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OU III AR 563

P-GJPO-753

MRAP OU III AR 563 4-1 RI/FS
SURFACE AND GROUNDWATER REMEDIAL
INVESTIGATION / FEASIBILITY STUDY H&S PLN 6/92

Monticello Mill Tailings Site
Operable Unit III

Surface- and Ground-Water
Remedial Investigation/Feasibility Stud

Health and Safety Plan

June 1992

Work performed under DOE Contract No. DE-AC04-86ID12584 for the **U.S. Department of Energy**
Grand Junction Projects Office

Chem-Nuclear Geotech, Inc.

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P-GJPO-753
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Chem-Nuclear Geotech, Inc.
Grand Junction, Colorado

Prepared for
U. S. Department of Energy
Albuquerque Field Office
Grand Junction Projects Office
P.O. Box 2576
Grand Junction, Colorado 81502-2567
Under DOE Contract No. DE-AC04-86ID12584

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Monticello Mill Tailings Site
Operable Unit III

Surface- and Ground-Water Remedial Investigation/Feasibility Study

Health and Safety Plan

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1.0 GENERAL INFORMATION

1.1 BACKGROUND

The Monticello millsite is a 78-acre tract located along Montezuma Creek on the south side of the city of Monticello, San Juan County, Utah (Figures 1-1 and 1-2). The mill was constructed in 1942 by the Vanadium Corporation of America (VCA) with funds from the Defense Plant Corporation. The Metals Reserve Company assumed operation of the ore-buying station in April 1942, while the VCA operated the mill. The first vanadium was produced at the new mill on 24 August 1942.

In 1943, VCA began producing a uranium-vanadium sludge for the Manhattan Engineer District (MED), which had recently initiated a program to obtain domestic uranium. The mill was closed in February 1944 but was reopened by VCA from 1945 to 1946 under lease from the Defense Plant Corporation to produce a uranium-vanadium sludge for the MED.

The Atomic Energy Commission (AEC) bought the Monticello millsite from the War Assets Administration in 1948. The mill closed in January 1960, but the ore-buying station remained open until 31 March 1962.

Tailings and other process-related contaminated material were generated as a result of the milling activities at the site between 1942 and 1960. The total volume of tailings, process-related contaminated material, and tailings-contaminated soil at the Monticello millsite is estimated to be 1,500,000 cubic yards. In addition, some properties adjacent to the site (referred to as peripheral properties) are contaminated by residues from the ore stockpiles and dispersed tailings. A number of businesses and residential properties (vicinity properties) in the city of Monticello are contaminated by windblown materials and from the use of mill tailings as construction and fill materials. The estimated amount of contaminated materials at the peripheral properties is 300,000 cubic yards and at the vicinity properties is 100,000 cubic yards.

1.2 MONTICELLO REMEDIAL ACTION PROJECT

In 1978, the U.S. Department of Energy (DOE), under the authority of the Atomic Energy Act, initiated the Surplus Facilities Management Program (SFMP) to ensure the safe caretaking and decommissioning of Government facilities that were retired from service but were still radioactively contaminated.

In 1980, the millsite was accepted into the SFMP and the Monticello Remedial Action Project (MRAP) was established.

In 1983, the remedial activities at the vicinity properties were separated from MRAP with the establishment of the Monticello Vicinity Properties (MVP) Project.

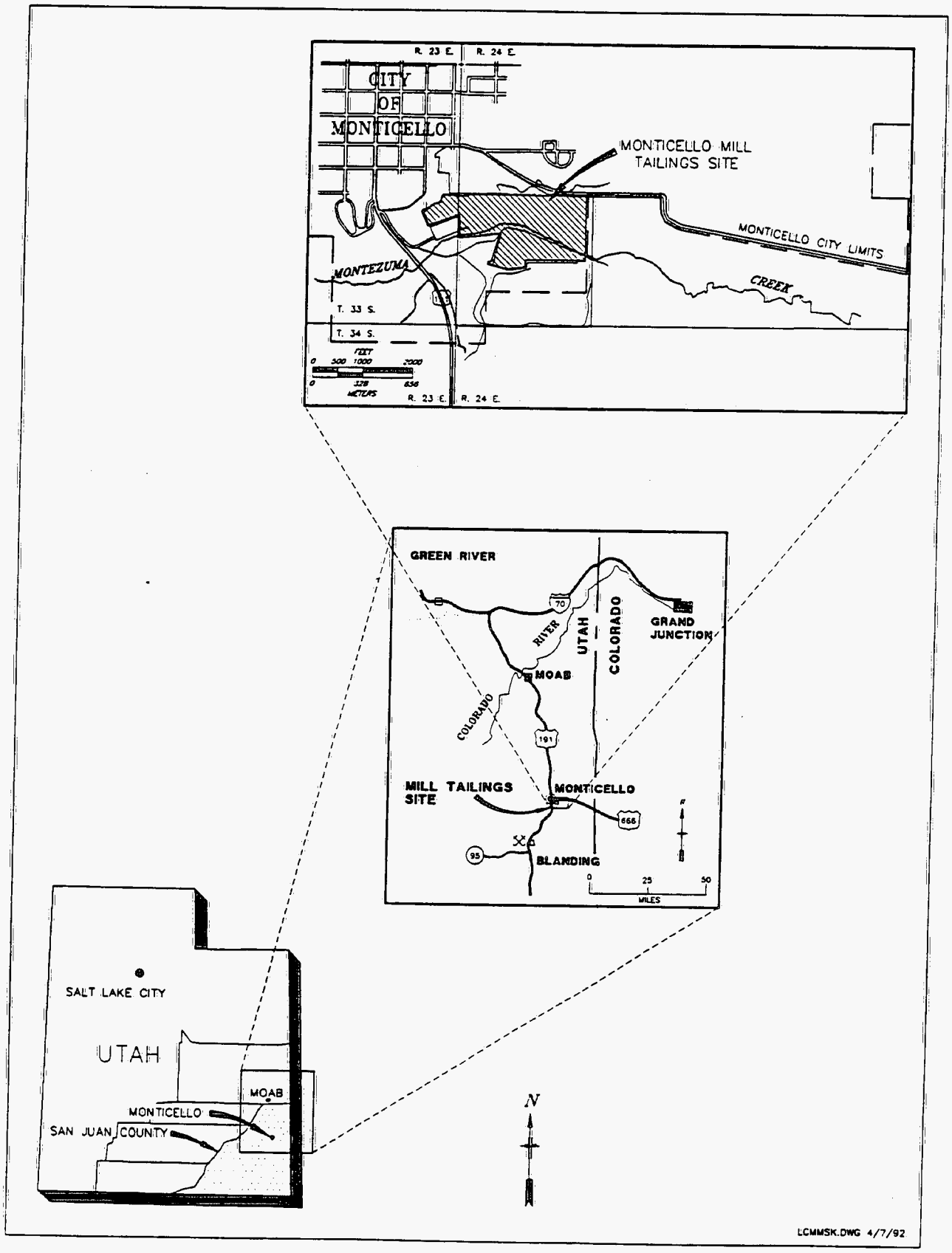

Figure 1-1. Monticello, Utah, Regional Area Map.

