Environmental Management - Grand Junction Office

UMTRA Project

Moab UMTRA Project Health and Safety Plan

Revision 1

March 2009

U.S. Department of Energy

Office of Environmental Management

Prepared by the Technical Assistance Contractor Under DOE Contract No. DE-AC30-07CC60012
and the Remedial Action Contractor Under DOE Contract No. DE-AT30-07CC00014
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Health and Safety Plan

Revision 1

Review and Approval

3-12-09

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3/16/09

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Revision History

Revision No.	Date	Reason/Basis for Revision
0	February 2008	Initial issue.
1	March 2009	Annual update.

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Figures

Tables

Attachment

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos-containing material
ANSI	American National Standards Institute
ATSDR	Agency for Toxic Substances and Disease Registry
CFR	Code of Federal Regulations
CO	carbon monoxide
CRZ/C	Contamination Reduction Zone/Corridor
dBA	decibels 8-hour time-weighted average
DHHS	Department of Health and Human Services
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
GFCI	ground-fault circuit interrupters
H&S	Health and Safety
HAZCOM	hazard communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	Health and Safety Plan
IARC	International Agency for Research on Cancer
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
LEL	lower explosive limit
m^3	cubic meter
µg	microgram
mg	milligram
mph	miles per hour
mrem	millirem
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
OEL	occupational exposure limit
OSHA	Occupational Safety and Health Administration
pCi/g	picocuries per gram
PEL	permissible exposure limit
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
PNOS	particles not otherwise specified
RAC	Remedial Action Contract or Contractor
Ra-226	Radium-226
RBA	radiological buffer area
RCT	Radiological Control Technician
RWP	radiological work permit
STEL	short-term exposure limit
TAC	Technical Assistance Contract or Contractor
TLV	threshold limit value
TWA	time-weighted average
UMTRA	Uranium Mill Tailings Remedial Action

1.0 General Information

1.1 Introduction

This Health and Safety Plan (HASP) has been prepared and issued by the Remediation Action Contractor (RAC) in conjunction with Technical Assistance Contractor (TAC) for the U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project in Moab, Utah. The requirements of Integrated Safety Management (ISM) and those for Worker Safety and Health flow down to the worker via this HASP. ISM is integrated into daily work activities by utilizing its Five Core Functions, which are:

1. Define the scope of work.
2. Identify and analyze hazards associated with the work.
3. Develop and implement hazard controls.
4. Perform work within controls.
5. Provide feedback on adequacy of controls and continue to improve safety management.

By following Integrated Safety Management System (ISMS), the scope of work is defined, hazards identified and analyzed, hazard controls developed for identified hazards associated with the work to be performed, and then work is performed within the established controls. The collection of worker feedback, such as through post job briefs, ensures continuous improvement. The effectiveness of our ISMS is ensured through worker involvement. This involvement is to occur at each stage of the utilization of the Five Core Functions, which are an integral aspect of the Integrated Work Plan (IWP) process. Key to this process is training. Workers are trained to constantly look for ways to improve the process. In short, they are trained to "THINK BEFORE DOING," and to: (1) understand the work; (2) understand the hazards; (3) understand the hazard controls; (4) work within the hazard controls; (5) recommend ways to improve the process; (6) be alert for changing conditions; and (7) raise questions and concerns if the controls seem inadequate.

The ISMS is the high-level program that umbrellas the Worker Safety & Health Program and sets forth the parameters for how the RAC and TAC integrate safety into all project activities. The *Moab UMTRA Project 851 Worker Safety and Health Program Description* (DOE-EM/GJ3002) identifies the procedures that govern Moab UMTRA Project activities, and sets forth the specific criteria that protects the worker and in fact steers the safety elements of this project.

In this HASP, Contractor refers to RAC/TAC Contractor personnel. Personnel position titles are Contractor employees unless otherwise specified.

This HASP identifies hazards and defines health and safety policies and procedures for all site workers (to include subcontractors) performing work under the UMTRA Project contract; and is applicable to all site workers (to include subcontractors), vendors, and visitors. Moab UMTRA Project work locations may include the Moab site, Crescent Junction site, vicinity property sites, off site operations and the Intrepid Potash Plant.

This HASP contains general hazard analysis and control information. Prior to performing work, a task-specific hazard analysis shall be performed and documented in an Integrated Work Plan (IWP). An IWP may contain a Radiological Work Permit (RWP) or other controlling

document(s) as appropriate for the work to be performed and hazards that are present (e.g., a Confined Space Entry Permit for work to occur within a Permit-Required Confined Space). Each worker shall receive a briefing on the applicable documents prior to the start of work. All of these documents are part of an IWP as described below:

The IWP is the work planning document used to integrate ISM into the performance of work associated with the Moab UMTRA Project. The IWP establishes the approved work steps, hazards, hazards controls for performing a work activity and provides for feedback and improvement. The IWP remains active until cancelled by the Operations Manager or for the duration of the task for which it was developed.

The IWP is created, by the IWP Development Team, composed of a cross section of operations and safety personnel assembled by the Operations Manager. The purpose of the IWP Development Team is to ensure that worker input is integrated into the body of the IWP. The IWP Development Team may include supervisors and workers in order to have the level of skill and experience necessary to ensure the successful development of an IWP and safe execution of work.

1.2 Scope of Work

The scope of work at the Moab site is as follows:

- Excavation, preparation, and transportation of mill tailings, radiologically contaminated soils, and debris to the Crescent Junction site.
- Site maintenance and operations.
- Maintenance of access and radiological controls for the uranium mill tailings pile, well field, railroad load-out station, and surrounding areas.
- Development and construction of site infrastructure.
- Initial and interim ground water actions, including operation of a ground water extraction well field, ground water injection system, evaporation pond, sprinkler system, and freshwater application system for selected near shore shallow river areas.
- Characterization and measurement of airborne, soil, and ground water concentrations of radioactive materials and potentially hazardous substances.
- The remediation of the contaminated ground water at the Moab site.
- Administrative activities occurring at the Grand Junction office as performed by DOE, RAC, and TAC personnel in support of the Moab UMTRA Project.
- Off-pile remediation of radiologcally contaminated soils and debris within site boundaries.
- Coordination with other involved agencies and stakeholders.
- Project management.

The scope of work at the Intrepid Potash Plant is as follows:

- Storage of locomotives at the Intrepid Potash Plant.

The scope of work on vicinity properties is as follows:

- Preliminary assessment and activities related to remediation of vicinity properties.
- Removal of radiologically contaminated soils and their transport to the Moab site.

The scope of work at the Crescent Junction site is as follows:

- Disposition of mill tailings, radiologically contaminated soils, and debris from the Moab site.

- Site maintenance and operations.
- Maintenance of access and radiological controls for the site and surrounding areas.
- Development and construction of site infrastructure.
- Characterization efforts, including drilling, seismic, and soil testing.
- Coordination with other involved agencies and stakeholders.
- Project management.
- Off-site activities (i.e., operation of pump system from the Green River and borrow area operations).

1.3 Site Description and History Overview

The Moab site is a former uranium ore-processing facility located about 3 miles northwest of Moab in Grand County, Utah. A site location map is provided as Figure 1.

The Moab site is bordered on the north and west by steep sandstone cliffs. The Colorado River forms the southeastern boundary of the site. U.S. Highway 191 intersects the northern site boundary and State Road 279 intersects the western boundary. Arches National Park is located north of the site across U.S. Highway 191, and Canyonlands National Park is more distantly located to the southwest. The Union Pacific Railroad traverses a small section of the site, just west of State Road 279, prior to entering a tunnel that emerges several miles to the southeast. Moab Wash runs in a southeasterly direction through the center of the site and joins with the Colorado River; this wash is an ephemeral stream that flows only when there is a precipitation event or during snowmelt. The entire site covers approximately 400 acres of land; approximately 130 acres are occupied by the tailings pile. Major site features are shown on Figure 1.

Originally, the property and facility were owned by the Uranium Reduction Company and were regulated by the U.S. Atomic Energy Commission. In 1956, the Uranium Reduction Company began operating the Moab mill. In 1962, the Atlas Minerals Company acquired URC and operated the mill until operations ceased in 1984. From 1956 to 1984, uranium mill tailings were deposited on site in an unlined impoundment. Decommissioning of the mill began in 1988, and an interim cover was placed on the impoundment from 1989 to 1995. In 1996, Atlas proposed to reclaim the tailings pile for permanent disposal in its current location.

The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, Public Law 106–398, stipulated that the license issued by the U.S. Nuclear Regulatory Commission for the materials at the Moab site be terminated and that the title and responsibility for cleanup be transferred to DOE. Title to the site was transferred to DOE on October 25, 2001. Specifically, the DOE Office of Environmental Management in Grand Junction, Colorado, now has primary responsibility for the Moab site. The act further designated that the Moab site undergo remediation in accordance with Title I of the Uranium Mill Tailings Radiation Control Act.

The Crescent Junction site is located north by northeast of the junction of Interstate 70 and U.S. Highway 191 between Crescent Junction, Utah, and Thompson Springs, Utah, in Township 21 South, Range 19 East. A site location map is provided as Figure 2.

DOE is managing the UMTRA Program at the Moab Project sites at Moab and Crescent Junction, Utah. The selected remedy involves moving the existing tailings material from the Moab site to a permanent repository at the Crescent Junction site.

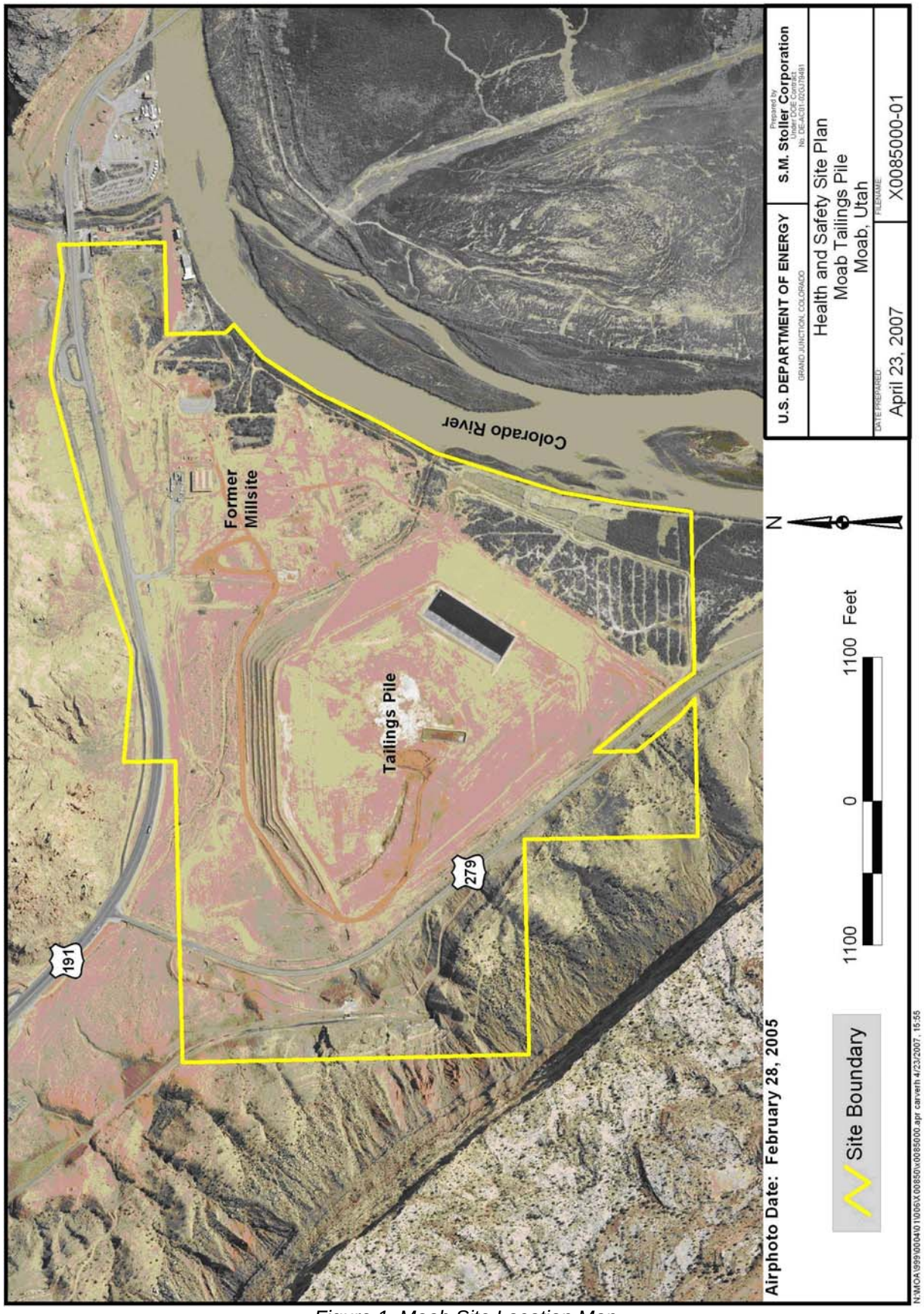

Figure 1. Moab Site Location Map

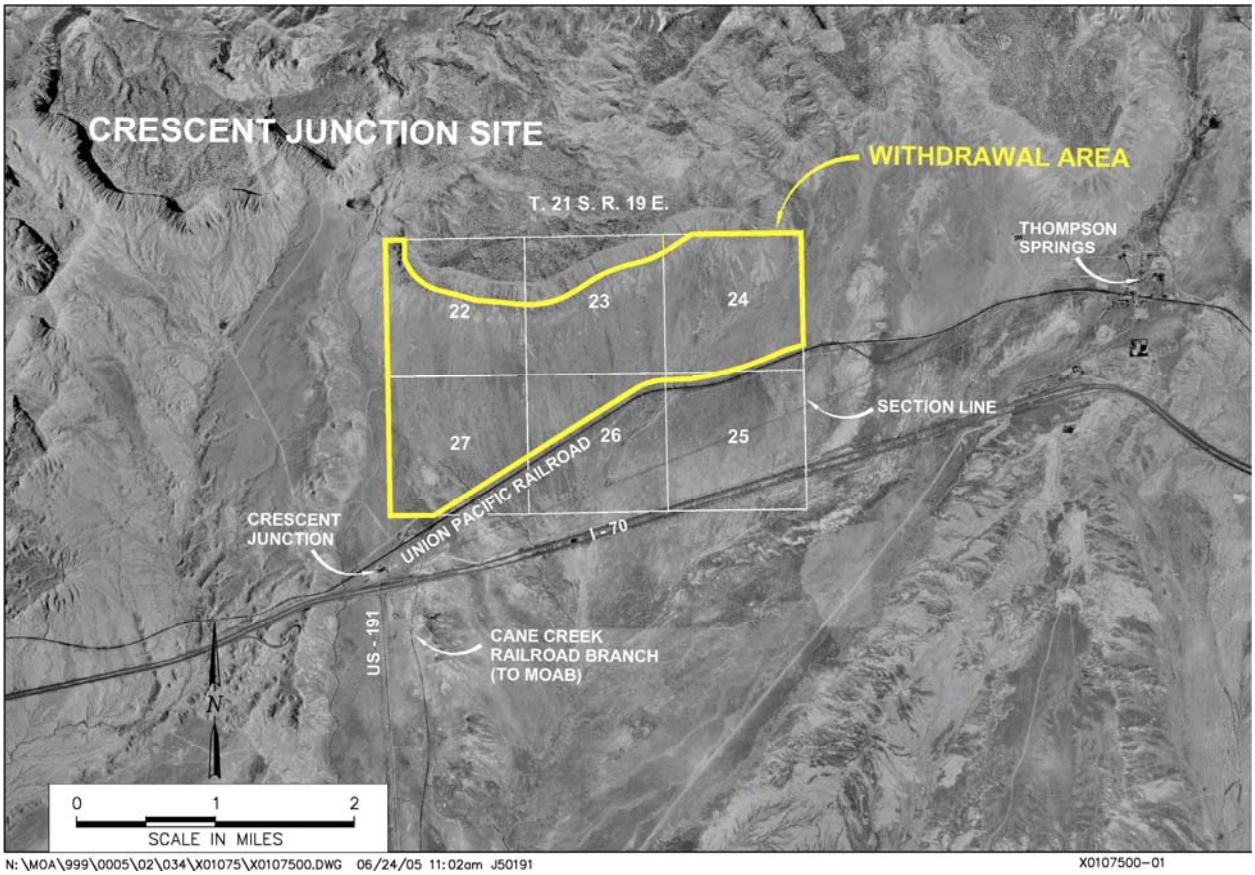

Figure 2. Crescent Junction Site Location Map

1.4 Regulatory Scope

The primary federal regulations governing the health and safety of site workers are:

- 29 *Code of Federal Regulations* (CFR) 1910, "Occupational Safety and Health Standards – General Industry."
- 29 CFR 1926, "Safety and Health Regulations for Construction."
- 10 CFR 835, "Occupational Radiation Protection."
- 10 CFR 851, "Worker Safety and Health Program."

