

CATEGORY <b>Health and Safety</b>	PROJECT <b>Rocky Mountain Arsenal</b>		Project: Plan <b>HS-001-RMA (Rev. 12)</b>
TITLE <b>Health and Safety Plan for the Program Management Contract</b>		LEGEND R-INDICATES REVISION	DATE <b>05/27/2010</b> Revised
		APPROVED BY	REPLACES ISSUE OF <b>12/31/2008 (Rev. 11)</b>

**Purpose**

The purpose of this Health and Safety Plan (HASP) is to define the health and safety-related planning process, requirements, and procedures to be used for the safe and compliant execution of work conducted under the Program Management Contract (PMC) at the Rocky Mountain Arsenal (RMA).

**Responsible Contact**

Steve Aldridge

**Tetra Tech EC, INCORPORATED**

**ROCKY MOUNTAIN ARSENAL**

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## FIGURES

- 1-1 Incident Prevention Plan
- 1-2 PMC Voluntary Protection Program Poster
- 2-1 PMC Line Management and Safety Organizational Structure
- 3-1 RMA Site Map
- 4-1 Health and Safety Field Change Request Form
- 4-2 Activity Hazard Analysis
- 5-1 Access Areas/ Tour Map
- 7-1 Anticipated Site Monitoring Requirements for Remedial Implementation Projects
- 7-2 Daily Site Monitoring Report Form
- 7-3 Air Monitoring Data Sheet
- 7-4 Heat Stress Physiological Monitoring Form
- 7-5 Air Monitoring Calculations
- 8-1 Typical Site Zone Layout
- 8-2 Typical Signage for Contaminated Areas
- 8-3 Typical Signage for Other Controlled Areas
- 9-1 Typical Decontamination Area Layout
- 10-1 Typical Hand Signals
- 11-1 Emergency Data Sheet
- 12-1 Example Personnel Training Tracking Form
- 12-2 Record of 3-Day Supervised Field Experience
- 13-1 Daily Safety Meeting Sign-In Sheet
- 14-1 Site EHS Inspection Form
- 14-2 Safety Observations of the Day Form and Guidelines
- 15-1 Event Report Form
- 15-2 Event Investigation Report Form
- 15-3 Event Report and Investigation Instructions
- 16-1 Hot Work Permit Form
- 16-1a Multiple-Day Hot Work Permit Post-Work Fire Watch Verification
- 16-2 Daily Excavation Inspection Checklist
- 16-3 Energized Electrical Work Permit
- 16-4 Example Lockout/ Tagout Permit Form
- 16-5 Confined Space Pre-Entry Briefing Checklist
- 16-6 Confined Space Entry Permit Form
- 16-7 Line Breaking Checklist

## TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	PROJECT ORGANIZATION AND RESPONSIBILITIES .....	6
3.0	SITE HISTORY AND CONTAMINANTS.....	11
4.0	TASK-SPECIFIC HEALTH AND SAFETY PLANS .....	14
5.0	POTENTIAL SITE HAZARDS AND CONTROLS .....	17
6.0	PERSONAL PROTECTIVE EQUIPMENT .....	26
7.0	SITE MONITORING.....	28
8.0	SITE CONTROL.....	42
9.0	DECONTAMINATION, CLEANING AND DISPOSAL.....	47
10.0	COMMUNICATIONS.....	50
11.0	MEDICAL SURVEILLANCE AND QUALIFICATION .....	53
12.0	WORKER TRAINING AND QUALIFICATION .....	56
13.0	SAFETY MEETINGS .....	62
14.0	INSPECTIONS.....	62
15.0	EVENT REPORTING AND INVESTIGATION .....	67
16.0	SITE SAFETY PROCEDURES.....	74
17.0	EMERGENCY RESPONSE ACTION PLAN.....	100
18.0	RECORDS AND REPORTS .....	107
19.0	REFERENCES.....	114

## APPENDICES

- A Task-Specific Health and Safety Plan Format
- B Activity Hazard Analysis Format

## TABLES

- 5-1 Properties of the Primary Contaminants of Concern
- 7-1 Screening Criteria for Heat Stress Exposure (Acclimatized Workers)
- 7-2 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers
- 7-3 Physiological Measurements and Actions

- 16-8 Construction Equipment/Vehicle Inspection Checklist
- 16-9 Critical Lift Plan
- 16-9a Critical Lift Plan Attachment A
- 16-10 ZIP SLIP Form
- 17-1 Emergency Action Drill Critique and Follow-up Form
- 18-1 Weekly Safety Report Cover Sheet
- 18-2 Emergency and Hazardous Chemical Inventory Report Form
- 18-3 Field Team Review of HASP

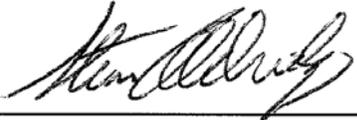
### ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos-Containing Material
Adcom 911	Adams County Communication Center, Inc.
AHA	Activity Hazard Analysis
APR	Air Purifying Respirator
BAS	Biological Advisory Subcommittee
bpm	beats per minute
CCG	Construction Coordination Group
CDL	Commercial Driver's License
CER	Community Emergency Responder
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
CRA	Central Remediation Area
CRZ	Contamination Reduction Zone
CWM	Chemical Warfare Materiel
dba	Decibels, A Scale
ELF	Enhanced Hazardous Waste Landfill
EPA	U.S. Environmental Protection Agency
ESQ	Environmental Safety and Quality
ESQSC	Environmental Safety and Quality Steering Committee
EZ	Exclusion Zone
FCR	Field Change Request
HASP	Health and Safety Plan
HQ	Hazard Quotient
HSS	Health and Safety Supervisor
ICP	Integrated Contingency Plan
IPP	Incident Prevention Plan
IRA	Interim Response Action
LL	Lessons Learned
MEC	Munitions and Explosives of Concern
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P1	Priority 1
PAI	Permit Authorizing Individual

PEL	Permissible Exposure Limit
PMC	Program Management Contract(or)
PPE	Personal Protective Equipment
RCWM	Recovered Chemical Warfare Materiel
RER	Residual Ecological Risk
RMA	Rocky Mountain Arsenal
ROC	Rocky Mountain Arsenal Operations Center
ROD	Record of Decision
ROSC	RMA On-Scene Coordinator
RQ	Reportable Quantity
RVO	Remediation Venture Office
SOP	Standing Operating Procedure
SQI	Submerged Quench Incinerator
SZ	Support Zone
THASP	Task-Specific Health and Safety Plan
TLV	Threshold Limit Value
TRER	Terrestrial Residual Ecological Risk
TSD	Treatment, Storage and Disposal
TtEC	Tetra Tech EC, Incorporated
TWA	Time-Weighted Average
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
VPP	Voluntary Protection Program(s)
WBGT	Wet Bulb Globe Temperature
WNV	West Nile Virus
ZIP	Zero Incident Performance

**APPROVALS**

This HASP has been reviewed and accepted for work at RMA.

<i>Title/Organization</i>	<i>Printed name:</i>	<i>Signature:</i>	<i>Date:</i>
PMC Program Manager	Thomas B. Kivett		6/4/10
PMC Health and Safety Manager	Steve Aldridge		6-4-10

## **1.0 INTRODUCTION**

### **1.1 Purpose**

The purpose of this Health and Safety Plan (HASP) is to define the health and safety-related planning process, requirements, and procedures to be used for the safe and compliant execution of work conducted under the Program Management Contract (PMC) at the Rocky Mountain Arsenal (RMA).

### **1.2 Scope**

This HASP covers activities conducted under the PMC, including site support operations, clean construction work and activities that fall under the scope of the Occupational Safety and Health Administration (OSHA) Standards for Hazardous Waste Operations and Emergency Response, Title 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65.

The HASP applies to all personnel who wish to gain access to active field worksites managed by the PMC, including, but not limited to, the following:

- PMC employees (Tetra Tech EC, Inc. [TtEC], Kellogg Brown and Root, Golder Associates, and Ensicon) PMC Subcontractors and lower-tier subcontractors
- Remediation Venture Office (RVO) employees, representatives, and Subcontractors
- Federal, state, or local government or community representatives

For field projects that do not involve hazardous waste or meet the scope of 29 CFR 1910.120 and have low risk (such as siting studies; wetland, biota, soil/geotechnical or cultural resource surveys; stream water quality sampling, etc.), an abbreviated EHS Plan, also called an Incident Prevention Plan (IPP) is usually sufficient. Figure 1-1 provides a template for IPPs.

Projects for which an IPP is appropriate are often of limited scope, budget and duration, but may take place in remote areas and involve significant off-road driving, hiking, or the use of all-terrain vehicles or boats. There is also the potential for encounters with wildlife and exposure to dangerous weather conditions. The IPP must address these risks, including training for using off-road vehicles, how to maintain contact, and emergency procedures.

All plans should address site emergency response and actions as directed in Section 17, Emergency Response Action Plan, or provide a separate emergency action plan. Figure 11-1 Emergency Data Sheet is provided (voluntary) for use when an injury or event occurs (EHS 3-2 Procedures - Environmental, Health & Safety Plan(s)).

In general, all sections of this HASP are applicable to on-site or off-site, fieldwork and site support operations under the PMC, unless a specific exemption is made and worker safety is maintained. Specific exemptions are made in the Subcontractor Health and Safety Requirements section of subcontracts, the Task-Specific Health and Safety Plan (THASP) process (Section 4), or as authorized by the PMC Health and Safety Manager.

### 1.3 Approach to Safety

The PMC safety culture begins with *Zero Incident Performance (ZIP)* as an expectation and promotes continuous improvement in safety performance. ZIP means error-free execution of our work: no injuries, illnesses, property damage, or adverse community or environmental impacts. ZIP does not happen by chance—it is achieved through the integration of safety into all management systems, the project process, and by individual effort. The PMC believes that all events are preventable.

Loss control management principles provide the framework for integrating our safety culture and values into the execution of our work. Health and safety programs, plans, and procedures define the applicable safety requirements and clearly specify the performance and behavior expected from each PMC and Subcontractor employee. Training is provided and/or required to ensure an understanding of the requirements. Communications, awareness, and recognition reinforce the training effort and provide motivation for the achievement of safety excellence. Monitoring and evaluation of PMC and Subcontractor safety performance provides feedback on the effectiveness of the overall safety program and results in continuous safety program improvement through implementation of Lessons Learned (LL).

This programmatic approach to safety establishes a work environment in which safety is a prerequisite and employee work practices reflect the RVO/PMC safety culture.

### 1.4 Voluntary Protection Program

The PMC and PMC Subcontractors (including lower-tier subcontractors) shall implement and maintain a safety program on-site consistent with the OSHA Voluntary Protection Program (VPP) requirements and guidelines. It is recognized that safety programs which go beyond mere compliance with OSHA standards achieve better safety performance and fewer worker injuries or illnesses, and save money. The health and safety management system described and required by the PMC HASP is intended to fulfill OSHA VPP standards. Specifically, PMC and Subcontractor safety programs shall, at a minimum, include the elements described below and elsewhere in this plan.

**Management Commitment** – On-site management, supervisors, and foremen show proactive, visible leadership for the safety program. This includes active involvement in safety meetings and safety inspections, including safety concern in the planning, budgeting, and scheduling process, and recognizing or rewarding employees for participation in safety programs and practicing safe work behaviors.

**Employee Involvement** – At least three meaningful avenues for employee involvement in the safety program are provided on-site including, as a minimum, involvement in 1) safety meetings (daily or periodic, and the monthly Subcontractor safety meeting), 2) safety inspections (periodic, weekly, and/or monthly), and 3) participation in the Safety Observer program. Additional avenues for employee involvement are encouraged, such as employee development or review of the THASP and Activity Hazard Analyses (AHAs), participation in event reporting and investigation, development and presentation of safety training, participation in the ZIP SLIP program, providing input to the Environmental Safety Quality Steering Committee (ESQSC), and participation in project or department safety committees.

**Worksite Analysis** – A worksite analysis program shall be developed and maintained including safety inspections, participation in periodic health and safety reviews and assessments, worksite monitoring (physical, chemical and biological hazards), tracking and trending of events and corrective actions, and provision of adequate, qualified health and safety resources for the work.

**Hazard Prevention and Control** – A worksite free of recognized hazards must be maintained. Work shall be planned to prevent or eliminate hazards where feasible. Adequate resources must be provided to control hazards using the following hierarchy; engineering controls, work practice or administrative controls and, lastly, Personal Protective Equipment (PPE). Adequate resources must be available to abate potential hazards in a timely manner.

**Safety and Health Training** – A complete safety and health training program shall be implemented and maintained to meet regulatory requirements and ensure that employees are adequately trained to perform work safely. Employees shall be trained to applicable plans and procedures and be aware of the health and safety hazards of the work, signs and symptoms of overexposure, and ways to protect themselves from workplace hazards. Additionally, employees shall be apprised of their rights and responsibilities under the Occupational Safety and Health Act.

A summary of the on-site VPP criteria suitable for posting and training employees is provided in Figure 1-2. Additional information on VPP is available from the PMC health and safety staff and at the website <http://osha.gov/dcsp/vpp/index.html>.

## 1.5 Applicable Requirements

The PMC and each PMC Subcontractor shall comply with applicable portions of the following codes, regulations, and standards when performing work at RMA:

- Public Law 91-596, Occupational Safety and Health Act of 1970, Section 5(a)(1), “General Duty Clause”
- 29 CFR 1910, General Industry Safety and Health Standards
- 29 CFR 1926, Construction Industry Safety and Health Standards
- 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses
- 49 CFR, Department of Transportation
- 10 CFR 834 and 10 CFR 835, Occupational Radiation Protection
- DOD STD 6055.9, Department of Defense Standard, Ammunition and Explosives Safety
- AR 385-64, Department of Army Regulation, Ammunition and Explosives Safety
- DA PAM 385-64, Department of Army Pamphlet, Ammunition and Explosives Safety Standards
- AR 50-6, Department of Army Regulation, Chemical Surety
- AR 385-61, Department of Army Regulation, Army Chemical Agent Safety Program
- DA PAM 385-61, Department of Army Pamphlet, Toxic Chemical Agent Safety Standards
- National consensus standards (most recent version), incorporated by reference in 29 CFR 1910 and 29 CFR 1926, in particular, American National Standards Institute Standards, National Electric Code, and National Fire Protection Association (NFPA) Codes
- Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, Current Revision
- Other health and safety-related codes, standards, regulations, and requirements as directed by the RVO or PMC

Figure 1-1 INCIDENT PREVENTION PLAN

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR          ROCKY MOUNTAIN ARSENAL</b>	<b>INCIDENT PREVENTION PLAN</b>
--	--	---------------------------------



Project Name: \_\_\_\_\_ [Insert](#)

IPP Revision Date: \_\_\_\_\_ [Insert](#)

INCIDENT PREVENTION PLAN		
<b>1. GENERAL INFORMATION</b>		
Client Name:	Project Name:	
Project Location:	Job Number:	
Project Manager:		
<b>2. Work Scope</b>		
<b>3. PROJECT TASKS, POTENTIAL HAZARDS, AND CONTROL MEASURES (Or Attach Relevant AHA)</b>		
TASK(S)	POTENTIAL SAFETY AND HEALTH HAZARD(S)	CONTROL MEASURE(S) SUCH AS WORK PRACTICES OR PPE*
<b>4. EMERGENCY INFORMATION (Or Attach Client or other Plans that meet requirements – Ref EHS 2-1)</b>		
<ul style="list-style-type: none"> <li>• Location of emergency facilities: (Hospital, WorkCare approved Clinics – Attach phone numbers, Maps &amp; Directions)</li> <li>• Emergency notification procedures - Include phone # if not 911: _____</li> <li>• Alarm System/Types:</li> <li>• Procedure to Account for Personnel:</li> <li>• First Aid/CPR Trained Individuals Names, FA Kit location:</li> <li>• Evacuation routes and rally point(s):</li> <li>• WorkCare Phone: 800-455-6155 (24 hour)</li> <li>• Additional information: (contact Phone numbers, etc.)</li> </ul>		
<b>5. INCIDENT PREVENTION PLAN SIGNOFFS</b>		
Prepared by:	Date:	Phone #
PESM Approval:	Date:	Phone #
Project Manager Approval:	Date:	Phone #

\* PPE identified in this plan was selected in accordance with 29 CFR 1910.132 and additional TtEC requirements.



Figure 1-2 PMC Voluntary Protection Program Poster



# VOLUNTARY PROTECTION PROGRAM



**You Have a Right to a Safe and Healthful Workplace. IT'S THE LAW!**

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post the notice "You have a Right to a Safe and Healthful Workplace" in your workplace.

## Management Leadership

**Lead by example. Good managers, supervisors, and foremen 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.**

**VPP Criteria:** Set safety policy, goals, and objectives. Provide visible safety program leadership, and ensure that subcontractors participate in the safety program.

- Some areas where you can demonstrate effective management leadership for safety include:
- Follow the PMC Environment, Safety, and Quality Policy statement.
  - Promote the overall goal of ZIP through proper planning, tasking, and execution of work.
  - Proactively implement the safety program objectives (requirements) for inspections, surveillances, event reporting, safety meetings/training, and worksite monitoring.
  - 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 event reporting, investigation, corrective action - share lessons learned.
  - Include all 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.**

**VPP Criteria:** Institute at least three meaningful ways for employees to become actively involved in the safety and health program.

- Other ways to become involved in the safety program and improve work conditions include:
- Participate and give feedback through the Safety Observer Program.
  - Initiate ZIP SLIPs to report hazards, suggest improvements, and recognize safe behaviors.
  - Lead or participate in Safety Meetings (daily and periodic).
  - Participate in worksite safety inspections (weekly, monthly, quarterly, and interproject).
  - Provide input to the PMC ESQ Steering Committee or project safety committee.
  - Submit a C/PIP for a safety or health-related item.
  - Develop or review safe work procedures, AHAs, and the task-specific HASP.
  - Participate in event reports, investigations, corrective actions, and Lessons Learned.

## Worksite Analysis

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

**VPP Criteria:** Implement systems to identify and evaluate safety and health hazards and analyze injury and illness trends.

- Worksite analysis methods used at RMA to identify and evaluate potential hazards include:
- Safety inspections (daily, weekly, monthly, and quarterly)
  - Develop or review safe work procedures, AHA's, and the THASP
  - Monitoring for air quality, heat stress, noise, ergonomics and other job hazards
  - Trending of events, inspections, and surveillances
  - ZIP Bulletins, Flash Reports and Lessons Learned

## Hazard Prevention and Control

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

**VPP Criteria:** Eliminate or control safety hazards, ensure availability of qualified safety and health professionals, and plan for emergency situations.

- Important points include:
- Eliminate hazards during the design or planning stages of a project or task.
  - Control hazards by:
    - Installing and maintaining *Engineering Controls*
    - Following *Administrative/Work Practice Controls*(HASP, AHAs, and safe work procedures)
    - 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.
  - Know the RMA Emergency Response/ Integrated Contingency Plan and your task emergency plan, and participate in drills.

## Safety and Health Training

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

**VPP Criteria:** Provide effective training so that workers understand procedures, hazards, emergency situations, signs and symptoms of exposure, and ways to avoid harm.

- Safety training courses and other communications methods used at RMA include:
- New employee orientation
  - Hazardous Waste Operations (40-hr., 8-hr. refresher, 3-day field ops., and supervisory) training
  - PMC HASP and task-specific HASP training
  - First Aid/CPR certification
  - 10-hour Construction Safety training
  - ZIP Bulletins and Flash Bulletins
  - Daily safety briefings
  - Department meetings and project or task briefings



## **2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**

### **2.1 Project Organization**

This section defines the organizational roles and responsibilities for PMC-related work.

#### **2.1.1 Remediation Venture Office**

The RVO provides direction and conducts oversight of the PMC, has overall policy and issue-resolution authority, and is responsible for Regulatory Agency interactions. The RVO is comprised of personnel representing the U.S. Army Program Manager, Shell Oil Company, and the U.S. Fish and Wildlife Service (USFWS).

#### **2.1.2 Program Management Contractor**

The PMC is the integrating contractor with responsibility for implementation of the Record of Decision (ROD) and designated site support operations at RMA. The PMC conducts the following activities:

- Engineering design
- Procurement of Subcontractors for construction, demolition, remediation efforts, and site support operations
- Oversight of subcontracted activities
- Quality assurance and quality control
- Preparation of closure documentation

#### **2.1.3 Subcontractors**

The PMC Subcontractors perform tasks to safely execute the remedy, including site support operations, construction, demolition, and remediation activities.

#### **2.1.4 Line Management and Safety Support Staff**

The PMC line management and safety support staff organizational structure and reporting relationship are shown in Figure 2-1. For each project, line management has functional supervision and oversight responsibility for the assigned health and safety staff. The PMC Health and Safety Manager has administrative and technical supervision responsibilities for the health and safety staff. This reporting relationship ensures an appropriate level of health and safety staff support and an independent health and safety oversight function is provided for each implementation project and site support operations.

## **2.2 Responsibilities**

### **2.2.1 General**

Each person has a responsibility to understand how to perform assigned tasks safely, to work safely, to identify and help correct potential problems, and to stop work if an imminent danger exists. Line management has primary responsibility and accountability for planning, leading, and controlling safety performance. Health and safety personnel support line management by providing information, technical analysis, advice and assistance, and by evaluating safety performance.

### **2.2.2 Site Personnel**

All site personnel have responsibility for performing work in a safe manner as follows:

- Becoming familiar with the requirements, information, instructions, and emergency response actions contained in the PMC HASP and any applicable THASP
- Complying with all applicable health and safety rules, regulations, and procedures
- Monitoring the worksites for unauthorized personnel and unauthorized work
- Inspecting all tools and equipment, including PPE, daily, prior to and during use
- Reporting any unsafe or potentially hazardous conditions to their supervisor
- Stopping work if an “imminent danger” situation exists
- Setting an example for safe work practices and attitudes by personal action and participation

### **2.2.3 Subcontractor Project Manager**

Each PMC Subcontractor Project Manager is responsible for ensuring that work is performed in a safe manner and in accordance with approved plans. Health and safety-related responsibilities include the following:

- Ensuring that all health and safety activities identified in the PMC HASP and THASP are conducted and/or implemented
- Identifying operational changes that require modification of the THASPs or procedures, preparing a Submittal Change Request, and ensuring that modifications are made and implemented
- Enforcing health and safety rules and compliance with the PMC HASP and THASP
- Planning fieldwork that uses appropriate safe procedures, equipment, and adequately trained personnel
- Conducting routine safety inspections of their work areas and ensuring timely corrective action(s)
- Setting an example for safe work practices and attitudes by personal action and participation
- Recognizing and rewarding personnel for participation and involvement in the safety program

### **2.2.4 Project Managers**

Each PMC Project Manager is responsible for the management and execution of all work tasks issued to PMC Subcontractors. Health and safety-related responsibilities include the following:

- Developing and approving work plans and organizing the resources necessary for project execution
- Controlling the work effort to ensure conformance with plans
- Ensuring that each individual working on projects under his/her control understands the applicable HASP requirements and executes work in accordance with plans as written
- Ensuring that PMC-related fieldwork is scheduled with adequate personnel and equipment resources to complete the job safely

- Setting an example for safe work practices and attitudes by personal action and participation
- Recognizing and rewarding personnel for participation and involvement in the safety program

### **2.2.5 Program Manager**

The PMC Program Manager has overall authority and accountability for execution and performance of work. Health and safety-related responsibilities include the following:

- Overall program health and safety performance
- Ensuring implementation of the PMC HASP through coordination with the Project Managers and the PMC health and safety staff
- Conducting periodic worksite inspections
- Participating in event investigations
- Setting an example for safe work practices and attitudes by personal action and participation

### **2.2.6 PMC Subcontractor Health and Safety Personnel**

Each PMC Subcontractor is responsible for designating a Health and Safety Supervisor (HSS) to assist Subcontractor management in the implementation of health and safety requirements and to act as liaison to the PMC regarding health and safety matters. This position may be a full-time or collateral duty position as determined by the requirements of the work to be performed and specified in the Subcontract. The designated HSS shall meet the requirements of 29 CFR 1926.65(a)(3) and be knowledgeable in appropriate safety and health practices and regulations, and experienced in fulfilling health and safety staff functions for construction, hazardous waste, or site support operations as appropriate. Health and safety-related responsibilities include the following:

- Directing and coordinating health and safety monitoring and site training activities
- Ensuring that proper PPE is used by field teams
- Assisting in conducting and documenting daily safety briefings
- Monitoring compliance with the PMC HASP and THASP
- Maintaining health and safety logbooks and other required records
- Determining upgrades or downgrades of PPE and other control measures based on site conditions and/or real-time and/or integrated monitoring results
- Monitoring decontamination practices to determine effectiveness and instituting corrective actions when necessary

### **2.2.7 PMC Health and Safety Staff**

PMC health and safety staff responsibilities include the following:

- Analyzing and evaluating potential hazards of tasks and sites in support of project planning and execution
- Advising management on work plan and safety plan requirements and approaches
- Assisting management with safe work plan development and implementation
- Evaluating project performance versus requirements

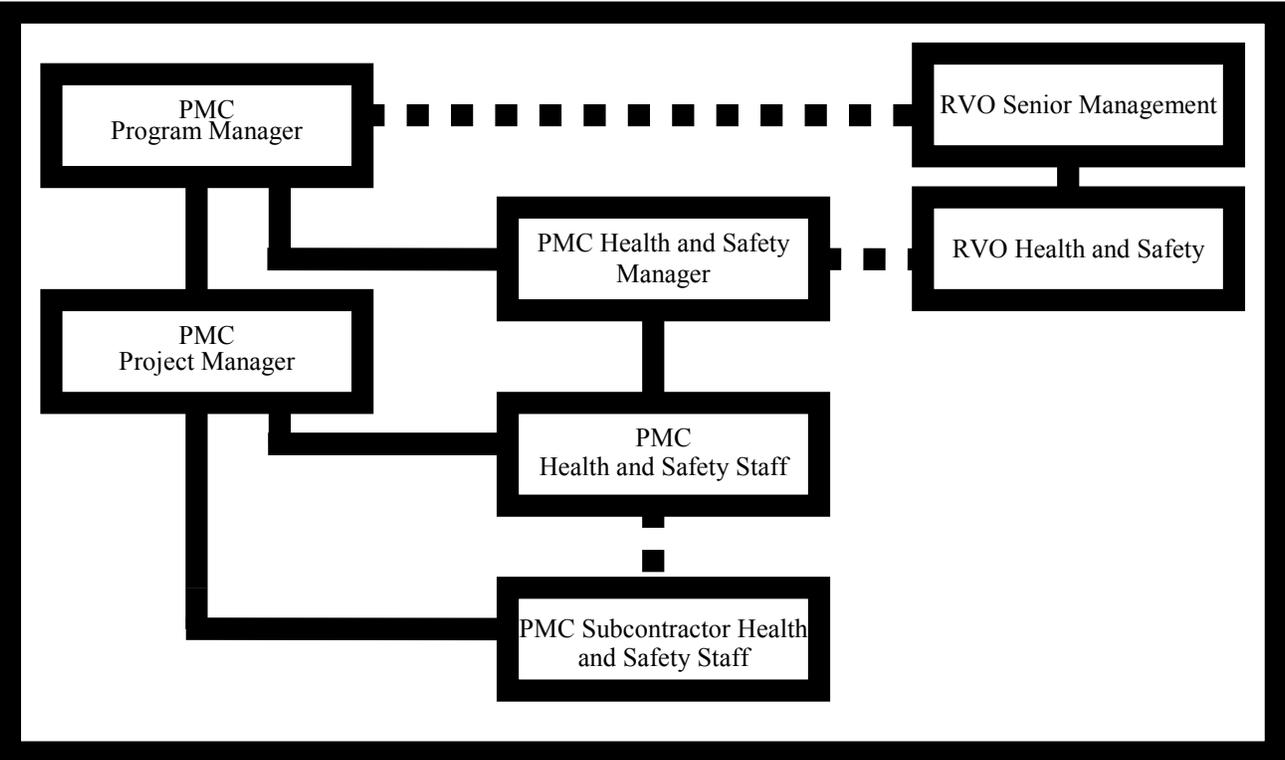
### **2.2.8 PMC Health and Safety Manager**

The PMC Health and Safety Manager is responsible for providing support to the Program Manager in implementation of the PMC Health and Safety Program, and overall technical direction and supervision of the health and safety support personnel. Health and safety-related responsibilities include the following:

- Developing and approving the PMC HASP and HASP modifications as necessary
- Serving as the primary contact to resolve complex health and safety matters
- Approving new or revised written health and safety-related procedures and safe work practice instructions
- Reviewing and approving Subcontractor THASPs
- Ensuring that each Subcontract clearly identifies the health and safety requirements for the task
- Assisting in the investigation of significant events
- Conducting periodic assessments for compliance with the PMC HASP

Figure 2-1. PMC Line Management and Safety Organizational Structure

 <p>TETRA TECH EC, INC.</p>	<p>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</p>	<p><b>PMC LINE MANAGEMENT AND SAFETY ORGANIZATIONAL STRUCTURE</b></p>
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### **3.0 SITE HISTORY AND CONTAMINANTS**

The RMA is located east of Commerce City, Colorado, approximately 10 miles northeast of downtown Denver (Figure 3-1). In 1942, at the height of World War II, the U.S. Army purchased the 17,000 acres of land on which to manufacture chemical weapons such as chemical-filled munitions, white phosphorus, and napalm. The Army continued to use the site through the early 1980s for manufacturing, maintenance, and dismantling of chemical and incendiary munitions.

To foster postwar economic growth in the area, offset operational costs, and maintain the facilities for national security, private industry was encouraged to lease facilities at RMA. Under the lease program, Julius Hyman and Company began producing pesticides in 1946. In 1952, Shell Chemical Company acquired Julius Hyman and Company and continued to produce agricultural pesticides on-site until 1982.

Currently, there are no production chemicals, chemical weapons production or chemical weapons storage at RMA. As of 2010 the 31 Implementation projects have been completed with only a few demolition task to be completed by end of the year. Most fieldwork is now considered "Clean Construction". The RVO mission is to complete the safe, timely, and cost-effective remediation and transition of the site to one of the largest urban national wildlife refuges in the United States.

### **3.1 Environmental Issues**

Wastes generated during production years at RMA were disposed using widely accepted practices of the time, including disposal of liquid wastes into unlined basins, and burning and burying solid wastes. Efforts to contain liquid wastes began soon after the discovery that contaminated groundwater caused crop damage north of RMA in the mid-1950s. In 1956, the Army built Basin F, an evaporation pond designed to store liquid wastes. Believed to be the first of its kind in the country, the 93-acre, asphalt-lined pond was capable of holding 243 million gallons of liquid wastes.

Since 1975, the Army and Shell have undertaken numerous efforts to investigate and control potentially contaminated areas at the site. Beginning in 1974, Interim Response Actions (IRAs) were designed to protect off-site human health and environment from RMA pollution. Included among the 14 IRAs was the construction and operation of four boundary and on-site groundwater treatment systems responsible for treating more than 1 billion gallons of groundwater each year. These systems will continue to operate as part of the final remedy.

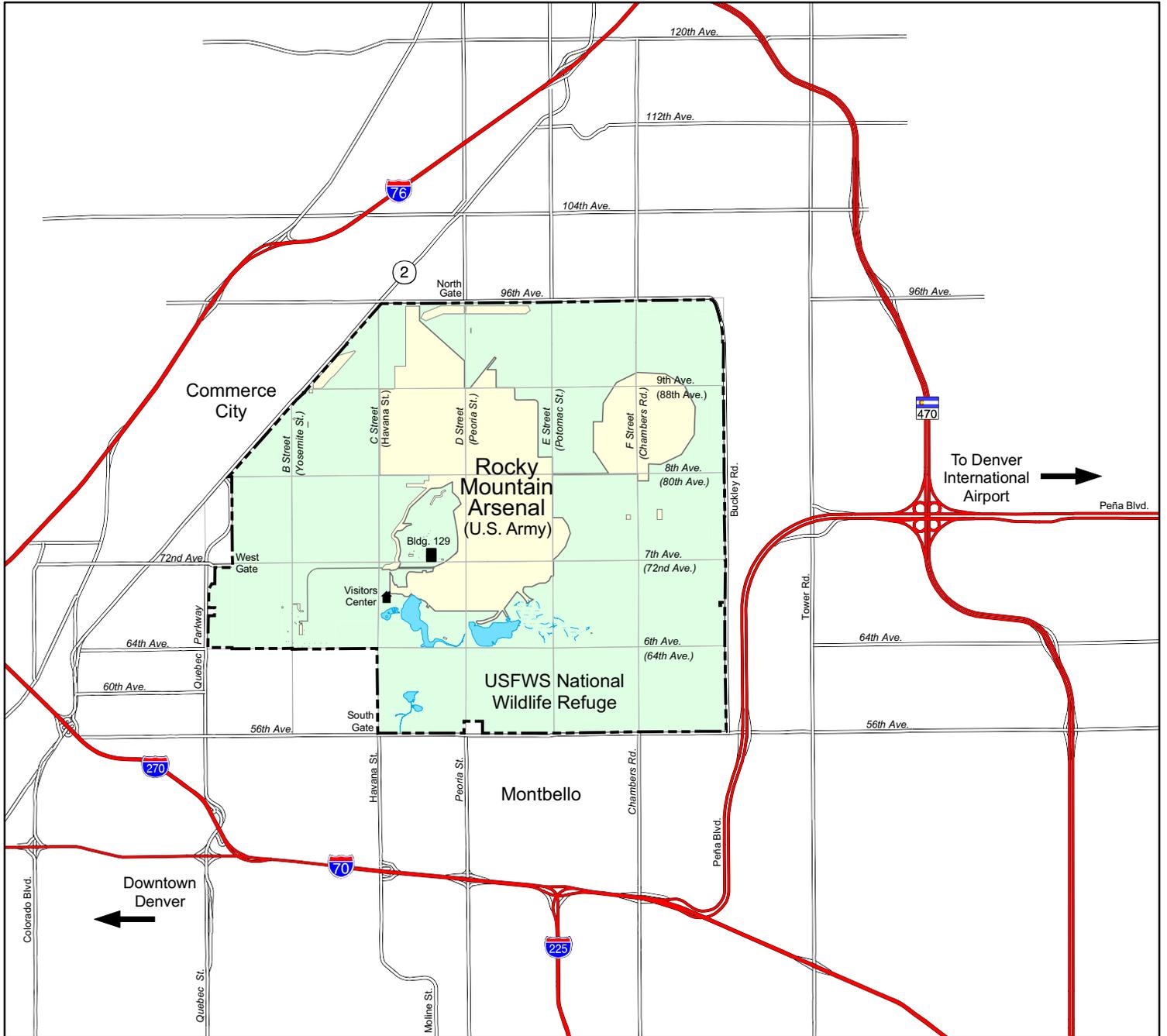
The On-Post Operable Unit (OU) addresses contamination within the fenced 26.6 square miles of RMA. In January 2003, a 1.5 square mile area of the On-Post OU was determined to meet cleanup requirements and is no longer part of the National Priority List (NPL) site. In January 2004, a second area of the On-Post OU measuring 7.9 square miles was determined to meet cleanup requirements and is no longer part of the NPL site. Additionally, in July 2006, a third area of the On-Post OU measuring 11.6 square miles was determined to meet cleanup requirements and is no longer part of the NPL site. Implementation of the remedy for the approximate 5.5 remaining square miles is ongoing and is scheduled for completion in 2011.

### **3.2 RMA Wildlife Refuge**

The USFWS involvement at RMA began in 1986 when a winter communal roost of bald eagles, then an endangered species, was discovered on-site. The USFWS soon discovered that approximately 300 wildlife species inhabit the RMA, including deer, coyotes, and owls. Under the Refuge Act, RMA has become one of more than 500 national wildlife refuges in the United States with over 12,000 acres of RMA under the management/jurisdiction of the USFWS. The goals and the vision of the USFWS were released on June 17, 1996, in the Comprehensive Management Plan, which outlines development of the Refuge. While simultaneously supporting the

environmental remediation and sustaining wildlife and their habitats, the plan allows public use of the Refuge through community outreach and educational programs.

# Rocky Mountain Arsenal Site Map



Remediation Venture  
Office

#### **4.0 TASK-SPECIFIC HEALTH AND SAFETY PLANS**

All THASPs shall be developed by the organization responsible for performing the work. When work at one site is divided into multiple projects or tasks by the PMC, one or more plans may be required. All THASPs must be reviewed and accepted by the PMC Project Management and Health and Safety Representatives prior to starting fieldwork.

As necessary, the PMC will identify any additional task-specific health and safety requirements in each Subcontract. These additional requirements, as well as the overall PMC HASP requirements, shall be addressed in the THASP.

