SulTRAC

March 14, 2014

Mr. Thomas Alcamo
Work Assignment Manager (SR-6J)
Remedial Response Unit No. 1
U.S. Environmental Protection Agency Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Subject: **Health and Safety Plan for**
CBS Multi-Sites Technical Assistance
Neal's Landfill, Bennett's Dump, and Lemon Lane Landfill
Monroe County, Indiana
Contract No. EP-S5-06-02, Work Assignment No. 103-TATA-05ZZ

Dear Mr. Alcamo:

SulTRAC is submitting the enclosed Health and Safety Plan (HASP) that provides information on the health and safety procedures that will be used during technical assistance field sampling activities at the above-referenced sites in Bloomington, Monroe County, Indiana. The HASP is one of the site-specific plans for the CBS Multi-Sites and is being submitted as required by the U.S. Environmental Protection Agency (EPA) Statement of Work dated January 2014 for the work assignment.

If you have any questions about the enclosed HASP, please call me at (312) 201-7491.

Sincerely,

Jeffrey Lifka, CHMM
Project Manager

Enclosure

cc: Parveen Vij, EPA Contracting Officer (letter only)
J. D. Campbell, Ph.D., P. E., SulTRAC Program Manager (letter only)
File

1 S. Wacker Drive, 37th Floor, Chicago, IL 60606
Tel 312.201.7700 Fax 312.201.0031

ENCLOSURE

HEALTH AND SAFETY PLAN FOR
CBS MULTI-SITES
TECHNICAL ASSISTANCE
NEAL'S LANDFILL, BENNETT'S DUMP, AND LEMON LANE LANDFILL
MONROE COUNTY, INDIANA

(86 Sheets)

REMEDIAL ACTION CONTRACT 2 FOR
REMEDIAL, ENFORCEMENT OVERSIGHT, AND
NON-TIME-CRITICAL REMOVAL ACTIVITIES
IN REGION 5

HEALTH AND SAFETY PLAN FOR CBS MULTI-SITES TECHNICAL ASSISTANCE NEAL'S LANDFILL, BENNETT'S DUMP, AND LEMON LANE LANDFILL MONROE COUNTY, INDIANA

Prepared for
U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

Work Assignment No.	:	103-TATA-05ZZ
EPA Region	:	5
Date Prepared	:	March 14, 2014
Contract No.	:	EP-S5-06-02
Prepared by	:	SulTRAC
SulTRAC Project Manager	:	Jeffrey Lifka
Telephone No.	:	(312) 201-7491
EPA Work Assignment Manager	:	Thomas Alcamo
Telephone No.	:	(312) 886-7278

Site Name: CBS Multi-Sites	**Site Contact: Jeffrey Lifka**	**Telephone: 312-201-7491**
Location: Bloomington, Monroe County, Indiana	**Client Contact: Thomas Alcamo**	**Telephone: 312-886-7278**
EPA ID No. IND980794341; IND980614556; IND006418651	**Prepared By: Adam Peterca**	**Date Prepared: March 4, 2014**
Project No. 103G1852103	**Dates of Activities: May 2014 through June 2016** (HASP is not valid for periods longer than 12 months)	**Emergency Response** ☐ Yes ☒ No

Objectives:

Task 1: Collect fish samples from multiple streams associated with each of the three sites that are addressed by this work assignment. Fish samples will be collected using electroshock method. Fish samples will be analyzed for PCBs as Aroclors and as congeners. Conditions will determine whether a boat is used. Field notes will be recorded in a log book and field photographs will be taken.

Task 2: Collect surface water, groundwater, and sediment samples from each of the three sites. All samples will be analyzed for PCBs as Aroclors. Field notes will be recorded in a log book and field photographs will be taken.

Task 3: RA oversight of any CBS site investigative activities (work assignment 165); no SulTRAC sampling involved, only oversight documentation of any CBS work being performed such as groundwater pump tests to determine recharge rates and pump test sample PCB concentrations, and any other PCB sampling investigations at the sites (including any groundwater, surface water, sediment or soil sampling).

Site Type: *Check as many as applicable.*

☒ Active	☒ Landfill	☐ Inner-City
☒ Inactive	☐ Railroad	☐ Rural
☒ Secured	☐ Residential	☐ Remote
☒ Unsecured	☐ Industrial	☐ Other (*specify*)

Project Scope of Work and Site Background

The CBS Multi-sites included in this project consist of Lemon Lane Landfill, Neal's Landfill, and Bennett's Dump. Each of these sites was included in a consent decree signed by Westinghouse Electrical Corporation (Westinghouse), now CBS Corporation (CBS) in 1985.

Lemon Lane Landfill: The Lemon Lane Landfill site is a former municipal landfill which accepted municipal and industrial waste. PCB-containing transformers and industrial byproducts were discovered on the site and linked to Westinghouse, making CBS the sole responsible party. The site is approximately 10 acres, 3 acres of which are owned by a private citizen. Source control remediation was conducted in 1987. Excavation of contaminated soil was completed in 2000. A water treatment plant for groundwater remediation was also installed in 2000. Additional work is nearly complete to install a new effluent line for the water treatment plant, and to evaluate further areas for both groundwater and sediment/soil remediation.

Neal's Landfill: The Neal's Landfill site is a former municipal landfill which accepted municipal and industrial waste. PCB-containing transformers and industrial byproducts were discovered on the site and linked to Westinghouse, making CBS the sole responsible party. The site is approximately 18 acres. Excavation of contaminated soil was completed in 2002. Groundwater collection systems and a water treatment plant have been installed at the site, and are currently in use and being evaluated. Sediment in-stream and along stream banks within the site will be excavated in the future.

Bennett's Dump: The Bennett's Dump site is a former limestone quarry that was then used as a dumping ground for various types of waste, including construction debris, household waste, and electrical components, including a large amount of PCB-containing transformers. The site consists of two parcels that constitute approximately 4 acres. PCB-containing transformers located in the site were discovered to have been manufactured by Westinghouse. CBS is the sole responsible party for this site. A passive quarry drain has been installed to aid on controlling groundwater flow. Further construction activities are being planned, including a collection trench and installation of a water treatment plant.

SulTRAC will collect fish tissue samples from streams located on or near the project sites listed above. The samples will be analyzed for PCBs as Aroclors and as congeners. Samples will be collected using electroshock equipment. A boat may be used for sampling if necessary as dictated by stream conditions.

SulTRAC will collect surface water, groundwater, and sediment samples from each of the three project sites listed above. The samples will be analyzed for PCBs as Aroclors. Field notes will be recorded in a log book and field photographs will be taken.

Health and Safety Approver Comments or Additional Instructions: Ensure that the entire area has been adequately surveyed and marked for ALL utilities and that no intrusive work is conducted within the margin of error of the survey. ONLY subcontractors that have been pre-approved by Tetra Tech and (if required) the client may be utilized. Further, subcontractors MUST complete their own HASP and provide JSA/AHAs for EACH of their assigned tasks, as well as comply with TT requirements. Follow attached AHAs. **This HASP is being submitted as DRAFT and MUST be reevaluated and amended as necessary prior to field operations.**

Health and Safety Plan Approver Signature: Chris Dragon **Date: 13 March 2014**

Note: A minimum of two persons with appropriate training and medical surveillance must be on site for any fieldwork subject to Level 2 HASP requirements.
Note: A detailed site sketch or figure may be included on Page 10 of 12.

Initial Isolation and Protective Action Distances (for emergency response operations only): NA

Initial Isolation Distance: This zone should extend in all directions; 660 feet for unknown hazards and 0.5 mile for tanker truck or rail car incidents.
NOTE: Keep a maximum distance away for unknown sites until the identity of the materials is determined.

Subsequent Isolation and Protection Action Zones Based on Air Monitoring Results:
NOTE: Distance at sites with unknown hazards should be increased, if necessary, based on air monitoring results.

Investigation-Derived Waste will be disposed of IAW the Work Plan

Wind Speed and Direction (Approach from upwind)	Temperature (°F)	Relative Humidity (%)	Probability of Precipitation (%)	Weather Forecast (such as partly cloudy, snow, etc.)
Weather information will be captured daily when onsite and documented on Daily Tailgate form or in field logbook				

On-Site Supplies: ☒ First Aid Kit ☐ Fire Extinguisher ☐ Air Horn ☐ Oral Thermometer ☐ Noise Dosimeter

Known or Anticipated Site Hazards or Concerns: (Hazards covered by existing Safe Work Practices are listed on the next page)

☐ Work on active roadway	☒ Overhead utilities	☒ Energized electrical systems
☐ Onsite laboratory	☒ Buried Utilities	☒ Portable hand tool use
☐ Explosion or fire hazard	☐ Surface or underground storage tanks	☐ Portable electrical tool use
☐ Oxygen deficiency	☒ General slips, trips, falls	☐ Machine guarding
☐ Unknown or poorly characterized chemical hazards	☒ Uneven, muddy, rugged terrain	☐ Portable fire extinguisher use
☐ Inorganic chemicals	☐ Lift (man lift, cherry picker) use	☐ Driving commercial vehicles
☒ Organic chemicals	☐ Industrial truck (forklift) use	☐ Driving personal vehicles
☐ Chemical warfare materiel	☐ Wood or metal ladder use	☐ Scientific diving operations
☐ Compressed Gas Cylinders	☐ Dangerous goods shipped by air	☐ Injury and Illness Prevention Program (California only)
☐ Asbestos	☐ Elevated work (over 6' high)	☐ Ergonomics (California only)
☐ Respirable particulates	☐ Heavy equipment use or operation	☐ Work in strip or shaft mines
☐ Respirable silica	☐ Construction work	☐ Client-specific safety requirements (attach to HASP)
☐ Blasting and explosives	☐ Excavation or trenching	☐ ATV use
☐ Non-ionizing radiation (lasers, radiofrequencies, UV)	☐ Benching, shoring, bracing	☐ Methamphetamine lab
☐ Ionizing radiation (alpha, beta, gamma, etc.)	☐ Scaffold use	☒ Working over or near water
☒ Heat stress	☐ High noise	☐ Mold
☒ Cold stress	☐ Grinding operations	☐ *Other (insert)*

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown

Chemical Products Tetra Tech EM Inc. Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

☒ Alconox or Liquinox	☐ Calibration gas (Methane)	☐ Hydrogen gas	☐ Isopropyl alcohol
☐ Hydrochloric acid (HCl)	☐ Calibration gas (Isobutylene)	☐ Household bleach (NaOCl)	☐ HazCat Kit
☐ Nitric acid (HNO_3)	☐ Calibration gas (Pentane)	☐ Sulfuric acid (H_2SO_4)	☐ Other (specify)
☐ Sodium hydroxide (NaOH)	☐ Calibration gas (4-gas mixture)	☐ Eyewash solution	☐ Other (specify)

WARNING: Eyewash solution shall be readily available on ALL projects where corrosives (acids or bases) are used, including sample preservatives

Applicable Safety Programs and Safe Work Practices (SWP). Attach to HASP:

- ☐ DCN 4-03 Demolition and Decontamination
- ☐ DCN 4-05 Trenching and Excavation Safety
- ☐ DCN 4-08 Asbestos Protection Program
- ☐ DCN 4-09 Haulage and Earth Moving
- ☐ DCN 4-10 Lead Protection Program
- ☐ SWP DCN 5-01 General Safe Work Practices
- ☒ SWP DCN 5-02 General Safe Work Practices HAZWOPER
- ☐ SWP DCN 5-03 Safe Work Practices for Office Employees
- ☐ SWP DCN 5-04 Safe Drilling Practices
- ☐ SWP DCN 5-05 Safe Direct Push (GeoProbe) Practices
- ☒ SWP DCN 5-06 Working Over or Near Water
- ☒ SWP DCN 5-07 Use of Heavy Equipment
- ☐ SWP DCN 5-08 Special Site Hazards (Firearms, Remote Sites, Mines, aircraft, etc.)
- ☐ SWP DCN 5-09 Safe Electrical Work Practices
- ☐ SWP DCN 5-10 Fall Protection Practices
- ☐ SWP DCN 5-11 Portable Ladder Safety
- ☒ SWP DCN 5-12 Drum and Container Handling Practices
- ☐ SWP DCN 5-13 Flammable Hazards and Ignition Sources
- ☐ SWP DCN 5-14 Spill and Discharge Control Practices
- ☒ SWP DCN 5-15 Heat Stress
- ☒ SWP DCN 5-16 Cold Stress
- ☒ SWP DCN 5-17 Biohazards
- ☐ SWP DCN 5-18 Underground Storage Tank Removal Practices
- ☐ SWP DCN 5-19 Safe Lifting Procedures
- ☐ SWP DCN 5-22 Hydrographic Data Collection
- ☐ SWP DCN 5-23 Permit-Required Confined Space Entry Practices
- ☐ SWP DCN 5-24 Non-Permit-Required Confined Space Entry Practices
- ☐ SWP DCN 5-26 Prevention of Sun Exposure
- ☐ SWP DCN 5-27 Respirator Cleaning Practices
- ☐ SWP DCN 5-28 Safe Use Practices for Use of Respirators
- ☐ SWP DCN 5-29 Respirator Qualitative Fit Testing Procedures
- ☐ SWP DCN 5-30 Laboratory Soil Testing Safe Work Practices

Tasks Performed At Job Site that are NOT Covered by SWPs

NOTE: Many AHA's can be found on the Health & Safety intranet site at: http://home.ttemi.com/C18/Activity%20Hazard%20Analysis%20Document/default.aspx

Attach Activity Hazard Analysis (AHA) for each non-covered task

- ☒ Site Documentation and Oversight Near Drill Rigs
- ☒ Backpack Electrofishing
- ☒ Sediment Sampling
- ☒ Groundwater sampling
- ☒ Monitoring Well Sampling (Bailing)

Tetra Tech Employee Training and Medical Requirements:

Basic Training and Medical

- ☒ Initial 40 Hour Training
- ☐ 8-Hour Supervisor Training (one-time)
- ☒ Current 8-Hour Refresher Training
- ☒ Current Medical Clearance (including respirator use)
- ☒ Current First Aid Training
- ☒ Current CPR Training
- ☐ Current Respirator Fit-Test

Other Specific Training and Medical Surveillance Requirements

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ OSHA 10-hour Construction Safety Training
- ☐ OSHA 30-hour Construction Safety Training
- ☐ Asbestos Awareness Training
- ☐ Asbestos B-Reader X-Ray
- ☐ Blood Lead Level and ZPP Pre, during and Post-Project
- ☐ Urinary Arsenic Level Pre and Post-Project
- ☐ Other _____
- ☐ Other _____

Materials Present or Suspected at Site	Highest Observed Concentration (specify units and sample medium)	Exposure Limit (specify ppm or mg/m^3)	IDLH Level (specify ppm or mg/m^3)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, or other)	Symptoms and Effects of Acute Exposure	Photoionization Potential (eV)
PCBs	58 ppb[a] (groundwater) >50 ppm[b] (sediment) 20 ppb (surface water) 42 ppm (fish tissue)	PEL = 0.5 mg/m^3 REL = 0.001 mg/m^3 TLV = 0.5 mg/m^3 [Skin] Hazard ☒	5 mg/m^3	Noncombustible liquid	Skin and eyes: acne, hyperpigmentation of skin and nails, eye discharges, and swelling of the upper eyelids Inhalation and ingestion: fever, hearing difficulty, muscle spasms, headache, vomiting, diarrhea, and liver damage	NA
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				
		PEL = REL = TLV = [Skin] Hazard ☐				

Specify Information Sources:

[A] NIOSH Pocket Guide to Hazardous Chemicals, September 2005

[B] American Conference of Governmental Industrial Hygienists (ACGIH). "Threshold Limit Values and Biological Exposure Indices for 2012."