Based on exposure potential, work at the Moab site will also be controlled in accordance with 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER) in areas where radiological contamination levels may exceed 100 picocuries per gram (pCi/g) of radium-226 (Ra-226). At this time, Crescent Junction is not controlled as a 29 CFR 1910.120 site; once residual radioactive material is transported from Moab and placed in the Crescent Junction disposal cell, it will fall under the controls of a 29 CFR 1910.120 site. Work at the Intrepid Potash Plant and at vicinity properties will not be controlled in accordance with 29 CFR 1910.120. The Health and Safety (H&S) Manager is responsible for interpreting regulatory requirements for applicability to all of the sites based on the hazards present.

1.5 Administrative Requirements

1.5.1 H&S Plan Changes

The information in this HASP shall be maintained current with site hazards and conditions. All revisions will be accomplished in accordance with Contractor policies for maintaining controlled documents.

1.5.2 Recordkeeping

Project documentation shall be maintained in accordance with the TAC Records Management Manual.

1.6 Accident Investigation

The Operations Manager, H&S Manager, and/or Project Manager shall be immediately notified of any accident, incident, abnormal event, and near miss that may affect the health and safety of site workers or the general public. Any equipment and/or work site involved in an accident/incident or near miss shall be secured until the Project and H&S Managers have given permission to resume work.

2.0 Key Personnel

2.1 Organizational Structure Key Personnel

The names for personnel critical to site operations are presented in Table 1. Emergency protocols and organizations to be contacted in the event of an emergency are identified in the *Moab UMTRA Project Emergency Response Plan* (DOE-EM/GJ1520).

Table 1. Key Positions

DOE Personnel
Federal Project Director[a]
Facility Representative – Moab
Facility Representative – Crescent Junction
Quality Assurance/H&S Field Manager
Contractor Personnel
Project Manager
Moab Site Manager
Crescent Junction Site Manager
H&S Manager
Radiological Controls Manager
Ground Water Coordinator
Environmental Compliance Lead

[a]The DOE Federal Project Director also acts as the DOE Public Affairs Specialist for the Moab UMTRA Project.

NOTE: For a listing of names and contact numbers associated with the above positions, please see Attachment 1, *Moab UMTRA Project Health and Safety Plan Organizational Structure Key Personnel* (DOE-EM/GJ1789). For a detailed explanation of

organizational structure and roles and responsibilities, see *Moab UMTRA Project Contractor Roles and Responsibilities* (DOE-EM/GJ3000).

2.2 Contractor Organization

2.2.1 Project Manager

The Project Manager has overall Contractor responsibility to implement the contract scope of work. The Project Manager issues the HASP with concurrence from the H&S Manager.

2.2.2 Operations Manager

The Operations Manager is responsible for work performed at the Moab site, Crescent Junction site, Intrepid Potash site, off site operations, and vicinity properties and for providing the resources necessary to perform the work. Specific responsibilities include project scheduling, cost updating, and overall site operations.

2.2.3 Construction Manager

The Construction Manager is responsible for infrastructure development as it relates to mill tailings relocation work, construction performed at the Moab and Crescent Junction sites, and for providing the resources necessary to perform the work. Specific responsibilities include project scheduling, cost updating, and overall site operations.

2.2.4 H&S Manager

The H&S Manager serves the management team by assisting with H&S policy development based on evaluation of DOE, Occupational Safety and Health Administration (OSHA), and other regulatory requirements. The H&S Manager is responsible for ensuring that the Project Manager has the necessary H&S support to effectively implement the HASP.

2.2.5 Ground Water Coordinator

The Ground Water Coordinator works with the Operations Manager to manage ground water activities at the Moab site such as routine monitoring, characterization, and performing immediate and interim actions.

2.2.6 Environmental Compliance

The Environmental Compliance Lead provides information on the regulatory notification requirements to the appropriate project management in the event of a spill or a release of regulated materials and recommends follow-up actions to remain in compliance with applicable regulations. This position is responsible for identification and disposition of regulated materials.

2.2.7 Employee Safety Responsibility

Employees are responsible for their own safety as well as the safety of those around them. Employees shall use all equipment provided in a safe and responsible manner as directed by their supervisors. All personnel shall follow the practices set forth in this HASP.

The keys to working safely and in compliance with 10 CFR 851, "Worker Safety and Health Program" are:

- **Understand the work.** Understand what is to be done, in what order, and what the end result should be.

- **Understand the hazards.** Understand what the hazards of the tasks are and understand any hazards posed by concurrent tasks.
- **Understand the hazard controls.** Understand how the hazards are to be eliminated or controlled while the work is being performed.
- **Work within the hazard controls.** While performing work, rigorously adhere to the hazard controls. Do not cut corners or skimp on safety to get a job done faster.
- **Recommend ways to improve the process.** Please provide feedback when asked and volunteer feedback if you are not asked.
- **Be alert to changing conditions.** By understanding the work, the hazards, and the controls, you can tell if the plans match the reality in the field. You will know if an unanticipated hazard is encountered, if work is not happening according to plan, or if the plan will not work.

2.2.8 Employee Stop Work Procedure

The Employee Stop Work Procedure is as follows:

1. STOP yourself and/or coworker if you see a DANGEROUS SITUATION.
2. PROTECT others and make the condition SAFE.
3. IMMEDIATELY NOTIFY your supervisor or H&S.
4. WAIT for direction from a supervisor.

You have the AUTHORITY and RESPONSIBILITY to STOP DANGEROUS WORK!

3.0 H&S Hazard Analysis

3.1 General Requirements

This section addresses the radiological, chemical, biological, and physical hazards for the Moab Project.

All site workers shall comply with the HASP. An IWP and RWP, if necessary, shall be developed and approved by H&S for each task or work activity. Copies of this HASP, IWPs, RWPs, and any other site-specific addenda shall be maintained on the applicable site.

The IWP is the work planning document to which Moab UMTRA Project work is performed. The IWP establishes the approved work steps, hazards, and hazard controls for performing a work activity. The IWP remains active until cancelled by the Operations Manager or for the duration of the task for which it was developed.

The RWP defines radiological conditions associated with work involving potential exposure to ionizing radiation; it includes controls, personal protective equipment (PPE), and radiological monitoring requirements for the work. The IWP is referenced in the *Moab UMTRA Project Hazard Communication Program* (DOE-EM/GJ1605).

3.2 Hazard Communication Program

The purpose of a hazard communication (HAZCOM) program is to ensure chemical hazards located at a site are communicated to all personnel according to 29 CFR 1910.1200 and 29 CFR 1926.59.

A written HAZCOM program ensures that the hazards of all chemicals produced or imported by chemical manufacturers or importers are evaluated and that information concerning their hazards is transmitted to all potentially affected employers and employees and contains the following information:

- Container Labeling – Personnel shall ensure that all drums and containers are labeled according to contents. These drums and containers shall include those from manufacturers and those produced on site by operations. Manufacturers' labels and warning will serve as the primary labeling system for all containers and will not normally be removed or covered with another label. Worn or damaged labels on manufacturers' containers shall be replaced with labels consistent with 29 CFR 1910.1200. Transfer containers (those without labels that are filled from the manufacturers' containers) that are kept for more than one shift shall be labeled consistent with 29 CFR 1910.1200. As a best management practice, off-specification products (e.g., expired chemicals) and other waste streams shall be clearly labeled to define contents and in accordance with Resource Conservation and Recovery Act requirements.
- Chemical list – a chemical list is maintained that includes any hazardous chemical used or stored on the project site.
- Material Safety Data Sheets (MSDS) – An MSDS shall be located on the site for each hazardous chemical used or known to be on the site. The MSDS location for each site shall be made known to all personnel.
- Employee information and training – Information about project-specific chemical hazards is communicated to employees through an initial site orientation meeting and during subsequent safety briefings. At a minimum, employees shall be instructed on the following:
  - Chemicals and their hazards in the work area.
  - How to prevent exposure to these hazardous chemicals.
  - Procedures to follow if exposed to the chemicals.
  - How to read and interpret labels and MSDS for hazardous substances.
  - Emergency spill procedures.
  - Proper storage and labeling.
  - Procedure for bringing new chemicals on site.

When any new chemical is introduced or discovered on site, employees shall be given information on this material during routine work planning sessions, safety meetings, or immediately if necessary. The chemical list and MSDS are maintained in the H&S main administration office for the site in question.

3.3 Hazard Characterization and Controls

3.3.1 Ionizing Radiation

The focus of the Moab site remedial action is the characterization and stabilization of radioactive material associated with the uranium mill tailings pile. These materials contain several radioactive isotopes in the uranium decay series. Collectively they emit alpha, beta, and gamma

radiation. Hazardous Waste Characterization and Controls and related issues are managed through *Hazardous Waste Site Operations* (ES-SH-PR-304), *Moab UMTRA Project Radiation Protection Plan* (DOE-EM/GJ610), *Moab UMTRA Project Health Physics Plan* (DOE-EM/GJ3003), and *Radiation Safety Policy* (ES-RS-PO-001).

Ionizing radiation hazards from uranium mill tailings result in low hazard to exposed workers. Three primary routes of exposure are inhalation of radioactive materials, ingestion of radioactive materials, and exposure to penetrating radiation.

The RAC will use passive and active engineered controls within the operational and facility design and implement administrative controls, where practical, to ensure that radiation exposures are maintained as low as reasonably achievable and that radioactive material is contained for effective personnel protection.

Radiation exposure to the work force and the public is controlled such that radiation absorbed doses are maintained well below regulatory limits and that there is no radiation exposure without commensurate benefit.

Each individual performing work for the Moab Project around or with radioactive material is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radioactive material.

Line Management (project managers) shall be responsible for:

- Compliance with the requirements of 10 CFR 835 and the content of the site *Moab UMTRA Project Radiation Protection Plan*.
- With the assistance of radiological protection personnel, identification and integration of applicable radiological protection aspects into work planning and execution.
- Notification of the radiological protection organization of physical and/or operational conditions that could result in significant changes in radiological hazards. Notifications initiate radiological protection evaluations and/or modifications to monitoring, posting, PPE, and/or entry controls.

No RAC/TAC employee, DOE employee, subcontractor, or visitor shall take or cause to be taken any action inconsistent with the requirements of the *Moab UMTRA Project Radiation Protection Plan* or any program, plan, schedule, or other process established by 10 CFR 835.

The specific activity of the radioactive materials on the Moab site and vicinity properties is low enough that potential exposure from all pathways is very low. Exposure to penetrating radiation is expected to be below the regulatory threshold for exposure monitoring for occupational workers (100 millirem [mrem] per year). Ingestion is not a significant concern due to the level of controls. Inhalation exposure is possible, but normal dust suppression techniques typically serve to maintain average airborne contamination concentrations below the regulatory value that would require personnel monitoring.

The potential exists for radiation exposure from radon daughters, and this exposure is considered to be occupational. The personal exposure monitoring threshold is 500 mrem per year. Personnel dosimetry requirements are determined by the Radiological Controls Manager.

In the Contamination Area (CA), personnel, equipment, and items may come in contact with soils and other items contaminated with uranium mill tailings and ore from uranium milling operations which may result in the transfer of radioactive contamination. However, controls are required and are implemented to minimize the spread of contamination, and the low concentrations of radioactivity pose no significant radiation exposure hazard to workers.

3.3.2 Noise

The American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) for noise exposure shall be followed. Where noise levels exceed a level of 85 decibels on an 8-hour time-weighted average (dBA) or 140 dBA impact noise level, hearing protection shall be made available to all exposed employees. Sound level surveys shall be conducted by the Contractor on the site with each piece of operable equipment if noise levels are suspected of exceeding the action level. Exposure assessments shall be accomplished for personnel whose exposure may exceed the ACGIH TLV (85 dBA). Site workers shall not be exposed above the TLV without adequate hearing protection. The action and exposure assessment criteria levels shall be adjusted according to the applicable ACGIH TLV for shifts longer than 8 hours. Issues related to occupational noise are covered in *Moab UMTRA Project Hearing Protection and Conservation* (DOE-EM/GJ1617).

3.3.3 Chemical Hazards Associated with Pile Excavation

Various chemical hazards are associated with the excavation of the tailings pile. This section addresses those hazards.

An occupational exposure limit (OEL) is defined as: (1) the concentration or intensity of a substance that is allowable; (2) the time period over which workplace concentrations are averaged; and (3) the allowable level. Some substances may have several OELs (e.g., OEL for 8 hours; OEL for 15 minutes; a not-to-exceed ceiling limit). OELs include regulated limits (e.g., OSHA's Permissible Exposure Limits [PELs] and Short-Term Exposure Limits [STEL]) and recommended limits (e.g., TLVs published by the American Conference of Governmental Industrial Hygienists [ACGIH]). In compliance with 10 CFR 851, the Moab UMTRA Project shall utilize the lower (more protective) of the two aforementioned limits to assess and control occupational exposures.

Additionally, the potential to encounter unknown chemical hazards within or around the tailings pile exist. Any unusual or discolored and/or odorous soils shall be reported to the Site Manager and H&S immediately upon discovery. In the case of such an event, stay upwind and out of the affected area until determination is made as to the need for and/or how to control exposure to the hazard. Environmental compliance management of hazardous wastes during excavation of the tailings is covered in *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633).

3.3.3.1 Carbon Monoxide from Internal Combustion Engines

Internal combustion engines, particularly gasoline-powered engines, produce carbon monoxide, which could produce hazardous concentrates. Any operation of such equipment inside areas of poor ventilation (i.e., interior of buildings, trenches) requires adequate ventilation to ensure a safe environment. Such operations shall be addressed on the applicable IWP and brought to the attention of H&S. Air monitoring and respiratory protection may be required.

3.3.3.2 Silica Quartz in Mill Tailings and Soil

Silica quartz is present in significant levels in concrete blocks, in mill tailings, and at lower concentrations in soil. Silica poses a hazard for such tasks as: cutting and jack hammering concrete; well or core drilling; moving, blading, or compacting mill tailings; and backfilling with clean soil. Sandstone composition in this region ranges from 30 to 60 percent silica quartz. With this high percentage of silica quartz in the surrounding environment and when blowing dust clouds are readily visible, silica monitoring on similar past projects have shown silica quartz in the air to be about half of the ACGIH TLV (0.25 mg/m^3, respirable fraction). Work activities that generate silica-containing dust shall require dust suppression, such as watering. If such suppression techniques are not feasible, air monitoring and respiratory protection may be required.

3.3.3.3 Hazardous Waste

Various types of waste containing hazardous components may be generated at all sites. All waste shall be managed in accordance with the *Moab UMTRA Project Waste Management Plan*. Waste storage locations shall be clearly established, waste containers shall be properly labeled, and routine inspections shall be performed and documented. Personnel who handle waste shall receive applicable training.

3.3.3.4 Metal Contaminants Found in Mill Tailings

Due to the nature of the milling process, various metal contaminants at various concentrations exist within the tailings pile. This section identifies those metals and the hazards they present. Control of exposure will occur primarily through dust suppression efforts. When conditions dictate (e.g., dust can't be controlled, action levels for exposure limits are reached), additional monitoring and respiratory protection may be required.

Antimony

Antimony is a silvery-white metal that is naturally occurring in the earth's crust. Antimony is found in mill tailings in very low concentrations.

Samples taken of the mill tailings pile at the site have an average antimony concentration of 20 parts per billion (ppb). Inhalation exposures from mill tailings dust containing this concentration of antimony, when controlled to the exposure limits for Particles Not Otherwise Specified (PNOS) of 10 mg/m^3, inhalable particles would not result in a measurable breathing zone exposure to antimony.

According to the Agency for Toxic Substances and Disease Registry (ATSDR), exposure to 9 milligrams (mg) of antimony per cubic meter (m^3) of air for a long time can irritate the eyes, skin, and lungs. Breathing 2 mg/m^3 of antimony for a long time can cause problems with the lungs (pneumoconiosis), heart problems (altered electrocardiograms), stomach pain, diarrhea, vomiting, and stomach ulcers. People who drank over 19 parts per million (ppm) of antimony vomited. It is not known what other health effects would occur to people who swallow antimony. It is not known if antimony can cause cancer or birth defects or affect reproduction in humans.