The THASP is intended as an adjunct document to the PMC HASP that clarifies any site- or job-specific safety information or requirement not already covered in the PMC HASP. Any changes or deviations from the PMC HASP shall be noted in the THASP as a change or deviation, and the reason for the change or deviation shall be given in the THASP. Appropriate sections of the PMC HASP or other existing PMC or Subcontractor company safety programs may be referenced in the THASP as long as the requirements set forth below are met and site workers readily understand the information and/or requirements.

#### **4.1 Task-Specific Health and Safety Plan Requirements**

The THASP shall be referenced to, and meet the requirements included in, the PMC HASP, Subcontract provisions, and the applicable requirements of 29 CFR 1910 (General Industry Standards), and/or 29 CFR 1926 (Construction Industry Standards). The PMC and/or Subcontractor shall include any additional requirements or procedures deemed necessary to ensure safe completion of the work specified in the THASP. A sample THASP format is shown in Appendix A. Additions, deletions, and revisions to this format are authorized if necessary for the task.

#### **4.2 Changes to Task-Specific Health and Safety Plans**

Changes/additions to the THASP shall be documented and accepted by using the Health and Safety Field Change Request (FCR) form shown in Figure 4-1 or by resubmitting for acceptance a revised THASP. The organization performing fieldwork is responsible for maintaining the THASP current and initiating an FCR as necessary. A revised THASP should be produced when a large number of changes (e.g., 15 or more not including AHAs) using FCRs has been employed. The PMC Project Manager and supporting PMC Health and Safety Representative shall be responsible for the review and acceptance of the FCR. Field Change Requests are not required for safety-related changes that a HSS would normally make in the field, such as upgrade or downgrade to PPE within preestablished action levels, expansion or reduction of work control zones based on air monitoring results, and similar changes made within the operating parameters of the THASP. The field copy of the THASP shall be kept up to date by annotating the appropriate section (i.e., update to AHA) to indicate that an FCR is in effect. The FCR number must be referenced in the THASP and available for review.

#### **4.3 Activity Hazard Analysis**

An AHA is a documented process whereby the tasks required to accomplish a phase of work are outlined, the actual or potential hazards of each step are identified, and measures for the elimination or control of those hazards are developed for implementation. For each work activity identified in the THASP, an AHA must be developed and workers trained on its contents prior to commencing work. Guidelines for developing an AHA include the following:

- Project personnel who have the knowledge of the process and who will be performing the work should create the AHA rather than relying on one person (e.g., health and safety personnel).

- When AHAs cannot be fully developed in conjunction with the THASP, develop the document with information known at the time, finishing it when the people knowledgeable of the activity are available to assist.
- It is better to list acceptable performance parameters in the recommended control column rather than provide specific or too-detailed information that can limit the applicability of the AHA (e.g., listing a specific type of equipment or tool to be used when several acceptable types of equipment or tools can be used).
- List information in the AHA directly applicable to the task and avoid general information that addresses project-wide concerns that are already covered in the THASP or in a project-wide AHA.

Once developed, AHAs should be reviewed at the daily safety briefing or as part of the work plan review prior to initiating the activity or task. Significant changes to the AHA must be reviewed and approved using an FCR. Refer to Figure 4-2, Activity Hazard Analysis for the general format, and Appendix B for an example of an acceptable AHA. The AHAs are considered attachments to the THASP and additions, deletions, or modifications to AHAs are made using the FCR process.

Figure 4-1. Health and Safety Field Change Request Form

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>HEALTH AND SAFETY FIELD CHANGE REQUEST FORM</b>
1. FCR No. (Assigned by PMC):		
2. Implementation Project/Location:		THASP Title and Revision No.:
3. Subject of Change:		
4. Recommended Change:		
5. Reason for Change:		
6. Submitted by:	Company:	Date:
7. Disposition Comments: <input type="checkbox"/> Accepted <input type="checkbox"/> Disapproved		
8. Documents Affected (list submittal number if applicable): <input type="checkbox"/> Task-specific HASP <input type="checkbox"/> Work Plan <input type="checkbox"/> Other Documents (List):		
9. Required Review/Acceptance:		Date:
PMC Project Manager NAME (PRINT): _____ SIGN: _____		
PMC Project Health and Safety Representative NAME (PRINT): _____ SIGN: _____		Date:
10. Review and Acceptance (review/acceptance signature is required only if box is checked):		Date:
<input type="checkbox"/> PMC HS Manager (required if PMC Project HS representative does not have delegated authority) NAME (PRINT): _____ SIGN: _____		

File Copies: PMC Health and Safety Department  
Implementation Project File

## 5.0 POTENTIAL SITE HAZARDS AND CONTROLS

The potential hazards associated with PMC and Subcontractor activities at RMA include chemical, physical, biological, radiological, recovered chemical warfare materiel (RCWM), and unexploded ordnance (UXO) hazards. The possibility of encountering these potential hazards, and the risk to worker health and safety, is dependent on a number of factors including the type of work performed, location and past use of the individual worksite, time of year, and equipment used to perform work.

The organization performing work is responsible for identifying, evaluating, and controlling potential hazards associated with the tasks and activities that will be performed. Identification, evaluation, and control of hazards associated with individual tasks or activities shall be addressed and documented in the THASP.

Existing company procedures or written safe work practices may be substituted for AHAs if the potential hazards of the work are identified and appropriate safety precautions and controls are included. This will be in accordance with subcontract guidance and approved by the PMC HS Manager. The PMC will identify the initial minimum requirements for AHAs and/or safe work procedures in each Subcontract. The Subcontractor or other organization performing work is responsible for identifying the need for, and including, any additional AHAs and/or safe work practices necessary for worker protection prior to conducting work, and as necessary as work progresses.

Recognized potential hazards and control measures associated with the PMC-related work at RMA are discussed below.

### 5.1 Safety Hazards

At RMA, safety hazards typical to construction work rather than chemical hazards are the most likely to result in injury to workers. Potential safety hazards for site support services and remediation work are numerous and are present due to the large amount of materials handling, construction, and demolition activities that will take place. Common safety hazards and planned activities that may result in safety hazards include, but are not limited to, the following:

Walking/ working surfaces and ergonomic hazards	Hoisting and rigging
Falls from heights	Crane operation
Motor vehicle operation	Electrical work
Heavy equipment operation	Confined space entry
Housekeeping	Trenching and excavation
Chemical handling and storage	Handheld power tools
Demolition operations	High noise operations
Materials handling (including lifting and shoveling)	Hot work and the possible industrial hygiene hazards with material being cut/welded
Decontamination Operations	

Safe work practices and guidelines for these and other potential safety hazards are discussed in Section 16.0, Site Safety Procedures.

### 5.2 Chemical Hazards

Due to past chemical manufacturing, handling, and disposal operations conducted at RMA, chemical hazards may be present during PMC or PMC Subcontractor activities. Contaminated

media include soil, structures, groundwater, surface water, and sediments. Access Areas/ Tour Map are shown in Figure 5-1. There are no known areas of contamination. Properties of the primary Contaminants of Concern identified through the Comprehensive Environmental Response, Compensation and Liability Act process at RMA are shown in Table 5-1.

Other chemical hazards may be present in work areas depending on the exact site location where the work is being performed. Additional chemical hazards, such as discarded wastes in containers, asbestos-containing material (ACM), lead-based paint, or chemicals brought on-site to perform remedial construction work may be present, depending on the specific job task or location.

The extent of soil contamination and its relative risk to biological receptors has been determined and classified in the ROD and by the Biological Advisory Subcommittee (BAS) for RMA. The five classifications of relative risk are identified as Human Health Exceedance/Principal Threat Soil, Biota Soil, Residual Ecological Risk Soil, Priority 1 (P1) Soil, and Terrestrial Residual Ecological Risk (TRER) Soil. For each soil classification, the definition is shown below. The risk categories are based on future work at the site, after remediation is complete, and do not relate to cleanup worker potential risks.

**Human Health Exceedance/Principal Threat Soil** - A human health exceedance/principal threat soil contains a contaminant or group of contaminants that, through various exposure pathways such as ingestion, inhalation, or skin contact, could result in a health effect to workers in excess of acceptable U.S. Environmental Protection Agency (EPA) allowable risks.

**Biota Soil** - Biota soils contain a contaminant or group of contaminants that may pose a risk to animal populations. The primary risk to biota includes bioaccumulation and biomagnification of contaminants in the food chain. The Biota soils do not exceed EPA's Human Health Risk range.

**Residual Ecological Risk Soil** – Surface soil (0 to 12 inches below ground surface) identified by the BAS as having contamination that may pose potential risk to biota. This determination is based upon either measured or modeled concentrations of aldrin and dieldrin with a combined hazard quotient (HQ) greater than two. The Residual Ecological Risk (RER) soils are outside of all ROD-identified remediation areas and include P1 soil and TRER soil.

**P1 Soil** – RER soil identified in 1997 by the BAS and directed per 1997 RMA Committee Agreement to be removed. This RER soil was labeled P1 because it exhibited higher risk to small birds and was considered the first priority for residual risk soil remediation. Priority 1 soils identified for removal would either be used as borrow or removed as part of an adjacent ROD remediation project. All P1 soil excavated will be removed to a depth of one foot.

**TRER Soil** – RER soil identified in 2003 by the BAS and directed per 2003 RMA Committee Agreement either to be used as borrow or to be tilled per the BAS-recommended 3-step tilling process. If used for borrow, TRER soil must be handled and disposed in the same manner as P1 soil. The TRER soil includes the soil formerly known as Priority 2 soil.

**These classifications were developed as site cleanup criteria and are not to be used as classifications for determining potential worker exposure.** Potential worker exposure and appropriate control measures must be determined when developing the THASP and AHAs. Factors that should be considered include, but are not limited to, site history, exposure pathways, type of work to be performed, work practices and equipment used, specific chemical compounds detected, and the associated concentration detected in media such as soils. Worker exposure shall be kept below current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and OSHA Permissible Exposure Limits (PELs). The action level

in use at the RMA according to the RVO SOP ES&H.300, is 50% of the PEL. When worker exposures exceed 50% of the PEL for particular hazards, further controls shall be implemented to prevent greater exposures.

### **5.3 Physical Hazards**

Physical hazards due to site work at RMA will include heat stress, cold stress, and high noise environments.

#### **5.3.1 Heat Stress**

Heat stress is a significant hazard when performing fieldwork at RMA, especially for personnel wearing protective clothing or when working during the hot summer months. All site personnel should be familiar with the signs and symptoms of heat stress. Refer to the RVO RMA Health and Safety Guidelines booklet (HS-002-RMA) Section 4.5 and Appendix A, Heat Index.

The PMC and Subcontractors shall implement heat stress prevention and monitoring procedures during field activities where heat stress is a potential hazard. Heat stress prevention and monitoring will begin at 70°F for personnel wearing impermeable clothing and for other personnel, when the wet bulb globe temperature (WBGT) index exceeds the ACGIH (Current version) TLVs. Heat stress prevention and monitoring programs shall be consistent with the most recent edition of the ACGIH TLVs for Physical Agents in the Work Environment, Heat Stress. Refer to Section 7.4.4 for Monitoring requirements.

#### **5.3.2 Cold Stress**

Work at RMA may involve fieldwork during periods of low temperature and/or when there is a high wind-chill factor. Cold injury (frostbite and hypothermia) and the impaired ability to work are the potential risks.

Personnel working outdoors in temperatures at or below freezing may become frostbitten. Extreme cold for a short time may cause injury to the surface of the body or result in profound generalized cooling. Areas of the body that have a high surface-area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible.

The PMC and Subcontractor shall control exposures to cold temperature extremes by implementing cold stress prevention and monitoring procedures appropriate to the fieldwork being conducted when cold stress is a potential hazard. Cold stress prevention and monitoring procedures shall be consistent with the most recent edition of the ACGIH TLV for Physical Agents in the Work Environment, Cold Stress.

#### **5.3.3 Noise**

Exposure to high noise levels is a hazard associated with the operation of heavy equipment, power tools, generators, compressors and pumps, and similar activities that may be performed by the PMC or Subcontractors. Exposure to steady state or intermittent high noise levels exceeding accepted standards may result in hearing loss.

Wherever noise levels are measured or anticipated to exceed a time-weighted average (TWA) of 85 decibels as measured on the A scale (dBA), worker protection against the effects of noise exposure shall be provided in accordance with 29 CFR 1910.95 or 29 CFR 1926.52 as appropriate. Administrative or engineering controls shall be provided where feasible. If such controls fail to reduce exposure to below 85 dBA TWA, appropriate hearing protection shall be provided and the work area or equipment shall be posted with warning signs to alert workers to the requirement for hearing protection use.

For high noise activities (greater than a TWA of 85 dBA), a written hearing conservation program meeting the requirements of 29 CFR 1910.95 is required and shall be implemented for affected personnel. Refer to Section 7.4.3 for Noise Monitoring requirements.

## 5.4 Biological Hazards

Activities at RMA involve work around various animals (e.g., prairie dogs, rabbits, mice, and deer), insects, spiders, snakes, and plants. Hazards include injuries (scratches and scrapes), stings, bites, and illness due to working in close proximity to plants and disease vectors. Important biological hazards at RMA are discussed below.

### 5.4.1 Wildlife and Diseases

During site operations, wildlife such as prairie dogs, rabbits, deer, coyotes, mice, bison, and rodents may be encountered. Workers shall use discretion and avoid all contact with wildlife. If wildlife is interfering with site operations, or if dead animals are observed, the USFWS Representative at RMA shall be contacted for assistance and advice.

### 5.4.2 Insects, Spiders, and Scorpions

Insects, spiders, scorpions, bees, and wasps can be prevalent during certain times of the year. Field personnel should try to avoid contact by surveying the area in which they will be walking, standing, sitting, leaning, grabbing, lifting, or reaching. Workers are encouraged to wear insect repellent when working in areas where insects are expected to be a hazard.

**Insect bites or stings** - Many insects bite or sting, but few can cause serious effects by themselves, unless the person is hypersensitive to contact. Bees, wasps, and hornets may be present during certain times of the year. Hives are prevalent in some buildings and are a hazard to personnel who are hypersensitive. Site personnel with known or suspected sensitivity should carry their "bee sting kit", which normally includes antihistamine and epinephrine to counter anaphylactic reactions. This information should also be provided to the HSS and disclosed on the Emergency Data Sheet as discussed in Section 11.

**Black Widow spiders** - The black widow spider has a shiny black body about the size of a pea, and has a red or yellow hourglass-shaped mark on its abdomen. It weaves shapeless webs in undisturbed areas, such as woodpiles. A bite may result in severe pain, illness, or death (usually from complications and not from the bite itself).

**Brown Recluse spiders** – Brown recluse spiders belong to a group of spiders commonly known as violin spiders or fiddlebacks. This is because of a characteristic fiddle-shaped pattern on their head region. The spider is golden brown with the fiddle being dark brown or black. This spider is not hairy and the fiddle pattern is often shiny. They are about ¼ to ¾ inch long. The severity of the bite may vary and the symptoms may vary from no harm at all to a reaction that is very severe. Often there is a systemic reaction within 24-36 hours characterized by restlessness, fever, chills, nausea, weakness, and joint pain. Where the bite occurs there is often tissue death and skin is sloughed off. In some severe cases, a wound may develop that lasts several months.

**Scorpions** - Several types of scorpions are native to Colorado. Scorpions may be brown to yellowish in color and range from 1/2 inch to 8 inches in length. They are most active at night. Most species do not inject a toxin that is harmful to humans. The sting may result in local swelling and discoloration, similar to a wasp sting, and may cause an allergic reaction. The sting of the more dangerous species of scorpions causes little or no swelling or discoloration, but locally there will be a tingling or burning sensation. Death, although unlikely, occurs occasionally in infants, young children, and older persons.

**Rocky Mountain Spotted Fever** - Bites of wood ticks may result in the transmission of Rocky Mountain Spotted Fever, a serious and possibly fatal disease caused by the Rickettsia virus. The Rickettsia virus infects wood ticks, which may bite humans, thereby transferring the virus into the bloodstream. Rocky Mountain Spotted Fever occurs mostly in the late spring and early summer, and is characterized by chills, fever, severe pain in the leg muscles and joints, and a body rash.

**Lyme Disease** - There is a low risk of Lyme disease in Colorado. Lyme disease is most often characterized with a "bull's-eye" rash, accompanied by nonspecific symptoms such as fever, malaise, fatigue, headache, muscle aches, and joint aches. Personal Protective Equipment offers some protection against insects, but personnel should also perform self-searches at the end of each day to check for ticks if they have been working in areas where ticks may be prevalent.

**West Nile Virus** – West Nile Virus (WNV) has become prevalent in Colorado. All residents of areas where WNV activity has been confirmed are at risk, with individuals over age 50 considered more vulnerable to the most severe forms of the disease. Most WNV infections are mild with symptoms that can include fever, headache, body aches and, occasionally, skin rashes or swollen lymph nodes. West Nile Virus, however, can also cause encephalitis (inflammation of the brain) and/or meningitis (inflammation of the brain's lining). In rare cases, it can be fatal. Symptoms of advanced WNV may include severe headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, muscle weakness or convulsions. Individuals with these symptoms should seek medical attention immediately. Two types of mosquitoes have been identified at RMA. The genus *Culex* is commonly found in the Upper Derby Lake area and other locations containing shallow water, and the genus *Aedes* is common in most other areas of RMA. *Culex* mosquitos breed in still water, and are known carriers (vectors) of disease, including WNV. *Aedes* lay their eggs in moist or muddy soil. Insect repellents containing N,N-diethyl-m-toluamide commonly known as DEET (more than 20 percent DEET for longer protection), picaridin, or oil of lemon eucalyptus should be applied to exposed skin and to clothing per manufacturers' instructions. Additional precautions include limiting field activities in areas where mosquitoes are prevalent, especially at dawn and dusk, eliminating areas conducive to mosquito breeding (standing water, old tires, etc.), and requesting treatment of mosquito breeding areas.

### 5.4.3 Snakes

Rattlesnakes are the most common poisonous snakes in the West. The degree of toxicity resulting from snakebite depends on the potency of the venom, the amount of the venom injected, and the general health, size, and age of the person bitten. Poisoning may also occur from absorption of venom through cuts or scratches. A snake may bite a person and not inject venom. Symptoms and signs of envenomation include the presence of fang marks, rapid and progressive swelling around the bitten area within 5 to 10 minutes, pain, weakness, faintness, nausea and vomiting, and changes in temperature, pulse, and blood pressure.

Snakes should never be moved or handled by field personnel. Trained UXO personnel or USFWS personnel should be contacted if snakes need to be removed from the work area. Precautionary measures for site workers on foot include avoiding walking in grass or underbrush at night, not climbing rocky ledges without visual inspection, and wearing high-top boots and heavy pants. In some instances, where snakes are known to be present, leg protectors or chaps may be necessary to reduce the risk of snakebite. Emergency treatment *does not* include incision through the fang marks. If bitten, the person should be immobilized in a horizontal position with the bitten part lower than the heart. Treat for shock and transport the person to the nearest medical facility.

#### **5.4.4 Birds**

Some structures at RMA contain a significant amount of bird droppings. Inhalation or ingestion of bird droppings may result in several types of diseases, including psittacosis (a communicable disease, with symptoms including headache, nausea, chill and fever, and occasionally, respiratory illness) and histoplasmosis (a fungal disease caused by inhaling spores found in contaminated soils with symptoms that include respiratory distress, fever, chest pains, and a dry nonproductive cough). Work in structures containing significant amounts of bird droppings will require the use of air-purifying respirators and disposable protective clothing.

#### **5.4.5 Plants**

The site does not host any plants that are poisonous to humans; however, there are plants that may promote allergic reactions and/or be mechanically injurious, such as cactus. Field personnel shall wear sturdy work clothes and shoes in order to prevent injuries. Existing allergies and sensitivities, which could be aggravated by the work environment, should be reported to the designated HSS and disclosed on the Emergency Data Sheet as discussed in Section 11, so that precautions can be initiated as necessary.

#### **5.5 Chemical Warfare Materiel**

The history of RMA involved the military production and handling of several types of chemical warfare materiel (CWM). Known CWM locations are depicted on Figure 5-1. Some CWM may be present in other locations depending on the type of work and exact location of work activities. The primary chemical agents of concern at RMA are blister (mustard and lewisite) and nerve (sarin and V agents). Skin contact with these chemical agents or inhalation of chemical agent vapor are the most common routes of exposure. The chemical agent absorption rate is accelerated through unprotected cuts and abrasions.

The risk of exposure to CWM or RCWM due to nonintrusive activities at RMA is considered to be very low due to degradation or hydrolysis of chemical agents in contact with water or surficial soils over time. The risk of exposure to chemical agents during intrusive activities is low, but will be dependent on the location of work, agent content in subsurface soils, and the type of intrusive activity.

Intrusive activities performed at locations identified as possibly containing chemical agent hazards may require special monitoring, PPE, and decontamination procedures. These requirements will be identified in the Subcontract for tasks in potentially agent-contaminated areas and are required to be addressed in the THASP.

#### **5.6 Munitions and Explosives of Concern Hazards**

The history of RMA involved the use and handling of military munitions. During testing periods, military munitions were used in various site areas. In some cases, discarded military munitions and unexploded ordnance may still exist in the soils of these test areas or be located as a lost or misplaced item in a building, manhole, or other aboveground location. Known Munitions and Explosives of Concern (MEC) locations are depicted on Figure 5-1.

Additional information regarding requirements for site evaluations, site munitions response procedures, personnel training, response actions, and coordination with other organizations will be provided by the PMC in the Subcontract for work in potential MEC hazard areas. Any MEC requirements identified shall be addressed in THASPs.

## **5.7 Radiological Hazards**

Radiological contamination or hazards due to past activities at RMA are not anticipated at any of the remedial action sites. Use of radioactive sources (e.g., nuclear density gauges) may be necessary to complete some tasks. Acceptance by the PMC Radiation Safety Officer and the RVO is required prior to bringing any radioactive source to RMA. Written requests to bring a radioactive source onto RMA must be transmitted to the RVO Radiation Safety Officer at least 30 days prior to bringing the material onto RMA. Using organizations shall comply with applicable provisions of PMC Procedure HS-005-RMA Radiation Safety, RVO Standard Operating Procedure, ES&H. 305 - Radiation, 10 CFR, 29 CFR, and 49 CFR including source operation and use, posting, labeling, training, material storage, and recordkeeping requirements.

## **5.8 Crystalline Silica**

Crystalline silica compounds such as quartz found in the soil at RMA may present an inhalation hazard during earthmoving activities, including clean construction work. For remediation or clean construction work at RMA, dust control is essential, primarily through wet methods. Spraying water to suppress dust generation during tasks such as excavation and building demolition, and on unpaved roadways, minimizes dust levels and possible exposure to crystalline silica. In tasks where concentrations of respirable silica may not be completely controlled to acceptable levels with wet methods, respiratory protection is worn. Enclosed cabs with air filtration systems on construction equipment typically prevent or minimize exposure to respirable silica, except when high dust levels overload the filtration system. In these instances, changing the filter to a high efficiency particulate air filter can reduce employee exposure to acceptable levels. Real-time air monitoring of dust levels during remediation tasks, combined with personal integrated air sampling, provide ongoing confirmation that control measures such as wet methods, work practices, and PPE are effective in controlling worker exposure.

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### Access Areas and Tour Routes

May 2010

-  Rocky Mountain Arsenal NWR Boundary
-  Public Access Areas
-  Public Access Roads
-  Employee Access Roads
-  Remedy O&M Access
-  RMA NWR Road Construction 2010-2011
-  Subsurface Contaminated Soil Containment Areas
-  Subsurface Potential Human Health Exceedance
-  Rocky Mountain Arsenal - U.S. Army
-  USFWS National Wildlife Refuge
-  USFWS Tour Route
-  BEMA Exclusion Zone (Oct. 15 - Apr. 15)
-  Bison Pilot Area (BPA)
-  Eagle Nest (Nov. 15 - Jul. 31)
-  BEMA Gates
-  Major Lakes and Ponds
-  Major Ditches and Intermittent Streams
-  Section Corners
-  Walking Trails
-  Administration Area & Visitors Center (Area Enlargement ES&H.109 Fig. 8.4)

### RMA Access Policy Attachment 8.3

This map's resolution is relatively coarse. While fine for general computer screen viewing & printing (letter-size), it is not designed for significant enlargement. For a higher-resolution version, please contact the RVO GIS Dept.

**Caution:** Information on this map is date dependent. If the date printed above indicates that this product is not recent, obtain a current map from sources listed in RVO SOP: ES&H.210.

Sources: U.S. Army, RVO GIS, TetraTech EC, URS - Washington Division, USFWS



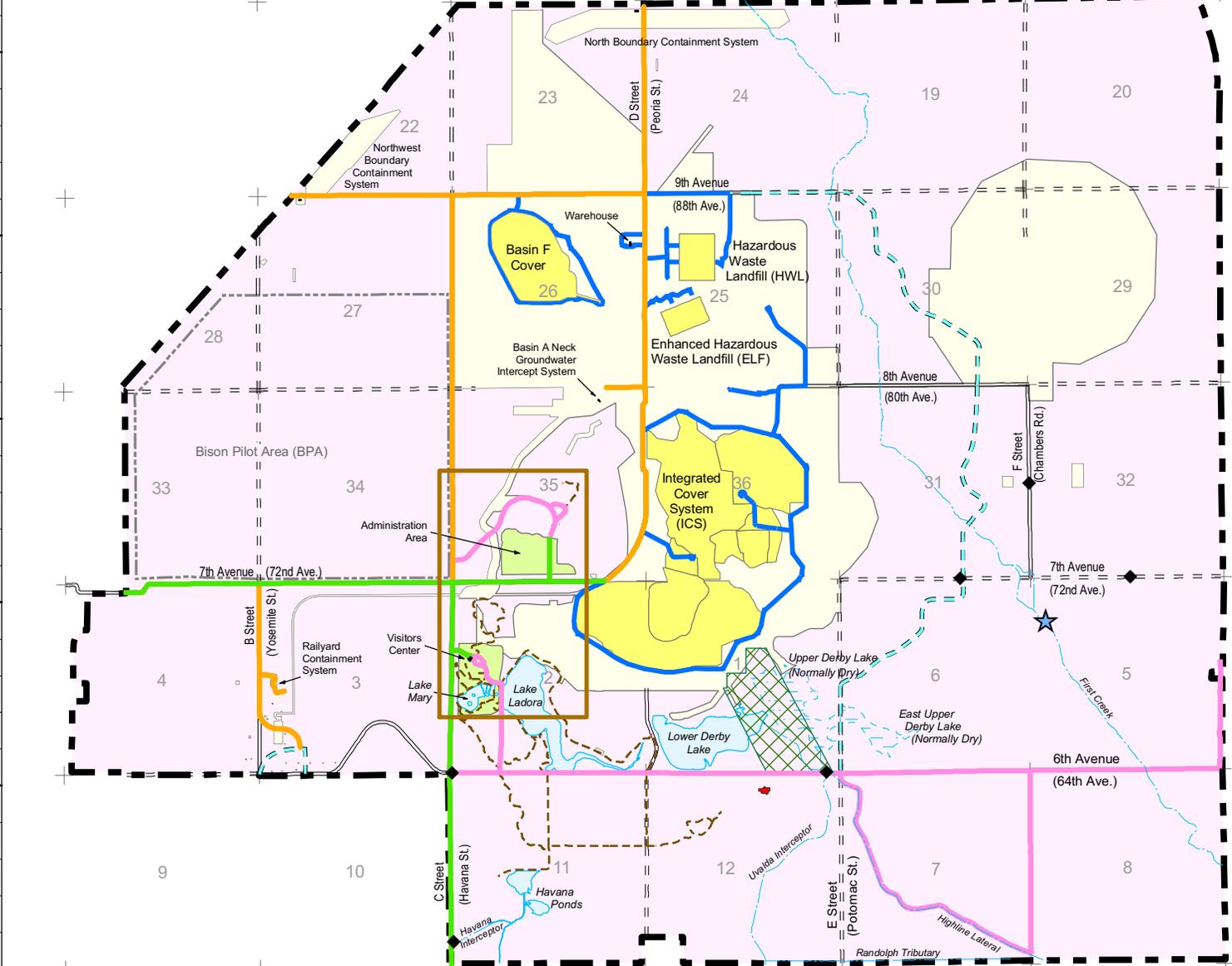
NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone



REMIEDIATION VENTURE OFFICE

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TETRA TECH EC, INC.

**TABLE 5-1**  
**Properties of the Primary Contaminants of Concern**

Contaminant	PEL	TLV	Route(s) of Exposure	Signs and Symptoms of Exposure								
				Acute	Chronic	Target Organs	IP	Specific Gravity	VP (mm)	Flash Point	LEL %	UEL %
Aldrin	0.25 mg/m <sup>3</sup> (skin)	0.05 mg/m <sup>3</sup> (skin)	Inhalation Absorption Ingestion Contact	headache, dizziness, nausea, vomiting, twitching muscles, convulsions	CNS, liver, kidney and skin damage, cancer	CNS, Liver, Kidneys, Skin	N/A	1.6	.00008	N/A	N/A	N/A
Arsenic Inorganic PEL = 0.1 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>	Inhalation Absorption Contact Ingestion	Ulceration of nasal septum, dermatitis, respiratory irritation	GI disturbances, peripheral neuropathy, cancer	Liver, kidney, skin, lungs, lymphatic system	N/A	5.73	0.0	N/A	N/A	N/A
Benzene	1 ppm	0.5 ppm (skin) 2.5 ppm STEL	Inhalation Contact Absorption Ingestion	Irritation of eyes, skin, nose, and respiratory system, dermatitis, headache, nausea	Bone marrow depression, anorexia, leukemia	Blood, CNS, skin, bone marrow, eyes, skin, respiratory tract	9.24	0.88	75	12	1.2	7.8
Cadmium	0.005 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup> 0.002 mg/m <sup>3</sup> Cpds resp. fraction	Inhalation Ingestion	Dyspnea, nausea, headache, tight chest, pulmonary edema	Cancer, muscle aches, vomiting, diarrhea, kidney, lung damage	Lungs, kidneys, blood, respiratory system, prostate	N/A	8.65	.0	N/A	N/A	N/A
Carbon tetrachloride	10 ppm (skin)	5 ppm (skin) 10 ppm STEL	Inhalation Absorption Ingestion Contact	Irritation of eyes, skin, CNS depression, drowsiness, dizziness, nausea, vomiting	Liver and kidney injury, (known to cause liver cancer in animals)	CNS, eyes, lungs, liver, kidneys, skin	11.47	1.59	91	N/A	N/A	N/A
Chlordane	0.5 mg/m <sup>3</sup> (skin)	0.5 mg/m <sup>3</sup> (skin)	Inhalation Ingestion Contact Absorption	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, tremors	Liver cancer, lung, and kidney damage in animals.	CNS, eyes, lungs, liver, kidneys	N/A	1.6	.00001	N/A	N/A	N/A

**TABLE 5-1**  
**Properties of the Primary Contaminants of Concern (continued)**

Contaminant	PEL	TLV	Route(s) of Exposure	Signs and Symptoms of Exposure			IP	Specific Gravity	VP (mm)	Flash Point	LEL %	UEL %
				Acute	Chronic	Target Organs						
Chloroacetic Acid Chloride (Chloroacetyl Chloride)	N/A	0.05 ppm (skin) 0.15 ppm STEL (skin)	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin, respiratory system; eye, skin burns; cough, wheezing	N/A	Eyes, skin, respiratory system	10.3	1.42	19	N/A	N/A	N/A
Chlorobenzene	75 ppm	10 ppm	Inhalation Ingestion Contact	Irritation of eyes, skin, nose; drowsiness, incoherence, CNS depression	Liver, lung, and kidney injury in animals	Eyes, skin, respiratory system, CNS, Liver	9.07	1.11	9	82	1.3	9.6
Chloroform	50 ppm (C)	10 ppm	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin; dizziness, mental dullness, nausea, confusion, headache, fatigue	Enlarged liver	Liver, kidneys, heart, eyes, skin	11.42	1.48	160	-82	N/A	N/A
Chromium	1.0 mg/m <sup>3</sup> (metal) 0.5 mg/m <sup>3</sup> (Cr II, III)	0.5 mg/m <sup>3</sup> 0.05 mg/m <sup>3</sup> water soluble Cr VI 0.01 mg/m <sup>3</sup> Insoluble Cr VI	Inhalation Ingestion Contact	Irritation of eyes, skin; sensitization dermatitis	Fibrotic formation in the lungs	Respiratory system, skin, eyes	N/A	varies	varies	N/A	N/A	N/A
Dibromochloropropane (DBCP)	0.001 ppm	NA	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin, nose, throat; drowsiness, nausea, vomiting, pulmonary edema	Liver and kidney damage; sterility	Skin, respiratory system, CNS, Liver, kidneys, spleen, reproductive system, digestive system	N/A	2.05	0.8	170	N/A	N/A

**TABLE 5-1**  
**Properties of the Primary Contaminants of Concern (continued)**

Contaminant	PEL	TLV	Route(s) of Exposure	Signs and Symptoms of Exposure			IP	Specific Gravity	VP (mm)	Flash Point	LEL %	UEL %
				Acute	Chronic	Target Organs						
Dicyclopentadiene (DCPD)	NA	5 ppm	Inhalation Ingestion Contact	Irritation of eyes, skin, nose, and throat; incoherence, headache, sneezing, coughing, skin blisters	Lung damage, kidney, liver damage in animals	Eyes, skin, respiratory system, CNS, kidneys	N/A	0.98	1.4	90	0.8	6.3
Dichlorodiphenyldichloroethene (DDE)	N/A	N/A	Inhalation Ingestion Contact Absorption	Headache, dizziness, nausea, vomiting, sweating, tremors/jerks, convulsions	Liver and kidney damage; Causes cancer in animals.	Liver, kidneys, CNS, skin	N/A	N/A	6.5x10 <sup>-6</sup>	N/A	N/A	N/A
Dichlorodiphenyltrichloroethane (DDT)	1 mg/m <sup>3</sup> (skin)	1 mg/m <sup>3</sup>	Inhalation Ingestion Contact Absorption	irritation of eyes, skin; paresthesia of tongue, lips, face, tremor, dizziness, confusion, headache, fatigue	Liver and kidney damage. Causes cancer in animals.	Liver, kidneys CNS, skin, PNS, eyes	N/A	0.99	0.000000 2	162-171	N/A	N/A
1,2-Dichloroethane (Ethylene Dichloride)	50 ppm	10 ppm	Inhalation Ingestion Contact Absorption	Irritation of eyes, CNS depression, nausea, vomiting, dermatitis	Liver, kidney, and CVS damage	Eyes, skin, kidneys, liver, CNS, CVS	11.05	1.24	64	56	6.2	16
1,1-Dichloroethylene (Vinylidene chloride)	N/A	5 ppm	Inhalation Contact	Irritation of eyes, skin, throat; dizziness, headache, nausea	Liver, kidney damage	CNS	10.00	1.21	500	-2	6.5	15.5
Dieldrin	0.25 mg/m <sup>3</sup> (skin)	0.25 mg/m <sup>3</sup> (skin)	Inhalation Ingestion Contact Absorption	Headache, dizziness, nausea, vomiting, sweating, tremors/jerks, convulsions	Liver and kidney damage; Causes cancer in animals.	CNS, liver, kidneys, skin	N/A	1.75	8x10 <sup>-7</sup>	N/A	N/A	N/A

**TABLE 5-1**  
**Properties of the Primary Contaminants of Concern (continued)**

Contaminant	PEL	TLV	Route(s) of Exposure	Signs and Symptoms of Exposure								
				Acute	Chronic	Target Organs	IP	Specific Gravity	VP (mm)	Flash Point	LEL %	UEL %
Endrin	0.1 mg/m <sup>3</sup> (skin)	0.1 mg/m <sup>3</sup> (skin)	Inhalation Ingestion Contact Absorption	Epileptic convulsions, stupor, headache, dizziness, abdominal discomfort, nausea, vomiting, confusion, lethargy, weakness	Liver damage	CNS, liver	N/A	1.70	N/A	N/A	N/A	N/A
Hexachlorocyclopentadiene	N/A	0.01 ppm	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin, respiratory system; eye, skin burns, lacrimation, sneezing, coughing, dyspnea, salivation, nausea, vomiting	Liver and kidney injury in animals	Eyes, skin, respiratory system, liver, kidneys	N/A	1.71	0.08	N/A	N/A	N/A
Isodrin	N/A	N/A	Inhalation Ingestion Contact Absorption	Malaise, nausea, vomiting, dizziness, tremors, convulsions	N/A	Eyes, skin, respiratory system, liver, kidneys	N/A	N/A	6x10 <sup>-6</sup>	N/A	N/A	N/A
Lead	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	Inhalation Ingestion Contact	Eye irritation	Weakness, anorexia, tremors, neuropathy, Hypo-tension	GI tract, CNS, eyes, kidneys, blood, gingival tissue	N/A	11.34	0	N/A	N/A	N/A
Mercury	0.1 mg/m <sup>3</sup> (C)	0.025 mg/m <sup>3</sup>	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin; cough, chest pain	CNS damage depending on group of mercurial compounds	CNS, kidneys, eyes, skin, respiratory system	N/A	13.6	0.0012	N/A	N/A	N/A

**TABLE 5-1**  
**Properties of the Primary Contaminants of Concern (continued)**

Contaminant	PEL	TLV	Route(s) of Exposure	Signs and Symptoms of Exposure								
				Acute	Chronic	Target Organs	IP	Specific Gravity	VP (mm)	Flash Point	LEL %	UEL %
Methylene chloride	25 ppm	50 ppm	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin; fatigue, weakness, numb limbs	CNS damage	Skin, CNS, CVS, eyes	11.32	1.33	350	N/A	13	23
Silica, crystalline-quartz (respirable)	10 mg/m <sup>3</sup> /%SiO <sub>2</sub> +2	0.025 mg/m <sup>3</sup>	Inhalation Ingestion	Irritation of eyes	Respiratory system damage Carcinogenic	Eyes, lungs	NA	NA	0	NA	NA	NA
1,1,2,2-Tetrachloroethane	5 ppm (skin)	1 ppm (skin)	Inhalation Ingestion Contact Absorption	Nausea, vomiting, abdominal pain, jaundice, hepatitis, dermatitis	Kidney damage	Skin, liver, kidneys, CNS, GI tract	11.1	1.59	5	N/A	N/A	N/A
Tetrachloroethylene	100 ppm	25 ppm  100 ppm STEL	Inhalation Ingestion Contact Absorption	Irritation of eyes, nose, throat; nausea, flushed face, vertigo, dizziness, incoherence	Liver damage	Eyes, skin, respiratory system, liver, kidneys, CNS	9.32	1.62	14	N/A	N/A	N/A
Toluene	200 ppm	50 ppm (skin)	Inhalation Contact Absorption	Irritation of eyes, nose ; dermatitis, fatigue, weakness, confusion, muscular fatigue	Insomnia; liver, kidney damage	CNS, liver, kidneys, skin, eyes, respiratory system	8.82	0.87	21	40	1.1	7.1
Trichloroethylene	100 ppm	50 ppm  100 ppm STEL	Inhalation Ingestion Contact Absorption	Irritation of the eyes and skin; headache, vertigo, visual disturbances, fatigue, giddiness, tremors, nausea, vomiting, dermatitis	Liver injury	eyes, skin, respiratory system, heart, liver, kidneys, CNS (causes cancer in animals)	9.45	1.46	58	N/A	8	10.5

Notes: C = ceiling  
 CNS = Central Nervous System  
 CVS = Cardiovascular System  
 GI = Gastrointestinal  
 IP = Ionization Potential  
 LEL = Lower Explosive Limit

mg/m<sup>3</sup> = milligrams per cubic meter of air  
mm = millimeter  
PEL = Permissible Exposure Limit  
PNS = Peripheral Nervous System  
ppm = parts per million  
STEL = Short-Term Exposure Limit  
TLV = Threshold Limit Value  
UEL = Upper Explosive Limit  
VP = Vapor Pressure

## **6.0 PERSONAL PROTECTIVE EQUIPMENT**

PPE shall be selected, used, maintained, and stored in accordance with 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the manufacturer's recommendations. Engineering, administrative, and/or work practice controls shall be implemented where feasible, rather than relying exclusively on PPE. At a minimum, all PMC and Subcontractor personnel shall wear sturdy work shoes, long pants, and shirts with sleeves when performing fieldwork. Additionally, personnel working in the Central Remediation Area (CRA) or at remediation project worksites shall have available and wear hard hats, safety glasses with rigid sideshields, steel-toed work boots, and high visibility reflective (e.g., orange) traffic safety vests except as provided in THASPs. Street clothes shall not be worn as the outer layer of protective clothing when working in designated contaminated soils areas (TRER, P1, Biota, Human Health, Principal Threat). Company-provided cotton coveralls, hospital scrubs, or disposable outer clothing is acceptable. Dual layers of clothing are not recommended for work in hot weather conditions.