Note: In the Exposure Limit column, include Ceiling (C) and Short-Term Exposure Limits (STEL) if they are available. Also, use the following short forms and abbreviations to complete the table above.

A = Air
CARC = Carcinogenic
eV = Electron volt
U = Unknown

IDLH = Immediately dangerous to life or health
mg/m^3 = Milligram per cubic meter
NA = Not available
NE = None established

PEL = Permissible exposure limit
ppm = Part per million
REL = Recommended exposure limit
S = Soil

TLV = Threshold limit value

Note: If no contingency level of protection is selected, all employees covered under this plan must evacuate the immediate site area if air contaminant levels require upgrading PPE. Level A field work requires a Level 3 HASP. This information is available on the chemical hazards page of this HASP.

Field Activities Covered Under this HASP:

Task Description	Level of Protection[1]		Date of Activities
	Primary	Contingency	
1 Collect fish tissue samples from creeks surrounding Lemon Lane Landfill, Neal Landfill, and Bennett's Dump using electroshock equipment.	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	May 2014 and May 2015
2 Collect surface water, sediment, and groundwater (from existing monitoring wells) samples.	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	May 2014 through June 2016
3 RA oversight (work assignment 165)	☐ A ☐ B ☐ C ☒ D	☐ A ☐ B ☐ C ☐ D	Through June 2015

Site Personnel and Responsibilities (include subcontractors):

Employee Name and Office Code / Location	Task(s)	Responsibilities
Jeffrey Lifka	1-2	• Project Manager: Manages the overall project, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary. Additionally, For projects lasting longer than one consecutive week on-site, the PM is responsible for conducting one field audit using Form AF-1.
Adam Peterca	1-2-3	• Field Team Leader: Directs field activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with the Project Manager and the client as necessary
Rob Kondreck/Adam Peterca	1-2-3	• Site Safety Coordinator (SSC): Ensures that appropriate personal protective equipment (PPE) is available, enforces proper use of PPE by on-site personnel and subcontractors; suspends investigative work if personnel are or may be exposed to an immediate health hazard; implements and enforces the HASP; identifies and controls site hazards when possible; communicates site hazards to all personnel; and reports any deviations observed from anticipated conditions described in the health and safety plan to the health and safety representative.
		• Alternate Site Safety Coordinator (if any)
Dave Franc, Kristi Root, Bethany Hand, Andrew Kleist, Rob Kondreck, Adam Peterca, Lance Summers, Matt Villicana	1-2-3	• Field Personnel: Completes tasks as directed by the project manager, field team leader, and SSC, and follows the HASP and all SWPs and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.
AECOM Technical Services, Inc.	1-2-3	• Tetra Tech-hired subcontractor personnel on site (a subcontract SSC MUST be identified by name): Completes tasks as outlined in the project scope of work in accordance with the contract. Participates in all Tetra Tech on-site safety meetings and follows all procedures and guidelines established in this HASP, as well as the company health and safety plan and program.

Note:
1. See next page for details on levels of protection

NOTE: Contingency level of protection section should be completed only if the upgraded level of protection is immediately available at the job site. If no contingency level of protection is denoted, all employees covered under this HASP must evacuate the immediate site area if air contaminant levels would require an upgrade of PPE.

Protective Equipment: (Indicate type or material as necessary for each task.)

Task	Primary Level of Protection (A,B,C,D)	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
1	D	Respirator type: N/A Cartridge type (if applicable): N/A CPC material: N/A Glove material(s): Nitrile Boot material: Steel-toe and shank work boot Other: Hardhat, safety glasses, safety vest, ear plugs, Type 2 or greater personal flotation device, rubber waders	NA	Level C is NOT Authorized for this project
2	D	Respirator type: N/A Cartridge type (if applicable): N/A CPC material: N/A Glove material(s): Nitrile Boot material: Steel-toe and shank work boot Other: Hardhat, safety glasses, safety vest, ear plugs, personal flotation device when near water	NA	Level C is NOT Authorized for this project
3	D	Respirator type: N/A Cartridge type (if applicable): N/A CPC material: N/A Glove material(s): Nitrile Boot material: Steel-toe and shank work boot Other: Hardhat, safety glasses, safety vest, ear plugs, personal flotation device when near water	NA	Level C is NOT Authorized for this project

Respirator Notes:
Respirator cartridges may only be used for a maximum time of 8 hours or one work shift, whichever is less, and must be discarded at that time. For job sites with organic vapors, respirator cartridges may be used as described in this note as long as the concentration is less than 200 parts per million (ppm), the boiling point is greater than 70 °Celsius, and the relative humidity is less than 85 percent. If any of these levels are exceeded, a site-specific respirator cartridge change-out schedule must be developed and included in the HASP using Tetra Tech Form RP-2 (Respiratory Hazard Assessment Form)

Notes:
All levels of protection must include eye, head, and foot protection.
CPC = Chemical protective clothing
Thermoluminescent Dosimeter (TLD) Badges must be worn during all field activities on sites with radiation hazards. TLDs must be worn under CPC.

Monitoring Equipment: All monitoring equipment on site must be calibrated before and after each use and results recorded in the site logbook				
Instrument (Check all required)	**Task**	**Instrument Reading**	**Action Guideline**	**Comments**
☐ Combustible gas indicator model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	0 to 10% LEL	Monitor; evacuate if confined space	
		10 to 25% LEL	Potential explosion hazard; notify SSC	
		>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSC	
☐ Oxygen meter model:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	>23.5% Oxygen	Potential fire hazard; evacuate site	
		23.5 to 19.5% Oxygen	Oxygen level normal	
		<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSC	
☐ Photoionization detector model: ☐ 11.7 eV ☐ 10.6 eV ☐ 10.2 eV ☐ 9.8 eV ☐ Other (specify): _____	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	
☐ Detector tube models:	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	
☐ Other (specify):	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	Specify:	Specify:	

Notes:
eV= electron volt LEL=Lower explosive limit mrem=Millirem PEL=Permissible exposure limit ppm=Part per million
a. Level B is required when chemical hazards are present, but are uncharacterized. Level C may be acceptable for certain tasks in some situations. If you are uncertain, consult your RSO.

Project-Specific Industrial Hygiene Requirements

OSHA-Regulated Chemicals*:

Check any present on the job site in any medium (air, water, soil)

- ☒ No chemicals below are located on the job site
- ☐ Friable Asbestos
- ☐ Silica, crystalline
- ☐ alpha-Napthylamine
- ☐ Methyl chloromethyl ether
- ☐ 3,3'-Dichlorobenzidine (and its salts)
- ☐ bis-Chloromethyl ether
- ☐ beta-Napthylamine
- ☐ Benzidine
- ☐ 4-Aminodiphenyl
- ☐ Ethyleneimine
- ☐ beta-Propiolactone
- ☐ 2-Acetylaminoflourene
- ☐ 4-Dimethylaminoazobenzene
- ☐ N-nitrosomethylamine
- ☐ Vinyl chloride
- ☐ Inorganic arsenic
- ☐ Lead
- ☐ Chromium (VI)
- ☐ Cadmium
- ☐ Benzene
- ☐ Coke oven emissions
- ☐ 1,2-Dibromo-3-chloropropane
- ☐ Acrylonitrile
- ☐ Ethylene oxide
- ☐ Formaldehyde
- ☐ Methylenedianiline
- ☐ 1,3-Butadiene
- ☐ Methylene chloride

* NOTE: Many states, including California and New Jersey, have chemical-specific worker protection requirements and standards for many chemicals and known or suspected carcinogens.

Emergency Contacts:	**Telephone No.**
WorkCare and Incident Intervention	888.449.7787, or 800.455.6155
Tetra Tech EMI 24-hour Anonymous Hazard Reporting Line	866.383.8070
U.S. Coast Guard National Response Center	800.424.8802
InfoTrac	800.535.5053
Poison Control	800.222.1222
Fire department	911
Police department	911

Personnel Call-Down List:

Job Title or Position:	**Name**	**Cell Phone:**
Regional Safety Officer	Chris Draper	615.969.1334
Project Manager:	Jeffrey Lifka	312-201-7491
Field Team Leader:	Adam Peterca	312-201-7768
Site Safety Coordinator (SSC):	Adam Peterca	312-201-7768
Subcontractor SSC:	John Bassett, AECOM	812-327-8074

Medical and Site Emergencies:

Signal a site or medical emergency with three blasts of a loud horn (car horn, fog horn, or similar device). Site personnel should evacuate to the area of safe refuge designated on the site map.

Hospital Name: IU Health Bloomington Hospital
Address: 601 West 2nd Street
Bloomington, IN 47403

General Phone: (812) 353-5252
Emergency Phone: 911
Ambulance Phone: 911

Hospital called to verify emergency services are offered? YES ☒ NO ☐

Step-by-step Route to Hospital: (see Page 11 of 12 for route map)

Route to Hospital:

From Neal's Landfill:

1) Starting on West 3rd St, go east - go 3.7 mi.
2) Veer right to continue on West 3rd St - go 0.1 mi
3) Continue on S Adams St - go 0.1 mi
4) Continue on S Patterson Dr - go 0.2 mi
5) Turn left onto West 2nd St – go 0.5 mi
6) Arrive at IU Health Bloomington Hospital

Directions from each specific sampling location will be supplied during daily tailgate meetings.

Note: This page must be posted on site.

Decontamination Procedures

The site safety coordinator overseas implementation of project decontamination procedures and is responsible for ensuring they are effective.

Personnel Decontamination

Level D Decon - ☐ Wet ☒ Dry

Level C Decon - ☐ Wet ☐ Dry

Level B Decon – Briefly outline the level B decontamination methods to be used on a separate page attached to this HASP.

Level A Decon – A Level 3 HASP is required. Notify your regional health and safety representative and health and safety director.

Equipment Decontamination

All tools, equipment, and machinery from the Exclusion Zone (hot) or Contamination Reduction Zone (warm) are decontaminated in the CRZ before they are removed to the Support Zone (cold). Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure, cross-contamination, and chemical incompatibilities.

Respirator Decontamination

Respirators are decontaminated in compliance with SWP 5-27 and should be included with this HASP.

Waste Handling for Decontamination

Procedures for decontamination waste disposal meet all applicable local, state, and federal regulations.

Decontamination Equipment

- ☐ Washtubs
- ☒ Buckets
- ☒ Scrub brushes
- ☐ Pressurized sprayer
- ☒ Detergent [Alconox or Liquinox]
- ☐ Solvent [Type]
- ☐ Household bleach solution

  Concentration/Dilution: _____
- ☐ Deionized water
- ☐ Disposable sanitizer wipes
- ☐ Facemask sanitizer powder
- ☐ Wire brush
- ☐ Spray bottle
- ☐ Tubs / pools
- ☐ Banner/barrier tape
- ☐ Plastic sheeting
- ☐ Tarps and poles
- ☒ Trash bags
- ☐ Trash cans
- ☐ Duct tape
- ☒ Paper towels
- ☐ Folding chairs
- ☐ Other

Emergency Response Planning

During the pre-work briefing and daily tailgate safety meetings, all on-site employees will be trained in the provisions of emergency response planning, site communication systems, and site evacuation routes.

In the event of an emergency that necessitates evacuation of a work task area or the site, the following procedures will take place.

- The Tetra Tech SSC will contact all nearby personnel using the on-site communications to advise the personnel of the emergency.
- The personnel will proceed along site roads to a safe distance upwind from the hazard source.
- The personnel will remain in that area until the SSC or an authorized individual provides further instructions.

In the event of a severe spill or a leak, site personnel will follow the procedures listed below.

- Evacuate the affected area and relocate personnel to an upwind location.
- Inform the Tetra Tech SSC, a Tetra Tech office, and a site representative immediately.
- Locate the source of the spill or leak, and stop the flow if it is safe to do so.
- Begin containment and recovery of spilled or leaked materials.
- Notify appropriate local, state, and federal agencies.