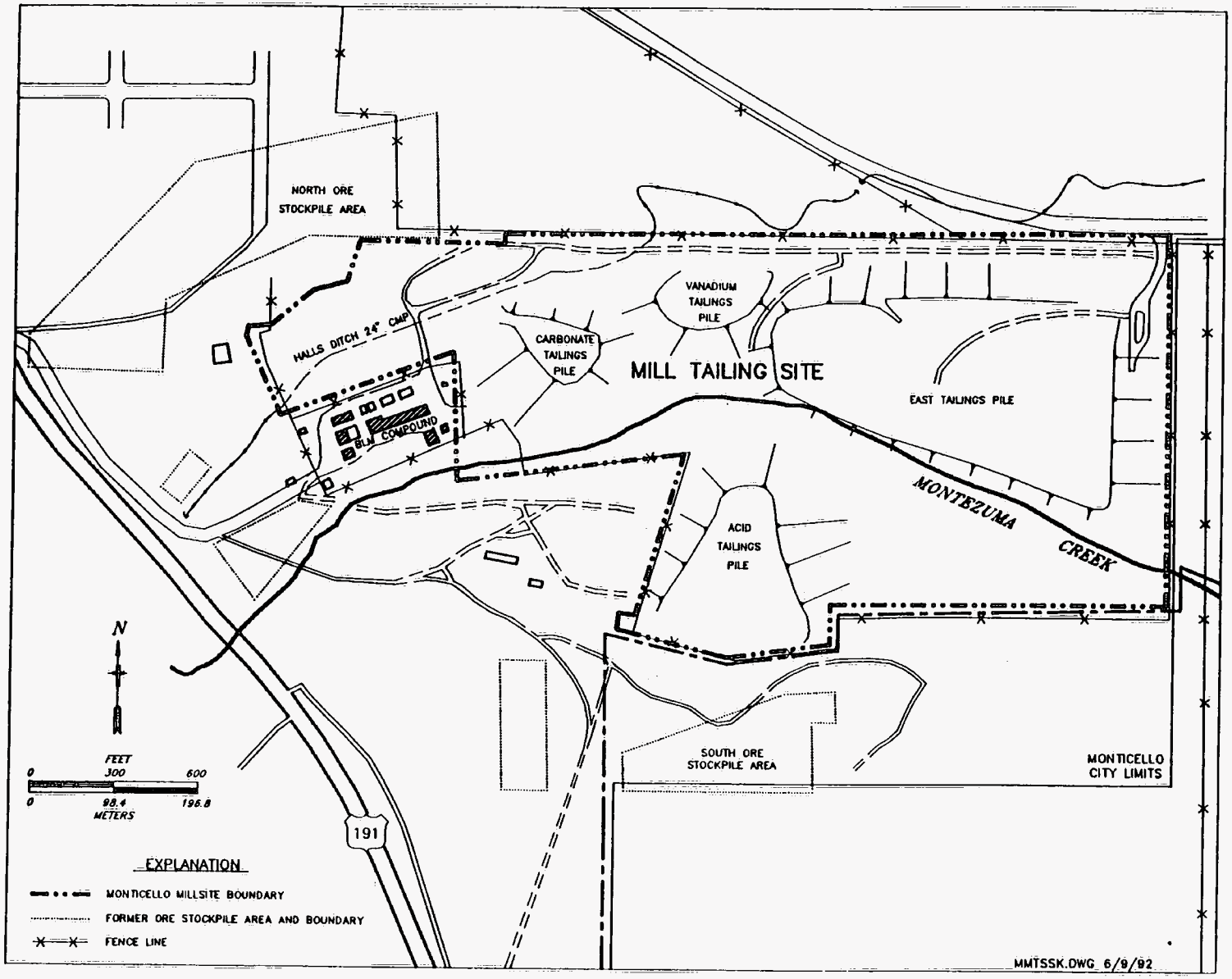

Figure 1-2. Location of the Monticello Mill Tailings Site/ BLM Compound.

The DOE entered into a Federal Facilities Agreement (FFA) with the EPA and the State of Utah in February 1989 to complete the remedial action at the Monticello sites. The Monticello Mill Tailings Site (MMTS) Record of Decision (ROD) was approved by all parties and signed September 1990. The ROD describes the selected remedial action for Operable Unit (OU) I - the Millsite, and OU II - Peripheral Properties. When the ROD was signed, DOE became obligated to commence continuous and substantive remediation 15 months from the date of signature. OU III - Ground Water and Surface Water (the Monticello Surface- and Ground-Water Remedial Action Project) will be addressed in a separate ROD.

In November 1990, the DOE reorganized to consolidate all its environmental restoration and waste management activities into a single office. The SFMP, including MRAP, was thereby incorporated into the newly created Office of Environmental Restoration and Waste Management Decontamination and Decommissioning Branch. The project now resides under the responsibility of the Division of Southwestern Area Programs.

Additional information concerning the history of the MMTS project is in the *Monticello Mill Tailings Site, Operable Unit III, Surface- and Ground-Water Remedial Investigation/Feasibility Study, Work Plan* (P-GJPO-751).

1.3 MONTICELLO SURFACE- AND GROUND-WATER REMEDIAL ACTION PROJECT HEALTH AND SAFETY PROGRAM

MRAP Health and Safety Program Volume I, Programmatic Health and Safety Plan

This project is listed on the U.S. Environmental Protection Agency (EPA) National Priorities List and is within the scope of Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120, Hazardous Waste Site Operations and Emergency Response. The program elements of the Monticello Surface- and Ground-Water Remedial Action Project Health and Safety Program are in the *Monticello Remedial Action Project Programmatic Health and Safety Plan* (P-GJPO-124, Rev. 2).

Surface- and Ground-Water Remedial Investigation/Feasibility Study Health and Safety Plan

This site-specific Health and Safety Plan (HSP) was developed to address the additional employee protection requirements necessary for the performance of surface- and ground-water investigation tasks (well installation, water sampling, etc.) described in the *Monticello Mill Tailings Site, Operable Unit III, Surface- and Ground-Water Remedial Investigation/Feasibility Study (RI/FS), Field Sampling Plan* (P-GJPO-752). Currently this HSP provides the protection requirements for conducting a baseline surface- and ground-water investigation. Subsequent tasks that will be included in the HSP are a feasibility study, environmental assessment, and long-term monitoring. As these tasks are further defined, the HSP will be revised to reflect the protection requirements necessary to conduct these activities.

1.4 PROJECT DURATION AND SCOPE

The surface- and ground-water investigation work is scheduled to start in 1992 and will be conducted to February 1995. This investigation includes installation of monitoring wells upgradient and downgradient to the millsite (upgradient wells are outside the scope of this HSP), collection of water samples from selected surface and well sites, geologic investigations, and environmental assessment. The OU-III *Field Sampling Plan* details exact drilling and water-sampling locations and types of water samples that will be collected for the initial phase of the investigation.

Tasks that are associated with the RI/FS preparation and long-term monitoring (mostly surface- and ground-water sampling activities) will be conducted to 2001, at which time the long-term monitoring tasks will be turned over to the Long-Term Surveillance and Maintenance Program.