Antimony can have beneficial effects when used for medical reasons. It has been used as a medicine to treat people infected with parasites. Persons who have had too much of this medicine or who were sensitive to it when it was injected into their blood or muscle have experienced

adverse health effects. These health effects include diarrhea, joint and/or muscle pain, vomiting, problems with the blood (anemia) and heart problems (altered electrocardiograms).

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the Environmental Protection Agency (EPA) have not classified antimony as to its human carcinogenicity. Lung cancer has been observed in some studies of rats that breathed high levels of antimony. No human studies are available. It is not known if antimony causes cancer in people.

The OSHA permissible exposure limit (PEL) for antimony is 0.5 mg/m^3 of air for 8-hour workdays, 40-hour workweeks.

The ACGIH and National Institutes of Occupational Safety and Health (NIOSH) currently recommend the same guidelines for the workplace as OSHA.

Inorganic Arsenic

Arsenic is a naturally occurring element that is widely distributed in the earth's crust. Arsenic is chemically classified as a metalloid, having properties of both a metal and a nonmetal; however, it is frequently referred to as a metal. Elemental arsenic (sometimes referred to as metallic arsenic) is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic.

Most inorganic and organic arsenic compounds are white or colorless powders that do not evaporate. They have no smell, and most have no special taste.

Samples taken of the mill tailings pile at the site have an average arsenic concentration of 4.64 ppm. Inhalation exposures from mill tailings dust containing this concentration of arsenic, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 0.1 microgram (µg) of arsenic per m^3 or about 1.5 percent of the OSHA PEL for inhalable inorganic arsenic.

According to the ATSDR, inorganic arsenic has been recognized as a human poison since ancient times, and large oral doses (above 60,000 ppb in water which is 10,000 times higher than 80 percent of U.S. drinking water arsenic levels) can result in death. If one breathes high levels of inorganic arsenic, then one is likely to experience a sore throat and irritated lungs. One may also develop some of the skin effects, including patches of darkened skin and the appearance of small corns or warts on the palms, soles, and torso; these are often associated with changes in the blood vessels of the skin. Skin cancer may also develop.

The exposure level that produces these effects is uncertain but it is probably above 100 $\mu g/m^3$ for a brief exposure. Longer exposure at lower concentrations can lead to skin effects and also to circulatory and peripheral nervous disorders. There are some data suggesting that inhalation of inorganic arsenic may also interfere with normal fetal development, although this is not certain. An important concern is the ability of inhaled inorganic arsenic to increase the risk of lung cancer. This has been seen mostly in workers exposed to arsenic at smelters, mines, and chemical factories, but also in residents living near smelters and arsenical chemical factories.

The OSHA PEL for inorganic arsenic is 10 μg/m^3 for 8-hour workdays, 40-hour workweeks.

The ACGIH TLV for inorganic arsenic is the same as the OSHA PEL at 0.01 mg/m^3 for 8-hour workdays, 40-hour work weeks.

Barium

Barium is a silvery-white metal that takes on a silver-yellow color when exposed to air. Barium occurs in nature in many different forms called compounds. These compounds are solids, existing as powders or crystals, and they do not burn well. Two forms of barium, barium sulfate and barium carbonate, are often found in nature as underground ore deposits.

Samples taken of the mill tailings pile at the site have an average barium concentration of 164 ppm. Inhalation exposures from mill tailings dust containing this concentration of barium, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 2.7 μg/m^3 or less than 1 percent of the OSHA PEL for barium compounds.

According to the ATSDR, the health effects information of the different barium compounds is limited to ingestion and depends on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful. Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time.

The OSHA PEL for barium compounds is set at 0.5 mg/m³ of soluble barium compounds for 8-hour workdays, 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m³ of total dust and 5 mg/m³ for respirable fraction.

The ACGIH 2005 TLV for barium and its soluble compounds is the same as the OSHA PEL set at 0.5 mg/m³ for 8-hour workdays, 40-hour workweeks. The ACGIH 2005 TLV for barium sulfate is more protective than the OSHA PEL at 10 mg/m³ for 8-hour workdays, 40-hour work weeks.

The NIOSH has set Recommended Exposure Limits (RELs) of 0.5 mg/m^3 for soluble barium compounds, 10 mg/m^3 (total dust) for barium sulfate, and 5 mg/m^3 (respirable fraction) for barium sulfate for 8-hour workdays, 40-hour work weeks.

Cadmium

Cadmium is a metal found in the earth's crust and is associated with zinc, lead, and copper ores. Pure cadmium is a soft, silver-white metal. Cadmium chloride and cadmium sulfate are soluble in water.

Samples taken of the mill tailings pile at the site have an average cadmium concentration of 0.23 ppm. Inhalation exposures from mill tailings dust containing this concentration of cadmium, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in a measurable breathing zone exposure to cadmium.

According to the ATSDR, breathing air with very high levels of cadmium can severely damage the lungs and may cause death. Breathing air with lower levels of cadmium over long periods of

time (for years) results in a build-up of cadmium in the kidneys and, if sufficiently high, may result in kidney disease.

Lung cancer has been found in some studies of workers exposed to cadmium in the air and studies of rats that breathed in cadmium. DHHS has determined that cadmium and cadmium compounds are known human carcinogens. IARC has determined that cadmium is carcinogenic to humans. The EPA has determined that cadmium is a probable human carcinogen.

OSHA has set the cadmium PEL at 5 $\mu g/m^3$ for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is less protective than the OSHA PEL for cadmium and compounds at 0.01 mg/m^3, but the ACGIH has also set a respirable fraction TLV at 0.002 mg/m^3 for 8-hour workdays, 40-hour work weeks.

Chromium

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. The three main forms of chromium are chromium (0), chromium (III), and chromium (VI). Small amounts of chromium (III) are considered to be a necessity for human health.

Samples taken of the mill tailings pile at the site have an average chromium concentration of 9.3 ppm. Inhalation exposures from mill tailings dust containing this concentration of chromium, when controlled to the exposure limits for PNOC (10 mg/m^3), would result in a breathing zone exposure of 0.13 $\mu g/m^3$ or 1.2 percent of the OSHA PEL for chromium (VI) compounds.

According to the ATSDR, Chromium (VI) compounds are more toxic than chromium (III) compounds. The most common health problem in workers exposed to chromium involves the respiratory tract. These health effects include irritation of the lining of the nose, runny nose, and breathing problems (asthma, cough, shortness of breath, wheezing). Workers have also developed allergies to chromium compounds, which can cause breathing difficulties and skin rashes.

The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium (VI) compared to chromium (III).

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium (VI).

IARC has determined that chromium (VI) compounds are carcinogenic to humans. The National Toxicology Program 11th Report on Carcinogens classifies chromium (VI) compounds as known to be human carcinogens. In workers, inhalation of chromium (VI) has been shown to cause lung cancer. An increase in stomach tumors was observed in humans exposed to chromium (VI) in drinking water. In laboratory animals, chromium (VI) compounds have been shown to cause tumors to the stomach, intestinal tract, and lungs.

The OSHA PEL is set at 5 $\mu g/m^3$ chromium (VI), 0.5 mg/m^3 chromium (III) and 1.0 mg/m^3 chromium (0) for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV for chromium metal and chromium III compounds is more protective than the OSHA PEL at 0.5 mg/m³, for Water-soluble chromium VI compounds it is 0.05 mg/m³, and for insoluble chromium VI compounds 0.01 mg/m³, for 8-hour workdays, 40-hour work weeks.

Cobalt

Cobalt is a naturally occurring element that has properties similar to those of iron and nickel. Samples taken of the mill tailings pile at the site have an average cobalt concentration of 3.43 ppm. Inhalation exposures from mill tailings dust containing this concentration of cobalt, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in a measurable breathing zone exposure to cobalt.

According to the ATSDR, cobalt has both beneficial and harmful effects on human health. Cobalt is beneficial for humans because it is part of vitamin B12, which is essential to maintain human health. Cobalt (0.16–1.0 mg cobalt/kg of body weight) has also been used as a treatment for anemia (less than normal number of red blood cells), including in pregnant women, because it causes red blood cells to be produced. Cobalt also increases red blood cell production in healthy people, but only at very high exposure levels. Cobalt is also essential for the health of various animals, such as cattle and sheep. Exposure of humans and animals to levels of cobalt normally found in the environment is not harmful.

When too much cobalt is taken into the body, however, harmful health effects can occur. Workers who breathed air containing 0.038 mg/m^3 (about 100,000 times the concentration normally found in ambient air) for 6 hours had trouble breathing. Serious effects on the lungs, including asthma, pneumonia, and wheezing, have been found in people exposed to 0.005 mg/m^3 while working with hard metal, a cobalt-tungsten carbide alloy. People exposed to 0.007 mg/m^3 at work have also developed allergies to cobalt that resulted in asthma and skin rashes.

OSHA has set a PEL of 0.1 mg/m^3 cobalt (metal, dust, and fume) for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is more protective than the OSHA PEL for cobalt and inorganic compounds at 0.02 mg/m³ for 8-hour workdays, 40-hour work weeks.

Copper

Copper is a reddish metal that occurs naturally in rock, soil, water, sediment, and, at low levels, in air. Its average concentration in the earth's crust is about 50 ppm. Copper also occurs naturally in all plants and animals. It is an essential element for all known living organisms, including humans and other animals, at low levels of intake. At much higher levels, toxic effects can occur.

Samples taken of the mill tailings pile at the site have an average copper concentration of 38 ppm. Inhalation exposures from mill tailings dust containing this concentration of copper, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 1.75 µg/m^3 or 0.2 percent of the OSHA PEL.

According to the ATSDR, copper is essential for good health. However, exposure to higher doses can be harmful. Long-term exposure to copper dust can irritate the nose, mouth, and eyes

and can cause headaches, dizziness, nausea, and diarrhea. Intentionally high intakes of copper can cause liver and kidney damage and even death. It is not known if copper can cause cancer in humans. The EPA does not classify copper as a human carcinogen, because there are no adequate human or animal cancer studies.

OSHA has set a PEL of 0.1 mg/m^3 for copper fumes (vapor generated from heating copper) and 1.0 mg/m^3 for copper dust (fine metallic copper particles) and mist (aerosols of soluble copper) in workroom air to protect workers during 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV for copper fume is 0.2 mg/m^3. The ACGIH 2005 TLV for copper dust and mist is the same as the OSHA PEL at 1 mg/m^3 for 8-hour workdays, 40-hour work weeks.

Lead

Lead is a heavy, low melting, bluish-gray metal that occurs naturally in the earth's crust. However, it is rarely found naturally as a metal. It is usually found combined with two or more other elements to form lead compounds.

Metallic lead is resistant to corrosion (i.e., not easily attacked by air or water). When exposed to air or water, thin films of lead compounds are formed that protect the metal from further attack.

Most lead used by industry comes from mined ores ("primary") or from recycled scrap metal or batteries ("secondary"). Lead is mined in the United States, primarily in Alaska and Missouri. However, most lead today is "secondary" lead obtained from lead acid batteries. It is reported that 97 percent of these batteries are recycled.

Materials and components containing lead may be present on any of the sites and shall be managed following *Moab UMTRA Project Occupational Lead Exposure Management* (DOE-EM/GJ1618) in accordance with 29 CFR 1910.125 and 29 CFR 1926. 62. All suspect and known lead materials shall be brought to the attention of H&S. Personnel who handle lead shall receive training and proper PPE shall be worn.

Samples taken of the mill tailings pile at the site have an average lead concentration of 11 ppm. Inhalation exposures from mill tailings dust containing this concentration of lead, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 0.31 μg/m^3 or 0.6 percent of the OSHA PEL.

According to the ATSDR, the effects of lead are the same whether it enters the body through breathing or swallowing. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults to lead at work has resulted in decreased performance in some tests that measure functions of the nervous system. Lead exposure may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people. Lead exposure may also cause anemia. At high levels of exposure, lead can severely damage the brain and kidneys in adults or children and can ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

There is no conclusive proof that lead causes cancer (is carcinogenic) in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. DHHS has determined that lead and lead compounds are reasonably anticipated to be human carcinogens based on limited evidence from studies in humans and sufficient evidence from animal studies, and the EPA has determined that lead is a probable human carcinogen. IARC has determined that inorganic lead is probably carcinogenic to humans. IARC determined that organic lead compounds are not classifiable as to their carcinogenicity in humans based on inadequate evidence from studies in humans and in animals.

OSHA has set the PEL for lead at 50 $\mu g/m^3$ for 8-hour workdays, 40-hour work weeks. If a worker has a blood lead level of 50 µg per deciliter or higher, then OSHA requires that the worker be removed from the workroom where lead exposure is occurring.

The ACGIH 2005 TLV is the same as the OSHA PEL for lead and inorganic compounds at 0.05 mg/m^3 for 8-hour workdays, 40-hour work weeks.

Manganese

Manganese is a naturally occurring substance found in many types of rocks and soil. Pure manganese is a silver-colored metal; however, it does not occur in the environment as a pure metal. Rather, it occurs combined with other substances such as oxygen, sulfur, and chlorine. Manganese is a trace element and is necessary for good health.

Samples taken of the mill tailings pile at the site have an average manganese concentration of 309 ppm. Inhalation exposures from mill tailings dust containing this concentration of manganese, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 31 $\mu g/m^3$ or 0.6 percent of the OSHA PEL.

According to the ATSDR, the most common health problems in workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as “manganism.” Other less severe nervous system effects, such as slowed hand movements, have been observed in some workers exposed to lower concentrations in the work place. The inhalation of a large quantity of dust or fumes containing manganese may cause irritation of the lungs which could lead to pneumonia. Loss of sex drive and sperm damage have also been observed in men exposed to high levels of manganese in workplace air. The manganese concentrations that cause effects such as slowed hand movements in some workers are approximately 20,000 times higher than the concentrations normally found in the environment. Manganism has been found in some workers exposed to manganese concentrations about a million times higher than normal air concentrations of manganese.

The EPA concluded that existing scientific information cannot determine whether excess manganese can cause cancer.

OSHA set a PEL of 5 mg/m^3 (ceiling) manganese in air for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is more protective for manganese and its inorganic compounds at 0.2 mg/m³ for 8-hour workdays, 40-hour work weeks.

Mercury

Mercury occurs naturally in the environment and exists in several forms. These forms can be organized under three headings: metallic mercury (also known as elemental mercury); inorganic mercury; and organic mercury. Most of the mercury found in the environment is in the form of metallic mercury and inorganic mercury compounds.

Inorganic mercury compounds occur when mercury combines with elements such as chlorine, sulfur, or oxygen. These mercury compounds are also called mercury salts. Most inorganic mercury compounds are white powders or crystals, except for mercuric sulfide (also known as cinnabar) which is red and turns black after exposure to light.

Samples taken of the mill tailings pile at the site have an average inorganic mercury concentration of 30 ppb. Inhalation exposures from mill tailings dust containing this concentration of mercury, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in measurable breathing zone exposures.

According to the ATSDR, the nervous system is very sensitive to mercury. Permanent damage to the brain has been shown to occur from exposure to sufficiently high levels of metallic mercury. Whether exposure to inorganic mercury results in brain or nerve damage is not as certain, since it does not easily pass from the blood into the brain.

Metallic mercury vapors or organic mercury may affect many different areas of the brain and their associated functions, resulting in a variety of symptoms. These include personality changes (irritability, shyness, nervousness), tremors, changes in vision (constriction or narrowing of the visual field), deafness, muscle incoordination, loss of sensation, and difficulties with memory.

Different forms of mercury have different effects on the nervous system, because they do not all move through the body in the same way. When metallic mercury vapors are inhaled, they readily enter the bloodstream and are carried throughout the body and can move into the brain. Inorganic mercury salts, such as mercuric chloride, do not enter the brain as readily as methylmercury or metallic mercury vapor.

The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues and thus more damage. All forms of mercury can cause kidney damage if large enough amounts enter the body. If the damage caused by the mercury is not too great, the kidneys are likely to recover once the body clears itself of the contamination.

In addition to effects on the kidneys, inorganic mercury can damage the stomach and intestines, producing symptoms of nausea, diarrhea, or severe ulcers if swallowed in large amounts. There is little information on the effects in humans from long-term, low-level exposure to inorganic mercury.

OSHA has set the PEL for mercury at 0.1 mg/m^3 mercury as a ceiling limit. NIOSH has set the REL at 0.05 mg/m^3 during a 10-hour workday.

The ACGIH 2005 TLV is more protective for elemental and inorganic mercury at 0.025 mg/m³ for 8-hour workdays, 40-hour work weeks.