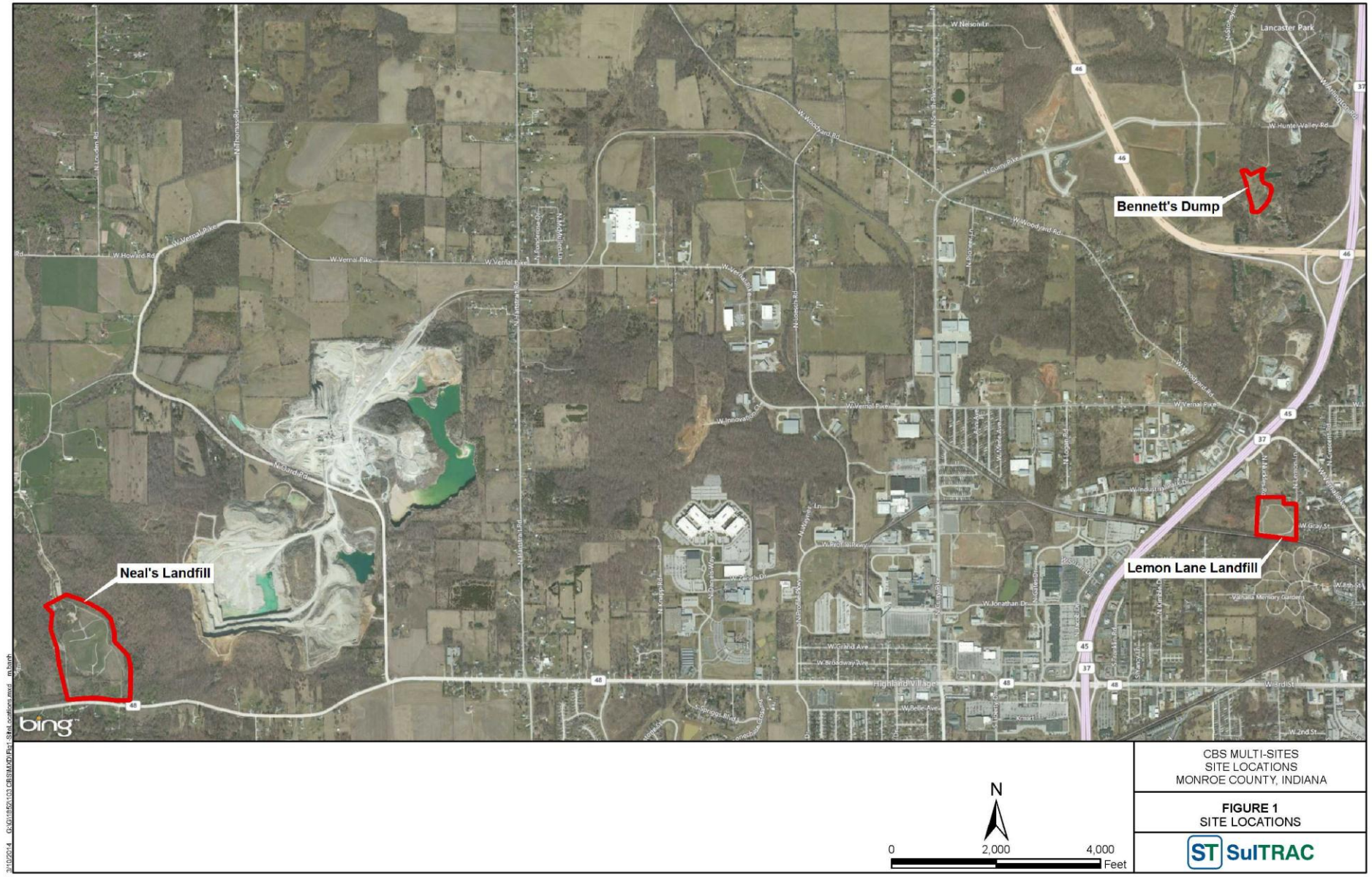
In the event of severe weather, site personnel will follow the procedures listed below.

- Site work shall not be conducted during severe weather, including high winds and lightning.
- In the event of severe weather, stop work, lower any equipment (drill rigs) and evacuate the affected area.
- Severe weather may cause heat or cold stress. Refer to SWPs 5-15 and 5-16 for information on both.

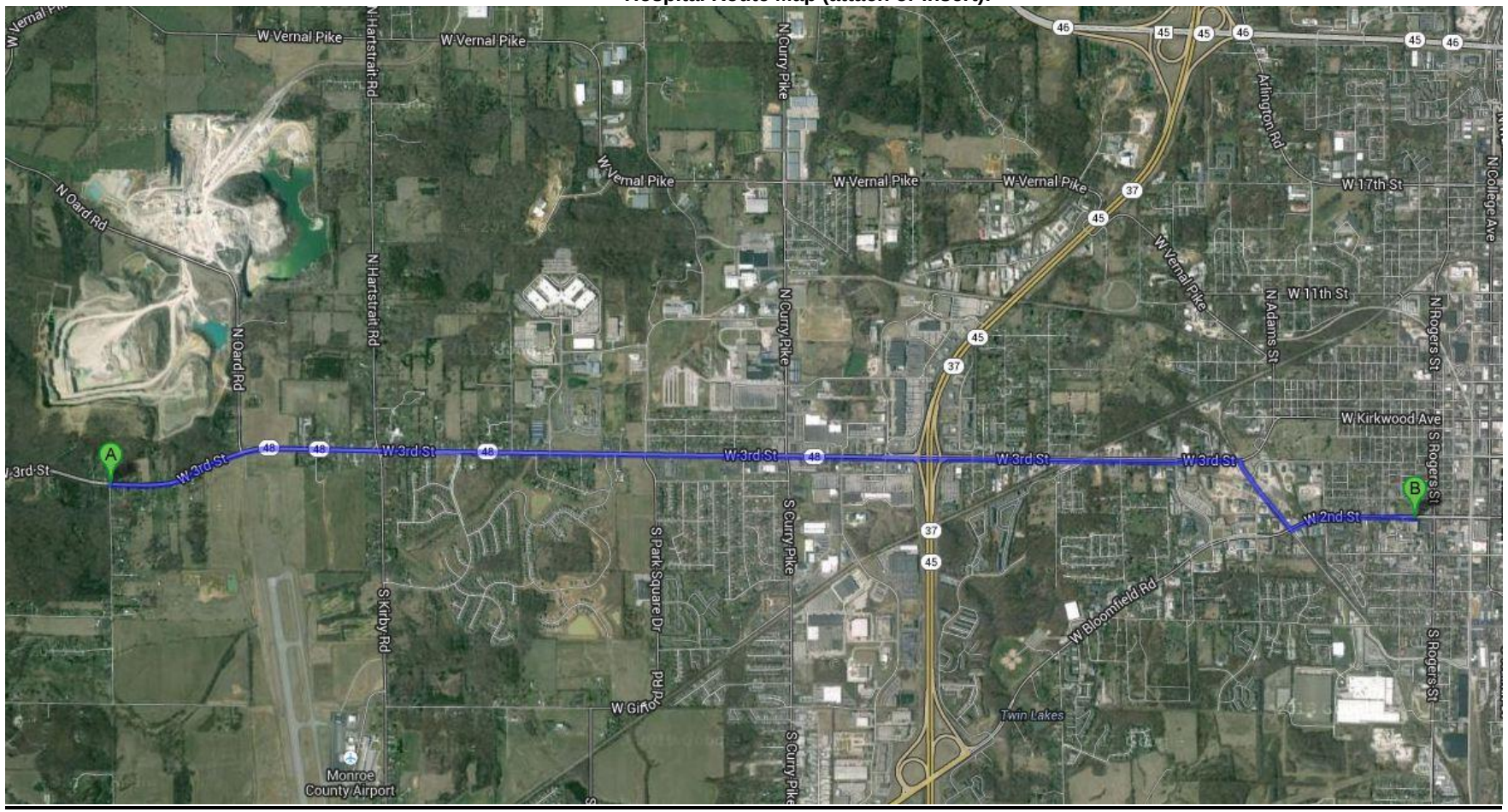
All work-related incidents must be reported. According to TtEMI's reporting procedures, for non-emergency incidents you should:

- Notify WorkCare and Incident Intervention at 888.449.7787, or 800.455.6155
- Notify your Project Manager or Regional Safety Officer (RSO) via phone immediately.
- Complete a "Tetra Tech Incident Report" (Form IR) within 24 hours and send it to your RSO. If an injury or illness has occurred, the Form IR-A and the WorkCare HIPAA form must be completed at the same time the Form IR is completed.

Site Map (May be drawn after crews arrive onsite or inserted using aerial photographs, site figures, etc.):



Hospital Route Map (attach or insert):



Route to Hospital:

From Neal's Landfill:

1) Starting on West 3rd St, go east - go 3.7 mi.
2) Veer right to continue on West 3rd St - go 0.1 mi
3) Continue on S Adams St - go 0.1 mi
4) Continue on S Patterson Dr - go 0.2 mi
5) Turn left onto West 2nd St – go 0.5 mi
6) Arrive at IU Health Bloomington Hospital

Note: A dry-run should be conducted to establish a physical location associated with the map included in the HASP. Verbal verification from the hospital emergency room should also be obtained to ensure that the hospital will accept chemically contaminated patients.

APPROVAL AND SIGN-OFF FORM

Project No.: 103-TATA-05ZZ

I have read, understood, and agree with the information set forth in this Health and Safety Plan and will follow the direction of the Site Safety Coordinator (SSC) as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual. I understand the training and medical requirements for conducting field work and have met these requirements.

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to their health and safety protection.

Name	Company / Agency / Organization	Signature	Date

I have read, understood, and agree with the information set forth in this Health and Safety Plan and comply with and will enforce this HASP, as well as procedures and guidelines established in the Tetra Tech, Inc., Health and Safety Manual.

Name	Project-Specific Position	Signature	Date
Jeffrey Lifka	Project Manager		
Adam Peterca	Field Team Leader		
Adam Peterca	Site Safety Coordinator		
John Bassett	Subcontractor SSC		

Tetra Tech has prepared this plan solely for the purpose of the health and safety protection of Tetra Tech employees. Subcontractors, visitors, and others at the site, while required to read, acknowledge and follow the provisions outlined in this plan at a minimum, should refer to their safety program for specific information related to health and safety.

Note: Use Additional sheets as necessary to ensure that all personnel sign and affirm this document.

TETRA TECH
Safety Excellence

VOLUNTARY PROTECTION PROGRAM

VPP
Voluntary Protection Programs
An OSHA Cooperative Program

Management Leadership

Lead by example. Good managers recognize the benefits of a strong safety program and ensure that their personnel and subcontractors have the right tools, equipment, and attitude to work safely.

Some areas where effective management leadership for safety can be demonstrated include:

- Provide visible safety leadership - start meetings with a safety topic, integrate safety into planning, scheduling, and budgeting processes, take personal action to resolve safety issues.
- Become involved in incident reporting, investigation, corrective action - share lessons learned.
- Include subcontractors in your safety program and oversee their work.

Employee Involvement

Get involved! Take personal action and work directly with your supervisor daily to identify, control, or eliminate potential safety hazards.

Other ways to become involved in the safety program and improve work conditions include:

- Initiate hazard reports to identify hazards, suggest improvements, and recognize safe behaviors
- Participate in safety meetings and worksite safety inspections (daily, weekly, monthly, and quarterly)
- Participate in incident reports, investigations, corrective actions, and Lessons Learned

Worksite Analysis

The process of identifying and evaluating potential hazards is a critical element in achieving zero incidents and creating low risk and hazard-free work areas.

Worksite analysis methods used to identify and evaluate potential hazards include:

- Safety inspections (daily, weekly, monthly, and quarterly)
- Develop or review safe work procedures, AHA's, and the HASP
- Monitoring for air quality, heat stress, noise, ergonomics and other job hazards

Hazard Prevention and Control

Eliminating hazards from your job, preventing new hazards, and controlling known hazards are fundamental parts of the projects safety program.

Important points include:

- Control hazards by:
  - Installing and maintaining ***Engineering Controls***
  - Following ***Administrative/Work Practice Controls*** (HASP, AHAs, and safe work practices)
  - Specifying and wearing ***Personal Protective Equipment*** where needed
- Perform integrated safety reviews for new or modified work tasks
- Consult with qualified medical and safety professionals as needed

Safety and Health Training

Effective safety training is an important element in incident prevention. Remember, if you are unfamiliar with the work or feel that you don't have the necessary training, speak up and notify your team leader or project manager.

Safety training methods that may be used at the project include:

- New employee orientation, including HASP and task-specific training
- Project meetings, daily briefings, and/or task briefings
- Lessons learned and monthly safety communications

Emergency Contacts

WorkCare - For issues requiring an Occupational Health Physician; assistance is available 24 hours per day, 7 days per week.

InfoTrac - For issues related to incidents involving the transportation of hazardous chemicals; this hotline provides accident assistance 24 hours per day, 7 days per week

U.S. Coast Guard National Response Center - For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Poison Control Center – For known or suspected poisoning.

Limitations:

The Level-Two HASP is not appropriate in some cases:

- Projects involving unexploded ordnance (UXO), radiation sources as the primary hazard, or known chemical/biological weapons site must employ the Level 3 HASP
- Projects of duration longer than 90 days may need a Level 3 HASP (consult your RSO)

Decontamination:

Decontamination Solutions for Chemical and Biological Warfare Agents[a]: PPE and equipment can be decontaminated using 0.5 percent bleach (1 gallon laundry bleach to 9 gallons water) for biological agents (15 minutes of contact time for anthrax spores; 3 minutes for others) followed by water rinse for chemical and biological agents. In the absence of bleach, dry powders such as soap detergents, earth, and flour can be used. The powders should be applied and then wiped off using wet tissue paper. Finally, water and water/soap solutions can be used to physically remove or dilute chemical and biological agents. Do not use bleach solution on bare skin; use soap and water instead. Protect decontamination workers from exposure to bleach.

Decontamination for Radiological and Other Chemicals: Primary decontamination should use Alconox and water unless otherwise specified in chemical specific information resources. The effectiveness of radiation decontamination should be checked using a radiation survey instrument. Decontamination procedures should be repeated until the radiation meter reads less than 100 counts per minute over a 100-square-centimeter area when the probe is held 1 centimeter from the surface and moving slower than 2.5 centimeters per second.

Decontamination Corridor: The decontamination setup can be adjusted to meet the needs of the situation. The decontamination procedures can be altered to meet the needs of the specific situation when compound- and site-specific information is available.

Decontamination Waste: All disposable equipment, clothing, and decontamination solutions will be double-bagged or containerized in an acceptable manner and disposed of with investigation-derived waste.

Decontamination Personnel: Decontamination personnel should dress in the same level of PPE or one level below the entry team PPE level.

All investigation-derived waste should be left on site with the permission of the property owner and the EPA on-scene coordinator. In some instances, another contractor will dispose of decontamination waste and investigation-derived waste. DO NOT place waste in regular trash. DO NOT dispose of waste until proper procedures are established.

Notes:

[a] Source: Jane's Information Group. 2002. *Jane's Chem-Bio Handbook*. Page 39.

TETRA TECH, INC.

DAILY TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Project No.: _____

Client: _____ Site Location: _____

Site Activities Planned for Today: _____

Weather Conditions: _____

Safety Topics Discussed	
Protective clothing and equipment:	
Chemical and physical hazards:	
Emergency procedures:	
Equipment hazards:	
Other:	
Attendees	
Printed Name	**Signature**

Meeting Conducted by:

_____ _____

Name Signature

TETRA TECH EM INC.