1.5 HAZARD ASSESSMENT OVERVIEW

Biological Hazards

Biological hazards expected at the millsite include exposure to insects, reptiles, and small mammals.

Physical Hazards

Physical hazards expected at the millsite include drilling operations, temperature extremes, industrial noise, and heavy construction equipment traffic.

Chemical Hazards

Chemical hazards that may be encountered at the millsite include heavy metal contamination (from the mill tailings), volatile and semivolatile organic compounds, pesticides, and herbicides.

Radiological Hazards

Radiological hazards from the residual radioactive materials are contained in the mill tailings.

While accurate breathing zone data are not available for the drilling and water sampling tasks planned, pre-entry monitoring (see Section 7.2) was conducted and indicate that Immediately Dangerous to Life or Health (IDLH) conditions are not present. Site activities are likely to generate breathing zone concentrations of the hazardous substances that are present to greater than the permissible or published exposure limits. The combined use of feasible engineering controls, work practices, and personal protective equipment (PPE) should prove adequate to maintain worker exposure at or below the applicable limits and as low as reasonably achievable (ALARA).

1.6 HEALTH AND SAFETY PLAN PAGE CHANGES

The information in this plan shall be maintained current with conditions at the project site. A page change notice (PCN) (Figure 1-3) shall be issued to amend the information or requirements in this plan. No other mechanisms (pen-and-ink line outs, Program Directives, etc.) are authorized for use in amending the information or requirements of this plan. When a PCN is issued, the document holder shall install the page change as directed by Records Management. After completing the page change, the document holder shall perform a revision/data check of the plan pages against the Table of Contents. The document holder shall correct immediately any discrepancies noted during the page check.

HSP PAGE CHANGE NOTICE	PCN Nº:
	Effective Date:
	Page of

Site Name:	Site Address:

Reason for the change to be incorporated into the HSP:

Synopsis of the change:

Instructions for inserting the Page Change:

Submitted	Project Manager	Date
Concurrence	Manager, Operational Health and Safety	Date
	Manager, Health safety and Security	Date
Approved	Program Manager	Date

(1/92)

Figure 1-3. Health and Safety Plan Page Change Notice Form

HSP PAGE CHANGE NOTICE

CONTINUATION PAGE

PCN Nº:	
Effective Date:	
Page of	

Site Name:	Site Address:

Reason for the change to be incorporated into the HSP:

Synopsis of the change:

Instructions for inserting Page Change

(1/92)

Figure 1-3 (continued). Health and Safety Plan Page Change Notice Form, continuation page

2.0 KEY PERSONNEL ASSIGNMENTS

2.1 GEOTECH PERSONNEL

The health and safety duties and responsibilities of the following personnel are addressed in the *MRAP Programmatic Health and Safety Plan*, Volume I (P-GJPO-124), Geotech *Health and Safety Manual* (Manual 103); Geotech *Operations Management Policy Manual* (Manual 104); and *HS&S Desktop Procedures Manual* (Manual 303). Table 2-1 identifies the personnel located at the GJPO who provide support for the tasks addressed in this plan. Table 2-2 identifies the personnel located in Monticello, Utah, who perform direct oversight activities during the drilling activities or will perform the water sampling tasks.

Table 2-1. GJPO Geotech Personnel Supporting MMTS, OU III

Position	Name	Phone No.
Denver/Utah Operations Director	Michael C. Butherus	303-248-6332
Decontamination and Decommissioning Programs Manager	Harry A. Perry	303-248-6018
Environmental Services Technical Project Manager	Kristen L. McClellen	303-248-6554
On-Site Field Supervisor	Sam E. Campbell or Designee	303-248-6654
Field Assessments Manager	Richard L. Murri	303-248-6024
Survey and Leasing Manager	Carl A. Freytag	303-248-6285
Health, Safety, and Security Manager	Richard B. Millward	303-248-6022
Occupational Medical Program Manager	M. Tim O'Malley	303-248-6713
Industrial Safety Manager	Michael W. Fullmer	303-248-6074
Radiological and Environmental Safety Manager	Michael D. Sandvig	303-248-6725
Radiological and Environmental Safety Health Physicist	D. Dwaine Brown	303-248-6722
Radiological and Environmental Safety Industrial Hygienist	Mark L. Mullis	303-248-6746
Occupational Health and Safety Manager	Douglas M. Frye	303-248-6717
Occupational Health and Safety Supervisor	Syd F. Pincock	303-248-6708
Occupational Health and Safety Site Coordinator	Syd F. Pincock or Designee	303-248-6654

Table 2-2. Geotech Personnel Assigned to the Monticello Site

Field Assessments		Telephone Number
Land Survey Lead	Fred N. Ruhs	303-248-6288
Responsibilities: • Reports to the Field Services Manager. Directs the Land Surveyors in the performance of the tasks identified. • Establishes the appropriate site control measures for the performance of the tasks identified, using the guidance provided by the Site Health and Safety Coordinator. Ensures that workers follow the engineering controls and personal protection equipment requirements assigned in Section 4.0 of this.		
On-Site Field Supervisor	Sam E. Campbell or designee	Telephone Number 303-248-6654
Responsibilities: • Reports to the MMTS Technical Project Manager. Directs the drilling activities and/or sampling teams in the performance of the tasks identified. • Establishes the appropriate site control measures for the performance of the tasks identified, using the guidance provided by the Site Health and Safety Coordinator. Ensures that workers follow the engineering controls and PPE requirements assigned in Section 4.0 of this plan.		
Health, Safety, and Security Geotech Site Health and Safety Coordinator	Syd F. Pincock or designee	Telephone Number 303-248-6708
Responsibilities: • Reports to the OH&S Supervisor. Responsible for oversight of health and safety requirements at the Millsite/BLM. Advises the On-Site Field Supervisor, Field Services Team Leaders, and drilling subcontractor on all aspects of the site health and safety requirements. Facilitates the pre-entry briefing and site-specific training. • Maintains available copies of the reference materials listed in this HSP, including 29 CFR 1910.120, and the Geotech Manuals 102 and 103, and the HS&S Desktop Procedures Manual. Maintains the documentation of employee medical surveillance as required by Section 6.0 of this plan. • Performs the required monitoring listed in Section 7.0 of this plan. Assists the On-Site Field Supervisor in maintaining the appropriate site control measures as required by Section 8.0 of this plan. Oversees and/or performs decontamination as required by Section 9.0 of this plan.		

3.0 SAFETY AND HEALTH HAZARD ANALYSIS

3.1 PURPOSE OF THE HAZARD ANALYSIS

All chemical and physical agents can produce adverse health effects at some dose or under specific exposure conditions (concentration plus duration). Risk is the *probability* or likelihood that an adverse outcome will occur in a person or group that is exposed to a particular concentration or dose of a hazardous substance. Hazard is the *source* of the adverse effect.

An example of this concept can be illustrated by the chemical benzene. Benzene is an exposure hazard because benzene is the *source* of a particular type of adverse effect — leukemia. Once exposure occurs, the risk of developing leukemia is dependant on the concentration and duration of exposure.

In short, risk is the possibility of loss or injury from a danger and hazard is the source of the danger.

