prohibited by law)
- Collection and testing of blood for HBV and HIV serological status

- Post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service
- Counseling
- Evaluation of reported illness

The source individual's blood shall be tested as soon as feasible after consent is obtained to determine and document HBV and HIV infection status. If the source individual is already known to be infected with HBV or HIV, the blood testing need not take place. The test results shall be made available to the exposed employee, and any applicable laws and regulations regarding disclosure of identity and infection status of the source individual will be complied with. Details of the exposure incident investigation shall be documented on the Tetra Tech "Post-Exposure Evaluation" (Form BBP-2, see Volume III, "Forms"). Copies of the completed form shall be forwarded to the RHSR, SHSR, and designated healthcare professional.

Information provided to the healthcare professional and the healthcare professional's written opinion for follow-up are discussed below.

7.2.1 Information Provided to the Healthcare Professional

In the event of an exposure incident, Tetra Tech shall provide the following information to the healthcare professional responsible for the employee's HBV vaccination:

- A copy of 29 CFR 1910.1030
- A description of the exposed employee's duties as they relate to the exposure incident
- Documentation of the routes of exposure and exposure incident circumstances
- Results of source individual's blood testing, if available
- All medical records relevant to the appropriate medical treatment, including vaccination status
- A copy of Form BBP-2, "Post-Exposure Evaluation"

7.2.2 Healthcare Professional's Written Opinion

Tetra Tech employees shall receive a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation. The opinion for HBV vaccination shall be limited to whether the vaccination is indicated and if the employee has received such vaccination. The employee will be informed of the results of the examination. During the evaluation, the employee will also be told about any medical conditions that may result from exposure to blood or OPIM and that may require further evaluation or treatment. All other findings or diagnoses shall remain confidential and shall not be included in the healthcare professional's written opinion.

8.0 INFORMATION AND TRAINING

All Tetra Tech employees with the potential for occupational exposure to blood and OPIM will receive training at the time of initial assignment to tasks during which occupational exposure might occur and at least annually thereafter. The training may be included with other health and safety training. Additional training will be provided when changes in tasks or procedures affect employee exposure potential. The training program shall contain or address the following elements:

- A copy of the 29 CFR 1910.1030 bloodborne pathogens standard, along with an explanation of its contents
- Epidemiology and symptoms of bloodborne diseases
- Modes of transmission of bloodborne pathogens
- Explanation of the Tetra Tech Bloodborne Pathogens Exposure Control Program and means by which the employee can obtain a copy
- Methods for recognizing tasks and other activities that may involve exposure to blood and OPIM
- Use and limitations of exposure prevention or reduction methods, including engineering controls, work practices, and PPE
- PPE types and their proper use, location, removal, handling, decontamination, disposal, and basis for selection
- HBV vaccination efficacy, safety, method of administration, benefits, and that the vaccine and vaccination will be offered free to eligible employees
- Appropriate actions in the event of an emergency involving blood or OPIM

- Procedures to follow in the event of an exposure incident, including method of reporting and medical follow-up that will be made available in accordance with Document Control No. 2-2

- Details of the post-exposure evaluation and follow-up

- Signs and labels and/or color coding regulated waste containers or other containers of blood or OPIM

All training conducted shall be documented and the training records kept for 3 years. An example of a suitable training record is Form BBP-3, "Bloodborne Pathogens Training" (see Volume III, "Forms"). Training documentation shall include the dates of the training, the contents or summary of the training session, names and qualifications of persons conducting the training, and the names of those attending.

TETRA TECH, INC.
HEARING CONSERVATION PROGRAM

This hearing conservation program has been established by Tetra Tech, Inc. (Tetra Tech), to protect employees from the harmful effects of noise exposure. This program is designed to comply with the Occupational Safety and Health Administration (OSHA) occupational noise exposure standard in Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.95, as well as federal, state, local, and contractual requirements.

Regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) are responsible for application and oversight of the hearing conservation program within their respective organizations. The RHSRs and SHSRs will maintain records of all noise exposure measurements for at least 2 years.

Project managers are responsible for ensuring compliance with hearing conservation controls and protection at their project sites. The site safety coordinator (SSC) is responsible for identifying noise control areas or operations and implementing the program on a site-specific basis. Field personnel are responsible for wearing appropriate hearing protection devices and following hearing conservation procedures in a noise control area.

The hearing conservation program elements describe how the criteria specified by the OSHA standard shall be implemented and maintained. Program elements include action levels, monitoring, employee notification, audiometric testing, hearing protection, warning signs and information, and training. This hearing conservation program shall be made available upon request to employees and their representatives.

1.0 ACTION LEVELS

The OSHA action level for noise is an 8-hour, time-weighted average (TWA) of 85 decibels measured on the A-weighted scale (dBA) in the slow response mode. When employees are exposed to sound that exceeds this action level, employers must implement specific hearing conservation program elements, including audiometric testing for exposed employees, training, and providing suitable hearing protection. Whenever possible, administrative or engineering controls will be used to reduce the sound level. If such controls are not feasible or fail to reduce sound levels to below 85 dBA, hearing protection will be

provided to employees to reduce sound exposures to below the 85 dBA limit. The Tetra Tech hearing conservation program mandates the use of hearing protection for 8-hour, TWA exposures of 85 dBA or greater.

2.0 MONITORING

In most instances, high noise levels at a work site are caused by subcontractor equipment, such as drill rigs and backhoes, or sources associated with the work site, such as factory equipment and vehicles. Most common high-noise-level sources have been measured, and instances where hearing protection is required shall be indicated in the site-specific health and safety plan (HASP). When noise exposures at a work site are suspected to equal or exceed an 8-hour, TWA of 85 dBA resulting from noise sources not previously measured, the SSC will conduct an evaluation to characterize the noise sources and exposure levels.

A portable sound-level meter is recommended for surveying general work areas and for estimating noise exposure when the noise levels are relatively constant. Noise dosimeters are recommended for documenting full-shift noise exposures when noise sources fluctuate, are intermittent, or otherwise difficult to document with the sound-level meter. Monitoring for occupational noise exposure will be conducted for each representative task or job position that the SSC deems necessary.

All noise measurements will be taken in the hearing zone of the individual. The hearing zone is an area within a radius not to exceed 12 inches from the ear closest or in most direct proximity to the noise source.

Monitoring equipment must be in factory calibration and will be checked in the field with an appropriate field calibration check standard before and after each set of measurements. Documentation of test field calibration checks will be kept with the field data collected.

In some cases, such as short-term and limited budget projects, the SSC may forgo actual noise level measurements and use a simple rule-of-thumb test to determine if noise levels are in excess of 85 dBA. The test requires the SSC to determine how loud he or she must speak to be heard at arm’s length from another person. If the SSC must raise his or her voice to be heard, average noise levels likely exceed 85 dBA.

3.0 EMPLOYEE NOTIFICATION

The SSC is responsible for informing employees exposed at or above an 8-hour, TWA of 85 dBA of the results of the monitoring.

4.0 AUDIOMETRIC TESTING

Audiometric testing is a component of the Tetra Tech medical surveillance program (see Document Control No. 3-2). The program consists of baseline audiograms, annual audiograms, and termination audiograms. Employees will be informed of the results of these tests at the time of their examination. Audiometric test results will be retained for Tetra Tech by our medical surveillance administrator or the medical clinic conducting the testing and will become a part of each employee's permanent medical record. Exposure and audiometric records will be made available to employees upon request.

5.0 HEARING PROTECTION

Tetra Tech will provide hearing protectors to all personnel that may experience 8-hour, TWA noise exposures of 85 dBA or greater. Hearing protectors must provide sufficient attenuation to limit employee noise exposure to an 8-hour, TWA of less than 85 dBA. The hearing protectors will be replaced as necessary. The SSC will supervise the correct use of hearing protectors at a work site. Personnel will receive instruction in proper fitting during initial and annual health and safety refresher classes.

6.0 WARNING SIGNS AND INFORMATION

The SSC will post "Hearing Protection Required" signs in areas where noise levels have been measured and determined to exceed the 85-dBA, TWA action level. Signs may also be posted in areas where monitoring has not been conducted but noise levels are expected to exceed the 85-dBA, TWA level based on similarity to past activities or on the judgment of the SSC.

For short-duration projects or where personnel exposure in the high-noise area is limited and controlled, the SSC may provide verbal notice of the need for hearing protection in place of the signs described above.

7.0 TRAINING

Hearing conservation training may be conducted as a stand-alone course or may be included in 40-hour initial health and safety training. This training will include the following:

- Effects of noise on hearing
- The purpose of hearing protectors
- The advantages, disadvantages, and attenuation of various types of hearing protection
- Instruction on selection, fitting, use, and care of hearing protectors
- The purpose of audiometric testing and an explanation of the test procedure

Documentation of training will be through class attendance records and course agendas. Specific components of the Tetra Tech hearing conservation program will be discussed during annual refresher training classes and documented through attendance records and course agendas.

TETRA TECH, INC.
CONFINED SPACE ENTRY PROGRAM

The purpose of this confined space entry program is to establish specific procedures to protect Tetra Tech, Inc. (Tetra Tech), and subcontractor employees from the hazards of entry into both non-permit and permit-required confined spaces. Procedures for confined space entry are based on the requirements of Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.146.

All requirements specified in this program will apply to all Tetra Tech employees and subcontractors working under the direct supervision of Tetra Tech. Evaluation of confined space entry program compliance and associated recordkeeping will be completed during regional and subsidiary audits conducted by the corporate health and safety office.

Definitions, responsibilities, program elements, and recordkeeping associated with the confined space entry program are discussed below.

1.0 DEFINITIONS

The following definitions apply to Tetra Tech's confined space entry program:

Attendant: A person who is stationed outside of a permit-required confined space, monitors the authorized entrants, performs other duties for the work, and has the authority to cancel the permit or certification if necessary and when the work is complete

Confined Space: A space or work area containing all of the following characteristics:

- Is large enough and configured so that an employee can bodily enter the space or area and perform assigned work
- Has limited or restricted means for entry or exit; examples are tanks, silos, vats, degreasers, sewers, tunnels, hoppers, underground utility vaults, and pipelines; low-lying outdoor areas such as ravines, ditches, pits, and trenches tend to accumulate heavier-than-air vapors and gases and may also qualify as confined spaces
- Is not designed for continuous employee occupancy

Non-Permit Required Confined Space: A confined space that does not contain, or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm

Permit-Required Confined Space: Any space or work area that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- Has an internal configuration that can trap or asphyxiate an entrant by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section
- Contains any other recognized serious safety or health hazard

Hazardous Atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape unaided from a space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL)
- Airborne combustible dust at a concentration that meets or exceeds its LEL (this condition is met if dust obscures vision at a distance of 5 feet or less)
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
- Atmospheric concentration of any substance that could result in employee exposure in excess of the substance's permissible exposure limit
- Any other atmospheric condition that is immediately dangerous to life or health (IDLH)

Entry: The action by which a person passes though an opening into a permit-required confined space; entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space

2.0 RESPONSIBILITIES

The responsibilities of personnel involved in the confined space entry program or that supervise such activities are as follows:

Operations Manager: The operations manager shall ensure the communication and implementation of the confined space entry program within his or her affected areas.

Project Manager: All project managers are responsible for implementation of the confined space entry program within their respective projects. Specifically, project managers shall ensure the following:

- Completion of a confined space entry permit (CSEP) or entry certificate, as appropriate, and that the conditions of each permit or certificate are not violated
- The availability of proper equipment necessary for safe confined space entry; equipment may include, but not be limited to communication, rescue, testing, and ventilation equipment, and personal protective equipment (PPE)
- That individuals authorizing CSEPs are qualified and trained
- That all personnel, including subcontractors, identified as authorized entrants or attendants have been properly trained
- That all documentation of training, permits, or certificates are maintained in permanent file records

Site Safety Coordinator (SSC): The SSC shall assist the project manager as necessary in preparation for confined space entry work, including obtaining equipment, implementing training, preparing health and safety plans (HASP), and other activities.

Corporate Health and Safety Manager (CHSM): The CHSM shall provide oversight and auditing of regional and subsidiary confined space entry program implementation.

3.0 PROGRAM ELEMENTS

Tetra Tech employees and subcontractor employees shall not enter a confined space without strict adherence to all preparation and entry procedures outlined in this program. Confined spaces that cannot be cleared of atmospheric hazards shall not be entered until all provisions and procedures for entry into a permit-required confined spaces are followed. Permit-required confined space entry procedures are provided in Safe Work Practices (SWP) 6-23 (see Volume III, “Safe Work Practices”). The CSEP is Form CS-1 in Volume III, “Forms.”

Procedures for entry into non-permit required confined spaces are outlined in SWP 6-24. The entry form is Form CS-2, "Preparation and Testing of Non-Permit Required Confined Space," in Volume III, "Forms." Non-permit required confined spaces meet the definition detailed in Section 1.0 of this program. The non-permit required confined space shall not have continuous sources of atmospheric hazards or uncontrolled physical hazards. If these conditions cannot be achieved, then the space shall be classified as a permit-required confined space.

If the project manager can demonstrate the absence of any hazardous conditions preventing safe entry through monitoring and inspection data, then entry into these confined space may follow the non-permit required entry procedures outlined in SWP 6-24 and Form CS-2. If initial entry is required to obtain monitoring and inspection data, then the initial entry shall be conducted in accordance with the permit-required confined space entry procedures.

Hazard identification, hazard control, permit and certification systems, and employee training under the confined space entry program are discussed below. These program elements fulfill the requirements of 29 CFR 1910.146.

3.1 HAZARD IDENTIFICATION

The project manager and SSC shall evaluate the scope of work at each job site and identify all confined space entry locations. All confined spaces shall be considered permit-required confined spaces until pre-entry procedures described in SWPs 6-23 and 6-24 demonstrate otherwise.

If the site contains permit-required confined spaces, Tetra Tech shall inform exposed employees, the client, and all subcontractors of the existence, location, and danger posed by the permit-required confined spaces by posting signs or another equally effective means.

3.2 HAZARD CONTROL

Employees entering confined spaces are subject to chemical and nonchemical hazards. The nonchemical hazards include the following:

Thermal Effects: Workers within confined spaces are prone to heat stress. Because of the nature and design of confined spaces, moisture control and radiant heat are difficult to control. All personnel

working within and around confined spaces shall be trained in the recognition of the signs and symptoms of heat stress and work and rest regimen guidelines. Special precautions must also be taken in cold environments to prevent frostbite, trench foot, and general hypothermia. Heat and cold stress control measures are outlined in SWPs 6-15 and 6-16 in Volume III, "Safe Work Practices."

Noise: Because of the nature of confined spaces, noise may be intensified and expose the employee to higher decibel levels than in an outside environment. The project manager shall evaluate noise exposures within the confined space as appropriate and comply with the Tetra Tech Hearing Conservation Program as necessary (see Document Control No. 2-4). Noise within the confined space may also interfere with communication between personnel inside and outside the space. Measures such as intrinsically safe communication devices, hand signals, or air horns shall be used if workers are unable to hear voice commands or danger signals because of excessive noise.

The hazard control measures discussed below for lockout and tagging, cleaning, entry and exit, and equipment and tools shall apply to all confined space work.

3.2.1 Lockout and Tagout

If activation of electrical or mechanical equipment would cause injury to confined space entrants, then the equipment shall be removed from service and stored energy must be released to prevent inadvertent activation before workers enter the confined space. The Tetra Tech lockout and tagout SWP shall be used for equipment deactivation (see SWP 6-2 in Volume III).

All confined spaces shall be completely isolated from other systems such as feed lines for liquids, solids, or gases, by physically disconnecting, double-blocking and bleeding, or blanking off all feed lines. In a continuous system where complete isolation is impossible, such as sewers or utility tunnels, specific procedures for isolation shall be included in the site-specific HASP for that site. Blanks used to seal off lines shall be capable of withstanding the maximum working pressure or load of the line (with a minimum safety factor of 4), have a gasket on the pressure side that can ensure a leak-proof seal, and be made of chemically nonreactive material. Shut-off valves servicing the confined space shall be locked in the closed position and tagged for identification.

3.2.2 Cleaning

Procedures and processes used to clean the inside of a confined space shall be specified in the site-specific HASP and site work plan then reviewed and authorized by the SSC or another qualified individual. The cleaning method used will depend on the space and the contents of the space. If possible, standing fluids that may produce toxic or displacing gases, vapors, or dust should be removed prior to entry. Also if possible, initial cleaning should be conducted outside the confined space. Special procedures should be evaluated and addressed in the site-specific HASP for situations where unique hazards may be created by the cleaning process itself.

3.2.3 Entry and Exit

The extent of entry and exit precautions needed to maintain a safe confined space work area will be determined by the SSC at each confined space entry location. All necessary entry and exit equipment shall be identified on the applicable permit. The following items shall be evaluated and considered:

- Type of confined space to be entered
- Barriers within the space
- The occupancy load of the space
- Time required for emergency exiting
- Time required for emergency rescue

At a minimum, all confined spaces deeper than 4 feet or the employee's shoulder height (whichever is less) shall be required to have a ladder securely fixed within the space. This ladder shall not be removed until all employees have exited the space.

3.2.4 Equipment and Tools

Confined space entry shall be allowed only when all equipment necessary for a safe entry has been assembled and shown to be in proper working order. Equipment that may be necessary includes: (1) atmospheric testing equipment, (2) PPE, (3) communication devices, and (4) entry and exit and rescue equipment. All equipment and tools to be used within a confined space shall be inspected and meet the following requirements:

- Hand tools shall be kept clean and in good repair and selected according to intended use.
- If portable electrical tools and equipment are used, they shall be equipped with a ground fault circuit interrupter and checked before use within a confined space.
- All electrical cords, tools, and equipment shall be of heavy-duty type with heavy-duty insulation and inspected for visual defects prior to use.
- All equipment that may be used in a flammable atmosphere shall be explosion-proof or intrinsically safe for the atmosphere involved.
- Lighting used within a confined space shall be of explosion-proof design and equipped with guards. Lighting must be listed by the Underwriters Laboratories for use in Division 1 atmospheres of the appropriate class and group, or be approved by the U.S. Bureau of Mines, the Mine Safety and Health Administration, or the U.S. Coast Guard.
- Lighting shall not be hung by electrical cords unless specifically designed for that purpose. The illumination of the area shall be sufficient to provide for safe work conditions.
- Cylinders of compressed gases shall never be taken into a confined space. When not in use, cylinders shall be turned off at the cylinder valve and capped. This restriction does not apply to self-contained breathing apparatuses or resuscitation equipment.
- Any hot work (such as welding, burning, or use of open flame) must follow guidelines outlined in the Hot Work SWP (SWP 6-6 in Volume III).

3.3 PERMIT AND CERTIFICATION SYSTEMS

Confined space entries shall be controlled through the implementation of either a permit or certification system. The appropriate permit or certificate must be completed prior to any entry of a confined space. The type of confined space to be entered will determine the need for either a permit or certification.

A permit-required confined space shall require a CSEP. Details of how the permit is completed are presented in SWP 6-23 in Volume III. The CSEP is Form CS-1 in Volume III, “Forms.”

A non-permit confined space requires completion of a certification, which Tetra Tech has titled “Preparation and Testing of Non-Permit Required Confined Space” (Form CS-2 in Volume III, “Forms”), prior to the entry of any person. Instructions for completion and use of this form are provided in SWP 6-24.

Each permit and Form CS-2 is valid for only one shift and will be "canceled" when confined space work is complete and may not be used for any future entries. Permits and Form CS-2 shall serve as a permanent record of entry activities and shall be kept in the project file after completion of work.

3.4 EMPLOYEE TRAINING

Awareness level confined space entry training shall be provided to all Tetra Tech field employees and employees supervising subcontractor personnel entering confined spaces. Confined space entry training of Tetra Tech employees may be conducted as a stand-alone course or as part of the 40-hour initial health and safety training and annual refresher training classes. Project managers shall verify that all subcontractor personnel have received training and are proficient and certified in their duties as required by this program.

Employees actually entering confined spaces must have the additional training described below for non-permit required and permit-required confined spaces before entry and must be briefed on site-specific hazards while on site.

3.4.1 Non-Permit Required Confined Space Training

Tetra Tech personnel performing non-permit required confined space entry shall receive training in the following:

- Definition of confined spaces
- Recognition, evaluation, and control of chemical and physical hazards within a confined space
- Requirements of the confined space standard (29 CFR 1910.146) and the Tetra Tech confined space entry program
- Use and limitations of atmospheric testing and PPE
- Use of the "Preparation and Testing of Non-Permit Required Confined Space" Form CS-2

3.4.2 Permit-Required Confined Space Training

Tetra Tech employees involved in permit-required confined space entries shall receive training to include the subjects listed in Section 3.4.1 plus additional specific training as necessary to safely perform the following assigned duties:

- Authorized entrants for permit-required confined spaces shall be trained and knowledgeable in the following:
  - The hazards of confined space entry, including information on the mode, signs, symptoms, and consequences of the hazard exposure
  - Communication rules
  - Rescue procedures
- Authorized attendants for permit-required confined space entries shall be trained and knowledgeable in the following:
  - The hazards of confined spaces and how to monitor confined space conditions to determine if it is safe for entrants to remain in the space
  - The mode, signs, symptoms, and possible behavioral effects of hazard exposure
  - Authorized entry identification requirements and the maintenance of an accurate count of personnel in permit spaces
  - Communication requirements with the entrants, including maintaining effective and continuous contact with the entrants
  - The reasons to order an evacuation, such as (1) observing conditions not allowed on the permit, (2) observing dangerous situations outside the space, (3) observing behavioral effects in authorized entrants, and (4) if the attendant must leave the work station or cannot safely perform his or her duties
- Individuals responsible for authorizing permits or in charge of entry into permit-required confined spaces must be trained and knowledgeable of the following:
  - Requisite information for permits
  - Procedures, practices, and equipment necessary for safe entry
  - Conditions under which permits should be canceled or entry terminated
  - How to deal with unauthorized personnel entry

4.0 RECORDKEEPING

This section outlines recordkeeping requirements under this program for permits, Form CS-2, and training certificates.

4.1 PERMITS AND FORMS

Copies of all permits and Form CS-2 shall be kept in the permanent project file. On an annual basis, each office health and safety representative shall review canceled permits or forms used on each project within his or her office to evaluate the effectiveness of the program. A brief summary of office compliance shall be forwarded to each regional health and safety representative or subsidiary health and safety representative. If there is reason to believe that the measures taken under this program are not protecting employees, the program will be revised to correct the deficiencies found.

4.2 TRAINING CERTIFICATES

Proof of training shall be issued to all employees successfully completing the appropriate confined space entry training. Proof shall consist of certificates of completion issued with 40-hour initial and 8-hour refresher health and safety training courses. Certificates shall contain the employee's name, signatures of the trainers, and the dates of the training. This certification shall be available for inspection by employees and their representatives.

TETRA TECH, INC.
RESPIRATORY PROTECTION PROGRAM

This program covers the use of respirators by Tetra Tech, Inc. (Tetra Tech), employees for protection from gases, vapors, dusts, mists, and other airborne contaminants. This program establishes policies and procedures for the selection, use, and care of respiratory protective equipment and was developed in accordance with the requirements of Title 29 of the *Code of Federal Regulations* (CFR), Parts 1910.120(g) and 1910.134.

Respiratory protection is of primary importance because inhalation is the major route of exposure to hazardous materials. It is Tetra Tech's intent to provide a safe and healthy work environment free of recognized hazards. Whenever possible, exposure to hazardous atmospheres will be reduced using engineering controls and appropriate work practices. When effective engineering controls are not possible or while they are being instituted, employees will wear respiratory personal protective equipment (PPE).

The effectiveness of the respiratory protection program will be evaluated by the corporate health and safety manager (CHSM) during annual regional and subsidiary audits. Program elements will be evaluated to (1) determine the adequacy of the respirators in providing necessary protection, (2) inspect program operations, and (3) assess wearer acceptance. The CHSM will document the evaluation and note corrective action plans and target dates if applicable.

The responsibilities and program elements associated with the respiratory protection program are discussed below.

1.0 RESPONSIBILITIES

The regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) shall be considered respiratory program administrators and are responsible for overseeing the respiratory protection program in their respective regions and subsidiaries. The site safety coordinators (SSC) are responsible for ensuring that (1) respiratory PPE is used appropriately as specified in the site-specific health and safety plan (HASP); (2) all employees potentially exposed to hazardous materials wear National Institute for Occupational Safety and Health (NIOSH)-certified respirators and follow federal or state Occupational Safety and Health Administration (OSHA) regulations for respiratory protective

equipment; (3) only medically cleared employees wear respiratory protective equipment; and (4) the required respirator maintenance, storage, and inspection procedures are followed.

Field personnel are required to use respirators provided in accordance with instruction and training received and to report any respirator malfunction or damage to the SSC.

2.0 PROGRAM ELEMENTS

This section establishes the elements of the respiratory protection program, including respirator selection, medical clearance, training, respirator fitting, respirator assignment, respirator inspection, procedures for routine use of respirators, gas and vapor cartridge change schedules, respirator maintenance and care, and breathing air and supply systems.

2.1 RESPIRATOR SELECTION

Only respirators certified by NIOSH will be used. The selection of proper respiratory protection for a given situation requires consideration of the following parameters:

- Nature of the hazardous material(s), including toxic effects, skin and eye hazards posed by the chemical, airborne concentrations, required or recommended exposure levels, the potential for immediately dangerous to life and health (IDLH) concentrations, and antagonistic or synergistic effects if two or more materials are present
- Service life of the chemical cartridge, filter, or canister approved for use
- Characteristics of the hazardous operation, process, or work area, including temperature extremes
- Location of the hazardous area in relation to an area with respirable air
- Employee conditioning and workload
- Period of time respiratory protection may be required
- Worker activities in the hazardous area
- Other PPE in use
- Physical characteristics, capabilities, and limitations of the various types of respirators
- Respiratory protection factors to determine the maximum use limit of a particular respirator

Tetra Tech shall systematically identify and evaluate respiratory hazards in the workplace. Respirator selection will be based on the assessment of the nature and extent of hazardous atmospheres anticipated during field activities. This assessment shall include a reasonable estimate of employee exposure to respiratory hazards and an identification of the chemical state and physical form of contaminants potentially encountered.

For each project requiring respirator use, a respiratory hazard assessment shall be conducted. The results of this assessment shall be documented on the Respiratory Hazard Assessment (see Volume III, "Forms," Form RP-2) and submitted to the RHSR or SHSR for approval. This requirement applies to all Tetra Tech employees as well as subcontractors operating under a Tetra Tech HASP. The completed Form RP-2 will be included as an attachment to the site HASP, and a copy will be kept in the project file.

Respirators used in environments that are IDLH and environments that are not IDLH differ. Requirements for respirators used in each environment are discussed below.

2.1.1 Respirators for Environments that are IDLH

If after the initial hazard assessment or during emergency situations when Tetra Tech cannot reasonably identify a contaminant or estimate exposure, the atmosphere shall be considered IDLH. Respirators used in IDLH environments must be supplied air respirators (SAR), either a full-face, pressure-demand, self-contained breathing apparatus (SCBA) with a minimum 30-minute service life or a combination full facepiece, pressure-demand airline system with an auxiliary self-contained 5-minute air supply.

When field personnel wearing respiratory protection could be overcome by a hazardous or oxygen-deficient atmosphere, the following requirements apply:

- Presence of at least one additional person using the "buddy system"
- At least one employee must be located outside the IDLH environment during entry of an employee into the IDLH environment
- Development of emergency rescue procedures to include appropriate retrieval equipment and a NIOSH-certified, positive pressure supplied air device

2.1.2 Respirators for Environments that are not IDLH

When potential contaminants to be encountered are identifiable gases or vapors and the concentrations are known or can be reasonably estimated, respiratory protection shall include one of the following:

- A SAR
- An air purifying respirator (APR) provided that it is equipped with a NIOSH-certified end of service life indicator (ESLI) for the identified contaminant. If no ESLI is available, a change schedule for cartridges and canisters must be developed based on objective data or information.

Respirator cartridge change out schedules will be determined or approved by either the RSHR or SHSR at the time of the respiratory hazard assessment. The respiratory hazard assessment form, Form RP-2, will describe the information and data used as the basis for determining the cartridge change out schedule. Section 2.8 of this program discusses procedures for developing change out schedules. Cartridge change out schedules and Form RP-2 will be included as part of the approved site-specific HASP.

For protection against particulate contaminants, approved respirators can include one of the following:

- A SAR
- A respirator equipped with a filter certified by NIOSH under 32 CFR Part 11 or 42 CFR Part 84 as a high-efficiency particulate air (HEPA) filter designated by N100, R100, or P100
- For particles with mass median aerodynamic diameter (MMAD) of at least 2 micrometers, an APR equipped with any certified NIOSH filter

Filter selection and change schedules shall be determined by either the RSHR or SHSR at the time of the respiratory hazard assessment. The respiratory hazard assessment, Form RP-2, will describe respiratory requirements for the site. The respiratory hazard assessment will be included as part of the approved site-specific HASP.

2.2 MEDICAL CLEARANCE

Respirator use may place a physiological burden on an employee depending on the health status of the employee, the type of respirator being worn, and workplace conditions. All field personnel are required to have a baseline medical examination prior to fit testing and use of respirators to determine their

physical ability to wear such equipment while working. These examinations will be given prior to initial assignment at a site and annually thereafter as part of the individual's annual medical examinations. As part of these examinations, personnel will be required to complete the health questionnaire presented in 29 CFR Part 1910.134, Appendix C, or an equivalent questionnaire. The (currently withdrawn) American National Standards Institute (ANSI) Standard Z88.6-1984 titled "American National Standard for Respiratory Protection-Respirator Use Physical Qualifications for Personnel" also provides recommended criteria for qualifying individuals for respirator use. The examining physician will use the information provided in the health questionnaire and the ANSI criteria to determine whether an employee qualifies for respirator use.

The following information will be provided to the physician prior to the medical evaluation:

- Type and weight of the respirator to be used
- Duration and frequency of respirator use (including use for rescue and escape)
- Expected physical work effort
- Protective clothing and equipment that may be worn
- Temperature and humidity extremes that may be encountered
- A copy of this Tetra Tech respiratory protection program

Respiratory clearances provided by the examining physician shall be provided to the RSHR or SHSR as appropriate. The office health and safety representative (OSHR) shall also maintain medical clearance records for each employee required to wear a respirator. These clearances shall state whether or not the employee is medically capable of using respiratory equipment; any limitations regarding respirator use related to the medical condition of the employee; the need, if any, for follow-up evaluations; and a statement from the physician that the employee has been provided with a copy of the examination results.

In addition to annual medical examinations, employees shall be examined if (1) the employee reports medical signs or symptoms related to the ability to wear a respirator; (2) if the RSHR, SHSR, supervisor, or physician determines the need for re-evaluation of the employee's ability to wear a respirator; or (3) if a change occurs in the workplace that may result in a substantial increase in the physiological burden placed on the employee.

2.3 TRAINING

All personnel required to wear respirators will receive effective respirator training prior to respirator use in the workplace. Training may be provided as single-subject course or included during the initial 40-hour or 8-hour refresher health and safety training. Each employee shall be trained on and demonstrate knowledge of the following topics:

- Knowledge of potential respiratory hazards
- Why a respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator
- Functions, capabilities, and limitations of the various types of respirators
- Proper selection of respirators (including consideration of respirator type, contaminant concentration, cartridge efficiency, properties of the contaminants, oxygen content, and IDLH situations)
- Proper inspection, donning, and doffing of respirators, and respirator fit testing techniques
- Proper maintenance and storage of respirators
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators

Respirator training shall be repeated annually or whenever changes in the workplace or the type of respirator renders previous training obsolete. Training will also be conducted prior to any site or project work where site-specific respiratory requirements were not included in the original training. Employee retraining is necessary when the knowledge and skill necessary is not retained by the worker or in any other situation where retraining appears necessary to ensure safe use.

Employees voluntarily electing to wear respiratory protection must be provided with a copy of 29 CFR Part 1910.134, Appendix D, “Information for Employees Using Respirators When Not Required Under the Standard.”

2.4 RESPIRATOR FITTING

Each respirator user will be qualitatively or quantitatively fit-tested in accordance with procedures specified in 29 CFR Part 1910.134, Appendix A. Safe Work Practice (SWP) 6-29, "Respirator Qualitative Fit Testing Procedures," Volume III, further describes the procedures for qualitative fit-testing of employees at Tetra Tech. Fit testing of field personnel will be conducted annually or prior to field work requiring respiratory protection. The Respirator Fit Test Record (see Volume III, "Forms," Form RP-1) is used to document fit testing. This record shall be maintained by the OSHR.

The requirements below apply to the qualitative fit test (QLFT) or quantitative fit test (QNFT):

- The test must be conducted on a respirator of similar make, model, size, and style of facepiece for any negative- and positive-pressure respirator an employee may be required to wear.
- The test must be conducted annually or whenever changes occur that could affect the fit of the respirator (such as scarring, weight gain or loss, dental work, and so on).
- A QLFT can only be used to fit negative-pressure APRs that must achieve a fit factor of 100 or less.
- A QNFT must be used for fit factors greater than 100. The QNFT is considered passed if the test result is equal to or greater than 100 for tight-fitting half-mask respirators or equal to or greater than 500 for tight-fitting full facepieces.
- The QLFT and QNFT must be conducted in a negative-pressure mode on a tight-fitting APR or SAR.

Full-face respirators fit-tested using qualitative methods can only be used in atmospheres up to 10 times the permissible exposure limit (PEL) of any contaminant.

2.5 RESPIRATOR ASSIGNMENT

Respirators will be provided to employees requiring respiratory protection. Respirators are provided based on the successful completion of a medical evaluation and qualitative or quantitative fit test as appropriate. Respirators shall not be loaned to any other employee or individual. Only persons trained in the proper selection of respirators will be permitted to issue them to others. Procedures for assignment or issue of respirators vary within Tetra Tech regions and subsidiaries. RHSRs and SHSRs can provide information to employees regarding respiratory assignment procedures within their region or subsidiary.

2.6 RESPIRATOR INSPECTION

Respirators must be inspected before and after use and during cleaning. Respirator inspection will include the following:

- Inspecting the tightness of connections and condition of the facepiece, headbands, valves, connecting tubes, and canisters
- Inspecting all rubber and elastomer parts for pliability and signs of deterioration

For in-service equipment owned and maintained for specific projects by Tetra Tech, monthly inspections will be conducted on emergency use respirators and SCBAs. Inspections of emergency-use respirators and SCBAs will help ensure that regulators and warning devices function properly. The SSC will maintain a record for each respirator that will include date of inspection, inspector name, findings, repairs made, and a serial number or other means to identify the respirator. This information may be provided on a label or tag that is attached to the storage compartment of the respirator or may be included in field audit reports. Any discrepancy effecting the reliability of a respirator will be corrected prior to use of the unit.