HEALTH AND SAFETY PLAN AMENDMENT

Site Name: _____

Amendment Date: _____

Purpose or Reason for Amendment: _____

_____

_____

Required Additional Safe Work Practices or Activity Hazard Analyses: _____

_____

Required Changes in PPE: _____

_____

_____

Action Level Changes: _____

_____

_____

_____

_____

AMENDMENT APPROVAL

RSO or Designee	_____ Name	_____ Signature	_____ Date
Site Safety Coordinator	_____ Name	_____ Signature	_____ Date

Date presented during daily site safety meeting: _____

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 physically present on jobsite			
6	Daily tailgate safety meetings conducted and documented on Form HST-2			
7	Documentation available proving compliance with HASP requirements for medical examinations, fit testing, and training (including subcontractors)			
8	HASP onsite matches scope of work being conducted			
9	Emergency evacuation plan in place and hospital located			
10	Exclusion, decontamination, and support zones delineated and enforced			
11	HASP attachments present onsite (VPP sheet, audit checklist, AHA, etc.)			
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 solution available when corrosive chemicals are present			
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			
22	Environmental and personnel monitoring performed as specified in HASP			

Safety Items		In Compliance?		
Personal Protection		Yes	No	NA
23	Splash suit, if required			
24	Chemical protective clothing, if required			
25	Safety glasses or goggles (always required)			
26	Gloves, if required			
27	Overboots, if required			
28	Hard hat (always required)			
29	High visibility vest, if required			
30	Hearing protection, if required			
31	Full-face respirator, if required			
Instrumentation				
32	Combustible gas meter and calibration notes			
33	Oxygen meter and calibration notes			
34	Organic vapor analyzer and calibration notes			
Supplies				
35	Decontamination equipment and supplies			
35	Fire extinguishers			
37	Spill cleanup supplies			
Corrective Action Taken During Audit:				

Note: NA = Not applicable

_____ _____

Auditor's Signature Site Safety Coordinator's Signature

_____

Date

Tetra Tech, Inc.	ACTIVITY HAZARD ANALYSIS (AHA) Tetra Tech, Inc. **Site Documentation and Oversight Near Drill Rigs**

Task Description

This Activity Hazard Analysis (AHA) applies to the task listed above. It has been developed and approved by the Director of Health and Safety for Tetra Tech, Inc. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required equipment (including safety equipment), inspections, and training. The hazard controls listed below are specific to this task.

Hazards		Actions
Task Steps Observe Near Drill Rigs	**Potential Hazards** NOISE HAZARD SLIP/TRIP/FALL STRUCK BY DRILL RIG EMPLOYEE EXPOSURE LACERATION	**Critical Safety Procedures and Controls** • Wear hearing protection • Visually inspect the area for slippery spots or debris and correct if found • Ensure a utility locate has been conducted and that borings are a sufficient distances from marked utilities • Ensure drill rig is not operating beneath overhead power lines or other utilities. Do not stand beneath overhead utilities when drill rig is operating. • Wear steel-toed, non-skid boots in accordance with Tetra Tech policy • Ensure all debris has been removed from the path of travel • Wear hard hat and reflective safety vest • Be aware of truck/equipment traffic on the property or site • Stay within drill rig operator's field of vision whenever possible • Discuss hand signals with equipment operator(s) before commencing work • Make eye or verbal contact with equipment operators before walking around moving or potentially moving equipment • Wear safety glasses and nitrile gloves • Have a first aid kit available for small cuts • Have map showing route to hospital in vehicle
Equipment to be Used • Level D PPE (steel-toed boots, safety glasses, nitrile gloves, hard hat, reflective safety vest) • First aid kit & eye wash	**Inspection Requirements** None	**Training Requirements** • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training)

Tetra Tech, Inc.

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Groundwater Sampling

Task Description

This Activity Hazard Analysis (AHA) applies to collection of grab groundwater samples. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls**
Set up equipment at piezometer or well	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Visually inspect the area for slippery spots or debris and correct if found • Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy • Use proper lifting techniques (lift with legs not back)
Measure depth to water	EMPLOYEE EXPOSURE	• Use PID or FID as indicated in the site-specific APP/HASP to monitor well head and ambient air • Wear safety glasses and nitrile gloves to protect against splash
Measure and insert tube into well	LACERATION	• Only use retractable safety blade to cut tubing • Cut in a direction away from the face/body
Begin extracting water from well	EMPLOYEE EXPOSURE	• Use PID or FID as indicated in the site-specific APP/HASP to monitor well head and ambient air • Wear safety glasses and nitrile gloves
Fill sample bottles with sample material, load coolers and IDW (if appropriate) into vehicle	LACERATION	• Handle all glass containers carefully • Have a first aid kit on-site available for small cuts • Dispose of all broken shards immediately
Store sample containers in coolers and load onto vehicles	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Ensure all debris has been removed from the path of travel • Use proper lifting techniques, including obtaining help with heavy coolers
Equipment to be Used • Level D PPE (steel-toed boots, safety glasses, nitrile gloves) • Reflective safety vest if in areas of vehicle traffic • Retractable safety blade • First Aid Kit • PID or FID	**Inspection Requirements** • None	**Training Requirements** • Safe Lifting Procedures • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training)

Tetra Tech, Inc.

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Monitoring Well Groundwater Sampling - Bailing

Task Description

This Activity Hazard Analysis (AHA) applies to the task listed above. It has been developed and approved by the Health and Safety Department for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required equipment (including safety equipment), inspections, and training. The hazard controls listed below are specific to this task.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls[1]**
Review the sampling area and set up sampling equipment	SLIPS, TRIPS, FALLS	• Don necessary Level D PPE, including safety-toe, non-skid boots, safety glasses, long pants, and nitrile (or similar) gloves • Visually inspect the area for slippery spots or debris and correct if found
	BACK STRAIN/SPRAIN	• Follow SWP 5-19, Safe Lifting Procedures when moving debris or other obstacles, unloading sampling equipment, and opening rusted well casing lids or stuck well caps
	BIOLOGICAL HAZARDS	• Follow SWP 5-17, Biohazards, when opening the well casings and well boxes specifically for stinging insects, poisonous animals, or irritant vegetation
	LACERATION	• Use leather work gloves to move open well boxes and rusty well casing lids
	HEAT/COLD-RELATED INJURY	• Follow SWPs 5-15, Heat Stress; 5-16, Cold Stress; and 5-26, Prevention of Sun Exposure • Establish appropriate work-rest schedules, provide water and sports drinks, and cool rest areas in hot weather • Take necessary breaks and rest as needed
Perform water level/well depth measurements	CHEMICAL EXPOSURE	• Don necessary Level D PPE, including safety-toe, non-skid boots, safety glasses, long pants, and nitrile (or similar) gloves • Open well cap away from face to avoid potential vapors and splash • Use PID or FID to monitor well for vapors in well head and breathing zone.
Purge/bail well water	LACERATION	• Use retractable safety blade or scissors to cut bailer string • Cut away from self or other personnel
	CHEMICAL EXPOSURE	• Don necessary Level D PPE, including safety-toe, non-skid boots, safety glasses, long pants, and nitrile (or similar) gloves • Empty bailer using slow, controlled motions to limit splash up at purge container
Groundwater sample collection and container handling	CHEMICAL EXPOSURE	• Don necessary Level D PPE, including safety-toe, non-skid boots, safety glasses, long pants, and nitrile (or similar) gloves • Fill sample containers slowly to avoid overflow of preserved containers
	LACERATION	• Handle glass sample containers carefully; dispose of any broken glass shards • Have a first aid kit on-site available for small cuts
	HEAT/COLD STRESS	• Follow SWPs 5-15, Heat Stress; 5-16, Cold Stress; and 5-26, Prevention of Sun Exposure • Establish appropriate work-rest schedules, provide water and sports drinks, and cool rest areas in hot weather
	BACK STRAIN/SPRAIN	• Follow SWP 5-19, Safe Lifting Procedures when moving heavy sample coolers; obtain help as needed

Equipment to be Used	**Inspection Requirements**	**Training Requirements**
• Level D PPE (steel toed boots, long pants, safety goggles, and nitrile gloves) • PID/FID • First Aid Kit • Sunscreen • Pesticide	• Inspect all equipment prior to use • Inspect the sampling area and remove any objects that could present a hazard	• Safe Lifting Procedures • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training) • [CA projects require Ergonomics, Heat Stress and Injury and Illness Prevention Plan training]

Tetra Tech, Inc.

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Sediment Sampling

Task Description

This Activity Hazard Analysis (AHA) applies to collection of sediment samples. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls**
Set up equipment at sampling location	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Visually inspect the area for slippery spots or debris and correct if found • Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy • Use proper lifting techniques (lift with legs not back)
Submerge trowel at sampling location	BACK STRAIN/SPRAIN EMPLOYEE EXPOSURE	• Wear safety glasses and nitrile gloves • Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy • Use proper lifting techniques (lift with legs not back)
Extract sediment by removing submerged trowel	BACK STRAIN/SPRAIN EMPLOYEE EXPOSURE	• Wear safety glasses and nitrile gloves • Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy • Use proper lifting techniques (lift with legs not back)
Fill sample bottles with sample material, load coolers and IDW (if appropriate) into vehicle	LACERATION	• Handle all glass containers carefully • Have a first aid kit on-site available for small cuts • Dispose of all broken shards immediately
Store sample containers in coolers and load onto vehicles	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Ensure all debris has been removed from the path of travel • Use proper lifting techniques, including obtaining help with heavy coolers
Equipment to be Used • Level D PPE (steel-toed boots, safety glasses, nitrile gloves)	**Inspection Requirements** • None	**Training Requirements** • Safe Lifting Procedures • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training)

• Reflective safety vest if in areas of vehicle traffic • First Aid Kit • Disposable scoop • Disposable trowel		

Tetra Tech, Inc.

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Surface Water Sampling

Task Description

This Activity Hazard Analysis (AHA) applies to collection of surface water samples. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls**
Set up equipment at sampling location	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Visually inspect the area for slippery spots or debris and correct if found • Wear steel-toed, non-skid boots in accordance with Tetra Tech EMI policy • Use proper lifting techniques (lift with legs not back)
Extract Surface Water by submerging bottleware	EMPLOYEE EXPOSURE	• Wear safety glasses and nitrile gloves
Fill sample bottles with sample material, load coolers and IDW (if appropriate) into vehicle	LACERATION	• Handle all glass containers carefully • Have a first aid kit on-site available for small cuts • Dispose of all broken shards immediately
Store sample containers in coolers and load onto vehicles	SLIP/TRIP/FALL BACK STRAIN/SPRAIN	• Ensure all debris has been removed from the path of travel • Use proper lifting techniques, including obtaining help with heavy coolers
Equipment to be Used • Level D PPE (steel-toed boots, safety glasses, nitrile gloves) • Reflective safety vest if in areas of vehicle traffic • First Aid Kit	**Inspection Requirements** • None	**Training Requirements** • Safe Lifting Procedures • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training)

Tetra Tech, Inc.

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech EM Inc.

Backpack Electrofishing

Task Description

This Activity Hazard Analysis (AHA) applies to backpack electrofishing. It has been developed and approved by the Director of Health and Safety for Tetra Tech EMI. The AHA contains potential hazards posed by each major step in this task, lists procedures to control hazards, and presents required safety equipment, inspections, and training.

Hazards		Actions
Task Steps	**Potential Hazards**	**Critical Safety Procedures and Controls**
Equipment Preparation	ELECTROCUTION BACK STRAIN	• Select appropriate voltage based on conductivity of water body to be sampled: 400 to 1,600 µS: Use 100 to 300 volts 15 to 400 µS: Use 400 to 700 volts 15 to 100 µS: Use 800 to 1,100 volts • Inspect all components/wires/connections for integrity • Use caution when lifting/moving backpack unit
Electrofishing Operation	ELECTROCUTION DROWNING SLIPS TRIPS FALLS BACK STRAIN	• Turn generator off when not in active use • Only use appropriate voltage levels • Avoid any contact of non-insulated materials (including skin) with water when unit is in use • Wear approved personal flotation device when within 15 feet of water • Exercise caution when wading; avoid excessively deep water • Wear rubber-soled hip waders; check for leaks before use • Exercise care when lifting/moving with electrofishing unit
Fish Handling	LACERATION	• Avoid sharp barbs/fins when handling fish
Equipment to be Used • Level D PPE (steel-toed boots, safety glasses, nitrile gloves) • Reflective safety vest if in areas of vehicle traffic • Personal Flotation Device when in/near water • Water quality unit for determining specific conductance of waterbody • Backpack electrofishing unit	**Inspection Requirements** • Inspect all wires and connections on electrofishing unit for integrity • Inspect/calibrate water quality unit • Inspect PPE, waders, and personal flotation device for integrity	**Training Requirements** • Safe Lifting Procedures • Personal Protective Equipment • Hazardous Waste Operations and Emergency Response (40-hour and current 8-hour update) • CPR/First Aid (one employee on-site must have current CPR/First Aid training)

	TETRA TECH, INC. GENERAL SAFE WORK PRACTICES for HAZARDOUS WASTE SITE ACTIVITIES	Revision Date: 10/1/2008 Document Control Number: SWP 5-2 Page 1 of 3

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 on hazardous waste sites. 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 contact with site contamination exists.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. If a source of potable water is not available at the work site that can be used for hands-washing, the use of waterless hand cleaning products will be used, followed by actual hand-washing as soon as practicable upon exiting the site. A thorough shower and wash 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 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 personnel, subcontractor personnel, and project site visitors; 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. Flames and open fires are not permitted on site.
- 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.

Revision Date	Document Authorizer		Revision Details
	Name	Approval Date	
10/1/2008	Chris McClain		Update from 1998 format
	Rick Lemmon		

The following sections discuss general procedures for working over or near water, underwater work, and cold water procedures.

1.0 SCOPE

This safe work practice (SWP) provides guidelines for all Tetra Tech employees and subcontractors who work over or near bodies of water three (3) or more feet deep or swiftly moving water. This SWP was developed in accordance with the Occupational Safety and Health Administration (OSHA) standard specified in Title 29 of the *Code of Federal Regulations* (CFR), Part 1926.106, "Working Over or Near Water."

2.0 RESPONSIBILITIES

The project manager (PM) is responsible for identifying all health and safety requirements of each project, including all tasks that may involve worker exposure to hazards or working in or near bodies of water. The PM will appoint a site safety coordinator (SSC) to ensure that this SWP is followed in the field. Workers will follow this SWP whenever working near or in any body of water that is over three (3) feet deep or swiftly moving.

3.0 GENERAL PROCEDURES

When working over or near water, the following precautions will be taken:

- All staff and team members must wear a personal flotation device (PFD) when working within 15 feet of a water body. Personnel will be provided with U.S. Coast Guard (USCG)-approved life jackets or work vests. The PFD should be Class III, which will support the head of an unconscious person above water.
- A Class V PFD, including Class V Hybrid PFD is acceptable only if it is US Coast Guard approved and/or meets International Life-Saving Appliance (LSA) Code and marked for use as a work vest for commercial use or for use on commercial vessels.