### **6.1 Selection and Use**

Selection and use of PPE shall be based on the performance characteristics of the PPE and task- or site-specific hazards. All PPE selection and use shall be documented in the THASP and shall meet certification requirements of 29 CFR 1910.132 regarding hazard assessment, activities evaluated, person certifying the evaluation, and the date of the assessment.

The PPE initially identified for tasks may be changed based on field reconnaissance, results of site monitoring, or additional hazard analysis. Changes to PPE in accordance with site monitoring criteria specified in the THASP shall be documented in the field health and safety logbook. Other significant PPE changes require an FCR or submission and acceptance of a modified THASP.

Due to the potential for slip and trip hazards in some RMA administrative areas, including uneven walking-working surfaces, gravel parking lots, weeds and animal burrows, appropriate sturdy footwear shall be worn. Shoes that may contribute to hazardous walking conditions, such as narrow high heels and flip-flops shall not be worn.

### **6.2 Maintenance and Storage**

Assigned PPE shall be maintained and stored in a clean and sanitary manner. The employer (PMC or Subcontractor) shall ensure that adequate facilities and supplies for cleaning, maintenance, storage, and issue of PPE (including respiratory protection) are made available for these activities at the work location or in a centralized area.

### **6.3 Training**

Appropriate training shall be provided to PPE users and documented as part of overall hazardous waste operations and emergency response training, site-specific training, and/or daily safety meetings. All respirator users shall be adequately trained in proper use of assigned respirators and the applicable respiratory protection program procedures. Personnel responsible for respirator cleaning, storage, maintenance, and issue shall be provided additional training as necessary to ensure that respirator program requirements are met. All respiratory protection training shall meet the requirements of 29 CFR 1910.134.

### **6.4 Commercial Laundries**

Where commercial laundries or cleaning establishments are used to decontaminate protective clothing or equipment, these entities shall be informed of any potential exposure hazards related to site contaminants by the PMC or Subcontractor arranging for these services.

## 6.5 Respiratory Protection

A written respiratory protection program meeting the requirements of 29 CFR 1910.134 is required for the PMC and Subcontractor anticipating the need for respiratory protection use at the site. PMC employees will follow PMC Health and Safety Procedure HS-004-RMA, Respiratory Protection Program, for work requiring the use of respirators. The Subcontractor shall submit a copy of their written respiratory protection program for review and acceptance by the PMC prior to respirator use. Voluntary use of respiratory protection shall meet all applicable requirements of 29 CFR 1910.134. Note: Where air purifying respirators (APRs) are selected, full-face APRs shall be used unless specific alternatives are authorized by the PMC Health and Safety Representative in the THASP or AHA.

## **7.0 SITE MONITORING**

## 7.0 SITE MONITORING

### 7.1 General

Industrial Hygiene monitoring should be part of the project planning process. By early planning, many times engineering controls can be put in place to eliminate or reduce industrial hygiene concerns. Sequencing of work may reduce work stresses by reducing the amount of Personal Protective Equipment (EHS 4-7 – Industrial Hygiene).

Site monitoring shall be performed as necessary for site remediation and clean construction work. This section covers general site monitoring for employee exposure to physical and chemical hazards including air contaminants (dust, metals, volatile organic compounds, and other specific compounds), heat stress, cold stress, and noise. If required, monitoring for potential CWM hazards will be performed in accordance with the project RCWM Safety Plan.

Minimum site monitoring requirements are determined by the PMC during the project design stage, and are specified in the Subcontractor Health and Safety Requirements section for implementation by the Subcontractor. Site monitoring shall be performed by, or under the direction of, the assigned Subcontractor HSS. The PMC may perform additional monitoring at field worksites, if necessary, and submit industrial hygiene samples to an approved analytical laboratory.

### 7.2 Required Site Monitoring

Site monitoring is required under the following conditions:

- When required by the Subcontract or THASP
- When required by specific OSHA standards (e.g., 29 CFR 1910.120, occupational noise exposure, ionizing radiation, asbestos, benzene, cadmium, inorganic arsenic, lead, formaldehyde, vinyl chloride, respirable dust, silica, etc.)
- When worker exposure is reasonably anticipated to be greater than 50 percent of the OSHA PEL, ACGIH TLV, or other recognized occupational exposure limit
- When necessary to verify the adequacy of hazard control measures and/or PPE, including respiratory protection
- When necessary to assess and evaluate worker exposure, or to resolve worker complaints or concerns

With the concurrence of the PMC Health and Safety Manager, site monitoring may be discontinued after representative initial monitoring is conducted and worker exposures are shown to be adequately controlled through the use of engineering, work practice, or PPE control measures. If work activities change so that the initial monitoring is no longer representative of worker exposure, monitoring shall be reinitiated.

### **7.3 Monitoring Strategy**

The anticipated site monitoring strategy for remedial implementation projects is shown in Figure 7-1. Where site monitoring is required, the Subcontractor shall develop and implement a site monitoring program that considers the factors that may affect worker exposure and the following elements:

- Monitoring requirements, contaminants, and monitoring equipment limitations
- Subcontractor-specific work locations, work activities, work practices, personnel, and equipment to be used on-site
- Any additional site-specific hazard information gathered by the Subcontractor during development of the THASP
- Subcontractor health and safety program requirements for site monitoring

The monitoring strategy and approach shall be documented in the THASP. Documentation shall include a discussion of rationale used to determine the site monitoring requirements that sufficiently justifies the approach. Background information, such as exposure modeling calculations and previous (or similar) exposure monitoring data, shall be included as necessary. The approach shall include the type of monitoring (direct reading, personal, perimeter or area monitoring), activities or locations to be monitored, contaminants, monitoring instrumentation, monitoring methods, and frequency of monitoring as appropriate.

### **7.4 Typical Site Monitoring**

#### **7.4.1 Direct Reading Exposure Monitoring**

Direct reading instruments for exposure monitoring are extremely useful on construction and hazardous waste sites. The primary advantages include ease of use, ability to monitor constantly changing conditions, and the rapid detection of flammable atmospheres, oxygen deficiency, certain gases and vapors, and physical hazards including noise and radiation.

Routine direct reading monitoring results (date/time, calibration information, results, and activities monitored) shall be recorded on the Daily Site Monitoring Report Form shown in Figure 7-2 or an equivalent form if approved by the PMC Health and Safety Manager. Monitoring results shall be recorded initially and periodically throughout the monitoring period (e.g., every 15 minutes, when results are above background levels, when site operations or locations change, or when unexpected site conditions arise). Direct reading instrumentation with datalogging and printing capabilities is preferred over manually recording monitoring results. When direct reading air monitoring results at the work location equal or exceed the action levels specified in the THASP for the project, the Subcontractor shall conduct Exclusion Zone (EZ) perimeter air monitoring. If the air concentrations at the perimeter of the EZ equal or exceed the action level(s), the boundaries of the EZ zone shall be expanded as necessary to maintain air contaminant concentrations below the action level(s) at the boundaries of the EZ. The Subcontractor shall notify the PMC Health and Safety Representative and/or PMC Construction Engineer who will then notify the Air Quality Group to determine whether additional perimeter air monitoring is necessary.

#### **7.4.2 Integrated Personal Air Monitoring**

Integrated personal air monitoring refers to the continuous collection of a sample over a period of time for subsequent analysis, usually by a laboratory. This monitoring typically involves the use of portable sampling pumps and an appropriate collection media such as filters, impingers, or adsorption tubes. Integrated monitoring can also be performed using organic vapor monitors and other passive sampling devices.

Personal sampling and analysis will be performed in accordance with the OSHA Industrial Hygiene Technical Manual, the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods, or other acceptable industrial hygiene practices. Only analytical laboratories accredited by the American Industrial Hygiene Association shall perform sample analysis. The laboratory analysis will include field blanks, as required by the individual method or laboratory. The laboratory shall also be a successful participant in the NIOSH Proficiency Analytical Testing program for the appropriate analytical category. Prior to sampling, the specific sampling and analytical method should be discussed with the receiving laboratory to determine any special requirements or variations to established methods necessary to collect an acceptable sample.

Sampling and analytical information for personal sampling shall be recorded on the Air Monitoring Data Sheet shown in Figure 7-3. Data sheets and the corresponding laboratory analytical reports shall be submitted to the PMC Health and Safety Representative as part of the weekly safety report (Section 18.1). To ensure timely reporting of analytical results, personal air sampling media shall be sent to the laboratory within 5 working days of the date collected, analyzed with normal laboratory turnaround time (10 to 14 calendar days), and the results reported to the PMC on the Air Monitoring Data Sheet within 5 working days after receiving them from the laboratory.

#### **7.4.3 Noise Monitoring**

Noise monitoring shall be conducted for operations that may exceed an 8-hour TWA sound level of 85 dBA (Refer also to Section 5.3.3). Noise monitoring shall be performed in accordance with 29 CFR 1910.95 using a sound level meter or noise dosimeter as appropriate. Results shall be documented as described in Section 7.4.1 and 7.6.6.

When construction or remediation activities are conducted within one-half mile of the RMA boundary/fence line which have the potential to exceed the level stated in the current version of PMC Procedure HS-003-RMA Perimeter Noise Monitoring Procedure, monitoring will be conducted to ensure that site activities do not create levels of noise that exceed such site action levels.

#### **7.4.4 Heat Stress Monitoring**

Heat stress monitoring shall be conducted as necessary to assist in determining initial work/rest regimens, and to verify that these regimens are adequate as the work progresses (refer also to Section 5.3.1). The following heat stress monitoring guidance should not be used as an absolute dividing line between safe and dangerous thermal stress levels. Professional judgment, use of competent persons, and overall heat stress management are required to ensure adequate protection for each situation. Heat stress monitoring shall be performed in accordance with guidance given in the latest edition of the ACGIH Thermal Stress Criteria (see Heat Stress Physiological Monitoring form shown in Figure 7-4). Two primary monitoring methods are used depending on the type of protective clothing worn; 1) WBGT monitoring (when wearing permeable protective clothing) and 2) personal physiological monitoring (when wearing impermeable protective clothing).

Figure 4-2. Activity Hazard Analysis

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	<b>ACTIVITY HAZARD ANALYSIS</b>
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<b>Project/Location:</b>	<b>Estimated Start Date:</b>	<b>Phase of Work:</b>
<b>Analysis Developed by</b>	<b>Date:</b>	<b>Analysis Approved by:</b>
		<b>Date:</b>
<b>PRINCIPAL STEPS</b>	<b>POTENTIAL SAFETY/HEALTH HAZARDS</b>	<b>RECOMMENDED CONTROLS</b>
Identify the principal steps involved and the sequence of work activities.	Analyze each principal step for potential hazards, e.g. physical, chemical, radiological, and biological.	Develop specific controls for each potential hazard.
<b>EQUIPMENT TO BE USED (Optional)</b>	<b>INSPECTION REQUIREMENTS (Optional)</b>	<b>TRAINING REQUIREMENTS (Optional)</b>
List equipment and tools to be used in the work activity.	List inspection requirements for the work activity.	List training requirements for the work activity, e.g., Lockout/Tagout (LO/TO), Confined Space Entry (CSE), specific hazard communication, etc.

### 7.4.5 Wet Bulb Globe Temperature Monitoring

When wearing permeable protective clothing (street clothes, cotton coveralls, and winter work uniform), WBGT monitoring is performed. A WBGT monitor integrates the ambient temperature, wet bulb temperature, and the globe temperature into an index that is predictive of potential heat stress conditions. The measured WBGT index is then compared to the ACGIH Screening Criteria for Heat Stress Exposure as shown below. Note: Higher heat exposures are permissible if workers have been undergoing medical surveillance and it has been established that they are more tolerant to work in heat than the average worker. An individual's exposure to heat stress should be discontinued when any of the following occur.

Sustained (several minutes) heart rate is in excess of 180 beats per minute (bpm) minus the individual's age in years (180-age), for individuals with assessed normal cardiac performance; or

Body core temperature is greater than 38.5°C (101.3°F) for medically selected and acclimatized personnel; or greater than 38°C (100.4°F) in unselected, unacclimatized workers; or

Recovery heart rate at one minute after a peak work effort is greater than 110 bpm; or

There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

**TABLE 7-1. Screening Criteria for Heat Stress Exposure (Acclimatized Workers)**

(Values listed in chart below are given in °C and [°F] WBGT, and were from the current version at time of revision.)

Work/Rest Regimen	Light Work Load	Moderate Work Load	Heavy Work Load	Very Hard Work Load
Continuous work	29.5 (85)	27.5 (82)	26.0 (79)	NA
75% Work -25% Rest, each hour	30.5 (87)	28.5 (83)	27.5 (82)	NA
50% Work -50% Rest, each hour	31.5 (89)	29.5 (85)	28.5 (83)	27.5 (82)
25% Work -75% Rest, each hour	32.5 (91)	31 (88)	30 (86)	29.5 (85)

The TLVs listed above are adjusted based upon wearing the following clothing and conditions:

Summer work uniform = 0° C

Cloth (woven material) overalls = 3.5° C

Double-cloth overalls = 5 ° C

### 7.4.6 Personal Physiologic Monitoring

Personal physiologic monitoring (heart rate and body temperature, and fluid loss, if possible) of workers shall be used to assist in determining work/rest regimens whenever impermeable protective clothing is worn. Remember that disposable clothing, such as Saranex or Poly-Coat, and raingear may be considered air or water vapor impermeable. The WBGT index is not used to determine work/rest regimens for impermeable protective clothing because the index takes into account the effects of evaporative cooling. Impermeable protective clothing impedes evaporative cooling.

The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing are the ambient temperature and radiant (solar) heat. These factors are combined into an index called the "adjusted temperature" using the formula shown below. In this formula, ambient temperature is measured with a dry bulb thermometer shielded from the sun, and the % sunshine is the percent time the sun is not covered by clouds that are thick enough to produce a shadow.

$$\text{Adjusted Temperature (°F)} = \text{ambient temperature (°F)} + (13 \times \% \text{ sunshine})$$

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. Table 7-2 gives the physiological monitoring frequency. The length of the work cycle is governed by the frequency of the required physiological monitoring. Initially, after physiological monitoring, rest periods are at least 15 minutes.

**TABLE 7-2. Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers**

Adjusted Temperature (°F)	Physiological Monitoring Frequency
90 or above	15 minutes
87.5 – 90	30 minutes
82.5 - 87.5	60 minutes
77.5 - 82.5	90 minutes
72.5 - 77.5	120 minutes

A person competent to accurately measure pulse and body temperature shall perform physiological monitoring. Monitoring results shall be recorded on the Heat Stress Physiological Monitoring form shown in Figure 7-4 or an equivalent Subcontractor form approved by the PMC Health and Safety Manager. The form is organized so that an individual worker’s measurements for a full work week can be recorded on one form. General guidelines for physiological monitoring are shown in Table 7-3.

**TABLE 7-3. Physiological Measurements and Actions**

Physiological Measurement	Actions
<b>Heart Rate:</b> Count the radial pulse during a 30-second period as early as possible in the rest period.	If the heart rate exceeds 110 bpm at the beginning of the rest period, shorten the next work cycle by one third and keep the rest period the same. If the heart rate still exceeds 110 bpm at the next rest period, shorten the following work cycle by one third.
<b>Body Temperature:</b> Use a clinical thermometer (3 minutes under the tongue) or a tympanic (ear) thermometer at the end of the work cycle (before drinking).	If core body temperature exceeds 101.3°F for medically selected and acclimatized personnel or 100.4°F in unselected, unacclimatized workers, shorten the next work cycle by one third without changing the rest period. If the temperature still exceeds 101.3°F for acclimatized workers or 100.4 °F for unacclimatized workers at the beginning of the next rest period, shorten the following work cycle by one third.
<b>Fluid Loss, if possible:</b> Measure weight on a scale accurate to 0.25 lb. at the beginning and end of each workday. Worker should wear similar weight (dry) clothing at each weighing.	The body fluid loss should not exceed 1.5 percent of the total body weight in one workday. If so, not enough fluids are being taken to prevent dehydration.

**7.5 Other Site Monitoring**

Other site monitoring may be necessary depending on the job task, subcontract requirements or site location of the work. The organization performing work under PMC is responsible for identifying and implementing any additional site monitoring necessary to adequately assess and control worker exposure.

**7.6 Data Quality Assurance**

**7.6.1 Training**

Persons conducting site monitoring shall have adequate training and/or experience commensurate with the type and complexity of the monitoring program. They should be able to

understand the limitations of the equipment they use, proper methods of calibration, proper methods of sealing and shipping samples and the importance of chain of custody.

### 7.6.2 Calibration

All instruments shall be calibrated (or checked for proper function if appropriate) before use for each shift or as required by manufacturer. Instrument calibration shall be documented on sample data sheets or in logbooks. Calibration checks may be necessary during the day and at the end of use to confirm instrument accuracy. Calibration should be performed using the sampling train to be used and in actual sampling conditions (e.g., altitude, barometric pressure, and temperature). Duplicate readings may be taken to confirm individual instrument response. Air sampling pumps will be calibrated with primary standards (e.g., dry calibrator or bubble-tube method). (HSG 1-1 – Air Sampling Pumps)

### 7.6.3 Operation and Maintenance

All instruments shall be operated and maintained in accordance with the manufacturer's requirements. The manufacturer's operation and maintenance manual will be kept at the site work location for each type of instrument that is being used.

### 7.6.4 Sample Shipment

Samples sent to a laboratory for analysis shall be packaged to prevent damage, spillage, or leaks. An air or bulk sample data sheet with chain-of-custody information must accompany any sample shipped.

**Filter Cassettes** – Filter cassettes should be mailed in a cardboard box and packed with paper. Do not use packaging peanuts or other static producing material because the static charge will draw material away and off the filter surface. This is especially true for asbestos fiber samples. Filter cassettes shall be taped over the top and bottom to keep the plugs on the end of the cassette and to prevent sample tampering prior to analysis.

**Charcoal Tubes** – Charcoal tubes should be mailed in a cardboard box and adequately packaged to prevent breakage during shipment. Charcoal tubes must never be shipped in the same package as bulk samples.

**Bulk Samples** – Bulk samples shall be packaged in labeled containers compatible with the sample and tightly sealed to prevent leaks and spills. Remember that some bulk samples may be considered hazardous materials by the Department of Transportation and have special requirements for packaging, labeling, and method of shipment. Bulk samples must never be shipped in the same package as charcoal tubes.

### 7.6.5 Data Review

The designated HSS or other qualified person will assess and interpret monitoring data and results based on standard industry practices and his/her professional judgment. All calculations performed on raw data (e.g., TWA calculations) shall be documented and reviewed by another qualified person. Commonly used air monitoring calculations are shown in Figure 7-5.

### 7.6.6 Recordkeeping and Posting

The PMC or Subcontractor performing work is responsible for maintaining adequate records of site monitoring activities, communicating or posting exposure information, and informing employees of monitoring results as may be required. All integrated personal air sampling results shall be communicated in writing to affected employees within five days of receiving laboratory results. All exposure monitoring and sampling results shall be maintained at the site and made

available for inspection and review by the PMC or RVO. Copies of records shall be submitted to the PMC in accordance with Section 18, Records and Reports. All employee exposure records are to be kept by the employer and made available in accordance with 29 CFR 1910.1020.

## **7.7 Additional Site Monitoring Considerations**

### **7.7.1 Monitoring Frequency**

Monitoring or sampling frequency will be influenced by a number of factors including the following:

- Frequency of contaminant release (i.e., continuously, intermittently, one-time release)
- Frequency of operation
- Number of samples required
- Number of different work groups requiring assessment
- Number of work shifts requiring monitoring

Each of these factors should be considered to determine the monitoring frequency.

### **7.7.2 Monitoring Duration**

When monitoring a worker's exposure for comparison to a published exposure limit value such as the OSHA PELs or ACGIH TLVs, monitoring may need to be conducted over a full 8-hour (or longer) work shift or a 10- to 15-minute period of time. In some cases, monitoring may need to be continuous if there is the potential for buildup of a dangerous atmosphere. Monitoring duration can also be affected by the duration of the operation being monitored (i.e., it may only operate one hour a day) or by the length of time a worker performs an operation. Duration can also be affected by the contaminant concentration in air. Oftentimes, higher concentrations of air contaminants will require the collection of shorter-term samples to avoid overloading the sample collection device.

### **7.7.3 Monitoring Location**

The monitoring location will be influenced by the purpose for monitoring. When monitoring for compliance with employee exposure limit values such as PELs or TLVs, monitoring close to the person's breathing zone will normally be required. On the other hand, ambient or area monitoring is often used to determine air concentrations in a general area that may then be used to estimate worker exposures when they are working in the area.

The location of monitoring will also be influenced by where the contaminant or hazard source originates and/or the dispersion pattern, which may be influenced by atmospheric conditions.

### **7.7.4 Number of Samples**

The number of samples that need to be collected and analyzed will be influenced by the purpose for the monitoring and the degree of confidence necessary. If the purpose of the monitoring is to collect subjective data to determine the magnitude of the airborne contamination, then only a few samples will be necessary. However, if the purpose is to determine and document compliance with a regulation, then a "statistically" significant number of samples will be necessary. In this case it may be necessary to consult with a statistician who can help develop a monitoring strategy to achieve sufficient statistical power. In many cases, three or more samples may be necessary to draw any preliminary conclusions.

When integrated personal sampling and analysis is required by the Subcontractor Health and Safety Requirements of the Subcontract, unless otherwise specified, at least three full-shift samples representative of worst-case exposure conditions are required. Alternate sampling plans

will be considered if proposed in the THASP and approved by the PMC Project Health and Safety Manager.

#### **7.7.5 Observation of Monitoring**

Observation of monitoring refers to two different aspects. First, all air monitoring needs to be checked throughout the day by the person performing the monitoring. All air-monitoring devices are subject to breakdown and tampering and thus they need to be checked periodically. Never set up a device and leave it unattended until the end of the monitoring period. If the monitoring period is only 10 to 30 minutes long, then it should be observed the entire time.

The other aspect to observation of monitoring is the right of employees or their representative to observe the monitoring. Employees have a right to observe monitoring (that affects them) and this right should be explained to them. Bargaining unit employees have a right to request that a union representative observe the monitoring.

Figure 7-1. Anticipated Site Monitoring Requirements for Remedial Implementation Projects

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	<b>ANTICIPATED MONITORING                      REQUIREMENTS FOR REMEDIAL                      IMPLEMENTATION PROJECTS</b>
<b>Implementation Project</b>	<b>Direct Reading                      Exposure Monitoring (see notes)</b>	<b>Integrated Personal                      Monitoring</b>
Misc. Structures	Total dust Noise Temperature extremes	Dust (particles not otherwise specified) Silica (respirable) Metals (lead, chromium, arsenic) Asbestos (phase contrast microscopy-PCM) Other building-specific contaminants as necessary
RCRA Cover Construction	Temperature extremes Total dust Noise	Respirable particulates not otherwise classified (PNOC) Silica (respirable) Radiological (for users of nuclear density gauges)
Revegetation	Total dust Noise Temperature extremes	Respirable PNOC Silica (respirable)
Subgrade Construction	Total dust Organic vapors (as necessary depending on soil classification)	Dust (particles not otherwise specified) Silica Metals (lead, chromium, arsenic, cadmium) Pesticides (aldrin, endrin, isodrin, dieldrin) ACM (when necessary)
Traffic Management	Total dust Noise Temperature extremes	Respirable PNOC Silica (respirable)

**Notes**

- Organic vapor monitoring will be conducted using a direct reading monitor equipped with a photoionization detector or flame ionization detector. Monitoring will be conducted for operations where unknown drums or containers could be encountered, or where soils potentially contaminated with significant levels of organics are handled.
- Total dust sampling will be conducted using a Miniram or equivalent. Monitoring will be conducted for operations that could produce elevated total dust or airborne silica concentrations.
- Noise monitoring shall be conducted in accordance with Section 7.4.3.
- Heat stress monitoring shall be conducted in accordance with Section 7.4.4.
- Respirable PNOC sampling and analysis shall be conducted according to NIOSH method 0600 or equivalent.
- Silica (respirable) sampling and analysis shall be conducted according to NIOSH method 7500 or equivalent.







Figure 7-3. Air Monitoring Data Sheet

 TETRA TECH EC, INC.		PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL		<b>AIR MONITORING DATA SHEET</b> (Personal Sampling) Page 1 of 2		
Employee			Date			
PMC Dbase #			Project			
Company			Task			
Job Title			Site			
Sample No.						
Pump No.						
Media						
Time On						
Time Off						
Total Time						
Flow Rate						
Volume						
STP Volume (Used for gas or vapor samples)						
Laboratory Analysis	Laboratory Used:			Report Nos. (attach copies)		
Contaminant	Lab Results (mg)	?????????????? ???? ?	TWA – 8 hr mg/m <sup>3</sup>	TLV – 8 hr mg/m <sup>3</sup>	?????????????? ??????????	PEL – 8 hr mg/m <sup>3</sup>
Description of Job Duties and Activities Conducted:						
<i>Continue on separate sheet if necessary</i>						
Control Measures:						
<i>Continue on separate sheet if necessary</i>						
PPE Utilized:						
<i>Continue on separate sheet if necessary</i>						

Figure 7-4. Heat Stress Physiological Monitoring Form

 <small>TETRA TECH EC, INC.</small>	<b>ROCKY MOUNTAIN ARSENAL PROGRAM MANAGEMENT CONTRACTOR</b>	<b>HEAT STRESS PHYSIOLOGICAL MONITORING FORM</b>					
Project _____		Company _____					
<p>1. Take and record measurement of temperature and pulse at the following times:</p> <p style="margin-left: 20px;">a. before beginning shift</p> <p style="margin-left: 20px;">b. at each break</p> <p style="margin-left: 20px;">c. at the end of the day</p> <p>2. Shorten the work cycle if measurements exceed:</p> <p style="margin-left: 20px;">Pulse – 110 beats per minute</p> <p style="margin-left: 20px;">Temperature – 99.6° F</p> <p>3. Never continue work if your body temperature is more than 100.4° F, or if you are experiencing sudden and severe fatigue, nausea, dizziness, or lightheadedness.</p>							
Employee: _____		Body Weight: prework _____					
Date: _____		postwork _____					
Ambient Temp.: _____		Weather Conditions: _____					
Time	_____	_____	_____	_____	_____	_____	_____
Temp	_____	_____	_____	_____	_____	_____	_____
Pulse	_____	_____	_____	_____	_____	_____	_____
Employee: _____		Body Weight: prework _____					
Date: _____		postwork _____					
Ambient Temp.: _____		Weather Conditions: _____					
Time	_____	_____	_____	_____	_____	_____	_____
Temp	_____	_____	_____	_____	_____	_____	_____
Pulse	_____	_____	_____	_____	_____	_____	_____
Employee: _____		Body Weight: prework _____					
Date: _____		postwork _____					
Ambient Temp.: _____		Weather Conditions: _____					
Time	_____	_____	_____	_____	_____	_____	_____
Temp	_____	_____	_____	_____	_____	_____	_____
Pulse	_____	_____	_____	_____	_____	_____	_____
Employee: _____		Body Weight: prework _____					
Date: _____		postwork _____					
Ambient Temp.: _____		Weather Conditions: _____					
Time	_____	_____	_____	_____	_____	_____	_____
Temp	_____	_____	_____	_____	_____	_____	_____
Pulse	_____	_____	_____	_____	_____	_____	_____
Employee: _____		Body Weight: prework _____					
Date: _____		postwork _____					
Ambient Temp.: _____		Weather Conditions: _____					
Time	_____	_____	_____	_____	_____	_____	_____
Temp	_____	_____	_____	_____	_____	_____	_____
Pulse	_____	_____	_____	_____	_____	_____	_____

Figure 7-5 Air Monitoring Calculations

	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>AIR MONITORING CALCULATIONS</b>
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1. DUST/CHEMICAL OF CONCERN (COC) SAMPLING CALCULATIONS

- a. Calculating Sample Air Volume in m<sup>3</sup> = sample time in minutes x sampler flow rate in lpm, divided by 1,000 liters/m<sup>3</sup>.

$$\text{Example: Air Volume} = \frac{600 \text{ minutes} \times 1.7 \text{ lpm}}{1000 \text{ l/m}^3} = 1.02 \text{ m}^3$$

- b. Calculating % COC = COC filter weight from lab divided by dust filter weight from lab x 100.

$$\text{Example: \% COC} = \frac{.0142 \text{ mg COC}}{.056 \text{ mg Dust}} \times 100 = 25.4\% \text{ COC}$$

- c. Calculating dust concentration in mg/m<sup>3</sup> = Dust filter weight from lab in mg divided by the sample air volume in m<sup>3</sup>.

$$\text{Example: Dust Concentration} = \frac{.056 \text{ mg Dust}}{1.02 \text{ m}^3} = .055 \text{ mg/m}^3$$

- d. Calculating COC Concentration = COC filter weight from lab in mg divided by the sample air volume in m<sup>3</sup>.

$$\text{Example: COC Concentration} = \frac{.014 \text{ mg COC}}{1.02 \text{ m}^3 \text{ Air Volume}} = 0.014 \text{ mg/m}^3$$

- e. Calculating Shift Time Weighted Average (TWA) = Concentration for Dust or COC x exposure time in hours, divided by 8 hours.

Example #1:

$$\text{Shift TWA} = .025 \text{ mg/m}^3 \text{ Dust Conc.} \times \frac{6 \text{ Hours Exposure}}{8 \text{ hours}} = .0188 \text{ mg/m}^3 \text{ Dust}$$

Example #2:

$$\text{Shift TWA} = .055 \text{ mg/m}^3 \text{ Dust Conc.} \times \frac{10 \text{ Hours Exposure}}{8 \text{ hours}} = .069 \text{ mg/m}^3$$

- f. Calculating Percent PEL for Dust or COC = Dust or COC Shift TWA Concentration in mg/m<sup>3</sup> divided by the PEL x 100.

Calculate the silica PEL using the OSHA PEL Equation:

$$\text{PEL} = \frac{10}{\% \text{Quartz} + 2(\% \text{Cristobalite}) + 2(\% \text{Tridymite}) + 2}$$

### Figure 7-5: Air Monitoring Calculations (continued)

This PEL equation incorporates the respirable fraction of the dust sample as well as the types of silica that may be found in the respirable dust sample.

Example:

Total respirable Shift-TWA = .069 mg/m <sup>3</sup>	
Total respirable dust Conc. = .055 mg/m <sup>3</sup>	
Silica - Quartz Conc. = .014 mg/m <sup>3</sup>	% Silica - Quartz = 25.45%
Cristobalite Conc. = .008 mg/m <sup>3</sup>	% Cristobalite = 14.55%
Tridymite Conc. = 0.0 mg/m <sup>3</sup>	% Tridymite = 0.0%

$$\text{PEL} = \frac{10}{25.45 + 2(14.55) + 2(0) + 2} = .177 \text{ mg/m}^3$$

$$\% \text{ PEL for silica} = \frac{\text{Shift-TWA}}{\text{PEL}} \times 100 = \frac{.069 \text{ mg/m}^3 \text{ TWA}}{.177 \text{ mg/m}^3 \text{ PEL}} \times 100 = 39.0\% \text{ PEL}$$

Since the %PEL equals .390 or 39.0%, which is less than 1 or 100%, then compliance is maintained.

If the formula calculates to > 1 or 100% then there is a possible overexposure. If the value is ≤ 1 or 100% then there is compliance.

## 2. GAS/VAPOR/MIST/FUME CONCENTRATION CALCULATIONS

- a. Calculating Sample Air Volume in m<sup>3</sup> (see Dust Sampling Calculations)
- b. Calculating Concentration = Sample results from lab in mg divided by the Sample Air Volume in m<sup>3</sup>. Be sure to correct the air volume to STP if sampling for gases or vapors, see 2e.