Nickel

Nickel combined with other elements occurs naturally in the earth's crust. It is found in all soil and is also emitted from volcanoes. Nickel is the 24th most abundant element. In the environment, it is primarily found combined with oxygen or sulfur as oxides or sulfides. Nickel is also found in meteorites and on the ocean floor in lumps of minerals called sea floor nodules. The earth's core is composed of 6 percent nickel. Nickel is released into the atmosphere during nickel mining and by industries that make or use nickel, nickel alloys, or nickel compounds. These industries also might discharge nickel in waste water. Nickel is also released into the atmosphere by oil-burning power plants, coal-burning power plants, and trash incinerators.

Samples taken of the mill tailings pile at the site have an average nickel concentration of 6 ppm. Inhalation exposures from mill tailings dust containing this concentration of manganese, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in measurable breathing zone exposures.

According to the ATSDR, the most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10 to 20 percent of the population is sensitive to nickel. A person can become sensitive to nickel when jewelry or other items containing nickel are in direct and prolonged contact with the skin. Wearing jewelry containing nickel in ears or other body parts that have been newly pierced may also sensitize a person to nickel. However, not all jewelry containing nickel releases enough of the nickel ion to sensitize a person. Once a person is sensitized to nickel, further contact with the metal may produce a reaction. The most common reaction is a skin rash at the site of contact. In some sensitized people, dermatitis (a type of skin rash) may develop in an area of the skin that is away from the site of contact. For example, hand eczema (another type of skin rash) is fairly common among people sensitized to nickel.

Some workers exposed to nickel by inhalation can become sensitized and have asthma attacks, but this is rare. People who are sensitive to nickel have reactions when nickel comes into prolonged contact with the skin. Some sensitized individuals react when they eat nickel in food or water or breathe dust containing nickel. More women are sensitive to nickel than men. This difference between men and women is thought to be a result of greater exposure of women to nickel through jewelry and other metal items.

People who are not sensitive to nickel must eat very large amounts of nickel to suffer harmful health effects. Workers who accidentally drank light-green water containing 250 ppm of nickel from a contaminated drinking fountain had stomach aches and suffered adverse effects in their blood (increased red blood cells) and kidneys (increased protein in the urine). This concentration of nickel is more than 100,000 times greater than the amount usually found in drinking water.

The most serious harmful health effects from exposure to nickel, such as chronic bronchitis, reduced lung function, and cancer of the lung and nasal sinus, have occurred in people who have breathed dust containing certain nickel compounds while working in nickel refineries or nickel processing plants. The levels of nickel in these workplaces were much higher than usual (background) levels in the environment. Lung and nasal sinus cancers occurred in workers who

were exposed to more than 10 mg/m^3 as nickel compounds that were hard to dissolve (such as nickel subsulfide).

DHHS has determined that nickel metal may reasonably be anticipated to be a carcinogen, and nickel compounds are known human carcinogens. IARC has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide are human carcinogens. These cancer classifications were based on studies of nickel workers and laboratory animals.

OSHA has set the PEL for nickel metal and its insoluble and soluble compounds at 1.0 mg/m^3 for 8-hour workdays, 40-hour workweek.

The ACGIH 2005 TLV for elemental nickel is less protective than the OSHA PEL at 1.5 mg/m³. For insoluble inorganic compounds the TLV is more protective at 0.2 mg/m³; and for soluble inorganic compounds the TLV is more protective at 0.1 mg/m³ for 8-hour workdays, 40-hour work weeks.

Selenium

Selenium is a naturally occurring, solid substance that is widely but unevenly distributed in the earth's crust. It is also commonly found in rocks and soil. Selenium, in its pure form of metallic gray to black crystals, is often referred to as elemental selenium or selenium dust. Selenium is not often found in the environment in its elemental form, but is usually combined with other substances. Much of the selenium in rocks is combined with sulfide minerals or with silver, copper, lead, and nickel minerals. Selenium also combines with oxygen to form several substances that are white or colorless crystals. Some selenium compounds are gases. Selenium is also used to prepare drugs and as a nutritional feed supplement for poultry and livestock.

Samples taken of the mill tailings pile at the site have an average selenium concentration of 1.7 ppm. Inhalation exposures from mill tailings dust containing this concentration of manganese, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in measurable breathing zone exposures.

According to the ATSDR, dizziness, fatigue, and irritation of mucous membranes have been reported in people exposed to selenium in workplace air at concentrations higher than legal levels. In extreme cases, collection of fluid in the lungs (pulmonary edema) and severe bronchitis have been reported. The exact exposure levels at which these effects might occur are not known, but they become more likely with increasing amounts of selenium and with increasing frequency of exposure.

Upon contact with human skin, industrial selenium compounds have been reported to cause rashes, redness, heat, swelling, and pain. Brief, acute exposure of the eyes to selenium dioxide as a dust or fume in workplace air may result in burning, irritation, and tearing. However, only people who work in industries that process or use selenium or selenium compounds are likely to come into contact with levels high enough to cause eye irritation.

Studies of laboratory animals and people show that most selenium compounds probably do not cause cancer. In fact, some studies of cancer in humans suggest that lower-than-normal selenium

levels in the diet might increase the risk of cancer. Other studies suggest that dietary levels of selenium that are higher than normal might reduce the risk of cancer in humans. However, taking selenium so that the daily amount is greater than that required might just increase the risk of selenium poisoning.

Based on studies done until 1987, IARC determined that selenium and selenium compounds could not be classified as to their ability to cause cancer in humans. However, since then, the EPA has determined that one specific form of selenium, called selenium sulfide, is a probable human carcinogen.

OSHA sets a PEL of 0.2 mg/m^3 selenium for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is the same as the OSHA PEL for selenium and its compounds at 0.2 mg/m^3 for 8-hour workdays, 40-hour work weeks.

Thallium

Pure thallium is a soft, bluish-white metal that is widely distributed in trace amounts in the earth's crust. In its pure form, it is odorless and tasteless. It can be found in pure form or mixed with other metals in the form of alloys. It can also be found combined with other substances such as bromine, chlorine, fluorine, and iodine to form salts. These combinations may appear colorless to white or yellow. Thallium remains in the environment since it is a metal and cannot be broken down to simpler substances.

Samples taken of the mill tailings pile at the site have an average thallium concentration of 60 ppb. Inhalation exposures from mill tailings dust containing this concentration of thallium, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in measurable breathing zone exposures.

According to the ATSDR, thallium can affect the nervous system, lung, heart, liver, and kidneys if large amounts are eaten or drunk for short periods of time. Temporary hair loss, vomiting, and diarrhea can also occur, and death may result after exposure to large amounts of thallium for short periods. Thallium can be fatal from a dose as low as 1 gram. No information is known on health effects in humans after exposure to smaller amounts of thallium for longer periods. As in humans, animal studies indicate that exposure to large amounts of thallium for brief periods of time can damage the nervous system and heart and can cause death. Animal reproductive organs, especially the testes, are damaged after drinking small amounts of thallium contaminated water for 2 months. These effects have not been seen in humans.

No studies were found on whether thallium can cause cancer in humans or animals.

OSHA has set the PEL at 0.1 mg/m^3 for thallium for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is the same as the OSHA PEL for thallium and its soluble compounds at 0.1 mg/m^3 for 8-hour workdays, 40-hour work weeks (which is the same as the OSHA PEL).

NIOSH has recommended that 15 mg/m^3 of thallium be considered immediately dangerous to life and health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Uranium
Uranium is a natural and commonly occurring radioactive element. It is found in very small amounts in nature in the form of minerals, but may be processed into a silver-colored metal. Rocks, soil, surface and underground water, air, and plants and animals all contain varying amounts of uranium. After the uranium is extracted, it is converted into uranium dioxide or other chemical forms by a series of chemical processes known as milling. The residue remaining after the uranium has been extracted is called mill tailings. Mill tailings contain a small amount of uranium, as well as other naturally radioactive waste products such as radium and thorium.

Samples taken of the mill tailings pile at the site have an average uranium concentration of 64 ppm. Inhalation exposures from mill tailings dust containing this concentration of uranium, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 17 $\mu g/m^3$ or 33 percent of the OSHA PEL.

According to the ASTDR, a few people have developed signs of kidney disease after intake of large amounts of uranium. Animals have also developed kidney disease after they have been treated with large amounts of uranium, so it is possible that intake of a large amount of uranium might damage the kidneys. There is also a chance of getting cancer from any radioactive material like uranium. Natural and depleted uranium are only weakly radioactive and are not likely to cause cancer from their radiation. No human cancer of any type has ever been seen as a result of exposure to natural or depleted uranium.

It is not known if exposure to uranium causes reproductive effects in people. Very high doses of uranium have caused reproductive problems (reduced sperm counts) in some experiments with laboratory animals. Most studies show no effects.

OSHA has set the PEL at 0.05 mg/m^3 for soluble uranium compounds and 0.25 mg/m^3 for insoluble uranium for 8-hour workdays, 40-hour work weeks.

The ACGIH TLVs is less protective than the OSHA PEL for soluble uranium compounds and only slightly more protective for insoluble uranium compounds at 0.2 mg/m^3. The ACGIH 2005 TLV also has a less protective 0.6 mg/m^3 STEL (200 $\mu g/m^3$) for both soluble and insoluble uranium compounds for 8-hour workdays, 40-hour work weeks.

Vanadium
Vanadium is a natural element in the earth. It is a white to gray metal, often found as crystals. It has no particular odor. Vanadium occurs naturally in fuel oils and coal. In the environment it is usually combined with other elements such as oxygen, sodium, sulfur, or chloride. The forms of vanadium most likely to be found at waste sites are not well known. Vanadium does not dissolve well in water, but it can be carried by water, much as particles of sand might be carried.

Samples taken of the mill tailings pile at the site have an average vanadium concentration of 250 ppm. Inhalation exposures from mill tailings dust containing this concentration of vanadium, when controlled to the exposure limits for PNOS (10 mg/m^3), would result in a breathing zone exposure of 13 $\mu g/m^3$ or 2.7 percent of the OSHA PEL.

According to the ASTDR, breathing large amounts of vanadium dust for short or long periods will cause irritation that causes coughing, sore throat, and red, irritated eyes. These effects stop

soon after breathing it. People who breathed 0.1 mg of vanadium per m^3 of air for 8 hours coughed for about 1 week and had irritated eyes.

No studies designed to look for cancer in laboratory animals exposed to vanadium were found.

OSHA has set a PEL of 0.05 mg/m^3 (ceiling) for vanadium pentoxide dust and 0.1 mg/m^3 (ceiling) for vanadium pentoxide fumes in workplace air for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is more protective than the OSHA PEL at 0.05 mg/m^3 (respirable fraction) for vanadium pentoxide dust or fume for 8-hour workdays, 40-hour work weeks.

The NIOSH IDLH REL is set at 35 mg/m^3 of vanadium. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Zinc

Zinc is one of the most common elements in the earth's crust. Zinc is found in the air, soil, and water and is present in all foods. In its pure elemental (or metallic) form, zinc is a bluish-white, shiny metal.

Zinc can also combine with other elements, such as chlorine, oxygen, and sulfur, to form zinc compounds. Zinc compounds that may be found at hazardous waste sites are zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Most zinc ore found naturally in the environment is in the form of zinc sulfide. Zinc compounds are used by the drug industry as ingredients in some common products, such as vitamin supplements, sun blocks, diaper rash ointments, deodorants, athlete's foot preparations, acne and poison ivy preparations, and antidandruff shampoos.

Samples taken of the mill tailings pile at the site have an average zinc concentration of 30 ppm. Inhalation exposures from mill tailings dust containing this concentration of zinc, when controlled to the exposure limits for PNOS (10 mg/m^3), would not result in measurable breathing zone exposures.

According to the ASTDR, inhaling large amounts of zinc (as zinc dust or fumes from smelting or welding) can cause a specific short-term disease called metal fume fever, which is generally reversible once exposure to zinc ceases. However, very little is known about the long-term effects of breathing zinc dust or fumes.

DHHS and IARC have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

OSHA has set a PEL of 15 mg/m^3 for zinc oxide total dust and 5 mg/m^3 zinc oxide respirable fraction for 8-hour workdays, 40-hour work weeks.

The ACGIH 2005 TLV is more protective than the OSHA PEL at 2 mg/m^3 (respirable fraction) and a STEL at 10 mg/m^3 (respirable fraction) for zinc oxide for 8-hour workdays, 40-hour work weeks.

Table 2 identifies the soil concentrations of those metals of concern at the Moab site and their estimated inhalable concentration as based upon the applicable PNOC value.

A Baseline Breathing Zone Exposure Assessment will be conducted for all metals listed below in Table 2, because they were determined to be present, and workers will be protected for any exceeding 10 percent of the TLV at the 99 percent confidence level.

Asbestos

Various types of asbestos-containing material (ACM) may be encountered at any of the project sites and shall be managed in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101, "Asbestos." If asbestos is suspected, work shall be suspended and the H&S Manager or appropriate member of the H&S Staff at the Moab Project shall be contacted to perform an inspection and coordinate sampling, if necessary. All known ACM shall be conspicuously marked and site workers shall be briefed if they are going to work in the vicinity of ACM.

3.3.4 Biological

The following biological hazards could be encountered; although such encounters are not likely to occur. In the event that either should occur, personnel shall notify their supervisor immediately.

Animal and spider bites and insect stings can cause localized swelling, itching, and minor pain that can be handled by first aid treatment. It should be noted that this geographical part of the country is inhabited by black widow spiders, brown recluse spiders, and scorpions, all of which can result in a much more serious injury or toxic reaction, necessitating immediate evacuation to the nearest hospital. In sensitized individuals, bites or stings from less toxic insects can result in serious allergic reactions requiring immediate medical attention as well. No attempts should be made to capture any wild or semiwild animals, such as cats or rats, because of the possibility of a bite or parasitic infestation.

Poisonous snakes are rarely encountered, although several species of small rattlesnakes are known to inhabit the area. To care for someone bitten by a venomous snake, the wound should be immediately washed, immobilized, and kept lower than the heart, if possible. Immediate medical attention shall be sought. A bite by a nonvenomous snake should be treated as a first aid case using routine procedures. If unsure whether the bite was from a venomous or nonvenomous snake, treat it as a bite from a venomous snake.

Animal and bird droppings often contain mold, fungus, or bacteria, which represent a significant respiratory hazard. Personnel should not touch droppings and must wear gloves and impervious coveralls when going into limited access areas, such as crawl spaces and high ceilings that have become refuges or nesting areas.

Table 2. Soil Concentrations of Metals of Concern

ANALYTE	Count	Min	Avg	Max	St Dev	Units	TWA	Ceiling	Units	Inhalable*	% Limit	Respirable**	% Limit
Antimony	4	0.01	0.02	0.03	0.01	mg/kg	0.5		mg/m^3	0.00000029	0.0001%	0.000000087	0.0000%
Arsenic	**14**	**1.40**	**4.64**	**12.90**	**3.68**	**mg/kg**	**0.01**		**mg/m^3**	**0.000129**	**1.2900%**	**0.0000387**	**0.3870%**
Barium	14	51.60	136.53	269.00	64.67	mg/kg	0.5		mg/m^3	0.00269	0.5380%	0.000807	0.1614%
Cadmium	7	0.05	0.23	0.38	0.12	mg/kg	0.005		mg/m^3	0.0000038	0.0760%	0.00000114	0.0228%
Calcium	7	18900.00	25228.57	34900.00	5425.16	mg/kg	10		mg/m^3	0.349	3.4900%	0.1047	1.0470%
Chromium	6	7.70	9.27	12.40	1.76	mg/kg	0.01		mg/m^3	0.000124	1.2400%	0.0000372	0.3720%
Cobalt	7	1.90	3.43	4.30	0.77	mg/kg	0.02		mg/m^3	0.000043	0.2150%	0.0000129	0.0645%
Copper	14	5.90	37.41	174.00	58.99	mg/kg	1		mg/m^3	0.00174	0.1740%	0.000522	0.0522%
Iron	7	4290.00	6951.43	8910.00	1619.11	mg/kg	5		mg/m^3	0.0891	1.782%	0.02673	0.5346%
Lead	14	2.00	10.99	31.00	9.55	mg/kg	0.05		mg/m^3	0.00031	0.6200%	0.000093	0.1860%
Manganese	7	230.00	309.00	433.00	63.12	mg/kg	0.2		mg/m^3	0.00433	2.165%	0.001299	0.6495%
Mercury	4	0.02	0.03	0.04	0.01	mg/kg	0.025		mg/m^3	0.00000044	0.0018%	0.000000132	0.0005%
Molybdenum	1	1.20	1.20	1.20		mg/kg	0.5		mg/m^3	0.000012	0.0024%	0.0000036	0.0007%
Nickel	7	3.80	6.14	7.30	1.22	mg/kg	1		mg/m^3	0.000073	0.0073%	0.0000219	0.0022%
Selenium	7	0.38	1.75	6.40	2.07	mg/kg	0.2		mg/m^3	0.000064	0.0320%	0.0000192	0.0096%
Strontium	7	27.30	73.13	94.40	22.51	mg/kg				0.000944		0.0002832	
Thallium	5	0.04	0.06	0.08	0.02	mg/kg	0.1		mg/m^3	0.00000079	0.0008%	0.000000237	0.0002%
Uranium	**86**	**0.57**	**64.50**	**1680.00**	**265.37**	**mg/kg**	**0.05**		**mg/m^3**	**0.0168**	**33.6000%**	**0.00504**	**10.0800%**
Vanadium	**7**	**18.80**	**250.27**	**1330.00**	**477.56**	**mg/kg**	**0.05**		**mg/m^3**	**0.0133**	**26.6%**	**0.00399**	**7.98%**
Zinc	7	11.40	29.91	46.80	12.72	mg/kg	2		mg/m^3	0.000468	0.0234%	0.0001404	0.007%

*Based on the exposure from a maximum inhalable dust concentration of 10 mg/m^3 containing the maximum analyte soil concentration.
**Based on the exposure from a maximum respirable dust concentration of 3 mg/m^3 containing the maximum analyte soil concentration.