2.7 PROCEDURES FOR ROUTINE USE OF RESPIRATORS

Written procedures for the use of respirators under routine and foreseeable emergency conditions are available in Safe Work Practice (SWP) 6-28, “Safe Work Practice for Use of Air Purifying Respirators,” Volume III. This SWP shall be attached to the HASP for all projects that involve the use of air purifying respiratory protection.

The SSC will monitor the use of respirators at work sites to ensure that the correct respirators and cartridges are used, are working properly, and are in good working condition. In work areas where respirator use is routine, inspections will be conducted before each use and during cleaning. For nonroutine respirator use, the respirator shall be checked for proper function prior to use, after each use and at least monthly thereafter. This inspection can be part of a health and safety audit.

2.8 GAS AND VAPOR RESPIRATOR CARTRIDGE CHANGE SCHEDULES

The purpose of a cartridge change schedule is to establish the time period for replacing respirator cartridges to prevent contaminant breakthrough and subsequent potential overexposure of the employee. Because breakthrough for particulate respirators is unlikely unless physical damage has occurred to the

facepiece or filter, this guideline only applies to change schedules for vapor and gas respirator cartridges. The use of warning properties as the sole basis for determining change schedules is now prohibited. However, if an effective change schedule is developed, air purifying vapor and gas respirators may be used for chemicals with few or no warning properties.

The change schedule guidelines described in this document were derived in part from Appendix A of OSHA Directive CPL 2-0.120, "Inspection Procedures for the Respiratory Protection Standard" and information contained on the OSHA webpage "Respiratory Protection Advisor" (http://www.osha-slc.gov/SLTC/respiratory_advisor/change_schedule.html). The sections below describe procedures and methods for determining cartridge change schedules.

2.8.1 Procedure

Selection of the method to be used for developing a change schedule depends on several factors, including the information available regarding the chemical hazard, the task to be completed, and the brand of respirator designated for a specific task.

Change schedules must be developed on a task-by-task basis following a complete hazard assessment of the work task or tasks for which respirator use may be necessary. The hazard assessment is documented using Form RP-2 in Volume III, "Respiratory Hazard Assessment." Information gathered during the hazard assessment, along with the methods described below, will be used to determine the cartridge change schedule for each task. Once the change schedule is developed, the information must be entered onto Form RP-2 and the form attached to the project HASP as documentation of the respirator selection process.

2.8.2 Methods

A brief description of allowable approaches or methods for determining cartridge change schedules is presented below. These methods are based on information such as manufacturers' objective data, experimental methods, mathematical predictive modeling, workplace simulations, analogous chemical structures, rules of thumb, mixture assumptions, and application of OSHA standards. It should be noted that mixtures, intermittent respirator use and contaminant concentrations, respirator storage practices, and other variables may require an administrative time limit, such as using a cartridge only for 1 day even though the estimated service life is longer.

2.8.2.1 Manufacturer's Objective Data

Respirator cartridge manufacturers may develop objective data that can be used to establish change schedules. The data are brand-specific and should not be applied to another brand because of differences in absorption capacities between brands of respirator cartridges.

Data provided by the manufacturer may be presented as tables or graphs of cartridge service life for a particular chemical at a given concentration. Following the rules of thumb described in Section 2.8.2.6 below, cartridge service life for concentrations other than the values presented in the table or graph can be estimated.

Some manufacturers have developed software programs that often can be downloaded from the Internet. These programs can calculate an estimated service life after key variables are entered such as the chemical and its concentration, the anticipated relative humidity, and the work rate of the user.

2.8.2.2 Experimental Methods

This method involves development of breakthrough-time data from laboratory-based simulations of worst-case workplace conditions. This method can provide very accurate service life information. However, this method is unfeasible for most work situations.

2.8.2.3 Mathematical Predictive Modeling

This method is very complex and is more typically applied by a cartridge manufacturer because of the need for proprietary information regarding cartridge specifications. However, OSHA has developed a mathematical model called "The Advisor Genius" for calculating contaminant breakthrough times using the Wood Equation. The model will estimate the contaminant breakthrough time for an activated carbon respirator cartridge based on physical and environmental parameters specific to the contaminant and the workplace. It is only applicable to contaminants in liquid form at the workplace temperature. The model can be accessed at

http://www.osha-slc.gov/SLTC/respiratory_advisor/advisor_genius_wood/advisor_genius.html

The OSHA model requires the following chemical contaminant information:

- Chemical name
- Molecular weight
- Liquid density in units of grams per cubic centimeter at the workplace temperature
- Vapor pressure of the contaminant in units of torr at the workplace temperature
- Molar polarization in units of cubic centimeters per mole

The Handbook of Chemistry and Physics (CRC press, latest edition) contains extensive chemical data required for calculating breakthrough times.

The model will require the following information about the respirator to be used, workplace conditions, and work rate:

- Number of cartridges used by the respirator
- Weight of sorbent in each cartridge in grams
- Carbon micropore volume in cubic centimeters per gram; if this number cannot be obtained from the manufacturer, a standard value of 0.4 can be assumed
- Bulk density of the packed bed in units of grams per cubic centimeter; this value can be calculated by disassembling a respirator cartridge and determining the total volume of the bed and then dividing this value into the sorbent weight
- Maximum temperature expected in the workplace
- Maximum humidity expected in the workplace; the model assumes a maximum humidity of less than 65 percent; for higher humidity, a safety factor must be applied to the calculated breakthrough time
- Maximum contaminant concentration expected in the workplace in units of parts per million or milligrams per cubic meter
- Estimated employee work rate to determine respiration in units of liters per minute (L/min); the type of work being performed, with office work having a typical work rate of about 20 L/min and heavy work having a work rate exceeding 60 L/min

The model has several limitations. Conservative assumptions are used to calculate the service life, and the service life estimate is therefore likely to be shorter than needed. Also, the model can only be used for single-contaminant situations. Situations involving mixtures are discussed below in Section 2.8.2.7.

2.8.2.4 Workplace Simulations

This method involves testing a cartridge in the workplace under actual working conditions of use. Air is drawn through the cartridge at a rate typical of that associated with breathing at a high work rate. An analytical device on the other side of the cartridge measures the breakthrough time. Although this method provides the most accurate change schedule, it is also one of the least practical.

2.8.2.5 Analogous Chemical Structure

Under certain circumstances, the service life values from other chemicals having an analogous chemical structure may be used to determine the breakthrough time and service life of the contaminant under evaluation. In certain cases, a chemical with a known migration rate may reasonably be anticipated to act as a surrogate for a similar chemical that would have a less rapid migration rate and breakthrough time. For example, it can usually be assumed that a heavier, less volatile compound than another in a similar chemical series that has been tested for breakthrough time would have a breakthrough time no faster than the tested chemical.

This method requires a substantial amount of judgment and a good understanding of chemistry and chemical groups. Data from higher molecular weight groups should not be used to predict the behavior of analogous substances with lower molecular weight. It is appropriate to include a safety factor into the predicted breakthrough time to account for the degree of similarity of the chemicals and the level of confidence regarding variables associated with the workplace conditions. A safety factor of 1 or 2 is appropriate for chemicals with similar structure and molecular weights, and where work place conditions are the same. A safety factor of 2 to 5 is advised where molecular weights differ by more than 1 carbon or halogen and where work rates vary substantially.

2.8.2.6 Rules of Thumb

Chapter 36 of the American Industrial Hygiene Association publication titled “The Occupational Environment: Its Evaluation and Control” presents organic vapor cartridge service life the rules of thumb summarized below.

- If a chemical’s boiling point is greater than 70 °C and the concentration is less than 200 parts per million, a service life of 8 hours can be expected at a normal work rate.

- Service life is inversely proportional to work rate.
- Reducing contaminant concentrations by a factor of 10 will increase service life by 50 percent.
- Relative humidity greater than 85 percent will substantially reduce service life.

These rules of thumb should only be applied when used with other methods for predicting cartridge service life for a specific contaminant.

2.8.2.7 Mixture Assumptions

Predictive mathematical models are very difficult to develop for mixtures of contaminants. Establishing change schedules for mixtures of contaminants is considerably more complex than for single contaminants and requires professional judgment to create a reasonable change schedule. The following assumptions can be applied to change schedules for mixtures:

- When the individual compounds in the mixture have similar breakthrough times (that is, within one order of magnitude), the service life of the cartridge should be established by assuming that the mixture stream behaves as a pure system of the most rapidly migrating component or compound with the shortest breakthrough time. The concentrations of the components should be summed, and the sum should be used as the compound concentration.
- When the individual compounds in the mixture vary by two orders of magnitude or greater, the service life can be based on the contaminant with the shortest breakthrough time.

A margin of safety or safety factor must be entered into developing a change schedule for mixtures to reflect the level of confidence in the breakthrough time estimate. For example, the margin of safety should reflect the level of confidence in applying the assumptions listed above to the mixture and the quality of data regarding actual concentrations of the contaminants. Assumptions regarding change schedules for mixtures can only be applied after information on individual mixture components such as breakthrough time has been gathered.

2.8.2.8 Application of OSHA Standards

Several of OSHA's chemical specific standards already address cartridge change schedules. The table below summarizes these standards and the applicable change schedule.

Chemical and Applicable Standard	Change Schedule
Acrylonitrile, 29 CFR 1910.1045(h)(2)(ii)	Calculated end of service life or end of shift, whichever comes first
Benzene, 29 CFR 1910.1028(g)(2)(ii)	Calculated end of service life or beginning of shift, whichever comes first
Butadiene, 29 CFR 1910.1051(h)(2)(ii)	Every 1, 2, or 4 hours, depending upon concentration according to Table 1 of the standard, and at beginning of each shift
Formaldehyde, 29 CFR 1910.1048(g)(2)(ii)	Every 3 hours or end of shift, whichever is sooner
Methylene chloride, 29 CFR 1910.1052(g)(2)(ii)	Cartridges can only be used for emergency escape and must be replaced after each use; APRs not allowed for routine use
Vinyl chloride, 29 CFR 1910.1017(g)(2)(ii)	Calculated end of service life or end of shift in which they are first used, whichever occurs first

2.9 RESPIRATOR MAINTENANCE AND CARE

When respirators are used on a routine basis, a cleaning and maintenance program will be established to ensure that the respirators are maintained at their original level of effectiveness. A respirator maintenance schedule will be established at each location where respirators are used. This schedule will be based on the specific respirators used and whether they are used routinely or nonroutinely. The respirator maintenance schedule will be included in the site-specific HASP.

All personnel will receive and wear a respirator that is clean and sanitized. Respirator cleaning procedures will be conducted in accordance with 29 CFR Part 1910.134, Appendix B-2. SWP 6-27, "Respirator Cleaning Procedures," has been prepared based on Appendix B-2. This SWP shall be attached to the HASP for all projects that involve the use of respiratory protection. Cleaning and sanitizing agents will be specified by the respirator manufacturer. During the cleaning of respirators, rubber or elastomer parts will be stretched and manipulated with a massaging action to aid in keeping the parts pliable and flexible and prevent them from becoming distorted during storage.

Respirator part replacements or repairs will be conducted by a qualified person only and with parts designed for the respirator only. No attempt shall be made to replace parts with other parts not specified by the manufacturer. Respirators that are defective shall be removed from service until repaired.

Inspected and cleaned respirators must be stored in areas protected against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. They shall be stored to prevent deformation of the facepiece and exhalation valve. All manufacturer storage instructions must be followed.

2.10 BREATHING AIR AND SUPPLY SYSTEMS

Breathing air and supply systems shall provide Type 1 Grade D breathing described in ANSI G-7.1-1989 titled "Commodity Specification for Air." If purchased cylinders of supplied breathing air are to be used on the site, the project manager shall retain a certificate of analysis from the supplier that the breathing air has been tested within the previous 6 months and meets the ANSI specifications.

The compressor for supplying breathing air shall be equipped with the necessary safety and standby devices. Compressors shall be constructed and situated to prevent entry of contaminated air into the system, and suitable in-line air purifying sorbent beds and filters must be installed to further ensure breathing air quality. The compressor shall have a tag containing information including the most recent filter and sorbent change date and signature of the person performing the service.

An escape respirator of sufficient capacity (minimum of five minute duration) to enable the respirator wearer to escape from a contaminated atmosphere in the event of compressor failure shall be provided. If an oil-lubricated compressor is used, it shall have both high-temperature and carbon monoxide alarms installed. Air-line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air-line respirators with nonrespirable gases.

Breathing air supply cylinders must meet the following requirements:

- Be maintained in a fully charged state and recharged when the pressure falls below 90 percent.
- Be tested and maintained as prescribed in the shipping container specification regulations of the U.S. Department of Transportation (specified in 49 CFR Part 173)
- Have a certificate of analysis from the supplier that the air meets the requirements of Grade D breathing air
- Have a moisture content that does not exceed a dew point of -50 °F

TETRA TECH, INC.
PERSONAL PROTECTIVE EQUIPMENT PROGRAM

Tetra Tech, Inc. (Tetra Tech), has developed this personal protective equipment (PPE) program to protect its employees from health and safety hazards and to prevent injury to employees from incorrect use or malfunction of PPE. This program covers the use of PPE by Tetra Tech employees to control contact with or exposure to hazardous chemicals, physical health and safety hazards, and any other health and safety risks exclusive of respiratory exposure. The program complies with the requirements of Title 29 of the *Code of Federal Regulations* (CFR), Parts 1910.120 (g) (5), 1910.132, 1910.133, 1910.135 through 1910.138, and 1926.28. Respiratory protection and compliance with applicable Occupational Safety and Health Administration (OSHA) standards for respirators are addressed under a separate program, the "Respiratory Protection Program" (see Document Control No. 2-6).

To the extent possible, engineering and administrative controls shall be used to eliminate or minimize health and safety hazards. When such controls are not feasible, appropriate PPE shall be used in accordance with this program. Tetra Tech shall provide and maintain PPE in various sizes and styles to provide a comfortable and effective fit for all wearers.

The proper use of PPE, in addition to safe work practices, site entry control, proper decontamination, and other safety considerations, reduces the potential for exposure or injury to Tetra Tech employees working at hazardous waste sites. As part of its overall corporate Health and Safety Program, Tetra Tech will develop and implement procedures for the introduction and use of new employee protective technologies as they become available. Tetra Tech will continually evaluate and use state-of-the-art methods, materials, and equipment to enhance employee protection.

The regional health and safety representative (RHSR) or subsidiary health and safety representative (SHSR) is responsible for establishing regional or subsidiary procedures for use of PPE, providing technical guidance on PPE procedures, and approving the site-specific PPE selection criteria developed in site-specific health and safety plan (HASP). The site safety coordinator (SSC) administers procedures for use of PPE at the work site and determines when an upgrade or downgrade of PPE is required. Each subcontractor is responsible for PPE program compliance for its own employees and must establish appropriate administrative control of its personnel for purposes of compliance with this program. The project manager is responsible for taking action to ensure that subcontractors achieve compliance with the PPE program. Oversight, evaluation, and auditing of the implementation and effectiveness of regional

and subsidiary PPE programs shall be the responsibility of the corporate health and safety manager (CHSM). Findings will be reported to the vice president of corporate administration.

PPE selection, levels of protection, upgrades and downgrades, use and limitations, in-use considerations, training requirements, inspection, maintenance and storage, and decontamination and disposal are discussed below, as well as government representative PPE use.

1.0 PPE SELECTION

PPE is available in a variety of materials and configurations that offer a range of protection against chemical and physical hazards. The most widely available source of information on the features and capabilities of PPE are manufacturer and vendor catalogs. The information is often in table form and lists chemical resistance ratings. Information may be qualitative or quantitative. Qualitative ratings are generally on a scale of "Excellent" to "Poor" or "Not Recommended" and may apply to permeation or degradation resistance.

Quantitative ratings are sometimes provided for permeation rates. The rating is in the number of minutes for a chemical to permeate through a material and be detected on the other side. These tables are intended as guidelines for the selection of PPE. Besides degradation and permeation, several other factors must be considered during PPE selection, including the following:

- Durability (resistance to wear, tear, abrasions, and punctures)
- Flexibility
- Ease of decontamination
- Comparability with other equipment
- User comfort in hot or cold temperatures

The selection and evaluation of PPE should not be limited to the selection factors stated above. The correct PPE ensemble cannot be assigned without knowledge of the types and degrees of hazards that may be encountered. The majority of PPE used by Tetra Tech personnel is associated with tasks related to site investigation, assessment, or remediation. All potential and existing chemical, physical, and biological hazards should be considered. Assessment of each potential hazard is necessary because not every type or style of PPE may be effective for that hazard.

Each site-specific HASP must specify mandatory PPE requirements and indicate the level of protection for each on-site task. PPE selection must be assigned by an experienced technical staff member or a health and safety specialist. As necessary, criteria for upgrades and downgrades should be established. The HASP reviewer must ensure that proper PPE has been selected for each project task, the hazard assessment is complete, and the hazard assessment certification of the HASP has been signed. Document Control No. 3-4, "Site-Specific Health and Safety Plan Program," should be referenced for further information on completing HASPs and hazard assessment certifications.

A thorough site evaluation of potential hazards must be made before commencing on-site work. The site evaluation and task risk analysis are discussed below.

1.1 SITE EVALUATION

Much of the information needed for the site evaluation should be gathered during site characterization. The effort needed to complete a site evaluation will vary from project to project but should be sufficient to anticipate all potential or known health and safety hazards. Factors to consider in PPE selection include the following:

- Hazardous materials known or anticipated to exist on the site
- Potential injury hazards
- Site characteristics (such as topography, building locations, and weather conditions)

1.2 TASK RISK ANALYSIS

In addition, many hazards associated with site work are related specifically to the tasks and activities performed. Factors that should be considered in PPE selection for the task risk analysis include the following:

- Type and duration of the project
- Exposure or injury sources and pathways
- Work rate and physical effort involved
- Capacity of personnel to work in PPE

- Daily work and rest schedule (work mission duration factors)

The task risk analysis is performed to evaluate each hazard associated with a particular task or activity during preparation of the HASP. The risks for each hazard are identified, and available control methods to reduce or eliminate each risk are listed. The analysis provides an opportunity to examine all aspects of the involved tasks to help determine PPE needs and types.

2.0 LEVELS OF PROTECTION

This program uses the classification system for levels of protection currently accepted by the hazardous waste industry and as defined in Appendix B of 29 CFR 1910.120, "General Description and Discussion of the Levels of Protection and Protective Gear." This appendix describes Levels of Protection A, B, C, and D, with Level A representing the maximum protection level.

Specific PPE for each level of protection is discussed below. An asterisk (*) behind a listed item indicates that its use is optional for that level of protection.

2.1 LEVEL A PROTECTION

Level A protection should be worn when a hazardous substance has been identified that requires the highest level of protection for skin, eyes, and the respiratory system. Level A PPE includes the following:

- Positive-pressure, full-facepiece, self-contained breathing apparatus (SCBA) or positive-pressure, supplied air respirator with escape SCBA approved by the National Institute for Occupational Safety and Health (NIOSH)
- Totally-encapsulating, chemical-protective suit
- Coveralls*
- Long underwear*
- Chemical-resistant outer gloves
- Chemical-resistant inner glove
- Chemical-resistant boots with steel toe and shank
- Hard hat (under suit)*

- Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally-encapsulating suit)

- Two-way radio (intrinsically safe, a designation used for equipment that will not produce a spark and therefore is safe to use in explosive atmospheres) *

Level A protection should be worn when one or more of the following situations apply:

- Exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin is possible based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates, or on site operations and work functions that involve a high potential for exposure.

- Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.

- Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A protection have not yet been determined.

- The atmosphere contains less than 19.5 percent oxygen.

Some Tetra Tech regions and subsidiaries do not perform work at sites where Level A protection is required.

2.2 LEVEL B PROTECTION

Level B protection is worn in atmospheres with potentially immediately dangerous to life or health (IDLH) concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard or that do not meet the criteria for use of air-purifying respirators. Level B protection is the minimum level recommended for initial site entry until hazards have been further characterized. Level B protection includes the following PPE:

- Positive-pressure, full-facepiece SCBA or positive-pressure, supplied air respirator with escape SCBA (NIOSH-approved)

- Hooded, chemical-resistant clothing (such as one- or two-piece chemical-splash suit, or disposable chemical-resistant overalls)

- Coveralls *

- Chemical-resistant outer gloves

- Chemical-resistant inner gloves

- Chemical-resistant boots with steel toe and shank
- Chemical-resistant outer boot covers (disposable) *
- Hard hat *
- Faceshield*
- Two-way radio (intrinsically safe)*

Level B protection should be worn when one or more of the following situations apply:

- The type and atmospheric concentration of a substance has been identified and requires the highest level of respiratory protection but a lesser level of skin protection.
- The atmosphere contains less than 19.5 percent oxygen.
- The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

2.3 LEVEL C PROTECTION

Level C PPE includes the following:

- Full-face or half-face mask air purifying respirator (NIOSH-approved) with appropriate cartridge
- Chemical-resistant clothing (such as two-piece chemical-splash suit or disposable chemical-resistant overalls)
- Coveralls *
- Chemical-resistant outer gloves
- Chemical-resistant inner gloves
- Chemical-resistant outer boots with steel toe and shank
- Chemical-resistant outer boot covers (disposable) *
- Hard hat *
- Escape mask*
- Faceshield*

- Two-way radio (intrinsically safe) *

Level C protection should be worn when one or more of the following situations apply:

- The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants.
- All criteria for the use of an air-purifying respirator have been met, including sufficient oxygen level, identification and quantification of contaminants, and availability of suitable filtering media.
- Exposure will not adversely affect any exposed skin.

2.4 LEVEL D PROTECTION

Level D protection should not be worn at any site where respiratory or skin hazards are present. Level D PPE is primarily a work uniform that provides minimal protection and includes the following:

- Coveralls
- Gloves*
- Boots or shoes with steel toe and shank and chemical-resistant soles
- Chemical-resistant outer boot covers (disposable) *
- Safety glasses or chemical splash goggles *
- Hard hat *
- Escape mask*
- Faceshield*

Level D protection should be worn when the following situations exist:

- The atmosphere contains no known skin or respiratory hazards.
- Work functions will not cause exposure to hazardous levels of any chemicals.

The use of escape masks is optional under Levels C and D protection. The SSC should determine whether they will be used on a case-by-case basis. Escape masks should be strategically located on site in areas that have a higher possibility for exposure of workers to vapors, gases, or particulates. OSHA

specifically requires that an escape SCBA having at least 5 minutes of air be carried by employees or kept available at their work station if a positive-pressure SCBA is not used as part of the entry ensemble during initial site characterization and analysis.

Combinations of PPE other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection. The site-specific HASP should specify specific PPE combinations within the framework of the Level A, B, C, and D system.

3.0 UPGRADES AND DOWNGRADES

The level of protection and PPE used should be re-evaluated periodically as site conditions change or as more information about the site becomes available. PPE should be re-evaluated by the SSC when one or more of the following situations arise:

- A new phase of work begins
- Work task change
- Significant change of weather
- New contaminants are encountered
- Ambient levels of contamination change

Ambient levels of contaminants are often linked to action levels that determine levels of protection. Action levels are defined as the concentrations of airborne contaminants measured with a direct-reading instrument that trigger a particular level of protection. Action levels are relative and can be changed depending on site conditions, the type of work, and how thoroughly contaminants have been identified. Each site-specific HASP should specify mandatory PPE requirements, along with specific action levels for site-specific contaminants or groups of contaminants.

4.0 USE AND LIMITATIONS

PPE is intended to shield or isolate individuals from the health and safety hazards that may be encountered on site. However, PPE is limited in its capability to completely protect users. In addition, the use of PPE can in itself create several worker hazards, including the following:

- Impaired mobility
- Impaired vision
- Impaired communication
- Increased workload and exertion

The PPE also has the following limitations during use:

- Permeation and degradation susceptibility
- Physical factors (limited durability, flexibility, or other factors)
- Available sizes

A person's medical condition can also limit the use of PPE. Some potential limiting medical conditions include the following:

- Compromised pulmonary function
- Heart disease
- Physical handicaps
- Obesity
- Physical condition and age

Finally, heat and cold can affect both the performance of the PPE and the user in his or her ability to tolerate PPE use. Heat and cold stress are discussed in detail in Safe Work Practices No. 6-15 and 6-16, respectively, in Volume III.

5.0 IN-USE CONSIDERATIONS

During equipment use, wearers should pay attention to the following factors that may affect PPE performance or indicate a health or safety concern:

- Perception of odors
- Irritation

- Discomfort
- Degradation or damage to PPE
- Fatigue
- Movement restrictions
- Personal response such as rapid pulse, nausea, chest pain, or other

If any of these factors is detected, the user should immediately move to the contaminant reduction zone with his or her buddy and explain the situation to the SSC.

6.0 TRAINING REQUIREMENTS

Proper PPE donning and doffing procedures will be demonstrated and practiced during both employee initial and annual health and safety training programs. Employee training in PPE use will be documented on dated attendance sign-in sheets that indicate the type of training (initial or refresher), name and signature of the attendees, and the class agenda that lists topics, demonstrations, and exercises included. Employees will receive a dated certificate signed by the instructor indicating successful completion of the training. Initial and refresher training in PPE use are discussed below.

6.1 INITIAL TRAINING

Tetra Tech personnel engaged in hazardous waste site activities will receive training in the selection, use, maintenance, and decontamination of PPE (Levels B through D) during initial 40-hour health and safety training. For site activities requiring Level A training, personnel are required to complete an additional training and field exercise in the use, maintenance, and decontamination of fully-encapsulating Level A PPE.

Training shall include lectures, classroom demonstrations, and videotape simulations. Employees will demonstrate their understanding of use by donning, wearing, and properly removing PPE in a minimum of a Level C ensemble and passing a written examination at the end of the training that includes questions about PPE.

In addition to basic classroom instruction, all personnel must complete a minimum of 24 hours of supervised training in the field in each level of protection before that employee is considered competent to operate at that level of protection in the field without supervision.

6.2 REFRESHER TRAINING

During annual refresher training, employees will be provided with information on any new types of or changes to available PPE. General concepts on the proper use of PPE will also be covered and will include discussion of any instances of improper use of PPE during the previous year.

7.0 INSPECTION

PPE must be inspected during and after use and periodically while in storage. Form PPE-1, "Protective Equipment Inspection," in Volume III provides guidance for both field use inspection and for inspecting stored equipment.

8.0 MAINTENANCE AND STORAGE

PPE maintenance needs vary with the amount of use and complexity of the equipment. Under all circumstances, manufacturer's recommendations and replacement parts shall be used. Taping, stapling, gluing, or other temporary measures shall not be allowed. Only trained personnel shall repair equipment. Whenever possible, Tetra Tech employees shall use disposable PPE. Disposable PPE shall not be repaired or reused.

PPE must be stored to prevent damage or malfunction from exposure to dust, moisture, sunlight, chemicals, impact, and extreme temperatures. General rules to follow for proper PPE storage are listed below.

- Used and potentially contaminated PPE should be stored separate from clean PPE and street clothing.
- Potentially contaminated PPE should be stored in a well-ventilated area.
- PPE should be folded, hung, or stacked to prevent distortion or damaging creases.

- PPE of similar appearance but different functions should not be stored together. For example, black gloves made of different materials (such as nitrile, neoprene, or rubber) could be mistaken for each other.

- In the field, PPE should be stored in a clean location such as a vehicle or office. PPE should not be stored at work sites or any location that may allow the PPE to be exposed to dust or chemicals.

9.0 DECONTAMINATION AND DISPOSAL

Decontamination procedures for PPE have been established as a component of each site-specific HASP. The procedures outline steps for decontamination of each level of protection. A more detailed discussion of decontamination is presented in the "Decontamination Program," Document Control No. 3-8.

All decontamination solutions and disposable PPE must be disposed of properly. Whenever possible, this waste should be disposed of in designated on-site containers. Wastes should not be returned to or stored at office locations or disposed of improperly.

10.0 GOVERNMENT REPRESENTATIVE PPE USE

Under certain federal contracts, Tetra Tech is required to have available at all times three clean sets of PPE ensembles (excluding negative-pressure air-purifying respirators and safety shoes) for use by government representatives and required for entry into the exclusion zone or contamination reduction zone. These items shall be stored in a clean area and clearly marked "For Use by Government Employees Only." Tetra Tech shall provide basic training in the use and limitations of the PPE provided and check prerequisite requirements prior to issuance. Such requirements include meeting minimum training requirements for the work tasks to be performed and obtaining medical clearance for site hazards and respiratory use.

TETRA TECH, INC.
VEHICLE SAFETY PROGRAM

In keeping with the Tetra Tech Safety Policy, the company is committed to providing and maintaining a healthy and safe work environment. Tetra Tech's health and safety program is designed to address the hazards associated with our business and prevent injury and illness in the workplace. The use of motor vehicles is an integral support function of Tetra Tech's business and the safe operation of these vehicles by Tetra Tech employees is of primary concern to the company.

This Vehicle Safety Program is designed to prevent injury or property damage resulting from motor vehicle incidents. The following elements which include responsibility for the program, rules of conduct, vehicle use policy, driver qualification, motor vehicle record checks, incident reporting, driver education, vehicle maintenance and recordkeeping requirements comprise the Tetra Tech Vehicle Safety Program.

1.0 SCOPE

This program covers the safe operation of all vehicles used for company business. Vehicles covered include company owned, personal, leased or rented vehicles such as passenger vehicles, pick up trucks, light trucks and vans. Appendix A of this document outlines additional safety elements for vehicles that require a Commercial Driver's License (CDL) for operation and are regulated by the Interstate Commerce Commission or the U.S. Department of Transportation.

2.0 RESPONSIBILITY

Implementing an effective Vehicle Safety Program is dependent upon the acceptance of responsibility by many individuals within the company. Specifically, these include:

2.1 ENTERPRISE FLEET ADMINISTRATOR

The Enterprise Fleet Administrator has the following responsibilities:

- Overall management and maintenance of this program, including maintaining familiarity with applicable laws, codes and other requirements and making changes to this program as appropriate;

- Establish enterprise qualified driver criteria for employees who operate motor vehicles on company business;

- Establish proper maintenance standards for company owned or leased vehicles to ensure Tetra Tech vehicles are maintained in safe operating condition;

- Establish company-wide Motor Vehicle Record (MVR) check protocols, including guidance regarding the performance and frequency of MVR random screening; and

- Collect information on motor vehicle accident frequency, cost information, loss trends and major loss sources and communicate this information to Operating Unit's Health and Safety Representatives (HSR) and Corporate Health and Safety Director.

2.2 MANAGEMENT

Management is responsible for ensuring that adequate planning efforts and resources are provided so that the provisions of this program can be effectively implemented and maintained. Line Managers with direct report employees affected by this program are responsible for ensuring that such employees satisfy the requirements of this program.

2.3 LOCAL FLEET ADMINISTRATORS

Each Tetra Tech operating unit shall identify a Local Fleet Administrator who shall be responsible for the following:

- Maintain a list of Regular Drivers for company business;

- Collect, review and maintain motor vehicle records on drivers enrolled in the MVR record check process;

- Ensure company owned or leased vehicles are kept in safe operating condition and are subject to regular maintenance service as required by applicable local laws and this program; and

- Ensure that CDL requirements outlined in Appendix A are implemented as appropriate.

2.4 HEALTH AND SAFETY REPRESENTATIVES

The Health and Safety Representative shall be responsible for the following:

- Coordinate defensive driver training courses for affected employees; and

- Monitor and communicate motor vehicle accident frequency, cost information, loss trends and major loss sources to operating unit management.

2.5 ENTERPRISE HUMAN RESOUCRES

- Ensure that driver qualifications specified in this program as well as direction pertaining to offering/denying employment, disciplinary measures, substance abuse testing and other issues with HR implications specified in this program are compliant with applicable regulations;

- Develop and maintain data processes as required by this program. Provide and communicate this information to operating unit HR managers; and

- Communicate changes in insurance policies, benefits, procedures, etc., as appropriate.

2.6 OPERATING UNIT HUMAN RESOURCES

- Ensure that new position openings adequately address requirements for driving capabilities and expected driving frequency and driver classification as defined in Section 6.2 of this program; and

- Implement HR processes for collecting motor vehicle histories for prospective new hires and existing employees.

2.7 EMPLOYEE DRIVERS

It is anticipated that each driver in our organization will do his or her part towards the success of this program. An employee driving for the company shall meet minimum company qualification requirements as outlined in Section 5.0 of this document and comply with Tetra Tech Driver Rules of Conduct and Vehicle Use Policy.

Drivers enrolled in the MVR record check process will be required to sign a consent form for review of their driving record.

3.0 RULES OF DRIVER CONDUCT

Because Tetra Tech has an interest in personal safety, as well as the safety of the general public, the Company has established the following Rules of Driver Conduct. Our policy provides that vehicles are to be operated only under the following conditions:

When the vehicle is in good, safe mechanical condition;

- Do a visual check of the vehicle. If defects are identified on a fleet vehicle, notify your Local Fleet Administrator prior to vehicle operation. If an employee is driving his/her personal vehicle for company purposes, the employee is responsible for performing self-inspection and for maintaining his/her vehicle in a safe operating condition.

When the driver feels capable of driving safely;

- Do not drive any vehicle while under the influence of alcoholic beverages or any drugs that could affect your driving ability. This includes prescription and over-the-counter medications.

- Do not drive any vehicle when impaired by fatigue, illness or other reason. Such conditions may include tiredness from sleep deprivation, sleepiness from long work hours, vertigo or impaired vision from illness. In cases where long distance driving is required, consider alternating driving responsibilities with another Tetra Tech qualified driver.

In accordance with all traffic laws, signals and markings;

In accordance with the principles of defensive driving techniques;

- Drivers must always be on alert and prepared to compensate for the unpredictable actions of other drivers and pedestrians. Defensive driving is defined as "driving to avoid incidents in spite of the incorrect actions of others, and the adverse conditions of weather, visibility, light, traffic and other potential dangers that the driver may encounter on the road."

- Maintain at least a 3-second following distance from the vehicle ahead under excellent driving conditions, 4-seconds if over 40 mph. If adverse conditions of the road are encountered (e.g. heavy traffic, light, poor visibility or inclement weather) double the following distance accordingly.

- Proceed through intersections cautiously, expecting other drivers to violate or ignore traffic laws and signals.

- Perform a vehicle walk around before backing up and proceed cautiously. When feasible, back into spaces, or pull through to adjacent row, so the first move out is forward.

In a courteous manner at all times, with consideration for the rights of other drivers and pedestrians;

- Vehicle operators should treat others as they would wish to be treated.

- Help other drivers to safely negotiate the roadway. If it is safe to do so, allow other drivers to merge into your lane. This applies at freeway on-ramps as well. This courtesy will help avoid incidents.

- Yield the right of way to pedestrians in the intersection. Be observant for bicycle and motorcycle riders and give them as much clearance as possible.