Example:

$$\text{Vapor Conc.} = \frac{200 \text{ mg}}{.665 \text{ m}^3} = 300.8 \text{ mg/m}^3$$

- c. Calculating Shift TWA =

$$\text{Sample Conc. in ppm or mg/m}^3 \times \frac{\text{Exposure Time in Hours}}{8 \text{ Hours}}$$

- d. Calculating % PEL or TLV =  $\frac{\text{shift TWA}}{\text{PEL / TLV}} \times 100$

**Figure 7-5: Air Monitoring Calculations (continued)**

- e. Standard temperature, pressure correction for gases and vapors:  
Where:

$$V_s = V \times \frac{T_{STP} P_a}{T_a P_{STP}}$$

$V_s$	=	Air volume at STP
$V$	=	Air volume sampled
$P_a$	=	barometric pressure in mm Hg.
$P_{STP}$	=	760 mm Hg
$T_a$	=	Temperature of sample air in Kelvin, °C + 273
$T_{STP}$	=	298 K
STP	=	Standard temperature and pressure

**3. ASBESTOS FIBER CONCENTRATION CALCULATION**

- a. Asbestos Fibers per cubic centimeter of air

$$f/cc = \frac{(\text{Fiber/Fields}) (385 \text{ mm}^2/\text{Filter})}{(7854 \text{ um}^2/\text{Field}) (\text{Liters of Air})} \times 1000$$

**4. CONVERSION CALCULATIONS**

- a. Converting ppm to mg/m<sup>3</sup>

$$\text{Example: ppm} = \frac{\text{mg/m}^3 \times (24.45)}{\text{MW}}$$

(MW = molecular weight of the air contaminant)

- b. Converting mg/m<sup>3</sup> to ppm

$$\text{Example: mg/m}^3 = \frac{\text{ppm} \times (\text{MW})}{24.45}$$

(MW = molecular weight of the air contaminant)

- c. Measurement conversions for common units

1 milliliter of air (ml) = 1 cubic centimeter of air (cc)  
 1000 ml = 1 liter  
 1000 l = 1 cubic meter (m<sup>3</sup>)  
 1000 milligrams (mg) = 1 gram (g)  
 1 mg/l = 1 ppm  
 10,000 ppm = 1.0%

## **8.0 SITE CONTROL**

Site zones are established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas.

### **8.1 Central Remediation Area**

The CRA is the area of RMA where the majority of the remediation work is being conducted. The limits of the CRA will change as tasks are initiated and completed by the PMC. Access to the CRA is controlled by the PMC. Only trained and authorized personnel will be allowed into the area. Authorized personnel include the PMC and Subcontractors, RVO personnel and representatives, and other personnel or Subcontractors performing work related to remediation activities or other official business.

Access to the CRA is controlled through a combination of signs, barricades, awareness, and identification badges. Additional information is provided in the current version of PMC Procedure A-007-RMA, PMC CRA Access Control Procedure.

### **8.2 Remediation Work Area Zones**

A three-zone approach will be used to control areas where site contaminants exist. Access will be allowed only after verification of appropriate training and medical qualification. The three-zone approach shall include an EZ, Contamination Reduction Zone (CRZ) and a Support Zone (SZ) as shown in Figure 8-1. The three-zone approach is not required for construction work performed outside contaminated areas where control of site contamination is not a concern.

Specific work control zones shall be established as necessary during task planning as part of the THASP. Site work zones should be modified in the field as necessary, based on such factors as equipment used, air monitoring results, environmental conditions, or alteration of work plans. A FCR is not required unless significant deviation from the planned work and original work control zones is necessary. The following guidelines shall be used for establishing and revising these preliminary zone designations.

#### **8.2.1 Support Zone**

The SZ is an uncontaminated area (trailers, offices, field vehicles, etc.) that will serve as the field support area for most operations. The SZ provides field team communications and staging for emergency response. Appropriate sanitary facilities and safety and emergency response equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged and decontaminated materials, or personnel with medical emergencies that cannot be decontaminated.

#### **8.2.2 Contamination Reduction Zone**

The CRZ is established between the EZ and the SZ, upwind of the contaminated area where possible. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel, portable handheld equipment and tools, and heavy equipment. A personnel decontamination area will be prepared at each EZ. The CRZ will be used for entry into and egress from the work area. In addition, the CRZ serves as access for heavy equipment and emergency support services. The CRZ shall be clearly demarcated and posted with signs as shown in Figure 8-2 or equivalent. The signs shall be visible to personnel approaching the CRZ.

#### **8.2.3 Exclusion Zone**

The EZ is where activities take place that may involve exposure to site contaminants and/or hazardous materials or conditions. This zone shall be clearly demarcated to prevent

unauthorized entry. More than one EZ may be established if there are different levels of protection to be employed or different hazards that exist in the same work area. The EZ shall be large enough to allow adequate space for the activity to be completed, including field personnel and equipment, as well as necessary emergency equipment.

The EZ shall be clearly demarcated with a physical barrier and posted with signs as shown in Figure 8-2 or equivalent. The recommended methods for EZ delineation include the use of temporary construction fencing and/or windproof (reinforced) plastic caution tape. The physical barrier and signs shall be placed so that they are visible to personnel approaching or working in the area. Barriers and boundary markers shall be removed when no longer needed. All personnel shall sign in before entering the EZ and sign out when leaving. Large EZs with controlled entry points such as Basin A, and the Enhanced Hazardous Waste Landfill (ELF) are not required to be completely surrounded by physical barriers and signs.

### **8.3 Other Controlled Areas**

Other work areas may need to be controlled due to the presence of an uncontrolled hazard, to warn workers of requirements, or to prevent unauthorized entry. Examples include general construction work areas, open excavations, high noise areas, vehicle access areas, and similar activities or limited access locations. These areas shall be clearly demarcated with physical barriers (fencing, cones, reinforced caution tape or rope) as necessary and posted with appropriate signage. An example sign is shown in Figure 8-3. Signs and physical barriers (fencing, cones, tape, and rope) shall be removed when no longer needed.

Figure 8-1, Typical Site Zone Layout

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	<b>TYPICAL SITE ZONE LAYOUT</b>
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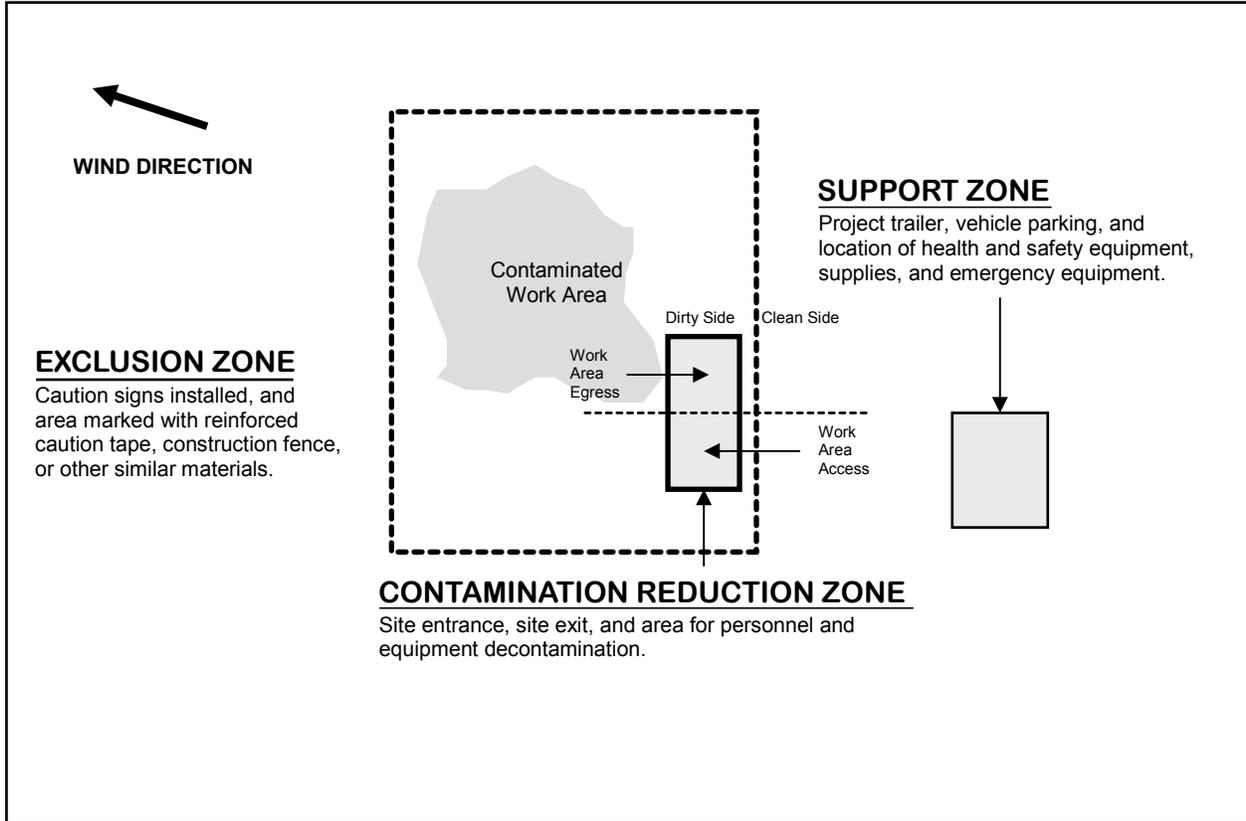


Figure 8-2, Typical Signage for Contaminated Areas

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	TYPICAL SIGNAGE FOR CONTAMINATED AREAS
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Red Letters

Black Letters on  
Yellow Background

Yellow Letters on  
Black Background



Red Letters

Black Letters on  
Yellow Background

Yellow Letters on  
Black Background

Figure 8-3, Typical Signage for Other Controlled Areas

 <p>TETRA TECH EC, INC.</p>	<p>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</p>	<p>TYPICAL SIGNAGE FOR OTHER CONTROLLED AREAS</p>
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## **9.0 DECONTAMINATION, CLEANING AND DISPOSAL**

Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the exclusion zone where possible and should consider any adjacent or nearby projects and personnel. Separate areas will be designated for personnel decontamination to minimize contamination of personnel by overspray from equipment decontamination. Equipment and vehicle decontamination and cleaning requirements are stated in Specification Section 01420, Vehicle and Equipment Decontamination, and Specification Section 01425, Vehicle and Equipment Cleaning Requirements. In areas not considered to be contaminated, care should be taken to prevent the tracking of mud or debris from the area onto RMA or public roadways.

### **9.1 Contamination Prevention**

Preventing or avoiding contamination of personnel, tools, and equipment will be considered in planning work activities at all field locations. Good contamination prevention and avoidance practices will assist in preventing worker exposure and result in a more efficient decontamination process. Procedures for contamination prevention and avoidance include the following:

- Do not walk through areas of obvious or known contamination.
- Do not directly handle or touch contaminated materials.
- Make sure there are no cuts or tears in PPE.
- Fasten all closures in suits and cover them with duct tape, if appropriate.
- Take particular care to protect any skin injuries.
- Stay upwind of airborne contamination, where possible.
- Do not eat or drink in contaminated work areas.
- Do not carry food, beverages, tobacco, or flame-producing equipment into contaminated work areas.
- Minimize the number of personnel and amount of equipment in contaminated areas necessary for accomplishing the work.
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned and decontaminated.
- Cover monitoring and sampling equipment with clear plastic, leaving openings for the sampling ports, as necessary.
- Minimize the amount of tools and equipment necessary in contaminated areas.

### **9.2 Personnel Decontamination**

All personnel exiting an EZ in contaminated areas shall move through a personnel decontamination station. The station will be set up in the CRZ as shown in Figure 9-1 and will have adequate equipment and facilities to decontaminate personnel, reusable protective clothing, respirators, small equipment, and tools or will properly containerize contaminated materials (disposable PPE, gross debris, and decontamination liquids). At a minimum, face and hand washing facilities are required when site-located shower facilities are not specified. Shower and change facilities are required for hazardous waste cleanup or removal actions with a fieldwork duration of more than six months in accordance with 29 CFR 1910.120 or when specified in the Subcontract. Specific decontamination procedures shall be developed in the THASP and communicated to all site workers.

### **9.3 Decontamination During Medical Emergencies**

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

### **9.4 Waste Collection and Disposal**

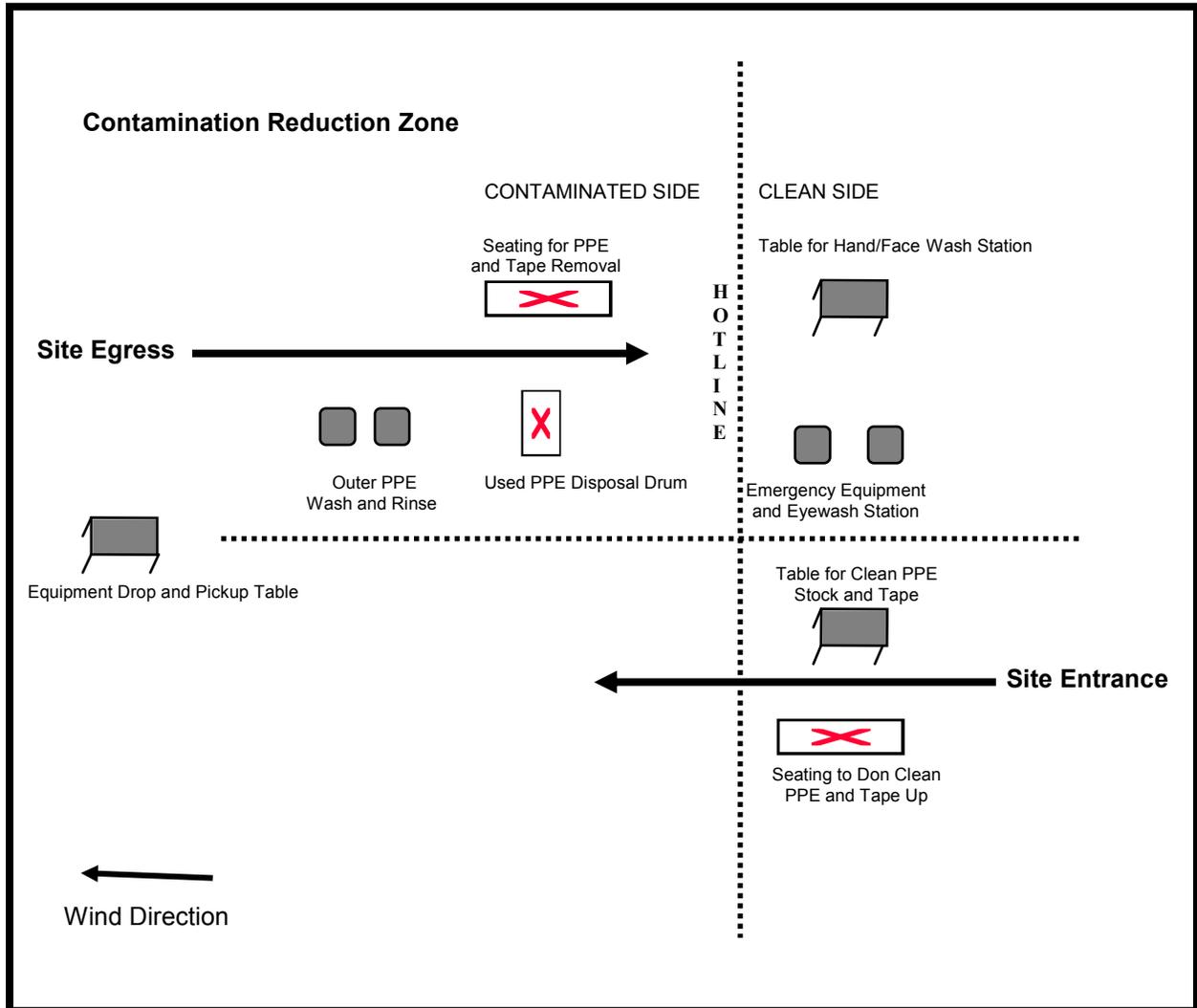
All contaminated material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly containerized and labeled, stored at a secure location, and disposed in accordance with applicable portions of PMC EC-002-RMA Remediation Waste Management Plan, specification sections, and THASPs.

### **9.5 Coordination with Waste Disposal Facilities**

The PMC and Subcontractor who will be sending waste materials to the on-site Waste Disposal Facilities are responsible for promptly communicating safety-related information about the waste material (including sampling results) to the receiving facility. The Subcontractor sending waste materials to on-site Waste Disposal Facilities shall ensure that adequate communication of the concern or hazard is made to the Waste Disposal Facility Subcontractor in a timely manner. The PMC Environmental Compliance Manager may assist Subcontractors with the waste disposal process. This will help to ensure that workers at the receiving facility are aware of potential hazards and have appropriate controls (including PPE) in place. Safety-related information includes notification of higher than expected real-time monitoring readings, odorous materials, dusty material, PPE upgrade, or other unexpected conditions that could pose a hazard to disposal facility workers.

Figure 9-1 Typical Decontamination Area Layout

 <p>TETRA TECH EC, INC.</p>	<p>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</p>	<p><b>TYPICAL DECONTAMINATION AREA LAYOUT</b></p>
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## **10.0 COMMUNICATIONS**

A primary and secondary means of communications shall be identified and used by the PMC and Subcontractor while working at RMA. Methods of communicating to emergency services are required for all site personnel. Methods for communicating among site personnel or work crews at remediation or construction worksites are required. Listed below are the communications methods to be used. These methods shall be identified, modified, or augmented if necessary in the THASP, based on actual site conditions. See also Section 15, Event Reporting, and Section 17, Emergency Action Plans for additional emergency communication information.

### **10.1 Administrative and Management Support Personnel**

Administrative and management support personnel will be working primarily in trailers or offices with dedicated phone systems. Phones will be used as the primary form of communication with emergency services. Secondary or backup communications systems available are radios, cellular phones, or motor vehicles.

### **10.2 Field Site Personnel**

#### **10.2.1 Communication with Emergency Responders**

Ability to communicate with potential responders, both the off-site Adams County Communication Center, Inc. (Adcom 911), and the on-site RMA Operations Center (ROC) shall be maintained. Where cellular phones and radios are used for emergency communications, they shall be tested before field operations begin to ensure that they perform adequately between the site location and Adcom 911 and the ROC.

Adcom 911 dispatches Community Emergency Responders (CERs) including police, fire, and medical response and may be contacted by dialing 911 using RMA facility phones, off-site telephones, or cellular telephones.

The ROC coordinates on-site communications and personnel notifications, including anomaly response, spill reporting, and RMA Law Enforcement, as required. The ROC may be contacted by dialing 5246 using RMA facility phones or by dialing 303-289-0246 using an off-site or cellular telephone. Contact with the ROC can also be made by using Channel #1 on the RMA radio network during normal business hours.

PMC personnel working at field sites lacking a dedicated phone system will have immediate access to cellular phones for communications with Adcom 911 and/or the ROC, or reliable radio communications to a designated person with phone access to Adcom 911 and/or the ROC. If radios are used as the primary means of communication, the "PMC Base" on radio Channel #7 is designated and available to relay PMC emergency response needs during normal business hours (7:30 a.m. to 4:00 p.m. Monday through Friday, except on designated holidays). Outside of normal business hours, the PMC individual or group performing fieldwork shall designate and ensure the availability of an individual to monitor the radio and relay emergency response needs to Adcom 911 and/or the ROC. The secondary means of communications with emergency services for the PMC may include cellular phones (if radios are used), radios (if cellular phones are used), utilizing Subcontractor communications resources, or use of project vehicles to drive to a location with a dedicated phone.

Subcontractor personnel working at field sites lacking dedicated phone systems will have immediate access to cellular phones for communications with Adcom 911, or reliable radio communications to a designated person with a phone access to Adcom 911. If radios are used as the primary form of communications with Adcom 911, a base station at the field site must be continuously manned during times of active field operations. The PMC or RVO will provide at least one radio to each Subcontractor who will use PMC Channel #1, to immediately

communicate RMA emergency conditions to the ROC. Secondary or backup communications systems that could be used are radios, cellular phones, or motor vehicles.

The Subcontractor is responsible for coordinating all Emergency Response needs with the applicable CERs. The Subcontractor shall rehearse the plan periodically and train all employees regarding provisions of the plan.

### **10.2.2 Buddy System**

Use of the buddy system is required for all fieldwork. The buddy system shall ensure that fieldwork is organized such that each worker is designated to be observed by at least one other worker, and the workers keep watch on the safety, security, and emergency needs of one another. Normally, the buddy system requires assignment of at least two workers to conduct field activities. The PMC Health and Safety Manager may exempt low-hazard work from this requirement. Exempted work shall be noted in the THASP and/or documented using the FCR process.

### **10.2.3 Communication Among Field Site Personnel**

**Radios and Cell Phones** – Radios and cell phones are used as appropriate by field teams for communication with the site support facilities or the base station. The base station shall be continuously manned any time on-going fieldwork uses radios as the primary means of communication. Refer to Section 16.15 Construction Equipment Safety for cell phone use.

**Hand Signals** - Hand signals shall be used by field teams, along with the buddy system, to ensure that potential emergency situations are communicated to all site personnel. The entire field team shall become familiar with the hand signals used before operations commence and their hand signal use shall be covered during site-specific training. Typical hand signals to be used are shown in Figure 10-1.

Figure 10-1 Typical Hand Signals

 <p>TETRA TECH EC, INC.</p>	<p>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</p>	<p><b>TYPICAL HAND SIGNALS</b></p>
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<b>SIGNAL</b>	<b>MEANING</b>
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist.	Leave the area immediately, no debate.
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.
Raised arm, clenched fist	Stop

## 11.0 MEDICAL SURVEILLANCE AND QUALIFICATION

All PMC and Subcontractor employers participating in hazardous waste operations or emergency response (or if required by Subcontract) shall maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. As necessary, the employer shall determine the employee's fitness for duty following an extended absence (e.g., five working days) due to injury, illness, or medical treatment that could affect the worker's ability to work safely. Documentation of employee medical qualification (e.g., physician's written opinion) shall be maintained at RMA by the employer (PMC or PMC Subcontractor) and made available for inspection by the PMC or RVO.

### 11.1 Hazardous Waste Operations and Emergency Response

PMC or Subcontractor personnel expected to participate in on-site hazardous waste operations or emergency response (or if required by Subcontract) at RMA are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including, if appropriate, any recommended limitations on the employee's assigned work. **The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.**

### 11.2 Project-Specific Medical Surveillance

For work that does not involve participation in hazardous waste operations, but that may be physically demanding, the Subcontractor shall ensure that all workers receive a Fit for Duty medical examination prior to performing fieldwork at RMA. The purpose of the Fit for Duty examination is to aid in determining the physical capability of potential employees to perform designated job duties, aid in determining the presence of pre-existing conditions, and make the employer aware of medical conditions that may require special accommodation. The Fit for Duty medical protocol shall include:

- Medical History Questionnaire
- Physical Examination
- Audiogram
- Back Fit Test

### 11.3 Job or Site-Specific Medical Surveillance

Due to the nature of hazards for a particular job or worksite, specialized medical surveillance may be necessary. This surveillance could include biological monitoring for specific compounds (e.g., cholinesterase), specialized medical examinations, or preemployment back evaluations. Job- or site-specific medical surveillance and/or testing requirements shall be specified in the THASP.

### 11.4 Respirator User Qualification

Personnel required to wear respirators shall have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

### **11.5 Hearing Conservation**

Personnel working in operations that fall under 29 CFR 1910.95 and exposed to noise levels in excess of the 85 dBA TWA shall be included in a hearing conservation program that includes annual audiometric testing and annual review/training.

### **11.6 Emergency Data Sheet**

An emergency data sheet is provided as Figure 11-1. This emergency data sheet should be completed by all on-site personnel and kept in a secure location maintained at the site by the site Supervisor or ESS during site operations. Site workers have the responsibility to disclose to the designated HSS any known allergy or sensitivity, medications, or medical condition that may affect or be aggravated by site work and update to maintain its accuracy. The information provided will be used only if a medical necessity arises and shared only with those who would need to know to assist in addressing the medical and/or workers compensation event.

Figure 11-1 Emergency Data Sheet

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR          ROCKY MOUNTAIN ARSENAL</b>	<b>EMERGENCY DATA SHEET</b>
<b>(Voluntary)</b> This Emergency Data Sheet should be completed by all on-site personnel and kept in a secure location by the Site Supervisor or ESS during site operations. Your health & safety is our priority. Under HIPAA you are entitled to complete privacy in regards to your medical information. The information you provide below will be used only if a medical necessity arises and shared only with those who would need to know to assist in addressing the medical and/or workers compensation event. Return completed form to project safety representative and update this data sheet as often as necessary to maintain its accuracy. This may include changes in medication, emergency contacts or allergies and sensitivities.		
Name:	Date:	
Address:	Age:	
	Home Telephone: <hr/> Work Telephone:	
Name and Telephone Number of Person(s) to be Contacted in the Event of an Emergency:		
Medications Currently Taking: (both prescribed and over-the-counter medication)		
Known Allergies or Sensitivities (such as allergic reaction to bee stings and food allergies):		
Other Significant Medical Alerts or Precautions:		
Name of Personal Physician:	Telephone No.:	
Implementation Project:	Supervisor's Name:	
Task:	Supervisor's Title:	
Company/Department:	Telephone Number:	

**This form may contain personal or sensitive information – Protect Accordingly!  
 Destroy when no longer needed.**

## 12.0 WORKER TRAINING AND QUALIFICATION

### 12.1 Site Orientation

All PMC employees and each PMC Subcontractor employee shall attend site orientation training prior to beginning fieldwork assignments at RMA.

### 12.2 General Health and Safety Training

The PMC and Subcontractors shall provide their employees with the health and safety training required to comply with subcontract requirements, achieve compliance with regulatory standards, and other training and qualification necessary for an employee to complete the assigned job duties safely. This training may include competent person training and/or training required by 29 CFR 1926.21, General Safety Training and Education. Employee participation in development and/or presentation of training curricula should be encouraged by site management and safety personnel.

Documentation of all required training (e.g., training certificates or attendance rosters) shall be maintained at RMA by the employer and made available for inspection by the PMC or RVO. Training documentation shall be maintained in an organized manner that is readily retrievable and shows that individual workers have the required training. Figure 12-1 is an example of a form that may be used to simplify personnel training tracking.

### 12.3 Hazardous Waste Operations and Emergency Response Training

All PMC and Subcontractor employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65 (or if required by Subcontract). At a minimum, the training shall have consisted of instruction in the topics outlined in 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

#### 12.3.1 Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignments, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable them to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120, paragraphs (p) and/or (q).

#### 12.3.2 Three-Day Supervised Field Experience

General site workers for hazardous waste operations shall have received three days of supervised field experience (on-the-job training) under the direct supervision of a trained, qualified supervisor, and the employer shall provide documentation that this training has been completed. Supervisors assigned to provide the three-day supervised field experience shall be trained in accordance with 29 CFR 1926.65(e)(4), "Management and supervisor training". If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment at RMA. An example record of Three-day Supervised Field Experience is provided as Figure 12-2.

#### 12.3.3 Refresher Training

General site workers engaged in hazardous waste operations and TSD workers shall receive eight hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

#### **12.3.4 Eight-Hour Supervisory Training**

PMC or Subcontractor on-site management, or supervisors who will be directly responsible for or supervise employees engaged in hazardous waste site operations, will have received the training specified in Section 12.3.1 and 12.3.2, and at least eight hours of additional specialized training on managing such operations prior to beginning fieldwork at RMA. Training shall meet requirements of 29 CFR 1926.65(e)(4).

#### **12.3.5 Site-Specific Training**

Prior to commencement of field activities, all field personnel assigned to the project will have completed site-specific training that will address the contents of applicable HASPs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified hazardous substances at the site, hazard communication as necessary, PPE, event reporting, emergency response actions, and available emergency services. This training allows field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

#### **12.4 First Aid and Cardiopulmonary Resuscitation**

Community Emergency Responders, e.g., South Adams County Fire Protection District, will provide first aid and emergency medical services for RMA workers when activated by Adcom 911 by calling 911. First aid and cardiopulmonary resuscitation (CPR)-trained PMC and Subcontractor employees may voluntarily provide first aid or CPR as a "Good Samaritan act" until a CER arrives at the scene. When employees voluntarily provide first aid or CPR involving blood or other potentially infectious materials, the Hepatitis B vaccination series shall be made available to them as soon as possible but no later than 24 hours following the potential exposure. Other applicable elements of 29 CFR 1910.1030, Bloodborne Pathogens, shall also be implemented by the employer.

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association, National Safety Council, or American Heart Association shall be administered by a certified trainer to an adequate number of people to provide volunteer support capability during an emergency situation. A minimum of two personnel per active field operation shall have first aid and CPR training. The PMC and Subcontractors are responsible for identifying on-site personnel selected for first aid and CPR training to support their work, and providing such training. Employee information and training for bloodborne pathogens shall be provided as required in 29 CFR 1910.1030 for personnel trained to administer first aid and/or CPR.

If the PMC or Subcontractor requires or designates personnel to provide first aid or CPR on the job, all requirements of 29 CFR 1910.1030, Bloodborne Pathogens, including, but not limited to, employee information and training, prophylactic Hepatitis B series vaccination (or Hepatitis B Vaccine Declination) shall be implemented.

#### **12.5 Substance Abuse**

All PMC and Subcontractor employers shall maintain and implement a Drug Free Workplace program for site work activities performed at RMA and as required by Subcontract. Use and/or

working under the influence of alcohol or controlled substances (other than prescribed or over-the-counter medication) is strictly prohibited **at any time** and may be reason for denial of access to RMA and/or reason for termination of employment.

Pework substance abuse testing performed by the current employer is required for PMC and Subcontractor employees as required by Subcontract. When required by Subcontract, either preemployment substance abuse testing or substance abuse testing conducted specifically for work at RMA will meet the requirement for prework substance abuse testing.

Site workers are subject to substance abuse testing at any time, as well as “for cause” or following a safety or property damage event. Subcontractors are responsible for ensuring that prework, for cause and post event drug and alcohol testing are performed for their employees and their subtier employees. Positive substance abuse results from “for cause” or post event substance abuse testing shall be reported to the PMC Health and Safety Manager immediately.

## **12.6 Other Required Training and Qualifications**

Other training and qualification may be required depending on the task work scope and assigned duties of an individual employee. This may include training for waste handling, hazardous materials transportation, respiratory protection, hazard communication, noise exposure or hearing conservation, and various qualified person requirements (e.g., operation of heavy equipment, forklifts, confined space entry, excavations). Specific additional training and/or qualified person requirements shall be identified through the activity hazard AHA or THASP planning process. The employer is responsible for ensuring that identified training and/or qualified person requirements are met for site workers.

Figure 12-1 Example Personnel Training Tracking Form

 <small>TETRA TECH EC, INC.</small>	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>PERSONNEL TRAINING TRACKING FORM</b>
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**Project:** \_\_\_\_\_ **Company:** \_\_\_\_\_

**Name:** \_\_\_\_\_ **Title/Job Function:** \_\_\_\_\_

Training/Certification	Date Completed	Due Date*
OSHA 40-hr (or 24-hr, if applicable)		
3-Day Supervised Field Experience		
8-hr OSHA Refresher		
8-hr OSHA Supervisor		
Annual Physical/Medical Approval for Hazardous Waste Work		
Medical Approval for Respirator Use		
Medical Data Sheet		
Respirator Fit Test		
Cholinesterase Test		
First Aid/CPR Certified		
PMC HASP Review		
Training on Site/Task-Specific HASP		
RVO Project Rules Handbook Signature Page		
Hearing Conservation training		
Audiogram		
Hazard Communication training		
Bloodborne Pathogens training		
Confined Space Entry training		
Fall Protection training		
Excavation / Competent Person training		
Commercial Driver's License		
Heavy Equipment / Lift Operator		
Asbestos Awareness		
Asbestos Worker		
Asbestos Supervisor		
Asbestos Inspector		
Pre-employment Drug Screen		
RMA Site Orientation (for Subcontractor or PMC)		
CRA Access training		

\* Indicate "NA" if not applicable or if training is one-time only training.

**NOTE:** This form is NOT a substitute of proper training documentation. Personnel training and medical documentation must be maintained on-site in addition to this form.

**Figure 12-2 Record of Three-day Supervised Field Experience**

 <small>TETRA TECH EC, INC.</small>	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>RECORD OF 3-DAY SUPERVISED FIELD EXPERIENCE</b>										
Last name _____ First _____ MI _____		Employee No. _____										
Company _____												
Address _____												
Immediate Supervisor _____		Position _____										
<b>Day 1 (Date)</b> _____												
Supervised by _____		Title _____										
Company _____												
Supervised duties _____												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="width:15%;">Protection levels</th> <th style="width:30%;">D</th> <th style="width:10%;">C</th> <th style="width:10%;">B</th> <th style="width:35%;">Total hours</th> </tr> </thead> <tbody> <tr> <td>Supervised hours in each</td> <td style="height: 30px;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Protection levels	D	C	B	Total hours	Supervised hours in each				
Protection levels	D	C	B	Total hours								
Supervised hours in each												
Comments _____												
Supervisor _____ Trainee _____												
Signature		Signature										
<b>Day 2 (Date)</b> _____												
Supervised by _____		Title _____										
Company _____												
Supervised duties _____												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="width:15%;">Protection levels</th> <th style="width:30%;">D</th> <th style="width:10%;">C</th> <th style="width:10%;">B</th> <th style="width:35%;">Total hours</th> </tr> </thead> <tbody> <tr> <td>Supervised hours in each</td> <td style="height: 30px;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Protection levels	D	C	B	Total hours	Supervised hours in each				
Protection levels	D	C	B	Total hours								
Supervised hours in each												
Comments _____												
Supervisor _____ Trainee _____												
Signature		Signature										
<b>Day 3 (Date)</b> _____												
Supervised by _____		Title _____										
Company _____												
Supervised duties _____												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="width:15%;">Protection levels</th> <th style="width:30%;">D</th> <th style="width:10%;">C</th> <th style="width:10%;">B</th> <th style="width:35%;">Total hours</th> </tr> </thead> <tbody> <tr> <td>Supervised hours in each</td> <td style="height: 30px;"></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Protection levels	D	C	B	Total hours	Supervised hours in each				
Protection levels	D	C	B	Total hours								
Supervised hours in each												
Comments _____												
Supervisor _____ Trainee _____												
Signature		Signature										

Date **supervisor** completed HAZWOPER 8-Hr Supervisor training (29 CFR 1926.65 (e) (4)) \_\_\_\_\_

### **13.0 SAFETY MEETINGS**

#### **13.1 Daily Safety Meetings**

The PMC and Subcontractors shall conduct daily “tailgate” safety meetings with each work crew member prior to the start of each work shift or when the individual arrives at work. The meeting shall include a discussion of the planned work activities and periodic special safety topics of interest to site personnel. In addition, the following items shall be discussed as appropriate:

- Necessary training requirements and site work rules
- Changes in work practices or environmental conditions
- Precautions or safe work practices related to the day’s site activities
- New or modified site-wide procedures or requirements
- Event alerts provided by the PMC or RVO

Active employee participation in daily safety meetings shall be encouraged by site management and safety personnel. Documentation of daily safety meetings shall be maintained at RMA by the PMC and Subcontractor and made available for inspection by the PMC or RVO. An example daily safety meeting sign-in sheet is provided as Figure 13-1.

#### **13.2 Monthly Supervisor Safety Meeting**

A monthly Supervisors Safety Meeting is attended each month by PMC and Subcontractor Supervisor personnel. The purpose of this meeting is to provide a small focus group forum for safety leadership guidance regarding roles and responsibilities for first line supervisors.

#### **13.3 Committee Meetings**

The PMC Program Manager shall designate a representative to the RVO Safety and Health Steering Committee.

If required in the Subcontract, the Subcontractor will nominate a representative to participate as a member of either the RVO Safety and Health Steering Committee or the PMC ESQSC. All employees (including Subcontractor and lower-tier subcontractor employees) may submit safety topic suggestions to any member of the ESQSC for consideration at future meetings.

#### **13.4 Incident Review Meetings**

In the event that an OSHA-recordable injury/illness or an incident that affects the compliance status of RMA occurs, a presentation at the RVO Safety Incident Review Committee meeting is required. The PMC Health and Safety Manager will schedule the presentation with the RVO. The presentation shall include, but is not limited to, contributing factors, root causes, preventive measures, results and LL. PMC and/or Subcontractor operations management, site management, and health and safety organization will be represented at the meeting as necessary.

**Figure 13-1 Daily Safety Meeting Sign-In Sheet**

### **14.0 INSPECTIONS**

Regular inspections of active fieldwork areas, including remediation projects and site support operations, shall be conducted to identify and correct potential worksite hazards as outlined below. The inspections shall be comprehensive and include such areas as project trailers, offices, vehicles, and sanitary facilities. A sample site inspection form is shown in Figure 14-1. This form may be modified as desired to reflect task- or site-specific health and safety issues.