NOTE: The data within this table were developed assuming that the contaminants in the soil, if airborne, would be the same concentration in mg/m^3. The inhalable and respirable values as well as the percent limit are based upon this worst case but very conservative assumption.

Hantavirus exposure can occur in areas where there are concentrations of mouse droppings. The virus can be inhaled in the dust from these areas where mice have nested or left their droppings. Minimizing dust inhalation or avoiding these areas will lessen the risk of exposure. Contact H&S if an area showing signs of infestation is present.

Sewer system breaks or leaks shall be immediately reported to the Operations Manager or H&S Manager, and the area shall be evacuated until an appropriate plan of action is made. Anyone who comes in contact with sewer waste shall immediately wash their hands with soap and warm water.

3.3.5 Physical

The following physical hazards could be encountered; in the event that any should occur, personnel shall notify their supervisor immediately.

3.3.5.1 Head, Eye, Ear, Hand, and Foot Injuries

Hard hats shall be donned prior to performing any site activities involving overhead hazards. Safety shoes that comply with American National Standards Institute (ANSI) Standard Z41.1 are required on the site for activities other than inspections and tours. For tours and inspections, substantial leather footwear appropriate for site conditions shall be worn. Compliance with 29 CFR 1926, Subpart E, "Personal Protective and Lifesaving Equipment," shall be enforced where applicable. Safety glasses and hearing protection shall be donned in areas where the hazards exist or in areas where posted.

3.3.5.2 Material Handling

Good ergonomic practices, such as keeping the spine straight, lifting with the legs, and keeping objects as close to the body as possible, shall be used when handling heavy or bulky objects. Mechanical equipment shall be used when possible. An individual should not lift an object weighing more than 50 pounds without assistance.

3.3.5.3 Hoisting and Rigging Operations

All hoisting and rigging operations shall comply with, and be executed in accordance with *Moab UMTRA Project Lifting and Rigging* (DOE-EM/GJ1613).

Requirements for hoisting and rigging operations must be defined clearly, and the work must be planned properly (including reach of boom), because the consequences of a hoisting and rigging accident may involve death, serious injury, and/or significant property damage.

Operators, riggers, and other involved personnel must have adequate training, must plan and work together as a team, and must execute applicable plans with attention to detail. The use of reliable equipment that is designed and sized for the task, regularly inspected, and appropriately maintained is essential to a safe lift.

3.3.5.4 Motor Vehicles and Heavy Equipment Operation and Inspection

All equipment must comply with the manufacturer's specifications, OSHA requirements, and/or *Moab UMTRA Project Motor Vehicle Safety* (DOE-EM/GJ1554). All equipment shall be inspected prior to initial use on the project. This inspection shall be performed or observed by appropriate and competent Contractor personnel (i.e, the H&S Manager or their designee). Daily vehicle/equipment checks shall be performed and documented as appropriate. A copy of the most

recent vehicle/equipment inspections shall be maintained on the site. Vehicles/equipment with defects that render the equipment unsafe to operate shall be taken out of service until the defects are corrected.

All equipment shall be operated by qualified personnel in accordance with manufacturers' guidelines and OSHA standards. Equipment operator qualifications shall be documented.

3.3.5.5 Hot Work: Open Flame, Welding, or Other Significant Spark-Producing Operations

Hot work should be performed in a designated safe area (i.e., an area designed and designated for the performance of work involving an open flame, welding, or other significant spark-producing operations such that hazards associated with fires and explosions are eliminated and employee exposure to fumes, arc flash, and open flame is controlled). When hot work cannot be moved to a designated safe area, *Moab UMTRA Project Fire Safety* (DOE-EM/GJ1555) Section 5.2.7, Welding, Cutting, and Open Flame Work (hot work), will be followed.

3.3.5.6 Flammable Liquids and Refueling

Storage of flammable liquids and refueling operations shall be in accordance with 29 CFR 1926.150 through 29 CFR 1926.152. Hazard communication signs meeting the requirements of 29 CFR 1926.150 through 29 CFR 1926.152 and Subpart G shall be posted at refueling and flammable liquid storage areas.

No smoking, open flames, or spark-producing work shall occur within 50 feet of flammable liquid storage locations or refueling operations. Fire extinguishers shall be provided and placed in accordance with 29 CFR 1926.150 through 29 CFR 1926.152 and shall be the pressurized dry chemical type with a minimum Underwriter Laboratory rating of 2A:20BC.

3.3.5.7 Electrical Hazards

All electrical work shall be performed in accordance with NFPA 70 E, *Moab UMTRA Project Electrical Safety* (DOE-EM/GJ1551), and 29 CFR 1926, Subpart K, "Electrical."

Utilities must be located prior to beginning operations and marked offsets must be established. Any work involving heavy equipment underneath or in close proximity to overhead power lines shall be addressed in the IWP. The IWP shall clearly identify appropriate controls such as barricades or use of spotters. A **minimum** of 10 feet between working equipment and energized overhead power lines shall be maintained at all times.

Electrical devices and equipment must be de-energized prior to working on them. *Moab UMTRA Project Lockout/Tagout* (DOE-EM/GJ1552) shall be followed. In order to prevent electrical equipment ground fault incidents, all portable equipment, temporary installations, extension cords, and ground-fault circuit interrupters (GFCI) must be kept out of water, protected from crushing, and tested quarterly by a competent person to ensure integrity.

The quarterly inspections shall be documented, and the tested item should be marked with colored tape in accordance with the following color scheme:

- January – March > Red
- April – June > Blue
- July – September > Green
- October – December > Yellow

Temporary electrical circuits and all cord and plug electrical tools must be used with a GFCI. Defective electrical equipment (e.g. cords, plugs, and tools) shall be tagged and removed from service.

Before new work starts, the subcontractor shall determine by inquiry, direct observation, or instruments whether the location of any part of an energized electric power circuit exposed or concealed during the performance of the work may bring a person, tool, or machine into physical contact with an energized electric power circuit. Where such a circuit exists, warning signs shall be posted. These warning signs should be of a standard design so that the meaning of them is clearly understood. Where such a circuit exists, employees shall be advised of the location of the lines, the specific hazards involved, and the protective measures to be taken. Depending on the nature of the system and the work being performed, lockout/tagout procedures may be necessary.

3.3.5.8 Slip/Trip/Fall Hazards

Caution must be exercised when using steps and stairs with slippery surfaces. Good housekeeping practices are essential to minimize trip hazards. The "three points of contact" rule shall be used while climbing, accessing, and egressing equipment.

If elevated work should be required, it shall be accomplished in accordance with 29 CFR 1926, Subpart M, "Fall Protection," and *Moab UMTRA Project Fall Protection* (DOE-EM/GJ1610).

The work area shall be kept clean and orderly. Tools and debris must be picked up and placed in the proper place to prevent tripping hazards. Spills shall be cleaned up immediately.

3.3.5.9 Underground Utilities

Underground utilities, including electrical power, high-pressure gas, telecommunications, water and sewer, may be present at all sites and are maintained by the applicable utility company. Any work in the vicinity of the marked gas lines shall be coordinated with the Operations Manager, H&S Manager, and utility company representatives. Mechanical excavation shall not be performed within 10 feet of underground gas lines or within utility right of way, without approval from the utility owner.

3.3.5.10 Excavations

Personnel entering excavations 5 feet or greater in depth shall be protected as per the requirements of 29 CFR 1926, Subpart P, "Excavations" and *Moab UMTRA Project Excavation and Trenching* (DOE-EM/GJ1609). A Competent Person for excavations shall determine the soil type being excavated and shall perform inspections of each excavation daily and after rain events. The inspections shall be documented.

Underground utilities shall be located and marked prior to commencing an excavation. Excavations within 18 inches of a known energy source shall be hand excavated, carefully uncovered, and protected and supported or removed, as necessary, to safeguard employees.

Ramps or ladders shall be provided in excavations 4 feet or greater in depth and placed no more than 25 feet from personnel in the excavation. All excavated materials must be kept 2 feet from the edge of the excavation.

3.3.5.11 Equipment and Hand Tools

All hand and power tools shall comply with 29 CFR 1926, Subpart I, "Tools – Hand and Power" and *Moab UMTRA Project Power and Hand Tools* (DOE-EM/GJ1611). In general, the tools shall be in good repair, shall be used only for the job they are designed to do, and should be kept clean. All damaged tools shall be removed from service. Repairs are to be made as per the manufacturers' requirements.

When working overhead, tools shall be placed in a holding receptacle or secured when not in use. Tools shall not be thrown or dropped from heights. Only nonsparking tools shall be used in flammable or explosive atmospheres. Electrical tools shall not be carried or lowered by their electrical cords.

3.3.5.12 Ladders

Portable ladders shall be used in accordance with *Moab UMTRA Project Ladder Inspection and Use* (DOE-EM/GJ1612). Employees who are required to use ladders as part of their employment shall be trained in accordance with 29 CFR 1926.1060.

3.3.5.13 Working Over or Near Water

When employees are working over or near water where the danger of drowning exists, U.S. Coast Guard-approved life jackets or buoyant work vests shall be worn. When the potential of falling into a body of water exists (e.g., personnel close to the shoreline), life vests shall be worn, and ring buoys shall be placed every 200 feet along the shoreline at active work locations. One life-saving skiff (boat) shall be immediately available at the location or adjacent to the water, if appropriate, and lifelines and body harnesses shall be provided.

3.3.5.14 Working On or Near Active Rail Lines

Active rail lines are present at both the Moab and Crescent Junction sites. Extreme caution shall be used when working on or near these active lines. At a minimum, two-person teams are required to perform work on or near rail lines. One person shall be designated as a train spotter for the length of time that work is being performed. If work is within 20 feet of the rail lines the railroad may require a railroad representative be present for these activities. The railroad must be contacted when working within 100 feet (railroad right of way) of active rail lines prior to work start.

3.3.6 Heat Stress

Personnel could potentially be exposed to heat stress conditions when ambient temperatures exceed 70°F.

The potential for heat stress is a concern, because of factors such as high air temperature, high relative humidity, low air movement, high radiant heat, protective clothing, and the level of physical activity of workers. The potential exists for the following:

- Heat rash from continuous exposure to heat or humid air, resulting in a reddish skin rash, usually in areas where clothing is restrictive and the skin stays wet from perspiration.
- Heat cramps caused by heavy perspiration and inadequate replacement of electrolytes. Signs and symptoms include:
  - Muscle spasms.
  - Pain in the hands, feet, and abdomen.

- Heat exhaustion from increased stress on various body organs, including inadequate blood circulation because of cardiovascular insufficiency or dehydration. Signs and symptoms include:
  - Pale, cool, moist skin.
  - Heavy perspiring.
  - Dizziness.
  - Nausea.
  - Fainting.
- Heat stroke. When heat stroke occurs, temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be immediately obtained. Signs and symptoms include:
  - Red, hot, and usually dry skin.
  - Lack of or reduced perspiration.
  - Nausea.
  - Dizziness and confusion.
  - Strong, rapid pulse.
  - Coma.

Heat stroke, heat cramps, and heat exhaustion should be discussed during safety meetings as appropriate. Workers are encouraged to increase consumption of water during warm weather. Water shall be provided on site and will be made available for consumption during work breaks.

A key factor in determining the potential for heat stress is the workload of the individual. American Conference of Government Industrial Hygienists (ACGIH) defines workload as: (1) light work – sitting or standing to control machines, performing light hand or arm work; (2) moderate work – walking about with moderate lifting and pushing; and (3) heavy work – intermittent heavy lifting with pushing or pulling.

When site personnel are wearing personal protective clothing during the performance of field activities, the action level for heat stress has been established as an oral temperature of 99.6°F or a pulse rate of 110 beats per minute. The oral temperature or pulse rate shall be obtained immediately after the work period, where possible, in a seated, shaded position. The work-rest regimen in Table 3 provides guidance to reduce the potential for heat stress based on a moderate workload.

Table 3. Work-Rest Regimen for Workers Wearing PPE in the CA

Temperature (°F)	Work Period (minutes)	Rest Period (minutes)
< 70	not limited	not required
70–77 150		15
78–82 120		15
83–87 90		15
88–90 60		15
> 90	45	15

If a worker's oral temperature exceeds 99.6°F or his or her pulse rate exceeds 110 beats per minute, that worker is undergoing heat stress, and the allowable work period shall be reduced to

the maximum for the next higher temperature range (e.g., if the oral temperature is greater than 99.6°F or the pulse rate is greater than 110 beats per minute at 78 to 82°F, the allowable work period shall be reduced to the work period corresponding to 83 to 87°F or 90 minutes). For work performed above 90°F, the work period shall be reduced by one-third each time the action level is exceeded (e.g., 45 minutes shall be reduced to 30 minutes).

For a worker whose oral temperature exceeds 99.6°F or their pulse rate exceeds 110 beats per minute, the oral temperature or pulse rate should be determined prior to resuming work to ensure that the worker has recovered. A worker whose temperature exceeds 100.6°F shall not be allowed to work in impermeable or semipermeable PPE ensembles. Acclimatized workers are susceptible to heat exhaustion from dehydration when wearing PPE ensembles because they sweat more quickly and more profusely than nonacclimatized workers without the same increase in heartbeats and temperatures.

Caution: Field activities in which site personnel are required to wear chemical protective clothing at ambient temperatures higher than 95°F should be avoided whenever feasible by scheduling those activities during the workday to avoid the peak ambient temperatures from 10 a.m. to 2 p.m.

Site personnel who have experienced a heat-related illness (heat cramps, heat exhaustion) shall be restricted to Level D PPE (hard hat, safety glasses, safety work boots, shirt with sleeves, and long pants) tasks for a minimum of 1 day after illness occurrence and must be examined and approved as fit for duty by a qualified physician prior to performing tasks requiring chemical-protective clothing.

3.3.7 Cold Stress

In cold surroundings, shivering increases the metabolic heat production, but the feet, face, and hands can still feel cold. This is often a confusing situation because the individual can be warmly clothed, in which case portions of the body become overheated while the extremities remain cold. The regulation of blood flow and sweating cannot uniformly keep all parts of the body in thermal balance. Clothing must be appropriate to obtain uniform thermal balance.

In cold environments, wind chill temperature is a better description of thermal conditions than the ambient temperature. The wind adds to the rate of cooling, and it is the combination of wind speed and air temperature that are most important. For example, at a wind chill temperature of -25 F (from a 5°F temperature and 15 mile per hour [mph] wind), exposed flesh can freeze within 1 minute. However, fingers, toes, nose tips, ears, or cheeks can become frostbitten at ambient temperatures as high as 28°F with high winds. This is approximately the freezing point of skin.

The wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. The wind chill index (Table 4) should be consulted when planning for exposure to low temperatures and wind. The wind chill index does not take into account the specific part of the body exposed to cold, the level of activity affecting body heat production, or the amount of clothing being worn.

3.3.7.1 Frostbite

The human body senses cold as a result of both the air temperature and the wind velocity. Cooling of exposed flesh will increase rapidly as the wind velocity increases. Frostbite can occur at

relatively mild temperatures if wind penetrates the body insulation. For example, when the actual air temperature of the wind is 40°F (4.4°C) and the velocity is 30 mph (48 kilometers per hour), the exposed skin would perceive this situation as an equivalent still air temperature of 13°F (-11 C).