Tetra Tech may revoke driving privileges, take disciplinary action up to and including termination and/or seek full reimbursement from an employee for a loss occurring as a result of an employee's negligence while driving a company, leased, rented or personal vehicle for company business. Negligence will have occurred in the following events, among others, whether or not the employee was operating the vehicle at the time, the employee allowed inappropriate use by another driver, and it is determined the operator of the vehicle committed any of the following violations:

- Driving under the influence of alcohol or other controlled substance;

- Transporting or possessing a listed DOT disqualifying drug or other controlled substance as identified in the Tetra Tech Substance Abuse Program;

- Felony, negligent homicide or manslaughter involving the use of a motor vehicle;

- Using false or fictitious driver's license;
- Leaving the scene of an incident or hit and run;
- Misrepresenting the facts concerning an incident to authorities, insurance agency personnel or authorized Tetra Tech personnel (e.g. HR and H&S);
- Reckless driving;
- Operating a company vehicle in an unsafe condition, while having prior notice of such condition;
- Causing damage to a third party arising from driver's negligence;
- Company vehicle use for any purpose in violation of federal, state or local laws; and
- Violating the Tetra Tech Rules of Driver Conduct or Vehicle Use Policy.

4.0 VEHICLE USE POLICY

Company vehicles are intended to be used for company business only. Personal use is **strictly prohibited**, unless the Local Fleet Administrator and operating unit senior management grants prior written permission. The use of a company vehicle is restricted to the assigned driver or other Tetra Tech qualified drivers. The employee will be held personally responsible for all damages and losses that may occur as a result of an unauthorized driver in a company vehicle or unauthorized personal use of a company vehicle.

The use of seat belts by vehicle operators and all occupants of the vehicle are **mandatory**. Studies have shown that injuries resulting from motor vehicle incidents are significantly reduced, or completely avoided, if seat belts are worn at the time of an accident.

Vehicles must be clean and maintained in safe operating condition per maintenance guidelines established by Tetra Tech and in accordance with guidelines outlined in the owner's manual of the vehicle. Particular attention should be paid to tire tread, proper inflation, functional lights, horn and wipers. Secure loads prior to operation of a vehicle.

Tetra Tech has elected to restrict the use of phones and other hand held communication devices while driving, operating equipment or performing any activity if your safety or the safety of others might be compromised. Unless devices can be operated with hands free accessories, employees may not place or accept a call while engaged in these activities. If a call must be placed or accepted, drivers must stop and park the vehicle in a safe area or a non-traffic zone.

Tetra Tech employees who use their personal cell phones for company business or while on company business are required to follow the above safety measures and are encouraged to follow this policy at all times for their personal safety.

Local regulations may prohibit the use of cell phones under any circumstances or further restrict the use of cell phones while driving. In these cases, Tetra Tech personnel are to abide by the local regulations.

It is further recommended that similar prudent safety measures be followed while engaging in other potentially distracting activities while driving such as eating or changing radio stations, CDs or cassette tapes.

Employees using motorcycles for official business are required to wear approved helmets while the motorcycle is in motion. This requirement applies regardless of state law requirements. Employees using any type of unenclosed off-road or all-terrain vehicle are required to wear approved head protection any time the vehicle is in motion regardless of speed or distance traveled.

Company vehicles owned, leased or rented within the U.S. shall not be operated outside of the U.S. unless written permission has been granted by Corporate Administration Risk Management. Insurance coverage may often not extend to Mexico or elsewhere beyond U.S. borders, its territories and possessions, Puerto Rico and Canada.

When working internationally, employees are responsible for ensuring they purchase adequate coverage when purchasing, renting or leasing vehicles that are to be used to conduct Company business. Employees are encouraged to contact Tetra Tech Corporate Administration Risk Management for guidance in such transactions.

Authorized driver's Motor Vehicle Records (MVRs) will be checked periodically. Tetra Tech will also require corrective action in those cases where driving records fail to meet minimum driver qualification standards.

All incidents involving company and personal vehicles being used for company business, must be reported to management, the Local Fleet Administrator and the operating unit's Health and Safety Representative as soon as practical but within 24 hours. It is the responsibility of the Local Fleet Administrator to notify the Enterprise Fleet Administrator and the insurance carrier as soon as possible but no later than 24 hours after the initial notification.

Events which may adversely impact your ability to perform driving duties as required by your position must be reported to the Local Fleet Administrator prior to operating a vehicle for company business. These events include but are not limited to driver's license revocation, suspension, moving violations, physical or medical limitations, DWI, DWAI or DUI convictions. Certain positions such as those requiring Government Security Clearances may have more detailed reporting requirements.

It is the employee's responsibility to maintain personal automobile insurance at legally mandated levels. The employee's insurance is the primary carrier in the event of an accident while using a privately owned vehicle for company business. If an employee is not covered to use his/her vehicle for company business then alternate forms of transportation must be utilized. If a rental vehicle is used, only approved rental car agencies should be used as outlined in Tetra Tech's Corporate Travel Policy. Company approved rental car agencies carry insurance as part of the rental agreement.

Any traffic violations incurred while driving a company vehicle or personal vehicle for company business will be at the expense of the driver.

5.0 DRIVER QUALIFICATION

Tetra Tech has established the following driver qualification criteria for employees driving for company business. It is not the intent of the company to validate all employees who may drive for company business; rather it is the responsibility of the employee to notify their Local Fleet Administrator if he or she fails to meet these criteria. Failure to notify may result in disciplinary action up to and including termination.

Any employee driving for company business purposes, including the operation of company owned or rented vehicles or who use his/her personal vehicle must:

- Be 18 years of age;
- Have a valid driver's license that meets the requirements for the type of vehicle the employee will be required to operate; and
- Have current driving privileges with the State of primary residence.

Driving records must not indicate any of the following conditions:

- Punitive suspension, denial or revocation of license within a three year period from preceding the date of the review;
- Conviction for impaired or intoxicated driving (DWAI, DUI, DWI) within three years immediately preceding the date of the review;
- Conviction of reckless driving, conviction of driving with a suspended, denied, revoked license, conviction of hit and run, or conviction of leaving the scene;
- Three or more moving violation convictions within three years immediately preceding the date of review;
- Three or more at fault accidents within three years immediately preceding the date of review; and
- Combination of three or more at-fault accidents or moving violations immediately preceding the date of review.

The date of conviction will be the date utilized when evaluating driver qualification and probationary driver status.

5.1 PROBATIONARY DRIVER STATUS

A prospective or existing employee who shall be expected to regularly drive for the company and has been convicted of either two at-fault incidents, two moving violations or a combination of a moving violation and at fault incident within a three year period will be subject to the following corrective actions:

- Restriction of company driving privileges until successful completion of a company approved defensive driving course, and

- One year probation status with semi annual review of driving record.

Prospective employees shall pay for the defensive driving course.

The operating unit HSR will review course content. The driver will be granted authorization on a one-year probationary basis.

Any moving violation or preventable incident during the probation period will result in suspension of company vehicle privileges and may be grounds for disciplinary action up to and including termination.

Additional training may be required in cases of preventable work related accidents as outlined in Section 8.0 Training.

The operating unit will provide written or email correspondence to probationary status drivers outlining current driving status and required corrective actions. The reinstatement of company driving privileges will require review and approval of the operating unit Supervision and the Enterprise Fleet Administrator.

Documents available to communicate driver status are found in Appendix B of this document.

5.2 EMPLOYEES OR PROSPECTIVE EMPLOYEES NOT MEETING DRIVER CRITERIA

In cases where a driver has not met the criteria detailed in Section 5.0, driving privileges will be immediately suspended until further review for existing employees. Prospective employees where driving is regularly required shall not be eligible for employment until further review.

A review of the driver's MVR will be conducted by the MVR Review Committee. During this review, consideration will be given to the type and severity of the violations, the relevance of the violations to driving behavior as well as information provided by the operating unit.

The MVR Review committee consists of representatives from Health and Safety, Human Resources and Operations. Notice of committee meetings are coordinated by the Enterprise Fleet Manager. The Enterprise Fleet Manager will also notify the affected unit Operations and HR Representatives for input prior to the review.

The MVR Committee will communicate the results of the review to the Corporate Administration office for a final determination of the driver's status. Corporate Administration reserves the right to authorize or not authorize drivers based on the Committee's recommendation and the circumstances of each individual driving record.

Documents available to communicate driver status are found in Appendix B of this document.

6.0 MOTOR VEHICLE RECORD CHECK PROCESS

The following describes the MVR check process including, enrollment requirements for existing and prospective employees, driver classification guidance, and MVR check frequency

The implementation of client or contract specific driver qualifications shall be the responsibility of the operating unit. The PM shall address and implement project specific requirements as appropriate.

Documents available to enroll in the MVR check process are found in Appendix C of this document.

6.1 ENROLLMENT

Prospective and existing employees shall be enrolled in the MVR check process at the operating unit level based on either driving frequency, type of driving, monitoring of driver qualification, or after an accident, incident, violation or similar event.

Prospective and existing employees enrolled in the MVR check process must provide driver license information to the HR Department either prior to hire or when existing job functions require regular driving for company business.

Existing employee driving privileges will be immediately suspended if an employee refuses enrollment.

6.2 DRIVER CLASSIFICATION

The following classifications are presented as guidance to identify employees for enrollment in the MVR Check Process. These classifications are based on vehicle usage. Each Local Fleet Administrator in conjunction with HR and operating unit management may use discretion in determining the classification of employee drivers.

Non-Driver
An employee whose normal job duties do not require him/her to drive in the course and scope of employment and does not normally drive, even on an irregular or infrequent basis.

Occasional Driver
An employee whose normal job duties do not require him/her to drive in the course of employment but may drive on an infrequent basis only. Examples of this would include an employee who drives three times a month to attend a meeting, conference, etc.

Regular Driver
An employee whose normal job duties require him/her to drive in the course and scope of employment on a frequent basis such as once per week.

Regular Driver – Commercial
A regular commercial driver is an employee whose normal job duties include the operation of a vehicle that requires a commercial driver's license for operation and is regulated by the Interstate Commerce Commission or the US Department of Transportation.

6.3 MVR CHECK FREQUENCY

Prospective employees identified as regular drivers shall be enrolled in the MVR check process and shall have their MVR record reviewed prior to hire.

MVR Checks may be performed at any time on existing employees but will generally be performed:

- Randomly on a statistically significant sample chosen from the pool of regular Tetra Tech drivers;
- As a result of required employee reporting of driving history as outlined in Section 5.0; or,
- For cause after an accident, incident, violation or similar event.

Each Local Fleet Administrator in conjunction with the Human Resource Department and Management may use discretion in determining the frequency of MVR checks for specific positions.

In specific cases where the MVR indicates incidents approaching company thresholds, more frequent MVR reviews and corrective actions may be required.

7.0 INCIDENT INVESTIGATION AND REPORTING

Any driver involved in an auto incident while on company business is responsible for notifying his/her supervisor, the operating unit's Health and Safety Representative and the Local Fleet Administrator as soon as practical but no later than 24 hours following the incident. Follow all claim reporting procedures as provided by the Corporate Administration Risk Management Office.

All motor vehicle incidents will be investigated in accordance with the Tetra Tech Incident Reporting and Investigation Program. Incidents will be investigated to determine root cause, determine if the incident was preventable and identify appropriate corrective actions to be completed.

While performing company business, an incident has occurred whenever:

- Your vehicle is involved in a collision with another party's property (whether it is a vehicle, home, lawn, pool etc.);
- Your vehicle injures another party or is suspected to have injured another party (whether a pedestrian or a passenger in a vehicle);
- Something happens to a passenger in your vehicle that may give him or her cause to file suit for damages against you personally, the company, or the vehicle leasing or rental company;
- You are injured while driving;
- Your vehicle is damaged whether minimal or extreme damage occurs (even if no other person, vehicle or property is involved). This includes vandalism, hit and run and natural occurrences; and

- A company-owned, leased or rented vehicle is stolen.

Collisions involving a company owned, leased or rented vehicle must be reported to the police department. For personal vehicles, follow all reporting procedures as identified by the employee's personal insurance provider. In cases where personal vehicles have been involved in an accident, the driver is responsible for completing and filing any required incident reports to the appropriate state and federal authorities if applicable.

7.1 INCIDENT SCENE PROCEDURES

If a Tetra Tech employee is involved in a vehicle incident, the following guidelines should be followed:

- Stop immediately;
- If there are no injuries, protect the scene to prevent other vehicles from becoming involved. Put out emergency reflectors or flares if available;
- In the case of any injury, call 911 for medical and law enforcement assistance;
- Render first aid, if certified to do so;
- Do not admit liability at the scene;
- Record the name, address, phone number, insurance policy number of the owner of the other vehicle involved;
- Record the name, addresses and phone numbers of all passengers and witnesses;
- If police or medical personnel have responded to the scene, record the names, badge numbers and precinct of the police officers and medical personnel involved;
- Take photographs of the scene, if a camera is available; and
- If the company vehicle is damaged and requires towing, the immediate supervisor should be notified with information regarding who towed the vehicle, where will the vehicle be located and the extent of the damage to the vehicle. This information should be provided to Tetra Tech's auto insurance carrier when the claim is filed.

Be courteous to others at the scene, but avoid making statements that attribute blame to yourself or others. Do not discuss the details of the incident with anyone other than a licensed authority such as a police officer, our insurance company representative or broker.

Upon returning to the office, obtain and complete the "Tetra Tech Incident Report Form IR and IR-C Motor Vehicle Report" or enterprise approved equivalent. Complete the Tetra Tech Injury or Illness Form IR-A or enterprise approved equivalent if injuries resulted from the accident. Attach copies of police reports when

available. Submit copies of all these documents to the appropriate operating unit supervisor and H&S Representative.

Employees are not to authorize any accident related repairs to company vehicles. The Local Fleet Administrator will authorize repairs after an incident report is received. Employees will be held personally liable for the full cost for damage to a company vehicle if it was determined that an unauthorized or impaired driver was operating the vehicle at the time of the incident.

8.0 TRAINING

Periodically, information will be made available to drivers who are regularly expected to use motor vehicles as part of that employee's official work assignment. This information shall include the following topics:

- Tetra Tech Rules of Driver Conduct
- Vehicle Use Policy
- Vehicle familiarization and general operation
- Unsafe driving practices
- Defensive driving techniques
- Use of vehicle safety systems, including seat belts and air bags
- Effects of drugs, alcohol, and fatigue on driver performance

This information may be presented online, via email communication, videotape or may be included as a component in other health and safety training.

In the event a Tetra Tech driver is involved in a preventable work related accident, the Local Fleet Administrator in conjunction with local operating unit management may require the employee to attend a company approved defensive driving training course. The operating unit HSR must approve course selection and content. A certificate of completion must be presented to the local fleet administrator prior to operating a vehicle for company business. Training records will be maintained at the operating unit level.

9.0 VEHICLE INSPECTIONS AND MAINTENANCE

In order to maintain a safe and operational fleet, Tetra Tech has implemented the following preventative inspection and maintenance guidelines.

9.1 INSPECTIONS

Prior to vehicle operation, a visual check of the vehicle should be conducted. If defects are identified on a fleet vehicle, notify your Local Fleet Administrator prior to vehicle operation. If an employee is driving his/her

personal vehicle for company purposes, the employee is responsible for performing self-inspection and for maintaining his/her vehicle in a safe operating condition. The following safety features should be included in this visual check:

- Horn
- Back Up Warning, if applicable
- Head, tail and signal lights
- Tire Inflation
- Mirrors
- Windshield Wipers
- Fire Extinguisher (company owned light trucks and vans only)
- Windshield and windows should be free of broken glass that can obstruct the view or present a potential hazard

Any fleet vehicle that does not pass a visual inspection must not be operated until repairs are made. The Local Fleet Administrator shall be notified to correct all deficiencies or problems.

9.2 MAINTENANCE

It is the responsibility of each Tetra Tech operating unit to maintain vehicles within its control in good working order. As a minimum, every company vehicle shall be inspected annually by a qualified mechanic. Certain Tetra Tech operating units have maintenance capabilities in house, others may outsource this activity. Qualified mechanics may be identified through the Tetra Tech Auto Insurance Carrier. Inspections must satisfy applicable local laws and must include the following minimum items:

- Visual inspection of brake system (wheel removal required)
- Essential fluid levels including brake, power steering, radiator, wiper fluids
- Brake pad wear
- Belts and hoses
- Steering control
- Battery condition
- Filter replacement

- Lubrication
- Oil change (based on mileage)
- Emission systems visual inspection
- Tire tread / wear patterns
- Wiper blades

The Local Fleet Administrator shall evaluate specific maintenance requirements in accordance with the manufacturers' recommended service guidelines and adjust this schedule as appropriate. A road test must be conducted after all maintenance activities. A maintenance log shall be maintained for each company owned vehicle. This log shall be updated as maintenance is performed. All company vehicle inspection and maintenance records shall be maintained by the Local Fleet Administrator or designee.

APPENDIX A
VEHICLE SAFETY PROGRAM: COMMERCIAL MOTOR VEHICLES

In addition to the general fleet safety requirements outlined in the Tetra Tech Fleet Safety Program, Tetra Tech operating units, may operate commercial motor vehicles (CMV) regulated by the U.S. Department of Transportation. Entities that own and operate Tetra Tech commercial motor vehicles must comply with the Federal Motor Carrier Safety Administration (FMCSA) Regulations as detailed in Title 49 CFR and the following program elements.

Commercial Drivers License (CDL)

Employees must hold a valid CDL if they are involved in interstate, intrastate, or foreign commerce and operate a vehicle that meets one of the following classifications:

(a) Has a gross combination weight rating of 11,794 kilograms or more (26,001 pounds or more) inclusive of a towed unit(s) with a gross vehicle weight rating of more than 4,536 kilograms (10,000 pounds); or

(b) Has a gross vehicle weight rating of 11,794 or more kilograms (26,001 pounds or more); or

(c) Is designed to transport 16 or more passengers, including the driver; or

(d) Is of any size and is used in the transportation of hazardous materials.

Requirements for transporting hazardous materials are not covered in this document.

Driver Requirements

In order to operate a commercial vehicle for Tetra Tech, the employee must have met all CDL minimum qualifications as outlined in 49 CFR Part 391. These requirements include but are not limited to the following:

- Be in good health and physically able to perform all duties of a driver and hold only one commercial motor vehicle license;
- Be at least 21 years of age;
- Speak and read English well enough to converse with the general public, understand highway traffic and signals, respond to official questions and be able to make legible entries on reports and records; and
- Know how to safely load and properly block, brace and secure cargo.

Employee Notification Requirements

All CDL drivers must notify the Local Fleet Administrator as soon as possible but prior to operating any vehicle for company business for any traffic violation except for parking, regardless of the nature of the violation or the type of vehicle that was driven at the time. This notification must be in writing and must include the following information:

- Driver's license number;
- Date of violation;
- Details about the offense;

- Indication of whether the violation occurred in a CMV;
- Location of offense; and
- Driver's signature.

If a CDL driver's license is suspended, revoked, canceled or is disqualified from driving, the employee must notify the Local Fleet Administrator within 8 hours following the receipt of the notice of suspension, revocation, cancellation, lost privilege or disqualification.

Driver Disqualifications

An employee will be disqualified as a CMV operator, will be prohibited from operating a CMV for Tetra Tech and may be subject to disciplinary action including termination for any of the following offenses:

- Driving a CMV while under the influence of alcohol;
- Driving under the influence of a disqualifying drug or other controlled substance;
- Transporting or possessing a disqualifying drug or other controlled substance;
- Leaving the scene of an accident that involves a CMV;
- Using a CMV to commit a felony;
- Using a CMV to violate an out of service order;
- Using a CMV to commit serious traffic violations;
- Two or more serious traffic violations within a 3-year period. These include excessive speeding, reckless driving, improper or erratic lane changes, following the vehicle ahead too closely and traffic offenses in connection with fatal traffic accident; or
- Using a CMV to violate the Roadway-Highway Grade Crossing rule.

Alcohol and Controlled Substance Testing

Operating Units with CDL drivers are required to implement DOT compliant Substance Abuse Programs as detailed in 49 CFR Part 382. Testing shall be conducted in the following situations

- Pre-employment;
- Post accident;
- Random;
- Reasonable Suspicion;
- Return to Duty; and
- Follow Up.

APPENDIX A
VEHICLE SAFETY PROGRAM: COMMERCIAL MOTOR VEHICLES

Program details and specific testing procedures are not addressed in this document and can be found in operating unit specific program as appropriate. Testing records shall be maintained for five years in a secure location with limited access.

Medical Clearance

Prior to operating a CMV for Tetra Tech, all drivers must receive and pass a medical fitness examination. All Tetra Tech drivers must carry a valid medical examiners certificate that indicates the employee is physically qualified to drive a commercial motor vehicle. The medical examination must be conducted every two years in accordance with examination guidelines found in 49 CFR Part 391.41. Examinations must include a physical examination, review of medical history, drug, vision and hearing tests.

DOT/FMCSA Audits

Tetra Tech is subject to audits of the CDL program and will receive a safety rating from the agency after review of compliance with Federal Motor Carrier Safety Administration Regulations. A compliance review is conducted to investigate potential safety violations, to investigate complaints or can be initiated in response to a request for change in rating.

The DOT will review records, evaluate roadside vehicle inspection data, and may include an examination of the following aspects of Tetra Tech's operations:

- Alcohol and controlled substance testing;
- Driver's hours of service;
- Driver qualification;
- Vehicle inspection and maintenance;
- Financial responsibility (insurance coverage in amounts as specified in the Standard);
- Accidents;
- Hazardous materials; and
- Roadside vehicle out of service rate.

The results of an unsatisfactory compliance review may result in initiation of enforcement actions.

USDOT Number

Tetra Tech commercial vehicles falling under the scope of 49 CFR Part 390.5 must be registered with the FMCSA and must display a USDOT Number. Tetra Tech commercial vehicles may operate under different USDOT numbers. USDOT numbers will be registered under the true legal name of the operating unit. The Enterprise Fleet Administrator must be contacted prior to registering for a USDOT number when there may more than one unit operating under the same true name.

APPENDIX A
VEHICLE SAFETY PROGRAM: COMMERCIAL MOTOR VEHICLES

The USDOT Number serves as a unique identifier for FMSCA when collecting and monitoring a company's safety information acquired during audits, compliance reviews, incident investigations, and inspections.

The marking must:

- Appear on both sides of the vehicle;
- Be in letters that contrast sharply in color with the background on which the letters are placed;
- Be readily legible, during daylight hours, from a distance of 50 feet (15.24 meters) while the vehicle is stationary; and
- Be maintained in a legible manner

Recordkeeping

The Local Fleet Administrator must maintain a qualification file for each employee who holds a CDL and regularly operates a commercial motor vehicle for Tetra Tech.

These records must contain the following items:

- A copy of the employee's application for employment;
- A record of investigation of the employee's employment record during the preceding three years (this investigation must be made within 30 days of the date employment begins);
- A record of inquiry made to the state agency for driving records for the preceding three years;
- Records of annual inquiry to the state agency for employee's driving record;
- Annual review of driving record and results of this review;
- Copy of annual driver's certification of violations;
- Copy of employee's road test certificate or equivalent;
- Copy of medical Exam Certificate; and
- Results of controlled substance testing.

APPENDIX B
DRIVER STATUS DOCUMENTATION

DRIVER STATUS FORM

Name _____ Date _____

Operating Unit _____ Location _____

Driver Classification _____ Review Cycle _____

Date of Next Review _____ Completed By _____

INSTRUCTIONS: Review the employee's MVR and complete Sections A through D. Attach completed MVR Driver Status Form to MVR Report and maintain in Local Fleet Administrator Vehicle Safety Program Records.

A Driver Qualifications
"Yes" required for Qualified Tt Driver Status.

	Yes	No	NA
Applicant is over 18 and has held a valid drivers license for at least one year for the type of vehicle required.			
Applicant has current driving privileges with the state of the applicant's primary residence.			

B Serious Violations or Convictions
"No" required within last 3 years for Qualified Tt Driver Status.

	Yes	No	Date
Conviction of hit and run or leaving the scene of an accident			
Any felony, homicide or manslaughter involving use of motor vehicles.			
Driving while impaired, intoxicated or under the influence of alcohol or controlled substances			
Punitive license suspension, revocation, or denial			
Conviction of driving with a suspended, denied or revoked license			
Conviction of reckless, negligent or careless driving,			
Refusal to submit to drug/alcohol test - Implied Consent Law			

C Number of At Fault Incidents or Other Moving Violations
Less than three within last 3 years for Qualified Tt Driver Status. Two within last 3 years considered Probation Status with required corrective actions

	Yes	No	Date
None			
1			
2			
3			
4			
5			

D STATUS (Check One Only)

Qualified	
Probation with Corrective Actions *	
Non-qualified	
Driving Privileges Reinstated	

* Indicate Corrective Actions and Completion Date:

_____

_____

PROBATIONARY DRIVER STATUS TEMPLATE

Company Letterhead/Logo
Date:

Recipient's full mane:
Address:

Subject: Motor Vehicle Record Results

Dear **Recipient**,

As part of Tetra Tech's Vehicle Safety Program, all employees who operate a motor vehicle for company business are required to meet minimum driver qualification criteria. In accordance with this program, Tetra Tech will periodically obtain and review motor vehicle records (MVR) as part of the company's ongoing efforts to monitor driver qualification. As a driver for Tetra Tech, your driving record must not contain any serious violations or convictions as described in the program and there may be no more than either two moving violations, at fault incidents or combination of a moving violation and at fault incident within the last three years.

Upon review of your most recent MVR, your driving history does not meet the Tetra Tech driver criteria. As indicated on the attached MVR Driver Status Form, your current driving status is considered "probationary" until you successfully complete a company approved defensive driving course and you remain free from any moving violation or at fault incident for the period of one year from the date of this memo.

You are not authorized to drive for company business until you have successfully completed the defensive driver training that is required of all probationary status drivers. If after one year your record remains clear of any moving violation or at fault incident, your driving status will be revised.

We are currently recommending enrollment in the online National Safety Council's Defensive Driving course. You can register for this course at http://www.NSCDDonline.com. You may also complete any other defensive driving course as long as the content is approved by our Health and Safety Representative prior to enrollment. Please submit proof of **successful completion** to your Local Fleet Administrator. If you are an existing employee, you will be reimbursed for the defensive driving training course upon submitting a certificate of successful completion, a copy of your receipt, and a completed expense report.

As a driver for Tetra Tech it is your responsibility to notify the company of any event that may impact your ability to meet established driver criteria. Please recognize that the loss of "company business" driving privileges may impact your employment at Tetra Tech.

If you have any questions or concerns about the information we have obtained regarding your MVR or if you have questions about the Vehicle Safety Program, please feel free to discuss this with me or Human Resources.
Sincerely,

Supervisor's name

_____ _____
Acknowledgement Signature Date
cc: **HR Representative**
Local Fleet Administrator
Enterprise Fleet Administrator

NON-QUALIFIED DRIVER STATUS TEMPLATE

Company Letterhead/Logo

Date:

Recipient's full name:
Address:

Subject: Motor Vehicle Record Results

Dear **Recipient**,

As part of Tetra Tech's Vehicle Safety Program, employees who operate a motor vehicle on company business are required to meet minimum driver qualification criteria. In accordance with this program, Tetra Tech will periodically obtain and review motor vehicle records (MVR) as part of the company's ongoing efforts to monitor driver qualifications. As a driver for Tetra Tech your driving record must not contain any serious violations or convictions as described in the program and must not contain three or more moving violations or at fault incidents within the last three years.

Upon review of your most recent MVR, your driving history has exceeded the Tetra Tech driver criteria. As indicated on the attached MVR Driver Status Form, your current driving status is considered "**non-qualified**". Therefore, under Tetra Tech's Corporate Vehicle Safety Policy you are not authorized to drive on Company business. This includes the operation of a Tetra Tech leased, owned, rented, or even a personal vehicle.

As a result of being a non-qualified driver, consideration will be given to rearrangement of your responsibilities or reassignment to a position which does not require the operation of an automobile. However, please recognize that if we are not able to work out a viable option, the loss of driving privileges may impact your employment at Tetra Tech. We will contact you as soon as a decision has been made.

In the meantime, if you have any questions or concerns about the information we have obtained regarding your MVR or if you have questions about the Vehicle Safety Program, please feel free to discuss this with me.

Sincerely,

Supervisor's name

_____ _____

Acknowledgement Signature Date

cc: **HR Representative**
Local Fleet Administrator
Enterprise Fleet Administrator

APPENDIX C
MOTOR VEHICLE RECORD CHECK ENROLLMENT DOCUMENTS

AUTHORIZATION FOR RELEASE OF DRIVING RECORD - Existing Employee

Tetra Tech Inc. obtains motor vehicle driving records on employees and/or prospective employees assigned to regularly drive either personal, company owned, leased or rented vehicles for company business. Motor vehicle records will be reviewed in accordance with criteria outlined in the Tetra Tech Vehicle Safety Program.

Tetra Tech Inc. reserves the right to rescind driving privileges, apply corrective action, deny employment and or terminate employment, if an employee or applicant's Motor Vehicle Record does not meet company accepted standards.

I, _____ , am an employee or prospective employee of Tetra Tech and I request a copy of my official Driving Record be released to my employer or prospective employer or their agent.

Name (print) First Middle Last Date of Birth

Signature Date

Driver's License Number State of Issue Expiration Date

_____
Employee Number

Tetra Tech is an employer or prospective employer of the above named individual and USIS Commercial Services Inc. is acting as agent on behalf of Tetra Tech, Inc. to obtain the abstract of the driver record of the above named individual. The abstract of the driver record shall be used exclusively to determine whether the above named individual should operate a motor vehicle for company business. No information contained therein shall be divulged, sold, assigned, or otherwise transferred to any third person or party unless mandated by legal authority.

Tetra Tech, Inc.
3475 East Foothill Blvd
Pasadena, CA 91107

AUTHORIZATION FOR RELEASE OF DRIVING RECORD - Prospective Employee

Tetra Tech Inc. obtains motor vehicle driving records on employees and/or prospective employees assigned to regularly drive either personal, company owned, leased or rented vehicles for company business. Motor vehicle records will be reviewed in accordance with criteria outlined in the Tetra Tech Vehicle Safety Program.

Tetra Tech Inc. reserves the right to rescind driving privileges, apply corrective action, deny employment and or terminate employment, if an employee or applicant's Motor Vehicle Record does not meet company accepted standards.

I, _____ , am an employee or prospective employee of Tetra Tech and I request a copy of my official Driving Record be released to my employer or prospective employer or their agent.

Name (print) First Middle Last Date of Birth

Signature Date

Driver's License Number State of Issue Expiration Date

Social Security Number

Tetra Tech is an employer or prospective employer of the above named individual and USIS Commercial Services Inc. is acting as agent on behalf of Tetra Tech, Inc. to obtain the abstract of the driver record of the above named individual. The abstract of the driver record shall be used exclusively to determine whether the above named individual should operate a motor vehicle for company business. No information contained therein shall be divulged, sold, assigned, or otherwise transferred to any third person or party unless mandated by legal authority.

Tetra Tech, Inc.
3475 East Foothill Blvd
Pasadena, CA 91107

TETRA TECH, INC.
HEALTH AND SAFETY MANUAL
VOLUME III

SAFE WORK PRACTICES (SWP)

GENERAL SAFE WORK PRACTICES

SWP NO.: 6-1

ISSUE DATE: JULY 1998

REVISION NO.: 1

GENERAL SAFE WORK PRACTICES

To prevent injuries and adverse health effects, the following general safe work practices (SWP) are to be followed when conducting work involving known and unknown site hazards. These SWPs establish a pattern of general precautions and measures for reducing risks associated with hazardous site operations. This list is not inclusive and may be amended as necessary.

- Do not eat, drink, chew gum or tobacco, take medication, or smoke in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. A thorough shower and washing must be conducted as soon as possible if excessive skin contamination occurs.
- Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, or other such areas. Avoid, whenever possible, kneeling on the ground or leaning or sitting on drums, equipment, or the ground. Do not place monitoring equipment on potentially contaminated surfaces.
- Remove beards or facial hair that interfere with a satisfactory qualitative respirator fit test or routine pre-entry positive and negative pressure checks.
- Be familiar with and knowledgeable of and adhere to all instructions in the site-specific health and safety plan (HASP). At a minimum, a safety meeting will be held at the start of each project to discuss the HASP. Additional meetings will be held, as necessary, to address new or continuing safety and health concerns.
- Be aware of the location of the nearest telephone and all emergency telephone numbers.
- Attend a briefing on the anticipated hazards, equipment requirements, SWPs, emergency procedures, and communication methods before going on site.
- Plan and delineate entrance, exit, and emergency escape routes.
- Rehearse unfamiliar operations prior to implementation.
- Use the “buddy system” whenever respiratory protection equipment is in use. Buddies should establish hand signals or other means of emergency communication in case radios break down or are unavailable.
- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity in order to assist each other in case of emergency.

- Minimize the number of personnel and equipment in contaminated areas (such as the exclusion zone). Nonessential vehicles and equipment should remain within the support zone.

- Establish appropriate support, contamination reduction, and exclusion zones.

- Establish appropriate decontamination procedures for leaving the site.

- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the site safety coordinator (SSC).

- Maintain a portion of the site field logbook as a project safety log. The project safety log will be used to record the names, entry and exit dates, and times on site of all Tetra Tech, subcontractor, and project site visitor personnel; air quality and personal exposure monitoring data; and other information related to safety matters. Form SSC-1, Daily Site Log, may be used to record names of on-site personnel.

- A portable eyewash station should be located in the support zone if chemical splashes to eyes are possible.

- Do not bring matches and lighters in the exclusion zone or contamination reduction zone.

- Observe coworkers for signs of toxic exposure and heat or cold stress.

- Inform coworkers of nonvisual effects of illness if you experience them, such as headaches, dizziness, nausea, or blurred vision.

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

CONTROL OF HAZARDOUS ENERGY SOURCES (LOCKOUT/TAGOUT)

SWP NO.: 6-2

ISSUE DATE: JULY 1998

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CONTROL OF HAZARDOUS ENERGY SOURCES (LOCKOUT/TAGOUT)

This safe work practice (SWP) establishes minimum requirements for the lockout and tagout of energy-isolating devices whenever maintenance or servicing is performed on machines or equipment. This SWP will be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out and tagged out before employees perform any servicing or maintenance during which the unexpected energization or startup of the machine or equipment or release of stored energy could cause injury. This document follows requirements of Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.147, the "Control of Hazardous Energy (Lockout/Tagout)."

The applicability of this SWP and definitions, responsibilities, and procedures associated with lockout and tagout are discussed below.

1.0 APPLICABILITY

This SWP applies to all Tetra Tech, Inc. (Tetra Tech), employees that may perform service or maintenance activities on equipment that could result in injury from equipment startup or energization. Only trained employees are allowed to perform lockout and tagout procedures in accordance with this SWP. Upon observing a machine or piece of equipment that is locked out and tagged out to perform servicing or maintenance, an employee shall not attempt to start, energize, or use that machine or equipment. Violation of this rule may result in immediate termination.

The following situations are exempt from the requirements of this SWP:

- Cord- and plug-connected electrical equipment under sole control of the employee performing the service or maintenance
- Installation of power by a utilities service

If work is conducted at a site where another contractor or the site has an existing lockout/tagout procedure, Tetra Tech shall inform the contractor or site personnel of Tetra Tech procedures and request access to their respective procedures.