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

### DAILY SAFETY MEETING SIGN-IN SHEET

Date: \_\_\_\_\_ Project Name/Location: \_\_\_\_\_  
Company: \_\_\_\_\_ Person Conducting Briefing: \_\_\_\_\_

**1. AWARENESS (e.g., special EHS concerns, EC/pollution prevention, Quality, recent events, etc.):**

---

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**2. OTHER ISSUES (HASP changes, new AHAs, attendee comments, etc.):**

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**3. DISCUSSION OF DAILY ACTIVITIES/TASKS AND SAFETY MEASURES TO BE USED:**

---

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---

---

**4. ATTENDEES (Print Name):**

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.
15.	16.
17.	18.
19.	20.
21.	22.
23.	24.
25.	26.
27.	28.
29.	30.

Separate inspections are not required for support operations such as quality assurance and quality control, PMC oversight tasks, and service and maintenance Subcontractor work operations. These support operations shall be included in the inspection program of the primary PMC Subcontractor controlling the site operations and facilities.

Administrative operations such as the PMC office and warehouse areas have less frequent inspection requirements as the working conditions and work practices in these areas are not expected to change as rapidly as in active fieldwork areas. The PMC trailer and warehouse areas will be inspected monthly (for fire extinguishers and first aid kits [check expiration dates and arrange for appropriate disposal or relocation/removal]) and quarterly in accordance with the current version of TtEC Environmental Health and Safety Programs Procedure EHS 3-3, EHS Inspections, or equivalent inspection process such as the PMC Safety Observer Program.

#### **14.1 Daily Inspections (Health and Safety Supervisor or Designee)**

The PMC or Subcontractor shall perform daily informal inspections of their active fieldwork area(s), including project support areas and trailers. The inspection shall cover workplace conditions, physical facility safety, and employee work practices. The inspection, conducted by the Subcontractor HSS, shall include a walkaround of the site and a review of workplace conditions and work practices. The Subcontractor HSS shall document any deficiencies and corrective actions in a logbook.

#### **14.2 Weekly Inspections (Site Supervision)**

The PMC or Subcontractor shall perform formal weekly inspections of the active fieldwork area(s), including project support areas and trailers. The inspection shall be performed by the first line supervisor, superintendent, or equivalent supervisory position and the Subcontractor HSS, in conjunction with the PMC Project Manager or designee. Employees and/or employee representatives shall be afforded the opportunity and encouraged to participate in weekly inspections. Subcontractors shall schedule the time of the weekly inspection in advance with the PMC Project Manager or designee. The inspection shall include a review of work activities and an evaluation of compliance with established HASPs, a walkaround of the site, physical facility safety, and employee work practices.

The inspection shall be documented using the form shown in Figure 14-1 or equivalent. The form shall identify the name of the inspector(s), the date of the inspection, the work area inspected, and a description of the inspection findings. Both compliant and noncompliant inspection findings shall be identified. Activities, equipment, site facilities, or program areas included on the inspection form but not present for inspection shall be recorded as NA, for not applicable. Inspection findings and recommended corrective actions shall be clearly identified. Closure of findings shall be documented on the form by entering the date of corrective action and the name of the person who completed or verified the corrective action. Noncompliant findings shall be documented on subsequent inspections (with the date of the original inspection added at the end of the corrective action) until the corrective action has been implemented. If the actual corrective action is significantly different from the recommended corrective action, this change shall be noted on the form.

#### **14.3 Monthly Inspections (Site and Project Management)**

PMC Subcontractors shall perform monthly inspections of their active fieldwork area(s), including project support areas and trailers. The PMC Subcontractor's Site Manager, in conjunction with the PMC Project Manager or designee, shall perform the inspection. Employees and/or employee representatives shall be afforded the opportunity and encouraged to participate in monthly inspections. The inspection format and documentation shall be the same as the weekly inspection. The weekly inspection is not required the week that a monthly inspection is

performed. PMC Subcontractors shall schedule the time of the monthly inspection in advance with the PMC Project Manager.

#### **14.4 Quarterly Inspections (Program Management)**

The PMC Program Manager, PMC Environmental Compliance Manager, and the PMC Health and Safety Manager or their designee will perform quarterly inspections of representative work areas in the CRA. The inspection format and documentation shall be the same as that of the weekly inspection. PMC Subcontractors shall participate in quarterly inspections.

#### **14.5 RVO Inspections**

The RVO may conduct worksite inspections at any time. Additionally, the RVO may, at their discretion, participate in any of the inspections required by this HASP. PMC Subcontractors shall participate in RVO inspections.

#### **14.6 Corrective Action**

Corrective actions shall be implemented in a timely manner and tracked through completion. Findings for weekly, monthly, or quarterly site inspections not completed or verified by the next scheduled inspection shall be reentered on the subsequent inspection form (with the date of the original inspection added at the end of the corrective action). Interim corrective actions that effectively control identified concerns shall be implemented for all items that cannot be completed in an expeditious manner. Incomplete corrective actions, including those with interim controls, should be carried forward on each subsequent inspection until the corrective action is completed and verified.

PMC Subcontractors shall implement corrective actions to inspection findings at the time of the inspection, where feasible. Interim corrective actions shall be implemented as necessary for areas that present an immediate hazard to site workers. Interim corrective actions may include suspending work, barricading unsafe areas, posting warning signs or other similar measures to effectively mitigate the immediate hazard.

#### **14.7 Safety Observer Program**

Where required by Subcontract, PMC Subcontractors shall implement a Safety Observer Program. As part of this program, daily worksite observations will be made and feedback provided to other workers in a forum such as the next available safety meeting. The Safety Observations of the Day form and Safety Observer Program instructions are provided in Figure 14-2. The Safety Observer Program for PMC employees is described in PMC HS 008-RMA Safety Observer Program.

Figure 14-1 Site EHS Inspection Form

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR          ROCKY MOUNTAIN ARSENAL</b>	<b>SITE EHS INSPECTION FORM</b>	
<b>Site Information:</b>			
Implementation Project:	Date of Inspection:		
Company(s):	Type of Inspection: <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly		
Tasks or Activities Observed:			
<b>Persons Conducting Inspection:</b>			
Name	Company	Name	Company
<b>A. General Workplace Conditions</b>			
Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No	
Walking/Working Surfaces			
Aisles and Passageways			
Platforms/Scaffolding			
Ladders			
Stairs			
Exits/Egress			
Roadways			
Excavations/Trenches			
Ventilation			
Lighting			
Noise Exposure			
Ergonomics			
Potable Water			
Sanitation Facilities			
Temperature Extremes			
<b>B. Hazardous Materials Use &amp; Storage</b>			
Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No	
MSDSs Available			
Material Labeling			
Storage Conditions			
Storage Containers Condition			
Chemical Storage Compatibility			
Compressed Gas Storage & Use			
Waste Storage/Disposal			



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

### SITE EHS INSPECTION FORM

**C. Motor Vehicles & Power Equipment**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Motor Vehicles Have Co. Signs		
Seatbelts & Backup Alarms		
Dozer Equipment		
Scraper Equipment		
Road Grader Equipment		
Water Trucks		
Front-End Loader/Backhoe Equipment		
Cranes/ Hoists & Rigging		
Forklifts		
Other Heavy Equipment		

**D. Hazard Controls**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
General Site Controls		
Work Zone Delineation		
Lockout Systems		
Accident Prevention Signs and Tags		
Barricades		
Hole Covers		
Electrical Grounding & GFCI Use		

**E. Emergency Systems**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Emergency Instructions		
Fire Protection		
Eye Wash and Showers		
First Aid Kits/ AEDs		
Emergency Rescue Equipment		

**F. Protective Equipment Use & Compliance**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Eye Protection		
Ear Protection		
Respiratory Protection		
Head Protection		
Hand Protection		
Foot Protection		
Body Protection		
Fall Protection		



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

### SITE EHS INSPECTION FORM

**G. Hand/Power Tools and Power Systems**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Hand Tools Condition		
Portable Power Tools Condition		
Welding/Burning Equipt. Condition		
Power Tools Guarding		
Electrical Power Generator		
Pneumatic Power Generator		

**H. Remediation Waste Management**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Waste Properly Categorized		
Cross Contamination Minimized		
Containers in Good Condition		
Waste Storage		
Staging/Stockpiling of Soil/Debris		
Decontamination Water		

**I. Project Environmental Programs**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Dust Control		
Odor Control		
Oil and Spill Prevention		
Stormwater/Erosion Control Activities		

**J. Environmental Management System**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
Pollution Prevention		
Recycling		
Paper Conservation		
EHS Continual Improvement		
Employee Participation		

**K. Postings/ Signs/ Labeling/ Markings**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No
OSHA Job Safety & Health Poster		
OSHA 300 Log (February) posted		
OSHA Noise Regulation posted		
Department of Labor Postings		



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

**SITE EHS INSPECTION FORM**

**K. Postings/ Signs/ Labeling/ Markings (continued)**

Emergency phone numbers posted		
Other suggested postings: a) Evacuation routes posted b) All hazard warning signs c) Noise hazard warning signs d) Control zones clearly identified e) Site perimeter posted and controlled f) Emergency exits clearly marked g) Fire extinguishers clearly marked h) Safety showers/ eyewashes clearly marked i) Circuit breakers labeled j) Low overhead hazards clearly marked		
Copy of TtEC Work Rules Posted (EHS 3-6)		
ESQ Policy posted		
TtEC Hotline Poster		
ZIP/EMS Bulletins are posted, as appropriate		

**L. Other Environmental Safety and Health Conditions or Work Practices**

Category	Observations (N/A if Not Applicable)	Action required <input type="checkbox"/> Yes <input type="checkbox"/> No



Figure 14-2 Safety Observations of the Day Form and Guidelines

 <small>TETRA TECH EC, INC.</small>	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>SAFETY OBSERVATIONS OF THE DAY FORM AND GUIDELINES</b>
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**SAFETY OBSERVATIONS OF THE DAY**

Activity Observed:	Safe	At-risk	N/A
<b>Body position</b>			
1. Out of line-of-fire of machine, machine parts			
2. Makes eye contact with operator			
3. Hand position			
4. Eyes on path			
5. Eyes on work			
6. Proper lifting procedure used (Back straight, load close to body, feet shoulder width, good balance, hand holds, lift with legs and arms - not back)			
7. Ascending/Descending - three points of contact			
8. Positions work to ensure good posture, no awkward positions			
<b>Proper PPE for task</b>			
1. Eye/face			
2. Head			
3. Hand			
4. Foot			
5. Body			
6. Respiratory			
7. Fall protection			
8. Hearing protection			
<b>Environment</b>			
1. Proper environmental controls are used			
2. Housekeeping			
3. Work surfaces			
4. Work areas barricaded properly			
<b>Proper tools/equipment</b>			
1. Proper tools/equipment selected			
2. Tools in good condition and inspected			
3. Used properly			
<b>Equipment Operations</b>			
1. Machine inspected today			
2. Seat belt fastened			
3. Safe Speed			
4. Works from stable base			
5. Safe slope operation			
6. Looks behind when backing			
7. Doesn't lift over people, truck cabs			
<b>Total Observations</b>			
<b>% Safe [#Safe / (#Safe + #At Risk) x 100%]</b>	%		
Comments:			
Safety Observer:		Date:	
Project:	Subcontractor:	Activity:	

## Figure 14-2 Safety Observations of the Day Form and Guidelines

### GUIDELINES FOR SAFETY OBSERVERS

#### 1. Overview

Each week, one field person is selected to spend time during each day observing field activities and to provide constructive feedback and to recognize/reinforce safe behavior.

#### 2. Benefits

- Involvement of field personnel
- Provides opportunity for workers to suggest improvements
- Can provide real-time positive reinforcement
- Provides opportunity for recognition with peers (tailgate meetings)

#### 3. Process

- PMC HS representative will explain program to each Subcontractor HS Supervisor.
- An individual is selected by the Subcontractor each Monday during the daily safety meeting to be Safety Observer of the Week.
- Subcontractor Health and Safety Supervisor reviews observation form and ensures that the individual understands the safe behaviors that are expected in the field.
- Each day, the observer performs the following:
  - Observer observes operations and looks for safe behaviors and substandard behaviors.
  - If the opportunity presents itself, observer provides positive reinforcement.
  - If observer identifies unsafe behavior, observer either addresses the situation or brings it to the attention of the supervisor. *The Subcontractor should provide guidance to observer on how to respond.*
  - Observer records observation on form. No names are used.
  - Observer reports observations at each of the daily safety meetings during the week. No names are used for substandard behaviors.
- Subcontractor maintains forms.

## **15.0 EVENT REPORTING AND INVESTIGATION**

### **15.1 Event Definition**

For all PMC and Subcontractor activities, an event is defined as follows:

- A work-related injury or illness
- An exposure to a hazardous substance above the allowable exposure limit or site action level
- Property/vehicle/equipment damage
- An unplanned fire or explosion
- An unplanned spill or release (including air releases) to the environment
- A permit or permit equivalent exceedance
- Any unexpected contact with or damage to aboveground or belowground utilities
- Discovery of an unknown and potentially hazardous material, or anomaly
- Discovery of confirmed or potential MEC or RCWM that may present a hazard
- A “near miss” or an unplanned event or workplace condition that has a reasonable probability of resulting in one of the outcomes described above had the circumstances been different, and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome (Figure 15-2, page 2 for a list of management programs.)

### **15.2 Employee Responsibility**

All PMC and PMC Subcontractor personnel have the responsibility to immediately report any event to their supervisor. Supervisors shall take appropriate corrective action and immediately report the event to the PMC Health and Safety Manager by phone.

### **15.3 Verbal (Oral) Notifications**

In addition to immediate verbal (oral) reporting of all events to the PMC Health and Safety Manager, for serious events, the PMC or PMC Subcontractor shall immediately notify the ROC on PMC Radio Channel #1, or by dialing 5246 using RMA facility phones, or 303-289-0246 using off-site telephones, or cellular telephones.

A “serious” event includes the following:

- Any 911 emergency response call
- Imminent danger safety conditions
- Any event (including near miss) involving the general public or visitors
- Discovery of confirmed or potential Ordnance/Explosive or RCWM that may present a hazard
- Work-related injury or illness requiring more than first aid
- Spills or release of hazardous material or contaminated media in excess of 1 gallon, the Reportable Quantity (RQ)\*, or any spill or release to surface water. This includes unknown or potentially hazardous soils, debris, and containers discovered on roadways.
- Any unexpected contact with or damage to aboveground or belowground utilities
- Other unusual events of a serious nature

\*Note: The RQ for some substances may be very small (e.g., mercury). If you are

uncertain of the RQ, **report the spill first**, and then seek assistance in determining the RQ.

#### **15.4 Event Reports**

The PMC or PMC Subcontractors will prepare a written event report for all events during the work shift when the event occurred, except as noted in Sections 15.9 and 15.10. The report is to be prepared by the supervisor responsible for the PMC or PMC Subcontractor activity/area where the event occurred.

The PMC event report form shown in Figure 15-1 shall be used and is due to the PMC Health and Safety Manager as soon as reasonably possible and prior to leaving the site for the day. The PMC Health and Safety Manager shall provide the initial Event Summary Report to the RVO Health and Safety Office no later than 24 hours or one business day after becoming aware of the event.

#### **15.5 Event Investigations**

An event investigation shall be performed for all events for which a report is required, except as noted in Sections 15.9 and 15.10 or when not required as determined by the PMC Health and Safety Manager or designee. The supervisor, affected employee, and the designated HSS shall perform the investigation and shall include participation by others as necessary. The investigation is to be initiated as soon as possible after the event.

The event investigation report form shown in Figure 15-2 shall be used and is due to the PMC Health and Safety Manager within 48 hours or two business days of event occurrence. Follow-up reports shall be provided as necessary if additional information regarding the event is learned. Instructions for completing event reports and investigations are shown in Figure 15-3.

#### **15.6 Official Record of Events and Investigations**

To protect personal or confidential information, the PMC event reports and investigations shall not be distributed outside the PMC organization without approval of the PMC Health and Safety Manager. The official program record of event reports and investigations is the PMC electronic Event Summary Report. The Event Summary Report consists of pertinent information about the event, investigation, and LL and meets requirements of the current version of RVO SOP ES&H 107. The official project record consists of an Event Summary Log (list of events) generated at the time of project file transfer to the RVO.

#### **15.7 Investigation Follow-Up**

The PMC and Subcontractor shall establish a follow-up system for all investigation findings under their control. The system shall identify the corrective action(s) to be taken, the individual responsible for each corrective action, and the date the corrective action was implemented and verified.

#### **15.8 Lessons Learned**

The PMC will develop LL reports for select events in accordance with the current version of PMC Procedure Q-006-RMA Lessons Learned. As requested, the Subcontractor will assist the PMC in preparing LL reports.

#### **15.9 Discovery and/or Emergency Response to Anomalies and Confirmed or Potential MEC or RCWM**

Discovery of and/or emergency response to anomalies and confirmed or potential MEC or RCWM that may present a hazard to personnel or to the environment does not require an event report or investigation unless requested by the Health and Safety or UXO Department Manager. All emergency response actions for confirmed or suspected MEC or RCWM are documented and tracked on a log using UXO Department protocols. Response to or discovery of potentially hazardous MEC or RCWM is reported to the ROC for immediate notification to responsible RVO and PMC personnel. Follow-up written or electronic documentation is provided to the RVO Health and Safety Group within 24 hours by the PMC UXO Department. Any chemical agent or explosives events will be reported to and investigated by the RVO in accordance with AR 385-40, Accident Reporting and Records (DA 1994). The PMC and Subcontractors will assist in reporting and investigating chemical agent or explosives events as directed by the RVO. Explosive events which may require reporting in accordance with AR 385-40 include the following:

- Any unplanned explosion or functioning of a device containing explosives, propellants, pyrotechnics, or other similar substances associated with these items which present real or potential hazards to life or property
- Accidents involving disposal of military munitions
- The inadvertent actuation, jettisoning, release, or launching of explosive devices

#### 15.10 Vehicle Fluid Spills

A spill or release involving not more than one gallon of a vehicle fluid (fuel, hydraulic fluid, brake fluid, or engine coolant) onto the ground that does not run into a stream or lake does not require an event report or investigation unless requested by the PMC Health and Safety Manager or Environmental Compliance Department Manager. A spill or release of any quantity that runs into a stream or lake (navigable body of water) or ditch leading to a stream or lake, requires completion of an event report at a minimum. Regardless of quantity and location, a spill or release of any vehicle fluid requires proper cleanup and disposal.

#### 15.11 Case Management of Potential Injuries or Illnesses

The PMC and each PMC Subcontractor is responsible for implementing and maintaining an effective case management program for their employees and lower-tier subcontractor employees that addresses potential injuries or illnesses related to work at RMA. The goal of the case management program is to ensure that workers receive the appropriate level of care, that injured or ill workers return to normal work duties as soon as possible, that injury or illness records are consistently and accurately maintained, that unnecessary or fraudulent injury or illness cases are avoided, and that the Subcontractor actively seeks to minimize the impact of any event with respect to recordability, restricted duty, and lost time.

The case management program shall include the following elements:

**Employee Information** - Each site worker shall be informed of the PMC event reporting and investigation requirements and their responsibilities in the event that an event occurs, including the location and hours of operation for the designated local medical provider.

**Employee Points of Contact** - Each site worker shall be made aware of the primary person to report all events to, and what to do if that individual is unavailable. This includes who to notify if a work-related condition develops or intensifies outside normal working hours.

**Designation of Local Medical Providers** - Each Employer, Subcontractor (and/or lower-tier subcontractor) shall establish a relationship with at least two local medical providers to provide nonemergency medical care in the event of an injury or illness related to work at RMA per Colorado law 1176. The PMC and Subcontractor shall establish a working relationship with providers' personnel, provide site and potential hazard information to provider personnel, and develop a mutual expectation for effective case management. A

provider shall be designated for normal work hours and outside normal work hours.

**Representation at Clinic Visits** - A knowledgeable Employer, Subcontractor Representative shall accompany any worker seeking medical attention for any event related to work at RMA. The Employer or Subcontractor Representative shall be knowledgeable in the worker's normal job duties and potential safety and health hazards present at the worksite, and be able to discuss any limitation or modification of normal duties with the local medical provider staff. The Representative shall also be knowledgeable (or have access to someone who is knowledgeable) of treatment options that provide equivalent medical attention while avoiding any impact to recordability, restricted duty, and lost time recordkeeping. Items that may affect the recording status of an injury or illness (such as prescription medications, limitations to normal job duties, and further treatment) shall be reviewed with the medical provider at the time of the visit to ensure that appropriate medical attention is provided with a minimum of impact.

**Status Reporting to PMC** - The Subcontractor shall keep the PMC Project Manager informed of case management status, progress, and issues for the duration of any evaluation or treatment provided. The Employer or Subcontractor shall provide updated information to the PMC Project Manager regarding injury or illness status as soon as practicable. Written follow-up information affecting the information contained in the event report or investigation is due to the PMC within 24 hours of each visit or change in status regarding recordability, restricted duty, or lost time.

Figure 15-1 Event Report Form

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>EVENT REPORT PAGE 1</b>
--	---	--------------------------------

PMC Report No:

Date of Report:

TtEC Report No:

**TYPE OF EVENT – (check all that apply)**

- |   |   |  |                                |
|---|---|--|--------------------------------|
| <input type="checkbox"/> INJURY/ILLNESS | <input type="checkbox"/> VEHICLE DAMAGE       | <input type="checkbox"/> HIGH LOSS POTENTIAL (NEAR MISS) | <input type="checkbox"/> FIRE  |
| <input type="checkbox"/> SPILL/RELEASE  | <input type="checkbox"/> PROPERTY LOSS/DAMAGE | <input type="checkbox"/> PERMIT OR EQUIV. EXCEEDANCE     | <input type="checkbox"/> OTHER |

**GENERAL INFORMATION**

IMPLEMENTATION PROJECT:	TASK:	
COMPANY OR SUBCONTRACTOR NAME(S):		
DATE OF EVENT:	DAY OF WEEK:	MILITARY TIME:
SUPERVISOR ON DUTY:	PHONE:	SUPV ON SCENE? <input type="checkbox"/> YES <input type="checkbox"/> NO
TTEC SUPERVISOR ON DUTY:	PHONE:	SUPV ON SCENE? <input type="checkbox"/> YES <input type="checkbox"/> NO
LOCATION OF EVENT:		
WEATHER/LIGHTING CONDITIONS:		

**DESCRIBE WHAT HAPPENED (step by step, use additional pages if necessary)**

1. What was the employee doing, or what was happening, just before the event occurred? Describe the activity, as well as the equipment, tools, or materials in use. *Be specific, e.g., "climbing a ladder while carrying tools" or "driving westbound on Main St."*

2. What happened? What was the contact or event and how did it occur? e.g., "When the ladder slipped on the wet floor, employee fell 20 feet" or "was distracted by bee, swerved off right side of road and struck the stop sign"

**IMMEDIATE CORRECTIVE ACTIONS (use additional pages if necessary)**

**AFFECTED EMPLOYEE INFORMATION (Include injured person or employees whose activities resulted in Event)**

N/A

NAME:	<input type="checkbox"/> MALE	<input type="checkbox"/> FEMALE	COMPANY:
JOB CLASSIFICATION:	YEARS IN JOB CLASSIFICATION:		
TIME EMPLOYEE BEGAN WORK:	DATE OF HIRE:		
DID EVENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION?: <input type="checkbox"/> YES <input type="checkbox"/> NO			

**INJURY/ILLNESS INFORMATION**

N/A

NATURE OF INJURY OR ILLNESS (Body part affected and how it was affected, e.g., strained back):				
OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:				
FIRST AID PROVIDED:	<input type="checkbox"/> YES	<input type="checkbox"/> NO	IF YES, WHERE:	<input type="checkbox"/> ON-SITE <input type="checkbox"/> OFF-SITE
IF YES, WHO PROVIDED FIRST AID?:				
WILL THE INJURY/ILLNESS RESULT IN: <input type="checkbox"/> RESTRICTED DUTY <input type="checkbox"/> LOST TIME <input type="checkbox"/> UNKNOWN				



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

EVENT REPORT  
PAGE 2

**TREATMENT OR EVALUATION INFORMATION (Attach Provider's Report/Statement)**  N/A

WAS TREATMENT OR EVALUATION PROVIDED?  YES  NO  FIRST AID  EVALUATION  MEDICAL TREATMENT  
Medical treatment does not include examination, diagnostic tests, or First Aid. See ZIP Bulletin 109 for OSHA definition of First Aid. Attach a copy of the treating professional's statement/work release or company clarification of treatment/ diagnosis.

IF YES, WHERE?  ON-SITE  DR'S OFFICE  HOSPITAL  OTHER:

NAME OF PERSON(S) PROVIDING TREATMENT OR EVALUATION:

ADDRESS WHERE TREATMENT OR EVALUATION WAS PROVIDED:

WAS THE EMPLOYEE HOSPITALIZED OVERNIGHT?:  YES  NO

TYPE OF TREATMENT OR EVALUATION:

**PROPERTY LOSS OR DAMAGE INFORMATION**  N/A

PROPERTY OR VEHICLE INVOLVED:

DESCRIPTION OF LOSS OR DAMAGE: ESTIMATED \$ LOST:

**SPILL OR RELEASE INFORMATION**  N/A

SUBSTANCE SPILLED OR RELEASED: FROM WHERE: TO WHERE:

ESTIMATED QUANTITY/DURATION:

REPORTABLE QUANTITY (RQ): RQ EXCEEDED?  YES  NO  
(25 gals for petroleum products)

RELEASED TO WATERS OF STATE?  YES  NO CERCLA HAZARDOUS SUBSTANCE?  YES  NO

RESPONSE ACTIONS TAKEN:

**PERMIT OR EQUIVALENT EXCEEDANCE**  N/A

TYPE OF PERMIT: PERMIT #:

DATE OF EXCEEDANCE: DATE FIRST KNOWLEDGE OF EXCEEDANCE:

PERMITTED LEVEL OR CRITERIA (e.g., Water quality, Air Quality):

EXCEEDANCE LEVEL OR CRITERIA: EXCEEDANCE DURATION:

RESPONSE ACTIONS TAKEN:

**PERSONS PREPARING REPORT (Employee and Supervisor to Complete Report)**

EMPLOYEE'S NAME (PRINT): SIGN: DATE:

EMPLOYEE'S NAME (PRINT): SIGN: DATE:

SUPERVISOR'S NAME (PRINT): SIGN: DATE:

**PERSONNEL NOTIFIED (Notify PMC Health and Safety Manager Immediately)**

ORGANIZATION	NAME(S)	DATE/TIME
<input type="checkbox"/> RMA OPERATIONS CENTER		
<input type="checkbox"/> PMC HEALTH AND SAFETY MANAGER		
<input type="checkbox"/> PMC ENV. COMPLIANCE MANAGER		
<input type="checkbox"/> OTHER PERSONNEL NOTIFIED		

RECEIVED BY PMC EH&S REP (NAME): DATE/TIME:

**Serious Events require immediate notification to RMA Operations Center and the PMC Health and Safety Manager. Completed Event Report due to the PMC Health and Safety Manager by the end of the workshift or prior to leaving site for the day. All spills and releases also require immediate notification of the PMC Environmental Compliance Manager.**







TETRA TECH EC, INC.

**5. REVIEW**

SUBCONTRACTOR PROJECT MANAGER (PRINT) SIGN: DATE:

COMMENTS:

TTEC PROJECT MANAGER (PRINT) SIGN: DATE:

COMMENTS:

TTEC EH&S MANAGER (PRINT) SIGN: DATE:

COMMENTS:

**EXAMPLES OF DIRECT COSTS**

- Out of pocket costs
- Actual property damage or repair costs
- Material or facility replacement costs
- Injured worker salary costs
- Medical treatment costs
- Worker's compensation costs

**EXAMPLES OF INDIRECT COSTS**

- Lost wages due to lost productivity
- Salary cost for time spent reporting/investigating
- Salary cost of other personnel affected
- Emergency response costs
- Cost for hiring/training replacement worker
- Loss of business/goodwill

**EXAMPLES OF IMMEDIATE/ DIRECT CAUSES**

SUBSTANDARD ACTS

1. Operating Equipment without Authority
2. Failure to Warn/Secure
3. Failure to Allocate Resources
4. Operating at Improper Speed
5. Making Safety Devices Inoperative
6. Using Defective Equipment
7. Failure to Use PPE Properly
8. Improper Loading/Placement/Lifting
9. Improper Position for Task
10. Servicing Equipment and Operation
11. Improper Employee/Management Behavior
12. Under the Influence of Alcohol and Other Drugs
13. Using Equipment Improperly
14. Failure to Follow Procedure/Policy/Practice/Values and Working Permits
15. Failure to Identify Hazards/Risks
16. Failure to Check/Monitor
17. Failure to Analyze React/Correct
18. Failure to Communicate/Coordinate
19. Failure to Identify Customer and Stakeholder Expectations
20. Failure to Identify and Dispose Nonconforming Parts/Materials

SUBSTANDARD CONDITIONS

21. Inadequate Guards or Barriers
22. Inadequate or Improper Protective Equipment
23. Defective Tools, Equipment, or Materials
24. Congestion or Restricted Action
25. Inadequate Communication with Employees, Customers or Stakeholders
26. Failure to Reach Business Goals and/or Objectives
27. Inadequate Warning System
28. Fire and Explosion Hazards
29. Poor Housekeeping/Disorder
30. Inadequate Quality/Safety/Health and Environmental Exposures
31. Presence of Harmful Materials
32. Inadequate Instructions/Procedures
33. Inadequate Information Data/Indicators
34. Inadequate Preparation/Planning
35. Inadequate Support/Assistance/Resources
36. Inadequate Communications Hardware/Software/Process
37. Road and Weather Conditions
38. Inadequate Identification of Regulations/Industry Codes and Permits to Operate
39. Inadequate Design Preparation/Planning
40. Failure to Comply with Customers and Stakeholders Requirements/Complaints
41. Inadequate EQSH System

**EXAMPLES OF BASIC / ROOT CAUSES**

PERSONAL FACTORS

1. Inadequate Physical/Physiological Capability
2. Inadequate Mental/Psychological Capability Knowledge
3. Physical or Psychological Stress
4. Mental or Psychological Stress
5. Inadequate Knowledge
6. Inadequate Skill
7. Improper Motivation/Hiring & Placement
8. Abuse or Misuse

JOB/SYSTEM FACTORS

9. Inadequate Leadership and/or Supervision
10. Inadequate Project Management and Engineering
11. Inadequate Purchasing and Contractor Management
12. Inadequate Maintenance Inspection and Controls
13. Inadequate Product, Tools and Equipment
14. Inadequate Work Standards/Compliance Requirements
15. Excessive Wear and Tear
16. Inadequate Communications
17. Inadequate Business Planning
18. Inadequate Emergency Systems

**MANAGEMENT PROGRAMS FOR CONTROL OF EVENTS**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Leadership and Administration</li> <li>2. Management Training</li> <li>3. Planned Inspections and Maintenance</li> <li>4. Task Analysis and Procedures</li> <li>5. Task Observation</li> <li>6. Emergency Preparedness</li> <li>7. Rules and Work Permits</li> <li>8. Accident/Event Analysis</li> <li>9. Personal Protective Equipment</li> </ol> | <ol style="list-style-type: none"> <li>10. Health Control</li> <li>11. Program Audits</li> <li>12. Engineering and Change Management</li> <li>13. Personal Communications</li> <li>14. Group Communications</li> <li>15. General Promotion/Awareness</li> <li>16. Hiring and Placement</li> <li>17. Purchasing Controls</li> <li>18. Off-the-Job Safety</li> </ol> |
|--|--|

Figure 15-3 Event Report and Investigation Instructions

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	EVENT REPORT AND INVESTIGATION INSTRUCTIONS PAGE 1
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**General:** The event report (pages 1 and 2) must be completed before the end of the workshift or prior to leaving site for the day. Do not delay the report if any information is unknown. It can be provided later by revising the Report. Complete all applicable sections of the form. If a section does not apply, indicate this by using “NA”. Names, dates, and signatures should be complete.

**Type of Event:** Check all that apply. A Near Miss (High Loss Potential) event is one that does not result in loss, but under slightly different circumstances, could have resulted in an OSHA Recordable injury, spill, release, permit exceedance, fire, or vehicle/property damage in excess of \$500. All Near Miss (High Loss Potential) events are to be investigated.

**General Information**

**Implementation Project/Task:** Give the Project Name, such as Sanitary Landfills and Task such as Section 4.

**PMC Report No.:** Number is assigned by the PMC Health and Safety Department.

**Supervisor on Duty:** The Supervisor on Duty responsible for the work effort involving the event.

**TTEC Supervisor on Duty:** The TTEC Supervisor on Duty (Construction Manager) responsible for the work effort involving the event.

**Location of Event:** The specific location on the project. The Section Number and Building number should be identified where applicable.

**Weather/Lighting Conditions:** Temperature, precipitation, approximate wind speed and direction, lighting conditions, cloud cover, relative humidity. This information may be included in the description section, and must be given in detail whenever it is a factor in the cause or impact, e.g., spill, release, heat stress, windblown material.

**Describe What Happened:** This section must be completed in sufficient detail to adequately describe the events and conditions leading up to and resulting from the event. Try to answer the questions who, what, where, when, and how. This information is then used to determine why (cause). Provide details such as work objective, procedure being used, body position, and PPE. Include diagrams or sketches for all events involving vehicles/equipment and other events where they aid in providing detail or perspective. Consider attaching photographs. Follow the guidelines in Practical Loss Control Leadership, and consider the impact of each of the following:

- P - People
- E - Equipment
- M – Material
- E – Environment

To do an effective job, a visual inspection of the scene is usually necessary along with private interviews of affected employees and witnesses.

Where appropriate, use terms indicating the type of contact, e.g., struck by; struck against; fall from elevation; fall on same level; caught in; caught between or under; caught on; contact with; overstress; equipment failure; environmental release; fire.

**Immediate Corrective Actions**

List what corrective actions were taken immediately as a result of the event such as containing spills, first aid, temporary barriers, work stoppage and similar actions.

**Affected Employee Information**

**Employee:** Direct hire, whether professional, administrative, or craft; full-time or part-time; permanent or temporary and/or Subcontractor employee.

**Hours Worked on Shift Prior to the Event:** Only include the amount of time the employee worked that shift or day prior to the event.

**Years with Company:** Give the number of years employed with the current company. If the employee has worked for the current company for less than a year, do not write <1. Give the answer in fraction of year, or specify the number of months, e.g., 0.1 or 1 month.

**Injury/Illness Information**

**Nature of Injury or Illness:** If the event resulted in an injury or illness, give a brief description of the body part affected and type of injury or illness, e.g., fractured thumb, left hand; carpal tunnel syndrome, right hand.

**First Aid Provided:** First Aid is any treatment that does not have to be provided by a health care professional, even if it is, e.g., cleaning and bandaging laceration in a clinic may constitute first aid, if sutures are not given.

**Will the Injury Result In:** Do not delay the report if this information is unknown.

**Medical Treatment Information**

**Was Medical Treatment Provided?** Medical treatment is that treatment that must be provided by a licensed medical practitioner, e.g., sutures, prescription medication, etc.

**Type of Treatment:** This information is important in determining OSHA recordability, since some forms of treatment would not constitute a Recordable case (e.g., one-time administration of prescriptions, negative diagnostic exams). Attach a copy of the treating professional's statement/work release or company clarification of treatment/diagnosis.

**Property Loss Damage Information**

**Vehicle/Property Involved:** For vehicles, indicate VIN and whether it is company owned or leased, business trip rental or owned by others.

**Description of Damage:** Be specific as to the identity of damaged part, location and extent.

**Estimated \$ Lost:** Estimate the monetary amount of loss or damage.

**Spill and Air Emissions Information**

**Substance Spilled or Released:** For pure substances, list materials by common name/chemical. For wastes, indicate waste code. For mixtures or contaminated media, provide contaminant name, CAS No., concentration.

**RQ Exceeded?** Reportable quantity. Contact the PMC Environmental Compliance Manager for guidance. Specify the RQ for the material, whether you answer yes or no.

**Response Action Taken:** Describe the mitigation efforts, as well as any reports made, beyond initial notification.

**Permit Exceedance**

**Type of Permit:** List name of permit or equivalent including the agency name where applicable (e.g., NPDES, PSAPCA NOC)

**Date of Exceedance:** Specify date exceedance occurred (e.g., date discharge in excess of permit limits occurred)

**Date First Knowledge of Exceedance:** Specify date when first knew there was an exceedance (i.e., date analysis received). This date may be different from the date of the exceedance listed above.

**Permitted Level or Criteria:** List numerical discharge or emission limit or narrative criteria specified in the permit (e.g., 20% opacity limit, Best Management Practices (BMP) implementation per SWPPP).