The safety and health hazard analysis evaluates the identified site safety and health hazards on the basis of available data. The hazard analysis subjectively rates the magnitude of the hazards, or potential hazards, so that the appropriate control measures can be implemented to maintain the exposures as low as reasonable achievable. The hazard analysis also establishes exposure monitoring requirements. Monitoring information and subsequent site activities will change the safety and health hazards, to which control measures are accordingly adjusted.

3.2 SAFETY AND HEALTH HAZARD ANALYSIS PROCESS

The safety and health hazard analysis process is explained in the following paragraphs and presented in a flow diagram in Figure 3-1.

Identification of the Operational Tasks — Degree of Exposure

This step defines routes of exposure that will be of concern, along with an indication of the degree to which workers will be exposed to the safety and health hazards while performing the task. For example, tasks that involve a combination of direct contact and inhalation exposure with the hazardous substances found at the project site (hand excavation around utilities) usually presents the potential for higher degree of exposure than tasks that involve only inhalation exposure and no direct contact (excavation using a track-hoe). There may be hazards, like known human carcinogens, where the degree of exposure is not applicable. The "Zero/Low Threshold Default" indicates the magnitude of the hazard is based solely on the toxicity of the hazard and does not consider the degree of exposure. (See Figure 3-1.)

Identification of the Safety and Health Hazards — Toxicity

This step evaluates the toxicity associated with each of the identified hazards. Hazards at a project site can be present in a wide spectrum, from chemical inhalation hazards to

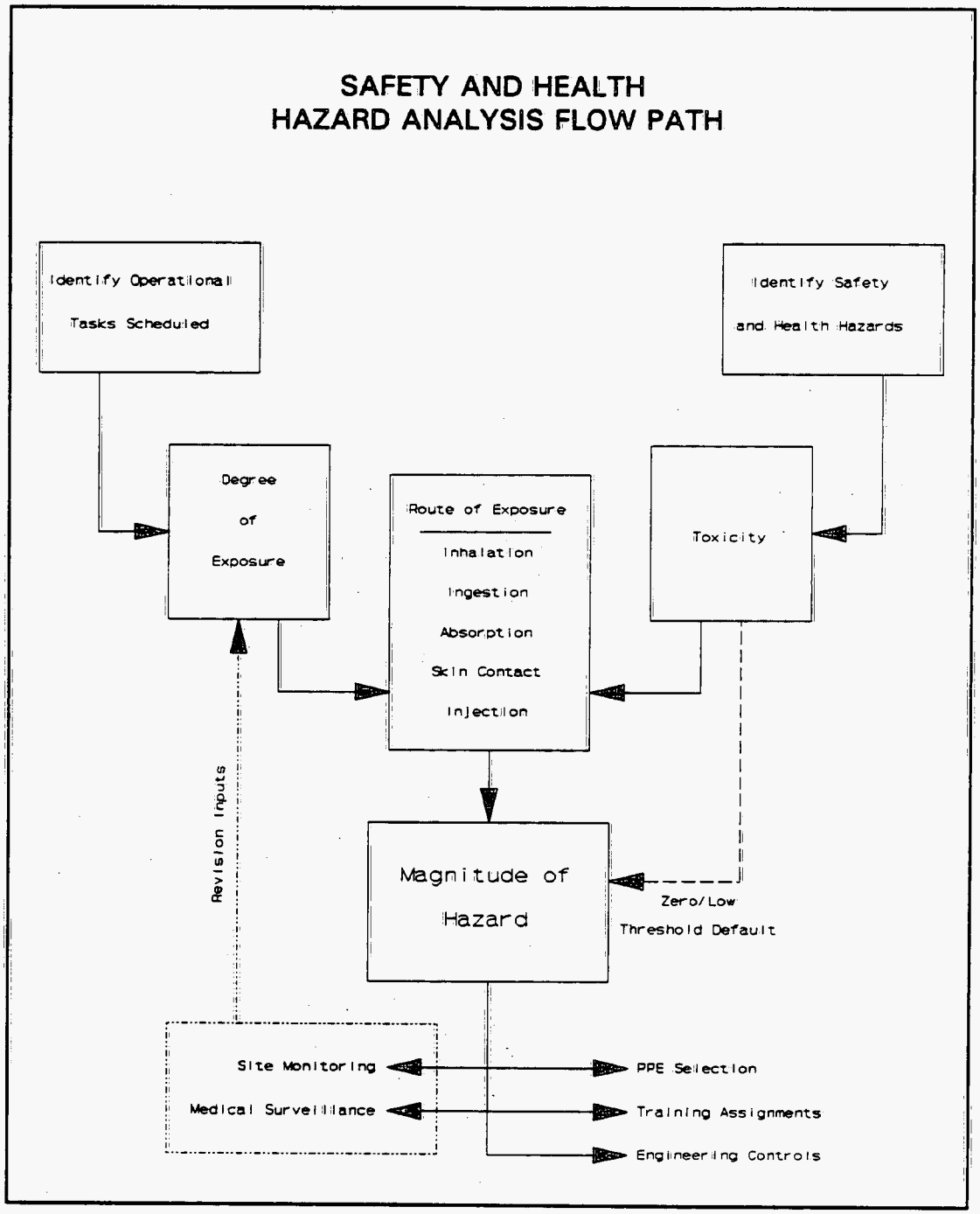

Figure 3-1. Flow Diagram of the Safety and Health Hazard Analysis Process

whole body radiation-exposure hazards. Each hazard has different exposure limitations that are based on the toxicity data available for the hazard.

Selecting the Applicable Route of Exposure

Workers can be exposed to these hazards through either single or multiple routes, depending on the individual hazard, the number of hazards present, and the task performed. For each task identified, the applicable routes of exposure are related to the hazards identified.

Selecting a Subjective Magnitude of Hazard

This step integrates the degree of exposure and the toxicity through the route of exposure. For example, combining a task that generates dusts in the worker's breathing zone in an area where the concentration of the hazard is considered toxic will result in a high magnitude of hazard. This is because the task will very likely produce a worker exposure exceeding the Permissible Exposure Limit (PEL) for the hazardous substance.

Outcome of the Hazard Analysis

Understanding the magnitude of the hazard helps define the degree to which protection from the hazards on the project site must be provided. The completed hazard analysis facilitates the appropriate assignment of project site controls such as training, medical surveillance, PPE, and site monitoring. Subsequent information obtained through exposure monitoring and medical surveillance is used to reevaluate the hazard potential and revise the controls selected.

Physical Hazard Recognition

The safety and health hazard analysis also considers physical hazards for each task. Worker protection requirements are developed on the basis of the presence of the hazard, and control measures are assigned according to the applicable industrial safety or industrial hygiene requirements. Examples of the physical hazards applicable are industrial noise, heat stress, electrical hazards, and confined spaces.

3.3 TASK IDENTIFICATION

3.3.1 Well Installation

Well installation will be completed by a Geotech subcontractor. During the well installations, the Site Health and Safety Coordinator (SHSC) (or OH&S technician under the direction of the SHSC) will perform continuous on-site health and safety oversight; conduct inspections for industrial safety, industrial hygiene, and health physics concerns; perform oversight of equipment decontamination efforts and perform decontamination of personnel; release equipment from contaminated areas; and instruct employees on the site health and safety concerns.