- PFDs should be fitted with a Safety of Life at Sea convention compliant whistle or noise making device. When worn at night, PFDs shall have Safety of Life at Sea rated reflective tape or materials affixed to the PFD
- When workers are exposed to conditions where there is a risk of hypothermia, insulated PFDs are to be used.
- PFDs are not appropriate for entrapment hazard such as deep mud
- Prior to each use, the user shall examine PFDs for deterioration or damage that might affect their strength and buoyancy. Defective PFDs shall be removed from service and either repaired or replaced.
- Fall protection systems should be utilized in conjunction with PFD vests and other work near water controls where possible. Examples include guard rails, fall arrest systems, lifelines, harnesses or safety nets.
- In cases where glass enclosed equipment is working around water, a break glass tool and seat belt cutter should be in the vehicle and readily assessable to the operator.
- Life jackets and work vests will be inspected before and after each use.
- Ring buoys with at least 90 feet of line shall be provided and readily available for employee rescue operations.
- The distance between ring buoys shall not exceed 200 feet.
- A USCG-approved life-saving skiff will be available.
- Under no circumstances will team members enter water bodies without protective clothing such as rubber boots or waders.
- At least one person will remain on shore as a look-out.

If a team member falls into the water, a ring buoy, branch, paddle, pole, or other floating object should be extended to the person in the water. Resist the impulse to dive in; employees should not attempt a deep water rescue unless they have been trained in water lifesaving skills.

When the person in the water grabs the extended item, the worker should be pulled toward the shore or boat. If the person is unconscious, the PFD, clothing, or hair should be hooked to pull the person toward the shore or boat. Once the person has been safely retrieved, necessary emergency medical procedures should be performed by qualified personnel. If none are necessary, the retrieved team member should change into dry clothing as soon as possible after any necessary personal decontamination.

4.0 UNDERWATER WORK

Underwater work should be performed in accordance with the procedures and guidelines of the Diving Safety Program (Document Control No. 2-15).

5.0 COLD WATER PROCEDURES

When the water temperature is below 45 °F, hypothermia is a serious risk. A person can loose feeling in the extremities within 5 minutes. Additional protective equipment such as cold water immersion suits may be required. All field staff members should be familiar with cold water survival techniques or should receive training from an American Red Cross-certified swimming instructor in cold water survival techniques when site conditions warrant such knowledge. Cold water safe work practices must be addressed in site specific safety documents.

After a person has been rescued from cold water, he or she should change into dry clothes as soon as possible. If the person who has fallen into the water displays hypothermia symptoms, he or she should be treated immediately and taken to a medical facility. Under no circumstances should the hypothermia victim be given hot liquids because this could accelerate shock. Drinks no warmer than normal body temperature are acceptable. If symptoms are severe and evacuation to a medical facility cannot be quickly conducted, any wet clothing should be removed, the victim should be placed in blankets or sleeping bags in a sheltered location, and the rescuer should climb into the blankets or sleeping bag with victim to provide additional warmth. The victim should also be treated continuously for shock, elevating feet and monitoring the victim's pulse and breathing rate.

If a team member falls into cold water, he or she should not remove any clothing while in the water because clothing provides additional insulation. Although clothing creates an added drag while swimming, the insulation outweighs the disadvantage of the additional drag. Each

team member should carry a wool hat to place on his or her head in case he or she falls into the water. A wool hat, even when wet, provides good insulation for the head, where a large amount of body heat is lost.

Revision Date	Document Authorizer	Revision Details
10/1/2011	Chris McClain	Update

This safe work practice (SWP) establishes standards to prevent injuries to Tetra Tech, Inc. (Tetra Tech), employees resulting from electrical work.

1.0 RESPONSIBILITIES

The project manager (PM) is responsible for ensuring that work areas and tasks 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), construction health and safety plan (C-HASP), job hazard analysis (JHA), job safety analysis (JSA), work permit or other site-specific health and safety documentation. The PM will notify the local utility company when elevated work occurs (including equipment with masts and booms) near their overhead power lines and guy wires. The voltage of the lines should be verified when the communication with the utility occurs, and the PM should ask about any permits that may be necessary.

The PM should also evaluate the risk associated with the work as it pertains to overhead power lines or other electrical sources. If the risk is deemed high, and the work cannot be avoided or changed to reduce or avoid the risk, Corporate Tetra Tech Health & Safety personnel will be consulted and a permit system shall be implemented. The permit would include information specific to the equipment being used, the operators, roles of field personnel, and limitations to reduce risk. In many cases, Tetra Tech will elect to not perform high risk work.

The site safety coordinator (SSC) is responsible for ensuring that on-site work is performed in accordance with this SWP. This will include conducting daily safety meetings that will include a discussion of this SWP. In some cases, work will be performed at a facility where client procedures require coordination with on-site client representatives. These representatives could include trained Permit Issuing Authorities. The SSC will be the Tetra Tech point of contact for the on-site client representatives.

2.0 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 and documented 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. Local regulations, including those of the utility company, may require greater clearances. The more stringent guidelines will be followed.

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 nearer power lines are required, necessary arrangements to turn off the power will be coordinated by the project manager. If that is not possible, insulating blankets may be used to shield the lines. These must be installed by the utility company. Care must still be taken to avoid damaging the lines, even if they are de-energized or shielded.

Guy wires present additional hazards and will be flagged when they are within the work area. The working distances in the table above will also be used for safe working distances when working near guy wires. Additional precautions are needed when heavy equipment is being moved near guy wires. This will include either barriers to prevent equipment from contacting the wires, or dedicated spotters who will monitor the distances and provide warning to equipment operators.

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.

3.0 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. Drill rigs or other boomed equipment shall not be moved with the mast or boom in the raised position. Except for unloading, dump trucks shall be moved with the beds in the lowered position. Dump trucks, when unloading their contents, should be facing away from overhead utilities or parallel to them so that the truck is not moving toward the overhead lines.
- Boomed equipment shall not be left overnight underneath overhead power lines.
- Equipment shall not be serviced underneath overhead utilities.
- 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.

- Extension cords shall not be used in lieu of permanent wiring applications.
- 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.

4.0 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.
- Moving equipment that is used near overhead power lines shall be equipped with grounding chains.

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.

Revision Date	Document Authorizer		Revision Details
	Name	Approval Date	
10/1/2008	Chris McClain		Update from 1998 format
	Rick Lemmon		

1.0 INTRODUCTION

This safe work practice (SWP) addresses situations during which heat illness is likely to occur and provides procedures for preventing and treating heat-related injuries and illnesses. This SWP is applicable to all Tetra Tech employees performing outdoor activities at both domestic and international project locations. This SWP incorporates safety regulations of the States of California and Washington to protect outdoor workers from heat-related illness. An "outdoor place" is an open area such as an agricultural field, forest, park, equipment and storage yard, outdoor utility installation, tarmac, and road. An outdoor workplace also can include a construction site at which no building shell has been completed, and areas of a construction site outside of any building shells that may be present.

Many factors contribute to heat illness and UV exposure, including personal protective equipment (PPE), ambient temperature and humidity, workload, sun exposure, and the physical condition of the employee, as well as predisposing medical conditions. However, the primary factors of heat illness are elevated ambient temperatures in combination with fluid loss. Because heat illness is one of the more common health concerns during field activities, employees must be familiar with the signs, symptoms, and various treatment methods of each form of heat illness. Health effects from heat illness may range from transient heat fatigue or rashes to serious illness or death. Tracking the weather is imperative during outdoor field projects because heat-related illness and fatalities occur primarily during heat waves.

2.0 Definitions

The following are typical terms and definitions associated with heat illness prevention and monitoring activities:

Acclimatization – Gradual adaptation of the body to work under temperature conditions to which it is exposed. Acclimatization peaks in most people within 4 to 14 days of regular work taking up at least 2 hours per day in the heat.

Ambient Temperature – Temperature of the surroundings.

Electrolytic Sports Drink – A beverage containing sodium and potassium salts that replenish the body's water and electrolyte levels after dehydration caused by physical activity.

Environmental Risk Factors for Heat Illness – Working conditions under which heat illness could occur. Environmental risk factors include air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement (or lack of), workload severity and duration, and protective clothing and PPE worn by employees.

Heat Illness – A serious medical condition resulting from the body's inability to cope with a particular heat load. Symptoms include heat cramps, heat exhaustion, and heat stroke (see Table 1).

Heat Index – An index that combines air temperature and relative humidity to indicate the human-perceived equivalent temperature (i.e., how hot it feels outdoors).

Heavy Work – Digging/hand-auguring, heavy lifting, cutting trees, using heavy hand tools, and similar tasks.

Light Work – Walking, writing notes, handling samples, and similar tasks.

Medium Work – Bailing wells, moving light equipment, driving nails, and similar tasks.

Personal Risk Factors for Heat Illness – Factors such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and use of prescription medications that affect the body's water retention or other physiological responses to heat.

Preventive Recovery Period – Period of time needed to recover from the heat in order to prevent heat illness.

Relative Humidity – The amount of water vapor that exists in a gaseous mixture of air and water vapor.

Shade – Blockage of direct sunlight. Canopies, umbrellas, and other temporary structures or devices may be used to provide shade. One indicator that blockage is sufficient is absence of a shadow of an object within the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it unless the car is running with air conditioning.

Wet Bulb Globe Temperature (WBGT) - a measurement used to indicate heat stress. WBGT takes into account the effects of humidity

3.0 Employee Duties and Responsibilities

Written procedures help Project Managers (PM), Site Safety Coordinators (SSC), and field team members reduce the risk of heat-related illnesses, and ensure that emergency assistance is provided without delay to all Tetra Tech employees. The following are the duties and responsibilities of the Project Team for implementing and managing the Heat Illness Prevention and Monitoring SWP.

3.1 Project Management

The PM must understand and agree to the responsibility for implementing this SWP for worker safety. The PM will assure that all employees at the work site comply with this SWP.

- The PM must designate an appropriate field team member to serve as the SSC who will implement this SWP and who will perform and document necessary monitoring requirements for worker safety.
- The PM will ensure necessary resources required to implement this SWP and necessary monitoring resources for worker safety are acquired and present at the work site prior to initiation of project activities in hot environments.
- The PM will work with the Director of Health and Safety and identify at risk employees.
- The PM will ensure all field team members are trained in heat illness management prior to working outdoors.
- The PM and SSC will modify working hours to schedule work during the cooler hours of the day, when possible. When a modified or shorter work-shift is not possible, more water and rest breaks shall be provided.
- The PM and SSC will verify that the elements of this SWP are documented in the Health and Safety Plan, as necessary.

3.2 Site Safety Coordinator

- The SSC must understand and agree to the responsibility for implementing this SWP in the field, and implement the necessary monitoring requirements for worker safety during outdoor activities.
- The SSC must have appropriate Occupational Safety and Health Administration (OSHA)-related training and experience to understand and implement this SWP, and to ensure required monitoring for worker safety during outdoor activities.
- The SSC must ensure that resources needed to implement this SWP and required monitoring for worker safety are acquired and present at the work site prior to initiation of project activities in hot environments.
- The SSC must maintain all necessary resources required under the SWP during project activities in hot environments.
- The SSC must ensure implementation and appropriate documentation of required monitoring for worker safety during site activities.
- The SSC must be familiar with and continuously monitor all employees, and must remain alert for onset of heat-related symptoms.
- The SSC and co-workers are encouraged never to discount any signs or symptoms of heat-related illness shown by one or more project team members, and to immediately report these signs or symptoms.
- The SSC will carry a cell phone or other means of communication to ensure that emergency services can be contacted, and will verify that these resources are functional at the worksite prior to each shift.

3.3 Field Team

- The field team will be able to recognize the hazards of working in warm environments.

- Co-workers will use a "buddy system" to monitor each other closely for discomfort or symptoms of heat illness.

- Every morning, workers must attend a daily tailgate safety meeting to be reminded of site-specific emergency procedures.

- A copy of site specific heat illness procedures shall be available for employee review.

4.0 Description and Requirements

4.1 Effects of Hot Weather

As the environment heats up, the body tends to warm up as well. The body's internal thermostat maintains a constant temperature by pumping more blood to the skin, which is cooled by evaporation from increasing perspiration production. In this way, the body increases the rate of heat loss to balance the heat burden created by a hot environment. Such situations generally do not cause harm, as long as the body is allowed to adjust to cope with the increasing heat.

In a very hot environment, however, the rate of heat gain exceeds the rate of heat loss. In this situation, the body's coping mechanisms can be overwhelmed, resulting in heat illness and leading to a range of serious and possibly fatal conditions.

4.2 Preparation for Hot Weather Work

The following list describes the process for preparing to work in hot weather conditions:

- Identify work that can pose a risk of heat stress and Ultraviolet (UV) exposure.
- Identify at-risk employees.
- Identify possible controls:
  - Establish controls for hot weather situations
  - Determine mandatory work and rest regimens based on current conditions, workload, clothing requirements, temperature and humidity for Threshold Limit Value (TLV).
  - Identify required fluid and food replacement schedules.

- Provide a location to cool down during breaks.
- Establish requirements to address UV exposure.
- Monitor workers in extreme heat conditions.

• Establish emergency response procedures to be followed for heat-related emergency situations.

• Provide for first aid and establish the requirement that first aid be administered immediately to employees displaying symptoms of heat-related illness.

• Provide training to employees and verify training records about site legal and regulatory requirements and about the characteristics and effects of heat stress and the recognition and prevention of heat-related injuries (See Table 1).

5.0 Employee Training

Training is an important component of heat illness prevention. Employees are instructed to recognize and treat heat-related illnesses during 8-hour health and safety refresher and first aid training courses. The conditions, symptoms, and treatment for heat-related illnesses are listed below in Table 1.

TABLE 1
HEAT ILLNESS 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 degrees Fahrenheit (°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
**** Any of these symptoms require immediate attention. If heat stroke is suspected, emergency medical personnel should be immediately contacted and on-site first aid provided.**			

Employee training procedures include, but are not limited to, the following:

- All employees (including and especially newly hired employees) will receive heat illness prevention training prior to working outdoors.
- SSCs will hold short tailgate meetings daily to review important heat illness and prevention information with all field team members.
- All workers will be assigned a "buddy" or experienced coworker to ensure that they understood the training and follow the company procedures.
- PMs and SSCs will be trained before assignment to supervise outdoor workers.

6.0 Heat Illness Prevention and Monitoring Requirements

6.1 Identification of Work Conditions

Hot weather is a condition that will be encountered during Tetra Tech operations. When work takes place outdoors during warm weather, working conditions shall be identified for both heat stress conditions and UV exposure.

6.2 Heat Index

The Heat Index (HI) can be used as a first indicator of thermal comfort. The HI can be obtained by directly measuring the dry bulb temperature and relative humidity. The dry bulb temperature and relative humidity forecast can be obtained by checking the local weather station information or measured by using a wet bulb thermometer. A direct reading of HI can be obtained by placing a heat stress monitor in full shade at the workplace.

The HI does not take into account acclimation, clothing or nature of work; therefore, if the HI is at 80°F (26.7°C) or above, further evaluation is required to adjust workload and clothing.