Frostbite can be either superficial, involving only the skin, or deeper, extending below the skin. Frostbite can be considered to be superficial if exposure time was short. Otherwise, assume the injury to be deep and serious, necessitating treatment at a hospital rather than in the field.

Table 4. Wind Chill Index

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

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.
Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (96.8°F) per cold stress TLV.

3.3.8 Wind

The project sites are in areas that are susceptible to high winds. When sustained wind speeds begin to effect work manageability or dust becomes difficult to control, workers should contact the H&S Manager or Operations Manager in order to determine if site activities should cease until the wind speed decreases. Dust suppression procedures shall be implemented at all times.

Hoisting and rigging operations shall be evaluated (e.g., necessary control of load swing, rocking, and/or rotation) by H&S. The evaluation shall consider the type of load relative to the wind conditions.

Reduced visibility conditions shall be evaluated by H&S to determine if it is unsafe for heavy equipment and vehicle traffic. When necessary, traffic should be halted until visibility improves adequately.

3.3.9 Vendors

Vendors accessing Moab UMTRA Project sites shall comply with all applicable H&S requirements. Hazards associated with vendors servicing equipment or facilities or supplying consumables such as fuel or calcium chloride shall be evaluated by the Operations Manager or

H&S Manager. Vendors shall complete a Vendor Safety Briefing prior to unescorted access to a site.

If the vendor has a large number of drivers delivering steadily to the site during a project, an attempt shall be made to hold a special safety briefing at the vendor's head office so that all the drivers can be trained before the project starts. Spotters shall be provided at unloading points, and backing up of trucks shall be avoided as much as possible.

Unusual/high-risk deliveries are those out of the ordinary that do not involve dump trucks under routine backfill operations, cement trucks, service trucks, and small vendors such as UPS and FedEx. Unusual/high-risk deliveries shall be evaluated by H&S prior to the delivery.

Controls to mitigate such hazards shall be identified in accordance with this plan. Vendors shall comply with the prescribed controls. Failure to adhere to H&S requirements shall result in the activity being stopped until the Operations Manager and H&S Manager are satisfied that the work will be accomplished safely and in compliance with applicable requirements.

4.0 Hierarchy of Controls

The hazards identified in Section 3.3, "Hazard Characterization and Controls," indicate the potential for exposure to a variety of hazardous substances and health hazards. Controls to mitigate those hazards are presented in this section.

Methods to control hazards are divided into three major categories:
- Elimination/Engineering controls. Elimination is the priority in removing hazards. If hazards cannot be eliminated, mitigate with engineering controls.
- Administrative controls and work practices.
- PPE – use only when elimination or control of hazards is not feasible.

All three methods of hazard control are employed on these sites.

4.1 Engineering Controls

Engineering controls are built into the process and designed to eliminate hazards. They include:
- Wetting of all soils prior to disturbance to eliminate dust generation.
- Working in a manner to minimize dust generation.
- Establishing control zones and traffic patterns.
- Observing speed limits.

4.2 Administrative Controls and General Work Practices

Administrative controls and general work practices are as follows:
- Understand and follow the H&S controls and procedures that govern work.
- Comply with IWPs, RWPs, and all Worker Safety and Health Program requirements.
- Attend all briefings and safety meetings as required.
- Use the "buddy system" to ensure constant visual contact while performing work.

- Wash hands and face upon leaving the work area and before eating, drinking, chewing gum or tobacco, smoking, or applying cosmetics or lip creams.
- Stop work if you have a reasonable belief that it poses an immediate danger to yourself or others.

NOTE: Anyone who does not comply with H&S controls and procedures as established by this HASP is subject to immediate dismissal from the site.

4.2.1 Contamination Control Practices

- Consciously minimize contact with all hazardous substances and avoid any contact with the facial area.
- Immediately notify the Operations Manager or H&S Manager if contamination of the skin or clothing is suspected.
- Refrain from walking through suspected contaminated liquid or soil.
- Avoid higher CAs unless entrance is required.
- Minimize the generation of hazardous waste and do not bring unnecessary materials into the Exclusion Zone.

4.3 PPE

PPE is the last line of defense to control exposure to a hazardous substance. When using PPE, site workers shall:

- Know the use and protection limits of PPE.
- Use the proper PPE assigned for the task or area.
- Ensure PPE fits properly.
- Ensure PPE is free from tears or holes and is in good working condition before entering the work area.
- Leave the area immediately if PPE is damaged.
- Inspect other workers' PPE and inform them of any problems such as tears and holes.

5.0 PPE

5.1 General Requirements

All personnel must wear appropriate protective equipment when activities involve exposure to hazards that cannot be adequately or feasibly controlled by engineering or administrative controls. Protective equipment listed below must meet the following indicated specifications:

- Hard hats – Hard hats meeting the specifications of ANSI Standard Z89.1, Class B, shall be worn when in areas where overhead hazards are present or anticipated.
- High-visibility clothing – Personnel exposed to vehicular traffic shall wear high-visibility apparel meeting the appropriate specifications of ANSI Standard ANSI/International Safety Equipment Association 107-2004 at all times while outside the Support Zone and as specified by a IWP, RWP or other H&S procedure.
- Safety shoes – Safety shoes meeting the specifications of ANSI Standard Z41.1 shall be worn at all times while working in the Exclusion Zone and when specified by an IWP, RWP, or other H&S procedure. Visitors are not required to wear safety shoes unless they may be

exposed to a foot-crush hazard, but visitors shall wear closed-toe, substantial footwear at all times they are on site.
- Eye protection – Eye protection meeting the specifications of ANSI Standard Z87.1 shall be worn at all times while outside the Support Zone and as specified by an IWP, RWP, or other H&S procedure.

PPE for each task is assigned in an IWP or RWP. Respiratory protection is required when activities are known or suspected to result in airborne hazards. When respiratory protection is used, adherence to *Moab UMTRA Project Respiratory Protection* (DOE-EM/GJ1620) is required. Skin, hand, and foot protection are required when direct skin contact with hazardous materials is possible. The following briefly describes the PPE level categories anticipated for the identified tasks. Note that the higher levels of protection, Levels A and B, are not described, because their use is not reasonably anticipated to be required for the identified project scope of work.

With exception of administrative work areas, work clothing shall consist of the following:
- Full-length trousers/slacks/jeans in good condition.
- Sturdy work shoes or boots meeting the requirements of ANSI Standard Z41.1.
- Shirts that cover the shoulders with sleeves at least T-shirt length.

Level D PPE is a work uniform affording minimal protection and is used for nuisance contamination only. Level D PPE consists of the following:
- Coveralls.
- Gloves (optional as applicable).
- Boots/shoes, chemical resistant, steel toe and shank.
- Boots, outer, chemical resistant, disposable (optional as applicable).
- Safety glasses or chemical splash goggles (optional as applicable).
- Hard hat (optional as applicable).
- Escape mask (optional as applicable).
- Face shield (optional as applicable).

Level C PPE is worn when the concentration(s) and type(s) of airborne substance(s) are known and the criteria for using air-purifying respirators are met. Level C PPE consists of the following:
- Full-face or half-mask, air purifying respirators (National Institute of Occupational Safety and Health [NIOSH]-approved).
- Hooded chemical-resistant clothing (overalls; two-piece chemical splash suit; disposable, chemical-resistant overalls).
- Coveralls (optional as applicable).
- Gloves, outer, chemical resistant.
- Gloves, inner, chemical resistant.
- Boots (outer), chemical resistant, steel toe and shank (optional as applicable).
- Boot covers, outer, chemical resistant, disposable (optional as applicable).
- Hard hat (optional as applicable).
- Escape mask (optional as applicable).
- Face shield (optional as applicable).

Detailed PPE assignments are defined in IWPs and RWPs. PPE policy is defined by *Moab UMTRA Project Personal Protective Equipment* (DOE-EM/GJ1619) and *Moab UMTRA Project Respiratory Protection*.

5.2 PPE Selection, Upgrading, and Downgrading

Selection of appropriate respirators and protective clothing demands a thorough evaluation of all issues related to the task and the PPE. Selection of PPE shall be made by H&S with input from line management.

Selection of specific respirators and cartridges, including disposable respirators for voluntary use, shall be made by the H&S Manager with concurrence from the Respiratory Protection Program Administrator using a Respirator Selection Checklist in conjunction with this HASP and applicable IWPs, RWPs, or procedures.

5.3 PPE Use and Limitation

Proper PPE use and limitations shall be communicated in the applicable pre-entry briefing. The worker using PPE should understand all aspects of the clothing operation and limitations. If the PPE does not appear to fit the intended use or properly protect the workers, H&S shall be notified to conduct a reevaluation.

5.3.1 PPE Inspection

The PPE user is responsible for properly inspecting PPE prior to use. Depending on the type of PPE clothing prescribed and the significance of exposure, the user shall:

- Visually inspect for tears, seam defects, pinholes, and nonuniform coating.
- Inspect all closure mechanisms (e.g., zippers, Velcro) for proper operation.
- Visually inspect flex-coated chemical protective clothing for evidence of surface cracks or signs of shelf-life deterioration.

5.3.2 PPE Donning and Doffing

Personnel shall be trained on how to properly don and doff PPE. Instructions for protective clothing donning should be posted at the designated PPE change area. Instructions for protective clothing removal should be posted at the designated removal station.

5.3.3 PPE Maintenance and Storage

PPE shall be maintained and stored in accordance with *Moab UMTRA Project Personal Protective Equipment*. Reusable PPE (e.g., respirators and rubber boots) should be maintained in accordance with the manufacturers' instructions and *Moab UMTRA Project Respiratory Protection*.

6.0 Training and Qualification

6.1 Site Access Training Requirements

The following provides minimum training requirements. Additional training requirements may be established based upon the scope of work assigned to employees.

6.1.1 Site Workers

For unescorted access to nonradiological areas (Support Zone), site workers (DOE, Contractor, and subcontractor employees assigned to the site) shall complete:

- Moab Project Site Pre-Entry Briefing.
- General Employee Training.
- Radiological Awareness Training

For unescorted access to radiological areas other than those posted as "Controlled Areas" (e.g. unescorted entry of a posted CA), site workers shall complete:

- Moab Project Site Pre-Entry Briefing.
- General Employee Training.
- 24-Hour HAZWOPER Training (40-Hour HAZWOPER training also meets this requirement).
- Annual 8-Hour HAZWOPER Refresher Training.
- 1-Day HAZWOPER "field experience under the direct supervision of a trained, experienced supervisor" (on-the-job training).
- Radiological Worker Training.

For unescorted access to Controlled Areas associated with the Moab site, Crescent Junction site, off site operations, Intrepid Potash Facility, and vicinity properties, site workers shall complete:

- Site Pre-Entry Briefing.
- General Employee Training.
- General Employee Radiological Training.

6.1.2 Visitors

Visitors and nontrained personnel shall receive a verbal briefing on emergency procedures and be escorted at all times by a trained site worker.

6.1.3 Vendors

Vendors shall complete the Moab Project Vendor Safety Briefing.

6.2 Daily Safety Meetings

All DOE, Contractor, and subcontractor employees shall attend a Daily Safety Meeting prior to commencing work activities. Site workers who arrive to perform work after the Daily Safety Meeting has been conducted shall read the information presented at that day's meeting. Documentation of the Daily Safety Meeting shall include the topics discussed, planned activities, and the signature of each participant, including those who arrived and were briefed (by reading) after the meeting was conducted. .Signing the Daily Safety Meeting roster acknowledges understanding of topics and activities taking place and adherence to set requirements.

Daily Safety Meeting topics should, at a minimum, include:

- Work planned for the day.
- Changes in site conditions and controls.
- Weather forecast.
- Lessons learned.
- New MSDS information.

- Periodic review of IWPs and RWPs.
- Changes to the HASP.

6.3 Plan of the Day

Work activities shall be evaluated daily by management. The Plan of the Day (POD) shall be documented and shall be available to all employees to review. The POD shall consist of authorized work activities, lead personnel, and the IWPs associated with the activity.

6.4 IWP and RWP Briefings

Prior to commencing physical work activity, site workers shall receive an IWP briefing. If personnel will be working in a Radiological Area (Exclusion Zone), they shall also receive an RWP Briefing from a Radiological Control Technician (RCT) as determined by the Radiological Controls Manager.

6.5 Training and Qualification Records

Records of training and qualification required by this section shall be maintained by the TAC Training Department. All employee training and qualification records shall be maintained in compliance with 10 CFR 851 and in accordance with applicable Moab UMTRA Project policies and procedures.

7.0 Medical Surveillance

7.1 Fitness for Duty Evaluation

Contractor and subcontractor employees who will work on site for more than 240 hours in a rolling 12-month period shall have a Fitness for Duty Evaluation performed by a qualified physician (licensed, registered, or certified as required in the state where employed) prior to commencing physical work activities or as soon as practical after activities have begun. Based on the evaluation of tasks to be performed, the Contractor may direct various levels of physical exams, and physicals may not be required for some tasks.

7.2 Return to Work

The Project Manager shall inform H&S whenever an employee has been absent because of an injury or illness for more than 5 consecutive workdays (or an equivalent time period for those individuals on an alternative work schedule) and schedule a return to work physical for the employee.

7.3 Medical Examination Policy

The medical exam policy is as follows:

- An annual medical examination by a qualified physician is required for employees who will routinely perform work within Exclusion Zones having the potential of exceeding PELs for 30 days or more per year or who will wear a respirator for 30 or more days per year.

- A biennial medical examination by a qualified physician is required for those employees working within the Exclusion Zone who do not meet the requirements regarding health hazard exposure or respirator usage.
- No routine medical examination is required for employees who enter Exclusion Zones on an infrequent basis for the purpose of supervising work, performing inspections and surveys, or conducting sampling operations as long as the annual medical examination policy above does not apply.

7.4 Emergency Treatment Facility

The emergency treatment facility and locations is:
Allen Memorial Hospital
719 West 400 North
Moab, Utah
435-259-7191

Routes to transport injured or ill employees to the emergency treatment facility are provided in Figure 1.

8.0 Worker Exposure Monitoring

Personnel and area monitoring shall be conducted to determine the exposure potential of site workers to hazardous materials. This monitoring can include personnel or area air samples, surface wipes, and soil samples.

8.1 Exposure Monitoring Methods

Industrial hygiene monitoring that represents time-weighted-average (TWA) exposure levels in worker breathing zones shall be performed for each identified task that has a potential for exposure.

Radiological surveys shall be performed in accordance with the *Moab UMTRA Project Health Physics Plan*.

8.2 Action Levels

The Action Levels in Table 5 shall be used in conjunction with monitoring data and guidance associated with Table 2 to ensure that the appropriate level of worker protection is maintained. Assigned PPE shall provide a level of protection that ensures exposures will not exceed action limits from known or suspected site hazards until such time as monitoring indicates that a downgrade in PPE is warranted.