3.3.2 Sample Collection

The sampling locations necessary to establish baseline characterization of the surface- and ground-water at the millsite are listed in Table 4-1 of the OU III Field Sampling Plan. The sample matrix, sampling technique, and analytes for each location is also provided. The OU-III Field Sampling Plan lists the following sampling techniques to be used:

- Submersion of sample bottle, disposable sampler, or peristaltic pump.
- Use of bladder, peristaltic pump, bailer, or submersible pump.

3.4 CHEMICAL HAZARD IDENTIFICATION

3.4.1 Chemical Contaminant Hazards on the Millsite.

Chemical contaminant hazard sources are the heavy metals typically found with the uranium-bearing ores. A wide range of heavy metals is found in the uranium-bearing ores brought to the mill. The milling process was not designed to remove these metals, and, consequently, they passed through the process at the same or higher concentrations than the source material. Sampling performed during the characterization of the millsite (*Final Remedial Investigation/Feasibility Study—Environmental Assessment for Monticello, Utah, Uranium Mill Tailings Site, January 1990* [RI/FS-EA] [DOE/EA-0424] identified heavy-metal contaminants in the tailings piles on the millsite. Table 3-1 provides a summary of concentration mean values for the metals determined from sampling the tailings piles on the millsite. The signs and symptoms of exposure to these metals are in the following sections.:

Antimony and Compounds — **Permissible Exposure Limit - 0.50 milligrams per cubic meter ($mg \cdot m^{-3}$)**

Antimony is not provided a "Skin" designation by OSHA but is considered a primary skin irritant. Lesions may appear on exposed moist areas of the body but rarely on the face. The dust may also irritate the eyes, nose, and throat and may be associated with gingivitis, anemia, and ulceration of the nasal septum and larynx. Symptoms of exposure include coughing and irritation of the nose, throat, and mouth.

Arsenic and Compounds **Permissible Exposure Limit - 0.01 mg · m^{-3}**

Arsenic is considered carcinogenic to humans by the International Agency for Research on Cancer (IARC) and is an OSHA-regulated carcinogen. Arsenic is a skin irritant and may cause dermatitis. Some arsenic compounds, after prolonged contact, are corrosive to the skin. Acute toxic effects of arsenic from inhalation are exceedingly rare. These effects of arsenic are generally seen following ingestion; however, this rarely occurs in the occupational setting. Symptoms of ingestion are constriction of the throat, stomach pains, vomiting, and diarrhea.

Beryllium and Compounds **Permissible Exposure Limit - 0.002 mg · m^{-3}**

Beryllium is considered probably carcinogenic to humans by IARC. Beryllium is a highly toxic substance. Entrance to the body is almost entirely through inhalation. Effects of exposure primarily involve the respiratory tract, such as a nonproductive cough, substernal pain, moderate shortness of breath, and some weight loss. Long-term exposure to beryllium can cause "Chronic Beryllium Disease," which frequently has a latency period from 5 to 10 years.

Cadmium Dust **Permissible Exposure Limit - 0.2 mg · m^{-3}**
Cadmium Oxide Fume **Permissible Exposure Limit - 0.1 mg · m^{-3}**

Cadmium is considered probably carcinogenic to humans by IARC. Cadmium is a respiratory tract irritant. Prolonged exposure can cause olfactory fatigue and a yellow stain that gradually appears on the necks of the teeth. Acute toxic effects of cadmium are almost always caused from inhalation of dusts or fumes when the cadmium is heated. Symptoms include irritation of the upper respiratory tract, coughing, pain in the chest, and sweating.

Chromium Metals and Insoluble Salts **Permissible Exposure Limit - 0.5 mg · m^{-3}**

In some workers, chromium metal acts as an allergen that causes dermatitis to exposed skin. Most cases of toxic effects to exposure to chromium occur in the electroplating industry and during manufacturing processes.

Lead Inorganic Fumes and Dust **Permissible Exposure Limit - 0.05 mg · m^{-3}**

Exposure to lead can be from inhalation of dusts or from skin exposure. Symptoms are non-specific and can be hard to distinguish from minor seasonal illnesses. The symptoms are decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive disorders (particularly constipation), abdominal pains, and decreased appetite.

Mercury and Inorganic Compounds **Permissible Exposure Limit - 0.05 mg · m^{-3}**

Mercury is a primary irritant of the skin and mucous membranes and may also be a sensitizer. Symptoms of exposure include weakness, loss of appetite, loss of weight, insomnia, indigestion, coughing, and chest pains.

Molybdenum and Soluble Compounds **Permissible Exposure Limit - 5. mg · m^{-3}**

Molybdenum exposure can cause irritation of the eyes, and the mucous membranes of the nose and throat.

Nickel and Soluble Compounds **Permissible Exposure Limit - 0.1 mg · m^{-3}**

Nickel is considered carcinogenic to humans by IARC. Skin sensitization is the most common form of toxic reaction to nickel. Inhalation of nickel dusts produce an increased incidence of lung and nasal cancer. The latency period of these cancers is about 25 years.

Selenium Compounds **Permissible Exposure Limit - 0.2 mg · m^{-3}**

The first and most characteristic sign of selenium exposure is a garlic odor of the breath. More subtle and earlier signs of exposure are a metallic taste in the mouth, lassitude, irritability, indigestion, and giddiness.

Silver (Metal and Soluble Compounds) **Permissible Exposure Limit - 0.01 mg · m^{-3}**

Symptoms of exposure to silver are argyria or a permanent pigmentation of the skin.

Thallium Soluble CompoundsPermissible Exposure Limit - 0.1 mg · m^{-3} (skin designation)

Thallium is a skin irritant and a sensitizer, but these symptoms rarely occur in the occupational environment. Thallium is extremely toxic and a cumulative poison. Early symptoms of exposure include fatigue, limb pain, metallic taste in the mouth, and loss of hair.

Vanadium Pentoxide Dust and Fume **Permissible Exposure Limit - 0.05 mg · m^{-3}**

Vanadium compounds, especially vanadium pentoxide, are irritants to the eyes and skin. Symptoms of exposure include watering and burning eyes, a green discoloration of the tongue, and a metallic taste in the mouth. Inhalation of vanadium pentoxide can cause an irritation of the respiratory tract, serous or hemorrhagic rhinitis, sore throat, cough, bronchitis, expectoration, and chest pain; these conditions may result after even brief exposure. More serious exposure can result in pulmonary edema and pneumonia, which may be fatal.