2.0 DEFINITIONS

Energy-isolating device: A mechanical device that physically prevents the transmission or release of energy

Lockout: Placement of a lockout device on an energy-isolating device to ensure that the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed

Lockout device: A device that uses a positive means, such as a key or combination lock, to hold an energy-isolating device in a safe position and prevent energizing of machine or equipment

Tagout: Placement of a tag on an energy-isolating device to indicate that the energy-isolating device and the equipment controlled must not be operated until the tag is removed

Tagout device: A prominent warning device, such as an attached tag, that can be securely fastened to an energy-isolating device to indicate that the equipment may not be operated until the tag is removed

3.0 RESPONSIBILITIES

Regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) will support operations managers in application of this SWP whenever necessary to their office-based projects. The operations manager may choose to delegate certain responsibilities, such as training and inspection, to the office health and safety representative (OHSR). The operations manager should contact a RHSR or SHSR for assistance with and evaluation of office implementation of this SWP.

Project managers shall ensure and enforce necessary lockout procedures on their projects. This responsibility may be delegated to the site safety coordinator for a specific project.

4.0 PROCEDURES

Procedures to ensure adequate energy control, employee training, and periodic inspections are discussed below.

4.1 ENERGY CONTROL PROCEDURES

This section describes basic procedures to follow for machine or equipment lockout/tagout. Whenever feasible, equipment should be locked out. Only when lockout is physically not feasible may tagout be the sole means of energy control.

4.1.1 Lockout or Tagout Sequence

The following sequence of activities must be followed for proper lockout or tagout:

- All affected employees should be notified that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance. The notification can be provided verbally, or else a written notice of intent to lockout for service or maintenance can be posted.

- The employee conducting the servicing or maintenance shall refer to all available reference materials and information sources to identify the type and magnitude of energy that powers the machine or equipment, shall understand the hazards of the energy, and shall know methods to control the energy.

- If the machine or equipment is currently operating, it must be shut down by the normal stopping procedure (such as depressing the stop button, opening the switch, closing the valve, or another method).

- The energy-isolating device(s) should be deactivated so that the machine or equipment is isolated from the energy source(s).

- The energy-isolating device(s) can then be locked out with assigned individual lock(s). Each lock must be accompanied by a "DANGER, DO NOT OPERATE" tag explaining why the equipment is locked out of service. Tags should contain complete information, such as name of servicing or maintenance employee, complete date, and reason for the tag. Tags must be written legibly. Each employee who has locked out the equipment will retain the lock key in his or her possession as long as the lock is installed.

  Note: Installing locks on ordinary stop-start stations is not considered a satisfactory electrical lockout. Lockout must occur at a circuit breaker, disconnect switch, block, or any similar device to block or isolate energy.

- Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by methods such as grounding, repositioning, blocking, or bleeding down, as appropriate.

- Personnel should ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, and then by verifying the isolation of the equipment by operating the "on" switch or other normal operating control(s) or by testing to make certain that the equipment will not operate.

  Caution: Operating controls should be returned to a neutral or "off" position after isolation of the equipment is verified.

- The machine or equipment is now locked out.

Each employee working on the equipment must be satisfied that it is safe for him or her to proceed with the work. Only the employee who has placed the lock can remove it, even if that person leaves the area with the lock or tag left on the equipment.

4.1.2 Restoration of Equipment to Service

When the servicing or maintenance job is completed and the machine or equipment is ready to return to normal operating conditions, the following steps shall be taken:

- The machine or equipment and the area around the machine or equipment should be checked to ensure that nonessential items have been removed and that machine or equipment components are operationally intact.
- The work area should be checked to ensure that all employees have been safely positioned or removed from the area.
- The controls should be in a neutral or "off" position.
- The lockout or tagout devices should be removed and the machine or equipment re-energized.
- Affected employees should be notified that the servicing or maintenance is completed and the machine or equipment is ready for use.

  Note: Some forms of blocking may require re-energization of the machine before the blocking can be safely removed.

4.2 EMPLOYEE TRAINING

Training shall be provided to all employees who may be required to use lockout and tagout procedures. The training shall cover the following topics as mandated in 29 CFR 1910.147:

- Types of energy sources anticipated
- Methods of energy isolation and control
- Purpose and use of energy control procedures
- Limitations of tagout

Retraining will be provided any time potential energy sources change or deviations are noted in techniques and procedures used by trained employees that do not comply with previously taught methods.

A roster of employees attending training sessions will be maintained and contain attendee signatures, attendance dates, and the content of the training program. Training will typically be included with annual refresher training sessions as discussed in "Health and Safety Training Program," Document Control No. 3-1.

4.3 PERIODIC INSPECTIONS

At a minimum, inspections of compliance with this SWP by field staff will be conducted as required by 29 CFR 1910.147(c)(6). Because of the low frequency of use of this SWP, compliance inspections will be conducted randomly by the SSC on projects with known lockout and tagout needs.

Inspections will be documented using the "Lockout/Tagout Inspection Certificate" (Form LOTO-1) in Volume III, Forms.

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SAFE WORK PRACTICES (SWP)

SAFE DRILLING PRACTICES

SWP NO.: 6-3

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SAFE DRILLING PRACTICES

This document establishes safe work practices (SWP) to follow during drilling operations. These SWPs are based on suggested safety procedures provided in the National Drilling Association's "Drilling Safety Guide." Procedures to follow before, during, and after drilling are listed below.

Before beginning any drill operation, each employee must be aware of the following:

- Wear a hard hat, safety glasses or goggles, steel-toed work boots, a shirt and full-length pants when working with or near the drill rig. Shirts must be tucked in at the belt.
- Do not wear loose or frayed clothing, loose long hair, or loose jewelry while working with rotating equipment.
- Do not eat, drink, or smoke near the drill rig.
- Identify all underground utility and buried structure locations before drilling.
- Ensure that the drill rig and any other machinery used is inspected daily by competent, qualified individuals. The site safety coordinator (SSC) will ensure compliance with this precaution.
- Drill rig operators will be instructed to report any abnormalities, such as equipment failure, oozing liquids, and unusual odors, to their supervisors or the SSC.
- Establish hand-signal communications for use when verbal communication is difficult. One person per work team will be designated to give hand signals to equipment operators.

While the drill rig is operating, employees should be aware of the following:

- Wear appropriate respiratory and personal protective equipment (PPE) when conditions warrant their use.
- Avoid direct contact with known or suspected contaminated surfaces.
- Move tools, materials, cords, hoses, and debris to prevent tripping hazards and contact with moving drill rig parts.
- Adequately secure tools, materials, and equipment subject to displacement or falling.
- Store flammable materials away from ignition sources and in approved containers.

- Maintain adequate clearance of the drill rig and mast from overhead transmission lines. The minimum clearance is 25 feet unless special permission is granted by the utility company. Call the local utility company for proper clearance.

- Only qualified and licensed personnel should operate drill rigs.

- Workers should not assume that the drill rig operator is keeping track of their exact location. Workers should never walk directly behind or beside heavy equipment without the operator's knowledge.

- Workers should maintain visual contact with drill rig operators at all times.

- When an operator must maneuver equipment in tight quarters, the presence of a second person is required to ensure adequate clearance. If much backing is required, two ground guides will be used: one in the direction the equipment is moving, and the other in the operator's normal field of vision to relay signals.

- Auger sections and other equipment are extremely heavy. All lifting precautions should be taken before moving heavy equipment. Appropriate equipment, such as chains, hoists, straps, and other equipment, should be used to safely transport heavy equipment too heavy to safely lift.

- Proper personal lifting techniques will be used. Workers should lift using their legs, not their backs.

- Workers will not use equipment they are not familiar with. This precaution applies to heavy as well as light equipment.

- All personnel not essential to work activities will be kept out of the work area.

- Workers will be aware of their footing at all times.

- Workers will remain alert at all times.

After drilling operations are completed, employees should do the following:

- Shut down machinery before repairing or lubricating parts (except parts that must be in motion for lubrication).

- Shut down mechanical equipment prior to and during fueling operations. When refueling or transferring fuel, containers and equipment must be bonded to prevent the buildup of static electricity.

- Keep drill rigs in the exclusion zone until work has been completed. Such equipment should then be decontaminated within the designated decontamination area.

- Engage parking brakes when equipment is not in use.

- Implement an ongoing maintenance program for all tools and equipment. All tools and moving equipment should be inspected regularly to ensure that parts are secured, are intact, and have no cracks or areas of weakness. The equipment must turn smoothly without wobbling and must operate in accordance with manufacturer specifications. Defective items should be promptly repaired or replaced. Maintenance and repair logs will be kept.

- Store tools in clean, secure areas to prevent damage, loss, or theft.

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SAFE WORK PRACTICES (SWP)

EXCAVATION PRACTICES

SWP NO.: 6-4

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EXCAVATION PRACTICES

This safe work practice (SWP) outlines minimum requirements to protect employees who may be exposed to hazards during trenching and excavation activities and to provide general guidance for compliance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1926, Subpart P, "Excavations."

Project managers shall ensure that all excavation, shoring, and trenching activities are conducted in accordance with the requirements outlined in this document and Subpart P of 29 CFR 1926. Project managers must also ensure that projects involving trenching and excavation are staffed by an individual capable of performing "competent person" duties as described in this procedure.

The site safety coordinator (SSC) is responsible for on-site enforcement of this SWP.

Definitions and procedures used for excavations are discussed below.

1.0 DEFINITIONS

The following definitions apply to this SWP:

Benching: Forming one or a series of horizontal levels or steps in the sides of an excavation to protect employees from cave-ins

Competent Person: One capable of identifying existing or predictable hazards in the work environment that are unsanitary or dangerous to employees and who has authorization to take prompt corrective measures to eliminate the hazards

Excavation: Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal

Shoring: Metal, hydraulic, mechanical, or timber system that supports the sides of an excavation and that is designed to prevent cave-ins

Sloping: Sloping the sides of an excavation at an incline away from the excavation to protect employees from cave-ins

Trench: A narrow excavation (in relation to its length) that is usually deeper than it is wide but less than 15 feet wide

2.0 PROCEDURES

Described below are the general safety requirements and protective system requirements for trenching and excavation activities.

2.1 GENERAL SAFETY REQUIREMENTS

General safety requirements that must be in place before work begins are as follows:

- Utility companies or a utilities locating service in the area must be notified **before excavation or trenching activities begin** to arrange for locating and protecting underground utilities.
- Access to trenching areas must be controlled and limited to authorized personnel. Prior to entering a trench or excavation, workers must notify the project manager, SSC, and nearby equipment operators whose activities could affect the trench or excavation.
- No person may enter a trench or work at the foot of the face of an excavation until a qualified, competent person has inspected the excavation and determined whether sloping or shoring is required to protect against cave-in or subsidence and the appropriate protection has subsequently been installed.
- Trenches and excavations must be assessed by a qualified, competent person, even in the absence of working personnel, whenever heavy equipment will be operating nearby in order to ensure that the trench or excavation will support the weight of the equipment without subsistence or causing the accidental overturning of machinery.
- Trenches and excavations must be inspected regularly (daily at a minimum) to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibration, or nearby equipment operation have not caused weakening of the sides, faces, and floors and to ensure that personnel protection is being maintained.
- When subsidence or tension cracks are apparent anywhere in an excavation, all work should be stopped until the problem is corrected.
- The competent person must inspect trenches or excavations after any precipitation event to ensure integrity has been maintained.
- Sufficient ramps or ladders must be provided in excavations 4 or more feet deep to allow quick egress. Ramps or ladders may be placed no more than 25 feet apart, must be

secured from shifting, and must extend at least 3 feet above the top of the trench or excavation. Structural ramps must be designed by a competent person.

- Material removed from an excavation or trench must be placed far enough from the edge (at least 2 feet) to prevent it from sliding into the excavation or trench or from stressing the trench or excavation walls. Worker protection must also be provided from loose rock or soil on the excavation faces.

- If trenches or excavations are near walkways or roadways, guards or warning barriers must be placed to alert pedestrians and drivers of the presence of the trench or excavation.

- If possible, trenches or excavations should be covered or filled in when unattended. Otherwise, strong barriers must be placed around the trench or excavation and lighting must be provided at night if the trench or excavation is near a walkway or roadway.

- When a hazardous atmosphere could exist, the excavation must be tested for appropriate hazardous substances and oxygen level before personnel entry. Excavation where hazardous atmospheres exist must be treated as a confined space. Entry must follow procedures outlined in "Confined Spaced Entry Program," Document Control No. 2-5.

- Entry is not allowed into excavations where water has accumulated.

2.2 PROTECTIVE SYSTEM REQUIREMENTS

Protective systems protect employees from cave-ins, material that could fall in or roll off the face of the excavation, and collapse of adjacent structures. Protective systems include shoring, shielding, sloping and benching, and other systems. Sloping and benching and shoring system requirements are described below.

2.2.1 Sloping and Benching Requirements

Sloping and benching system construction must follow the guidelines established in Appendix B to Subpart P of 29 CFR 1926. Maximum allowable slopes for excavations are summarized below. All slopes indicated are expressed as the ratio of horizontal distance (H) to vertical rise (V).

Soil or Rock Type	Maximum Allowable Slope (H:V) for Excavations Less than 20 Feet Deep
Stable Rock	Vertical (90°)
Type A	0.75:1 (53°)
Type B	1:1 (45°)
Type C	1.5:1 (34°)

Soil types are defined in Appendix A to Subpart P of 29 CFR 1926 and are summarized below.

Type A: Cohesive soils with an unconfined compression strength of 1.5 tons per square foot (ton/ft^2) or greater (such as clay, silty clay, sandy clay, or clay loam)

Type B: Cohesive soils with an unconfined compression strength of greater than 0.5 but less than 1.5 ton/ft^2 (such as angular gravel, silt, silt loam, or sandy loam)

Type C: Cohesive soils with an unconfined compression strength of less than 0.5 ton/ft^2 (such as gravel, sand, loamy sand, submerged soil, or unstable submerged rock)

Sloping and benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.

Soil types must be determined by the competent person using at least one visual and one manual test. Manual tests include plasticity, dry strength, thumb penetration, and drying tests.

2.2.2 Shoring System Requirements

Appendixes C, D, and E to Subpart P of 29 CFR 1926 outline requirements for timber shoring for trenches, aluminum hydraulic shoring for trenches, and alternatives to timber shoring, respectively. Guidelines for shoring systems are listed below.

- If it is not economically feasible or there are space restrictions to prevent cutting the trench or excavation walls back to a safe angle of repose, all trenches or excavations 5 feet deep or more must be shored.
- Shoring should be erected as trenching or excavation progresses and as closely as possible to the excavation floor.
- Shoring timber dimensions must meet the minimum timber requirements specified in Tables C1.1 through C1.3 of Appendix C to Subpart P 29 CFR 1926. Aluminum hydraulic shoring must be constructed using the guidelines and dimension requirements specified in Appendix D of the same standard.

- Trench shields may be used instead of shoring or bracing. Shields must be constructed of steel flat sides welded to a heavy framework of structural pipe. Shields should be moved along by the excavator as trenching or excavation proceeds.

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SAFE WORK PRACTICES (SWP)

HOT WORK PRACTICES

SWP NO.: 6-6

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HOT WORK PRACTICES

This safe work practice (SWP) documents procedures to protect employees and prevent combustible materials from exposure to fire, sparks, hot metal, or any other source of ignition whenever hot work is performed outside of a designated safe hot work area. Definitions, responsibilities, hot work requirements, and hot work in confined spaces are discussed below. This SWP also addresses Occupational Safety and Health Administration (OSHA) requirements specified in Title 29 of the *Code of Federal Regulations* (CFR) 1910.252 for fire prevention and protection during welding, cutting, and brazing.

1.0 DEFINITIONS

Designated Safe Hot Work Area: An area that has been designed and constructed specifically for performing open-flame or spark-producing work (for example, maintenance shops are designated safe hot work areas)

Fire watch: At least one individual dedicated solely to the look out and control of stray fires; the fire watch shall remain in a location that allows immediate communication with the individual(s) performing hot work; the fire watch shall also remain in the work area after work is completed to ensure the risk of fire from hot work has passed (at a minimum, this period will last at least 0.5 hour)

Hot Work: Work using an open-flame or spark-producing apparatus; hot work includes, but is not limited to, welding, cutting, burning, grinding, and related heat-producing jobs that could ignite combustible materials or flammable atmospheres

2.0 RESPONSIBILITIES

The project manager must issue hot work permits, ensure that employees are trained in hot work requirements, and ensure that contract personnel meet requirements detailed in this SWP. Hot work shall not begin until the project manager can ensure and document in the site logbook the following:

- People and combustible materials will not be exposed to fire, sparks, or any other source of ignition.

- Emergency response procedures are in place.
- The work area is safe.

The site safety coordinator (SSC), working under the authority of the project manager, is responsible for on-site compliance with hot work requirements including completion of hot work permits. Tetra Tech health and safety specialists are available to assist in site-specific procedure development. The SSC should periodically evaluate the effectiveness and integrity of site-specific hot work procedures.

The fire watch shall attend all hot work performed in circumstances where a fire might develop. These circumstances exist when one or more of the following is true:

- An appreciable amount of combustible material that can be easily ignited (including material such as the building structure or other materials) is within 35 feet of the hot work area
- Wall or floor openings exist within a 35-foot-radius of the hot work area that expose combustible materials in adjacent areas; openings include concealed spaces in walls or floors
- Combustible materials likely to be ignited by conduction or radiation are near the other side of hot work areas near the metal partitions, walls, ceilings, or roofs

The fire watch shall also ensure that the appropriate extinguishing equipment is readily available and be trained in its use. The type of hot work procedures performed shall determine equipment required. At a minimum, an extinguisher rated at 2A:40BC shall be provided. Depending on the amount of combustible materials in the area and the location of the hot work, a hose with a stream diameter of up to 1.5 inches may be required. A Tetra Tech health and safety specialist should be consulted for assistance with fire extinguisher selection.

The fire watch shall be familiar with the equipment for sounding an alarm in the event of a fire and watch for fires in all exposed areas. Personnel should not try to extinguish fires unless the fire is extinguishable given the capacity of the equipment available. In the event of fire beyond the extinguisher's capacity, the fire watch shall summon aid.

3.0 HOT WORK REQUIREMENTS

The following minimum requirements apply at sites where hot work will be performed:

- A hot work permit shall be completed to authorize hot work performed outside of designated safe hot work areas. Hot work may not begin until a permit has been obtained. Form HW-1 in Volume III, "Hot Work Permit," is suitable for most work.
- Combustible materials, including ordinary combustible materials, and flammable and combustible liquids should be relocated at least 35 feet from the hot work area. If relocation is impractical, combustibles shall be protected with flame-proof covers or shielded with metal or flame-proof curtains.
- The hot work permit should specify the concentrations of vapors and gases in areas as applicable.
- If flammable vapors or gases are present but their levels do not exceed 10 percent of the lower explosive limit (LEL), hot work should not be started until the person approving the permit
  - Knows the source of the flammable gases or vapors and
  - Determines that their concentration will not increase while the hot work is in progress.
- Hot work should not be performed if the concentration of flammable gases or vapors exceeds 10 percent of the LEL.
- Lower areas should be roped off when hot work is performed overhead. Warning signs must then be posted to prevent combustible materials and personnel from entering the lower areas.
- Barriers should be placed around and under hot work areas to confine sparks unless this action is physically impossible.
- Open drains leading to underground systems that may contain flammable or combustible materials should be protected by the following:
  - The atmosphere should be tested for flammable vapors before a permit is issued and
  - The open drain should be covered with a fire blanket or similar protective shield to prevent the entry of sparks, even if a safe atmosphere currently exists.

4.0 HOT WORK IN CONFINED SPACES

When performing hot work in confined spaces, employees shall comply with the Confined Space Entry Program (see Document Control No. 2-5 in Volume I). In addition, employees shall do the following:

- Keep all gas cylinders and welding machines outside of confined spaces
- Positively isolate the gas supply outside the confined space when torches are not in use for a substantial period of time (such as during a lunch break); when practical, employees shall also remove torches and hoses from confined spaces
- De-energize electrode holders by electrically disconnecting the power supply when arc welding is to be suspended for an appreciable amount of time or the welder has occasion to leave work
- Use insulating mats or similar insulating equipment to protect welders using alternating current equipment over 50 volts from electrical contact with conductive materials
- Ensure that available ventilation in the confined space meets the ventilation requirements set forth in 29 CFR 1910.252(c).

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SAFE WORK PRACTICES (SWP)

SAFE ELECTRICAL WORK PRACTICES

SWP NO.: 6-8

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SAFE ELECTRICAL WORK PRACTICES

This safe work practice (SWP) establishes standards to prevent injuries to Tetra Tech, Inc. (Tetra Tech), employees resulting from electrical work. The project manager is responsible for ensuring that work areas are evaluated for the presence of high-voltage or other hazardous electricity sources and that all electrical equipment and circuits are de-energized prior to any normal electrical maintenance work. Any site-specific safe electrical work practices should be identified and detailed in the site-specific health and safety plan (HASP). Power lines, general SWPs, and grounding are discussed below.

1.0 POWER LINES

Site activities will proceed with caution in any area where historical data or instrument surveys indicate the presence of utility lines (such as gas, telephone, and other lines). All site activities at these locations will be coordinated by the site safety coordinator.

The minimum clearances summarized below will be maintained between equipment and energized overhead power lines. Additional distances may be required depending on equipment in use, wind conditions, sway distance of lines and the equipment, and other factors causing changes in the spatial relationship of the equipment and power line.

Voltage	Working Clearance	Equipment Clearance (feet)
Less than 50 kilovolts (kV)	10 feet	4
50 to less than 345 kV	10 feet, plus 4 inches per extra kV (50 kV or more)	10
345 to 750 kV	10 feet, plus 4 inches per extra kV (50 kV or more)	16

If site activities near power lines are required, necessary arrangements to turn off the power will be coordinated by the project manager.

Electrical service shall be provided by certified electricians in accordance with all applicable local and National Electric Codes (NEC) when high-voltage electrical service is required for site or project activities. Before work begins, Tetra Tech shall ascertain by inquiry, direct observation, or instruments

whether any part of an energized electric power circuit, exposed or concealed, is located so that the performance of work may bring any person, tool, or machine into physical or electrical contact with the electrical power circuit. The location shall be posted wherever such a circuit exists. All employees shall be advised of the location of such lines, the hazards involved, and the protective measures to be taken.

2.0 GENERAL SAFE WORK PRACTICES

The general procedures below shall be implemented, depending on site location, equipment, and work to be performed.

- Site team members should locate and ensure that there will be no adverse contact with overhead utilities prior to positioning or moving any elevated work platform.
- Ground fault circuit interrupters should be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- Electric lines, cables, and extension cords shall be guarded and maintained in good condition.
- All underground power lines should be identified and maintained before any ground-breaking work is performed.
- All power equipment should be locked out before the commencement of work by following Tetra Tech SWP No. 6-2, “Control of Hazardous Energy Sources (Lockout/Tagout).” These procedures shall apply to all electrical circuits, electrical power equipment, steam systems, hydraulic systems, compressed air and gas systems, and any other systems that have the potential for causing injury or damage if they are improperly or accidentally energized.
- All temporary electrical equipment used on a project should conform to the NEC, the National Electrical Safety Code, and other site requirements for that specific application. No damaged or defective tools shall be used.
- Extension cords should be used with portable electric tools of the three-wire type, protected from damage, and not fastened with staples, hung from nails, or suspended from wires. Splices should be soldered wire connections with insulation equal to the cable. Worn or frayed cables shall not be used.
- Portable task lights should be equipped with guards. Temporary lights should not be suspended by electric cords unless designed for suspension. Broken or burned out lamps must be replaced immediately.

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

- Each disconnecting means for motors and appliances and each service feeder or branch circuit should be marked legibly at the point where it originates to indicate its purpose unless such devices are located and arranged so that the purpose is evident.

- Cables passing through work areas should be covered or elevated to protect them from damage. Cables and cords should be kept clear of walkways and other locations where they may be damaged or create tripping hazards.

- Boxes for disconnecting electricity should be secured, rigidly fastened, and fitted with covers.

- Appropriate warning signs should be posted in high-voltage areas, which should also be barricaded.

- Energized wiring in boxes, circuit breaker panels, and similar places should be covered at all times.

- Tetra Tech shall not permit any employee to work near any part of an electric power circuit that the employee could contact in the course of work unless the employee is protected against electric shock by de-energizing the circuit and grounding it, or by guarding it effectively by insulation, barricades, or other means.

3.0 GROUNDING

The grounding procedures below shall apply as appropriate to all project sites. Additional site-specific procedures shall be detailed in the site-specific HASP.

- All electrical tools and equipment must be approved, double-insulated, and properly grounded or used with ground-fault circuit interrupters.

- For 15- and 20-ampere receptacle outlets on single-phase, 120-volt circuits that are not part of the permanent wiring of the building or structure, either ground-fault circuit interrupters or an approved equipment grounding conductor program will be used.

An equipment grounding conductor program will include the following:

- Each cord set, attachment cap, plug, and receptacle of cord sets, and any equipment connected by a cord and plug, except cord sets and receptacles that are fixed and not exposed to damage, will be inspected before each day's use for external defects and possible internal damage.

- Tests will be performed on all cord sets, receptacles that are not part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded. Grounding conductors will be tested for continuity. Each receptacle and attachment cap or plug will be tested for correct attachment of the equipment grounding conductor.

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SAFE WORK PRACTICES (SWP)

FALL PROTECTION PRACTICES

SWP NO.: 6-9

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FALL PROTECTION PRACTICES

This safe work practice (SWP) presents general guidelines for basic fall protection when working in elevated areas. Continuous elevated work or elevated construction work will require detailed procedures included in a site-specific health and safety plan. SWP No. 6-10, "Portable Ladder Safety," should also be consulted. During elevated work, the precautions below must be taken.

- All fall hazards should be identified at work sites with the potential for elevated work. Once an elevated fall hazard has been recognized, an appropriate control measure must be selected. Priority should be given to elimination of the fall hazard over the use of fall protection equipment.
- Approved safety harnesses and lanyards shall be worn by employees whose work exposes them to falls of greater than 6 feet.
- Lanyards should be anchored at a level no lower than the employee's waist to limit the fall distance to a maximum of 4 feet and to not allow the employee to contact the next lower work level, where practical.
- All fall protection devices should be used only in accordance with manufacturer's recommendations.
- All fall protection devices shall be inspected daily before use.
- Any lifeline, harness, or lanyard actually subjected to in-service loading (a fall) should be immediately removed from service and not used again for employee fall protection.
- Anchor points and lanyards capable of supporting a minimum dead weight of 5,400 pounds should be used.
- Employees who are required to wear fall protection should be trained in the use of the equipment, as well as in fall protection work practices.

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SAFE WORK PRACTICES (SWP)

PORTABLE LADDER SAFETY

SWP NO.: 6-10

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PORTABLE LADDER SAFETY

This safe work practice (SWP) applies to portable ladders only. Fixed ladder systems shall be used when regular access is required such as for entering storage tanks and raised work platforms. These SWPs follow the regulatory requirements for ladders as found in Title 29 of the *Code of Federal Regulations* (CFR) Part 1926.1053. Procedures to ensure portable ladder safety are listed below.

- Ladders should be maintained in good condition at all times. Damaged ladders shall be withdrawn from service immediately.
- Ladders should be inspected regularly and removed from service and repaired or discarded if defective.
- Rungs should have slip-resistant surfaces and be kept free of grease and oil.
- Tops and pail shelves of portable stepladders should not be used as steps.
- Rung and cleat ladders should be placed so that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder.
- Ladders should not be placed in front of doorways, drives, or passageways.
- Ladders should not be placed on boxes, barrels, or other unstable bases to add height.
- Employees should always face the ladder during ascent or descent.
- Metal ladders should not be used in areas with the potential for contact with electric circuits.
- Ladder side rails shall extend at least 3 feet above the upper landing surface to which the ladder is used to access.
- Ladder shall be used only on stable and level surfaces. Do not use ladders on slippery surfaces.

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SAFE WORK PRACTICES (SWP)

DRUM AND CONTAINER HANDLING PRACTICES

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DRUM AND CONTAINER HANDLING PRACTICES

This safe work practice (SWP) establishes procedures to protect field personnel and the public from exposure to hazardous materials resulting from the handling, opening, sampling, transferring, overpacking, and shipping of drums.

Regional health and safety representatives (RHSR) and subsidiary health and safety representatives (SHSR) are responsible for providing technical guidance to project managers and site safety coordinators (SSC) on drum and container handling procedures. Project managers are responsible for ensuring implementation of this SWP, when warranted, on their projects. SSCs are responsible for enforcement of this SWP at the work site. Field personnel are required to adhere to drum and container handling guidelines and procedures.

All drum and container handling operations must adhere to all applicable federal, state, local, contractual, and company requirements. Preparation and shipping of containers of hazardous materials must comply with applicable U.S. Environmental Protection Agency (EPA) and U.S. Department of Transportation (DOT) regulations. All drums and containers used during hazardous waste operations must meet appropriate DOT regulations for the materials they contain.

Drum and container handling should be approached in a systematic, stepwise manner, especially when the contents are unknown or containers are in poor condition. Inspection, opening, sampling, overpacking, and staging requirements for drums and containers are described below.

1.0 INSPECTION

Drums or containers should be visually inspected before any work is conducted to gain as much information as possible about their contents. Field personnel should document in the field logbook the following information:

- Any labels or other markings indicating possible contents
- Drum or container condition (such as rusted, leaking, or dented)
- Signs of pressure (such as bulging or swelling)

- Drum or container size, construction, and type
- Configuration of drum or container head (open or closed top)

After observations are documented in the field logbook, each drum or container should be labeled with an identification code for future tracking.

2.0 OPENING

For efficient and safe drum or container opening, personnel must adhere to the guidelines below.

- If available, remote-controlled drum or container opening equipment should be used.
- In order to protect the employee, a suitable shield shall be placed between the employee and the drum being opened.
- Only spark-proof tools should be used to open drums and containers.
- Drums or containers containing unknown materials should be opened using Level B personal protection, including splash protection.
- Drums or containers containing radioactive material should not be opened or handled until the appropriate personnel with expertise in this area have been consulted.
- Air monitoring equipment should be available near the drum or container being opened, such as combination oxygen and combustible gas meters, colorimetric tubes, and photoionization detectors.
- Tools used for drum or container opening should be decontaminated after each use to avoid mixing incompatible wastes.
- Drums or containers should be resealed as soon as possible to minimize vapor generation.
- If possible, drums or containers exhibiting signs of pressure should not be opened.

3.0 SAMPLING

Drum and container sampling poses a variety of potential hazards to worker health and safety, including direct contact with hazardous materials, inhalation of hazardous vapors, and the possibility of drum or container explosion or rupture. The guidelines below should be used to properly sample drums and containers.

- Prior to sampling, a sample plan must be developed that includes the following information:
  - Background information on the waste
  - Which drums or containers will be sampled
  - Appropriate sampling devices
  - Sample containers to be used
- Sampling personnel should not stand on drums or containers or lean over other drums or containers to obtain samples.
- All phases in the vertical cross section of each drum or container should be sampled.
- Disposable glass tubing or other disposable sampling devices should be used to sample liquid.
- When sampling liquids, absorbent pads should be placed on drum tops to collect spillage that may occur while transferring samples into containers.
- Sampling personnel should document container number, any container labeling, sampling date and time, and number and color of different phases.

4.0 OVERPACKING

During an emergency, drums and containers should be handled as detailed below.

- Leaks should be plugged or patched immediately if this can be done without risk.
- Damaged drums and containers should be placed in an overpack container with absorbent pads to collect any spilled material or the contents transferred into a clean, compatible drum or container.
- Absorbent material should be used to collect any leakage that may occur during shipment.

During remedial actions, the procedures below apply to drum and container handling.

- Drums or containers should be placed in overpack containers, and any identification number assigned to the drum or container should be placed on the outside of the overpack container.

- If drum or container contents are to be bulked with other drum or container contents, the compatibility of the contents should be verified by a field characterization study prior to bulking.

5.0 STAGING

Staging refers to moving drums or containers in an organized manner to predesignated areas. Drums or containers may be staged to facilitate characterization and remedial action and also to protect drums or containers from potentially hazardous site conditions (such as high temperatures and proximity to ignition sources or heavy equipment). To ensure that staging is conducted in a safe and efficient manner, the guidelines below should be followed.

- Staging activities should be kept to a minimum to prevent hazards associated with increased handling of drums or containers.
- The staging area should be as close as possible to the site exit.
- The staging area should be level and covered with plastic sheeting or absorbent material.
- The staging area should be diked to contain possible spills.
- Drums or containers should be secured on pallets whenever possible to aid in the safe movement of drums or containers and to isolate the drums or containers from the soil surface.
- Drums or containers should not be stacked on top of each other.
- Drums or containers should be staged according to chemical composition of the contents. Drums or containers containing incompatible materials should be kept segregated.
- Drums and containers should be staged far enough apart to allow for the movement of equipment and personnel.

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SAFE WORK PRACTICES (SWP)

FLAMMABLE HAZARDS AND IGNITION SOURCES

SWP NO.: 6-13

ISSUE DATE: JULY 1998

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FLAMMABLE HAZARDS AND IGNITION SOURCES

This safe work practice (SWP) provides guidelines for handling flammable materials and controlling ignition sources in a manner that will prevent explosions and fires that may result in injuries. The guidelines also present procedures for proper flammable liquids transfer.

1.0 RESPONSIBILITIES

The project manager is responsible for ensuring that the work area is evaluated for the presence of flammable hazards and ignition sources and that all precautions provided in this SWP are implemented. The project manager is also responsible for ensuring that appropriate air monitoring procedures are defined in the site-specific health and safety plan (HASP). The site safety coordinator is responsible for recognizing potential flammable hazards and ignition sources, conducting air monitoring, posting warning signs, and notifying on-site workers of the hazards.

All field personnel must know that explosion and fires at a work site may result from any of the following:

- Chemical reaction
- Ignition of explosive or flammable materials
- Agitation of shock-sensitive compounds
- Sudden release of materials under pressure

Field personnel must also understand that each flammable gas and vapor has a minimum concentration in air below which propagation of flame does not occur on contact with an ignition source. This concentration is known as the lower explosive limit (LEL) and is expressed as a percent in air. Likewise, for every flammable gas and vapor, there is also a maximum concentration of gas or vapor in air above which propagation of flame does not occur. This value is known as the upper explosive limit (UEL) and is also expressed as a percent in air. The flammable range of a particular gas or vapor is the range between the LEL and UEL where the gas-air mixture will support combustion.

Proper precautions must be taken to protect against fire and ignition hazards, including air monitoring, elimination of ignition sources, and proper chemical handling and transfer. These precautions are discussed below.

2.0 AIR MONITORING

Monitoring for flammable or explosive atmospheres is performed using a combustible gas indicator (CGI). This instrument is designed to provide data in terms of the percent LEL. Instructions on the model use, calibration, and operating procedures shall be incorporated into the site-specific HASP as appropriate.