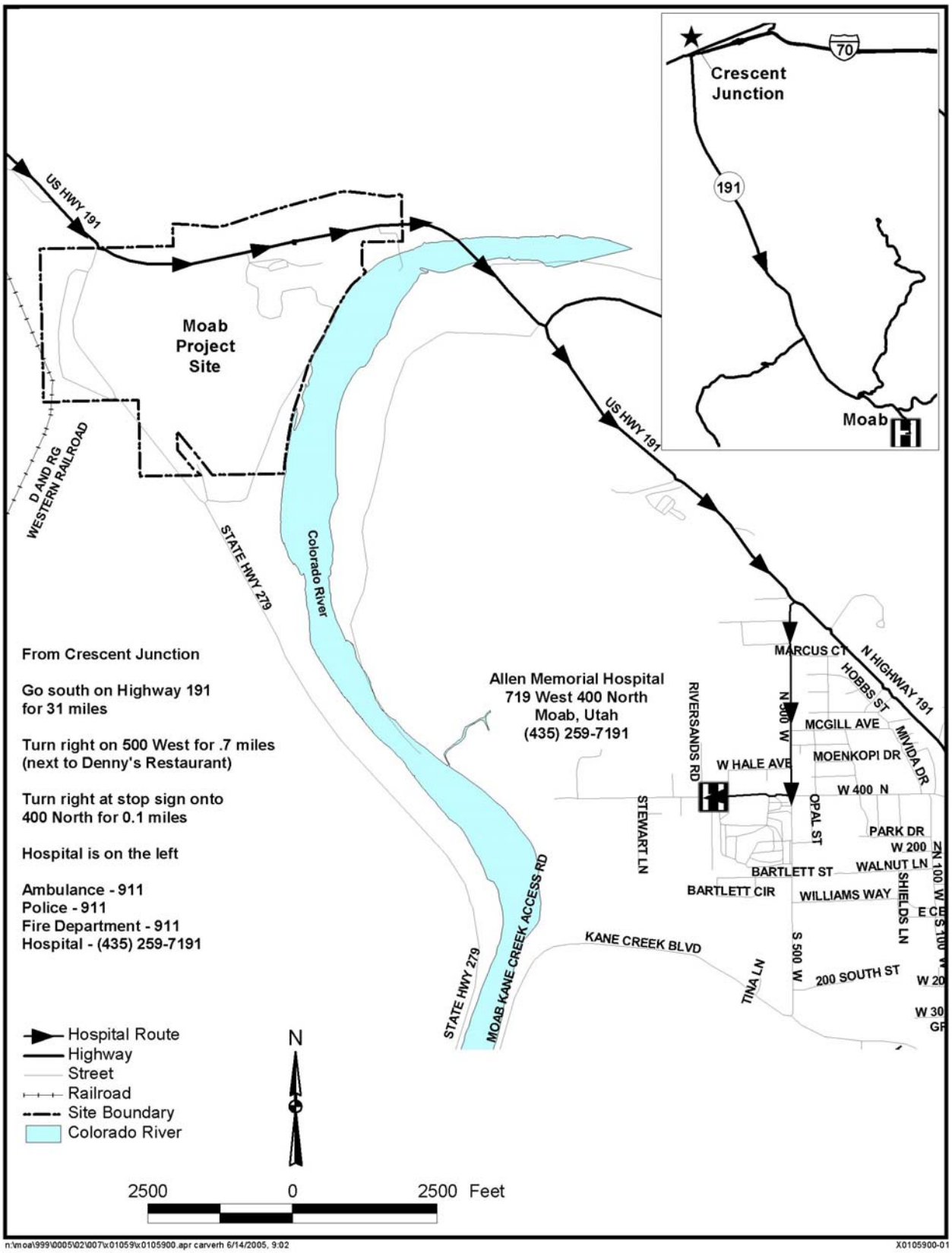

Figure 3. Routes to Transport Injured or Ill Employees

Table 5. Personnel Exposure Action Levels

Parameter	Action Level	Action Required
External Radiation Dose Rate	> 5 mrem/hr at 1 ft (30 cm) from source.	Establish Radiation Area (Exclusion Zone) controls in accordance with *Radiation Protection Program (DOE-EM/GJ610)* and assign dosimetry.
Annual Radiation Exposure	> 100 mrem/yr Total Effective Dose Equivalency and/or > 500 mrem/yr from radon or radon progeny.	Radiological Worker Training and assign dosimetry.
Radiological Surface Contamination	Removable contamination > 1,000 dpm/100cm^2 or total contamination > 5,000 dpm/100cm^2.	Establish applicable CA (Exclusion Zone) controls in accordance with *Radiation Protection Program.*
Airborne Radioactivity	Long-lived radioparticulate activity $\geq$ 10% of 5×10^{-11} µCi/ml or Radon Daughter Concentration $\geq$ 10% of 0.33 Working Levels.	Establish applicable Airborne Radioactivity Area (Exclusion Area) controls in accordance with 10 CFR 835.
Soil Contamination	1. Ra-226 activity exceeds the environmental cleanup standard but is $\leq$ 100 pCi/g. 2. Ra-226 activity > 100 pCi/g.	1. Establish Soil CA controls in accordance with the *Radiation Protection Program.* 2. Establish CA (Exclusion Zone) controls in accordance with the *Radiation Protection Program.*
Oxygen	< 19.5% or > 23.5% Oxygen (O_2)	Evacuate area, ventilate, and continuously monitor until O_2 is between 19.5% and 23.5%.
Combustible Gas	1. > 10% Lower Explosive Limit (LEL) 2. > 25% LEL	1. Stop work and control source. Continuously monitor until LEL < 10%. 2. Evacuate area.
Carbon Monoxide (CO)	12.5 parts per minute (ppm)	Evaluate hazard and engineering controls. Continuously monitor until CO < 25 ppm. Ensure CO remains below 100 ppm for 5-minute average. Evacuate area if CO > 100 ppm for 5 minutes or remains above 25 ppm for more than 2 hours.
Volatile Organic Compounds	5 ppm	Evacuate and evaluate situation. Don air-purifying respirator to monitor area with continued elevated reading.
Acids, Bases, Metals	> 50% of PEL.	Stop work, commence application of further engineering controls to reduce concentration, and assign respiratory protection.
Respirable Dust	1. Respirable Silica > 0.05 mg/m^3 2. Respirable Dust > 3 mg/m^3 3. Total Dust > 10 mg/m^3	Assign respiratory protection and evaluate engineering controls, contact IH for guidance regarding potential for metals exposure.
Noise >	85 dBA	Institute engineering controls and/or use approved hearing protection.

9.0 Project Site Control

9.1 Site Security

A signboard with pertinent information should be erected at the main entrance to each site, as needed.

Site control should be established by a perimeter fence.

Security guards may be used for site access control and 24-hour 7-days-per-week patrol.

9.2 Site Map

A map which shows all work areas, the route of travel to the nearest emergency medical facility, and site evacuation routes shall be posted. A map of site facilities including locations of fire extinguishers, first aid stations, first aid kits, and evacuation assembly areas should be posted in each building.

9.3 Site Work Zones

To reduce the spread of hazardous substances from CAs to clean areas, zones should be delineated on the site where different types of operations will occur, and the flow of personnel among the zones should be controlled. Three frequently used zones are the Exclusion Zone, Contamination Reduction Zone (CRZ), and Support Zone. Since the principle hazardous substance of concern for the Moab UMTRA Project is soils and materials contaminated with uranium mill tailings and ore from milling plant operations, radiological controls are used to define the Exclusion, Contamination Reduction, and Support Zones as follows:

- Exclusion Zone – the CA. The Exclusion Zone is where the highest possibility for worker exposure to hazardous materials occurs. Exclusion Zones may consist of a CA, Airborne Radioactivity Area, and/or Radiation Area. An RCT shall be on site at all times workers are in the Exclusion Zone.
- Contamination Reduction Zone/Corridor (CRZ/C) – the area where decontamination takes place. The entry/exit routes between the Exclusion Zone and the Support Zone are in the CRZ. The CRZ/C may consist of a Radiological Buffer Area (RBA).
- Support Zone – the uncontaminated area to which general public access is controlled and where workers should not be exposed to hazardous substances. The Support Zone is a clean area where administrative and support functions are located. Normal work clothes are appropriate for the Support Zone. The Support Zone may be posted as a Controlled Area.

9.4 Site Access Log

The site Access Log shall be maintained at the administration office, and all nonpermanent site personnel shall fill it out when they arrive and depart the site. The Site Access Log information should include the date, name, company or agency, and time of entry and exit. In addition, access to the Exclusion Zone shall be recorded on a Radiological Access and Egress Log.

9.5 Classification of Persons for Site Access

9.5.1 Site Workers

Site workers are DOE, Contractor, and subcontractor personnel who are assigned to work at the site and have completed training and qualification and medical surveillance in accordance with this HASP prior to unescorted access into the Support Zone and/or Exclusion Zone.

9.5.2 Administrative Workers

Administrative workers are DOE, Contractor, and subcontractor personnel who are assigned to work at the site and have completed training in accordance with this HASP prior to unescorted

access to the Support Zone and who do not enter the Exclusion Zone or CRZ. This classification normally includes technical office support personnel and administrative support personnel.

9.5.3 Visitors

Visitors are untrained persons who do not require access to the site as part of their routine job duties and are not directly assigned to the project as an employee. This category includes personnel who will not be exposed to hazardous substances above PELs. Some examples include:

- Senior DOE, Contractor, or subcontractor personnel.
- Federal and state regulators.
- Vendors.
- Public officials.
- Subcontract technical professionals.
- Utility company personnel performing maintenance or monitoring.

Visitors shall check in and sign the Visitor Log immediately upon arrival. Only visitors with legitimate reason, and who are authorized by the Site Manager and H&S, will be allowed access to the work areas. Each visitor or group of visitors shall be escorted by a qualified person and must have a visitor badge.

Visitor access shall be limited to a maximum of 7 consecutive days and will not normally apply to persons performing physical work at the site. Visitor access beyond 7 consecutive days must have written approval from the Operations Manager and H&S Manager.

9.6 Buddy System

A "buddy system" shall be implemented when a task to be performed or the area where a task is performed involves significant hazards or risk to personnel health and safety. "Buddy system" means that two or more individuals are assigned to work together as a team to perform a task. The buddies should be close enough to one another to communicate verbally without the aid of radios, telephones, or other means of voice amplification and to provide immediate assistance to one another if necessary.

Workers using the buddy system must:

- Stay within visual and clear voice communication distance with the partner(s).
- Observe the partner(s) for signs of overexposure to hazardous materials and environmental stresses, such as heat and cold exposure.
- Periodically check the integrity of the partner's PPE.
- Immediately notify the Operations Manager or H&S Manager if emergency assistance is needed.

9.7 Access Control

9.7.1 Access Control Point Requirements

Exclusion Zones shall be controlled through a designated Access Control Point. The Access Control Point shall be physically secured (fences, ropes, or barricades) and clearly marked with signs according to *Hazardous Waste Site Operations* and the *Moab UMTRA Project Health*

Physics Plan. All personnel and equipment shall enter and exit the Exclusion Zone through the Access Control Point unless an alternative location has been approved by Radiological Control.

9.7.2 Signs, Signals, and Barricades

Signs, signals, and barricades used to identify radiological hazards shall comply with the *Moab UMTRA Project Health Physics Plan*. Signs, signals, and barricades used to identify other site hazards (including traffic control) shall comply with 29 CFR 1926, Subpart G, "Signs, Signals, and Barricades."

9.8 Site Communications

9.8.1 On Site Communications

Before accessing the site, each person shall establish communications with off site personnel and with other personnel on the site with whom he or she may need to communicate. Communication must be maintained between each site worker or group of workers and off site personnel.

No site worker shall access any site without having at least one other site worker who:

- Is aware of the work (activity) being done on the site.
- Is in communication with the worker(s) on the site.
- Is able to communicate to off site personnel and immediately summon emergency assistance should it become necessary.

If hand signals or codes (e.g., a series of blasts on a horn or a flash of headlights) or radios are used to communicate information on the site, these signals or codes should be communicated to all individuals on the site and should not conflict with other signals or codes already in use on the site (e.g., emergency signals).

9.8.2 Off Site Communications

When any person is on the site, at least one person in communication with on site personnel shall be capable of immediately communicating with off site personnel. The off site communications system must be capable of notifying project Key Personnel and executing the *Moab UMTRA Project Emergency Response Plan*.

9.9 H&S Inspections

A Site Safety Supervisor-trained person shall be assigned to each task performed and is responsible to ensure compliance with this HASP. The Site Manager and H&S should perform frequent inspections of active work locations to verify HASP implementation and effectiveness. The inspections should be documented, follow-up corrective actions should be identified and tracked to completion, and a report should be placed in the project files.

9.10 Sanitation

The sanitation requirements of this section are based on 29 CFR 1926.51 and 29 CFR 1910.141. The following accommodations shall be provided for site workers.

9.10.1 Drinking Water

The following subsections detail drinking water provisions inside and outside the Exclusion Zone.

9.10.1.1 Outside the Exclusion Zone

Provisions for drinking water outside the Exclusion Zone and the CRZ/C include:

- Potable water adequate for the number of workers at the site in containers with a tight-fitting cap.
- Water dispensers (if used) equipped with a tap to dispense the water. (Water shall not be dipped from the container.)
- All containers used to dispense drinking water shall be clearly marked for exclusive use as a drinking-water container.
- Single-serve disposable cups, a sanitary container for the unused cups, and a receptacle for the used cups.

9.10.1.2 Inside the Exclusion Zone

Drinking water in the Exclusion Zone shall be considered only when the following conditions are met as determined by the Contractor and controlled by an RCT:

- Potential for heat-induced stress is present and represents a significant hazard compared with the radiological and chemical hazards present.
- Administrative and engineering controls to reduce the potential for heat-induced stress in workers on the site performing a specific task are either ineffective or not reasonable and prudent.

Only when these two conditions above are met will the consumption of drinking water in the Exclusion Zone be permitted. When it is determined that drinking will be permitted, the following controls are required:

- Drinking containers shall be protected from contacting hazardous substances before they are issued to the worker.
- Drinking containers shall be sealed, single-serving, disposable containers.
- The participating workers shall remove their outer gloves and frisk their hands and face. If contamination is detected, the worker shall proceed to Access Control Point for radiological survey by an RCT.
- If the worker's hands and face frisk clean, then the worker may wash their face with wet wipes.
- Drinking containers and wet wipes may not be shared among workers.
- Drinking containers shall be disposed after single use. Workers may not reseal the container and save contents for later consumption.
- Workers shall don gloves and reseal as required before returning to the work area.

9.10.2 Toilet and Washing Facilities

Toilet and washing facilities shall be provided. Washing facilities shall:

- Use potable water or other method (hand cleaner/sanitizer). Potable wash water containers shall be clearly marked for exclusive use as washing water containers, including prohibition of drinking.
- Be in the immediate vicinity of any toilet facility.

9.10.3 Showers and Change Rooms

Because worker exposures to hazardous substances are not expected to exceed the applicable PELs, sanitation showers are not expected to be required under the provisions of 29 CFR 1910.120 (n). Sanitation showers may be required and shall be provided before work proceeds if:

- Site conditions change so that present evaluations are not applicable.
- Monitoring data indicate that personnel are being routinely exposed above the applicable PELs.
- OSHA substance-specific standards (e.g., asbestos regulations) require showers and changing rooms.

Change rooms, as designed to facilitate personnel showers under the provisions of 29 CFR 1910.120 (n) (7), are not provided because sanitation showers are not currently required. Modesty clothing, including shorts and t-shirts at a minimum, shall be worn at all times in areas and facilities shared by men and women. Items of value should not be brought to the work site.

9.10.4 Smoking

Smoking is not allowed within posted radiological areas (i.e. the CA, Radiological Buffer Area, or Controlled Area) or within 50 feet of flammable or combustible liquids or gases.

10.0 Decontamination

10.1 Contamination Prevention

Minimizing worker contact with hazardous substances starts by working in a safe manner so that contact is avoided as much as possible. Workers should avoid touching exposed portions of skin or personal clothing while in the Exclusion Zone.

10.2 Decontamination Location and Layout

Radiological Control staff shall assist the Site Manager in establishing the location and layout of the RBA/CRZ along with PPE removal and decontamination stations.

Radiological decontamination shall follow *Moab UMTRA Project Radiation Protection Plan* and *Moab UMTRA Project Health Physics Plan* wherever applicable.

10.3 Personnel Decontamination

PPE removal, including proper sequence and technique, is the primary method by which personnel decontamination is effected on these sites. When radiological contamination in excess of the surface contamination limits is present in the work area, personnel shall perform whole body contamination surveys following PPE removal and prior to exiting the CA. At a minimum, a hand and foot frisk is required for personnel exiting an RBA. Personnel who have completed the whole body survey and were found free of contamination are not required to perform the hand and foot frisk upon exit of the RBA, provided they did not loiter within the RBA prior to exit.

After the PPE removal sequence has been completed, if radioactive contamination is detected on the worker during the frisk, personnel shall contact an RCT immediately. The *Moab UMTRA Project Radiation Protection Plan* and the *Moab UMTRA Project Health Physics Plan* shall be followed as applicable in the event of a personal contamination event.

10.3.1 Emergency Eyewash Stations

Emergency eyewash stations shall be provided at the site and strategically located.

10.3.2 Emergency Shower Station

An emergency shower station shall be provided at the site and strategically located.

10.4 Material, Equipment, and Vehicle Decontamination

All materials, equipment, and vehicles leaving the Exclusion Zone will be subject to radiological survey for unrestricted release criteria by an RCT. After all residual visible material is removed; the vehicle shall be surveyed in accordance with the *Moab UMTRA Project Radiation Protection Plan* and the *Moab UMTRA Project Health Physics Plan*, wherever applicable.

10.5 PPE and Decontamination Solution Storage and Disposal

PPE removed from the RBA/CRZ shall be either decontaminated or properly bagged to contain any contamination. All used disposable clothing shall be placed in bags, marked or labeled as required, and stored in a designated storage location pending arrangements for disposal. All items that cannot be sufficiently decontaminated shall be evaluated by the Radiological Control Manager and Environmental Compliance staff and designated as radioactive, hazardous, or mixed waste and stored and disposed of properly. All decontamination solutions shall be collected and retained for evaluation prior to disposal.