Table 3-1. Summary of Mean Values for Tailings Data from Monticello RI/FS-EA

Element	Mean Concentration (parts per million)					
	Carbonate Pile	Vanadium Pile	East Pile	Acid Pile	All Piles	Sandstone Abundance[a]
Antimony	<1.8	<1.0	<1.0	<1.0	<1.0	0.5
Arsenic	89	52	70	72	71	6.5
Beryllium	<1.4	1.5	<2.0	2.0	1.8	<4
Cadmium	<3.1	3.2	<3.5	2.6	3.0	-
Chromium	52	58	47	33	47	27
Copper	634	590	1964	1656	1134	19
Lead	74	73	107	78	83	14
Mercury	<.06	<.08	<.07	<.10	<.06	.05
Molybdenum	22	17	45	43	32	-
Nickel	31	25	41	42	35	24
Selenium	<1.0	<1.0	<1.0	<2.8	<1.0	-
Silver	<2	<2	<2	<2	<2	.24
Thallium	<2	<2	<2	<2	<2	1
Vanadium	3806	4264	585	1143	2256	64
Zinc	206	169	221	164	190	57

[a] Abundance concentrations are determined from sandstone data listed in the *Handbook of Geochemistry*.

3.4.2 Chemical Contaminant Hazards on the BLM Compound Portion of the Millsite.

The chemical hazards identified during initial site visits and from subsequent sampling are as follows:

Asbestos **Permissible Exposure Limit - 0.2 fibers/cm^3**

Building 2: A half-buried tank on the west end of the building and piping that has asbestos lagging. A crawl space has asbestos-contaminated surface soils. Vinyl asbestos tile (VAT) is used as a floor covering.

Building 6: Piping has asbestos lagging. VAT is used as a floor covering.

Foundation "A": VAT is used as a floor covering.

Volatile Organic Compounds

Floor drains on Foundation "C" contain 1,2,-dichloroethane (1,2-DCA); trichloroethene (TCE); tetrachloroethene (PCE); and ethylbenzene.

Several gasoline/diesel underground storage tanks (USTs) exist on the west end of the BLM compound and contain product.

Polychlorinated Biphenyls (PCBs)

A valve pit in the western-most bay of Building 7 has "oily" soil that may contain PCBs.

3.4.3 Other Chemical Hazards on the MMTS

Silica Quartz

The soil in Eastern Utah has naturally occurring high concentrations of silica quartz (SiO_2).

Carbon Monoxide

Carbon monoxide (CO) levels can exceed the action level during heavy equipment operations and internal combustion operations in confined areas or outdoor areas shielded from the wind.

Consumer Products

Some consumers products will be used in the drilling and sampling activities such as oils and greases for machinery maintenance and the addition of acids and bases to samples for preservation purposes. Material Safety and Data Sheets (MSDSs) will be required at the work site for these consumer products so that chemical hazards can be identified.

3.5 BIOHAZARD AND BIOLOGICAL HAZARD IDENTIFICATION

No historical data exist to indicate that any biohazard associated with medical wastes are a concern at the project site. Biological hazards expected to be found include insects such as black widow spiders and small mammals (prairie dogs). These hazards represent a potential for spreading infectious diseases such as rabies.

3.6 RADIOLOGICAL HAZARD IDENTIFICATION

Residual radioactive material cleanup is the focus of the MRAP. The waste resulting from uranium milling operations, mill tailings, contain several isotopes of concern. These isotopes along with the decay mode and Derived Air Concentration (DAC) limits are provided in Table 3-2. The Manager, OH&S, shall authorize the use of a Default DAC only after calculation approval by the R&ES Health Physicist.

Table 3-2. Typical Radioisotope Contamination for MMTS

Element or Isotope	Decay Type	Derived Air Concentration[a]
Uranium-238	α,β,γ	6×10^{-10} $\mu Ci \cdot mL^{-1}$ (22 $Bq \cdot m^{-3}$)
Radium-226	α,β,γ	3×10^{-10} $\mu Ci \cdot mL^{-1}$ (11.1 $Bq \cdot m^{-3}$)
Thorium-230	α,β	7×10^{-12} $\mu Ci \cdot mL^{-1}$ (259 $mBq \cdot m^{-3}$)
Radon-222	α,β,γ	3×10^{-8} $\mu Ci \cdot mL^{-1}$[b] (1110 $Bq \cdot m^{-3}$)
Default DAC Mixture	α,β,γ	To be determined

[a]Derived Air Concentration listed in DOE Order 5480.11

[b]These values are appropriate for protection from radon combined with its short-lived daughters and are based on IRCP Publication 32 (EPA 520/1-88-020).

3.7 HAZARD ANALYSIS

Chemical, Biological, and Radiological Hazards Analysis

Table 3-3 provides the magnitude of hazard associated with the known chemical, biological, radiological, and physical hazards associated with the performance of the surface- and ground-water drilling and sampling activities at the MMTS.

Controls for the hazards evaluated are established in this plan. When the hazards identified at the MMTS are beyond those evaluated in this plan, the SHSC shall provide any additional controls, that are required immediately by using an approved Radiation Work Permit (RWP) or Safe Work Permit (SWP), according to the Geotech *Health and Safety Manual*, (Manual 103), Procedures 3.11 and 2.4, respectively. Concurrent with the initiation of the SWP/RWP, the Project Manager shall initiate a HSP PCN to include these additional hazards in this plan.

Table 3-3. Hazard Assessment for Each Task

Task Number and Description	Type of Hazard	Magnitude of Hazard	
Well Installation	Chemical	Inhalation	Low
		Absorption	Very Low
		Contact	Low
	Biological	Injection	Very Low
	Radiological	External Exposure	Low
		Internal Exposure	Moderately Low
		Skin Contamination	Moderate
Surface- and Ground-water Sampling	Chemical	Inhalation	Low
		Ingestion	Moderately Low
		Absorption	Moderate
		Contact	Moderately High
	Biological	Injection	Very Low
	Radiological	External Exposure	Low
		Internal Exposure	Moderately Low
		Skin Contamination	Moderate

Industrial Safety Risk Assessment

The physical hazards associated with well installation are discussed in the *Minimum Drilling Health and Safety Requirements for Operation of Small Auger, Rotary, and Core Rigs* (P-GJPO-113). This Health and Safety Plan will be followed during all drilling activities for OU III.

The physical hazards for the sample collection tasks are addressed in the individual procedures specified in the OU III *Field Sampling Plan* and are available in the Geotech *Environmental Procedures Catalog*.

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 PERSONAL PROTECTIVE EQUIPMENT ASSIGNMENT BY TASK

During the well installation, any person having direct contact with soils or performing decontamination shall wear Modified Level D protection. During the sample collection, the sampler shall wear Modified Level D. Any person accessing the millsite shall wear Level D. Detailed PPE assignments, mandatory for Geotech personnel, are listed in Table 4-1. PPE may be upgraded, as necessary, on the basis of site-specific data using an RWP or SWP.

Table 4-1. PPE Levels Assigned by Task

Task		Level of Protection					
		A	B	Mod C	C	Mod D	D
Well Installation	OH&S Technician Environmental Services Technician Drilling Subcontractor Personnel					Table 4-5	
Ground-Water Sampling	Environmental Services Technician					Table 4-4	
Surface-Water Sampling	Environmental Services Technician					Table 4-4	
Millsite Entry	Environmental Services Technician Drilling Subcontractor Personnel						Table 4-3

4.2 ACTION LEVELS

The action levels detailed in Table 4-2 shall be used during the site activities to ensure that the hazards present at the project site are properly evaluated and the correct actions are taken to protect the workers.