Because flammable gases and vapors can be heavier or lighter than air, it is important to remember that the sampling probe should be moved slowly up and down at multiple levels when monitoring for gases. Response time varies between different meters, sensor types, sample hose lengths, and accessories used.

3.0 ELIMINATION OF IGNITION SOURCES

The risk of fires and explosions will be reduced when ignition sources are eliminated by using the following procedures:

- Ignition sources that are not required for the completion of the project should not be allowed in the exclusion zone or contamination reduction zone at hazardous waste sites or in the vicinity of work associated with flammable materials at any site.
- Warning signs should be posted and the work zone barricaded or blocked off before any work is conducted that might release flammable gases or vapors.
- All ignition sources should be eliminated from areas where flammable gases or vapors may be present or migrate to.
- If the wind direction may carry flammable gases or vapors into areas outside the work zone where ignition sources may be present, work should not be performed without careful monitoring of concentrations at the work zone boundary.
- Sparks caused by friction or electrostatic effects should be controlled using with proper grounding and bonding procedures for transfer of flammable liquids. This requires maintaining constant contact using metal between the containers and providing a metallic route to the ground to discharge electrostatic buildup.

- Sparkless tools should be used.

4.0 PROPER CHEMICAL HANDLING AND TRANSFER

Precautions to reduce the risk of fire and explosion during chemical handling and transfer include the following:

- Liquids and residues should be removed from containers or tanks using explosion-proof or air-driven pumps.
- Pump motors and suction hoses should be bonded to the container or tank or otherwise grounded to prevent electrostatic ignition hazards.
- If a vacuum truck is used to remove liquids or residues, the area of operation for the vacuum truck should be vapor or gas free. The truck should be located upwind and outside of the path of probable gas or vapor travel. Vacuum pump exhaust gases should be discharged downwind of the truck through a hose of adequate size and length.
- After chemicals have been transferred, lines leading to the truck should be disconnected using nonsparking procedures and then the lines should be drained of their contents. Precautions should be taken to ensure that the contents of the lines do not spill into the environment during line disconnection.
- Only nonsparking or nonheat-producing tools should be used for opening containers and tanks. Electrical equipment shall also be explosion-proof.

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SAFE WORK PRACTICES (SWP)

SPILL AND DISCHARGE CONTROL PRACTICES

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SPILL AND DISCHARGE CONTROL PRACTICES

This safe work practice (SWP) provides contingency measures for spills and unintentional discharges from handling and transporting hazardous materials. Spill and discharge control practices should follow specific procedures to ensure the safety of responders and bystanders and to limit environmental impacts.

1.0 GENERAL PROCEDURES

Immediate action should be taken to control and contain any spill following the general guidelines below:

- Unnecessary people should be kept away from the spill or discharge.
- The hazardous area should be isolated.
- If the spill or discharge creates a hazardous situation or results in injury or an environmental release, the emergency procedures of the HASP should be implemented. Emergency response telephone numbers, designated contacts, and special reporting procedures are presented in the HASP.
- Personnel should stay on the upwind side of the spill or discharge.
- Entry into a confined space or low area where liquids or vapors may accumulate should be avoided.
- Sources of ignition should be eliminated if the spill or discharge involves combustible materials.
- Drains, manholes, waterways, sewers, and the like should be identified and covered or protected.
- The spill should be controlled or absorbed using appropriate media or devices.
- When the spill or discharge is fully contained and under control, spill or discharge material should be collected.
- Following cleanup, the spill area should be evaluated by collecting soil samples and screening the area with air monitoring instruments.

2.0 SOLIDS

If the spill or discharge material is solid and nonreactive, the material should be scooped up and placed in a suitable and compatible container until the disposal method has been determined.

3.0 LIQUIDS

If liquid is discharged, the following general procedures apply:

- The point of discharge should be immediately identified and measures taken to eliminate further discharges by uprighting or patching containers, transferring contents, or other appropriate methods.
- Any discharged liquids or sludge should be removed or retrieved.
- Discharged materials should be cleaned up with absorbent materials or devices.
- Spent absorbent material should be placed into storage or disposal containers.

4.0 REPORTING

In some instances, a release may require reporting to government agencies. If a reportable quantity is released (this quantity is stated on the Material Safety Data Sheet) or human health or the environment is threatened, appropriate national, state, and local administering agency personnel should be notified. The timeframe for notification may vary from agency to agency. Notification may be required immediately or within 24 hours, depending on the type, location, and amount of released material. The appropriate agency to report spills to should be determined during HASP development.

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SAFE WORK PRACTICES (SWP)

HEAT STRESS

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HEAT STRESS

This safe work practice (SWP) describes situations where heat stress is likely to occur and provides procedures for the prevention and treatment of heat-related injuries and illnesses. Wearing personal protective equipment (PPE), especially during warm weather, puts employees at considerable risk of developing heat-related illness. Health effects from heat stress may range from transient heat fatigue or rashes to serious illness or death.

Many factors contribute to heat stress, including PPE, ambient temperature and humidity, workload, and the physical condition of the employee, as well as predisposing medical conditions. However, the primary factors are elevated ambient temperatures in combination with fluid loss. Because heat stress is one of the more common health concerns that may be encountered during field activities, employees must be familiar with the signs, symptoms, and various treatment methods of each form of heat stress. Heat stroke is the most serious heat-related illness—it is a threat to life and has a 20 percent mortality rate. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age directly affect the tendency to heat stroke. Table 1 lists the most serious heat conditions, their causes, signs and symptoms, and treatment.

Training is an important component of heat stress prevention. Employees are instructed to recognize and treat heat-related illnesses during 8-hour health and safety refresher and first aid training courses. When working in hot environments, specific steps should be taken to lessen the chances of heat-related illnesses. These include the following:

- Ensuring that all employees drink plenty of fluids (Gatorade® or its equivalent)
- Ensuring that frequent breaks are scheduled so overheating does not occur
- Revising work schedules, when necessary, to take advantage of the cooler parts of the day (such as working from 5:00 a.m. to 11:00 a.m. and 6:00 p.m. to nightfall).

When PPE must be worn (especially Levels A and B), suggested guidelines relating to ambient temperature and maximum wearing time per excursion are as shown in Table 2.

TABLE 1

HEAT STRESS CONDITIONS

Condition	Causes	Signs and Symptoms	Treatment
Heat cramps	Fluid loss and electrolyte imbalance from dehydration	• Painful muscle cramps, especially in legs and abdomen • Faintness • Profuse perspiration	• Move affected worker to cool location • Provide sips of liquid such as Gatorade® • Stretch cramped muscles • Transport affected worker to hospital if condition worsens
Heat Exhaustion	Blood transport to skin to dissipate excessive body heat, resulting in blood pooling in the skin with inadequate return to the heart	• Weak pulse • Rapid and shallow breathing • General weakness • Pale, clammy skin • Profuse perspiration • Dizziness • Unconsciousness	• Move affected worker to cool area • Remove as much clothing as possible • Provide sips of cool liquid or Gatorade® (only if conscious) • Fan the person but do not overcool or chill • Treat for shock • Transport to hospital if condition worsens
Heat Stroke	Life threatening condition from profound disturbance of body's heat-regulating mechanism	• Dry, hot, and flushed skin • Constricted pupils • Early loss of consciousness • Rapid pulse • Deep breathing at first, and then shallow breathing • Muscle twitching leading to convulsions • Body temperature reaching 105 or 106 °F or higher	• Immediately transport victim to medical facility • Move victim to cool area • Remove as much clothing as possible • Reduce body heat promptly by dousing with water or wrapping in wet cloth • Place ice packs under arms, around neck, at ankles, and wherever blood vessels are close to skin surface • Protect patient during convulsions

TABLE 2

SUGGESTED GUIDELINES WHEN WEARING PPE

Ambient Temperature	Maximum PPE Wearing Time per Excursion
Above 90 °F	15 minutes
85 to 90 °F	30 minutes
80 to 85 °F	60 minutes
70 to 80 °F	90 minutes
60 to 70 °F	120 minutes
50 to 60 °F	180 minutes

Source: National Institute for Occupational Safety and Health (NIOSH). 1985. Memorandum Regarding Recommended Personal Protective Equipment Wearing Times at Different Temperatures. From Austin Henschel. To Sheldon Rabinovitz. June 20.

To monitor the level of an employee's heat stress, the following should be measured:

- Heart Rate: Count the radial (wrist) pulse during a 30-second period as early as possible in the rest period; if heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  If the heart rate still exceeds 110 beats per minute at the next period, shorten the following work cycle by one-third.

- Oral Temperature: Use a clinical thermometer (3 minutes under the tongue) to measure the oral temperature at the end of the work period. If oral temperature exceeds 99.6 °F (37.6 °C), shorten the next work cycle by one-third without changing the rest period. If oral temperature still exceeds 99.6 °F at the beginning of the next rest period, shorten the following work cycle by one-third. Do not permit a worker to wear impermeable PPE when his or her oral temperature exceeds 100.6 °F (38.1 °C).

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SAFE WORK PRACTICES (SWP)

BIOHAZARDS

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BIOHAZARDS

Biological hazards, or "biohazards," include plants, animals or their products, and parasitic or infectious agents that may present potential risks to worker health. This safe work practice (SWP) discusses procedures for working with biohazards, preventive guidelines, and first-aid procedures for the most common hazards field staff are likely to encounter. This SWP does not address biohazards such as those associated with medical waste. Procedures for working with this type of biohazard should be addressed in the site-specific health and safety plan (HASP) on a case-by-case basis.

During preparation of the site-specific HASP, the preparer should consider which plants, animals, and other biological agents may be encountered; assess their potential risk to project personnel; and attach this SWP to the HASP, if necessary. Office health and safety representatives should become familiar with biological hazards indigenous to the geographical area in which most of their office personnel work and assist in evaluating the risks to personnel on projects staffed from their offices. SWPs for insects, snakes, animals, plants, waterborne pathogens (giardia), and hantavirus are provided below.

1.0 INSECTS

SWPs for reducing the chance of insect bites or stings and for treating bites or stings are listed below.

- Workers should keep as much skin area covered as possible by wearing long-sleeved shirts, long pants, and a hat. Pant legs should be tucked into socks or boots and shirts into pants. In addition, workers should wear light colored clothing.
- A proven insect repellent should be used on bare skin and clothing.
- When possible, tall grasses and brush that could harbor ticks should be avoided.
- Several times during the day and at the end of the work day, each worker should perform a check for evidence of imbedded ticks or previous bites. Particular attention should be paid to the scalp, neck, ankles, back of the legs, and waist.
- When opening well covers, vaults, or other closed items, workers should watch for hornet or wasp nests and black widow or brown recluse spiders. Workers should never reach into spaces with unprotected arms.
- Workers should watch carefully for bees around open soft drinks or food.

- If a worker is stung by a bee, the stinger should be carefully removed, if present. The wound should be washed and a cold pack applied. Allergic reaction should be watched for and is evidenced by extreme swelling, redness, pain, or difficulty breathing.

- If a worker is stung or bit by a spider or scorpion, medical attention should be obtained immediately.

2.0 SNAKES

SWPs for encounters with snakes and for treating snakebites are listed below.

- Workers should avoid walking in areas known to harbor snakes. Workers should be cautious when picking up or moving items that have been on the ground.

- Workers should wear boots made of heavy material that protect the ankles and pants. Heavy work gloves should be worn for picking up items.

- If one snake is encountered, others may be present. Workers should leave the area by retracing their steps.

- If a worker is bitten, the wound should be washed and the injured area immobilized and kept lower than the heart, if possible. Ice or a tourniquet should not be applied to a snake bite. The wound should not be cut. If medical care is more than 30 minutes away from a work site, a snakebite kit should be available on site and workers should know how to use it.

3.0 ANIMALS

SWPs for encounters with animals and for treating associated wounds are listed below.

- If workers encounter a wild animal, the animal should be observed for unusual behavior such as a nocturnal animal out during the day, drooling, an appearance of partial paralysis, irritability, meanness, or a strangely quiet demeanor.

- Workers should never touch the body of a dead animal because certain diseases could be carried by fleas still on the body.

- Workers should avoid animal droppings (including bird droppings). Pathogens, some of which can become airborne, may still be present in the droppings.

- If a worker is bitten, he or she should get away from the animal to avoid further bites. Workers should not try to stop, hold, or catch the animal.

- If the wound is minor, it should be washed with soap and water. Any bleeding should then be controlled, and an antibiotic ointment and dressing should be applied. All animal bite wounds should be watched for signs of infection.

- If the wound is bleeding seriously, the bleeding should be controlled but the wound should not be cleaned. Medical assistance should be summoned immediately.

- If a rabid animal is suspected, immediate medical attention should be summoned. If possible, workers should try to remember what the rabid animal looked like and the area in which it was last seen. The animal should be reported by calling the local emergency number.

4.0 PLANTS

SWPs for plants are as follows:

- Workers should be aware of the types and appearances of poisonous plants in the work site area. Poison ivy, oak, and sumac are the most frequently encountered plants that can cause reaction from casual contact. If a worker is extremely sensitive to these plants, he or she should avoid the area entirely because airborne drift could be sufficient to cause a reaction. Other plants, such as fireweed, can cause painful, short-term irritation and should be avoided as well. Workers should avoid touching face and eye areas after contact with any suspicious plant.

- Workers should wear proper clothing if working in or near overgrown areas. Disposable outerwear should be used, if necessary, and workers should not touch the material with bare hands during removal if the outerwear may have contacted poisonous plants.

- If contact with a poisonous plant has occurred, the affected area should be immediately washed thoroughly with soap and water. If a rash or weeping sore has already begun to develop, a paste of baking soda and water should be applied to the area several times a day to reduce discomfort. Lotions such as Calamine or Caladryl should be applied to help soothe the area. If the condition gets worse and affects large areas of the body or the face, a doctor should be consulted.

- Bushy and wooded areas should be thoroughly checked for thorn-bearing trees, brush, and bramble. In some cases, impalement can cause severe pain or infection.

5.0 WATERBORNE PATHOGENS-GIARDIA

Giardia is a waterborne pathogen consisting of a protoplasmic parasite of the mammalian digestive tract.

Giardia is present worldwide, with the highest occurrence in areas with poor sanitation. In the United

States, most reported cases are in mountainous regions where drinking water is obtained from streams and is unfiltered or untreated.

Giardia is contracted by ingesting water contaminated with giardia cysts in the dormant state. Giardia parasites can only thrive in the digestive tracts of mammals. Dormant giardia organisms enter water through the feces of infected animals or humans. Giardia symptoms include severe diarrhea and upset stomach. Some people are asymptomatic but can transmit the disease to others. Medical treatment of giardia can be difficult and unpleasant; therefore, prevention is critical. Precautions for preventing exposure to giardia are listed below.

- Workers should assume that all fresh water streams are infected with the giardia organism and not drink any untreated water.
- Team members collecting sediment and water samples from streams should wash their hands thoroughly with soap and water after collecting the samples.
- Giardia parasites are relatively easy to destroy or filter. Water should be treated for drinking or cooking with iodine or another recommended giardia treatment before use.

6.0 HANTAVIRUS

Hantavirus pulmonary syndrome (HPS) is a potentially fatal infection caused by a rodent-borne hantavirus. HPS begins with a brief illness most commonly characterized by fever, muscle pain, headache, coughing, and nausea or vomiting. Other early symptoms include chills, diarrhea, shortness of breath, abdominal pain, and dizziness. In the first identified cases of HPS, this stage of the infection lasted 2 to 5 days before victims were hospitalized. Typically, by the time of hospitalization, victims were found to have tachycardia (a heart rate of greater than 100 beats per minute) and tachypnea (a breathing rate of greater than 20 breaths per minute). Fever was also common. In most cases, death occurred within 2 to 16 days of the onset of symptoms, and victims exhibited pulmonary edema and severe hypotension.

Currently, experts believe that HPS is spread by the deer mouse (*Peromyscus maniculatus*). Though the deer mouse has been found to be the primary host of hantavirus, several other rodent species have also tested positive for the virus. Pinon mice (*Peromyscus truei*), brush mice (*Peromyscus boylii*), and western

chipmunks (*Tamia spp.*) are also likely to carry the virus. Also, cases of HPS have been reported in areas of the United States where these particular rodents are not indigenous.

Infected rodents shed the virus in their urine, feces, and saliva. Humans can be exposed to the virus through (1) inhalation of suspended rodent excreta or dust particles containing rodent excreta, (2) introduction of rodent excreta into the eyes or broken skin, and (3) ingestion of food or water contaminated by rodent excreta. HPS has a reported mortality rate of 55 percent. Transmission of hantavirus from infected individuals to healthy persons has not been documented.

Prevention of HPS infection is essential because no known antidote and no specific treatment exists for treating HPS. Therefore, employees should practice risk reduction and control measures. Guidelines for workers in locations that may have rodent infestations or habitats are listed below.

- The best approach for HPS control and prevention is through environmental hygiene practices that deter rodents from colonizing the work environment.
- Information about the symptoms of HPS and detailed guidance on preventive measures should be provided to all employees assigned to field activities.
- Medical attention should be sought immediately for workers who develop a febrile or respiratory illness within 45 days of the last potential exposure to rodents. Attending physicians should be advised of each worker's potential for occupational exposure to hantavirus. Physicians should contact local health authorities promptly if hantavirus-associated illness is suspected. A blood sample should be obtained from the affected worker and forwarded with the baseline serum sample through the state health department to the Centers for Disease Control and Prevention for hantavirus antibody testing.
- Respiratory protective equipment should be worn when handling rodents, when removing rodents from traps, and when working in areas with evidence of rodent droppings or hair. Respiratory protective equipment should include, at a minimum, a half-face air-purifying respirator (APR) or powered APR equipped with a high-efficiency particulate air (HEPA) filter (P100). Full-face regulators may be needed under some circumstances. Respiratory protective equipment should be used in accordance with Occupational Safety and Health Administration regulations.
- Dermal protection should be worn when handling rodents or traps containing rodents, or if contact with contaminated surfaces could occur. Dermal protection should include rubber or plastic gloves that should be washed and disinfected before removal.

- A trap contaminated with rodent urine or feces or in which a rodent was captured should be disinfected with a commercial disinfectant or a 0.4 percent bleach solution. A dead rodent should be disposed of by placing the carcass in a plastic bag containing enough general-purpose household disinfectant to thoroughly wet the carcass. The bag should be sealed and disposed of by burning or by burying it in a 2- to 3-foot-deep hole. Local and state health departments can also provide appropriate disposal methods.

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SAFE WORK PRACTICES (SWP)

PERMIT-REQUIRED CONFINED SPACE ENTRY PRACTICES

SWP NO.: 6-23

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PERMIT-REQUIRED CONFINED SPACE ENTRY PRACTICES

This safe work practice (SWP) presents procedures that must be followed for all permit-required confined space entries. If any of the space preparation or entry requirements discussed in this SWP cannot be met, entry shall not proceed until the space is evaluated by the project manager and the site safety coordinator (SSC).

This SWP supplements Document Control No. 2-5, "Confined Space Entry Program," and provides specific procedures for permit-required confined space entry. This SWP must be included with the health and safety plan for all projects with permit-required confined space entry.

The entry permit, hazard inspection, atmospheric testing, ventilation, respiratory protection, pre-entry briefing, communication, evacuation, and rescue provisions for permit-required confined space entry are discussed below.

1.0 ENTRY PERMIT

Tetra Tech, Inc. (Tetra Tech), has established a confined space entry permit (CSEP) system to ensure safe entry and safe performance of work within a permit-required confined space. Before entry into a permit-required confined space can occur, a CSEP must be issued. The CSEP is a written authorization and approval that specifies the location of the confined space, specifies the type of work to be conducted in the space, certifies that all existing and potential hazards have been evaluated, and verifies that necessary protective measures have been taken to ensure the safety of each worker.

The CSEP is Form CS-1 in Volume III and must be completed in its entirety and signed by a permit authorizer (either the project manager or the SSC). Blank entries are not allowed, and all sections requesting a specific time or date must be completed. Additional sheets may be necessary.

The permit authorizer shall do the following:

- Determine that the entry permit contains the requisite information and that all tests specified by the permit have been conducted before endorsing the permit and allowing entry

- Determine that the necessary procedures, practices, and equipment necessary for safe entry are in effect before allowing entry
- Cancel entry authorization and terminate entry whenever unacceptable entry conditions are present
- Take the necessary steps for concluding an entry operation, such as closing off a permit space and canceling the permit once the authorized work has been completed
- Ensure that confined space entrants are properly trained and that an authorized attendant will remain outside of the confined space to monitor the entrants throughout the entire entry

The permit authorizer must be readily available for reviewing the permit and must personally inspect the confined space before the startup of the entry task. The permit authorizer shall then sign the permit.

The completed permit shall be posted at the entry portal or displayed by any other equally effective means before entry activities begin so that authorized entrants can confirm that all pre-entry preparations have been completed. All authorized entrants shall initial the CSEP after their name after reviewing it.

A copy of the CSEP shall be furnished to the project manager and the office health and safety representative. The original copy of the permit shall be retained as a permanent record in the project file. The CSEP posted at the work site shall be removed upon completion of the job or the end of the shift, whichever is first.

The date and time the permit has been authorized for shall be indicated on the permit. Permits are valid for a maximum of 8 hours. Reauthorization of the permit shall be required for each day of entry.

A CSEP becomes void under any of the following conditions:

- If work in the confined space does not start within 1 hour after atmospheric testing is performed
- The job is interrupted for more than 60 minutes for any reason
- Atmospheric testing of the confined space is discontinued

- Atmospheric changes occur resulting in (1) an oxygen content below 19.5 percent or above 23.5 percent, (2) greater than 10 percent of the lower explosive limit (LEL) of combustible gases or vapors, or (3) concentration of a hazardous airborne contaminant exceeding its permissible exposure limit
- Injury or illness of an entrant
- A power failure affecting lighting or telephone usage
- Severe weather

2.0 HAZARD INSPECTION

Before scheduling a confined space entry, the permit authorizer shall inspect the area around the confined space for (1) sources of combustion exhaust, (2) flammable gases, (3) sparks and fire, and (4) objects that might fall into the space.

The confined space and the scope of work within that space shall be evaluated to identify potential hazards and identify and implement appropriate hazard controls. The permit authorizer shall ensure that appropriate hazard controls are in place prior to entry activities. Such hazard controls can include, but are not limited to, the following:

- Lockout and tagout requirements
- Confined space cleaning procedures
- Equipment and tool requirements
- Safe entry and exit procedures
- Physical hazard controls (such as hearing protection and heat stress controls)

Each hazard control identified above is specifically detailed in the Document Control No. 2-5 in Volume I, “Confined Space Entry Program.”

3.0 ATMOSPHERIC TESTING

Atmospheric testing shall be conducted to evaluate the potential hazards and verify that entry conditions for the space are acceptable. Atmospheric testing equipment is described in Document Control No. 3-7, "Air Monitoring Program." The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise so that appropriate permit procedures can be developed to ensure safe entry.

The duration of testing for each atmospheric contaminant shall be made for at least the minimum response time of the test instrument as specified by the manufacturer plus an allowance for dead space in sampling lines.

Testing shall be conducted to ensure that all spaces are surveyed for hazardous conditions and shall include all sections of noncontiguous spaces and all levels of each space to account for stratification. When monitoring for entries involving descent into atmospheres that may be stratified, measurements shall be recorded at a distance of approximately 4 feet in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and the detector response.

Atmospheric testing shall be conducted in the following order:

- Oxygen content must be tested for first because most combustible gas meters are oxygen-dependent and will not provide reliable readings in an oxygen-deficient atmosphere
- Combustible gases must be tested for next because the threat of fire or explosion is more immediate and life threatening in most cases than exposure to toxic gases and vapors
- Toxic gases and vapors must be tested for last for specific toxic gases and vapors as necessary

Continuous monitoring for oxygen, combustible gases, and specific hazardous contaminants is required in all permit-required confined spaces unless lack of such monitoring is specifically approved by the corporate health and safety manager, regional health and safety representative (RHSR), or subsidiary health and safety representative (SHSR). Results shall be noted regularly on Form CS-1.

Equipment for continuous monitoring of gases and vapors shall be explosion-proof (intrinsically safe) and equipped with an audible alarm that will alert personnel when a hazardous condition develops. Testing equipment shall be calibrated in accordance with the manufacturer's recommendations. Calibration parameters shall be recorded in the field logbook, and each piece of equipment will be tagged with its calibration results. Calibration records should be included in the permanent project file.

Pre-entry evaluation must, at a minimum, include remote atmospheric testing before employee entry and before validation or revalidation of a CSEP to ensure the following:

- An oxygen content between 19.5 and 23.5 percent
- Less than 10 percent LEL of combustible gas
- The absence of other atmospheric contaminants, if the space contained toxic, corrosive, or irritant materials

Pre-entry evaluation test data and entry procedures should be reviewed by or under the direction of a technically qualified individual such as a certified industrial hygienist, certified safety professional, or a certified marine chemist.

Verification testing of the atmosphere of the permit space shall be conducted for all contaminants identified during evaluation testing procedures at the time of entry in order to verify that concentrations are within the range of acceptable conditions. Testing results shall be recorded on the CSEP for the space.

4.0 VENTILATION

Natural ventilation of the confined space prior to initial entry and for the duration of the CSEP shall be provided. However, positive-pressure, forced mechanical ventilation may also be required. Before forced ventilation is initiated, information such as restricted areas within the confined space, voids, the nature of contaminants present, the size of the space, the type of work to be performed, and the number of entrants involved should be considered. The procedures listed below also apply.

- The confined space shall be ventilated before starting work and for the duration of the time that work is to be performed in the space.

- Ventilation air should not create an additional hazard resulting from recirculation of contaminants, improper arrangement of the inlet duct, or substitution of anything other than Grade D or fresh air.

- When air-moving equipment is used to provide ventilation, the equipment shall be tested before each shift and provided with an audible alarm to signal ventilation failure.

- Chemicals shall be removed from the vicinity of the air supply to prevent their introduction into the confined space by air-moving equipment or any other means.

- Vehicles shall not be left running near confined spaces or near air-moving equipment being used for confined space ventilation because vehicle exhaust can act as a source of carbon monoxide.

5.0 RESPIRATORY PROTECTION

Respiratory protection needed for confined space entry shall be determined by a technically qualified person such as a Tetra Tech health and safety specialist based on site conditions, air monitoring results for the confined space, and the work activity to be performed. Air-purifying respirators with appropriate cartridges can be worn only if (1) testing indicates that the atmosphere is not oxygen deficient, (2) the contaminants are at concentrations below the protection factor of the respirator selected, and (3) an approved respiratory hazard assessment has been completed (Form RP-2, Volume III).

Self-contained breathing apparatuses (SCBA) or National Institute for Occupational Safety and Health-certified, positive-pressure, airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in any confined space when conditions have been determined to be immediately dangerous to life and health.

6.0 PRE-ENTRY BRIEFING

Immediately before entering a confined space, the authorized attendant and entrants shall again review all potential hazards and emergency procedures during a pre-entry briefing. The following topics shall be discussed:

- CSEP components
- Work to be completed and the time period the CSEP shall remain in effect
- Location of telephone and emergency numbers
- Atmospheric, physical, electrical, and miscellaneous hazards expected in the space
- Rescue provisions and procedures
- Reasons to evacuate the confined space

7.0 COMMUNICATION

When visual monitoring of the entrants is not possible because of the layout of the confined space, the authorized attendant shall maintain voice contact as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

Attendants shall not enter the space to communicate with entrants. Passing of the head through the plane of the opening is not allowed. The attendant shall also know emergency telephone numbers. If a mobile telephone or radio is not available, other communication procedures must be arranged.

8.0 EVACUATION

Evacuation of the permit-required confined space will be initiated if any of the following conditions arise:

- Observation of a condition not allowed on the CSEP
- Entrant exhibits signs or symptoms of hazardous exposure
- Situation outside the space endangers entrants
- Uncontrolled hazard (such as fire or spill)
- Loss of power or ventilation
- Monitoring equipment malfunctions
- Authorized attendant must leave

9.0 RESCUE PROVISIONS

Provisions must be made for rescue equipment and procedures for each permit-required confined space entry. If a worker becomes ill or injured, the attendant will contact the nearest emergency response team (by dialing 911 or a site-specific emergency telephone number). The attendant may then attempt to retrieve the ill or injured employee by retrieval line until arrival of a rescue team. If rescue operations are provided by non-Tetra Tech personnel, the rescue personnel must be informed of the hazards they may confront during rescue.

Under no circumstances shall the attendant enter the confined space to attempt rescue unless trained and equipped for rescue operations and relieved of his or her attendant duties. The attendant must have appropriate rescue respiratory protection available for rescue teams. This equipment must include a positive pressure airline (with 5-minute escape bottle) or SCBA. Anyone using emergency respiratory equipment must have received training in its use.

To facilitate non-entry rescue, retrieval systems or methods shall be used when an authorized entrant enters a permit space unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The authorized entrant shall be fitted with a chest or full-body harness with a retrieval line attached at a suitable point so that if rescued, the employee easily fits through the entrance. Wristlets can be used when the use of a chest or full-body harness would present a hazard and the use of wristlets is the safest and most effective alternative.

A mechanical retrieval device shall be available to retrieve personnel from a vertical-type permit-required space more than 5 feet deep. The line will be at least 0.5-inch in diameter and tested for 2,000 pounds. Mechanical retrieval devices are not required for spaces less than 5 feet deep or during horizontal entries. A simple retrieval line on the entrant can be tied off outside the entrance for these spaces.

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

NON-PERMIT-REQUIRED CONFINED SPACE ENTRY PRACTICES

SWP NO.: 6-24

ISSUE DATE: JULY 1998

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NON-PERMIT-REQUIRED CONFINED SPACE ENTRY PRACTICES

The following safe work practices (SWP) apply to entry into confined spaces classified as non-permit-required. The confined space must conform to the definition of a non-permit-required confined space as discussed in the Confined Space Entry Program (see Document Control No. 2-5 in Volume I). Entry into spaces classified as non-permit-required are preferable over entry into permit-required spaces. When feasible, efforts shall be directed to prepare confined spaces so they meet the definitions of non-permit-required confined space.

If any of the procedures discussed in this SWP cannot be completed or an unanticipated hazard is identified, the non-permit-required status of the space will be revoked until the space is re-evaluated and reapproved as a non-permit-required space by a technically qualified individual such as a Tetra Tech health and safety specialist.

Non-permit-required confined space entry procedures before entry into the space are listed below.

- The project manager and the site safety coordinator (SSC) should be notified of the need to enter into a confined space. This notification must allow sufficient time to assemble necessary safety equipment.
- A blank "Preparation and Testing of Non-Permit Required Confined Space" form (Form CS-2) must be obtained (see Volume III).
- The necessary safety equipment can include, but is not limited to, atmospheric testing meters and devices, a mechanical ventilator, and a ladder for entry and exit.
- All equipment to be used during entry must be tested and inspected before use. Atmospheric testing equipment shall be calibrated in accordance with the manufacturer's instructions to ensure proper operation. Calibration parameters shall be documented in the field logbook, and the equipment will be tagged with a label specifying these parameters.
- Hazardous conditions associated with the removal of the entrance cover should be eliminated before opening the confined space. After removal of the entrance cover, the opening should be promptly barricaded by a railing, temporary cover, or other temporary barrier to prevent employees and equipment from accidentally falling through the opening.
- The internal atmosphere should be tested for the following conditions, in the order given:

  - Oxygen content (should be between 19.5 to 23.5 percent)
  - Combustible gases (should be less than10 percent of the lower explosive limit)
  - Potential toxic air contaminants

- The space should be tested at all levels (top, middle, and bottom) and in all areas where work may occur. The atmosphere within the space must not be hazardous whenever an employee is inside the space.
- If forced-air ventilation is used, the following conditions apply:
  - Ventilation should not be used to control continuous sources of hazardous contaminants.
  - There must be a clean source of air that will not increase the hazard within the space.
- The entrant shall document on Form CS-2 that the space is safe for entry and that pre-entry measures required by this SWP have been taken. The form shall be made available to each employee entering the space and shall be kept at the work site until completion of confined space work. The certificate will then become part of the permanent project file.

The atmosphere within the confined space must be tested periodically while entrants are within the confined space. Frequency of testing shall be every 30 minutes during the first 2 hours, then hourly afterwards when entrants are in the confined space. If at any time during occupancy a hazardous atmosphere is detected, the entrants shall leave the space immediately. The space shall then be evaluated to determine how the hazardous atmosphere developed, and measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry. Re-entry shall not be allowed until atmospheric testing demonstrates acceptable conditions.

When changes in the use or configuration of a non-permit-required space cannot be eliminated or controlled, the SSC shall re-evaluate the space, and if necessary, reclassify it as a permit-required confined space.

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

OIL AND PETROLEUM DISTILLATE FUEL PRODUCT HAZARDS

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OIL AND PETROLEUM DISTILLATE FUEL PRODUCT HAZARDS

This safe work practice (SWP) establishes minimum procedures for protecting Tetra Tech, Inc. (Tetra Tech), personnel against the hazardous properties of oil and petroleum distillate fuel products during the performance of field work, including known and suspected releases of such materials. The SWP was developed to enable health and safety personnel and project managers to quickly prepare and issue site-specific health and safety plans (HASP) for investigations of such releases. A completed short form HASP and this SWP can comprise a site-specific HASP for sites where oil and petroleum distillate fuel products may be encountered. Forms HSP-3A and HSP-3B in Volume III, "Forms," should be used as checklists for site preparation activities. These forms should be attached to the HASP. Safety procedures for drilling, trenching, and other construction operations should be attached as necessary. Anticipated physical hazards associated with site activities should be discussed in the HASP.

This SWP must not be used for confined space entry (including trench entry) or for installing or operating full-scale fuel recovery systems. The applicability of this SWP, hazard evaluation, health and safety requirements, air monitoring, area controls, decontamination, underground storage tank (UST) preparation, emergency response, and accident reporting associated with work involving oil and petroleum distillate fuel products are discussed below.

1.0 APPLICABILITY

This SWP is applicable to field investigations involving any of the substances listed below and involving any of the activities listed below.