6.3 Heat Exposure Limits and Measurement

The TLV is a means of providing heat exposure limits and gauging potential heat impacts. To determine the TLV, the Wet Bulb Globe Temperature (WBGT) index is measured. The WBGT is calculated using a formula that takes into account air temperature, speed of air movement, radiant heat from hot objects, sunshine and body cooling due to sweat evaporation. WBGT direct reading meters, often called 'heat stress analyzers,' are also available. These meters give direct WBGT readings; no calculations are necessary.

A trained person shall take WBGT measurements. If a WBGT direct reading meter is not available, two different methods are used to calculate WBGT in the workplace: one for workplaces with direct sunlight, and the other for workplaces without direct sunlight. In addition, when conditions of the workplace fluctuate widely, time-weighted WBGT is often used. The WBGT calculation is used in determining heat stress exposure guidelines and heat stress and clothing guidelines. Table 2 presents approximate WBGT values.

APPROXIMATE WBGT VALUE (°F) TABLE

Dry Bulb Temperature		Relative Humidity																			
°C	°F	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
18.33	65	59	59	60	61	62	62	63	64	64	65	66	67	67	68	69	70	70	71	72	73
18.89	66	59	60	61	61	62	63	64	65	65	66	67	68	68	69	70	71	71	72	73	74
19.44	67	60	61	61	62	63	64	65	65	66	67	68	69	69	70	71	72	72	73	74	75
20.00	68	60	61	62	63	64	64	65	66	67	68	69	69	70	71	72	73	74	74	75	76
20.56	69	61	62	63	63	64	65	66	67	68	69	69	70	71	72	73	74	75	75	76	77
21.11	70	62	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76	77	77	78
21.67	71	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76	77	78	79	79
22.22	72	63	64	65	66	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
22.78	73	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
23.33	74	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
23.89	75	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
24.44	76	65	66	67	68	69	71	72	73	74	75	76	77	78	79	80	81	82	83	85	86
25.00	77	66	67	68	69	70	71	72	74	75	76	77	78	79	80	81	82	84	85	86	87
25.56	78	66	67	69	70	71	72	73	74	76	77	78	79	80	81	82	84	85	86	87	88
26.11	79	67	68	69	71	72	73	74	75	76	78	79	80	81	82	84	85	86	87	88	90
26.67	80	68	69	70	71	72	74	75	76	77	79	80	81	82	84	85	86	87	88	90	91
27.22	81	68	69	71	72	73	75	76	77	78	80	81	82	83	85	86	87	89	90	91	92
27.78	82	69	70	71	73	74	75	77	78	79	81	82	83	85	86	87	88	90	91	92	94
28.33	83	69	71	72	73	75	76	78	79	80	82	83	84	86	87	88	90	91	92	94	95
28.89	84	70	71	73	74	76	77	78	80	81	83	84	85	87	88	90	91	92	94	95	97
29.44	85	71	72	73	75	76	78	79	81	82	84	85	87	88	89	91	92	94	95	97	98
30.00	86	71	73	74	76	77	79	80	82	83	85	86	88	89	91	92	94	95	97	98	100
30.56	87	72	73	75	76	78	80	81	83	84	86	87	89	90	92	93	95	97	98	100	101
31.11	88	72	74	76	77	79	80	82	84	85	87	88	90	92	93	95	96	98	100	101	103
31.67	89	73	75	76	78	80	81	83	85	86	88	90	91	93	94	96	98	99	101	103	104
32.22	90	74	75	77	79	80	82	84	86	87	89	91	92	94	96	97	99	101	103	104	106
32.78	91	74	76	78	80	81	83	85	87	88	90	92	94	95	97	99	101	102	104	106	108
33.33	92	75	77	79	80	82	84	86	88	89	91	93	95	97	98	100	102	104	106	107	109
33.89	93	76	77	79	81	83	85	87	89	90	92	94	96	98	100	102	103	105	107	109	111
34.44	94	76	78	80	82	84	86	88	90	92	93	95	97	99	101	103	105	107	109	111	113
35.00	95	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	108	110	112	114
35.56	96	77	79	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
36.11	97	78	80	82	84	86	89	91	93	95	97	99	101	103	105	108	110	112	114	116	118
36.67	98	79	81	83	85	87	90	92	94	96	98	100	103	105	107	109	111	113	116	118	120
37.22	99	79	82	84	86	88	91	93	95	97	99	102	104	106	108	111	113	115	117	120	122
37.78	100	80	82	85	87	89	91	94	96	98	101	103	105	108	110	112	115	117	119	121	124
38.33	101	81	83	85	88	90	92	95	97	100	102	104	107	109	111	114	116	119	121	123	126
38.89	102	81	84	86	89	91	93	96	98	101	103	106	108	111	113	116	118	120	123	125	128
39.44	103	82	84	87	89	92	94	97	100	102	105	107	110	112	115	117	120	122	125	127	130
40.00	104	83	85	88	90	93	96	98	101	103	106	108	111	114	116	119	121	124	127	129	132
40.56	105	83	86	89	91	94	97	99	102	105	107	110	113	115	118	121	123	126	129	131	134
41.11	106	84	87	89	92	95	98	100	103	106	109	111	114	117	120	122	125	128	131	133	136
41.67	107	84	87	90	93	96	99	101	104	107	110	113	116	119	121	124	127	130	133	136	138
42.22	108	85	88	91	94	97	100	103	106	108	111	114	117	120	123	126	129	132	135	138	141
42.78	109	86	89	92	95	98	101	104	107	110	113	116	119	122	125	128	131	134	137	140	143
43.33	110	86	90	93	96	99	102	105	108	111	114	117	120	124	127	130	133	136	139	142	145
43.89	111	87	90	93	97	100	103	106	109	113	116	119	122	125	128	132	135	138	141	144	148
44.44	112	88	91	94	98	101	104	107	111	114	117	121	124	127	130	134	137	140	143	147	150
45.00	113	88	92	95	99	102	105	109	112	115	119	122	126	129	132	136	139	142	146	149	153
45.56	114	89	93	96	99	103	106	110	113	117	120	124	127	131	134	138	141	145	148	152	155
46.11	115	90	93	97	100	104	108	111	115	118	122	125	129	133	136	140	143	147	150	154	158
46.67	116	90	94	98	101	105	109	112	116	120	123	127	131	134	138	142	146	149	153	157	160
47.22	117	91	95	99	102	106	110	114	118	121	125	129	133	136	140	144	148	152	155	159	163
47.78	118	92	96	100	103	107	111	115	119	123	127	131	134	138	142	146	150	154	158	162	166
48.33	119	92	96	100	104	108	112	116	120	124	128	132	136	140	144	148	152	156	160	164	168
48.89	120	93	97	101	105	110	114	118	122	126	130	134	138	142	147	151	155	159	163	167	171

Notes: Calculated values assume outdoor work in full sun, with a light (<5 mph) wind.
WBGT of green-shaded cells is less than dry-bulb temperature.

6.4 Heat Stress Exposure Guidelines

Heat stress exposure guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) are shown in Table 3: ACGIH Screening Criteria for Heat Stress Exposure. This table is used to determine the allocation of work in a work/rest cycle, which is dependent on the type of work and WBGT values.

Table 3: ACGIH Screening Criteria for Heat Stress Exposure

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUE															
Clothing Type	**Summer Lightweight**			**Cotton Coveralls**			**Winter Work**			**Permeable Water Barrier (Tyvek)**			**Fully-Encapsulating Suit (Level 4)**		
Work Load	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**	**Light**	**Moderate**	**Heavy**
Work/Rest Schedule / WBGT	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
Continuous Work	86	80	77	82	76	73	79	73	70	75	69	66	68	62	59
75% Work, 25% Rest / Hr	87	82	79	83	79	75	80	75	71	76	72	68	69	64	61
50% Work, 50% Rest / Hr	89	85	82	85	81	79	81	78	75	78	74	71	71	67	64
25% Work, 75% Rest / Hr	90	88	86	86	84	82	83	81	79	79	77	75	72	70	68

Notes: Temperature is approximate WBGT from accompanying tables, based on outdoor work, temperature, and relative humidity measurement during work activities. Light Work includes walking, writing notes, handling samples, and similar activities (metabolic rate up to 200 kilocalories [kcal]/hour). Medium Work includes bailing wells, moving light equipment, driving nails, and similar tasks (metabolic rate of 200-350 kcal/hour). Heavy Work is digging, heavy lifting, cutting trees, using heavy hand tools, and similar tasks (metabolic rate above 350 kcal/hour).

Table 3 is based on five-day work weeks and eight-hour work days with conventional breaks. Conventional breaks include a 15-minute break in a four-hour period and a half-hour lunch in an eight-hour period. The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. The limits are higher than that if they had been developed to prevent discomfort. A safety factor should be used to protect sensitive individuals or increase comfort. Examples to clarify work load intensity:

- Rest: sitting (quietly or with moderate arm movements).
- Light work: sitting or standing to control machines, performing light hand or arm work (e.g., using a table saw), occasional walking, driving.
- Moderate work: walking about with moderate lifting and pushing or pulling, walking at a moderate pace, scrubbing in a standing position.
- Heavy work: digging, carrying, pushing/pulling heavy loads, walking at a fast pace, pick and shovel work, carpenter sawing by hand.
- Very heavy: very intense activity at a fast to maximum pace (e.g., shoveling wet sand).

For example, in order to minimize heat stress exposure, an employee who is acclimated and is performing heavy work such as shoveling dirt in a temperature of 78°F (25.6°C), would fall into a work/rest regimen of 100% work.

TLVs assume that workers who are exposed to these conditions are adequately hydrated, are not taking medication, are wearing lightweight clothing and are in generally good health.
When the WBGT is at a temperature that exceeds the TLV, 'Stop Work' should be enforced.

6.5 Heat Stress and Clothing Guidelines

The exposure limit should be adjusted for workers wearing heavy clothing. ACGIH recommendations for these conditions are listed in Table 4: Correction of TLV for Clothing.

Table 4: Correction of TLV for Clothing

Clothing Type	WBGT Correction (in °F [°C])
Work Clothes (long-sleeved shirts and pants)	0 (0)
Cloth coveralls (woven material)	+3 (0)
Spunbonded Meltdown Spunbonded polypropylene coveralls	+6 (+0.5)
Polyolefin coveralls	+8 (+1)
Double-layer woven clothing	+9 (+3)
Limited-use vapor-barrier coveralls	+18 (+11)

For example, an acclimated worker wearing double-layer woven clothing doing moderate work in 30°C would have a corrected exposure level of 30 + 3 = 33°C (91.4°F). This would lower the allowable exposure to 0-25% work from 25-50% work.

For Fire Retardant Clothing (FRC), there is no WBGT correction. FRC can be obtained in various weight materials. The lightest weight FRC should be worn during work in warm environments. No second layer of clothing should be worn except for cotton undergarments.

These values are not to be used for completely encapsulating suits. The assumption is that coveralls are worn with only modest clothing underneath, not a second layer of clothing.

6.6 Identifying At-risk Employees

A screening program for identifying at risk employees shall include identification of health conditions that are aggravated by extreme environmental temperatures. How a person functions under conditions of heat stress will be unique that person and will depend on:

- Age.
- Weight.
- Metabolism.
- Alcohol or drug use.
- Pre-existing medical conditions.

- Level of physical fitness.
- Use of medications.
- Individual sensitivity to heat.
- Possibility of hypertension.

Note: Employees with any 'at-risk' conditions shall have more stringent work/rest regimens or controls

6.7 Health and Safety Controls

Controls shall be based on a risk assessment approach. Conditions and available controls will vary from site to site. Therefore, the HASP shall define and document the site specific control plan. Controls shall be appropriate for the risks that are associated with heat hazards.

6.7.1 Acclimation

The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimation. Acclimation is a response by the body that results in increased heat tolerance.

People differ in their ability to acclimate to heat. Usually, acclimation is obtained in four to five days. However, it is lost in approximately the same amount of time. After a period of acclimation, the same activity will produce fewer cardiovascular demands. The worker will perspire more efficiently, leading to better evaporative cooling, and thus will more easily be able to maintain normal body temperatures.

All site workers who could be exposed to hot weather conditions shall be acclimated or go through an acclimation process, as necessary. Where workers are already acclimated, no acclimation process is necessary. A previously acclimated person is someone who has already been in similar working and heat conditions.

6.7.2 Fluid and Nutrient Replacement

Cool (50°-60°F [10°-15°C]) water or other cool liquid, except alcoholic beverages, should be made available to workers.

Provision of Water (Not Temperature Dependent)

Water is the principal preventive measure to minimize the risk of heat-related illnesses. Tetra Tech employees shall have access to potable drinking water (or electrolytic sports drink). Where the supply of water is not plumbed or otherwise continuously supplied, water shall be provided in sufficient quantity at the beginning of the work shift to provide **1 quart per employee per hour for drinking for the entire shift**. Frequent drinking of water shall be encouraged by the SSC. Water provision requirements include the following:

- At least 2 quarts of water per employee will be available at the start of the shift.
- The SSC will monitor water containers every 30 minutes, and employees are encouraged to report low levels or dirty water to the SSC when observed.
- The SSC will provide reminders to the field team members to drink frequently, and more water breaks will be provided as needed.
- During the daily tailgate safety meeting each morning, the SSC will remind the field team about the importance of frequent water consumption throughout the shift.
- Water containers will be placed as close to the workers as safety conditions allow.
- When drinking water levels within a container drop below 50%, the water shall be replenished immediately.
- If a common water source is used, disposable/single-use drinking cups will be provided to employees each day.
- Communication devices such as radios, cell phones, or air horns may be used to remind field team members to take water breaks.

Although some commercial replacement drinks contain salt, this is not necessary for acclimated people, because most people have enough salt in their normal diets. Commercial replacement drinks contain high amounts of sugar and may contribute to an individual's inability to cope with the warm environment. If used, commercial replacement drinks should not be used at full strength and should be diluted with water on at least a one-to-one ratio.

Energy drinks shall not be used while working in warm environments.

Poor nutrition, over eating and under eating are factors contributing to heat stress. During hot conditions, employees should eat small, regular meals.

6.7.3 Additional Control Measures

Outdoor workers are exposed to not only potential heat illness, but also UV radiation. Long-term exposure to UV radiation poses additional risks and can lead to a variety of skin disorders, including skin cancer and cataracts of the eyes.

Protection from UV exposure, sunscreen and appropriate eye protection should be considered in addition to the additional controls listed below:

Access to Shade (Not Temperature-Dependent)

Access to rest and shade or other cooling measures are important preventative steps to minimize the risk of heat-related illnesses and exposure to UV radiation. Tetra Tech employees suffering working in extreme temperatures for any period of time shall be provided access to an area with shade that is either open to the air or provided with ventilation or cooling. Such access to shade shall be permitted at all times. Procedures for the provision of shade include the following:

- SSC will set up an adequate number of shaded areas as needed. Examples of shaded areas include vehicles with air conditioning, umbrellas, canopies, or other portable devices. Shading should be placed in close proximity to the work activity (no more than 50-100 yards away, or at the closest location safety conditions allow).