Table 4-2. Actions Required for Specific Exposure Monitoring Results

Parameter	Action Level	Action Required
Radiation Dose Rate	> 2 mRem/hr (20 μSv/hr) at 1 ft (30 cm) from source	Follow Geotech *Health and Safety Manual*, Procedures 3.3, 3.11, and 3.33. Also follow *HS&S Desktop* supporting procedures for posting and RWP and TLD requirements.
Surface Contamination	Refer to *Health and Safety Manual*, Manual 103, Procedure 3.5, Figure 2	Follow Geotech *Health and Safety Manual*, Procedures 3.3, 3.7, 3.11, 3.17, and 3.22. Also follow *HS&S Desktop* supporting procedures for posting, RWP, and survey and decontamination requirements.
Airborne Radionuclides	>10% of DAC	Follow Geotech Health and Safety Manual, Procedures 3.3, 3.8, and 3.11. Also follow HS&S Desktop supporting procedures for posting, RWP, bioassay requirements.
	>100% of DAC	Respiratory protection required until engineering controls have shown to be effective.
Metals (as analyzed in closed-face total dust samples)	Action Level = 50% Mixture PEL - or - Single Metal Action Level (all values in mg/m^3) As > 0.005 Ni > 0.025 Be > 0.001 Sb > 0.25 Cd > 0.025 Se > 0.1 Cr > 0.025 Tl > 0.05 Cu > 0.5 V_2O_5 > 0.025 Pb > 0.030 Zn > 5 Mo > 5	Respiratory protection required when breathing zone concentrations are at or above the action level.
VOCs	5 ppm - PID Real Time Analysis (RTA)	Evacuate and evaluate situation. Don APR to monitor area before returning.
CO	17 ppm - GX-86 RTA	Evacuate area. Continuously monitor until CO < 17 ppm.
Silica	0.05 mg/m^3 - Respirable Dust	Don APR. Evaluate engineering controls.
Total Dust	5 mg/m^3 - MiniRam RTA	Don APR. Evaluate engineering controls.
Cold Stress	Ambient Temp. < 30°F Equivalent Chill Temp. < 20°F	Follow current ACGIH TLVs Evaluation and Control Establish current ACGIH TLVs Work-Warming Regimen
Heat Stress (permeable clothing)	Wet Bulb Globe Thermometer (WBGT)	Monitor temperature with a WBGT and initiate work/rest regime to reduce exposure below TLV for work load.

4.3 PPE DEFINED

PPE is defined in this plan by a letter designator that is based on the general level of protection afforded by the ensemble. Because of the diversity of protection requirements, some of these general classifications for protection levels have multiple definitions listed in Tables 4-3 through 4-7. For example, two tasks may require different Modified Level D ensembles or a single task may be performed in areas containing different hazards. The ensemble components required to provide Level D, Modified Level D, Level C, Modified Level C, and Level B protection are listed in Tables 4-3 through 4-8 respectively. In all cases, a qualified OH&S representative will make the proper selection of respiratory protection by completing a Respiratory Selection Checklist. The general classifications are provided below:

Level D

The Level D is the basic work clothing ensemble, used as the minimum level of PPE for work that includes worker-supplied sturdy work pants, long- or short-sleeved shirt, and sturdy work boots. Level D may also include additional industrial safety PPE such as steel-toed shoes, hard hat, safety glasses, or hearing protectors.

Modified Level D

This level of PPE is used during conditions requiring moderate dermal protection and excludes any respiratory protection. PPE includes Geotech-supplied protective gloves, nonpermeable boots, and coveralls.

Level C

This level of PPE is used during conditions requiring moderate dermal and respiratory protection and includes Geotech-supplied protective gloves, nonpermeable boots, Tyvek coveralls, and a properly selected full-face air-purifying respirator.

Modified Level C

This level of PPE is used during conditions requiring a high level of dermal protection and moderate respiratory protection, and includes Geotech-supplied protective gloves, nonpermeable boots, poly-coated Tyvek coveralls, and a properly selected full-face air-purifying respirator.

Level B

This level of PPE is used during conditions requiring a high level of dermal and respiratory protection and includes Geotech-supplied protective gloves, nonpermeable boots, poly-coated Tyvek coveralls, and a properly selected full-face airline respirator or self-contained breathing apparatus.

Table 4-3. Level D PPE Defined

Route of Exposure	Protection Requirement	Type of PPE
Respiratory	No	
Head	Yes[a]	Hard Hat meeting ANSI Z89.1.
Eyes	Yes[a]	Safety glasses (with side shields) meeting ANSI Z87.1.
Ears	No	
Face	No	
Hands	Yes[a]	Leather or sturdy cotton work gloves.
Arms	Yes	Employee-supplied long- or short-sleeved work shirt.
Trunk	Yes	Employee-supplied long- or short-sleeved work shirt.
Legs	Yes	Employee supplied work pants.
Feet	Yes	Sturdy sole work boot meeting ANSI Z41.1-75.

[a]As assigned by the SHSC, based on specific tasks and site conditions.

Table 4-4. Modified Level D PPE Defined

Route of Exposure	Protection Requirement	Type of PPE
Respiratory	No	
Head	Yes[a]	Hard hat meeting ANSI Z89.1.
Eyes	Yes[a]	Safety glasses (with side shields) meeting ANSI Z87.1.
Ears	No	
Face	No	
Hands	Yes	Latex gloves
Arms	Yes[a]	Saranex or similar material sleeves will be worn.
Trunk	Yes[a]	Laboratory apron will be worn.
Legs	Yes[a]	Laboratory apron will be worn.
Feet	Yes	Rubber overshoes will be worn over sturdy sole, smooth leather upper, work boot (meeting ANSI Z41.1-75); -or - Bata Hazmax, Polyblend, or Superpoly boots will be worn.

[a]As assigned by the SHSC, on the basis of specific tasks and site conditions.

Table 4-5. Modified Level D PPE Defined.

Route of Exposure	Protection Required?	Type of PPE
Respiratory	No	
Head	Yes[a]	Hard hat meeting ANSI Z89.1
Eyes	Yes	Safety glasses (with side shields) meeting ANSI Z87.1
Ears	Yes[a]	Earplugs during drilling activities only.
Face	No	
Hands	Yes	Leather, sturdy cotton, and/or latex gloves when handling a contaminated soil sample.
Arms	Yes	Coveralls of cotton or similar material will be worn.
Trunk	Yes	Coveralls of cotton or similar material will be worn.
Legs	Yes	Coveralls of cotton or similar material will be worn.
Feet	Yes	Rubber overshoes will be worn over sturdy sole, smooth leather-upper, work boot (meeting ANSI Z41.1-75); or Bata Hazmax, Polyblend, or Superpoly boots will be worn.

[a] As assigned by the SHSC, on the basis of specific tasks and site conditions.

Table 4-6. Modified Level D PPE Defined.