11.0 Emergency Response Plan

Refer to the *Moab UMTRA Project Emergency Response Plan*.

12.0 Spill Response Plan

12.1 Policy

It is the policy of the Contractor to conduct and manage activities in accordance with applicable laws and regulations and to:

- Prevent or minimize to the extent possible the spilling of petroleum products, hazardous substances, or radioactive materials during remediation.
- Prevent or minimize to the extent possible the spread of petroleum products, hazardous substances, or radioactive materials resulting from remedial activities.
- Report spills to local, state, and federal authorities as required by this plan in accordance with applicable laws and regulations as defined by the Environmental Compliance Lead.

12.2 Scope

This spill response plan shall be implemented to prevent, contain, and report spills of petroleum products, hazardous substances, and radioactive materials at Moab UMTRA Project sites.

12.3 Prevention of Spills

12.3.1 Inspections

The Site Manager shall schedule routine periodic inspections of all equipment used for spill containment and cleanup to ensure availability. Heavy equipment used at the site shall be routinely inspected to reduce the possibility of spills resulting from equipment defects or malfunction.

12.3.2 Training

DOE employees, Contractor employees, and subcontractor field personnel shall be trained in this spill response plan during the Pre-Entry Site Briefing and periodically during Daily Safety Meetings at the job site.

12.3.3 PPE

The H&S Manager shall determine the PPE requirements for use during emergency containment and subsequent cleanup activities associated with a spill of petroleum products, hazardous substances, or radioactive materials.

12.3.4 Spill Response Kit

The H&S Manager shall prepare and maintain Spill Response Kits for use during emergency response to spills. Spill Response Kits shall be assembled and staged at designated locations.

The inventory requirements for the Spill Response Kit are listed in Table 6.

12.4 Procedures for Response to Spills

Note: Immediate Actions are the responsibility of all on site personnel. Supplemental Actions are the responsibility of various organizations and individuals (identified following each action). Supplemental Actions should be carried out as quickly as is reasonable after Immediate Actions are complete. **Prior to responding, assess the situation for life-threatening safety issues. Proceed with the response only if it is safe to do so.**

12.4.1 Response to a Spill of Petroleum Products or Hazardous Substances of Known Composition

Immediate and supplemental actions regarding responses to spills of petroleum products or substances of known composition are detailed below.

Table 6. Spill Response Kit Inventory

Cotton coveralls	Air sample filters
Tyvek coveralls	Plastic bags
Canvas gloves	Plastic bags for radiological material
Nitrile gloves	Duct tape
Chemical gloves	Barrier rope
Cotton glove liners	CA signs
Rubber overshoes	Traffic cones or triangles
Vinyl shoe covers	Absorbent pads
Plastic shoe covers	Bulk absorbent material (kitty litter)
Clip board	Hand soap with pumice
Survey maps	Liquid soap
Pens Cornstarc	h
Marking pen	Scrub brush
Steno pad or substitute	Wash tub
Smears Lon	g-handled shovel

12.4.1.1 Immediate Actions

Immediate actions regarding responses to spills of petroleum products or substances of known composition are as follows:

1. **Stop** or secure the operation causing the spill (e.g., secure a dump gate, upright a container, stop a pump, close a valve).
2. **Warn** others in the area using whatever means are available (e.g., voice, telephone, radio, car horn).
3. **Identify** any other hazards that may be present (e.g., the potential for fire or explosion).
4. **Isolate** the affected spill area and establish control boundaries, if possible.
5. **Contain** the spill to prevent further spread (e.g., by moving soil to create berms and using absorbent material).
6. **Minimize** individual exposure to the spilled product or contaminant.
7. **Move** personnel upwind, upstream, or upgrade.
8. **Notify** the Site Manager, H&S Manager, and Environmental Compliance Manager.

12.4.1.2 Supplemental Actions

Supplemental actions regarding responses to spills of petroleum products or substances of known composition are as follows:

1. Determine the extent of the spill area and verify the adequacy of the control boundaries already established (H&S/Environmental Compliance Lead).
2. Install liners around the spill to stabilize the material and prevent further spread (as directed by H&S/Environmental Compliance Lead).
3. Remove personnel who may have initially responded to the spill without PPE from the spill area (H&S). H&S shall determine appropriate decontamination procedures.
4. Obtain air samples in the affected and adjacent spaces to assess the airborne contaminant concentrations (as directed by H&S/Environmental Compliance Lead).
5. Initiate the reporting requirements as outlined in Section 12.5 of this spill response plan (Site Management/Environmental Compliance).
6. Establish PPE requirements for the spill response team entry (H&S).
7. Develop a follow-up action plan for recovery of the spilled material (responsible contractor or subcontractor). The follow-up action plan for recovery must be documented and reviewed by the Environmental Compliance Lead and approved by the Site Manager.

8. Initiate the spill incident investigation process as outlined in Section 12.6 of this spill response plan (Site Management).

12.4.2 Response to a Spill of Hazardous Substances of Unknown Composition

Immediate and supplemental actions regarding responses to spills of hazardous substances of unknown composition are detailed below.

12.4.2.1 Immediate Actions

Immediate actions regarding responses to spills of hazardous substances of unknown composition are as follows:

1. **Evacuate** personnel in the spill area to a safe distance.
2. **Warn** others in the area using whatever means are available (e.g., voice, telephone, radio, car horn).
3. **Isolate** the affected spill area and establish control boundaries, if possible.
4. **Minimize** individual exposure to the unknown contaminants.
5. **Move** personnel that may be affected by the spill to a position upwind, upstream, or upgrade.
6. **Notify** the Site Manager and H&S.

12.4.2.2 Supplemental Actions

Supplemental actions regarding responses to spills of hazardous substances of unknown composition are as follows:

1. Determine the extent of the spill area and verify the adequacy of the control boundaries already established (H&S/Environmental Compliance Lead).
2. Install liners around the spill to stabilize the material and to prevent further spread (as directed by H&S/Environmental Compliance Lead).
3. Remove personnel who may have initially responded to the spill without PPE from the spill area (H&S). H&S shall determine the appropriate decontamination procedures.
4. Obtain air samples in the affected and adjacent spaces to assess the airborne contaminant concentrations (as directed by H&S/Environmental Compliance Lead).
5. Initiate the reporting requirements as outlined in Section 12.5 of this spill response plan (Site Management /Environmental Compliance Lead).
6. Establish PPE requirements for the spill response team entry (H&S).
7. Develop a follow-up action plan for recovery of the spilled material (responsible Contractor or subcontractor). The follow-up action plan for recovery must be documented and reviewed by the Environmental Compliance Lead and approved by the site manager.
8. Initiate the spill incident investigation process as outlined in Section 12.6 of this spill response plan (Site Management).

12.4.3 Response to a Spill of Radioactive Materials

Immediate and supplemental actions regarding responses to spills of radioactive materials are detailed below.

12.4.3.1 Immediate Actions

Immediate actions regarding responses to spills of radioactive materials are as follows:

1. **Stop** or secure the operation causing the spill (e.g., secure a dump gate, upright a container, stop a pump, close a valve).
2. **Warn** others in the area using whatever means are available (e.g., voice, telephone, radio, car horn).

3. **Isolate** the affected spill area and establish control boundaries, if possible.
4. **Minimize** individual exposure to radiation and contamination.
5. **Move** personnel upwind, upstream, or upgrade. Secure unfiltered ventilation if the spill occurs in an enclosed space where building or area ventilation is in use and may cause the further spread of airborne contamination.
6. **Notify** the Site Manager and Radiological Control Manager.

12.4.3.2 Supplemental Actions

Supplemental actions regarding responses to spills of radioactive materials are as follows:

1. Stabilize the material to prevent further spread (as directed by Radiological Control Manager/Environmental Compliance Lead).
2. Determine the extent of the spill area and verify the control boundaries already established (Radiological Control Manager/Environmental Compliance Lead).
3. Remove personnel who may have initially responded to the spill without PPE from the spill area and survey them for radioactive contamination (Radiological Control Manager).
4. Personnel who are identified as contaminated shall be decontaminated in accordance with the *Moab UMTRA Project Radiation Protection Plan* and the *Moab UMTRA Project Health Physics Plan* wherever applicable.
5. Obtain air samples in the affected and adjacent spaces to assess the airborne radioactive contamination levels (Radiological Control Manager).
6. Initiate the reporting requirements as outlined in Section 12.5 of this spill response plan (Site Management).
7. Establish PPE requirements for the spill response team entry (Radiological Control Manager).
8. Develop and document a follow-up action plan for recovery of the spilled radioactive material (responsible Contractor or subcontractor). The follow-up action plan must be approved by the Site Manager.
9. Initiate the spill incident investigation process as outlined in Section 12.6 of this spill response plan (Site Management).

12.5 Notification and Reporting Requirements

Notifications and reporting steps below shall be conducted according to *Moab UMTRA Project Incident/Occurrence Reporting* (DOE-EM/GJ1549).

12.5.1 Notification Requirements

Notification requirements are as follows:

- All notifications to agencies and organizations other than the Contractor and DOE shall be approved by and coordinated through the Contractor Project Manager and the DOE Public Affairs Specialist.
- The person or persons identifying a spill shall immediately notify the Site Manager of any spill.
- The Site Manager shall notify the Project Manager, H&S Manager, and the Environmental Compliance Lead.
- The Site Manager and the H&S Manager shall classify the spill event in accordance with the Occurrence Reporting and Processing System classification criteria.
- The Site Manager shall verbally report the incident to Contractor management and DOE.

- All petroleum product releases shall be reported to the Environmental Compliance Lead to determine notification or reporting requirements.
- Releases of hazardous substances above the reportable quantity must be verbally reported by the Project Manager to the National Response Center at 1-800-424-8802.

12.5.2 Reporting Requirements

Reporting requirements are as follows:

- All spills or releases of petroleum products, hazardous substances, or radioactive materials must be reported using the Incident Report form (1743), regardless of the quantity of the spill or the activity involved.
- Any quantity of radioactive material with total activity in excess of concentrations listed in 49 CFR 173.436 spilled outside of posted and controlled Radiological Areas while in transport shall be reported to DOE by the Project Manager.

12.6 Spill Incident Investigation

- A critique shall be initiated as soon as practicable following stabilization of the spill.
- If classification of the event or results of the critique indicate that further investigation is required, the Project Manager and the H&S Manager shall initiate additional investigation as required in the Condition Report form (QA-F-031).
- Lessons learned from the critique and investigation shall be formally documented and distributed in an effort to prevent a similar spill. Lessons learned reporting and processing shall be performed in accordance with *Moab UMTRA Project Operating Experience and Lessons Learned* (DOE-EM/GJ1568).

13.0 Confined Space Entry

Confined spaces shall be evaluated and controlled in accordance with *Moab UMTRA Project Confined Spaces* (DOE-EM/GJ1553).

A Confined Space is defined as a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit. For example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.
- Is not designed for continuous employee occupancy.

A Permit-Required Confined Space is a space that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a small cross section.
- Contains any other recognized serious safety or health hazard.

Examples of confined spaces include, but are not limited to: well vaults, tanks, boilers, vessels, bins, manholes, tunnels, pipelines, underground utility vaults, or any open-top space more than

4 feet in depth, such as pits, tubes, trenches, or vessels. The hazards present determine if a permit is required for entry.

14.0 References

The following references directly support the implementation of this HASP and shall be available.

10 CFR 835. Title 10, *Code of Federal Regulations*, Part 835, "Occupational Radiation Protection."

10 CFR 851. Title 10, *Code of Federal Regulations*, Part 851, "Worker Safety and Health Program."

29 CFR 1910. Title 29, *Code of Federal Regulations*, Part 1910, "Occupational Safety and Health Standards – General Industry."

29 CFR 1926. Title 29, *Code of Federal Regulations*, Part 1926, "Safety and Health Regulations for Construction."

49 CFR 173. Title 49, *Code of Federal Regulations*, Part 173, "Shippers – General Requirements for Shipments and Packaging."

ANSI (American National Standards Institute) Standard Z41.1. *Men's Safety Toe Footwear*.

ANSI (American National Standards Institute) Standard Z87.1. *Practice for Occupational and Educational Eye and Face Protection*.

ANSI (American National Standards Institute) Standard Z89.1, Class B. *Safety Requirements for Industrial Head Protection*.

ANSI (American National Standards Institute) Standard ANSI/ISEA (International Safety Equipment Association) 107-2004. *Standard for High-Visibility Safety Apparel and Headwear*.

DOE (U.S. Department of Energy), 1996. *Handbook for Occupational Health and Safety During Hazardous Waste Activities,* Office of Environment, Safety and Health, Office of Environmental Management.

DOE (U.S. Department of Energy), 2004. *Hoisting and Rigging Standard* (formerly *Hoisting and Rigging Manual*) DOE-STD-1090-2004, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 2007. *Hazardous Waste Site Operations* (ES-SH-PR-304), Grand Junction, Colorado, May.

DOE (U.S. Department of Energy), 2007. *Moab UMTRA Project Radiation Protection Plan* (DOE-EM/GJ610), Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Electrical Safety* (DOE-EM/GJ1551), Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Fire Safety* (DOE-EM/GJ1555), Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Incident/Occurrence Reporting* (DOE-EM/GJ1549), Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Lockout/Tagout* (DOE-EM/GJ1552), Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Motor Vehicle Safety* (DOE-EM/GJ1554), Grand Junction, Colorado, February.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Excavation and Trenching* (DOE-EM/GJ1609), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Fall Protection* (DOE-EM/GJ1610), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Hazard Communication Program* (DOE-EM/GJ1605), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Hearing Protection and Conservation* (DOE-EM/GJ1617), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Ladder Inspection and Use* (DOE-EM/GJ1612), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Lifting and Rigging* (DOE-EM/GJ1613), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Occupational Lead Exposure Management* (DOE-EM/GJ1618), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Personal Protective Equipment* (DOE-EM/GJ1619), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Power and Hand Tools* (DOE-EM/GJ1611), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Respiratory Protection* (DOE-EM/GJ1620), Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Waste Management Plan* (DOE-EM/GJ1633), Grand Junction, Colorado, July.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Contractor Roles and Responsibilities* (DOE-EM/GJ3000), Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Operating Experience and Lessons Learned* (DOE-EM/GJ1568), Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Health Physics Plan* (DOE-EM/GJ3003), Grand Junction, Colorado, October.

DOE (U.S. Department of Energy), 2008. *Moab UMTRA Project Confined Spaces* (DOE-EM/GJ1553), Grand Junction, Colorado, December.

DOE (U.S. Department of Energy), 2008. *Radiation Safety Policy* (ES-RS-PO-001), Grand Junction, Colorado.

DOE (U.S. Department of Energy), 2009. *Moab UMTRA Project 851 Worker Safety and Health Program Description* (DOE-EM/GJ3002), Grand Junction, Colorado, January.

DOE (U.S. Department of Energy), 2009. *Moab UMTRA Project Emergency Response Plan* (DOE-EM/GJ1520), Moab Utah, March.

Attachment 1
Moab UMTRA Project Health and Safety Plan Organizational Structure
Key Personnel

The names for personnel critical to site operations are presented in this attachment. Emergency protocols and organizations to be contacted in the event of an emergency are identified in the *Moab UMTRA Project Emergency Response Plan* (DOE-EM/GJ1520).

Position	Name	Phone No.
DOE Personnel		
Federal Project Director[a] Don	ald Metzler	970-257-2115 Cell: 202-834-1820
Deputy Federal Project Director	Joel Berwick	435-719-2820 Cell: 970-370-4727
Facility Representative – Moab/Crescent Jct.	Ken Wethington	435-719-2890 Cell: 970-370-4725
Environmental, Safety, and Health/Quality Assurance Manager	Art Murphy	435-719-2845 Cell: 970-370-4726
Contractor Personnel		
Project Manager (RAC)	Larry Brede	970-257-2117 Cell: 865-621-0752
Moab Site Manager (RAC)	Garth Stowe	435-719-2865 Cell: 509-308-0026
Crescent Junction Site Manager (RAC)	Brent Anderson	435-564-3409 Cell: 801-209-5520
Health and Safety Manager (RAC)	Kris Brey (acting)	435-719-2849 (Moab) 435-564-3425 Cell: 970-778-6372
Radiological Controls Manager (RAC)	Bill Craig	435-719-2867
Ground Water Lead (TAC)	Ryan Moran	435-719-2810 Cell: 435-259-4931
Environmental Compliance Manager (RAC)	Ed Baker	970-257-2112 435-719-2838 (Moab) Cell: 435-260-6177

[a]The DOE Federal Project Director also acts as the DOE Public Affairs Specialist for the Moab UMTRA Project.