- Employees should have access to an office, construction trailer, or other places with air conditioning.

- Every morning a short tailgate meeting will occur to remind workers about the importance of rest breaks and the location of shade.

- Other cooling measures may be used **if (and only if)** these can be deemed effective as shade.

- As safety conditions allow, SSCs shall provide areas for employee breaks that are:
  - Readily accessible
  - In the shade, open to air, and ventilated
  - Near sufficient supplies of drinking water

7.0 Heat Illness Monitoring

A medical monitoring program shall be planned with the assistance of a medical or industrial hygiene professional. The monitoring program shall be specify the leading indicators to be used (e.g. heat rate, body temperature, blood pressure, respiration rate, and other) and frequency of measurement.

Heat illness monitoring will be conducted by the SSC or his/her designee when work conditions warrant implementation of a work/rest schedule based on temperature conditions and PPE requirements associated with project activities. Monitoring will be conducted as follows:

- 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 without changing the rest period.
  - If the heart rate still exceeds 110 beats per minute at the next period, shorten the following work cycle by one-third.

- Body Temperature: If body temperature exceeds 99.6 degrees Fahrenheit (°F) (37.6 degrees Celsius [°C]), shorten the next work cycle by one-third without changing the rest period. If body 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 body temperature exceeds 100.6 °F (38.1 °C). Use any of the following thermometers:

- Oral Thermometer – Use a clinical thermometer (3 minutes under the tongue) to measure the oral temperature at the end of the work period.
- Tympanic (ear) Thermometer
- Temporal (swipe) Thermometer

The SSC will document throughout the entire work shift results of heat illness monitoring for each team member participating in work activities.

8.0 EXTREME CONDITIONS

Extra Measures During Heat Waves

Extreme environmental conditions during a heat wave can cause an employee's physical and mental conditions to change rapidly into a serious medical condition. Workers previously fully acclimatized are at risk for heat illness during a heat wave because during a heat wave, the body does not have enough time to adjust to a sudden, abnormally high temperature or other extreme conditions. The onset of heat illness may be confused with other problems and may not always be obvious before it becomes life-threatening. Therefore, the following extra measures may be required to prevent and/or respond to heat illness.

- **Alertness to the Weather** – Make sure to monitor the weather and the specific locations where work activities are occurring. Continue to stay updated throughout the work shift on the changing air temperatures and other environmental factors. Use current weather information to make the appropriate adjustments in work activities throughout the workday.
- **Extra Vigilance** – Apply real-time communication and the "Buddy System" to account for the whereabouts of employees at more frequent intervals throughout the work shift and at the end of the work shift.
- **Additional Water Consumption** – Encourage employees to drink small quantities of water more frequently, and have effective replenishment measures in place for provision of extra drinking water to ensure available supplies.

- **Additional Cooling Measures** – Other alternative cooling measures may be necessary in addition to shade (e.g., allowing employees to spend time in air conditioned places or having them spray themselves with water).

- **Additional and/or Longer Rest Breaks** – Allowing employees to take more frequent and longer breaks may be necessary.

- **Change of Work Scheduling and Assignments –** One or more of the following additional measures may be necessary:

  — Start the work shift earlier in the day or later in the evening.

  — Cut work shifts short or stop work altogether.

  — Bring in more personnel to accommodate longer, more frequent breaks as necessary to meet production requirements.

  — Reduce the severity of work by scheduling slower paced, less physically demanding work during the hot parts of the day, and the heaviest work activities during the cooler parts of the day (early morning or evening).

9.0 Establish Emergency Response

Specific procedures to be followed for heat related emergency response shall be established and documented in the HASP.

10.0 Variation to the Heat Illness Prevention and Monitoring Program

Before deviation from the requirements of this document, a designated manager shall authorize the variation. The exception process does not need to be followed for variations that impose more stringent requirements that those outlined in this document.

11.0 Disclaimer

This safe work practice (SWP) is the property of Tetra Tech, Inc. (Tetra Tech). Any reuse of the SWP without Tetra Tech's permission is at the sole risk of the user. The user will hold harmless Tetra Tech for any damages that result from unauthorized reuse of this SWP. Authorized users are responsible for obtaining proper training and qualification from their employer before performing operations described in this SWP.

Revision Date	Document Authorizer		Revision Details
	Name	Approval Date	
4/27/2011	Chris McClain	4/27/2011	Update from 1998 format

This safe work practices (SWP) describes situations where cold stress is likely to occur and discusses procedures for the prevention and treatment of cold-related injuries and illnesses. Cold conditions may present health risks to employees during field activities. The two primary factors that influence the risk potential for cold stress are temperature and wind velocity. Wetness can also contribute to cold stress. Other factors that increase susceptibility to cold stress include age (very young or old), smoking, alcohol consumption, fatigue, and wet clothing. Hypothermia can occur at temperatures above freezing if the individual has on wet or damp clothing or is immersed in cold water. The combined effect of temperature and wind can be evaluated using a wind chill index as shown in Table 1.

Bare flesh and body extremities that have high surface area-to-volume ratios such as fingers, toes, and ears are most susceptible to wind chill or extremely low ambient temperatures. Because cold stress can create the potential for serious injury or death, employees must be familiar with the signs and symptoms and various treatments for each form of cold stress. Table 2 provides information on frostbite and hypothermia, the two most common forms of cold-related injuries.

1.0 Training

Training is an essential component of cold stress prevention. Employees are taught to identify and treat cold-related injuries during various mandatory training events such as, but not limited to, the 8-hour HAZWOPER refresher, site-specific training, tailgate meetings, and first aid training courses.

2.0 Cold stress assessment

If a worker is or may be exposed to cold stress conditions, employees should conduct a cold stress assessment to determine the potential for hazardous exposure of workers. The first step in a cold stress assessment is to determine the areas, occupations, or tasks that place workers at risk of hypothermia or cold-related injuries. Consider factors such as the following:

- Areas with an equivalent chill temperature (ECT) below 19.4°F (see below)
- Fine dexterity tasks that require work with bare hands
- Contact with metal surfaces or use of evaporative liquids (gasoline, alcohol, or cleaning liquids)
- Working on or near bodies of water

- Areas about which employees have expressed concern

Once the areas or tasks that should be monitored are determined, the risk of developing hypothermia or a cold-related injury should then be evaluated. A cold stress assessment shall include determining the air temperature (below 45ºF) and wind speed (to determine the "equivalent wind chill temperature"). This information is available by obtaining weather, temperature, and wind information from a local weather source, or if there is a monitoring station close to the area in which the work is to be conducted. The site safety officer (SSO) shall check temperature, wind speed, and the conditions of the worker every hour to determine appropriate controls.

Wind chill is a concern when the equivalent chill temperature is less than 19.4°F (See Table 1). The conditions when this occurs are:

- The air is calm and the temperature falls below 19.4°F
- The wind speed is 5 mph or greater and the air temperature is 23°F
- The wind speed is 10 mph or greater and the air temperature is 32°F
- The wind speed is 20 mph or greater and the air temperature is 41°F

As part of the risk assessment, the potential for worker exposure to artificially generated air velocities should also be considered, for example when working in walk-in refrigerators and freezers, when riding all-terrain vehicles or snowmobiles, or when exposed to helicopter rotor downwash.

A general assessment of contact cooling for exposed skin, particularly the hands, should consider the following when workers are in contact with metal:

- Below 59°F - Prolonged contact may impair dexterity.
- Below 44°F - Prolonged contact may induce numbness.
- Below 32°F - Prolonged contact may induce frostnip or frostbite.
- Below 19.4°F - Brief contact with may induce frostnip or frostbite.

For materials other than metal, such as plastics and wood, the temperatures will be lower than those noted above since they are less conductive than metal. Contact with metal or other like-conductive materials should be avoided if possible. Any contact with liquids at subzero temperature is also of concern and should be avoided if possible.

Workers should be provided with gloves or other method of warming the hands when the air temperature is below:

- 61°F for sedentary work
- 39°F for light work
- 19.4°F for moderate work

3.0 Cold Exposure Control Plan

If a worker is or may be exposed to cold stress conditions, the employer shall assign a buddy system and develop and implement a cold exposure control plan on site. Some specific components of the cold exposure control plan, as they relate to education and training of workers are described below.

3.1 Control Plan Education and training

This element should contain initial and ongoing training and education that will be provided to all workers who work in areas where there is a reasonable likelihood of exposure to conditions that could cause cold stress.

The training and education material provided to workers who have not previously worked in a cold stress environment should include the following information:

- Recognition of the signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur
- Recognition of impending frostbite
- Proper re-warming procedures and appropriate first aid treatment
- Proper use of clothing
- Proper eating and drinking practices
- Safe work practices appropriate to the work that is to be performed

As previously noted, those workers exposed to cold-stress environments, Tetra Tech provides refresher training and education to ensure that workers remain knowledgeable about the above-mentioned items.

3.2 Engineering controls

Tetra Tech reduces the exposure hazard of workers to thermal conditions that could cause cold stress or injury using a hierarchy of control methods: engineering controls, followed by administrative controls and, as a last resort, personal protective equipment.

Here are some examples of engineering controls Tetra Tech uses to reduce cold exposure:

- Isolate the worker from the environment, where possible.
- Use local heating for the body and especially bare hands. This may include the use of warm air jets, radiant heaters, or contact warming plates.
- Provide barricades or other structures to block air or reduce air velocities at the work location.
- Provide a designated shelter to warm up during breaks.
    - At extreme temperatures employees will be directed to the warm shelters at regular intervals, or anytime cold stress signs or symptoms develop.
    - The shelter will be the designated area to change into dry clothing
- Provide heated metal tools and equipment handles or cover them with thermal insulating materials.
- Use machine controls and tools designed so that workers do not have to remove mittens or gloves to use them.

3.3 Administrative controls

If the above action is not practicable, Tetra Tech will reduce the exposure hazard by providing effective administrative controls to reduce the exposure hazard of workers to thermal conditions that could cause cold stress or injury.

Several administrative controls Tetra Tech commonly uses to reduce worker exposure to cold stress are described below:

- Work/warm-up schedules
    - A work/warm-up schedule (see Table 3) refers to the period a worker spends working in a cold environment and the time spent in a warm area.
    - Worker acclimatization should be a major factor in determining work/rest schedules for extreme cold (ECT of 10°F or less)

- Scheduling and organization of work – Tetra Tech will schedule tasks so as to minimize the length of time of exposure and to maximize the temperatures to which workers may be exposed. For example:
    - Schedule tasks for the warmest part of the day or when the wind is the most calm.
    - Minimize standing or sitting still for long periods in cold conditions (ECT of 10ºF or less).
    - Identify employees with conditions and risk factors which could contribute to cold stress
        - Require more frequent work/warm up schedule, mandatory insulated clothing, and establish a "buddy system".
        - These individuals shall be excluded from work in temperatures of 30ºF or below.
    - Schedule routine maintenance and repair work for warmer seasons of the year.
    - Postpone non-urgent tasks when equivalent chill temperatures are in the "great danger" portion of the "Cooling Power of Wind" ACGIH table (Table 1).
    - Take the equivalent chill temperature (Table 1) into account when planning or scheduling work activities.
    - Warm shelters are made available when work is performed continuously in cold weather with an ECT at or below 20° F
- Fluid replacement and diet
    - An ample supply of warm drinks and/or soup should be available, and workers encouraged to drink them in order to replace fluids lost through breathing and perspiration.
    - Workers should restrict their intake of coffee because of diuretic and circulatory effects.
    - A diet high in fats and carbohydrates will help to maintain body temperature.
- Appropriate measures such as warm vehicles/shelters, clothing and blankets will be available for cold related injuries.
- Heavy work shall not be assigned as to cause heavy sweating that will result in wet clothing.
-

Employees should be thoroughly cognizant of the signs and symptoms of frostbite and hypothermia (see Table 3) in themselves as well as in coworkers. All instances of cold stress should be reported to the site safety coordinator. If a worker exposed to cold shows signs or reports symptoms of cold stress or injury, the worker must be removed from further exposure

and treated by an appropriate first aid attendant, if available, or a physician. Work schedules may be adjusted and warm-up regimes imposed as needed to deal with temperature and wind conditions. Continuous skin exposure is not permitted when air speed and temperature results in an Equivalent Chill Temperature (ECT) of 25°F (32°C)

3.4 Personal Protective Equipment

If the above actions are not practicable, Tetra Tech will reduce the exposure hazard by providing effective PPE to reduce the exposure hazard of workers to thermal conditions that could cause cold stress or injury.

Several examples of PPE Tetra Tech commonly uses to reduce worker exposure to cold stress are described below:

- Protecting of exposed skin surfaces with appropriate clothing (such as face masks, handwear, and footwear) that insulates, stays dry, and blocks wind;
- Using adequate insulating clothing to maintain a body core temperature of above 98.6° F (36 °C);
- Providing extra insulating clothing on site in case of extreme temperature drops within a single shift;
- If an employee's clothing becomes wet while working below 40°F, he or she will automatically be given a change of clothing and checked for cold stress symptoms.
- Additional cold weather clothing will be identified for individuals with predisposed conditions that contribute to cold stress situations;

TABLE 1
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE

The ACGIH criteria, in the Fahrenheit scale, are listed in the following table as it appears in "Cold Stress" portion of the 2011 Threshold Limit Values and Biological Exposure Indices (or most current). The table shows the cooling power of wind on exposed flesh. If there is a wind, use the wind speed in the first column and the actual temperature across the top to find what the equivalent temperature would be under calm conditions.

Estimated wind speed (in mph)	**Actual temperature reading** (degrees Fahrenheit)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent chill temperature (degrees Fahrenheit)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speeds greater than 40 mph have little additional effect	**LITTLE DANGER** In < 1 hour with dry skin. Maximum danger of false sense of security.				**INCREASING DANGER** Danger from freezing of exposed flesh within one minute.				**GREAT DANGER** Flesh may freeze within 30 seconds.			
	Trench foot and Immersion foot may occur at any point on this chart.											

Note: Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36 C (96.8 F) per cold stress TLV.