SUBSTANCES

- Motor oil (used and unused)
- Leaded and unleaded gasoline
- Fuel oil No. 1 (kerosene and JP-1)
- Fuel oil No. 1-D (light diesel)
- Fuel oil No. 2 (home heating oil)

- Fuel oil No. 2-D (medium diesel)
- Fuel oil No. 4 (residual fuel oil)
- Fuel oil No. 5 (residual fuel oil)
- Fuel oil No. 6 (Bunker C fuel oil)
- JP-3, JP-4, and JP-5 (Jet fuels)
- Gasohol

ACTIVITIES

- Collection of subsurface soil samples using a truck-mounted drill rig, hand-held power auger, or hand auger
- Construction, completion, and testing of groundwater monitoring wells
- Collection of groundwater samples from new and existing wells
- Observation of removal of underground fuel pipes and USTs
- Small-scale removal of contaminated soils

2.0 HAZARD EVALUATION

Oil and petroleum distillate fuel products are mixtures of aliphatic and aromatic hydrocarbons. The predominant classes of compounds in motor oil, gasoline, kerosene, and jet fuels are paraffins (such as hexane and octane), naphthenes (such as cyclohexane), and aromatics (such as benzene and toluene). For example, gasoline contains about 80 percent paraffins, 6 percent naphthenes, and 14 percent aromatics. Kerosene and jet fuels contain 42 to 48 percent paraffins, 36 to 68 percent naphthenes, and 16 to 20 percent aromatics. Diesel fuels and heating oils contain 14 to 23 percent naphthenes, 68 to 78 percent nonvolatile aromatics, and less than 10 percent paraffins. Heavier fuels contain almost no volatile aromatic compounds. Chemicals may be added to automotive and aviation fuels to improve their burning properties. Examples are tetraethyl-lead and ethylene dibromide. Flammability, toxicity, and exposure limits of oil and petroleum distillate fuel products are discussed below.

2.1 FLAMMABILITY

Oil and petroleum distillate fuel products possess two intrinsic hazardous properties—flammability and toxicity. The flammable property of oils and fuels presents a far greater hazard to field personnel than toxicity. Vapors of volatile components of oils and fuels can therefore also be explosive when confined.

Oil and petroleum distillate fuel products will not burn in liquid form. Only the vapors burn and then only if (1) the vapor concentration is between the compound-specific upper explosive limit (UEL) and lower explosive limit (LEL), (2) sufficient oxygen is present, and (3) an ignition source is present. The probability of fire and explosion can be minimized by eliminating any of the three factors needed to produce combustion. Two of the factors, ignition source and vapor concentration, can be controlled in many cases. Ignition can be controlled by the following:

- Open fires and smoking should be prohibited on site.
- Spark arresters should be installed on drill rig engines.
- Engines should be turned off when any compound's LEL is approached.

Vapor concentrations can be reduced by using fans and portable ventilation systems. In fuel storage tanks, vapor concentrations in head spaces can be reduced by introducing dry ice (solid carbon dioxide) into the tank because the carbon dioxide gas displaces combustible vapors and oxygen.

The LELs (in air) of the fuels discussed in this section range from 0.6 percent for JP-5 to 1.4 percent for gasoline. Flash points range from -36 °F for gasoline to greater than 150 °F for fuel oil No. 6. JP-5 has a flashpoint of 140 °F. Although it has a lower LEL than gasoline, JP-5 is usually considered less hazardous than gasoline because its vapors must be heated to a higher temperature to ignite.

2.2 TOXICITY

Oil and petroleum distillate fuel products exhibit relatively minor acute inhalation and dermal toxicity effects. Concentrations of 160 to 270 parts per million (ppm) gasoline vapor have been reported to cause eye, nose, and throat irritation after several hours of exposure. Gasoline vapor concentrations of 500 to 900 ppm can cause irritation and dizziness in 1 hour, and levels of 2,000 ppm or above have produced

mild anesthesia in 30 minutes. Most fuels, particularly gasoline, kerosene, and jet fuels, are capable of causing skin irritation after several hours of contact.

Some gasoline additives, such as ethylene dichloride, ethylene dibromide, and tetraethyl and tetramethyl lead, are highly toxic; however, the additives are present in gasoline at low concentrations and their contribution to the overall toxicity of gasoline and other fuels is therefore negligible in most cases.

2.3 EXPOSURE LIMITS

In 1989, the Occupational Safety and Health Administration (OSHA) developed a permissible exposure limit (PEL) of 300 ppm for gasoline. However, this PEL was subsequently vacated. OHSA has also established PELs for individual components, such as benzene. The American Conference of Governmental Industrial Hygienists has established a threshold limit value (TLV) of 300 ppm for gasoline. This TLV takes into consideration the average concentration of benzene in gasoline (1 percent), as well as gasoline's common additives. Oil mist has a PEL of 5 milligrams per cubic meter of air. Exposure limits have been established for some of the other petroleum constituents.

3.0 HEALTH AND SAFETY REQUIREMENTS

This section discusses medical surveillance, training, and personal protective equipment (PPE) requirements for personnel working at sites where oil or petroleum distillate fuel products may be encountered.

3.1 MEDICAL SURVEILLANCE REQUIREMENTS

On-site personnel must participate in a medical surveillance program and be certified by an occupational health physician as being physically fit to wear respiratory protective devices and to perform their assigned field work. Tetra Tech's medical surveillance program is discussed in Document Control No. 3-2 in Volume II.

3.2 TRAINING REQUIREMENTS

On-site personnel potentially exposed to site health and safety hazards must successfully complete 40 hours of initial, off-site training and receive a certificate from a course meeting the requirements of

Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.120 (e). Supervisory and refresher training must also have been completed, as necessary, for applicable site personnel. Tetra Tech's health and safety training program is discussed in Document Control No. 3-1 in Volume II.

Before field work begins, the site safety coordinator (SSC) will brief all field personnel, including subcontractor employees, on their work assignments and site safety procedures. Each worker must read the site-specific HASP and sign a safety compliance agreement before commencing work. Individuals that refuse to sign the agreement will be prohibited from on-site work.

3.3 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

PPE for work at sites where oil or petroleum distillate fuel products may be encountered is summarized below.

- Chemical-resistant safety boots, such as neoprene or butyl boots with steel toe and shank, must be worn during the performance of work where surface soil is obviously contaminated with oil or fuel, when product quantities of oil or fuel are likely to be encountered, and within 10 feet of operating heavy equipment.
- National Institute for Occupational Safety and Health-approved full- or half-face respirator with organic vapor cartridges must be worn whenever total airborne hydrocarbon levels in the breathing zone of field personnel reach or exceed a 15-minute average of 11 ppm in summer and 25 ppm in winter. If total airborne hydrocarbons in the breathing zone exceed 100 ppm, work must be suspended, personnel directed to move a safe distance from the source, and the regional health and safety representative (RHSR) or subsidiary health and safety representative (SHSR) or designee consulted.
- Chemical-resistant gloves, such as nitrile or neoprene gloves, must be worn whenever soil or water known or suspected of containing oil or petroleum hydrocarbons is collected or otherwise handled.
- Chemical-resistant coveralls, such as Saranex or polyethylene-coated Tyvek coveralls, must be worn whenever product quantities of oil or fuel are actually encountered and when oil- or fuel-saturated soil is handled.
- Splash-proof safety goggles or glasses with full side shields must be worn when working within 10 feet of any operating heavy equipment (such as a drill rig or backhoe). Splash-proof goggles or face shields must also be worn whenever product quantities of oil or fuel are encountered.

- Hard hats must be worn when personnel work with or in the vicinity of an operating drill rig, backhoe, or other heavy equipment.

Operators of some sites such as refineries often require all personnel working within site boundaries to wear certain specified safety equipment. Such requirements shall be strictly observed by Tetra Tech personnel and subcontractors.

4.0 AIR MONITORING

Air monitoring shall be performed to protect field personnel and prevent fires or explosions. Monitoring must be performed by individuals trained in the use and care of the monitoring equipment. Instruments used on site must be maintained and calibrated in accordance with manufacturer requirements. Instrument manuals with calibration instructions shall be transported to each site along with the instrument. The following equipment is required for monitoring for oil or petroleum distillate vapors:

- Organic vapor monitor using flame ionization or photoionization technology
- Combustible gas indicator (CGI)

During drilling operations, vapor emissions from boreholes must be measured whenever the auger is removed from the boring and whenever flights are added or removed from hollow-stem augers. This requirement does not apply to borings less than 5 feet deep and borings of any depth drilled to install monitoring wells in soil known to be uncontaminated. Measurements should first be made with an organic vapor monitor and then with a CGI if vapor levels exceed the highest concentration measurable with the organic vapor monitor. (For example, if the organic vapor monitor goes off the scale when set on the highest range.)

Initially, measurements shall be made about 12 inches from the borehole at both upwind and downwind positions. If the total hydrocarbon concentration 12 inches from the borehole exceeds the respirator use action level (11 ppm in summer and 25 ppm in winter averaged over 15 minutes), measurements must be made in the breathing zone of the individual(s) working closest to the borehole. Decisions regarding respiratory protection should be made based on vapor concentrations in the breathing zone.

If total organic vapor concentrations within 12 inches of the borehole exceed the capacity of the organic vapor monitor, a CGI must be used to determine if explosive conditions exist. If combustible gas concentrations reach 5-10 percent of the LEL, continuous monitoring is required and operations may proceed with caution. If combustible gas concentrations reach 10 percent of the LEL within a 12-inch radius of the borehole or 5 percent of the LEL at a distance greater than 24 inches from the borehole, operations must be suspended, the drill rig motor shut down, and corrective action taken. If corrective action cannot be taken, field personnel and all other individuals in the vicinity of the borehole must move to a safe area and the local fire department and project manager must be alerted.

5.0 AREA CONTROLS

Access to hazardous and potentially hazardous areas must be controlled to reduce the possibility of physical injury and chemical exposure to field personnel, site visitors, and the public. A hazardous or potentially hazardous area includes any area where field personnel are required to wear respirators, borings are being drilled with powered augers, or excavation with heavy equipment is being performed.

The boundaries of hazardous and potentially hazardous areas must be identified by cordons, barricades, or emergency traffic cones, depending on conditions. If such areas are left unattended, signs warning of danger and forbidding entry must be placed around the perimeter if the areas are accessible to the public. Trenches and other large holes must be guarded with wooden or metal barricades spaced no further than 20 feet apart and connected with yellow or yellow and black nylon tape not less than 0.75 inch wide. The barricades must be placed no less than 2 feet from the edge of the excavation or hole.

Entry to hazardous areas shall be limited to individuals who must work in these areas. Unofficial visitors must not be permitted to enter hazardous areas while work is in progress. Official visitors should be discouraged from entering hazardous areas but may be allowed to enter only if they agree to abide by the provisions of this document, follow orders issued by the SSC, and are informed of the potential dangers that could be encountered in these areas.

6.0 DECONTAMINATION

A mild detergent and hot water can be used to remove oil and petroleum distillate fuel products from skin. Liquid dishwashing detergent is more effective than hand soap, and hot water is more effective than cold.

Mechanic's waterless hand cleaner is recommended for initial cleaning, followed by a detergent and water wash, for removing motor oil and heavier fuel oils (fuel oils No. 4 through 6) that are weathered to an asphaltic condition.

Detergent and hot water should also be used to clean gloves, respirators, hard hats, boots, and goggles. However, if boots do not come clean after washing with detergent and water, a strong solution of trisodium phosphate and hot water can be used. Split-spoon sampling equipment, augers, vehicle undercarriages, and tires should be steam cleaned.

7.0 UNDERGROUND STORAGE TANK PROCEDURES

Procedures used by the firm responsible for UST removal and transport must agree with procedures recommended by the American Petroleum Institute (API). If the removal and transport firm's procedures, especially firms addressing the removal or inerting of flammable vapors, disagree substantially with API procedures, the Tetra Tech project manager must be notified immediately. The project manager shall then inform the client that Tetra Tech personnel will not report to the site during UST removal or transport operations unless proper procedures are used. If the firm responsible for tank removal or transport is under subcontract to Tetra Tech, it must follow API procedures (see SWP No. 6-18, "UST Removal Practices," for additional information).

8.0 EMERGENCY RESPONSE

Standard procedures to follow in the event of an emergency involving oil and petroleum distillate fuel products are summarized below. All responses should be coordinated through the designated SSC. First aid should be administered by trained first aid providers.

- In the event of a fire,
  - Stop work, shut off equipment, and evacuate to safe distance (a company vehicle should be kept at a reasonable distance from the work area to prevent fire hazards);
  - Contact the fire department and then the appropriate Tetra Tech office;
  - Keep a safe distance away until emergency services arrive; and

  - Do not attempt to fight fires that are not incipient fires

- In the event of an injury or illness,
  - Perform first aid, if possible, and call 911;
  - Do not move the victim if broken bones are suspected unless life is endangered; and
  - If the person is safe to move (has minor cuts or burns), transport the person to the hospital, but if injuries or illness are more serious, arrange for a rescue squad or ambulance.

- In the event of overexposure,
  - Remove the employee (only if there is no danger to rescuers) from the exposure source to a location with fresh air;
  - Contact a rescue squad or ambulance as necessary;
  - Do not continue work until the source of exposure is identified and controlled; and
  - Contact the appropriate Tetra Tech office for technical assistance.

- In the event of a hazardous materials accident,
  - Stop equipment and work;
  - Relocate to a safe distance;
  - To the extent possible, determine the source of incident (such as a utility line, gas line, pipeline, or other);
  - Contact the appropriate Tetra Tech office; and
  - Do not attempt to backout equipment from an underground utility strike without the guidance of the utility company.

9.0 ACCIDENT REPORTING

All accidents and near misses must be reported as required by Tetra Tech company policy. Information on accident reporting is presented in the corporate Health and Safety Manual, Document Control No. 2-2, "Accident and Illness Investigation Program."

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HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

USE OF HEAVY EQUIPMENT

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USE OF HEAVY EQUIPMENT

Truck-mounted heavy equipment and field trucks are among the types of equipment that may be used during field work. Heavy equipment can present a substantial hazard to workers. General requirements for motor vehicles and material-handling equipment are provided in the Occupational Safety and Health Administration (OSHA) Construction Industry Standards, 29 CFR 1926, Subpart O. The following precautions will be followed when heavy equipment (such as drill rigs, front-end loaders, and backhoes) is in use:

- Heavy equipment will be inspected by the operator before each work shift. The site safety coordinator (SSC) will ensure compliance with these precautions
- Equipment operators will be instructed to report any abnormalities, such as equipment failure, oozing liquids, and unusual odors, to their supervisors or the SSC
- Only qualified and licensed personnel will operate heavy equipment
- Hard hats, steel-toed boots, and safety glasses or goggles will be worn at all times around heavy equipment. Other personal protective equipment (PPE) specified in the site health and safety plan (HASP) will also be required
- Workers will not assume that the equipment operator is keeping track of their exact location. Workers will never walk directly behind or to the side of heavy equipment without the operator's knowledge
- Workers in close proximity to heavy equipment will maintain visual contact with equipment operators at all times
- When an operator must maneuver equipment in tight quarters, the presence of a second person will be required to ensure adequate clearance. If backing is required, two ground guides will be used: one in the direction the equipment is moving, and the other in the operators's normal field of vision to relay signals
- All heavy equipment used at a contaminated work site will be kept in the exclusion zone until the work has been completed. Such equipment will then be decontaminated within the designated decontamination area
- Hand-signal communications will be established when verbal communication is difficult. One person per work team will be designated to give hand signals to equipment operators
- Equipment with an obstructed rear view must have an audible alarm that sounds when the equipment is moving in reverse (unless a spotter guides the operator)

- Parking brakes will be kept engaged when equipment is not in use
- Blades, buckets, dump bodies, and other hydraulic systems will be kept fully lowered when equipment is not in use
- Equipment cabs will be kept free of all nonessential and loose items
- Seat belts must be present in all vehicles having a rollover protective structure (ROPS)
- With certain exceptions, all material-handling equipment must be equipped with ROPS
- Material-handling equipment that lacks a ROPS will not be operated on a grade unless the grade can safely accommodate the equipment involved
- Drilling auger sections and other equipment are extremely heavy. All precautions must be taken before moving heavy equipment. Appropriate equipment must be used to transport heavy equipment
- Only chains, hoists, straps, and other equipment that safely aids transport of heavy materials will be used
- Proper personal lifting techniques will be used. Workers will lift using their legs, not their backs
- A safety barrier will be used to protect workers when tires are inflated, removed, or installed on split rims
- An ongoing maintenance program for all tools and equipment must be in place. All tools and moving equipment will be inspected regularly to ensure that parts are secured, are intact, and have no cracks or areas of weakness. The equipment must turn smoothly without wobbling and must operate according to manufacturer specifications. Defective items will be promptly repaired or replaced. Maintenance and repair logs will be kept
- Tools will be stored in clean, secure areas to prevent damage, loss, or theft
- Workers will not use equipment with which they are not familiar. This precaution applies to heavy as well as light equipment
- Loose-fitting clothing and loose, long hair will be prohibited around moving machinery
- Workers will make sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines present a hazard in the work area
- All personnel who are not essential to work activities will be kept out of the work area

- Workers will be aware of their footing at all times
- Workers will remain alert at all times

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

RESPIRATOR CLEANING PROCEDURES

SWP NO.: 6-27

ISSUE DATE: FEBRUARY 1999

REVISION: 0

RESPIRATOR CLEANING PROCEDURES

This safe work practice (SWP) provides guidelines for proper and thorough cleaning of respiratory protection equipment. The Occupational Safety and Health Administration (OSHA) regulates the use of respiratory protection for general industry in Title 29 of the *Code of Federal Regulations* (CFR) Part 1910.134, "Respiratory Protection." Appendix B-2 of the standard outlines mandatory requirements for respirator cleaning and is used as the basis for this SWP. This SWP supplements Document Control No. 2-6, "Respiratory Protection Program." It provides specific respirator cleaning and disinfection procedures and shall be included as an attachment to the site-specific health and safety plan for projects for which respirator use is planned or is a contingency.

1.0 APPLICABILITY

This SWP shall apply to any project that involves use of respirators with reusable facepieces.

Respirators shall be cleaned and disinfected as discussed below.

- Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition.
- Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals.
- Respirators maintained for emergency use shall be cleaned and disinfected after each use.
- Respirators used in fit testing and training shall be cleaned and disinfected after each use.

2.0 CLEANING AND DISINFECTION PROCEDURES

Mandatory respirator cleaning procedures as defined in 29 CFR Part 1910.134, Appendix B-2, are listed below. All wash and rinse water should be warm, with a maximum temperature of 110 °F (43 °C).

1. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, and any other components as recommended by the manufacturer. Discard or repair any defective parts.

2. Wash components in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

3. Rinse components thoroughly in clean, warm, preferably running water. Drain all components.

4. When the cleaner does not contain a disinfecting agent, respirator components should be immersed for 2 minutes in one of the following:

   - Hypochlorite solution [50 parts per million (ppm) of chlorine] made by adding approximately one milliliter of laundry bleach to 1 liter of warm water
   - Aqueous solution of iodine [50 ppm iodine made by adding approximately 0.8 milliliter of tincture of iodine (6 to 8 grams ammonium and/or potassium iodide per 100 cubic centimeters of 45 percent alcohol) to 1 liter of warm water]
   - Other commercially available cleansers of equivalent disinfectant quality when used as directed if their use is recommended or approved by the respirator manufacturer

5. Rinse components thoroughly in clean, warm, preferably running water. Drain all components. The importance of thorough rinsing cannot be over emphasized. Detergents or disinfectants that dry on facepieces may cause dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

6. Components should be air-dried or hand-dried with a clean, lint-free cloth.

7. Reassemble the facepiece. Replace filters, cartridges, and canisters prior to next use.

8. Test the respirator to ensure that all components work properly.

9. Place the respirator in a clean bag and seal for storage.

Depending on work conditions, respirator facial sealing surfaces may need periodic cleaning during the course of daily use. Cleaning of the facial sealing surface during work breaks can reduce the chance of facial irritation caused by sweat, natural skin oil, or irritating materials that may have deposited on the facepiece. Facial sealing surfaces can be cleaned using disinfectant wipes soaked in isopropyl alcohol or benzalkonium chloride. After use of the disinfectant wipe, the sealing surface should air dry or be dried thoroughly using paper towels or tissues.

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

SAFE WORK PRACTICES FOR USE OF AIR PURIFYING RESPIRATORS

SWP NO.: 6-28

ISSUE DATE: FEBRUARY 1999

REVISION: 0

SAFE WORK PRACTICES FOR USE OF RESPIRATORS

This safe work practice (SWP) was developed to ensure the proper use of respirators in routine and foreseeable emergency situations. The SWP supplements Document Control No. 2-6, "Respiratory Protection Program." This SWP shall be included as an attachment to the site-specific health and safety plan (HASP) for projects for which respirator use is planned or is a contingency.

1.0 APPLICABILITY

This SWP shall apply to any project that involves use of air purifying respirators and shall not be used for situations involving the use of supplied air systems such as self-contained breathing apparatuses and air-line apparatuses.

2.0 ROUTINE RESPIRATOR USE PROCEDURES

The procedures below apply to the routine use of air purifying respirators.

- Respirators shall not be issued to or worn by individuals when conditions prevent valve function or a good facial seal. These conditions may include but are not limited to facial hair, such as the growth of beard, sideburns, or excessive mustaches, and possibly the wearing of corrective eyeglasses.
- If spectacles, goggles, face shields, or welding helmets must be worn with a facepiece, they will be worn so as not to adversely affect the seal of the facepiece to the face.
- For all tight-fitting respirators, a positive and negative pressure seal check shall be performed each time the respirator is donned. Seal checks shall be performed as follow:
  - *Negative pressure check:* Close off the inlet opening of the canister or cartridge(s) by covering it with the palm of the hand(s), inhale gently so that the facepiece collapses slightly, and hold the breath for 10 seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is satisfactory.
  - *Positive pressure check*: Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. The exhalation valve cover may have to be removed to perform this procedure.

- *Manufacturer's recommended seal check*: If the respirator manufacturer recommends specific procedures for performing a user seal check, these procedures may be used instead of the negative and positive pressure checks.

- Work areas must be monitored for conditions that may adversely affect the effectiveness of respiratory protection. Employees may leave the work area where respirators are required under the following conditions:

  - To wash the face and respirator facepieces as necessary to prevent eye or skin irritation

  - If vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece is detected

  - To replace the respirator or the filter, cartridge, or canister elements

  - If established monitoring instrument action levels are exceeded

  - For any other criteria as established in a project specific health and safety plan

3.0 RESPIRATOR USE DURING EMERGENCY SITUATIONS

Emergency situations may arise during the wearing of respiratory protection. These situations could include medical emergency, respirator failure, fire, chemical spills or leaks, and other events that pose an immediate risk. Procedures for respirator use during emergency situations are summarized below.

- When an emergency situation arises that creates or has the potential to create immediately dangerous to life and health (IDLH) conditions, the work environment shall be evacuated immediately and shall not be reentered by employees without suitable protective gear.

- Work environments with the potential for the development of atmospheres that may present IDLH conditions shall only be entered by employees using the buddy system.

- When an emergency situation arises that includes physical hazards that may interfere with the proper use of respiratory protection, the work environment shall be evacuated.

- Under no circumstances shall respirator users remove facepieces in hazardous atmospheres. In the event of respirator malfunction, users should leave the hazardous environment immediately and proceed to a known safe location before removal of the facepiece.

- Episodes of respirator failure shall be thoroughly investigated before work activities begin again. The investigation shall include re-evaluation of work area atmospheric

conditions, review of the respirator selection criteria and service life calculations, and an evaluation of the working conditions under which respirator failure occurred.

TETRA TECH, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

RESPIRATOR QUALITATIVE FIT TESTING PROCEDURES

SWP NO.: 6-29

ISSUE DATE: APRIL 1999

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RESPIRATOR QUALITATIVE FIT TESTING PROCEDURES

The safe work practice (SWP) addresses the need for proper and thorough procedures for qualitative fit testing of respirators. The Occupational Safety and Health Administration (OSHA) regulates general industrial use of respiratory protection under Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.134. Appendix A of the standard outlines mandatory procedures to use for both qualitative fit tests (QLFT) and quantitative fit tests (QNFT). This SWP was written to meet the requirements of Appendix A for QLFTs. This SWP must be used in conjunction with the Tetra Tech, Inc. (Tetra Tech), "Respiratory Protection Program," Document Control No. 2-6.

The following sections describe the SWP's applicability, qualifications of fit testers, and fit testing procedures for use during QLFTs.

1.0 APPLICABILITY

This SWP applies to all Tetra Tech employees who use respirators on the job and to employees who conduct any fit testing. In addition, when a Tetra Tech company or office uses an outside service to perform fit testing, the organization conducting the fit testing shall meet the minimum requirements for QLFT and QNFT procedures specified in Appendix A of the standard.

Respirator fit testing shall be conducted at the following intervals:

- Prior to initial use of a respirator
- Whenever a different respirator facepiece (size, style, model, or make) is used
- At least annually thereafter
- After any reported or observed changes in an employee's physical condition that could affect respirator fit. This includes but is not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

If an employee notices that the fit of a respirator has become unacceptable, he or she will be given an opportunity to select another respirator facepiece.

2.0 QUALIFICATION OF FIT TESTERS

Tetra Tech employees who conduct QLFTs must demonstrate sufficient understanding and expertise in the required testing procedures. Fit testers shall qualify through appropriate education, experience, or both. Qualifications of fit testers shall be determined on a case-by-case basis by regional health and safety representatives (RHSR) or subsidiary health and safety representatives (SHSR) based on the fit tester's demonstrated knowledge of OSHA-mandated fit test procedures and performance of a simulated fit test. The RHSR or SHSR must ensure that persons administering fit tests are able to prepare test solutions, calibrate and operate equipment, perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order. The fit tester must also demonstrate how to clean and maintain equipment to operate within the parameters for which it was designed.

3.0 FIT TESTING PROCEDURES

Appendix A of 29 CFR 1910.134 provides instruction for five OSHA-accepted QLFT procedures. Tetra Tech has selected two of these procedures for its fit test program. The sections below describe general requirements that must be followed during all fit tests and for any fit test method used. Both the Bitrex™ and irritant smoke QLFT protocols are discussed below.

3.1 GENERAL REQUIREMENTS

QLFTs must be conducted in accordance with the general requirements discussed below.

- The test subject shall be shown how to put on a respirator, position it on the face, set strap tension, and determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning the facepiece.
- The test subject must be allowed to choose from a sufficient selection of models and sizes to identify a respirator that fits correctly and is comfortable. The subject shall be informed that he or she is being asked to select the respirator that provides the most acceptable fit. The subject shall be asked to hold each chosen facepiece up to the face and eliminate those that obviously do not provide an acceptable fit.
- The subject shall don the most comfortable respirator and wear it for at least 5 minutes to assess comfort. If the subject is not familiar with a particular respirator, the subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper strap tension.

- The tester shall review the following points with the subject and allow the subject adequate time to determine the comfort of the respirator:
  - Position of the mask on the nose
  - Room for eye protection
  - Ability to talk
  - Position of the mask on the face and cheeks
- The following criteria shall be used to help determine the adequacy of the respirator fit:
  - Chin properly placed
  - Adequate strap tension (not overly tight)
  - Fit across nose bridge
  - Proper size to span distance from nose to chin
  - Tendency of respirator to slip
  - Self-observation in a mirror to evaluate fit and respirator position
- The subject shall conduct a user seal check using the negative- and positive-pressure seal check procedures described in Appendix A of this SWP. Before conducting the check, the subject shall be instructed to seat the mask on the face by moving the head from side to side and up and down slowly while taking a few slow, deep breaths. If the seal checks fail, the subject shall choose another facepiece.
- Seal checks and fit testing shall not be conducted if there is any facial hair growth such as stubble beard growth, beard, mustache, or sideburns that interferes with the facepiece sealing surface. Any interfering apparel shall be altered or removed.
- If the subject experiences difficulty in breathing during testing, the testing shall stop immediately and he or she shall be referred to a company physician for assessment.
- If the subject finds the fit of the respirator unacceptable, the subject shall be given the opportunity to select a different respirator and to be retested.
- Prior to commencement of the fit test, the subject shall be given a written description of the respirator user seal check procedures (see Appendix A) and exercises to perform during the testing. Exercises and a prepared text to be read during the test are included in Appendix B of this SWP.
- All exercises in Appendix B must be performed for all QLFT methods.

3.2 BITREX™ SOLUTION QUALITATIVE FIT TEST PROTOCOL

Bitrex™ solution (denatonium benzoate) is a taste aversion agent. To conduct a QLFT using Bitrex™, the test subject must first pass a taste threshold screening. The entire procedure must be explained to the test subject before the screening is conducted. The sections below describe taste threshold screening and fit test procedures. Particulate filters (cartridges) are used during this test.

3.2.1 Taste Threshold Screening

The taste threshold screening is intended to determine whether the individual tested can detect the taste of Bitrex™. The procedures below shall be used for the taste screening.

- Prior to testing, the tester shall prepare a quantity of threshold check solution by adding 13.5 milligrams (mg) of Bitrex™ to 100 milliliters (mL) of 5 percent salt solution in distilled water. A nebulizer for taste screening shall be clearly marked to distinguish it from the fit test solution nebulizer. The taste screening nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every 4 hours.

- During the taste screening as well as during the fit testing, subjects shall wear an enclosure around the head and shoulders that is approximately 12 inches in diameter by 14 inches tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts #14 and #15 combined, is adequate.

- The test enclosure shall have a 0.75-inch hole in front of the test subject's nose and month area to accommodate the nebulizer nozzle.

- The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he or she detects a bitter taste.

- Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely. The bulb is then released and allowed to fully expand. Correct use of the nebulizer means that approximately 1 mL of liquid is used at a time in the nebulizer body.

- The nebulizer should be rapidly squeezed 10 times and then the test subject is asked whether the Bitrex™ solution can be tasted. If the subject reports tasting the bitter taste during the 10 squeezes, the screening test is complete. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

- If the first response is negative, the nebulizer is rapidly squeezed 10 more times and the test subject is again asked whether the Bitrex™ solution is tasted. If the test subject reports tasting the bitter taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

- If the second response is negative, the nebulizer is rapidly squeezed 10 more times and the test subject is again asked whether the Bitrex™ solution is tasted. If the test subject reports tasting the bitter taste during the third 10 squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

- If the Bitrex™ solution is not tasted after 30 squeezes, the test subject is unable to taste the Bitrex™ solution and cannot be fit tested using the Bitrex™ solution test.

- The tester will note the number of squeezes required to solicit a taste response. When a taste response has been elicited, the test subject shall be asked to note the taste for reference in the fit test.

3.2.2 Bitrex™ Solution Fit Test Procedures

The procedures below must be followed to conduct the actual Bitrex™ solution fit test:

- A fit test solution is prepared by adding 337.5 mg of Bitrex™ to 200 mL of a 5 percent salt solution in warm water. A second nebulizer dedicated to fit testing shall be clearly marked to distinguish it from the taste screening solution nebulizer. The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every 4 hours.

- The test subject shall be instructed not to each, drink, smoke, or chew gum for 15 minutes before the test.

- The person being fit tested shall don the respirator without assistance and perform the required user seal check (see Appendix A).

- The fit test uses the same enclosure described for taste threshold screening in Section 3.2.1. The test subject shall don the enclosure while wearing the respirator selected as described in the general requirements in Section 3.1. The respirator shall be properly adjusted and equipped with particulate filter(s).

- As before, the test subject shall breathe through his or her slightly opened mouth with tongue extended, and shall be instructed to report is he or she tastes the bitter taste of Bitrex™

- The nebulizer is inserted into the hole in front of the enclosure, and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20, or 30) based on the number of squeezes required to elicit taste response noted during the screening test.

- After generating the aerosol, the test subject shall be instructed to perform the test exercises provided in Appendix B.

- Every 30 seconds, the aerosol concentration shall be replenished using one half the number of squeezes used initially (such as 5, 10, or 15).

- The test subject shall indicate to the tester if at any time during the fit test the taste of Bitrex™ solution is detected. If the test subject does not report tasting the Bitrex™ solution, the test is passed.

- If the taste of Bitrex™ solution is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried, and the entire test procedure (screening and test) is repeated.

3.3 IRRITANT SMOKE (STANNIC CHLORIDE) QUALITATIVE FIT TEST PROTOCOL

This QLFT uses a person's response to irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator. To conduct this QLFT, the general requirements and precautions, a sensitivity screening check, and fit test procedures discussed below must be followed.

3.3.1 General Requirements and Precautions

General requirements and precautions related to the irritant smoke QLFT are discussed below.

- The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) or P100 series filter(s). Tetra Tech recommends that the person performing the fit test also wear a full-face respirator with HEPA or P100 series filters.

- Only stannic chloride smoke tubes shall be used for this protocol.

- No test enclosure or hood for the test subject shall be used.

- The smoke can irritate the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be

taken when performing the sensitivity screening checks that only the minimum amount of smoke is used necessary to elicit a response from the test subject.

- The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or buildup of irritant smoke in the general atmosphere.

3.3.2 Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke as discussed below.

- The tester shall break both ends of a ventilation smoke tube containing stannic chloride and attach one end of the smoke tube to (1) a low-flow air pump set to deliver 200 mL per minute or (2) an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

- The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his or her eyes closed while the test is performed.

- The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he or she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine if he or she can detect it.

3.3.3 Irritant Smoke Fit Test Procedures

The procedures below must be followed to conduct the actual irritant smoke fit test.

- The person being fit tested shall don the respirator without assistance and perform the required user seal check (see Appendix A).

- The test subject shall be instructed to keep his or her eyes closed.

- The tester shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject using the low-flow pump or squeeze bulb at least 12 inches from the facepiece. The tester shall move the smoke stream around the whole perimeter of the mask. The tester shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

- If the person being tested does not have an involuntary response or detect the irritant smoke, the test should proceed with the test exercises provided in Appendix B.

- The test exercises shall be performed by the test subject while the respirator seal is being continually challenged by the smoke around the perimeter of the respirator at a distance of 6 inches.

- If the person being fit tested reports detecting the irritant smoke at any time, the fit test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

- Each test subject passing the irritant smoke test without evidence of a response is required to undergo a second sensitivity screening check after the respirator has been removed using the smoke from the same smoke tube used during the fit test to determine whether he or she still reacts to the smoke. Failure to evoke a response shall render the fit test void. If the subject responds during the second sensitivity check, the fit test is passed.

APPENDIX A

RESPIRATOR USER SEAL CHECK PROCEDURES

APPENDIX A

RESPIRATOR USER SEAL CHECK PROCEDURE

Individuals using tight-fitting respirators must perform a user seal check each time a respirator is put on to ensure that an adequate seal is achieved. Two methods are available for use; one is the positive- and negative-pressure check and the other is the respirator manufacturer's method. Either the positive- and negative-pressure checks described below may be used or, if a manufacturer of a particular respirator brand has developed its own recommended seal check method, that method may be used in place of the negative- and positive-pressure seal checks. User seal checks are not a substitute for qualitative or quantitative fit tests. The user check procedures described below are as described in the mandatory Appendix B-1 of Title 29 of the *Code of Federal Regulations*, Part 1910.134.

- Positive-Pressure Check

  Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replace it after the test.

- Negative-Pressure Check

  Close off the inlet opening(s) of the canister or cartridge(s) by covering the opening with the palm of the hand(s) or by replacing the filter seal(s). Inhale gently so that the facepiece collapses slightly, and hold the breath for 10 seconds. The inlet opening of some cartridges cannot be effectively covered with the palm of the hand. In this case, the test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

APPENDIX B

RESPIRATOR FIT TEST EXERCISES

RESPIRATOR FIT TEST EXERCISES

Test subjects shall perform the exercises below during fit test process. Prior to the actual fit test, the test subject shall (1) select a suitable and comfortable respirator; (2) don, adjust, and then wear the respirator for 5 minutes to assess comfort; (3) conduct a user seal check in accordance with the procedures outlined in Appendix A, (4) report any difficulties breathing while wearing the respirator, (5) select a different respirator if the fit and level of comfort is unacceptable, and (6) perform the fit test exercises described below in the order listed. The qualitative fit test (QLFT) shall be performed in a test environment.