**Exceedance Level or Criteria:** Specify actual numerical discharge/emission limit or narrative criteria which was exceeded (e.g., 22% opacity, failure of BMPs [silt fencing collapse] per SWPPP)

**Exceedance Duration:** Specify time frame by date and hours (using military time) during which exceedance occurred.

See “**Spill/Release Information**” (above) for description of remaining questions.

**Persons Preparing Report**

**Employee’s Name:** The affected employee described on page 1 should review the report and sign here, as well as other employees witnessing or involved in the event.

**Supervisor’s Name:** The Supervisor must review and sign the report indicating agreement. The Supervisor and the employee involved should be involved in conducting the investigation.

**Event Investigation**

**Report No.:** This is the same as the event report number.

**Date of Investigative Report:** This date should be within 72 hours of the event. In cases where the investigation is not completed until a later date, submit the incomplete report within the 72 hours, and a revised report should be submitted when the missing information is obtained.

**Direct Event Cost:** For all vehicle/equipment or property damage cases, an estimated or actual loss value must be entered. If an estimated value is entered, the report must be revised when the actual costs are known.

**OSHA Recordable:** This section should be completed in consultation with the supporting HS organization. If it cannot be determined at the time of the report, the HS organization should consult with the PMC Health and Safety Manager and revise the report when a determination is made.

**No. of Restricted Days:** This relates to days of restricted work activity, not restrictions on motion or physical capability. If the employee is capable of doing his normal job the day after the injury and thereafter, there are no restricted days, even if the physician indicates a physical restriction. It does not include the day of the injury.

**No. of Days Away from Work:** The number of days after the day of the injury that the employee could have worked (including weekends and holidays) but could not due to an occupational injury. If the treating physician releases an employee to return to work, but the employee chooses not to come to work, do not count those days. In this case the PMC Health and Safety Manager should be consulted.

### Cause Analysis

**Summary:** Based on information gathered during the event investigation process, describe how this event occurred.

**Immediate Causes:** Determine the immediate causes, using the example on page 2 of the Event Investigation Report. If one or more of the examples fits the circumstance, use those words in the cause description. This facilitates statistical analysis of the evident database for program evaluation/modification. However, do not confine your cause determination to the guide words. Explain, e.g., Improper Lifting – employee attempted to lift box by bending at the waist and twisting while lifting. Be sure that the event description on page 1 of the Event Investigation Report is sufficiently detailed to support the causal analysis in this section. An assumption of cause (e.g., improper lifting) from the injury (low back pain) is not acceptable.

**Basic Causes:** Like the Immediate Causes, use the guide words in the attachment whenever appropriate and explain. For example, improper motivation may be because the correct way takes more time or effort; short cutting standard procedure is tolerated or positively reinforced; or the person thinks there is no personal benefit to always doing the job correctly.

**Note:** The investigator is encouraged to review the Practical Loss Control Leadership chapters on *Causes and Effects of Loss* and *Accident/Incident Investigation* before doing the causal analysis. As a check, the investigator may refer to the S.C.A.T. Chart available from the PMC Health and Safety Manager.

**Remedial Actions:** Include all actions taken or those that should be taken to prevent recurrence. Be sure that actions address the causes. For example, training (safety meetings) may be a necessary response for lack of knowledge, but may be inadequate for improper motivation. Verification of actions completed should be verified by persons other than the persons responsible (name of persons should be spelled out and then said persons shall sign or initial). If completion dates are not verified prior to submitting the report, a revised report must be submitted or verification of closeout noted on the original report.

**Persons Performing Investigation:** The primary investigator is the Supervisor in charge of the work where the event occurred. Others participating in the investigation, such as the employee, Project Manager, HS, QC, site engineer, foreman, etc. should also sign the report.

**Review:** The Project PMC and Subcontractor Manager's affected employee and the PMC Health and Safety Manager must sign the report indicating their satisfaction with thoroughness of the investigation and the report, and their concurrence that the action items address the identified causes. This constitutes the peer review, and the report, particularly the description, should be clear to readers not familiar with the project or event.

## **16.0 SITE SAFETY PROCEDURES**

### **16.1 General Site Safety Procedures**

General site safety procedures for the PMC and each PMC Subcontractor are summarized in the current version of HS-007-RMA *Zero Incident Performance* Project Rules Handbook and the current version of HS-002-RMA Rocky Mountain Arsenal Health and Safety Guidelines Handbook. These handbooks shall be distributed to and reviewed by all PMC and Subcontractor personnel. Employees shall complete the acknowledgment form in the back of the Zero Incident Performance Project Rules Handbook, and the acknowledgment form shall be kept in the employee's on-site training record.

### **16.2 Task-Specific Safety Procedures**

The task-specific requirements or Subcontract may identify additional safety procedures required due to the work activities or site location. Identified safety procedures shall be included in THASPs and/or AHAs.

### **16.3 Passenger Vehicles**

All site workers who operate passenger vehicles, including pickup trucks, at RMA shall possess a valid driver's license, proof of vehicle insurance, Colorado emission certificate if applicable, and current vehicle registration. Seat belts shall be worn at all times and posted speed limits shall be observed. The speed limit is 25 miles per hour in areas without a posted speed limit. Overcrowding in passenger vehicles is prohibited. A seat belt must be provided for and used by each passenger, and seating passengers in the pickup truck bed is not permitted. Vehicles shall not be left unattended while the engine is running and when parked, the parking brake shall be set. The use of cellular phones (including the use of a hands-free feature in conjunction with a cellular phone), operation of a radio or GPS unit or any other action or distraction that could compromise the ability of the driver to operate the vehicle in the safest and most responsible manner is prohibited.

Site workers (other than visitors) shall obtain a valid vehicle pass for personal vehicles from the RVO RMA Decal Administrator. Privately owned vehicles shall be parked only in designated areas and are not permitted in the CRA (except for designated areas such as the parking areas adjacent to Hazardous Waste Landfill / ELF, and former Submerged Quench Incinerator (SQI).

A walkaround inspection of vehicles for apparent damage or vehicle safety-related problems (cracked windshield, flat tire, rear view mirrors, etc.) shall be performed by the operator prior to each vehicle use. If equipped, vehicle fire extinguisher inspections must be performed monthly by the company/organization that owns or leases the vehicles.

### **16.4 Pedestrian and Bicycle Traffic**

All site workers are permitted to use open, designated roadways and areas for pedestrian (walking and running) and/or bicycle traffic for recreation or commuting. Please refer to the current version of the Rocky Mountain Arsenal Routes and Trails Map specific routes. Current maps are available through the PMC Health and Safety Department. Note that open, designated routes and trails are subject to change at any time.

Bicyclists must follow all applicable traffic laws and RMA Access requirements and are required to wear a bicycle helmet and attach a high visibility flag to their bicycle, or wear a high visibility traffic vest, jersey or jacket while riding at RMA. Employees entering/exiting the Arsenal on foot shall wear a high visibility vest, jersey or jacket. Bicycles ridden after and before daylight hours shall be equipped with operational front and rear lights. RVO-organized and -approved events

may be exempted from these requirements.

## 16.5 Permit Programs

The PMC and Subcontractor shall implement the following permit programs when conducting work at RMA. Approved permits shall be kept in the work area or other readily accessible location for review by Subcontractor, PMC, or RVO personnel, and posted where practical. Subcontractors shall coordinate permits through the PMC Project Manager or assigned designee.

### 16.5.1 Hot Work

Work practices that do not require hot work shall be used where feasible. All PMC and/or Subcontractor personnel shall comply with the current version of the TtEC Environmental Health and Safety Programs Procedure EHS 6-5, Welding/Hot Work and the RVO SOP ES&H.213, Hot Work Permits. All hot work (flame- or spark-producing activity) requires completion of a hot work permit, Figure 16-1, and authorization by the PMC project Health and Safety Representative or project designee. A project designee is an individual who is trained and qualified to perform the duties of the permit authorizing individual (PAI) in the absence of the PMC Project Health and Safety Representative. All PAIs will be trained to the requirements of NFPA 51B and to other applicable fire protection and safety regulations, and a copy of the training record shall be maintained in the employee's training file.

Hot work permits are completed by the organization performing hot work and normally authorized for one day at a specific location. To facilitate the hot work permit process, hot work shall be conducted during normal business hours unless special arrangements have been made in advance with the PMC Health and Safety Representative or project designee. Multiple-day permits may be issued for equipment maintenance operations if an area, prepared and approved for hot work, is used and maintained. The Multiple-Day Hot Work Permit Post-Work Fire Watch Verification, Figure 16-1a, shall be used to document fire watch inspections 30 minutes following work completion each day hot work is performed. The organization performing hot work is responsible for implementing a hot work program consistent with the requirements of NFPA 51B, *Standard for Fire Prevention During Welding, Cutting or Other Hot Work*. NFPA 51B is incorporated by reference into 29 CFR 1910.252, *General Requirements for Welding, Cutting, and Brazing*.

A Hot Work Permit is initiated by the organization needing to perform the hot work. After completing the Hot Work Permit form shown in Figure 16-1 and having the information and hot work area controls validated by PMC Health and Safety or project designee, the permit is assigned a computer-generated number. The permit number is obtained by contacting the PMC Health and Safety Office at extension 5510 using RMA facility phones or by dialing 303-289-0510 using an off-site or cellular telephone. An alternate means of access is available by contacting "PMC Base" on site radio Channel #7. The following information is necessary to obtain the hot work permit number: WORK TYPE, LOCATION, COMPANY NAME, RESPONSIBLE SUPERVISOR'S NAME, and LENGTH OF PERMIT IN DAYS. After completing the hot work, the closed permit must be delivered to the PMC Health and Safety Office, no later than the business day following work completion, for closure processing in the Hot Work Permit database.

### 16.5.2 Intrusive Soil Activity

#### 16.5.2.1 Definition

Intrusive soil activities are defined as "any man-made disturbance of the soil such as a cut, cavity, scrape, grading, excavation, trench, or depression in the earth's surface (including drilling activities) formed by earth removal, regardless of dimensions or depth. The following activities, if performed outside of the designated MEC Potential Areas, are excluded from this definition:

- Placement of markers such as flags or wooden stakes
- Road surface maintenance activities, including snow removal
- Vehicle and pedestrian traffic
- Clearing and grubbing activities outside designated contamination areas at depths less than 6 inches
- Sod removal, shallow landscaping, and revegetation activities outside designated contamination areas at depths less than 6 inches
- Stockpiles placed and moved within the same project scope by the same company

#### **16.5.2.2 Requirements**

Intrusive soil activities work shall be conducted in accordance with this section, 29 CFR 1926, Subpart P and the current version of PMC Procedure CP-008-RMA Intrusive Soil Activity Procedure. Copies of the Intrusive Soil Activity Procedure and designated area maps are available through the PMC Construction Coordination Group (CCG). Note that work conducted in designated contamination areas, UXO potential areas, and/or Cultural Resource Areas requires advance review and acceptance by the PMC, and intrusive activities may be restricted.

The PMC or Subcontractor shall ensure that all employees in an excavation are protected from cave-ins by an adequate protective system for all excavations that are 4 feet or deeper, and for excavations less than 4 feet where examination by a competent person indicates a potential for cave-ins. An AHA shall be developed for personnel who are working in and around an excavation deeper than 4 feet or where the potential for cave-in is present. Excavated materials (spoils) should be placed a minimum distance of 5 feet from the edge of the excavation where feasible, and in all cases no less than 2 feet from the edge of the excavation. Excavation inspections by the competent person shall be documented on a Daily Excavation Inspection Checklist, Figure 16-2, or equivalent form.

#### **16.5.2.3 Permits**

An approved PMC Intrusive Soil Activity Permit (Attachment 2, CP-008-RMA Intrusive Soil Activity Procedure) shall be obtained prior to performing any intrusive soil activities. Permits, permit reviews/acceptance, and utility locates shall be coordinated through the PMC CCG.

#### **16.5.2.4 Training and Qualifications**

The PMC and Subcontractor shall ensure that all personnel in and around excavations have awareness training which includes a discussion of the hazards and control measures associated with underground utilities, cave-ins, access and egress, use of protective systems (benching, shoring, sloping, trench boxes), potential atmospheric hazards, equipment operations hazards, water accumulation hazards, stability of adjacent structures, and the employer's excavation inspection program.

The PMC and Subcontractor shall assign a qualified competent person meeting the requirements of OSHA 29 CFR 1926 Subpart P to each excavation (for work under their control). The competent person shall be available on-site (at the excavation area as necessary) and involved in all important aspects of planning and executing excavation work including soil classification, identification and use of protective systems, and permit acceptance. The competent person is responsible for understanding and enforcing all safe work practices required for the excavation work including training, inspections, and precautions for work near potentially hazardous utilities. The qualification (knowledge, experience, and/or training) of the competent person shall be

demonstrated to the PMC Project Manager or designee and documented prior to the start of excavation work.

#### **16.5.2.5 Intrusive Activities Near Underground Utilities**

Contacting underground utilities while performing intrusive soil activities can be extremely hazardous. The PMC CCG will assist Subcontractors in avoiding this hazard by performing a locate (physical marking of the approximate location) of the known underground utilities that are shown on RMA Base Information Maps or identified through historical knowledge. There are additional underground utilities located on RMA that belong to civilian firms (Qwest/Excel Energy). These utilities will be located prior to intrusive operations by contacting the "One Call Center" of the Utility Notification Center of Colorado at 1 (800) 922-1987. The Subcontractor is responsible for marking or "white lining" the excavation area prior to the utility locate activity, and verifying the PMC utility locate using field instruments, potholing, or other methods deemed appropriate by the Subcontractor. The potential for unknown underground utilities may exist in many areas, and the Subcontractor is responsible for ensuring that safe work practices are used to further identify and avoid contact with unidentified underground utilities. When an intrusive soil activity is planned within 5 feet, either laterally or vertically, of an identified and potentially hazardous utility (electrical lines, gas lines, high pressure lines, chemical lines) the utility must be locked out/tagged out and either de-energized or blocked during the intrusive soil activity. Safe work practices used by the Subcontractor to avoid contact with known or unknown underground utilities shall be included in the THASP or AHA as appropriate.

Intrusive soil activities conducted within a 2-foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, communications, gas, chemical storage tanks, pipelines, sewers, etc.) requires nonaggressive excavation methods such as hand excavation using nonconductive hand tools, an air spade, hydro-excavation, or similar means. The boundaries of the Buffer Zone will be observed at all times and aggressive excavation methods (excavators, backhoes, drill rigs and other mechanized equipment) shall be restricted to areas outside the Buffer Zone. Additionally, the utility will be de-energized (and purged if necessary) verified as de-energized, and locked out. Methods for de-energizing will depend on the utility or material being conveyed and shall physically prevent the transmission, flow, or release of energy. De-energizing utilities shall be verified by demonstration (e.g., opening valve, switching on equipment, or through use of electrical test equipment by qualified electrical workers) and be in accordance with an approved Lockout/Tagout program.

There may be occasions where it is necessary to use aggressive excavation methods inside the Buffer Zone, or where utilities cannot be de-energized. These situations require prior acceptance by the PMC Health and Safety Manager or designee using the FCR process. Additional safe work practices such as use of an excavation observer, protection of utilities, use of additional PPE, and similar precautions may be required as a condition of acceptance.

### 16.5.2.6 Overhead Utilities

Work under or near overhead utilities shall be avoided where practical. Decontamination areas, support facilities, roads and other temporary facilities should be planned and located to avoid overhead utilities. Certain activities may require the use and operation of construction equipment such as motorized vehicles, heavy equipment, water trucks, and haul trucks below or around overhead utilities, such as electrical lines or telephone cable. The organization performing work is responsible for providing all controls necessary to control the associated hazards. These activities shall be coordinated through the PMC CCG to address methods for utility protection, service interruption and safe working distances. At a minimum, a clearance distance of at least 10 feet in all directions shall be maintained between any equipment and energized electrical lines.

Overhead utilities in active construction/remediation work areas shall be clearly delineated on the ground and warning signs erected to warn ground personnel and equipment operators of the overhead hazards. Use of a ground level spotter with no other duties is required when working within 10 feet of overhead utilities. The spotter shall be positioned to effectively monitor both vertical and horizontal distances.

### 16.5.3 Energized Electrical Work

When electrical work is conducted by the PMC or its Subcontractors, review of proposed work by a qualified person is required. If necessary, coordinate activities with the Infrastructure and Program Support staff. For work required on energized electrical lines, an Energized Electrical Work Permit (Figure 16-3) must be completed. Additionally, the provisions of NFPA 70-E shall be implemented.

### 16.5.4 Lockout/Tagout

Lockout/tagout of hazardous energy sources shall be controlled using permit systems and applicable requirements as described in the following OSHA standards:

- 29 CFR 1910.147 – The Control of Hazardous Energy (Lockout/Tagout)
- 29 CFR 1926.417 – Lockout and Tagging of Circuits
- 29 CFR 1910, Subpart S – Electrical
- 29 CFR 1926, Subpart K – Electrical
- 29 CFR 1910.331 – Safety – Related Work Practices
- 29 CFR 1926, Subpart G – Signs, Signals and Barricades

As shown in Figure 16-4 an example of a Lockout/ Tagout Permit shall be utilized or an equivalent Subcontractor checklist. A specific energy isolation procedure would be required for machinery or equipment with multiple energy sources (Ref:29 CFR 1910.147©(4), or those failing to meet all of the items listed in the EXCEPTION in 29 CFR 1910(c)(4)(i).

The PMC and Subcontractors shall maintain and implement the following as part of their Lockout/Tagout program:

- A current written Lockout/Tagout program which covers the work to be performed
- A Lockout/Tagout training program that includes annual training and updated training whenever there is a change in the work environment
- A written procedure or AHA for each unique machine or piece of equipment that requires Lockout/Tagout

- The PMC Subcontractor shall obtain PMC Project Manager or assigned designee acceptance of Lockout/Tagout programs, procedures, or AHAs prior to conducting work.

#### **16.5.5 Confined Space Entry**

All confined space entries shall be controlled through the use of a permit system (Note: this includes spaces that meet the OSHA definition of nonpermit-required confined spaces). All PMC personnel shall comply with the confined space entry procedures contained in the current version of the TtEC Environmental Health and Safety Programs Procedure EHS 6-1, Confined Space Entry. Subcontractor shall comply with their own company permit system, the use of which requires acceptance by the PMC Health and Safety Manager. The attached Confined Space Pre-Entry Checklist and Permit shown in Figures 16-5 and 16-6 or equivalent Subcontractor checklist and permit are required for each confined space entry. After completion of a confined space entry permit by a Subcontractor, and prior to personnel entry, a PMC Health and Safety Representative shall review the completed permit for regulatory compliance and shall inspect the proposed entry site to ensure that serviceable atmospheric monitoring equipment and rescue equipment, if required, are available. The Health and Safety review should be documented on the appropriate permit by annotating with date, time and name of the reviewer.

Where required for emergency rescue support/standby, PMC and/or Subcontractor personnel shall coordinate with the ROC and, if appropriate, with the CER prior to the onset of a required confined space entry. Nonemergency support standby shall be verified by each Subcontractor prior to any planned confined space entry.

#### **16.6 Line Breaking**

Line breaking or cutting pipelines, tanks, and similar structures shall be performed in accordance with a PMC-accepted written procedure that addresses the safety hazards associated with this work. This procedure may be standalone or part of a THASP or AHA. The Line Breaking Checklist shown in Figure 16-7 shall be completed by the PMC Subcontractor and must be approved by the PMC Project Manager or designee prior to line breaking.

#### **16.7 Munitions Response**

All munitions response activities shall meet the requirements of the PMC UXO Department procedures. For specific projects that involve munitions response operations, the Subcontractor shall follow the requirements detailed in the PMC UXO work plan and THASP. Activities must be coordinated with the PMC UXO Department if the worksite is located within a MEC Potential Area. MEC potential areas are identified in the ROD or by the PMC UXO Department.

#### **16.8 Asbestos**

All field operations involving asbestos or ACM shall be conducted in accordance with applicable requirements of 29 CFR 1926.1101, and 5 Code of Colorado Regulations 1001-10 (Regulation No. 8, Control of Hazardous Air Pollutants, Part B - Emission Standards for Asbestos).

#### **16.9 Hazard Communication**

Subcontractors who use hazardous chemicals on-site that fall under the requirements of 29 CFR 1910.1200 or 29 CFR 1926.59 are required to maintain and implement a Hazard Communication Program in compliance with OSHA requirements. Minimum elements shall include a written plan, delineation of responsibilities for program implementation, maintenance of a list of hazardous chemicals used on-site, maintenance of Material Safety Data Sheets (MSDS) for each chemical, proper labeling of containers, and employee training. Site implementation of the Hazard Communication program elements by Subcontractors shall be included in the THASP. Hazardous waste does not fall under the scope of a Hazard Communication Program.

Subcontractors shall maintain a list of chemicals and corresponding MSDS on-site (at RMA) that is readily accessible to site workers. Employee training shall be conducted and documented during the initial site-specific training, and periodically during daily safety meetings if new chemicals are brought on-site. The PMC or Subcontractors shall ensure that all containers are properly labeled and appropriate for safely handling the chemical.

PMC employees will follow the current version of the Hazard Communication Program established by TtEC Environmental Health and Safety Programs Procedure EHS 4-2, Hazard Communication. A list of hazardous chemicals and corresponding MSDS is maintained in Trailer Z-90 and locations that use and store hazardous chemicals. Hazard communication training is provided initially during site-specific training and periodically during safety meetings for new chemicals used at the site. The PMC Procurement Department is responsible for ensuring that health and safety acceptance is obtained prior to ordering chemicals, and that the vendor provides a MSDS for new chemicals used at the site. All hazardous material containers must be properly labeled, either with the manufacturer's original label or with the hazardous material name and corresponding NFPA warning label.

#### **16.10 Fall Protection**

PMC and Subcontractor employees working over any machinery, open spaces, hazardous substances, unguarded heights or steep slopes, or otherwise exposed to falls 6 feet or greater in height shall be protected by adequate fixed scaffolding, guard rails or safety nets, or secured by personal fall arrest systems. Shock-absorbing lanyards shall be used where feasible to prevent injury during a fall. Where conventional fall protection is infeasible or creates a greater hazard, the PMC or Subcontractor engaged in leading edge work, precast concrete erection work, or residential construction work may submit a fall protection plan as outlined in 29 CFR 1926 .502(k) to the PMC Safety and Health Manager for acceptance. Ensure workers are trained (by a competent person) in the proper selection, use and maintenance of fall protection systems.

The PMC or Subcontractor shall allow sufficient time for plan review, acceptance, and implementation of plan requirements. Fall protection, stairways and ladders shall meet the requirements of 29 CFR 1926 Subpart M, Fall Protection, and 29 CFR 1926 Subpart X, Stairways and Ladders. Use of portable ladders requires maintaining three points of contact at all times, otherwise alternative means such as scaffolds or sky lifts shall be used.

#### **16.11 Fall Hazards and Construction Equipment**

Fall hazards associated with construction equipment inspection, maintenance, and repair operations shall be assessed and adequately controlled using best available practices. The minimum fall protection requirements shall be defined in the task AHA and workers shall be trained and familiar with these requirements. The following fall protection practices should be used where feasible, remembering that positive fall protection practices that eliminate the hazard (e.g., adequate work surfaces with guardrails) are preferred, rather than relying on fall protection practices that could be subject to human error or failure.

- Bring work down to ground level to eliminate the potential fall hazard.
- Use equipment that was designed with adequate fall protection measures such as good walking and working surfaces, well located access points, handrails and guardrails.
- Retrofit equipment with antislip surfaces and grab bars as necessary.
- Use fall protection (e.g., body harness) when necessary, and when use does not create additional hazards.

- Use man-lifts, scaffolds, and work platforms with guardrails and stairs for routine operations.
- Use ladders only in situations where three points of contact can be maintained and other ladder safety measures can be implemented (e.g., flat and level surface, ladder tie-off point, adequate height ladder, platform stepladder, etc.).
- Use the buddy system to assist personnel working at height (access to tools, removing waste materials).
- Use a safety spotter to warn workers of unsafe locations or work positions.
- Ensure that elevated walking/working surfaces are clean, dry, or otherwise free of slip hazards.
- Whenever possible, perform maintenance activities in a designated area, with adequate working surfaces, outside of exclusion zones to minimize the use of restrictive PPE by maintenance personnel.

### **16.12 Lifting Operations**

Personnel lifting guidelines have been included in the current edition of ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. These lifting TLVs are important considerations in the prevention of work-related low back and shoulder disorders associated with lifting tasks. Lifting tasks shall be evaluated to ensure that maximum lifting limits are not exceeded. Repetitive lifting tasks are defined as the performance of a task or motions repeatedly without giving the body time to rest, recuperate and repair from the activity, thereby, potentially resulting in soft tissue injury to the affected area.

The PMC and Subcontractor employees involved with lifting tasks shall consult and comply with the guidance provided in the current edition of the ACGIH Lifting TLVs, along with applicable tables contained therein for differing lifting regimes.

### **16.13 Demolition Operations**

Demolition operations shall be conducted in accordance with 29 CFR 1926, Subpart T, Demolition, including performance of an engineering survey by a competent person.

### **16.14 Trailers and Other Facilities**

Plans for the layout of temporary construction facilities, trailers, fencing, access routes and anchoring systems for temporary structures shall be submitted to the PMC Project Manager or designee for acceptance prior to placement. The trailer or temporary office must have adequate exterior stairways, lighting, walking surfaces, and a means of egress that meets OSHA requirements.

Fire lanes providing access to all areas shall be established and maintained free of obstruction. Vehicles, equipment, materials, and supplies shall not be placed so that access to fire hydrants and other fire fighting equipment is obstructed. Material storage is prohibited underneath trailers.

Additional requirements specific to trailers and trailer stairs are given in Specification Section 01550, Temporary Facilities, Utilities and Controls.

### **16.15 Construction Equipment Safety**

Use and operation of construction equipment such as motorized vehicles, heavy equipment, water trucks, and haul trucks (excluding passenger vehicles and pickup trucks) shall meet the following requirements:

- On-site equipment shall meet the requirements of all relevant OSHA standards.
- Equipment will be inspected by the Subcontractor HSS or designee upon arrival at RMA prior to use. The inspection will include a check for cleanliness, fluid leaks, and confirming installation of appropriate safety devices, including seat belts, headlamps and brake lights, backup alarms, appropriate fire extinguisher, and rollover protection. Results of the inspection will be documented on an inspection checklist. Deficiencies found shall be corrected before use. The PMC will assess Subcontractor compliance with equipment inspection requirements as necessary.
- Operators shall complete inspections on all construction equipment prior to use each day to ensure that parts, accessories, and equipment are in safe operating condition and free of apparent damage. The inspection shall be documented on the Construction Equipment/Vehicle Inspection Checklist shown in Figure 16-8 or an equivalent Subcontractor form. The inspection should include, as a minimum, basic equipment and motor vehicle components and systems such as service brakes, parking brakes, emergency brakes, horn, steering mechanisms, operating controls, windshields, windows, mirrors, tires, lights, seat belts, headlamps, brake lights, rollover protection structures, backup alarms and evidence of fluid leaks. Deficiencies shall be noted and corrected prior to use. Copies of the inspections shall be maintained on-site and readily available for inspection by PMC or RVO Representatives. Vehicles are to be taken out of service if they do not pass inspection.
- Operators of over-the-road vehicles on RMA such as haul trucks and water trucks must possess a valid commercial driver's license (CDL) if a CDL is normally required when operating such vehicles on public roads.
- Subcontractors shall obtain copies of valid and relevant vehicle operator licenses such as a CDL (or have a system in place to verify possession of current licenses) and/or training records.
- All haul trucks that must enter consolidation areas or other controlled areas where windows are required to be kept closed, must have adequate climate control equipment installed in the cab that includes defrosting and air conditioning.
- Construction equipment used for demolition or materials handling shall be equipped with a demolition cage, wire screen, or equivalent structures to prevent materials or debris from breaking cab windows where the potential for window breakage hazards exists.
- Construction equipment shall be equipped with operable audible backup alarms.
- When equipped, construction equipment shall have operable visual backup indicators.
- Skid steer equipment (e.g., Bobcats) shall not be used unless authorized by the PMC Health and Safety Representative and use is limited to specific authorized tasks and areas of operation.
- Eating, drinking, smoking, and using cellular telephones (including the use of a hands-free feature in conjunction with a cellular phone) are prohibited when operating construction equipment.
- Construction equipment operators shall have the experience, skills, and knowledge to safely operate the equipment to be used. PMC Subcontractors are responsible for ensuring that operators have the appropriate skills and qualifications and shall ensure the following is accomplished:
  - Evaluate each operator's experience relative to the job task(s).
  - Evaluate each operator's skills prior to unsupervised operation of the vehicles or equipment.

- Subcontractors shall maintain documentation of their evaluation(s) of each operator's capability to operate each assigned vehicle/equipment type in a safe manner.
- Over-the-road haul vehicles shall have documentation of annual inspections in accordance with Department of Transportation requirements given in 40 CFR 396, Subpart B, Appendix G, Minimum Periodic Inspection Standards.
- Subcontractors contemplating the use of end dump trucks for the project shall be aware of the high potential for U-bolt failure on dump system structural components that could result in property damage or injury. If end dump trucks are used, Subcontractors shall review LL from previous site U-bolt failure experience, and incorporate potential mitigating measures into the project THASP. At a minimum, projects shall comply with manufacturer's recommended trailer maintenance schedule; provide the best possible road surface for haul trucks; include U-bolts on daily equipment inspections; consider replacing U-bolts with new ones prior to equipment arrival at RMA worksite; and develop a U-bolt changeout schedule as warranted.
- Subcontractors shall ensure that haul trucks are not loaded beyond the truck/trailer manufacturer's recommendations.
- All construction equipment is to have documented preventive maintenance per the manufacturer's recommendations. The preventive maintenance program is to be implemented by a trained/qualified individual and preventive maintenance records shall be maintained on-site. For rental equipment, copies of preventive maintenance records shall be readily accessible and available for review by the PMC. For acceptance, the organization must be able to demonstrate that an equipment vendor has an adequate preventive maintenance program and records can be made available to the PMC upon request.
- Repair/maintenance work shall not be conducted on heavy equipment from heights greater than 6 feet without manlifts, work platforms, fall protection, or an approved AHA if fall protection is not feasible or creates a greater hazard.
- Equipment operators may not work for more than 12 hours in any 24-hour period without prior acceptance from the PMC Project Manager and Health and Safety Representative.
- Operators shall not jump to the ground from vehicle ladders, cabs, or platforms.
- Equipment shall be operated on grades in accordance with the equipment manufacturer's recommendations.
- Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.
- Chocking is required whenever a worker is under any part of any construction equipment or associated loads and during decontamination or cleaning processes (unless a written AHA is in place requiring control measures that provide equivalent protection).
- Chocking is not required for tracked equipment or rubber-tired equipment if the parking brakes are set and components such as blades, buckets, outriggers, etc. are fully lowered to the ground and the equipment is completely stabilized.
- Equipment shall be parked in a zero energy condition (blades, dump bodies, buckets, loads, hydraulic lift gates, etc.) so that there is no retained energy remaining in the equipment.
- On-site equipment maintenance operations that pose a hazard to personnel shall be addressed in the THASP or AHA.
- Personnel in areas in which heavy equipment is being operated shall wear high visibility traffic safety vests and make eye contact with the operator before approaching.

- All construction vehicles shall be operated in accordance with the Site Wide Traffic Management Plan and/or specification.

#### **16.16 All-Terrain and Utility Vehicles**

All-terrain and utility vehicles (e.g., John Deere Gator, Kawasaki Mule, Polaris Utility Vehicle) shall not be used at RMA without specific written acceptance from the PMC Project Manager and the PMC Health and Safety Manager. If acceptance is obtained, the following requirements are applicable:

- The vehicle must be appropriate for the specific task(s) to be performed.
- The vehicle must be equipped with a rollover protective structure, seatbelts, headlights, brake lights, side or rearview mirrors, and a high-visibility flag extending upwards a minimum of 4 feet above the rollbar.
- An approved AHA for the task(s) is required which addresses the hazards associated with the vehicle use, including, but not limited to, vehicle limitations on rough and uneven terrain, operation near other construction or heavy equipment, use on open access and haul roads.
- Operators shall be qualified through appropriate training and/or experience and the qualifying documents be maintained as part of the employee's training records.
- Operators are required to read and follow the guidelines of the vehicle operator's manual and the task(s) AHA.

#### **16.17 Powered Industrial Trucks**

All powered industrial trucks shall fully comply with 29 CFR 1910.178, 29 CFR 1926.602, American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1-1969, and with the following:

- Modifications and additions (i.e., spreader bars, booms and other lifting devices) which affect capacity and safe operation shall not be performed by the customer or user without manufacturer's prior written authorization, or professional engineer approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.
- If the truck is equipped with front-end attachments other than factory installed attachments, the user shall request that the truck be marked to identify the attachments and show the approximate weight of the truck and attachment combination at maximum elevation with load laterally centered.
- All attachments shall be positively secured to the truck with rated cable, chain, or clamps.

#### **16.18 Crane and Hoisting Operations**

Crane operations shall be conducted in accordance with 29 CFR 1926.550, Cranes and Derricks. Rigging of loads being lifted by cranes shall comply with the requirements of 29 CFR 1926.251, Rigging Equipment for Material Handling. For critical lifts, a critical lift plan is required that meets the requirements of the current version of TetEC Construction Procedure CP-13, Critical Lifts. Refer to Figure 16-9, Critical Lift Plan and Figure 16-9a, Critical Lift Plan Attachment A.

All critical lift plans require the review and acceptance of the PMC Project Manager or designee. Critical lifts are defined as lifts for which any of the following conditions exist:

- Any lift of 30,000 pounds or more

- The weight of the lift exceeds 75 percent of the crane's rated capacity in the configuration that will be used during the lift.
- Lifts for which the path of travel is out of the operator's view
- Lifts made with more than one piece of lifting equipment
- Lifts involving nonroutine or difficult rigging arrangements
- Hoisting of personnel with a crane or derrick
- Lifts involving high value items where damage would result in an unacceptable financial or production loss
- Any lift which the lifting equipment operator believes should be considered critical

#### **16.19 Flammable and Combustible Liquids**

Dispensing of flammable and combustible liquids shall comply with the following:

- Refueling areas shall be located at least 25 feet from other operations.
- Spill containment, collection, and cleanup materials shall be provided in refueling areas.
- Transfer containers shall be bonded together electrically.
- All spark-producing equipment in the immediate vicinity of flammable liquid dispensing operations shall be shut down. Adequate cool-down time for generators, pumps, and other portable equipment shall be provided prior to refueling.
- Pressure buildup in portable fuel cans shall be relieved away from hot surfaces and spark-producing equipment.
- Dispensing nozzles shall have an automatic shutoff and no "latch open" devices.
- Disconnect switches for refueling equipment shall be located away from refueling operations.
- Smoking and spark-producing equipment or tools are prohibited in the fueling area.
- A fire extinguisher rated no less than 20lb, type ABC, shall be securely placed between 25 and 75 feet from each refueling operation.

Flammable and combustible liquid storage requirements in above ground storage tanks are defined in Specification Section 01561 Management of Petroleum Liquids and Materials. In addition, for flammable and combustible liquid storage requirements, address the following:

- Only properly labeled and approved safety containers shall be used for handling and storage.
- Flammable storage cans shall not be stored in direct sunlight.
- For indoor storage of flammable liquids, no more than 25 gallons of flammable liquids may be stored outside of a flammable cabinet, so long as the material is stored in 5-gallon safety cans within 25 feet of a minimum 10lb type ABC fire extinguisher.
- A fire extinguisher rated no less than 20lb, type ABC, shall be securely placed between 25 and 75 feet from outside storage of flammable materials other than vehicle refueling facilities (e.g., 5-gallon safety cans of gasoline).
- Exits and other means of egress shall not be used for storage.
- All nonbulk materials shall be stored in a flammable cabinet. Stored quantities shall not exceed 60 gallons per cabinet. No more than three cabinets shall be placed in a single area.

- Outdoor portable tanks shall be separated by a minimum 5-foot clear area.
- A 12-foot-wide access shall be maintained for fire equipment to reach outdoor storage areas.
- Outdoor storage areas shall be maintained free of weeds, rubbish, and other fuel sources.
- Outdoor storage tanks shall have adequate venting capacity.