TABLE 2
TWO OF THE MOST COMMON COLD STRESS CONDITIONS

Condition	Causes	Signs and Symptoms	Treatment
Frostbite	Freezing of body tissue, usually the nose, ears, chin, cheeks, fingers, or toes	• Pain in affected area that later goes away • Area feels cold and numb • Incipient frostbite (frostnip) - skin is blanched or whitened and feels hard on the surface • Moderate frostbite - large blisters • Deep frostbite - tissues are cold, pale, and hard	• Move affected worker to a warm area • Immerse affected body part in warm (100 to 105 °F) water—not hot! • Handle affected area gently; do not rub • After warming, bandage loosely and seek immediate medical treatment
Hypothermia	Exposure to freezing or rapidly dropping temperatures	• Shivering, dizziness, numbness, weakness, impaired judgment, and impaired vision • Apathy, listlessness, or sleepiness • Loss of consciousness • Decreased pulse and breathing rates • Death	• Immediately move affected person to warm area • Remove all wet clothing and redress with loose, dry clothes • Provide warm, sweet drinks or soup (only if conscious) • Seek immediate medical treatment

TABLE 3
WORK/WARM-UP SCHEDULE FOR A 4-HOUR SHIFT

A WORK/WARM-UP SCHEDULE IS AN EXAMPLE OF AN ADMINISTRATIVE CONTROL. THE ACGIH STANDARD CONTAINS A WORK/WARM-UP SCHEDULE FOR A 4-HOUR SHIFT FOR WORKERS WHO ARE PROPERLY CLOTHED.

Table 3 TLVs Work/Warm-up Schedule for Outside Workers based on a Four-Hour Shift*

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°F (approx)	°C (approx)	Max. work Period	No. of Breaks**	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-15° to -19°	-26° to -28°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-20° to -24°	-29° to -31°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25° to -29°	-32° to -34°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-30° to -34°	-35° to -37°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-35° to -39°	-38° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
-40° to -44°	-40° to -42°	30 min.	5	Non-emergency work should cease							
-45° & below	-43° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: (1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1,750 W/m2; (2) all non-emergency work should have ceased at or below a wind chill of 2,250 W/m2. In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

Revision Date	Document Authorizer		Revision Details
	Name	Approval Date	
2/7/2012	Chris McClain Denny Cox	2/7/2012	Update from 2008 format

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), construction health and safety plan (C-HASP), job safety analyses (JSAs), activity hazard analyses (AHAs), or other health and safety project planning documents on a case-by-case basis.

During preparation for site work, the document 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 document 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.

Revision Date	Document Authorizer	Revision Details
10/1/2008	Chris McClain	Update from 1998 format

1.0 PURPOSE

Numerous types of injuries can result from unsafe or improper handling and storing of materials. Workers should be able to recognize the methods for eliminating—or at least minimizing—the occurrence of such incidents. Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.

This Health and Safety Safe Work Practice (SWP) describes the potential hazards of handling materials and provides information on training, education, and applying general safety principles that will help reduce workplace accidents involving moving, handling, and storing of materials.

2.0 POTENTIAL HAZARDS FOR WORKERS

Workers frequently cite the weight and bulkiness of objects that they lift as major contributing factors to their injuries. Bending, twisting, and turning were the more commonly cited movements that caused back injuries. Other hazards include falling objects, improperly stacked materials, and the potential for injury from the use of various types of equipment.

Potential injuries that can occur when manually moving materials include:

- Strains and sprains from lifting loads improperly or from carrying loads that are too large or too heavy.
- Fractures and bruises caused by being struck by materials or by being caught in pinch points.
- Cuts and bruises caused by falling materials that have been improperly stored or by incorrectly cutting ties or other securing devices.

In addition, mechanical handling equipment operation can present hazards. Refer to the Tetra Tech Health and Safety Safe Work Practices (SWP) 05-45; Forklift Safety and SWP 05-37 Critical Lift Safe Practices for information on the training components and safe work practices for operating forklifts and working around cranes.

3.0 PRECAUTIONS WHEN MOVING, STACKING AND WORKING WITH STORED MATERIALS

This section describes the precautions workers should take when manually or mechanically moving materials, when stacking materials, and when working with stored materials. In addition, a number of material handling tools are posted online in the toolkit section including 1) Body Strain Risk Worksheet, 2) Back Checklist – Lifting and Material Handling Guide, and 3) Strain Prevention Behavior Checklist. For critical lifts requiring rigging refer to the Tt SWP 05-37; Critical Lifts.

3.1 Moving Materials Manually

Proper lifting technique is critical to back safety, but proper planning may be even more important. Before you lift that box, tool, or piece of equipment, take a moment to consider your action:

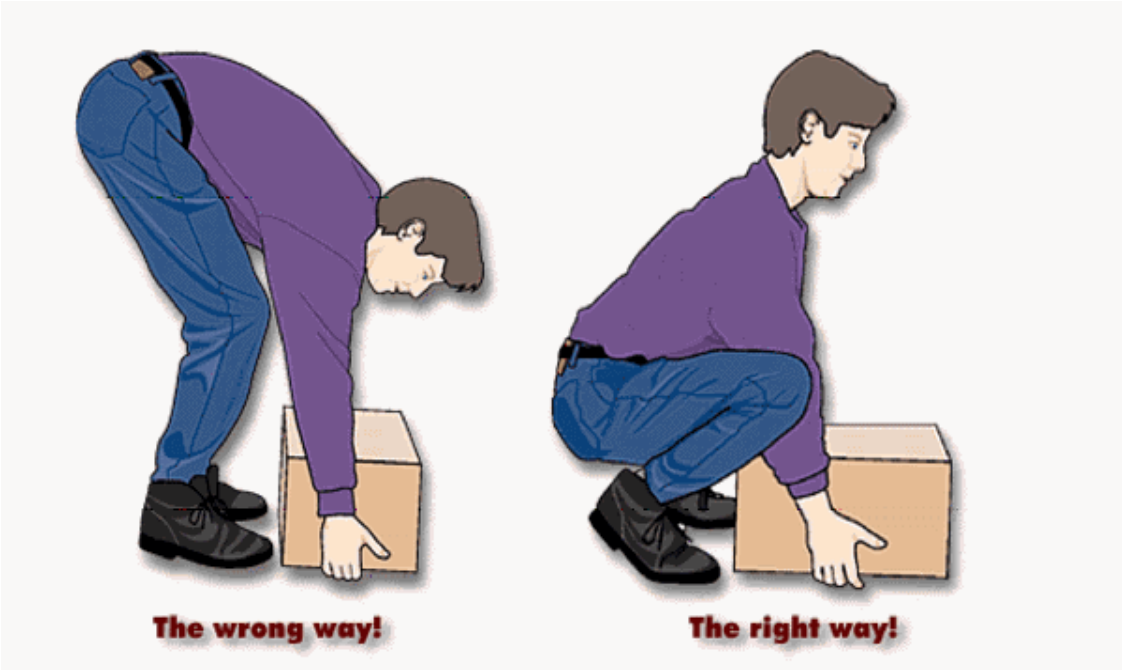
- Do you need to lift the item manually?
- How heavy is it?
- Where are you moving the item?
- Where does it have to go?
- What route do you have to follow?

Workers should always wear appropriate personal protective equipment (e.g., gloves, eye protection, steel-toed safety shoes or boots) and use proper lifting techniques when manually moving materials.

3.1.1 Proper Lifting Technique

- Wear shoes with non-slip soles.
- Clear a space around the object.
- Check your route. Make sure that the floors are not slippery and that there are no obstacles to maneuver around.
- Stand close to the object. Keep your feet apart, staggered if possible.
- Keeping your back upright, lower your body by bending your knees.
- Grip the object firmly.
- Tighten your abdominal muscles.
- Lift with a straight back, pushing with your legs for strength. Keep your head up and look straight ahead.
- Do not hold your breath.
- If you must turn - turn with your feet and your ENTIRE body. Never jerk or twist!
- Hold the object close to your body.
- Make sure you can see over the object.
- Lift and lower the load slowly and smoothly.
- Do not rely on a belt.

- If unsure about technique or weight of the object, ask for help
- If at anytime during lifting there are signs of discomfort or a problem, set down the load and get help.



3.1.2 Workers should seek help to lift items in the following circumstances:

- When a load is too heavy.
- When a load is so bulky that they cannot properly grasp or lift it.
- When they cannot see around or over a load.
- When they cannot safely handle a load.

3.1.3 Follow these procedures to prevent injury from oversize loads:

- Always practice safe lifting techniques
- Position yourself as close to the load as possible when moving an item from a hard-to-reach place. Slide it out to get it closer, and be sure that you have adequate room for your hands and arms.
- Provide sufficient headroom under overhead installations, lights, pipes, and sprinkler systems.

- Be aware of adjacent obstructions, on either side or above the load. Think about where the item will be placed once you've lifted it. Will it be overhead? Under an overhang? In a narrow spot?
- Allow as much room as possible to set the load down. You can always shift it slightly later.
- Check your path from place to place. Remove tripping hazards.
- Make sure that the lighting is sufficient to see where you are going. Stabilize uneven or loose ground, or choose an alternate route. The shortest way isn't always the fastest, or the safest.
- When loading or unloading equipment or materials from a pickup truck, always do so from the back end with the tailgate down. Do not lift anything over the sides of the bed and never stand on the tires to gain access.
- When possible, attach handles or holders to loads and use blocking materials to manage loads safely. When placing blocks under a raised load, be sure that the load is not released before you can remove your hands from under the load. Blocking materials and timbers should be large and strong enough to support the load safely. Do not use materials with rounded corners, cracks, splintered pieces, or dry rot.
    - Handle only stable or safely arranged loads.
    - When using mechanical help, remember to push, not pull – you'll have more control and greater leverage.
    - Fasten the load to the equipment so sudden stops or vibrations don't jar it off.

3.2 Moving Materials Mechanically

Use mechanical help – a dolly, hand truck, or forklift – wherever possible. However, keep in mind that using mechanical equipment to move and store materials may increase the potential for employee injuries due to hazards associated with the equipment being used. Follow these general safety rules.

- Let the weight, size, and shape of the material being moved dictate the type of equipment used. All materials-handling equipment has rated capacities indicating the maximum weight the equipment can safely carry and the conditions under which it can handle the weight. The department or project manager must ensure that the capacity is displayed on each piece of equipment and that it is not exceeded.
- Do not place extra weight on the rear of a counterbalanced forklift to allow an overload.

- Center the load on the platform as close to the support as possible to minimize the potential for tipping over or the load to fall.
- Adjust the load to the lowest position when traveling.
- Follow the equipment manufacturer's operational requirements.

3.3 Stacking Materials

Stacking materials can be dangerous if workers do not follow safety guidelines. Falling materials and collapsing loads can crush or pin workers, causing injury or death. To help prevent injuries, follow these general safety rules:

- Consider the need for availability of the material.
- Paint walls or posts with stripes for quick reference of the maximum stacking heights.
- Ensure that stacks are stable and self-supporting.
- Stack bags and bundles in interlocking rows to keep them secure.
- Step back the layers and cross-key bags at least every 10 layers. To remove bags from the stack, start from the top row first.
- Band or secure boxed materials with crossties or shrink plastic fiber.
- Do not store pipes and bars in racks that face main aisles, where it may create a hazard to passersby when supplies are removed.

3.4 Avoiding Storage Hazards

Workers must be aware of the height and weight of stored materials, their accessibility, and the condition of the containers where the materials are being stored. To prevent creating hazards when storing materials, the following guidelines should be used:

- Keep storage areas free from materials that could cause tripping, fires, explosions, or that may harbor rats or other pests.
- Place stored materials inside buildings that are under construction and at least 6 feet from hoist ways, or inside floor openings and at least 10 feet away from exterior walls.
- Separate materials that are not compatible (refer to SWP 05-13; Flammable Hazards and Ignition Sources).

4.0 OTHER IMPORTANT SAFETY MEASURES

Injuries from handling and storing materials may be reduced by adopting sound ergonomics practices, taking general fire safety precautions, keeping aisles and passageways clear and using ladders safely. Managers are expected to periodically evaluate current work station configurations

and employees' work techniques to assess the potential for and prevention of injuries. Injuries caused by improper lifting will be inviestigated in accordance with Tetra Tech DCN 02-02 Incident Reporting and Investigation Program. Investigatvive findings will be incorporated into work procedures to avoid future injuries. The following general guidelines are provided to aid managers and workers in these areas.

4.1 Ergonomics

Ergonomics (the study of work) is based on the principle that the job should be adapted to fit the person rather than forcing the person to fit the job. Workplace conditions should be restructured or changed to make the job easier and reduce stressors that cause musculoskeletal disorders. Ergonomic principles may require reducing the size or weight of the objects lifted, installing a mechanical lifting aid, or changing the height of a pallet or shelf. Although no lifting approach completely eliminates back injuries, a substantial number of injuries can be prevented by implementing sound ergonomic practices and by training employees in appropriate lifting techniques.

Not all back injuries are a result of sudden trauma; most are of a cumulative type, where a repeated minor injury has flared up, continued use of a heavy tool in the same position has caused pain, or a great deal of time is spent in the same position.

4.2 Fire Safety

Flammable and combustible materials must be stored according to their fire characteristics. Flammable liquids, for example, must be separated from other material by a firewall. Other combustibles must be stored in an area where smoking and using an open flame or spark-producing device is prohibited. Dissimilar materials that are dangerous when they come into contact with each other must be stored apart.

4.3 Aisles and Passageways

Allow sufficient clearance of aisles at loading docks, through doorways, at turning points, and in other parts of the workplace when mechanically moving materials. Providing sufficient clearance will prevent workers from being pinned between the equipment and fixtures, such as walls, racks, posts, or other machines. Sufficient clearance will also prevent the load from striking an obstruction and falling on an employee.

Ensure that passageways remain clear of obstructions and tripping hazards. Do not store materials in excess of supplies needed for immediate operations in aisles or passageways.

5.0 TRAINING AND EDUCATION

OSHA recommends that employers establish a formal training program to teach workers to recognize and avoid materials handling hazards. Training of Tt personnel on this topic will be implemented through the issuance of this SWP and periodic discussion of the topic during monthly health and safety meetings, as well as during pre-project and tailgate safety meetings. The training should reduce workplace hazards by emphasizing the following factors:

- Avoidance of unnecessary physical stress and strain.
- Awareness of what a worker can comfortably handle without undue strain.
- Proper use of equipment.
- Recognition of potential hazards and how to prevent or correct them.
- Prevention of back injuries

Prevention of back injuries should receive special emphasis because of the high incidence of back injuries. Training on proper lifting techniques should cover the following topics:

- Health risks of improper lifting vs. the benefits of proper lifting.
- Body strengths and weaknesses and determining one's own lifting capacity.
- Physical factors that might contribute to an accident.
- Safe postures and timing for smooth, easy lifting.
- Warning signals from your body to watch for when lifting.

Revision Date	Document Authorizer Name	Revision Details
11/27/2013	Chris McClain	Update from 1998 format