Test Exercises

Each exercises below shall be conducted for 1 minute. During testing, the subject will be questioned and observed to determine if the respirator is comfortable. The respirator shall not be adjusted during the fit testing procedure. Any adjustment voids the test, and the test must be repeated from the beginning.

1. **Normal breathing.** In a normal standing position without talking, breathe normally.
2. **Deep breathing.** In a normal standing position, breathe slowly and deeply. Be careful not to hyperventilate.
3. **Turning head from side to side.** Standing in place, slowly turn the head from side to side between the extreme positions on each side. Hold the head at each extreme momentarily and inhale at each side.
4. **Moving head up and down**. Standing in place, slowly move the head up and down. Inhale in the up position (such as when looking toward the ceiling).
5. **Talking.** Talk out loud slowly and loud enough to be heard clearly by the fit tester. Read the entire "Rainbow Passage" on the next page.
6. **Bending over.** Bend at the waist as if to touch the toes.
7. **Normal breathing.** Complete the same exercise as item 1 above.

After these test exercises are completed, the tester shall ask the test subject about the comfort of the respirator. If the respirator is uncomfortable, another respirator shall be tried and the fit test, as well as user check and screening procedures, will be repeated.

RAINBOW PASSAGE

"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

Source: Appendix A of Title 29 of the *Code of Federal Regulations,* Part 1910.134

TETRA TECH, INC. AND SUBSIDIARIES
Substance Abuse Policy Statement

I. INTRODUCTION

Tetra Tech, Inc. and its subsidiaries (herein referred to as Tetra Tech or the Company) are committed to providing employees with a safe and healthy work environment, free from the effects of drug and alcohol abuse. To demonstrate our commitment to that goal, Tetra Tech has implemented a substance abuse policy.

II. POLICY STATEMENT

This policy prohibits the unlawful manufacture, distribution, dispensation, possession, or use of controlled substances on any Company-owned or leased space, client facility or work site. The policy further states that employees shall not use alcohol or drugs on or off Company property where its usage affects their ability to perform their jobs.

In order to enforce this policy, the Company may investigate potential violations and require personnel to undergo drug/alcohol screening, including urinalysis, blood tests or other appropriate tests. The Company may also conduct searches of all areas of the Company premises, including, but not limited to work areas, rest rooms, break areas, personal articles, employee's clothes, desks, work stations, lockers, and personal and Company-owned vehicles.

Violation of this policy or any of its provisions may result in disciplinary action up to and including termination of employment. Employees may be subject to discipline up to and including termination for refusing to cooperate with searches or investigations, refusing to submit to screening, or failing to execute consent forms when required by supervisors.

Employees who are convicted of any criminal drug statute for a violation occurring in the workplace are required to notify their Human Resources Representative no later than five days after the conviction. It shall also be the responsibility of each employee who observes or has knowledge of another employee in a condition which impairs the employee to perform his or her job duties or who presents a hazard to the safety and welfare of others to promptly report that fact to his or her immediate supervisor.

III. EMPLOYEE ASSISTANCE PROGRAMS

Employees who are experiencing problems with drug and/or alcohol abuse are urged to participate in a Company-sponsored Employee Assistance Program (EAP) where available. Volunteering to participate in an EAP to address substance abuse problems does not relieve an employee of the obligation to satisfy the Company's standards regarding an employee's performance, and participation will not prevent the Company from administering discipline for violation of its policies.

EMPLOYEE ASSISTANCE PROGRAMS (continued)

It is the responsibility of the employee to seek and accept assistance before drug and alcohol problems lead to disciplinary action. Confidentiality of records and information will be maintained in accordance with all local, state, and federal laws.

IV. TESTING

Tetra Tech shall conduct drug or alcohol tests in the following circumstances:

A. Where there is reasonable suspicion that an employee may have violated the rules set forth in this policy. Reasonable suspicion may arise from, among other factors, supervisory observation, co-worker reports or complaints, performance decline, attendance or behavioral changes, results of drug searches or other detection methods or involvement in a workplace or vehicular accident indicating a possible error in judgment or negligence.

B. Prior to employment as required by any Tetra Tech entity which has implemented a pre-employment drug screening program. All offers of employment for those entities will be contingent upon the results of the drug test. Job applicants must submit to a drug test. Refusal to submit or a positive confirmed drug test may be used as a basis for refusal to hire the applicant.

C. The Company shall subject applicants and current employees to pre-employment drug testing and/or random drug testing when required through specific project contracts. Affected employees will be notified of such drug testing requirements and will be included in project specific drug testing programs in accordance with applicable federal, state or local regulations.

D. Drug testing may also be conducted as part of or as follow up to a prescribed treatment program for substance abuse.

Note: Some Tetra Tech entities have a supplemental Substance Abuse Policy with additional guidelines that are required due to the Drug Free Workplace Act or contractual requirements. Copies of these policies are available for review from your Human Resources Department.

ATTACHMENT 2

PROJECT AND FIELD FORMS

TETRA TECH, INC.

FIELD AUDIT CHECKLIST

Project Name: _____ Project No.: _____

Field Location: _____ Completed by: _____

Project Manager: _____ Site Safety Coordinator: _____

General Items		In Compliance?		
Health and Safety Plan Requirements		Yes	No	NA
1	Approved health and safety plan (HASP) on site or available			
2	Names of on-site personnel recorded in field logbook or daily log			
3	HASP compliance agreement form signed by all on-site personnel			
4	Material Safety Data Sheets on site or available			
5	Designated site safety coordinator present			
6	Daily tailgate safety meetings conducted and documented			
7	On-site personnel meet HASP requirements for medical examinations, fit testing, and training (including subcontractors)			
8	Compliance with specified safe work practices			
9	Documentation of training, medical examinations, and fit tests available from employer			
10	Exclusion, decontamination, and support zones delineated and enforced			
11	Windsock or ribbons in place to indicate wind direction			
12	Illness and injury prevention program reports completed (California only)			
Emergency Planning				
13	Emergency telephone numbers posted			
14	Emergency route to hospital posted			
15	Local emergency providers notified of site activities			
16	Adequate safety equipment inventory available			
17	First aid provider and supplies available			
18	Eyewash stations in place			
Air Monitoring				
19	Monitoring equipment specified in HASP available and in working order			
20	Monitoring equipment calibrated and calibration records available			
21	Personnel know how to operate monitoring equipment and equipment manuals available on site			
23	Environmental and personnel monitoring performed as specified in HASP			

TETRA TECH, INC.

FIELD AUDIT CHECKLIST (Continued)

Safety Items		In Compliance?		
Personal Protection		Yes	No	NA
1	Splash suit			
2	Chemical protective clothing			
3	Safety glasses or goggles			
4	Gloves			
5	Overboots			
6	Hard hat			
7	Dust mask			
8	Hearing protection			
9	Respirator			
Instrumentation				
10	Combustible gas meter			
11	Oxygen meter			
12	Organic vapor analyzer			
Supplies				
13	Decontamination equipment and supplies			
14	Fire extinguishers			
15	Spill cleanup supplies			
Corrective Action Taken During Audit:				
Corrective Action Still Needed:				

Note: NA = Not applicable

_____ _____

Auditor's Signature Site Safety Coordinator's Signature

_____

Date

TETRA TECH, INC.

HEALTH AND SAFETY PROGRAM AUDIT CHECKLIST

Date: _____ Office: _____ Auditor: _____

Health and Safety Representative: _____ Office Manager: _____

AUDIT AGENDA

A. Initial meeting with health and safety representative

1. Follow-up on past deficiencies
2. General assessment of equipment and office
3. Review Health and Safety Program compliance (see attached checklist)

B. Exit meeting to summarize findings.

	Yes	No	NA
A. RECORDS AND POSTING			
1. Ensure Health and Safety Program binders are up to date			
2. Check following records:			
Training			
CPR and first aid			
Accident and near miss investigations			
Occupational Safety and Health Administration (OSHA) Forms 200			
Illness and Injury Prevention Program (IIPP) records (California only)			
Nevada Workplace Safety Program (NWSP) records (Nevada only)			
Medical examination records			
Fit test records			
3. Check for OSHA poster			
Comments: _____			
B. EQUIPMENT INSPECTION			
1. Inspect types and condition of the following:			
Respirators - face pieces and cartridges			
Gloves			
Chemical protective clothing			

Note: NA = Not applicable

	Yes	No	NA
Ear plugs and muffs			
B. EQUIPMENT INSPECTION (Continued)			
Safety glasses			
Boots and boot covers			
First aid kits (check for CPR mask and vinyl or latex gloves)			
Eye wash supplies			
Fire extinguishers - types			
Comments: _____			
2. Check storage area for cleanliness, organization, and easy access			
Comments: _____			
C. OFFICE INSPECTION			
1. Aisleways and doors clear			
2. Exit signs visible and lighted			
3. Emergency lighting operational			
4. All exit points unlocked and accessible			
5. Slip, trip, and fall hazards controlled			
6. Computer work stations ergonomically designed			
Comments: _____			
D. FIRE PREVENTION			
1. Fire extinguishers in place and accessible			
2. Inspection tags current			
3. Halon units available near sensitive electronic equipment			
4. Smoke detectors in place and functional			
5. Combustibles stored away from heat sources			
6. Flammable liquids stored properly			
Comments: _____			

Note: NA = Not applicable

TETRA TECH, INC.

HEALTH AND SAFETY PROGRAM COMPLIANCE CHECKLIST

Date: _____ Office: _____ Auditor: _____

Health and Safety Representative: _____ Office Manager: _____

DOCUMENTATION

	Yes	No	NA
A. MEDICAL SURVEILLANCE			
1. All field staff up to date			
2. Proper forms used for documentation			
3. Records maintained in locked, fire-proof file cabinet			
4. Exit physicals completed as needed			
5. Information on clinics maintained			
6. Board-certified physicians used			
7. Physician certifications on file			
Comments: _____			
B. TRAINING			
1. Health and safety training up to date			
2. First aid and CPR training up to date			
3. Training certificates on file			
4. All eligible supervisors trained			
5. Miscellaneous records of completion maintained			
6. Documentation of course content on file			
Comments: _____			
C. ACCIDENT AND ILLNESS INVESTIGATION			
1. Review of reported incidents to date			
2. Review of quality of reports			
– Reports complete			
– Reports signed as required			

Note: NA = Not applicable

	Yes	No	NA
C. ACCIDENT AND ILLNESS INVESTIGATION (Continued)			
3. Adequacy of follow-ups to date			
– Actions identified			
– Actions implemented			
4. Review of OSHA Forms 200 (up to date and correct)			
Comments: _____			
D. SITE HEALTH AND SAFETY PLANS (HASP)			
1. Compare copy of current project list to HASPs on file			
2. Review of documentation			
– Approval sheet used and filed			
– Compliance agreement sheet used and filed (HSP-4)			
– Tailgate safety meeting held and documented (HST-2)			
3. Field auditing forms used and filed (AF-1)			
Comments: _____			
E. FIT TESTING			
1. Fist tests performed at start of work and annually			
2. Respirator fit test records on file (RP-1)			
Comments: _____			
F. SUBCONTRACTORS			
1. Contractor questionnaire used and filed (HSQ-1)			
2. Subcontractor training certification form used (HSQ-2)			
Comments: _____			
G. SUBSTANCE ABUSE			
1. All employees signed off on policy			
2. Hotline number posted			
3. Training completed (as applicable)			

Note: NA = Not applicable

	Yes	No	NA
G. SUBSTANCE ABUSE (Continued)			
Comments: _____			

PROGRAM COMPLIANCE

	Yes	No	NA
A. PERSONAL PROTECTIVE EQUIPMENT (PPE) AND RESPIRATORY PROTECTION			
1. Who selects PPE and respirators for a project? _____			
2. Where is the equipment stored? _____			
3. Are regular inspections of conditions conducted?			
4. Who orders supplies? _____			
5. Are a sufficient number and sizes of facepieces available?			
6. Are employees issued personal facepieces?			
7. Who inspects and cleans equipment? _____			
8. Brand(s) used at this location? _____			
9. Hazard assessments documented (per 29 CFR 1910.132)?			
Comments: _____			
B. CONFINED SPACE ENTRY (CSE)			
1. Who reviews projects for potential CSE? _____			
2. Who signs off on CSE permits? _____			
3. Is training completed annually?			
4. Is test equipment available (CGI, detector tubes, or other)			
Comments: _____			
C. HAZARD COMMUNICATION			
1. Are hazardous materials inventories completed?			
2. Are MSDSs available for all hazardous materials?			
3. Are employees allowed access to MSDSs?			

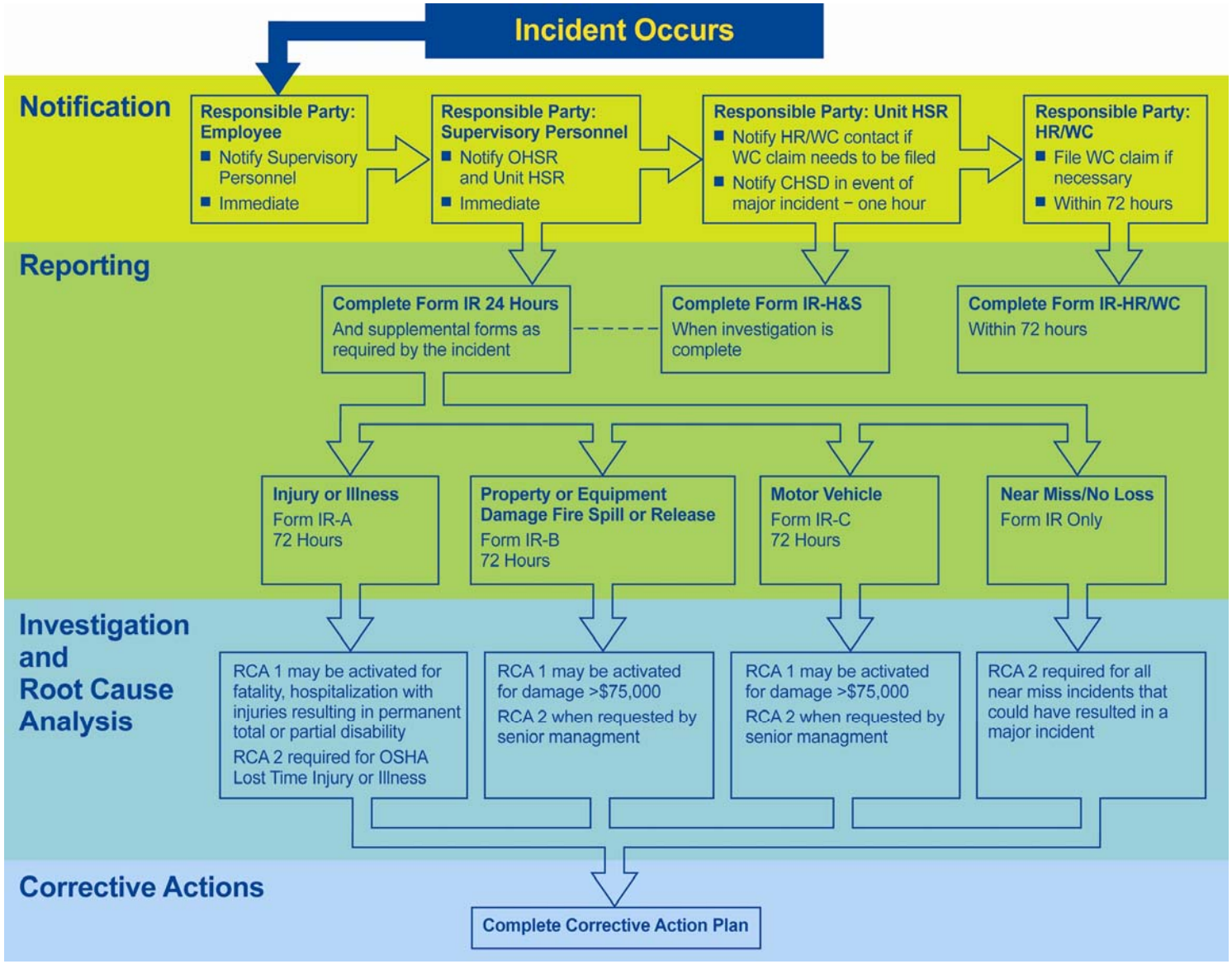
Note: NA = Not applicable

	Yes	No	NA
4. How? _____			
C. HAZARD COMMUNICATION (Continued)			
5. Are any unlabeled containers of hazardous materials stored in office or shed?			
6. Why? _____			
Comments: _____			
D. ILLNESS AND INJURY PREVENTION PROGRAM (CALIFORNIA ONLY)			
1. Are staff trained?			
2. Has a suggestion box been placed for employee comments?			
3. Has a hazard evaluation been completed for office and administrative work areas?			
4. Are inspections conducted at least every 6 months?			
5. Has training been properly documented?			
Comments: _____			
E. HEARING CONSERVATION			
1. Is a hearing conservation program established?			
2. Has any noise monitoring been performed for this or another office?			
3. If yes, were employees notified of results?			
4. Has any employee been identified as experiencing a standard threshold shift in hearing?			
5. If yes, has this employee been informed of the need to wear hearing protectors at 85 decibels (A-weighted scale) or greater?			
6. Have all employee been shown how to wear hearing protectors?			
7. Is training provided annually and documented?			
Comments: _____			
F. BLOOD BORNE PATHOGENS STANDARD			
1. Is training provided and documented?			
2. Are vaccinations offered?			

Note: NA = Not applicable

	Yes	No	NA
3. Have any exposure incidents been reported?			
F. BLOOD BORNE PATHOGENS STANDARD (Continued)			
Comments: _____ _____			
G. NEVADA WORKPLACE SAFETY PROGRAM (STATE PROGRAM)			
1. Are signed "Rights and Responsibilities" sheets on file for all staff?			
2. Are safety committee meetings held monthly?			
3. Are safety inspections conducted biannually?			
4. Have inspection deficiencies been addressed?			
Comments: _____ _____			

Note: NA = Not applicable


Incident Occurs
Notification
Responsible Party: Employee
Notify Supervisory Personnel
Immediate
Responsible Party: Supervisory Personnel
Notify OHSR and Unit HSR
Immediate
Responsible Party: Unit HSR
Notify HR/WC contact if WC claim needs to be filed
Notify CHSD in event of major incident – one hour
Responsible Party: HR/WC
File WC claim if necessary
Within 72 hours
Reporting
Complete Form IR 24 Hours
And supplemental forms as required by the incident
Complete Form IR-H&S
When investigation is complete
Complete Form IR-HR/WC
Within 72 hours
Injury or Illness
Form IR-A
72 Hours
Property or Equipment Damage Fire Spill or Release
Form IR-B
72 Hours
Motor Vehicle
Form IR-C
72 Hours
Near Miss/No Loss
Form IR Only
Investigation and Root Cause Analysis
RCA 1 may be activated for fatality, hospitalization with injuries resulting in permanent total or partial disability
RCA 2 required for OSHA Lost Time Injury or Illness
RCA 1 may be activated for damage >$75,000
RCA 2 when requested by senior managment
RCA 1 may be activated for damage >$75,000
RCA 2 when requested by senior managment
RCA 2 required for all near miss incidents that could have resulted in a major incident
Corrective Actions
Complete Corrective Action Plan

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Safety Excellence

TETRA TECH, INC.
INCIDENT REPORT

Report Date	Report Prepared By	Incident Report Number

INSTRUCTIONS:

All incidents (including those involving subcontractors under direct supervision of Tetra Tech personnel) must be documented on the IR Form.

Complete any additional parts to this form as indicated below for the type of incident selected.

TYPE OF INCIDENT (Check all that apply)	Additional Form(s) Required for this type of incident
Near Miss (No losses, but could have resulted in injury, illness, or damage)	☐ Complete IR Form Only
Injury or Illness	☐ Complete Form IR-A; Injury or Illness
Property or Equipment Damage, Fire, Spill or Release	☐ Complete Form IR-B; Damage, Fire, Spill or Release
Motor Vehicle	☐ Complete Form IR-C; Motor Vehicle

INFORMATION ABOUT THE INCIDENT

Description of Incident

_____

_____

_____

_____

Date of Incident	Time of Incident
	_____ AM ☐ PM ☐ *OR* Cannot be determined ☐
Weather conditions at the time of the incident	**Was there adequate lighting?**
	_____ Yes ☐ No ☐

Location of Incident

_____ Was location of incident within the employer's work environment? Yes ☐ No ☐

Street Address	City, State, Zip Code and Country
Project Name	**Client:**
Tt Supervisor or Project Manager	**Was supervisor on the scene?**
	Yes ☐ No ☐

WITNESS INFORMATION (attach additional sheets if necessary)

Name	Company
Street Address	**City, State and Zip Code**
Telephone Number(s)	

CORRECTIVE ACTIONS

Corrective action(s) immediately taken by unit reporting the incident:

_____

_____

_____

_____

Corrective action(s) still to be taken (by whom and when):

_____

_____

_____

_____

ROOT CAUSE ANALYSIS LEVEL REQUIRED

Root Cause Analysis Level Required: Level - 1 ☐ Level - 2 ☐ None ☐

Root Cause Analysis Level Definitions

Level - 1	**Definition:** A Level 1 RCA is conducted by an individual(s) with experience or training in root cause analysis techniques and will conduct or direct documentation reviews, site investigation, witness and affected employee interviews, and identify corrective actions. Activating a Level 1 RCA and identifying RCA team members will be at the discretion of the Corporate Administration office. The following events may trigger a Level 1 RCA: ▪ Work related fatality ▪ Hospitalization of one or more employee where injuries result in total or partial permanent disability ▪ Property damage in excess of $75,000 ▪ When requested by senior management
Level - 2	**Definition:** A Level 2 RCA is self performed within the operating unit by supervisory personnel with assistance of the operating unit HSR. Level 2 RCA will utilize the 5 Why RCA methodology and document the findings on the tools provided. The following events will require a Level 2 RCA: ▪ OSHA recordable lost time incident ▪ Near miss incident that could have triggered a Level 1 RCA ▪ When requested by senior management

Complete the Root Cause Analysis Worksheet and Corrective Action form. Identify a corrective action(s) for each root cause identified within each area of inquiry.

NOTIFICATIONS

Title	Printed Name	Signature	Telephone Number	Date
Project Manager or Supervisor				
Site Safety Coordinator or Office H&S Representative				
Operating Unit H&S Representative				
Other: _____				

The signatures provided above indicate that appropriate personnel have been notified of the incident.

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TETRA TECH, INC.
INCIDENT FORM IR-A

INSTRUCTIONS:

Complete all sections below for incidents involving injury or illness.
Do NOT leave any blanks.
Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)	

EMPLOYEE INFORMATION

Company Affiliation

Tetra Tech Employee? ☐ TetraTech subcontractor employee (directly supervised by Tt personnel)? ☐

Full Name	**Company (if not Tt employee)**
Street Address, City, State and Zip Code	**Address Type**
_____ _____	Home address (for Tt employees) ☐ Business address (for subcontractors) ☐

Telephone Numbers

Work: _____ Home: _____ Cell: _____

Occupation (regular job title)	**Department**
Was the individual performing regular job duties?	**Time individual began work**
Yes ☐ No ☐	_____ AM ☐ PM ☐ *OR* Cannot be determined ☐

Safety equipment

Provided? Yes ☐ No ☐

Used? Yes ☐ No ☐ If no, explain why

_____
_____
_____

Type(s) provided:
☐ Hard hat ☐ Protective clothing
☐ Gloves ☐ High visibility vest
☐ Eye protection ☐ Fall protection
☐ Safety shoes ☐ Machine guarding
☐ Respirator ☐ Other (list)

_____

NOTIFICATIONS

Name of Tt employee to whom the injury or illness was first reported	**Was H&S notified within one hour of injury or illness?**
	Yes ☐ No ☐
Date of report	**H&S Personnel Notified**
Time of report	**Time of Report**

If subcontractor injury, did subcontractor's firm perform their own incident investigation?

Yes ☐ No ☐ If yes, request a copy of their completed investigation form/report and attach it to this report.

INJURY / ILLNESS DETAILS

What was the individual doing just before the incident occurred? Describe the activity as well as the tools, equipment, or material the individual was using. Be specific. Examples: "Climbing a ladder while carrying roofing materials"; "Spraying chlorine from a hand sprayer"; "Daily computer key-entry"

What Happened? Describe how the injury occurred. Examples: "When ladder slipped on wet floor and worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; Worker developed soreness in wrist over time"

Describe the object or substance that directly harmed the individual: Examples: "Concrete floor"; "Chlorine"; "Radial Arm Saw". If this question does not apply to the incident, write "Not Applicable".

MEDICAL CARE PROVIDED

Was first aid provided at the site: Yes ☐ No ☐ If yes, describe the type of first aid administered and by whom?

Was treatment provided away from the site: Yes ☐ No ☐ If yes, provide the information below.

Name of physician or health care professional	**Facility Name**
Street Address, City State and Zip Code	**Type of Care?**
	Was individual treated in emergency room? Yes ☐ No ☐
	Was individual hospitalized overnight as an in-patient? Yes ☐ No ☐
Telephone Number	Did the individual die? Yes ☐ No ☐ If yes, date:
	Will a worker's compensation claim be filed? Yes ☐ No ☐

NOTE: Attach any police reports or related diagrams to this report.

SIGNATURES

I have reviewed this report and agree that all the supplied information is accurate

Affected individual (print)	**Affected individual (signature)**	**Telephone Number**	**Date**

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.

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Safety Excellence

TETRA TECH, INC.
INCIDENT FORM IR-B

INSTRUCTIONS:

Complete all sections below for incidents involving property/equipment damage, fire, spill or release.
Do NOT leave any blanks.
Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)	

TYPE OF INCIDENT (Check all that apply)

Property Damage ☐ Equipment Damage ☐ Fire or Explosion ☐ Spill or Release ☐

INCIDENT DETAILS

Results of Incident: Fully describe damages, losses, etc.

Response Actions Taken:

Responding Agency(s) (i.e. police, fire department, etc.)	**Agency(s) Contact Name(s)**

DAMAGED ITEMS (List all damaged items, extent of damage and estimated repair cost)

Item:	**Extent of damage:**	**Estimated repair cost**

SPILLS / RELEASES (Provide information for spilled/released materials)

Substance	**Estimated quantity and duration**	**Specify Reportable Quantity (RQ)**
		_____ Exceeded? Yes ☐ No ☐ NA ☐

FIRES / EXPLOSIONS (Provide information related to fires/explosions)

Fire fighting equipment used? Yes ☐ No ☐ If yes, type of equipment: _____

NOTIFICATIONS

Required notifications	**Name of person notified**	**By whom**	**Date / Time**
Client: _____ Yes ☐ No ☐			
Agency: _____ Yes ☐ No ☐			
Other: _____ Yes ☐ No ☐			

Who is responsible for reporting incident to outside agency(s)? Tt ☐ Client ☐ Other ☐ Name: _____

Was an additional written report on this incident generated? Yes ☐ No ☐ If yes, place in project file.

TETRA TECH, INC.
INCIDENT FORM IR-C

INSTRUCTIONS:

Complete all sections below for incidents involving motor vehicle accidents. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)	

INCIDENT DETAILS

Name of road, street, highway or location where accident occurred	Name of intersecting road, street or highway if applicable

County	City	State

Did police respond to the accident?	Did ambulance respond to the accident?
Yes ☐ No ☐	Yes ☐ No ☐
Name and location of responding police department	**Ambulance company name and location**
Officer's name/badge #	

Did police complete an incident report? Yes ☐ No ☐ If yes, police report number: _____
Request a copy of completed investigation report and attach to this form.

VEHICLE INFORMATION

How many vehicles were involved in the accident? _____ (Attach additional sheets as applicable for accidents involving more than 2 vehicles.)

Vehicle Number 1 – Tetra Tech Vehicle		Vehicle Number 2 – Other Vehicle	
Vehicle Owner / Contact Information		**Vehicle Owner / Contact Information**	
Color		**Color**	
Make		**Make**	
Model		**Model**	
Year		**Year**	
License Plate #		**License Plate #**	
Identification #		**Identification #**	
Describe damage to vehicle number 1		**Describe damage to vehicle number 2**	
Insurance Company Name and Address		**Insurance Company Name and Address**	
Agent Name		**Agent Name**	
Agent Phone No.		**Agent Phone No.**	
Policy Number		**Policy Number**	

DRIVER INFORMATION

Vehicle Number 1 – Tetra Tech Vehicle		Vehicle Number 2 – Other Vehicle	
Driver's Name		**Driver's Name**	
Driver's Address		**Driver's Address**	
Phone Number		**Phone Number**	
Date of Birth		**Date of Birth**	
Driver's License #		**Driver's License #**	
Licensing State		**Licensing State**	
Gender	Male ☐ Female ☐	**Gender**	Male ☐ Female ☐
Was traffic citation issued to Tetra Tech driver? Yes ☐ No ☐		Was traffic citation issued to driver of other vehicle? Yes ☐ No ☐	
Citation #		**Citation #**	
Citation Description		**Citation Description**	

PASSENGERS IN VEHICLES (NON-INJURED)

List all non-injured passengers (excluding driver) in each vehicle.
Driver information is captured in the preceding section.
Information related to persons injured in the accident (non-Tt employees) is captured in the section below on this form.
Injured Tt employee information is captured on FORM IR-A

Vehicle Number 1 – Tetra Tech Vehicle		Vehicle Number 2 – Other Vehicle	
How many passengers (excluding driver) in the vehicle? _____		How many passengers (excluding driver) in the vehicle? _____	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	

INJURIES TO NON-TETRATECH EMPLOYEES

Name of injured person 1				Address of injured person 1		
Age	**Gender**	**Car No.**	**Location in Car**	**Seat Belt Used?**	**Ejected from car?**	**Injury or Fatality?**
	Male ☐ Female ☐			Yes ☐ No ☐	Yes ☐ No ☐	Injured ☐ Died ☐
Name of injured person 2				**Address of injured person 2**		
Age	**Gender**	**Car No.**	**Location in Car**	**Seat Belt Used?**	**Ejected from car?**	**Injury or Fatality?**
	Male ☐ Female ☐			Yes ☐ No ☐	Yes ☐ No ☐	Injured ☐ Died ☐

OTHER PROPERTY DAMAGE

Describe damage to property other than motor vehicles	
Property Owner's Name	**Property Owner's Address**

COMPLETE AND SUBMIT DIAGRAM DEPICTING WHAT HAPPENED

TETRA TECH, INC.

POST-EXPOSURE EVALUATION

I. Exposed Person		**II. Exposure Source** (if legally obtainable)	
Name:	Date of Birth:	Name:	Date of Birth:
Street Address:		Street Address:	
City, State, Zip Code:		City, State, Zip Code:	
Telephone No.: Work: ( ) Home: ( )		Employer:	
Employer (and office location):		Employer's Street Address:	
Personal Physician or Clinic:		City, State, Zip Code:	

III. Description of Incident Resulting in Exposure

Date of Incident (month/day/year):	Time of Incident: ☐ a.m. ☐ p.m.

Specific Description of Incident (include estimate of volume of fluid involved):

Type of Incident and Body Fluid Exchanged (check all that apply):

Body Fluid	Action	Route of Entry of Exposed Person
☐ Blood	☐ Needle puncture	☐ Eye
☐ Sputum or saliva	☐ Bite that breaks skin	☐ Nose
☐ Urine	☐ Impalement	☐ Mouth
☐ Feces	☐ Splash or splatter	☐ Open wound or break in skin
☐ Semen	☐ Mouth-to-mouth CPR	
☐ Vaginal secretions	☐ Cut or wound	
☐ Vomitus	☐ Other	

TETRA TECH, INC.

POST-EXPOSURE EVALUATION (Continued)

Have you been vaccinated against Hepatitis B virus? ☐ No ☐ Yes If yes, what year?		
The above information accurately describes the exposure. I request disclosure of the source person's body fluid/bloodborne pathogen(s) test results.		
Exposed Person's Signature:		Date Signed:
IV. Significant Exposure Certification by Physician		
I certify that the incident described above had the potential for the exposed person to have a significant exposure to blood or other body fluids. I have informed the exposed person about medical conditions that may require further evaluation or treatment as a result of this exposure.		
A Hepatitis B vaccination is recommended for the exposed person: ☐ Yes ☐ No		
The exposed person has received the Hepatitis B vaccination: ☐ Yes ☐ No		
Physician's Name (print):	Physician's Signature:	Date Signed:
Business Telephone No.: ( )	Physician's License No.:	
Physician's Business Address (street, city, state, zip code):		

TETRA TECH, INC.
CONFINED SPACE ENTRY PERMIT

This permit must be posted at the job site until the job is completed.

Permit Valid from : _____ a.m./p.m. to _____ a.m./p.m. Date: _____

Site Information

Project Name: _____ Project No.: _____

Field Location: _____

Description of Work Performed: _____

_____

Permit Space Hazards
(indicate specific hazards with initials)

____ Oxygen deficiency (less than 19.5%)

____ Oxygen enrichment (greater than 23.5%)

____ Flammable gases or vapors (greater than 10% of LEL)

____ Airborne combustible dust (meets or exceeds LEL)

____ Toxic gases or vapors (greater than PEL)

____ Mechanical hazard

____ Electrical shock

____ Material harmful to skin

____ Engulfment

____ Other: _____

Equipment Required for Entry and Work
(specify as required)

Protective clothing:: _____

_____

_____

Respiratory protection: _____

_____

Air monitoring: _____

_____

Communication: _____

_____

Rescue equipment: _____

Other: _____

_____

Communication Procedures (to be used by attendants and entrants)

_____

_____

_____

Authorized Entrants
(List by name or attach roster)

_____ _____

_____ _____

_____ _____

Emergency Service

Name of Service	Telephone Number
_____	_____
_____	_____
_____	_____

Authorized Attendants
(List by name or attach roster)

_____ _____

_____ _____

_____ _____

Additional Information

_____

_____

_____

Permit Authorization

I certify that all safety precautions have been taken and necessary equipment has been provided for safe entry and work in this confined space. Air monitoring results will be recorded on this permit.