#### **16.20 Fire Protection and Prevention**

Effective fire prevention requires the following:

- Smoking is prohibited in any structure (e.g., building, trailer, shed) on RMA regardless of ownership.
- Smoking is prohibited within 50 feet of any structure.
- All work operations shall comply with the requirements of 29 CFR 1926, Subpart F, Fire Protection.
- Fire extinguishers shall be installed in all trailers and buildings.
- Fire extinguishers shall be inspected and maintained monthly and equipped with inspection tags.
- Flammable and combustible liquid and gas storage and dispensing areas shall be posted "No Smoking or Open Flame."
- Fuel storage areas shall be maintained free of weeds and other fuel sources.

#### **16.21 Office Safety**

An office safety program shall be implemented for personnel who would normally work in the office environment to inform them of the hazards that may be encountered and the precautions to follow to prevent injury or illness. The elements of the office safety program shall include the following:

- Office safety practices in the THASP
- Conducting personnel training on office safety hazards and the precautions to take to avoid injury or illness, including emergency plans and fire prevention methods
- Conducting regular office area inspections that document findings and corrective actions (This should be included in regular project or task-specific inspection programs.)
- Maintaining an office area that is clean and orderly

#### **16.22 ZIP SLIPs**

ZIP SLIPs are used to promote employee involvement in environmental, safety, and quality (ESQ) programs through personal action, and serve as a simple mechanism to document this involvement. ZIP SLIPs are used to

- 1) recognize ESQ actions,
- 2) suggest improvements,
- 3) report potential hazards,
- 4) report potential quality concerns.

ZIP SLIPs should not be used in lieu of existing ESQ programs such as direct reporting and correction of hazards by employees and supervision, event reporting, nonconformance reporting,

or use of the work order mechanism to improve workplace conditions. However, ZIP SLIPs can be used to document personal action taken by employees in these ESQ program areas.

The PMC and Subcontractors are responsible for encouraging the use of ZIP SLIPs and assigning a ZIP SLIP Coordinator to facilitate the process and keep records. A printable version of the ZIP SLIP, including ZIP SLIP Guidelines, is included as Figure 16-10. Equivalent employee involvement programs developed by PMC Subcontractors may be substituted for the ZIP SLIP if reviewed and approved by the PMC Health and Safety Manager.

### **16.23 Electrical Safety**

When electrical work is conducted by the PMC or its Subcontractors, review of proposed work by a qualified person is required. If necessary, coordinate activities with the Infrastructure and Program Support staff. For work required on energized electrical lines, an Energized Electrical Work Permit (Figure 16-3) must be completed.

Safety precautions regarding general electrical work and field/office electrical issues can be found in the RMA Health and Safety Guidelines (HS-002-RMA), NFPA 70-E *Voluntary Standard for Electrical Safety in the Workplace*, and Tetra Tech's EHS 3-10 *Electrical Safety - Assured Equipment Grounding*

Figure 16-1 Hot Work Permit Form

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>HOT WORK PERMIT</b>			
<b>BEFORE INITIATING HOT WORK, ENSURE PRECAUTIONS ARE IN PLACE! MAKE SURE AN APPROPRIATE FIRE EXTINGUISHER IS READILY AVAILABLE!</b>					
This Hot Work Permit is required for any operation involving open flames or producing heat and/or sparks. This includes, but is not limited to: Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch-Applied Roofing, and Cadwelding.					
<p style="text-align: center;"><b>INSTRUCTIONS</b></p> <p>A. Verify precautions checked at right are in place, or do not proceed with the work.</p> <p>B. Complete and retain a copy of this permit (provide original to PMC Health and Safety when the permit is closed).</p> <p><b>WORK TYPE:</b>  <input type="checkbox"/> Cutting      <input type="checkbox"/> Welding      <input type="checkbox"/> Other</p> <p><b>DATE:</b> _____ <b>PERMIT NO.:</b> _____</p> <p><b>LOCATION:</b> _____</p> <p><b>NATURE OF JOB:</b> _____</p> <p><b>NAME OF PERSON DOING HOT WORK:</b> _____</p> <p><b>COMPANY NAME:</b> _____</p> <p><b>RESPONSIBLE SUPERVISOR:</b>                  NAME: _____                  I verify the above location has been examined and the precautions checked on the Required Precautions Checklist have been taken to prevent fire.</p> <p><b>SIGNATURE:</b> _____</p> <p><b>START TIME:</b> _____ <b>FINISH TIME:</b> _____</p> <p><b>ASSIGNED FIRE WATCH:</b>                  NAME: _____  <b>SIGNATURE:</b> _____</p> <p><b>PMC HS REPRESENTATIVE OR PROJECT DESIGNEE:</b>                  NAME: _____                  I verify that the location was inspected and determined to be fire safe and that precautions checked on the Required Precautions Checklist are in place. Permission is authorized to start work.</p> <p><b>SIGNATURE:</b> _____</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:20%;"><b>PERMIT EXPIRES:</b></td> <td style="width:20%;"><b>DATE:</b></td> <td style="width:20%;"><b>TIME:</b></td> <td style="width:40%;"><b>AM PM</b></td> </tr> </table>	<b>PERMIT EXPIRES:</b>	<b>DATE:</b>	<b>TIME:</b>	<b>AM PM</b>	<p><b>Required Precautions Checklist</b>                  APPLICABLE (Check appropriate box)                  YES NO</p> <p><input type="checkbox"/> <input type="checkbox"/> Available sprinklers, hose streams, or extinguishers are in service/operable.</p> <p><input type="checkbox"/> <input type="checkbox"/> Hot work equipment in good repair.</p> <p><input type="checkbox"/> <input type="checkbox"/> Eyewash availability.</p> <p><b>Requirements within 35 feet of hot work</b></p> <p><input type="checkbox"/> <input type="checkbox"/> Flammable liquids, dust, lint, and oil deposits removed.</p> <p><input type="checkbox"/> <input type="checkbox"/> Explosive atmosphere in area eliminated.</p> <p><input type="checkbox"/> <input type="checkbox"/> Floors swept clean.</p> <p><input type="checkbox"/> <input type="checkbox"/> Combustible floors wet down, covered with damp sand or fire-resistant sheets.</p> <p><input type="checkbox"/> <input type="checkbox"/> Remove other combustibles where possible. Otherwise protect with fire-resistant tarpaulins or metal shields.</p> <p><input type="checkbox"/> <input type="checkbox"/> All wall and floor openings covered.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire-resistant tarpaulins suspended beneath work.</p> <p><input type="checkbox"/> <input type="checkbox"/> Vegetation removed or wet down.</p> <p><b>Work on walls or ceilings/enclosed equipment</b></p> <p><input type="checkbox"/> <input type="checkbox"/> Fire/ smoke alarms in immediate area deactivated (coordinate w/ occupants/ IPS).</p> <p><input type="checkbox"/> <input type="checkbox"/> <b>ALERT: INSTRUCT ALARM COMMUNICATIONS CO. TO DISREGARD ALARMS FOR BUILDING (#) IF INADVERTENTLY ACTIVATED.</b></p> <p><input type="checkbox"/> <input type="checkbox"/> Construction is noncombustible and without combustible covering or insulation.</p> <p><input type="checkbox"/> <input type="checkbox"/> Combustibles on other side of walls moved away.</p> <p><input type="checkbox"/> <input type="checkbox"/> Danger exists by conduction of heat into another area.</p> <p><input type="checkbox"/> <input type="checkbox"/> Enclosed equipment cleaned of all combustibles.</p> <p><input type="checkbox"/> <input type="checkbox"/> Containers purged of flammable liquids/vapors.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire/ smoke alarms in immediate area reactivated.</p> <p><b>Fire watch/hot work area monitoring</b></p> <p><input type="checkbox"/> <input type="checkbox"/> Fire watch will be provided during and for 30 minutes after work, including any coffee/ lunch breaks.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire watch is supplied with suitable extinguishers.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire watch is trained in use of this equipment and in sounding alarm.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire watch may be required for adjoining areas, above and below.</p> <p><input type="checkbox"/> <input type="checkbox"/> Monitor hot work area for 30 minutes after job is completed.</p> <p><input type="checkbox"/> <input type="checkbox"/> Fire Watch waived (reason) _____</p> <p><input type="checkbox"/> <input type="checkbox"/> Notify PMC HS representative or Project designee after hot work is complete.</p>
<b>PERMIT EXPIRES:</b>	<b>DATE:</b>	<b>TIME:</b>	<b>AM PM</b>		
<b>REPORT EMERGENCIES BY DIALING 911 ON ANY SITE, COMPANY, OR CELL PHONE</b>		I verify that I conducted an inspection 30 minutes following completion of hot work and the area was in a fire safe condition. NAME: _____			
<b>THIS PERMIT IS GOOD FOR ONE DAY OR UNTIL EXPIRATION DATE AS NOTED</b>		SIGNATURE: _____			



Figure 16-2 Daily Excavation Inspection Checklist

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b>	<b>DAILY EXCAVATION INSPECTION CHECKLIST</b>
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**To be completed by a "Competent Person"**

Project		Location
Date	Time	Competent Person
Soil Type(s)		
Soil Classification(s)	Excavation depth	Excavation width
Type of protective system used		

*Indicate for each item by circling: Y (Yes), N (No), - Address in Comments, Not Applicable (NA.)*

**I. General Inspection of Job Site**

- |  |   |   |    |
|--|---|---|----|
| A. Surface encumbrances removed or supported   | Y | N | NA |
| B. Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation        | Y | N | NA |
| C. Hard hats worn by all employees   | Y | N | NA |
| D. Spoils, materials, and equipment set back 5 feet where possible and at least 2 feet from the edge of the excavation   | Y | N | NA |
| E. Barriers provided at all remotely located excavations, wells, pits, shafts, etc.                                      | Y | N | NA |
| F. Walkways and bridges over excavations 4 feet or more in depth are equipped with standard guardrails                   | Y | N | NA |
| G. Warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic | Y | N | NA |
| H. Warning system established and utilized when mobile equipment is operated near the edge of the excavation             | Y | N | NA |
| I. Employees prohibited from working on the faces of sloped or benched excavations above other employees                 | Y | N | NA |

**II. Utilities**

- |  |   |   |    |
|--|---|---|----|
| A. Utility companies contacted and/or utilities located                              | Y | N | NA |
| B. Exact location of utilities marked when approaching the utilities                 | Y | N | NA |
| C. Underground installations protected, supported or removed when excavation is open | Y | N | NA |

**III. Means of Access and Egress**

- |   |   |   |    |
|---|---|---|----|
| A. Lateral travel to means of egress no greater than 25 feet in excavations 4 feet or more in depth                     | Y | N | NA |
| B. Ladders used in excavations secured and extended 3 feet above the edge of the trench                                 | Y | N | NA |
| C. Structural ramps used by employees designed by a competent person  | Y | N | NA |
| D. Structural ramps used for equipment designed by a registered professional engineer (RPE)                             | Y | N | NA |
| E. Ramps constructed of materials of uniform thickness, cleated together on the bottom, equipped with a no-slip surface | Y | N | NA |
| F. Employees protected from cave-ins when entering or exiting the excavation  | Y | N | NA |



**IV. Wet Conditions**

- A. Precautions taken to protect employees from the accumulation of water Y N NA
- B. Water removal equipment monitored by a competent person Y N NA
- C. Surface water or runoff diverted or controlled to prevent accumulation in the excavation Y N NA
- D. Inspections made after every rainstorm or other hazard-increasing occurrence Y N NA

**V. Hazardous Atmospheres**

- A. Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard Y N NA
- B. Ventilation – ventilation required for hazardous atmosphere or for oxygen levels less than 19.5% or greater than 22% Y N NA
- C. Testing conducted often to ensure that the atmosphere remains safe Y N NA
- D. Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmospheres could or do exist Y N NA
- E. Safety harness and life line used and individually attended when entering deep confined excavations Y N NA

**VI. Support Systems**

- A. Materials and/or equipment for support systems selected based on soil analysis, trench depth and expected loads Y N NA
- B. Materials and equipment used for protective systems inspected and in good condition Y N NA
- C. Materials and equipment not in good condition have been removed from service Y N NA
- D. Damaged materials and equipment used for protective systems inspected by a RPE after repairs and before being placed back into service Y N NA
- E. Protective systems installed without exposing employees to the hazards of cave-ins, collapses or being struck by materials or equipment Y N NA
- F. Members of support system securely fastened to prevent failure Y N NA
- G. Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc. Y N NA
- H. Excavations below the level of the base or footing approved by an RPE Y N NA
- I. Removal of support systems progresses from the bottom and members are released slowly to note any indication of possible failure Y N NA
- J. Backfilling progresses with removal of support system Y N NA
- K. Excavation of material to a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth Y N NA
- L. Shield system placed to prevent lateral movement Y N NA
- M. Employees are prohibited from remaining in shield system during vertical movement. Y N NA

**VII. Comments**

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Figure 16-3 Energized Electrical Work Permit

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	ENERGIZED ELECTRICAL WORK PERMIT
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**PART I: TO BE COMPLETED BY THE REQUESTER:**

Job/Work Order Number \_\_\_\_\_

- (1) Description of circuit/ equipment/ job location: \_\_\_\_\_  
\_\_\_\_\_
- (2) Description of work to be done: \_\_\_\_\_  
\_\_\_\_\_
- (3) Justification of why the circuit/ equipment cannot be de-energized or the work deferred until the next scheduled outage:  
\_\_\_\_\_  
\_\_\_\_\_

Requester/ Title \_\_\_\_\_

Date \_\_\_\_\_

**PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS *DOING* THE WORK:**

- |   | Check when Complete      |
|---|--------------------------|
| (1) Detailed job description procedure to be used in performing the above detailed work: _____<br>_____   | <input type="checkbox"/> |
| (2) Description of the Safe Work Practices to be employed? _____<br>_____   | <input type="checkbox"/> |
| (3) Results of the Shock Hazard Analysis: _____<br>_____  | <input type="checkbox"/> |
| (4) Determination of Shock Protection Boundaries: _____<br>_____  | <input type="checkbox"/> |
| (5) Results of the Flash Hazard Analysis: _____<br>_____  | <input type="checkbox"/> |
| (6) Determination of the Flash Hazard Analysis: _____<br>_____  | <input type="checkbox"/> |
| (7) Necessary personal protective equipment to safely perform the assigned task: _____<br>_____   | <input type="checkbox"/> |
| (8) Means employed to restrict the access of unqualified persons from the work area: _____<br>_____   | <input type="checkbox"/> |
| (9) Evidence of completion of a Job Briefing including discussion of any job-related hazards: _____<br>_____  | <input type="checkbox"/> |
| (10) Do you agree the above described work can be done safely? <input type="checkbox"/> Yes <input type="checkbox"/> No    (If <i>no</i> , return to requester) |                          |

Electrically Qualified Person(s) \_\_\_\_\_

Date \_\_\_\_\_

Electrically Qualified Person(s) \_\_\_\_\_

Date \_\_\_\_\_

**PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:**

\_\_\_\_\_  
Manager

\_\_\_\_\_  
Maintenance Manager

\_\_\_\_\_  
EHS Representative

\_\_\_\_\_  
Electrically Knowledgeable Person

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

**Note: Once the work is complete, forward this form to PMC HS Department for review and retention.**



Figure 16-5 Confined Space Pre-Entry Checklist

 TETRA TECH EC, INC.	PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL	<b>CONFINED SPACE          PRE-ENTRY BRIEFING CHECKLIST</b>
<b>PROJECT AND TASK:</b>		<b>LOCATION:</b>
<b>COMPANY:</b>	<b>BRIEFING COORDINATOR/DATE :</b>	
<b>ATTENDEES:</b>		
<ul style="list-style-type: none"> <li><input type="checkbox"/> Hazard Communication (including the signs, symptoms, and modalities of chemical overexposure)</li> <li><input type="checkbox"/> Physical hazards present (including potential for falls)</li> <li><input type="checkbox"/> Hazard controls used</li> <li><input type="checkbox"/> Acceptable entry conditions</li> <li><input type="checkbox"/> Emergency procedures</li> <li><input type="checkbox"/> Rescue procedures</li> <li><input type="checkbox"/> Duties of entrants and attendants during routine and emergency operations</li> <li><input type="checkbox"/> Frequency and Types of Monitoring</li> <li><input type="checkbox"/> Communications system backup to be used</li> <li><input type="checkbox"/> Review of work to be accomplished during entry</li> <li><input type="checkbox"/> Decontamination procedures (if necessary)</li> <li><input type="checkbox"/> PPE disposal</li> <li><input type="checkbox"/> Potential emergencies that may occur outside the confined space</li> </ul>		



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

# CONFINED SPACE ENTRY PERMIT

**PERMIT VALID FOR ONE SHIFT ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED.**

DATE: \_\_\_\_\_ SITE LOCATION/DESCRIPTION: \_\_\_\_\_

PURPOSE OF ENTRY: \_\_\_\_\_

SUPERVISOR(S) IN CHARGE OF CREWS/TYPE OF CREW/PHONE #: \_\_\_\_\_

COMMUNICATION PROCEDURES: \_\_\_\_\_

**RESCUE PROCEDURES AND PHONE NUMBERS:**

Name of Emergency Service (ES)	Phone# of ES	Date/Time ES contacted	ES Available ? Y or N	Date/Time ES Response Made		Comments/Problems with Service
				Before Confined Space	After Confined Space	

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Breathing Apparatus	_____	_____	Line(s) Broken-Capped/Blank	_____	_____
Emergency Escape/Fall Retrieval Equipment	_____	_____	Protective Clothing	_____	_____
Fire Extinguishers	_____	_____	Purge-Flush and Vent	_____	_____
Full Body Harness w/ "D" Ring	_____	_____	Respiratory Protection	_____	_____
Lifelines	_____	_____	Secure Area (Post and Flag)	_____	_____
Lighting (Explosive Proof)	_____	_____	Standby Safety Personnel	_____	_____
			Ventilation	_____	_____

Note: For items that do not apply, enter N/A in the blank. See reverse side for special requirements.

**RECORD MONITORING RESULTS EVERY 1/4 HOUR**

TEST(S) TO BE TAKEN	Permissible Entry Level	Time(s)
PERCENT OF OXYGEN	19.5% to 22.0%	_____
LOWER FLAMMABLE LIMIT	Under 10 %	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

REMARKS: \_\_\_\_\_

GAS TESTER NAME & CHECK #	INSTRUMENT(S) USED	MODEL &/OR TYPE	SERIAL &/OR UNIT #
_____	_____	_____	_____
_____	_____	_____	_____

SUPERVISOR AUTHORIZATION—ALL CONDITIONS SATISFIED: \_\_\_\_\_ CO./PHONE \_\_\_\_\_

PMC HS REPRESENTATIVE REVIEW: NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_ FUNCTION (i.e., entrant, attendant, or supervisor) \_\_\_\_\_

SPECIAL REQUIREMENTS: \_\_\_\_\_

COMMENTS: \_\_\_\_\_



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

# LINE BREAKING CHECKLIST

## Complete Prior to Opening, Cutting, or Demolishing Potentially Hazardous Pipelines and Containers

Implementation Project:	Company:	Date:
Company Point of Contact:	Phone/Radio:	Date of work:
Describe work to be performed:		
Identify the task-specific HASP that addresses this work:		
Identify the Line Breaking Procedure to be followed:		
Has an Activity Hazard Analysis been written for this work?	Yes    No	(If yes, attach a copy)
Is appropriate worker PPE specified in the HASP, Line Breaking Procedure, or AHA?	Yes    No	
What does (or did) the line contain?		
Has the line been depressurized?	Yes    No    N/A	
Has the line been drained from all low points?	Yes    No    N/A	
Has the line been purged or flushed to ensure that no material remains in the line?	Yes    No    N/A	
What tests have been performed to ensure that the line is safe to open?		
Describe how the line will be broken and tools used:		
Are proper lockouts in place to prevent refilling or repressurizing the line while it is open?	Yes    No    N/A	
Is a hot work permit required?	Yes    No    N/A	Is the permit approved?    Yes    No    N/A
List emergency equipment available in the work area (e.g., fire extinguisher, eyewash, safety shower)		
List spill cleanup materials available in the work area (e.g., absorbents, shovels, drums, etc.)		
Are emergency contacts and phone numbers known to site workers?	Yes    No    N/A	

### Review

Responsible Subcontractor Representative:	Signature:	Date
PMC Project Representative:	Signature:	Date

## Use Completed Form to Brief Site Workers and Maintain Record On-Site

Figure 16-8 Construction Equipment/ Vehicle Inspection Checklist

 <small>TETRA TECH EC, INC.</small>	<b>PROGRAM MANAGEMENT CONTRACTOR</b> <b>ROCKY MOUNTAIN ARSENAL</b>	<b>CONSTRUCTION EQUIPMENT/VEHICLE</b> <b>INSPECTION CHECKLIST</b>
<b>PROJECT/TASK:</b>		<b>COMPANY:</b>
<b>DATE:</b>	<b>TIME:</b>	<b>S   M   T   W   T   F   S</b> <small>(Circle One)</small>
<b>Incoming: (Check One)</b>	<b>Outgoing: (Check One)</b>	<b>Daily Insp. (Check One)</b>
<b>Make/Description:</b>		<b>Model:</b> _____ <b>I.D. No:</b> _____
<b>Inspected By: (Name and Signature)</b>		
<b>EQUIPMENT</b>	<b>Acceptable</b>	<b>Not Acceptable</b>
	<b>N/A</b>	<b>COMMENTS AND ACTION TAKEN</b>
Operation/Owners Manual		
Brakes		
Brake Lights		
Reverse Signal Alarm		
Horn/Air Horn		
Tires/Tracks		
Steering		
Seat Belt		
Operating Controls		
Fire extinguisher		
Lights		
Defroster		
Mirrors		
Instruments		
Coupling Devices		
Bed/Cargo Area		
Tailgate and latch		
Tarp/covers		
Windshield Wipers		
Windshield/Window Glass		
Mudflaps/Rock guards		
Exhaust Systems		
Hitches and Safety Cables		
Hydraulic Lines/ Air Hoses		
Engine Oil Level		
Hydraulic Oil Level		
Rollover Equipment		
Cleanliness		
<b>Comments:</b>		





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PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

### CRITICAL LIFT PLAN

<b>Weight Calculations</b>	<b>Weight (lbs)</b>	<b>Comments</b>
Weight of Object Empty		
Weight of Contents		
Weight of Block		
Weight of Spreader Bar		
Weight of Jib (stored or erect)		
Weight of Rigging (used Attachment A if needed)		
Weight of Jib Headache Ball		
Weight of Boom Extension		
Weight of Rope Below Sheaves		
Other		
Total Weight		
<b>Crane/Lift Data</b>	<b>Data</b>	<b>Comments</b>
Manufacturer		
Model Number		
Boom Length		
Boom Radius		
Boom Angle		
Hoisting from Main-Aux-Jib		
Crane Capacity		
Rated Capacity for Lift Over Front		
Rated Capacity for Lift Over Rear		
Distance from Center Pin to Center of Load		
Percent of Crane's Capacity		
Cable Capacity		
Number of Parts		
Size of Rigging		
Rigging Arrangement		
Communications		
<b>Cranes Certifications Valid/ Onsite</b>		
Spreader Bar		
Valid Test Data		
Label or Markings		



TETRA TECH EC, INC.

PROGRAM MANAGEMENT CONTRACTOR  
ROCKY MOUNTAIN ARSENAL

### CRITICAL LIFT PLAN

#### Lift Checklist (see additional comments below)

	Yes	No		Yes	No
Obstacles to lift or swing	<input type="checkbox"/>	<input type="checkbox"/>	Swing area checked and marked	<input type="checkbox"/>	<input type="checkbox"/>
Electrical hazards	<input type="checkbox"/>	<input type="checkbox"/>	Maximum counterweights	<input type="checkbox"/>	<input type="checkbox"/>
Operational hazards	<input type="checkbox"/>	<input type="checkbox"/>	Load chart in crane	<input type="checkbox"/>	<input type="checkbox"/>
Outriggers fully extended	<input type="checkbox"/>	<input type="checkbox"/>	Taglines used	<input type="checkbox"/>	<input type="checkbox"/>
Outriggers stabilized	<input type="checkbox"/>	<input type="checkbox"/>	Crane in good working condition	<input type="checkbox"/>	<input type="checkbox"/>
Wind conditions checked	<input type="checkbox"/>	<input type="checkbox"/>	Operator's aids functional	<input type="checkbox"/>	<input type="checkbox"/>
Crane solid, stable, level	<input type="checkbox"/>	<input type="checkbox"/>	Maintenance records checked	<input type="checkbox"/>	<input type="checkbox"/>
Foundation support checked	<input type="checkbox"/>	<input type="checkbox"/>	Preparatory inspections complete	<input type="checkbox"/>	<input type="checkbox"/>
Center of gravity determined	<input type="checkbox"/>	<input type="checkbox"/>	Rigging Tag/ Inspection	<input type="checkbox"/>	<input type="checkbox"/>
Spreader Bar Inspection/ Certifications	<input type="checkbox"/>	<input type="checkbox"/>	Crane Inspection/ Certifications	<input type="checkbox"/>	<input type="checkbox"/>

#### Checklist Comments

Blank area for checklist comments.

#### Lift Sequence (attach additional sheets if necessary)

Blank area for lift sequence details.



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ROCKY MOUNTAIN ARSENAL

### CRITICAL LIFT PLAN

#### Pre-Lift Checklist/ Briefing

- A safety briefing has been held to review this plan. All key personnel have initialed by their names to indicate receiving the briefing and that they understand the plan.
- Rigging satisfactorily inspected prior to the lift.
- Rigging hardware, shackles, etc. – proper size and grade only marked shackles will be used (see Attachment A,
- Crane satisfactorily inspected prior to the lift.
- Operator has qualification certificate and medical exam.
- Weather conditions suitable.
- Above ground utilities and hazards have been marked.

#### Sign In List

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	



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ROCKY MOUNTAIN ARSENAL

**CRITICAL LIFT PLAN**  
Attachment A

**Rigging Plan**

1. Load

- a description: \_\_\_\_\_
- b load weight (L): \_\_\_\_\_ ( known,  estimated)
- c dimensions: \_\_\_\_\_
- d center of gravity: \_\_\_\_\_ (high / low / right / left / balanced)

2. Rigging to be used and rated capacity.

(1)	_____	c _____	weight: _____
(2)	_____	a _____	weight: _____
(3)	_____	a _____	weight: _____
(4)	_____	c _____	weight: _____
(5)	_____	a _____	weight: _____
(6)	_____	a _____	weight: _____
(7)	_____	c _____	weight: _____
(8)	_____	a _____	weight: _____
(9)	_____	a _____	weight: _____
(10)	_____	c _____	weight: _____
(11)	_____	a _____	weight: _____
(12)	_____	a _____	weight: _____
(13)	_____	c _____	weight: _____
(14)	_____	a _____	weight: _____
(15)	_____	a _____	weight: _____
(16)	_____	c _____	weight: _____
(17)	_____	a _____	weight: _____
(18)	_____	a _____	weight: _____
(19)	_____	c _____	weight: _____
(20)	_____	a _____	weight: _____
(21)	_____	a _____	weight: _____

Total weight of rigging devices (R): \_\_\_\_\_



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ROCKY MOUNTAIN ARSENAL

CRITICAL LIFT PLAN  
Attachment A

3. Sling angles:

- a. angle: \_\_\_\_\_
- b. angle: \_\_\_\_\_
- c. angle: \_\_\_\_\_
- d. Effective Load Weight:
  - (1) Load Weight: (L) \_\_\_\_\_
  - (2) Effective Load: (L) \_\_\_\_\_ (see table of sling angle factor)
- e.  Confirm that all hooks, bridles, slings, shackles (clevis), turnbuckles, and other "below the hook" rigging subject to sling angles have sufficient capacity for the effective load weight (L' above includes sling angle factor)?

4. Crane radius (center of crane boom table to farthest pint away from crane).

- a. Pick point radius: \_\_\_\_\_
  - (1) Configuration: \_\_\_\_\_
  - (2) Over the  front,  back,  side
  - (3) Capacity at this radius and configuration: \_\_\_\_\_
- b. Place point radius: \_\_\_\_\_
  - (1) Configuration: \_\_\_\_\_
  - (2) Over the  front,  back,  side
  - (3) Capacity at this radius and configuration (be sure to account for the hook weight and above hook wire rope weights): \_\_\_\_\_
- c. Wire rope length. Is there enough wire rope (length) to pick and place the load as configured?
  - (1) When picking from a high point you need to account for the extended boom, including jib, heights and the full length of the boom with jibs. Don't forget to add additional height to accommodate slings below the hook in order to keep the headache ball clear of the anti-two-block.
  - (2) When placing to a low point (perhaps below the level of the crane) or when moving an object with extended boom, be sure there is enough wire rope to reach down to that level.
- d. Extreme configuration capacity. Between pick and place, will there be a configuration with a lower capacity than the picking or placement capacity?
 

yes / no

  - (1) Extreme potential radius: \_\_\_\_\_
  - (2) Extreme configuration: \_\_\_\_\_
  - (3) Over the  front,  back,  side
  - (4) Capacity at this radius and configuration: \_\_\_\_\_
- e. Referring to the above configurations, what is the minimum anticipated crane capacity during the lift: (c) \_\_\_\_\_



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ROCKY MOUNTAIN ARSENAL

**CRITICAL LIFT PLAN**  
**Attachment A**

5. Crane capacity evaluation:

- a. Minimum crane capacity: (c) \_\_\_\_\_
- b. Load weight (L above) (L) \_\_\_\_\_
- c. Weight of rigging (R above) (R) \_\_\_\_\_
- d. Percentage of capacity  $100\% \times (L+R)/c$  (%) \_\_\_\_\_
- e.  Confirm that crane capacity (c) is adequate for lift weight (L+R).

6. Lift Diagram:

Identify the slings, lifting bars, rigging accessories, and below-the-hook lifting devices from section 2, **above (Use the same numbers and capacities from section 2, to identify them).**

Identify load-indicating devices, lifting points, **slings angles from section 3 above**, boom and swing radiuses.

Identify the **hitch types in section 7 below** using the same numbers and terms.

Describe methods of attachment, crane orientations and other factors affecting equipment capacity such as wind, footing, obstructions, and utility clearances.



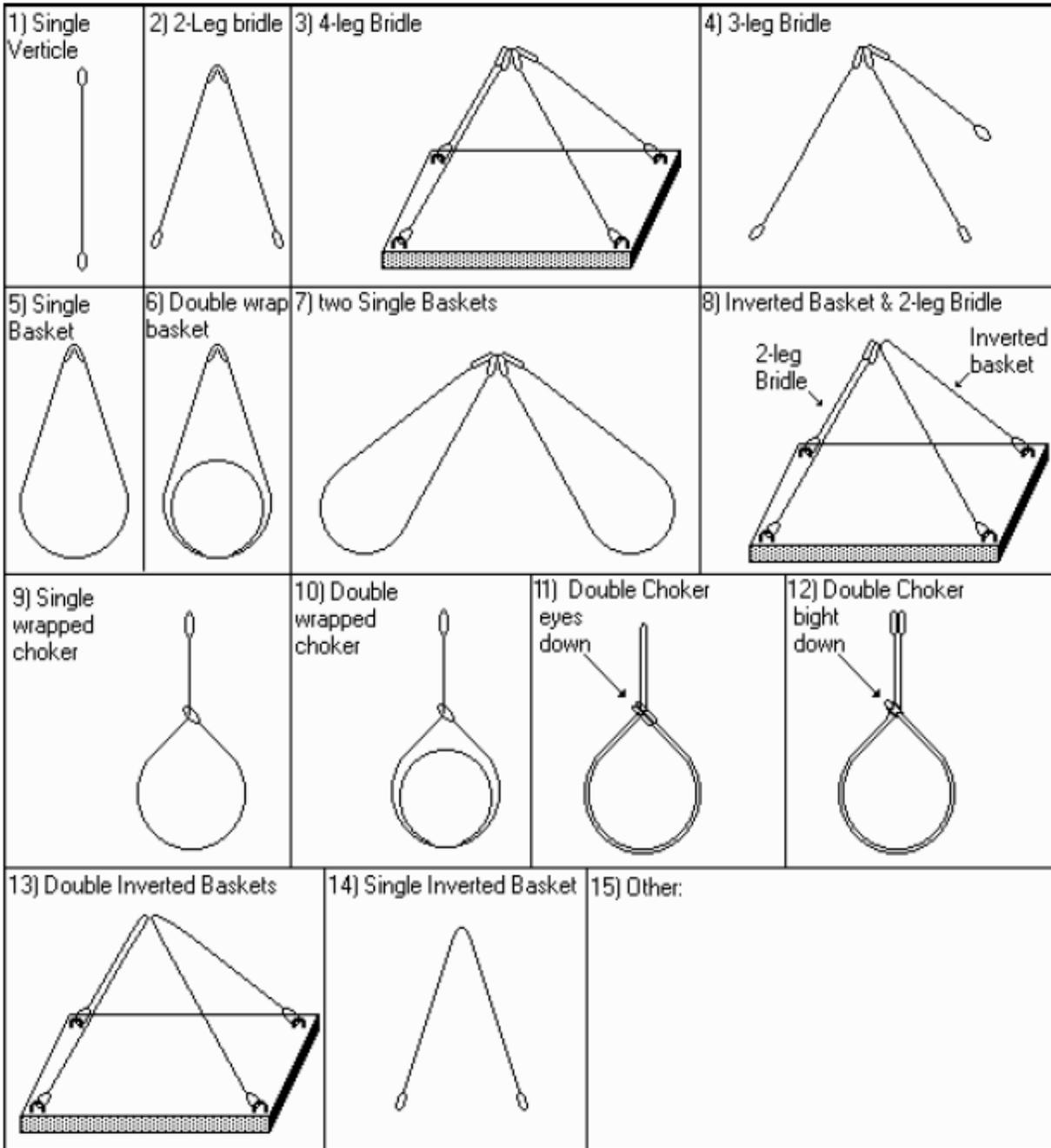
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CRITICAL LIFT PLAN  
Attachment A

- 7. Hitch Selecti

**DIAGRAMS OF HITCH TYPES**  
(refer to these diagram #s in this plan)





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**CRITICAL LIFT PLAN**  
**Attachment A**

**Selection of Hitch Types**

Hitch Type	Above or below center of gravity	Number of legs loading (3)	Load control	Diagram #
single verticle	above	1	poor	1
2-leg bridle	above	2	average	2
4-leg bridle	either	2	excellent	3
3-leg bridle	either	3	excellent	4
Single wrap basket	either (1)	2	average	5
double wrap basket	either (1)	2	good	6
two single baskets	either (2)	4	poor	7
inverted basket with a 2-leg bridle	either	4	excellent	8
single wrap choker	either (1)	1	average	9
double wrap choker	either (1)	1	good	10
double choker with bight in hook	either (1)	2	good	11
double choker with the eyes in the hook	either (1)	2	poor	12
double inverted basket (both bights in the hook)	above	4	poor	13
single inverted basket (bight is in the hook)	above	2	poor	14

(1) Never use as single hitch below the center of gravity

(2) Compounds loading at pick points

(3) Where bridle arrangement is not rated as a unit, this is the number of legs that can be considered load bearing for purposes of dividing the total load weight

8. Electrical Hazards:

**Clearances Required  
when operating near high voltage power lines**

Normal Voltage (phase to phase)	Minimum Clearance
50 kV	10 ft.
Over 50 to 200 kV	15 ft.
Over 200 to 350 kV	20 ft.
Over 350 to 500 kV	25 ft.
Over 500 to 750 kV	35 ft.
Over 750 to 1,000 kV	45 ft.



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**CRITICAL LIFT PLAN**  
**Attachment A**

Load weight estimating sheet:

materials &  
weight lbs/cu.ft.