Permit Authorized by (printed name): _____

Signature: _____ Time: _____ Date: _____

TETRA TECH, INC.
CONFINED SPACE ENTRY PERMIT (Continued)

Preparation for Entry
(check after steps have been taken)

____ Notification of affected departments of service interruption

____ Emergency Response Team available

____ Isolation methods:

- ____ Lockout/tagout
- ____ Blank/blind
- ____ Purge/clean
- ____ Inerting
- ____ Ventilate
- ____ Atmospheric test
- ____ Barriers
- ____ Other: _____

____ Personnel awareness:

- ____ Pre-entry briefing on specific hazards and control methods
- ____ Notify contractors of permit and hazard conditions
- ____ Other: _____

____ Additional permits required and attached:

- ____ Hot work
- ____ Line breaking
- ____ Other: _____

Testing Record

		Result					
	Acceptable Conditions	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:___ am/pm
Oxygen-min.	19.5%						
Oxygen-max.	23.5%						
Flammability	<10% LEL						
H_2S	<10 ppm						
Cl_2	<0.5 ppm						
CO	<35 ppm						
SO_2	<2 ppm						
Heat	°F/°C						
Toxic (specify)							
Other							
Tester Initials							

Notes:

Cl_2	=	Chlorine	PEL	=	Permissible exposure limit
CO	=	Carbon monoxide	ppm	=	Part per million
H_2S	=	Hydrogen sulfide	SO_2	=	Sulfur dioxide
LEL	=	Lower explosive limit			

Permit Authorizer's Signature: _____

Original to project file
Copies to project manager and office health and safety representatives

TETRA TECH, INC.

PREPARATION AND TESTING OF NON-PERMIT REQUIRED CONFINED SPACE

Site Information

Project Name: _____ Date: _____

Specific Field Location: _____ Project Manager Initials: _____

_____ Project No.: _____

Description of Work Performed

Space Preparation

Precautions taken for entrance cover opening: _____

Entrance barrier(s) used: _____

Ventilation equipment used: _____

Atmospheric Testing Record

		Result					
	Acceptable Conditions*	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:____ am/pm	_____:___ am/pm
Oxygen-min.	>19.5%						
Oxygen-max.	<23.5%						
Flammability	<10% LEL						
H_2S	<10 ppm						
Cl_2	<0.5 ppm						
CO	<35 ppm						
SO_2	<2 ppm						
Heat	°F/°C						
Toxic (specify)							
Other							
Tester Initials							

* If acceptable conditions are not met, describe techniques used to control the hazard:

Signature of Tester:

Notes:

Cl_2	=	Chlorine	LEL	=	Lower explosive limit
CO	=	Carbon monoxide	ppm	=	Part per million
H_2S	=	Hydrogen sulfide	SO_2	=	Sulfur Dioxide

If atmospheric testing indicates that the hazards are not being controlled within acceptable conditions, entrants must leave the confined space. Procedures for a permit-required confined space must then be followed.

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Project No.: _____

Client: _____ Site Location: _____

Site Activities Planned for Today: _____

_____

Safety Topics Discussed
Protective clothing and equipment:
Chemical hazards:
Physical hazards:
Environmental and biohazards:
Equipment hazards:
Decontamination procedures:
Other:
Review of emergency procedures:
Employee Questions or Comments:

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM (Continued)

Attendees	
Printed Name	**Signature**

Meeting Conducted by:

_____ _____

Name Title

_____

Signature

TETRA TECH, INC.

CERTIFICATION OF HEALTH AND SAFETY REQUIREMENTS FOR SUBCONTRACTORS

Note: Sign and return to the site safety coordinator.

The SUBCONTRACTOR hereby certifies that it has in place a health and safety program and that its employees have been trained in accordance with the provisions of the SUBCONTRACTOR program. In addition , the SUBCONTRACTOR hereby certifies that its health and safety program complies with applicable OSHA regulations including but not limited to:

- ❑ Title 29 of the *Code of Federal Regulations*, Part 1910.120, "Hazardous Waste Operations and Emergency Response,"
- ❑ Title 29 of the *Code of Federal Regulations*, Part 1926 Construction Industry Standards
- ❑ Other_____

(Check regulations that apply)

All employees of the SUBCONTRACTOR who will be engaged in work on

_____

Project Name

shall comply with the provisions of this and other applicable regulations and the provisions of the site-specific health and safety plan.

Name and Title of Officer of the Firm: _____

Name of Firm: _____

Signature of Officer of the Firm: _____

Date Received by Tetra Tech, Inc.:_____

Printed Name of Site Safety Coordinator: _____

Signature of Site Safety Coordinator: _____

TETRA TECH, INC.

HOT WORK PERMIT

(for electric or gas welding and cutting operations)

Project Name: _____ Project No.: _____

Date: _____ Completed by: _____

Work Location: _____

Work to be Performed: _____

Hazard Assessment

Are combustible materials within 35 feet of operations? ☐ Yes ☐ No

Are open grates or cracks in floor, walls, or windows? ☐ Yes ☐ No

Are lower areas protected from overhead work? ☐ Yes ☐ No

Note: Confined space work must follow confined space entry procedures established in Document Control No. 2-5 of the Tetra Tech, Inc., Health and Safety Manual.

Fire Prevention and Response

Spark Containment Method: _____

Fire Extinguisher Size and Type: _____

Location of Nearest Telephone: _____

Emergency Telephone Numbers: _____

Location of Emergency Alarm: _____

Note: Fire watch must continue for at least 0.5 hour after completion of hot work.

Monitoring

Potential Contaminants: _____

Monitoring Instruments: _____

Sign-Offs

_____ _____

Fire Watch (signature) Lead Hot Work Employee (signature)

TETRA TECH, INC.
LOCKOUT/TAGOUT INSPECTION CERTIFICATE

Date: _____ Project Name: _____

Project No: _____ Inspector: _____

Machine or Equipment	Employee	Comments

TETRA TECH, INC.

PROTECTIVE EQUIPMENT INSPECTION

PROTECTIVE CLOTHING

Before use:

- Determine that the clothing material is correct for the specific task at hand.
- Visually inspect the equipment for
  - Imperfect seams
  - Nonuniform coatings
  - Tears
  - Malfunctioning closures
- Hold up to light and check for pinholes.
- Flex the equipment and
  - Observe for cracks
  - Observe for other signs of shelf deterioration

After use, inspect inside and out for the same signs of chemical attack.

During use, periodically inspect equipment for

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure
- Tears
- Punctures
- Seam discontinuities

Note: Discard any protective clothing that has any of the conditions listed above.

GLOVES

Before use:

- Visually inspect gloves for
  - Imperfect seams
  - Tears and abrasions
  - Nonuniform coatings
- Pressurize glove with air and listen for pinhole leaks.

Note: Discard any gloves that exhibit any of the conditions listed above.

FOOTWEAR

Before use, inspect footwear for

- Holes and cuts
- Interior wetness
- Integrity of closures
- Cracks in sole

Note: Discard any footwear that exhibits any of the conditions listed above.

EYEWEAR

Before use, inspect eyewear for

- Cracks
- Fogginess
- Scratches
- Sturdiness of frame or supports and suspension

Note: Discard any eyewear that exhibits any of the conditions listed above.

HEADGEAR

Before use, inspect headgear for

- Cracks or gouges
- Sturdiness of suspension system

Note: Discard any headgear that exhibits any of the conditions listed above.

TETRA TECH, INC.

RESPIRATOR FIT TEST RECORD

Name: _____ Region or Subsidiary:_____

Office: _____ Last Medical Examination: _____

Fit Test Date:_____ Corrective Lenses Needed: ☐ Yes ☐ No

Employee briefed on fundamental principles of respiratory protection, use, selection, inspection, cleaning, maintenance, and storage of equipment ☐ Yes ☐ No

	Respirator 1	Respirator 2	Respirator 3
Equipment Type			
Manufacturer Name			
Model			
Size			
Facepiece Composition (rubber or silicone)			

	Respirator 1		Respirator 2		Respirator 3	
Test Performed	Pass	Fail	Pass	Fail	Pass	Fail
Negative-Pressure Test						
Positive-Pressure Test						
Irritant Smoke Test						
Bitrex™						
Quantitative Fit Test (attach record)						

The individual named above has been fit-tested in accordance with procedures specified in the Tetra Tech, Inc., Health and Safety Program Manual. Fit-test protocols have been adapted from OSHA 29 CFR 1910.134, Appendix A.

_____ _____ _____

Printed Examiner's Name Examiner's Signature Date

_____ _____

Employee's Signature Date

TETRA TECH, INC.

RESPIRATORY HAZARD ASSESSMENT

Project Name:				Project No.:	
Location:				Project Manager:	
Type: ☐ Baseline ☐ Reassessment		Date:		Valid for _____ days	
Job/Task Description:				☐ Routine ☐ Escape	
Hazard Identification and Source:		Workplace Factors: Temperature: _____ Humidity: _____ Other: _____		User Factors: Work rate: _____ Protective clothing: _____ Other: _____	
Chemical:					
PEL:					
ACGIH TLV:					
Form (part/gas/vapor):					
IDLH:					
Eye Irritant (Y/N):					
Skin Absorption(Y/N):					
Monitoring (Y/N) :*					
Frequency:					
Maximum Concentration Estimated:**					

* Monitoring Method:

☐ PID ☐ NIOSH method: _____

☐ FID ☐ Vapor badge: _____

☐ Detector tube: _____ ☐ Other: _____

Respirator Type:

☐ Half-face disposable Brand: _____

☐ Half-face reusable Brand: _____

☐ Full-face Brand: _____

☐ Air-supplied airline Brand: _____

☐ Air-supplied SCBA Brand: _____

☐ PAPR Brand: _____

☐ ESCBA Brand: _____

** If concentrations exceed the immediately dangerous to life and health (IDLH) value, use air-supplied systems.

Vapor and Gas Cartridge Exchange:

ESLI: ☐ Yes ☐ No

Exchange frequency: _____

Cartridge/Filter Selection

☐ N100 ☐ R100 ☐ P100

☐ N99 ☐ R99 ☐ P99

☐ N95 ☐ R95 ☐ P95

☐ Organic vapor ☐ Acid gas

☐ Ammonia ☐ Mercury ☐ Formaldehyde

☐ Combo: _____

☐ Other: _____

Basis for Exchange Frequency

☐ Manufacturer's data ☐ Workplace simulations

☐ Experimental methods ☐ AIHA "Rules of Thumb"

☐ Predictive modeling ☐ Analogous chemical structure

☐ OSHA Regulation: _____

☐ Other: _____

_____ _____
Completed by Date

_____ _____
Reviewed by Date

DEFINITIONS AND ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ESLI	End of service life indicator
FID	Flame ionization detector
IDLH	Immediately dangerous to life and health
NIOSH	National Institute for Occupational Safety and Health
N100/99/95	Non-oil-proof particulate filter
OSHA	Occupational Safety and Health Administration
P100/99/95	Oil-proof particulate filter
PEL	Permissible exposure limit
PID	Photoionization detector
PPE	Personal protective equipment
R100/99/95	Oil-resistant particulate filter
SCBA	Self-contained breathing apparatus
TLV	Threshold limit value

Note: This form must be reviewed by a regional health and safety representative or subsidiary health and safety representative (or designee) only and must be attached to the site-specific health and safety plan once completed. A copy must also be placed in the project files.

TETRA TECH, INC.

DAILY SITE LOG

Site Name:_____ Date: _____

Name (print)	Company	Time	
		In	Out

Comments:

_____

_____

_____

_____

ATTACHMENT 3

ACTIVITY HAZARD ANALYSIS (AHA) SHEETS

ACTIVITY HAZARD ANALYSIS (AHA)
Mobilization and Site Setup

Analyzed By/Date: R. Margotto, CIH, CSP 12/07

Principle Steps	Potential Safety/ Health Hazards	Recommended Controls
1. Set up work areas.	Workers could be exposed to chemical hazards.	Delineate limited access zone (LAZ) and use PPE as required by type of material being used. Refer to MSDSs. Maintain dust control. Visual observation will be used to verify selection of PPE. Identify all chemical hazards and receive training (MSDSs) regarding safe handling of chemicals. The HSO will file copies of all MSDSs at site.
	Noise from site setup could cause hearing loss.	Hearing protection is required when sound levels exceed 85 dBA continuously. Usually this will only be for workers working in unenclosed cabs of heavy equipment or ground workers working near heavy equipment.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and work, barricade, or eliminate slip, trip, and fall hazards, if feasible. Keep work area neat and orderly. Always place supplies in areas away from normal foot traffic and equipment and tools in a safe location that does not present a trip hazard to nearby workers. Maintain proper illumination in all work areas. Work is authorized normally during daylight hours only.
	Sharp objects could cause punctures.	Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, blunt sharp edges. Workers should not stand or walk on equipment or supplies.
	Strains from manually moving materials and equipment could occur.	Direct personnel to use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Encourage the use of a hand truck. Employees will not lift more than 50 pounds. Obtain assistance from another worker or use a mechanical device.
	Workers could be exposed to extreme temperatures.	Monitor for heat stress in accordance with the SHSP. Provide fluids and rest breaks during warm weather and especially while wearing impermeable protective clothing.

ACTIVITY HAZARD ANALYSIS (AHA)
Mobilization and Site Setup

Analyzed By/Date: R. Margotto, CIH, CSP 12/07

Principle Steps	Potential Safety/ Health Hazards	Recommended Controls
	Eye hazards could be present.	Safety glasses are the minimum required eye protection for all work areas.
	Electrocution could occur from generator, if used to power site power tools. Connection to temporary wiring could also cause electrocution.	Only qualified electricians are allowed to hook up or disconnect electrical circuits. Follow lock-out/tag-out protocols. Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Extension cord must be rated for hard usage or extra hard usage (Table 400-4, National Electrical Code). Inspect extension cord connection. Use GFCIs on all outdoor 115- to 120-volt, 20-ampere or less circuits. Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching (cover only in accordance with National Electrical Code requirements). Keep plugs and receptacles out of water, unless they are approved, submersible types. Ground all electrical circuits in accordance with the National Electrical Code or other applicable standards and regulations. If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. National Electrical Code 250-6 lists the exceptions for grounding portable and vehicle-mounted generators.
	Lack of communication in widely dispersed areas could lead to delayed response in an emergency.	Ensure that each work team has a telephone or access to a telephone for communication. In addition, workers must have a 2-way radio that can contact someone who has access to a phone if they are not in line of sight of other workers. If more than one team at a time is working, ensure that there is communication between the work teams and project management. Use the buddy system.
	Workers could be struck by or against heavy equipment.	Wear high-visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Use traffic barricades, signs, flags, and backup spotters during field activities.
3. Install barricades and other support structures.	Improper use of power and hand tools could cause injury or damage tools.	Inspect all tools before each use. Train personnel in the proper use of hand tools. ground all power tools or protect by GFCI, or double-insulation.
	Material handling could cause injury.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE.

ACTIVITY HAZARD ANALYSIS (AHA)
Mobilization and Site Setup

Analyzed By/Date: R. Margotto, CIH, CSP 12/07

Principle Steps	Potential Safety/ Health Hazards	Recommended Controls
	Strains from handling materials could occur.	Direct personnel to use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Encourage use of hand trucks and steady pace of work.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, hand tools	Daily and before use. Use form provided in plan.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks. Specific training for power tools, hand tools, and electrical safety is required.

Abbreviations and Acronyms:

CIH – Certified Industrial Hygienist
CSP – Certified Safety Professional
dBA – decibels, A-scale
GFCI – ground fault circuit interrupter
HSO – Health and Safety Officer
MSDS – Material Safety Data Sheet
PPE – personal protective equipment

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ACTIVITY HAZARD ANALYSIS (AHA)

Install Office Trailer

Analyzed By/Date: Roger Margotto, CIH 12/07

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Identify driver requirements prior to trailer delivery.	Lack of tractor/trailer inspections could lead to citations or tickets.	Ensure that driver has a current commercial driver's license.
2. Locate utilities.	Contact with above- and below-ground utilities could cause injury or property damage.	Make sure all above- and below-ground utilities have been identified per the mobilization AHA #1.
3. Queue truck at selected site.	Location could create a traffic hazard.	Locate trailer in an area that will not obstruct traffic and ensure that flaggers are certified.
4. Position trailer into selected area.	Truck or trailer could hit someone or something.	Use spotters when positioning trailer. Ensure that spotters know how to communicate with driver of truck.
5. Make sure truck is secured.	Truck and trailer could roll.	Set parking brake and chock wheels to prevent truck and trailer from rolling.
6. Unhook trailer.	Improper placement of trailer jack could cause failure.	Ensure that trailer jack is working properly and placed on stable ground or cribbing.
	Trailer could fall off hitch.	Ensure that non-essential personnel stay clear of operation.
7. Level trailer.	Back injuries, trip hazards, and falls could occur.	Use correct lifting techniques, and be aware of potential hazards.
8. Secure trailer.	Contact with above- and below-ground utilities could cause injury to worker and damage to property or equipment.	Make sure all above- and below-ground utilities have been identified.
9. Install anchors.	High winds could tip over trailer.	Ensure that trailer is anchored according to recommended procedures.
	Workers could be struck by tool when pounding in anchors. Stakes or straps could break away when struck, causing pieces to fly.	Review procedure for safe use of tool. Ensure that others are not in vicinity. Wear safety glasses.
	Noise and sharp edges could be present.	Ensure that hearing and hand protection is worn when installing anchor straps.
10. Install stairs.	Failure to maintain door clearances could cause injury or property damage.	Ensure that swing radius of door and stair platform maintains a 20-inch clearance.
	Doors could blow open during high winds and strike personnel.	Ensure that doors are equipped by a restraint system.
	Non-OSHA compliance could result in injury.	Ensure that stairs, hand rails, mid rails and platform meet OSHA standards.
11. Secure stairs.	Unstable stairs could result in injury.	Ensure that stairs are anchored to the trailer or ground.
12. Run cables for electrical and telephone hookup for trailer.	Cables could cause trip hazards.	Carefully unroll cables. Place cables in holders and mark any trip hazards.
	Cables could be energized.	Ensure that cables are not connected to live sources.
13. Install utilities.	Employees could be electrocuted during installation or due to improper installation.	Only qualified electricians are allowed to hook up or disconnect electrical circuits. Follow a written lock-out procedure such as the one in the SHSP. Electrician will not work on any energized circuits on site.

ACTIVITY HAZARD ANALYSIS (AHA)

Install Office Trailer

Analyzed By/Date: Roger Margotto, CIH 12/07

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
14. Inspect cords and connectors.	Extension cords and connectors could be damaged or improper for tools used, causing potential injury to workers or damage to tools.	Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Use extension cords rated for hard usage in damp environment (S, SJ, SJO, SV, and others listed in NEC Section 401). Document extension cord inspection. Do not pass temporary wiring through walls, doors, or windows (extension cords are one type of temporary wiring).
15. Connect tools and other equipment in outdoor areas.	A potential for electrocution exists in damp or wet areas.	Use GFCIs on all outdoor 115- to 120-volt, 20-ampere or less, circuits. Cover or elevate electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching. (Do not place cords through pipes). Keep plugs and receptacles out of water, unless they are approved, submersible types. Ground all electrical circuits in accordance with the NEC, or other applicable, regulations or standards
16. Use generator for temporary electrical supply.	Improper connections or installation of generator could cause electrocution of workers.	If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. NEC 250-6 lists the exceptions for grounding portable and vehicle-mounted generators. Follow the other requirements specified above in this AHA. Ensure that the outlets on the generator are protected by GFCI. If they are not, be sure to install an inline portable GFCI.
17. Refuel generator.	Improper refueling of generator could expose workers to fuel, expose the environment to fuel, or cause a fire.	Never refuel a generator while it is running, unless the manufacturer specifies that this can be done. (Normally this is allowed only during emergencies or where shutdown of unit would significantly impair operations.) Avoid refueling while the engine is hot. Workers should review the MSDS for fuel used and follow all safe handling precautions. A person must attend to all refueling activities at all times. Never lock a fuel nozzle in an on position and walk away to do something else. Never refuel in an environmentally sensitive area. Either move the unit away from the area before refueling or place an impermeable barrier (plastic liner) under the generator. Have spill control supplies readily available.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles	Daily and before use. Use equipment safety checklist.	Only licensed personnel will operate vehicles.
Generator, if used	Daily and before use. Use inspection checklist provided by manufacturer.	Only trained personnel may operate generator. Only qualified electricians may work on electrical components of system.
Equipment, hand tools	Inspect all equipment and tools before each use.	Specific training for power tools and hand tools will be provided.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
GFCI – ground fault circuit interrupter
MSDS – Material Safety Data Sheet
NEC – National Electrical Code
OSHA – Occupational Safety and Health Administration
SHSP - Site Health and Safety Plan

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ACTIVITY HAZARD ANALYSIS (AHA)
Excavation

Analyzed By/Date: Roger Margotto 12/07

Principal Steps	Potential Safety/Health Hazards	Recommended Control
1. Inspect work area/excavation.	The following excavation hazards could be present: improper shoring or sloping could cause excavation to collapse; accumulation of water can erode excavation; and personnel could be struck by operating equipment. Loads in equipment could drop on top of workers. Workers or others could inadvertently fall into an excavation.	Reverify all utility markings. Protect all utilities, wells, and piezometers. Ensure proper shoring or sloping. Spoil banks and equipment must be at least 3 feet away from the excavation. [Cal-OSHA requires at least 2 feet from the edge of the excavation. Daily inspections of excavation, the adjacent areas, and protective systems shall be made by the project-assigned competent person. Workers will never work under loads.
2. Inspect first aid kit, eye wash station, and fire extinguisher.	Failure to have proper medical supplies during emergency could result in inadequate treatment of personnel or potentially increase injuries.	Ensure that first aid kit contains all necessary supplies and that eye wash station is capable of supplying a 15-minute steady supply of solution.
3. Conduct safety inspection of excavators, graders or backhoes, dump trucks, water trucks (for dust control) and site pickup trucks.	Workers could be vulnerable to slips, trips, and falls, getting caught in between equipment, pinch-points, and cuts. Damage to equipment could occur if not in good working condition.	When accessing heavy equipment (climbing on or off) always use the "Three Points of Contact" system to prevent falls.
	Failure of equipment to operate in a safe manner could causes injury to worker.	Crew needs to remain alert to work flow and hazards as they change. Equipment Safety Inspections must be conducted for each piece of equipment; use the correct forms.
	Broken hydraulic/oil lines could cause burns.	An inspection of oil lines and connections should be performed and any suspect leaks should be reported immediately to management. Do not use equipment until is repaired or specifically authorized by the Project Superintendent or Project Manager. Operator's manual must be on site and reviewed to ensure proper inspection and operation of equipment.
4. Inspect and load tools and supplies into work trucks.	Workers could be vulnerable to muscle/back strain, slips, trips, falls, cuts, abrasions, and splinters.	Handle tools and material carefully. Make sure tools are clean and in good working order. Only pick up one tool at a time. Do not carry loads over 50 pounds. Employee need to be aware of working areas. Wear leather gloves.

ACTIVITY HAZARD ANALYSIS (AHA)
Excavation

Analyzed By/Date: Roger Margotto 12/07

Principal Steps	Potential Safety/Health Hazards	Recommended Control
5. Excavate the soil.	Heavy equipment could pose hazards to workers.	Equip all heavy equipment on this project with rollover protection systems and backup alarms. Stay clear of moving equipment unless necessary. (If working near equipment, workers must be in visual contact with the operator.) Be aware of the swing radius of the equipment, especially the counterbalance on an excavator. Inspect all equipment daily before use to ensure that proper maintenance is being performed. Make eye contact with operator. Heavy equipment has right-of-way.
	Workers could be exposed to chemically-contaminated soil or landfill debris	Wear PPE and respiratory protection as specified in the SHSP for contamination. For work with or near refuse, wear Tyvek coveralls, nitrile gloves, and avoid generating dust (use a water truck). Do not handle wet materials manually unless wearing PPE specified in SHSP
	Workers could be exposed to physical hazards created by refuse including sharp objects and heavy items.	Avoid handling refuse items directly. Use equipment. Workers should stand back from refuse being handled.
6. Use shovels.	Workers could get strains from use of shovels.	Maintain steady work pace. Avoid pivoting at waist; rather, pivot using feet. If possible, rotate tasks among the workers. Inspect tools to ensure that they are in good condition.
7. Load trucks.	Workers could be hit by debris or be crushed by loads.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS). Load trucks so that dust generation is minimal, by dropping the load as close as possible to the top of the truck.

ACTIVITY HAZARD ANALYSIS (AHA)
Excavation

Analyzed By/Date: Roger Margotto 12/07

Principal Steps	Potential Safety/Health Hazards	Recommended Control
8. Material may be hauled from the excavation to another part of the landfill.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow a Traffic Control Plan. Wear reflective warning vests. Avoid equipment swing areas, and designated traffic routes/staging areas. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers as necessary to direct trucks, as well as any nearby traffic.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, dump trucks	Daily or before use.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks.

Notes:

AHA – Activity Hazard Analysis
Cal-OSHA – California Occupational Safety and Health Administration
FOPS – falling object protective system
PPE – personal protective equipment
SHSP – Site Health and Safety Plan

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ACTIVITY HAZARD ANALYSIS (AHA)
Hollow-Stem Auger (HSA)

Analyzed By/Date R. Margotto, CIH CSP, 12/07

Principal Steps	Potential Safety/ Health Hazards	Recommended Control
1. Pre-survey area that HSA rig will drive over.	Vehicle could run over unstable surface ground or hazards.	Mark all physical hazards. Weight of rig can be significant; verify stability of all routes of travel.
2. Pre-survey area to ensure underground locator services have marked utilities and that as-built drawings have been reviewed.	Underground utilities – could cause release of gas, water; electrocution if an underground power line is struck; damage to communication lines.	Verify that there are no utilities; especially PVC water lines that are often placed in some concrete pads and lead shield electrical service lines. Review drawings, nearby utility connections, and scan, locate, and mark. Dig Alert (call before you dig) should have already been contacted and area marked based on previous site activities.
3. Perform drilling operations; inspect drill rig.	Improper inspection of rig could cause workers to be exposed to hazards associated with operating mechanical devices.	Ensure that the rig and all associated equipment are inspected by a competent person and that the rig is in safe operating condition. Inspect equipment, including brakes, tire pressure, cables, and hydraulic and pneumatic hoses, before use and at start of each shift. Verify that there is a guard cage that can surround the rotating auger when the rig is in use. Tag and remove from service faulty or unsafe equipment. Verify that emergency shutdown systems (at least two) are clearly marked, and all site workers know locations. Verify that shutdown systems work properly when trip wires are pulled or pushed. Operator's manual must be available and reviewed prior to operation.
4. Perform drill operations; set up work area and move rig into position.	Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damage to underground utilities, or tipping rig over in unstable soil conditions.	Do not move drill rig into any work area until site layout plan has been completed and route of travel to any work site has been assessed for hazards (overhead lines and stability of roads and ground). At the pre-activity safety briefing, discuss site layout plan and analysis of route of travel, along with AHAs. Use a spotter for positioning as necessary. Set brake and place wheel chocks under front wheels of mobile rig. Extend stabilizer jacks and ensure sound footing. Vehicle must be level to vertical and horizontal planes. Do not position wheels (loads) or rig over manholes, vaults, valve boxes, etc. Do not place rig within 15 feet of any overhead electrical lines.
	Rig could contact overhead lines, including power lines, if it is transported with rig raised, causing electric shock.	Never move the rig when the mast is extended.

ACTIVITY HAZARD ANALYSIS (AHA)
Hollow-Stem Auger (HSA)

Analyzed By/Date R. Margotto, CIH CSP, 12/07

Principal Steps	Potential Safety/ Health Hazards	Recommended Control
Perform drill operations; set up work area and move rig into position (continued).	Vehicle may move if not properly set up.	Use spotter to properly position vehicle. Set brakes and place wheel chocks under front wheels of mobile rig. Extend stabilizer jacks, and ensure sound footing. Ensure that ground can support weight of unit and any outriggers. Use cribbing of specified size and strength as required by manufacturer, if necessary. Vehicle must be level to the vertical and horizontal planes.
	When raising rig, rig may not install properly due to the condition of rig and connecting cables.	Inspect all components of rig to determine condition. Make all repairs before raising rig.
	When raising rig, mast could come into contact with, or be in close proximity to, overhead power lines causing electrocution of workers.	The mast and other equipment must be at least 15 feet from any overhead utility lines. Verify the voltage of any overhead power lines. If any lines are above 50 kV, the clearance distance must be greater. Refer to National Electrical Code for voltages above 50 kV.
	Workers may become pinned between rig and other truck components, or workers could be pinned under truck rig if rig must be serviced from under the truck.	When any part of the rig or equipment is in motion, workers will stand far enough away from the moving parts so as not to be pinned between them. Workers will not manually guide any moving part of the rig when it is raised up. Workers will not work under the rig or under the truck. If work must be done under the rig or truck, the drill crew supervisor will contact the HSO to ascertain a safe method for lock-out of the equipment to ensure that adequate blocking is installed.
	High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.	Check weather conditions and forecasts to determine if conditions are acceptable for use of rig. Do not operate the rig if winds exceed manufacturer's recommended tolerances. Policy requires an evaluation anytime wind exceeds 25 miles per hour.
	Excessive noise exposure could cause hearing loss.	When necessary, earplugs will be worn.
	Workers could be exposed to pinch points.	Avoid placing hands close to moving machinery. Wear gloves, as appropriate.
	Traffic in area of drilling could injure workers because vehicles fail to see to workers or workers fail to see the vehicles.	Wear high-reflective safety vests. Barricade and mark drilling sites for visibility. Use a flagger, if necessary, to direct traffic away from drilling areas.
5. Hand auger first 5 feet of intended borehole.	Workers could experience back and muscle strain from using tools.	Avoid prolonged repetitive motion. Rotate job task with other workers.

ACTIVITY HAZARD ANALYSIS (AHA)
Hollow-Stem Auger (HSA)

Analyzed By/Date R. Margotto, CIH CSP, 12/07

Principal Steps	Potential Safety/ Health Hazards	Recommended Control
6. Perform drilling operations; start up drill and perform drilling.	Unqualified operators and personnel in area do not have knowledge of drilling hazards.	Ensure that personnel are trained in use of drilling equipment. Ensure that the operator has current certifications to operate the equipment. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. Ensure that a spill-control kit is available at drilling location. Ensure that there is a first-aid kit, eyewash, and an emergency air horn nearby.
	Start up of unit auger could cause workers to come into contact with auger causing injury or death.	In no case will the auger be engaged without a clear zone. Workers will not approach a rotating auger.
	Pressurized hydraulic lines could rupture, causing release of hot hydraulic fluid. Hot fluid could ignite if contact is made with an engine. Hot fluid could burn workers. Fluid could cause environmental contamination.	Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. Immediately shut down equipment if lines rupture. Ensure that a 20-pound dry chemical ABC fire extinguisher is readily available. Ensure that a spill-control kit is available at drilling location. If rupture occurs, as quickly as possible, berm the liquid to minimize the area over which the liquid spreads. Ensure that all pressurized lines have whip checks.
	Air hoses or hydraulic hoses under pressure could suddenly release, whip, and hit workers causing severe injury.	Do not disconnect air hoses and compressors until hose line has been bled. Visually inspect all connection of any lines under pressure. Use safety clamps to connect each side of connection to the other if the connection breaks. (The safety clamps will keep the hoses from whipping under the sudden release of pressure.) Tie back or attach hoses wherever possible to minimize the length of hose that could whip around if there is a sudden release of pressure.
	Strains could result from manually moving materials, equipment, and drums.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with the legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. Mechanical equipment will be used as much as possible. Use care when handling augers or drill rods. Avoid standing under any load. Do not lift more than 50 pounds without assistance.

ACTIVITY HAZARD ANALYSIS (AHA)
Hollow-Stem Auger (HSA)

Analyzed By/Date R. Margotto, CIH CSP, 12/07

Principal Steps	Potential Safety/ Health Hazards	Recommended Control
	Workers could be exposed to atmospheric and come into contact with hazards from chemical agents such as gases from the bore hole, or contact with refuse material	Ambient air/visual monitoring will be used to verify selection of PPE. An MSDS for any drilling fluids will be obtained/reviewed with workers. Decontaminate drilling implements after use (or cover contaminated parts when moving to the next drilling site). Avoid exposure to dust. Use dust control as necessary and possible. PPE will be used. Drum and label all soil cuttings. Determine if PPE is contaminated (based on exposure to contaminants). Place contaminated PPE in a separate, properly labeled, container. Discard other PPE, as approved by the CIH. Do not place face or head over hole.
	Sometimes workers use plastic sheeting in the area where they are drilling to protect the surrounding ground. This sheeting becomes very slippery when drilling muds are placed on it.	Avoid using plastic sheeting, if possible. Many drillers today build a small bermed area where they place the drilling muds. It is easier to clean up the surface of the soil than to have workers slip on plastic sheeting. If plastic sheeting must be used, dig out a small depression, place the plastic on the ground, and cover it with the removed soil. This way, the plastic sheeting should not become too slippery, as it will be covered by the removed soil. (This creates a larger volume of soil to be disposed of, but it is a safer method than working on slippery plastic.)
	The mast could be used to lift other objects as it is being raised, causing potential failure of the mast.	Masts shall be used in a manner specified by the manufacturer and should never be loaded beyond their capacity.
	Workers could climb the drill mast and expose themselves to a fall hazard.	Climbing on the mast is not allowed.

ACTIVITY HAZARD ANALYSIS (AHA)
Hollow-Stem Auger (HSA)

Analyzed By/Date R. Margotto, CIH CSP, 12/07

Principal Steps	Potential Safety/ Health Hazards	Recommended Control
	Workers could place hands into moving parts of the rig, or loose clothing could become entangled in moving machine parts, either of which could injure workers.	Chains, sprockets, and moving parts will be guarded. Workers will not wear loose clothing or any jewelry. Workers will not place their hands or any part of their bodies between the drill auger or rod and the drill plate. Workers should never place themselves in positions where they could come into contact with the moving drill rods or augers. There must be a guard "cage" around the auger while it is operating. The operator will verbally alert all workers and visually ensure that all workers are clear of dangerous parts of equipment before starting or engaging equipment. Workers will avoid contact with any moving auger. Means will be provided to guard against employee contact with auger. (For example, barricade the perimeter of auger or use an electronic brake activated by a presence-sensing device.)
	Workers could injure themselves by cleaning the augers while they are rotating.	Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal "all clear" to the operator, and the operator has visually determined that the worker is clear of the auger. Only long-handled shovels will be used to remove cuttings from the auger.
	Workers could trip or fall by the borehole.	Cap and flag open boreholes. If left unattended, protect all open boreholes as any open excavation.
	Workers could be exposed to pinch points.	Avoid placing hands close to moving machinery. Wear gloves, as appropriate. Keep constantly alert.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles – pickup trucks Equipment – HSA, boring rods Hand tools – basic screwdrivers, hammers, pliers, etc.	Daily and before use. Inspect equipment before each use following manufacturers' requirements. Document inspection on an inspection form or in a logbook. Inspect hand tools before each use following manufacturers' requirements.	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for use of HSA rig will be provided or worker already has documented training. Personnel must have reviewed operators' manual and have been trained on power tools. Only qualified person will operate generator or compressor, if used.

Abbreviations and Acronyms:

CIH – Certified Industrial Hygienist
CSP – Certified Safety Professional
HSA – Hollow-Stem Auger
HSO - Health and Safety Officer
kV – kilovolt
MSDS – Material Safety Data Sheets
PPE – personal protective equipment
PVC – polyvinyl chloride