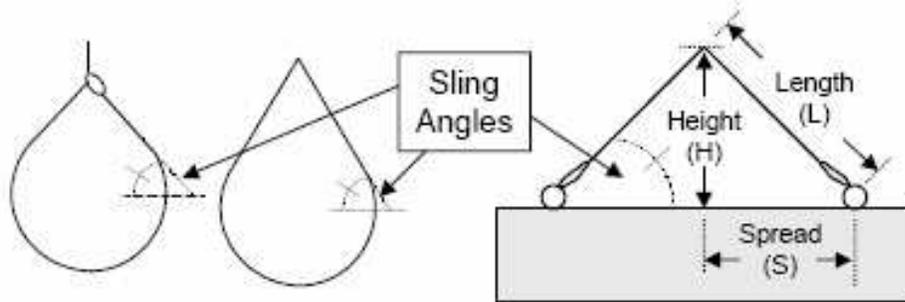
- aluminum 165
- brass 524
- bronze 534
- cast iron 450
- lead 708
- steel 490
- zinc 437
  
- diesel fuel 52
- gasoline 45
- motor oil 58
- water 63
- water (8.3 lbs/gal)
- asphalt 153
- loose dirt 75
- moist excavated dirt 90
- crushed rock 95
- limestone 97
- reinforced concrete 150
- portland cement 94
- dry loose sand 100
- wet sand 130
- brick 120
- coal 56
  
- glass 162
- rubber 94
  
- hay bales 24
- dry white pine 26
- southern yellow pine 46
- fir 33
- oak 60
- railroad ties 50
- paper 58



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ROCKY MOUNTAIN ARSENAL

**CRITICAL LIFT PLAN**  
Attachment A



Sling Angle Factors						
ratio of H/L (1)	ratio of S/L (2)	sling angle	Factor		Weight of Load	Effective Load L' <sup>(3)</sup>
1.000	0.000	<b>90° (vertical)</b>	<b>1.000</b>	<b>X</b>	=	
0.996	0.087	<b>85°</b>	<b>1.004</b>	<b>X</b>	=	
0.985	0.174	<b>80°</b>	<b>1.015</b>	<b>X</b>	=	
0.966	0.259	<b>75°</b>	<b>1.035</b>	<b>X</b>	=	
0.940	0.342	<b>70°</b>	<b>1.064</b>	<b>X</b>	=	
0.906	0.423	<b>65°</b>	<b>1.104</b>	<b>X</b>	=	
0.866	0.500	<b>60°</b>	<b>1.155</b>	<b>X</b>	=	
0.819	0.574	<b>55°</b>	<b>1.221</b>	<b>X</b>	=	
0.766	0.643	<b>50°</b>	<b>1.305</b>	<b>X</b>	=	
0.707	0.707	<b>45°</b>	<b>1.414</b>	<b>X</b>	=	
0.643	0.766	<b>40°</b>	<b>1.555</b>	<b>X</b>	=	
0.574	0.819	<b>35°</b>	<b>1.732</b>	<b>X</b>	=	
0.500	0.866	<b>30° <sup>(4)!</sup></b>	<b>2.000</b>	<b>X</b>	=	<sup>(4)!</sup>
0.342	0.940	<b>20° <sup>(4)!!</sup></b>	<b>2.924</b>	<b>X</b>	=	<sup>(4)!!</sup>
0.174	0.985	<b>10° <sup>(4)!!!</sup></b>	<b>5.75</b>	<b>X</b>	=	<sup>(4)!!!</sup>

- (1) Determine the sling angle by calculating the ratio of the Height (H) divided by the sling leg length (L) (this is the sine of the sling angle), **OR**
- (2) You can also determine the sling angle by calculating the ratio of the Spread (S) divided by the sling leg length (L) (this is the cosine of the sling angle).
- (3) The effective load on a sling or a leg is the weight of the load multiplied by the selected factor.
- (4) Due to the rapid increase of effective load you should not allow sling angles to drop below 30 degrees.



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ROCKY MOUNTAIN ARSENAL

**CRITICAL LIFT PLAN**  
**Attachment A**

**Shackles**

- a. Table shall be used to determine the safe working loads of various sizes of shackles, except that higher safe working loads are permissible when allowed by the manufacturer if a safety factor of at least five is maintained. Only marked shackles shall be used.
- b. Shackles shall not be eccentrically loaded.

**TABLE**  
**SAFE WORKING LOADS FOR SHACKLES**

<b>Material size (in/cm)</b>	<b>Pin diameter (in/cm)</b>	<b>Safe working load (lb/kg)</b>
1/2 (1.2 cm)	5/8 (1.5 cm)	2,800 (1,270 kg)
5/8 (1.5 cm)	3/4 (1.9 cm)	4,409 (2,000 kg)
3/4 (1.9 cm)	7/8 (2.2 cm)	6,393 (2,900 kg)
7/8 (2.2 cm)	1 (2.5 cm)	8,598 (3,900 kg)
1 (2.5 cm)	1 1/8 (2.8 cm)	11,199 (5,080 kg)
1 1/8 (2.8 cm)	1 1/4 (3.1 cm)	13,404 (6,080 kg)
1 1/4 (3.1 cm)	1 3/8 (3.4 cm)	16,424 (7,450 kg)
1 3/8 (3.4 cm)	1 1/2 (3.8 cm)	20,018 (9,080 kg)
1 1/2 (3.8 cm)	1 5/8 (4.1 cm)	23,810 (10,800 kg)
1 3/4 (4.3 cm)	2 (5 cm)	32,407 (14,700 kg)
2 (5 cm)	2 1/4 (5.5 cm)	42,549 (19,300 kg)

## ZIP SLIP Guidelines

### 1) Recognition for ESQ Actions

To recognize individuals or groups for proactive ESQ actions.

- Print the individual(s) or group name in the OBSERVATION section of form along with recognition observation.
- If recommending an award, suggest the type of award in the ACTION TAKEN section of form (e.g., certificate, ball cap, t-shirt, etc.).
- Try to recognize personnel as quickly as possible by talking with them, talking about the situation at a meeting, or giving an ESQ award. Keep in mind that some people prefer private vs. public recognition.

### 2) Suggestions for Improvement

➤ ESQ suggestions are those that promote ESQ goals and should be encouraged. In the OBSERVATION section of form, detail the initial observation and in the ACTION TAKEN section of form, detail the suggestion. Suggestions can be to improve a workplace condition, practice, or process.

### 3) Report of Potential Hazard

- Correct immediately-dangerous situations right away or barricade and remove personnel from the hazard until it can be corrected.
- Use the event report and investigation forms for any high loss potential near hit.
- Try to correct the problem on your own or within your work team. In the OBSERVATION section of form, detail the Potential Hazard. Upon correction, fill in the ACTION TAKEN section with the actions taken and submit it to your ZIP SLIP Coordinator.
- When you cannot resolve the problem yourself, report it to your Supervisor or Dept. Lead. Indicate this on the ACTION TAKEN portion of this ZIP SLIP.

### 4) Report of Potential Quality Concern

- Deviations from established quality requirements must be corrected immediately.
- Try to correct the concern on your own or within your work team. In the OBSERVATION section of form, detail the Potential Quality Concern. Upon correction, fill in the ACTION TAKEN section and submit it to your ZIP SLIP Coordinator.
- When you cannot resolve the quality concern yourself, detail in the OBSERVATION section and report it to your Supervisor or Dept. Lead. Indicate this on the ACTION TAKEN portion of this ZIP SLIP.

- ✓ **When completed, return to your project or group ZIP SLIP Coordinator.**
- ❖ PMC Contact: Cheryl Medford – Trailer Z-90 (X5510)

# ZIP SLIP



- Recognition for ESQ actions
- Suggestion for improvement
- Report of potential hazard
- Report of potential quality concern

— ZIP SLIPS should not be used in lieu of existing ESQ programs such as direct reporting and correction of hazards by employees and supervision, event reporting, nonconformance reporting, or use of the work order mechanism to improve workplace conditions. ZIP SLIPS can be used to document personal action taken by employees in these ESQ program areas. —

Project or Location \_\_\_\_\_



**OBSERVATION**  
(completed by Submitter)

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Name: \_\_\_\_\_ Date: \_\_\_\_\_  
(Optional)

Figure 16-10 ZIP SLIP (Rev. 12)

**ACTION TAKEN**  
(completed by Submitter)

Action	Date
1. <input type="checkbox"/> <b>Recognition</b> - If recommending an award, suggest the type of award (e.g., certificate, ball cap, t-shirt, etc.).	
2. <input type="checkbox"/> <b>Suggestion</b> - Detail the suggestion. Suggestions can be to improve a workplace condition, practice, or process.	
3. <input type="checkbox"/> <b>Potential Hazard</b> - Detail the action taken or when irresolvable, report it to your Supervisor and indicate here.	
4. <input type="checkbox"/> <b>Potential Quality Concern</b> -Detail action taken or when irresolvable, report it to your Supervisor and indicate here.	
(completed by ZIP SLIP Coordinator)	
<input type="checkbox"/> Reviewed	Date: _____
<input type="checkbox"/> Closed Out	Date: _____
<input type="checkbox"/> Copy to Originator	Date: _____

Name: \_\_\_\_\_  
ZIP SLIP Coordinator

## 17.0 EMERGENCY RESPONSE ACTION PLAN

### 17.1 RMA Emergency Response Integrated Contingency Plan

The RMA Emergency Response Integrated Contingency Plan (ICP) is the overall guidance document to assist the RVO and RMA organizations in response to and recovery from unplanned events. The ICP defines roles, responsibilities and methods to be followed in response to emergencies. The RVO personnel (RMA On-Scene Coordinator [ROSC], CERs, Health and Safety, Public Relations, etc.) use the ICP once an emergency situation has been reported to the ROC.

There are several key components of the ICP that the PMC or Subcontractors performing fieldwork need to ensure are included as part of the emergency action plan section of THASPs and as part of response to emergency situations. These components are discussed below.

- **Designate an Emergency Action Coordinator and Alternate** – Names and phone numbers should be listed in the THASP and posted conspicuously in the workplace.
- **Ensure that employees are trained for emergency situations** – This training is part of RMA site orientation for project sites, included as part of the THASP training and reinforced at periodic safety meetings.
- **Communicate emergency information to employees** – It is important to keep employees apprised of pertinent information during and after an emergency situation.
- **Immediately report emergency situations to Adcom 911 and/or the ROC** – Report all serious events (refer to Section 15.3) and other potential emergency situations such as acts or threats of violence, severe weather sightings.
- **Be prepared to provide support.** Due to the resources available on-site to the PMC and Subcontractors, we may be called on to provide support to any developing emergency situation at RMA. This could involve disconnecting utilities, constructing support areas or roads, assisting with site evacuations or other support services. Work will be performed only at the ROSC's direction of the PMC, and where adequate safety and health measures for personnel are available (e.g., training, protective equipment, rescue capability, etc.)

### 17.2 Emergency Response

In general, if any emergency event arises beyond the capability of on-site personnel, the Adcom 911 shall be notified immediately to dispatch emergency services. Potentially seriously injured or ill employees shall not be transported to a medical treatment facility by private conveyance.

Local CERs have the capability to provide or obtain fire, emergency medical, environmental spill response, or natural disaster assistance anywhere within a short time. Additional information is provided below concerning events that may occur during work at RMA. All emergency situations require completion of the event reporting and investigation forms as specified in Section 15.

The Subcontractor is responsible for coordinating all Emergency Response needs with the applicable Community Emergency Responders prior to commencing fieldwork. The Subcontractor shall develop an emergency response plan for site activities as part of their THASP, train all employees regarding provisions of the plan, and rehearse emergency response plans periodically.

### 17.3 Response and Notification Determination

The required level of response and appropriate notifications are determined case by case depending on the severity of the occurrence. Responding authority and notification procedures are separated into two categories: Immediate Danger to Life or Health and RMA Emergencies. Those situations deemed as "Immediate Danger to Life or Health" require off-site support provided through Adcom 911. RMA Emergencies are handled internally through coordination with the ROC.

### 17.3.1 Immediate Danger to Life or Health

Any person discovering a situation that is immediately dangerous to life or health requiring an urgent response shall immediately notify Adcom 911. These include the following emergency situations:

- Medical emergency
- Fire or explosion
- Bomb threat or threat of terrorism
- Act of violence
- Plane crash

Adcom 911 may be contacted by dialing 911 using RMA facility phones, off-site telephones, or cellular telephones.

As soon as possible, the individual shall contact the ROC and provide available information. Effective actions shall be taken to promptly investigate the situation.

#### 17.3.1.1 Medical Emergency

General guidelines for medical emergencies include the following:

**Physical injury** - Evaluate the extent of injuries. Provide first aid if you are qualified to do so and the injury is minor. Summon emergency help for all other injuries. Modify decontamination procedures as appropriate, depending on extent of injuries and contamination.

**Chemical exposure** - Flush with water, remove clothing if necessary, wash and rinse affected area for at least 15 minutes. Decontaminate and provide appropriate medical attention.

**Inhalation** - Move victim(s) out of the immediate area to fresh air. If the person is not breathing, check for a pulse rate, summon emergency help and, while awaiting response personnel, if qualified, administer rescue breathing and CPR, as appropriate.

**Ingestion** - Decontaminate affected person and summon emergency help for transportation to hospital. Provide hospital with information regarding potential chemical contamination, quantity (if known), and MSDS if possible.

**Eye Contact** - Summon emergency help and flush eyes with water and/or saline solution for 15 minutes. Decontaminate and transport to hospital for medical attention.

#### 17.3.1.2 Fire or Explosion

All personnel shall leave the immediate area of the fire, move to an upwind location, report to the assigned assembly station and await the arrival of emergency help. Radio Channel #1 should be monitored for further instructions. Personnel shall not fight fires unless properly trained to do so and only fires in the incipient (beginning) stage.

### **17.3.1.3 Bomb Threat or Threats of Terrorism**

Personnel who receive a bomb threat or threat of terrorism should try to obtain as much information as possible from the caller, then notify their supervisor, who in turn will immediately notify the Program Manager and Adcom 911. If an evacuation is ordered, all personnel shall proceed to their designated rally point, assemble for head count, and await further instructions.

### **17.3.1.4 Act of Violence**

Any act of violence that escalates, or could reasonably escalate beyond the capability of on-site management or Law Enforcement, shall be immediately reported to Adcom 911 and the ROC. Affected personnel should remove themselves from any potentially hazardous situation to a safe location and await further instructions.

### **17.3.1.5 Plane Crash**

In the event of an airplane crash, all personnel shall immediately evacuate the work area if it is near the crash site, and notify Adcom 911. The ROC will notify Law Enforcement and Denver International Airport communications. If a site-wide evacuation is ordered, office personnel will receive instructions via voice mail and/or computer message and field personnel via radio Channel #1. Personnel will proceed to the designated rally point (as designated in the THASP), assemble for head count, and await further instructions.

## **17.3.2 RMA Emergencies**

Any person discovering any of the following situations shall notify the ROC:

- Potential MEC
- Potential RCWM
- Hazardous material release in excess of one gallon, the RQ, or beyond the capability of project personnel
- Utility outage
- Actual or pending natural disaster

The ROC may be contacted by dialing 5246 using RMA facility phones or by dialing 303-289-0246 using an off-site or cellular telephone. Contact with the ROC can also be made by using Channel #1 on the RMA radio network.

### **17.3.2.1 Potential MEC Discovery**

In the event that potential MEC is discovered, all work in the immediate area shall stop and personnel shall retreat a minimum of 900 feet from the area. Personnel shall immediately notify the ROC. Procedures for handling the MEC will then be implemented by the personnel responsible for MEC control and removal. Work will not resume in the area until the MEC is properly identified and disposed, and resumption is authorized.

### **17.3.2.2 Discovery of CWM**

In the event that CWM or RCWM is detected through monitoring of potential CWM items or in the general work area, all work in the area shall stop and personnel will process through a decontamination station to a predetermined safe rally point. Equipment will be left in place, and work will not restart until the work area is confirmed free of CWM contamination. Personnel shall notify the ROC and the ROSC for response. Procedures for handling the CWM will then be implemented by the personnel responsible for CWM control and removal.

### 17.3.2.3 Material Release/Spill

All hazardous chemical spills greater than 1 gallon or greater than the chemical's RQ shall be reported to the ROC immediately. Project personnel shall follow the procedures outlined in the THASP for containment and cleanup of the hazardous chemical spill. In situations where the spill is beyond the capabilities of project personnel, they should move to a safe distance upwind and contact Adcom 911 and the ROC for assistance. Radio Channel #1 should be monitored for further instructions. The PMC Environmental Compliance Manager or alternate shall be notified at 303-289-0801 for determination of reporting requirements to Regulatory Agencies. It is the project's responsibility to clean up all hazardous chemical spills, however minor, and coordinate disposal with the assigned PMC Environmental Compliance Representative.

### 17.3.2.4 Utility Outage

Localized or site-wide utility outages, i.e., electrical, water, or natural gas, shall be reported to the ROC for proper disposition. Personnel reporting these types of outages to the ROC should ensure that information regarding loss of critical systems, i.e., facility fire suppression capability, or other conditions that adversely affect compliance with facility or structure safety, is clearly stated for proper response evaluation.

### 17.3.2.5 Actual or Pending Natural Disaster

Any person observing the onset of any type of natural disaster, or any condition that could reasonably be expected to result in a pending natural disaster, shall notify the ROC immediately, and then seek appropriate shelter to prevent injury. Situations in this reporting category include imminent severe weather conditions, atmospheric conditions conducive to the development of potentially damaging wind microburst, and conditions that could potentially escalate to a point requiring site evacuation evaluation.

#### 17.3.2.5.1 Severe Weather Response

Severe weather notification at RMA is indicated by a steady 3-minute continuous signal from the site-located siren system. Severe weather activities such as tornados or intense lightning are examples of events that could require sheltering. Site-wide office personnel will receive instructions via voice mail and/or computer message, and field personnel via radio Channel #1. Upon notification of a weather emergency, all personnel shall proceed to their designated rally point, assemble for head count, and await further instructions. If there is not enough time to reach the designated rally point, personnel shall move to lower levels of buildings or to similar areas with solid structural protection, including closets and bathrooms.

In the event of a tornado, all personnel working in trailers shall exit the trailers and move to the designated Tornado Safety Location. If you are unable to reach the designated building, seek refuge in a permanent or anchored building, or dry, low-lying area such as a ditch or ravine. Lie down flat in a low-lying area and be aware of possible flash flood hazards. Personnel working in the field shall also move to a designated Tornado Safety Location, permanent or anchored building, or low-lying area. Never try to outrun a tornado on foot or with a vehicle. A map and directions to designated Tornado Safety Locations shall be included in the THASP and posted in work areas as appropriate.

In the event of severe lightning hazards during field operations, activities must be suspended, personnel evacuated to a safe area, and weather conditions monitored to determine when it is safe to resume field operations. Lightning safety protocols established in the appropriate THASP shall be followed. The ROC may suspend all activities on-site if necessary due to severe weather. Safe areas include fully enclosed metal vehicles with windows rolled up, and substantial or permanent buildings. Unsafe areas include small structures (huts and rain shelters) and areas

near metallic objects (fences, gates, electrical equipment, wires and power poles). Always avoid trees, water, and open fields. If you are isolated from shelter during close-in lightning, adopt a low crouching position on your toes with feet together and hands covering ears.

Personnel shall remain sheltered until a steady 60-second siren signal, followed by additional information by radio or supervisors indicates that the sheltering requirement is terminated.

Individual projects and field sites may have additional severe weather requirements that shall be included in THASPs and communicated to site workers.

#### **17.3.2.5.2 Site Evacuation**

Site evacuation notification is made by the ROC via radio, and through initiation of the site-located siren system. In the event of a situation that requires facility, or potential site-wide evacuation, a 3-minute oscillating siren will sound. All personnel must evacuate facilities and proceed to their designated assembly point and await further instructions. Situations that may require either facility or site-wide evacuation include bomb threats or other potential acts of terrorism. Office personnel may receive instructions via voice mail and/or computer message and field personnel via radio Channel #1. If instructed, personnel will evacuate the site via the nearest accessible route. Alternately, for site-specific evacuations, proceed to the designated rally point, assemble for head count, and await further instructions regarding evacuation of the site.

A map and directions to designated assembly points shall be included in the THASP and posted in work areas as appropriate.

#### **17.4 Task-Specific Emergency Response Action Plan**

A task-specific emergency response action plan shall be developed as part of each THASP. The task-specific emergency response action plan shall address foreseeable emergency situations and response actions associated with the individual worksite and tasks. Emergency response actions shall be compatible with the Rocky Mountain Arsenal Emergency Response ICP (available from the PMC Health and Safety Department).

Emergency response situations and actions contained in the THASP shall be reviewed with each on-site worker during site-specific briefings. Workers shall be provided updated information whenever there is a significant change to the plan and kept apprised of emergency information during an actual event. The plan shall be periodically rehearsed, critiqued, and performed at least once during the life of the task, and documented using the Emergency Action Plan Drill Evaluation and Follow-up form or equivalent, shown in Figure 17-1.

#### **17.5 Task-Specific Emergency Response Action Plan Requirements**

The task-specific emergency response action plan is included as part of the THASP and shall include the following:

- Availability of Emergency Responders
- Emergency coordinator and alternate
- Evacuation and accountability
- Notifications
- Weather
- Material release and spill containment
- Injury
- Fire/explosion

A map and directions to designated medical facilities shall be included in the THASP and posted in work areas as appropriate.

 TETRA TECH EC, INC.	<b>PROGRAM MANAGEMENT CONTRACTOR  ROCKY MOUNTAIN ARSENAL</b>	<b>EMERGENCY ACTION DRILL CRITIQUE  AND FOLLOW-UP  PAGE 1</b>		
Project(s):	Company(s):	Date:		
Location(s):	Evaluator(s) and Organization:			
Describe the emergency action or drill scenario:				
<b>Emergency Notifications:</b>		<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. How were the affected project personnel notified of the emergency or drill? Was the notification timely and effective?				
Comments:				
2. How were the Supervisor and Emergency Coordinator (or alternate) notified of the emergency or drill? Was the notification timely and effective?				
Comments:				
3. Were other emergency response groups notified? Was the notification timely and effective?				
Comments:				
<b>Emergency Response Actions:</b>		<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Did project personnel respond appropriately to the emergency or drill? (i.e., evacuate site, shut down equipment, provide first aid, control traffic, evacuate nonessential personnel)				
Comments:				
2. Did the project Emergency Coordinator (or alternate) perform duties required by plans or the emergency situation?				
Comments:				
3. Did Law Enforcement and/or other emergency response groups respond in a timely manner?				
Comments:				



<b>Post Emergency Response Actions:</b>				Yes	No	N/A
1. Was the "all clear" to return to work given to project personnel by an authorized individual?						
Comments:						
2. Was feedback or a debriefing provided to affected personnel?						
Comments:						
<b>Emergency Action Plans:</b>				Yes	No	N/A
1. Did the available Emergency Action Plan or alternate plans adequately address the emergency or drill scenario?						
Comments:						
<b>Overall Evaluation:</b>						
<input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Adequate <input type="checkbox"/> Marginal <input type="checkbox"/> Poor						
Comments:						
<b>Areas Needing Improvement:</b>						
<b>Corrective Action(s) Taken:</b>				By Whom?	Date	

## **18.0 RECORDS AND REPORTS**

The following is a summary of the required reports and health and safety records for PMC and Subcontractor activities at RMA. All health and safety-related recordkeeping shall be maintained on-site during project execution by the organization performing the work. Records must be readily retrievable and are subject to review for compliance by the RVO and/or PMC. Refer to the Health and Safety Requirements and/or the submittal requirements in the project specification sections for any additionally required health and safety records and reports.

### **18.1 Health and Safety-Related Implementation Project Records**

Certain Health and Safety records will become part of the Implementation Project Remediation Record as described in the current version of PMC Procedure A-012-RMA Document Control. These records include originals or copies of the following:

- THASP
- THASP FCRs
- Event Report Summary (kept by PMC as described in Section 15.6)
- Project Health and Safety Logbooks
- Documentation of Safety Meetings and sign-in sheets
- Project Health and Safety Air Monitoring and Sampling records
- Project OSHA 300 Log and 301 records
- Weekly Safety Report Review Sheet

At project completion, these records will be included in the official project record transmitted to the RVO.

### **18.2 Weekly Safety Report**

Subcontractors shall submit a Weekly Safety Report to the PMC for oversight and monitoring purposes. The Weekly Safety Report is due each Monday (or Tuesday if Monday is a scheduled holiday) for activities conducted during the previous week. The report shall include a brief summary of significant safety activities during the week, a one-week look ahead, and originals or copies of the following items:

- Daily safety meeting documentation and attendee sign-in sheets
- Completed weekly (or monthly) site inspections and corrective actions
- Health and safety logbook pages
- Any integrated personal sampling results, including data sheets, laboratory analytical results, and exposure calculation sheets
- Any site monitoring reports and direct reading monitoring results (including air, noise, and heat/cold stress monitoring results)
- Any permits or safety-related checklists used for the week including intrusive soils activity permits, hot work permits, lockout/tagout documentation, confined space entry permits/checklists, and line breaking checklists
- Any initial or daily inspections performed such as excavation inspections, hoisting and rigging inspections, and vehicle or equipment inspections
- Site briefing documentation and sign-in sheets for new site workers
- Any FCRs or changes to the THASP
- The site First Aid Log if there are new entries for the week

- Completed "Safety Observations of the Day" forms
- ZIP SLIPs completed during the week
- If applicable, status of any lost time or restricted duty injury/illness cases

The Weekly Safety Report cover sheet to be used by the Subcontractor is attached as Figure 18-1. After review of the weekly safety report by the PMC Health and Safety Representative, a copy of the cover sheet will be kept on file by the PMC. Contents of the weekly safety report will be kept on file by the Subcontractor.

### **18.3 Monthly Safety Report**

The PMC shall prepare and submit a monthly safety report including all PMC-related activities to the RVO by the 15th day of each month. The report will include the number of OSHA recordable cases, lost workday cases/and days lost, restricted duty cases/and restricted days experienced, and work hours for the previous month.

### **18.4 Medical Qualification and Training Records**

Maintenance of employee medical qualification and training records is the responsibility of each Organization. Documentation of the most recent medical qualification for site work (hazardous waste operations and respirator use) and training, such as the OSHA 40-hour, 8-hour refresher, supervisor, and other applicable training (e.g., competent person qualification, confined space entry training, forklift safety, equipment operation) shall be kept at the site.

### **18.5 Exposure Records**

Each employer is required to maintain employee exposure records in accordance with 29 CFR 1910.1020. Personal monitoring results, related laboratory reports and calculations, and sampling data sheets may be considered part of an employee exposure record. Copies of any site work-related exposure record generated will be kept at the site by the PMC Subcontractor. Copies of personal exposure records will be delivered to the PMC at Subcontract closeout or upon request.

### **18.6 Event Reports**

Event reports and investigation reports will be maintained at the PMC site in accordance with Section 15 and a summary report at the Subcontractor site.

### **18.7 First Aid Log**

The PMC and Subcontractors shall maintain a First Aid Log for any First Aid provided at RMA. The log shall identify the company, project/task, date, and employee, and include what items were used. New entries on the First Aid Log will be reported to the PMC in the Weekly Safety Report.

### **18.8 OSHA Form 300**

The PMC and Subcontractors shall maintain a current OSHA Form 300 (Log of Work-Related Occupational Injuries and Illnesses) at the site covering RMA site work. Subcontractors shall include all lower-tier subcontractor injuries and illnesses sustained while performing RMA work on the Subcontractor Project Log. Each recordable injury or illness shall be recorded on this log within five work days. A supplemental record (OSHA Form 301, Injuries and Illnesses Incident Report or equivalent) is required for each entry and shall be kept with the OSHA Form 300. Copies of OSHA 300 and 301 Form shall be provided to the PMC on request.

## 18.9 Health and Safety Field Logbooks

The PMC and Subcontractors shall complete and maintain logbooks in the field to document health and safety-related events as they occur during the day. Logbooks should document any significant safety-related information such as site monitoring and calibration, sampling, weather conditions, conversations, changes to PPE requirements, unusual conditions, and other items related to site health and safety. Where logbooks are assigned to PMC personnel, they will be maintained in accordance with the current version of PMC Procedure Q-002-RMA Logbooks.

The following logbook guidelines should be used:

- Use blue or black ink.
- Write clearly and print if necessary.
- Use an underline (rather than highlighter) to emphasize important information.
- Do not use correction fluid - draw one line through errors, write the correction above, then initial and date next to the correction.
- Start a new day at the top of a page with identifying information such as the project name, location, and date.
- Add entries in chronological order and note the time periodically throughout the day.
- If there is blank space at the end of the day, mark through it with a slash or NA and initial at the bottom of the last page for the day.

## 18.10 Field Change Requests

Changes to THASPs, procedures, or other requirements in the field will be documented using the Health and Safety Field Change Request Form (Figure 4-1). Health and safety-related FCRs require PMC acceptance prior to implementation. Field change requests with appropriate acceptances shall be maintained with the affected plan or procedure used.

## 18.11 Material Safety Data Sheets

The MSDS shall be available on-site at RMA prior to and during work activities for ready access and review by site workers. Copies of MSDS shall be included in the THASP and submitted to the PMC Health and Safety Manager and RMA ROC upon request.

## 18.12 Emergency and Hazardous Chemical Inventory Report

An Emergency and Hazardous Chemical Inventory Report will be submitted by the PMC to the RVO Safety and Health Office for any material with a volume exceeding 50 gallons in one container or one location, or any extremely hazardous substance or reactive material in excess of 1 pound. Organizations shall submit an Emergency and Hazardous Chemical Inventory Report to the PMC Health and Safety Manager for review prior to material delivery to the site. The Emergency and Hazardous Chemical Inventory Report Form is shown in Figure 18-2.

## 18.13 Field Team Review of PMC and THASP

The PMC HASP and applicable THASPs shall be reviewed with on-site workers prior to field activity assignment, normally during the site-specific safety briefing. Documentation of the field team review shall be kept on-site at RMA. A Field Team Review documentation form is attached as Figure 18-3.

#### 18.14 Closeout Safety Report

When required by Subcontract Documents, a Closeout Safety Report shall be submitted at the completion of Subcontractor work activities at the site. The Closeout Safety Report shall be submitted to the PMC Health and Safety Manager within 15 days of site work completion. The report will include the following items:

- A description of significant events, exposures, events, first aid cases and actions taken to prevent their recurrence
- A description of the coverage and responsibilities provided by the professional health and safety staff on the project
- A summary of monitoring results including air, noise, radiation, and heat stress monitoring or sampling performed
- A description of the site control requirements and site control measures implemented for the project
- A description of any RVO, state, or federal inspections involving health and safety of site workers
- A description of the ESQ recognition program and how it was implemented on the project
- Records to be included in the Closeout Safety Report:
  - THASP
  - THASP FCRs
  - Project Health and Safety Logbooks
  - Documentation of Daily (or periodic) Safety Meetings and sign-in sheets
  - Air Monitoring and Sampling records including all copies of project site monitoring reports, direct reading monitoring results, and integrated air sampling results (data sheets, laboratory analytical results, and exposure calculation sheets)
  - Project OSHA 300 Log and 301 records

 TETRA TECH EC, INC.	Program Management Contractor Rocky Mountain Arsenal	<b>WEEKLY SAFETY REPORT</b>
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[Project Name]  
[Project Number]

To: [PMC HS Representative]

Date: [Submittal Date]

From: [Subcontractor HSS and Company]

Week Ending: [Friday Date]

**Brief Look-Ahead at Next Week’s Activities [as it relates to safety] and if applicable Status of any lost time or restricted duty injury/illness cases.**

The following items with a checkmark are included; if not checked, the item is not applicable for the week.

**The five items below will remain in the Subcontractor Project Files after review and signature by the PMC Health and Safety Representative and will be included in the Closeout Report:**

- Copies of any integrated personal sampling results, including data sheets, laboratory analytical results, and exposure calculation sheets
- Copies of site monitoring reports and direct reading monitoring results if not already documented in the health and safety logbook
- Copies of health and safety logbook pages completed during the previous week
- Copies of any Field Change Requests or changes to the task-specific HASP
- Copies of daily safety meeting documentation and attendee sign-in sheets

**When checked the remaining items of the weekly safety report listed below will remain in the Subcontractor Project Files after review and signature by the PMC Health and Safety Representative:**

- Copies of completed weekly or monthly site inspections and corrective actions
- Copies of any permits used for the week including excavation permits, hot work permits, lockout/tagout documentation, and confined space entry permits
- Copies of initial or any daily inspections performed such as excavation inspections, hoisting and rigging inspections, and vehicle or equipment inspections
- Copies of site briefing documentation and sign-in sheets for new site workers
- Copies of the site first aid log if there are new entries for the week
- Copies of “Safety Observer of the Day” forms
- Copies of ZIP SLIPS completed for the week

**Note: To be submitted each Monday for the previous week’s activities.**

Review		
PMC Reviewer	Signature	Date

Figure 18-2 Emergency and Hazardous Chemical Inventory Report Form

 <p>TETRA TECH EC, INC.</p>	<p><b>PROGRAM MANAGEMENT CONTRACTOR ROCKY MOUNTAIN ARSENAL</b></p>	<p><b>EMERGENCY AND HAZARDOUS CHEMICAL INVENTORY REPORT</b></p>
<p>1. Implementation Project:</p>		<p>2. Task(s):</p>
<p>3. Subcontractor:</p>	<p>4. Location of Chemical:</p>	
<p>5. Chemical Name:</p>		
<p>6. CAS Number:</p>		
<p>7. Manufacturer's Emergency Phone Number:</p>		
<p>8. Required Monitoring Equipment:</p>		
<p>9. Decontamination Procedures:</p>		
<p>10. Neutralization Material and Its Location:</p>		
<p>11. Safe Withdraw Distance (ft):</p>		
<p>12. Attach copy of MSDS.</p>		

\* Required for acutely toxic chemical, reactive chemical, or greater than 50 gallons in one container. Include in task-specific Health and Safety Plan with a copy to PMC Health and Safety Manager.



## 19.0 REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists) *Threshold Limit Values (TLVs)- Chemical Substances and Physical Agents and Biological Exposure Indices*.  
Current version

American National Standard  
1969 ANSI B56.1 *Powered Industrial Trucks*

Colorado  
2007 (Aug 30) 5 Code of Colorado Regulations (CCR)  
1001-10 *Regulation No. 8, Control of Hazardous Air Pollutants, Part B- Emission Standards for Asbestos*

DA (Department of the Army)  
1994 (Nov. 1) Army Regulation (AR) 385-40, Accident Reporting and Records.

EPA (U.S. Environmental Protection Agency)  
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)  
40 CFR 302 *Hazardous Substance Release Reporting Regulations*

NFPA (National Fire Protection Association)  
2009 NFPA 51B *Standard for Fire Prevention During Welding, Cutting or Other Hot Work*  
NFPA 70-E *Voluntary Standard for Electrical Safety in the Workplace*

OSHA (Occupational Safety and Health Administration) Standards for Hazardous Waste Operations and Emergency Response  
National Archives and Records Administration  
Title 10 Code of Federal Regulations (CFR) Nuclear Regulatory Commission  
Title 29 CFR Labor  
1910 *General Industry Standards and subsequent Subpart requirements as appropriate*  
1926 *Construction Industry Standards and subsequent Subpart requirements as appropriate*  
Title 49 CFR Transportation

Public Law  
91-596 *Occupational Safety and Health Act of 1970, Section 5(a)(1), 'General Duty Clause'*  
102-402 *Rocky Mountain Arsenal National Wildlife Refuge Act of 1992*  
(Oct. 9)  
1996 (Jun.) *Record of Decision for the On-Post Operable Unit.*

RVO Health and Safety Program Standard Operating Procedures  
RVO SOP ES&H 107 *Incident Reporting and Lessons Learned*  
RVO SOP ES&H 213 *Hot Work Permits*  
RVO SOP ES&H 300 *Personal Exposure Monitoring*  
RVO SOP ES&H 305 *Radiation*  
2008 (Nov) *Emergency Response Integrated Contingency Plan*

PMC Procedures  
A-007-RMA *PMC CRA Access Control Procedure*  
A-012-RMA *Document Control*  
CP-008-RMA *Intrusive Soil Activity Procedure*  
EC-002-RMA *Remediation Waste Management Plan*  
HS-002-RMA *Rocky Mountain Arsenal Health and Safety Guidelines*  
HS-003-RMA *Perimeter Noise Monitoring Procedure*

HS-004-RMA	<i>Respiratory Protection Program</i>
HS-005-RMA	<i>Radiation Safety</i>
HS-007-RMA	<i>Zero Incident Performance Project Rules Handbook</i>
HS-008-RMA	<i>Safety Observer Program</i>
HS-009-RMA	<i>PMC Task-Specific Health and Safety Plan</i>
Q-002-RMA	<i>Logbooks</i>
Q-006-RMA	<i>Lessons Learned</i>

TtEC (Tetra Tech EC Incorporated)

Corporate Procedures

CP-13	<i>Critical Lifts</i>
EHS 3-2	<i>Procedures - Environmental, Health &amp; Safety Plan(s)</i>
EHS 3-3	<i>EHS Inspections</i>
EHS 3-10	<i>Electrical Safety - Assured Equipment Grounding</i>
EHS 4-2	<i>Hazard Communication</i>
EHS 4-7	<i>Industrial Hygiene</i>
EHS 6-1	<i>Confined Space Entry</i>
EHS 6-5	<i>Welding/Hot Work</i>
HSG 1-1	<i>Air Sampling Pumps</i>

USFWS (U.S. Fish and Wildlife Service)

1996 (Jun. 17)	<i>Comprehensive Management Plan</i>
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