Route of Exposure	Protection Required?	Type of PPE
Respiratory	No	
Head	Yes[a]	Hard hat meeting ANSI Z89.1
Eyes	Yes	Safety glasses meeting ANSI Z87.1
Ears	No	
Face	No	
Hands	Yes	Nitrile gloves (> 10 mil) will be worn.
Arms	Yes	Coveralls of Tyvek or similar material will be worn.
Trunk	Yes	Coveralls of Tyvek or similar material will be worn.
Legs	Yes	Coveralls of Tyvek or similar material will be worn.
Feet	Yes	Rubber overshoes will be worn over sturdy sole, smooth leather-upper, work boot (meeting ANSI Z41.1-75); or Bata Hazmax, Polyblend, or Superpoly boots will be worn.

[a] As assigned by the SHSC on the basis of specific tasks and site conditions.

Table 4-7. Level C PPE Defined

Route of Exposure	Protection Requirement	Type of PPE
Respiratory	Yes	Full-face air-purifying respirator (APR).
Head	Yes[a]	Hard hat meeting ANSI Z89.1.
Eyes	Yes	Full-face air purifying respriator.
Ears	No	
Face	Yes	Full Face Air Purifying Respirator
Hands	Yes	Nitrile gloves (> 10 mil) will be worn.
Arms	Yes	Coveralls of Tyvek or similar material will be worn.
Trunk	Yes	Coveralls of Tyvek or similar material will be worn.
Legs	Yes	Coveralls of Tyvek or similar material will be worn.
Feet	Yes	Rubber overshoes will be worn over sturdy sole, smooth leather-upper, work boot (meeting ANSI Z41.1-75); or Bata Hazmax, Polyblend, or Superpoly boots will be worn.

[a]As assigned by the SHSC on the basis of specific tasks and site conditions.

Table 4-8. Modified Level C PPE Defined

Route of Exposure	Protection Requirement	Type of PPE
Respiratory	Yes	Full-face APR.
Head	Yes[a]	Hard hat meeting ANSI Z89.1.
Eyes	Yes	Full-face APR.
Ears	No	
Face	Yes	Full-face APR.
Hands	Yes	Nitrile gloves (> 10 mil) will be worn.
Arms	Yes	Coveralls of Saranex or poly-coated Tyvek or similar material will be worn.
Trunk	Yes	Coveralls of Saranex or poly-coated Tyvek or similar material will be worn.
Legs	Yes	Coveralls of Saranex or poly-coated Tyvek or similar material will be worn.
Feet	Yes	Rubber overshoes will be worn over sturdy sole, smooth leather-upper, work boot (meeting ANSI Z41.1-75); or Bata Hazmax, Polyblend, or Superpoly boots will be worn.

[a] As assigned by the SHSC, on the basis of specific tasks and site conditions.

5.0 TRAINING PROGRAM

Information about safety hazards at the site and instruction on the requirements of the Health and Safety Plan will be given to on-site workers. Training addresses the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200); OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120); and DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

5.1 PRE-PROJECT TRAINING

All Geotech field and subcontractor personnel will be properly trained in health and safety regulations associated with radioactive and hazardous materials and the safe operation of equipment. All employees will receive hazardous communication training, a minimum of 40 hours of initial off-site Hazardous Waste Site Operations (HWSO) Training (HS 201), Radiation Worker Training (HS 101), and Standard First Aid Training (HS 201). On-site supervisors must complete at least 8 additional hours of specialized training in HWSO supervisory training for hazardous waste operations (HS 201). This training includes familiarization with safety and emergency procedures. Employees will also receive 3 days of on-the-job training (HS 206) and documentation of this training. The appropriate refresher course, Radiation Worker Training Refresher (HS 103) or Hazardous Waste Site Refresher (HS 203), must be taken when 1 year has lapsed since HS 101 or HS 201 training has been received. All training documentation will be made available for verification and will follow procedures in the Geotech *Health and Safety Manual* (Manual 103), Sections 9.1, 9.2, and 9.3.

All subcontractor personnel will also be required to complete a certified 40-hour Hazardous Waste Site Operation Training course within the last year or an 8-hour refresher course. At least one member of each drill crew, who will be in full attendance, will have completed an OSHA approved 8-hour Hazardous Waste Site Supervisor course. In addition, at least one member of the drill crew must have completed a certified Red Cross First Aid and Cardiopulmonary Resuscitation (CPR) training course. Because the drilling site may have low-level radioactive tailings deposited in the areas to be drilled, all subcontractor personnel must attend a 4-hour Geotech Radiation Worker Training class (HS 201). Current documentation of each subcontractor employee's training shall be presented to and must be approved by Geotech OH&S prior to commencement of any work.

5.2 PRE-ENTRY PROJECT SITE-SPECIFIC TRAINING AND READINESS REVIEW MEETING

Training specific to the project (OU III) is an integral part of the overall preparation for work. OSHA 1910.120 requires that a "pre-entry briefing" be provided as part of the Health and Safety Plan. This "pre-entry briefing" will be required by all employees and subcontractors that perform work on the project site for OU III. Outlined in this section is the project site-specific training that is needed to meet this requirement. A readiness

review will be held to determine if the project is ready to commence. Adequacy of the site-specific training outlined in this section is an important part of the readiness review. The readiness review checklist will be used to document pre-entry project site-specific training and pre-project training, as well as other aspects of the project and will bear the signature of the OH&S supervisor and the assigned OH&S technician.

Relevant aspects of project site-specific training are

- Training for all on-site workers prior to the commencement of site activities;
- Training for new workers prior to accessing Controlled Areas or entering the Decontamination Zone;
- Names of personnel and alternates responsible for project health and safety;
- Safety, health, and other hazards present on the project site;
- Proper application of PPE;
- Approved Standard Operating Procedures (SOPs) and Emergency Response Actions;
- Safe use of engineering controls, methods of posting controlled areas; and
- Requirements of the Program, Health and Safety Plan, and any addenda.

5.3 VERIFICATION OF TRAINING

Employee Responsibilities

Employees shall check with their line managers to ensure the required training is completed for their assigned duties and responsibilities prior to commencing those tasks. Employees shall ensure that their training is kept up to date, which include ensuring that their Training Record (GJPO 1761) is updated immediately after training has been received.

Line Manager Responsibilities

Line managers shall ensure that only qualified and properly trained personnel perform assigned work according to the Geotech *Management Policy Manual* (Manual 100), Section 14, and Geotech *Health and Safety Manual* (Manual 103), Policy 1.

On-Site Field Supervisor Responsibilities

The On-Site Field Supervisor shall maintain an up-to-date Site Briefing List of personnel who have completed the Millsite Pre-Entry Briefing. During the pre-entry briefing, the

training requirements for site entry shall be reviewed. The On-Site Field Supervisor shall instruct the millsite guard to deny access to any employee unless (1) the employee's Training Record (GJPO 1761) documents that the correct training has been completed and has not expired and (2) the employee's name is listed on the site briefing list.

Both the On-Site Field Supervisor and SHSC shall conduct spot checks of personnel training records. Any untrained employee shall be immediately expelled from the millsite. Should there be an occurrence of unauthorized access, the On-Site Field Supervisor shall initiate the Off-Normal Events reporting process according to the Geotech *Health and Safety Manual*, Section 7. The reporting category for this incident is "Off-Normal Occurrence".

Documentation of site briefings shall be forwarded to Geotech Training and Employee Development Section for filing.

6.0 MEDICAL PROGRAM

6.1 PHYSICAL EXAMINATION

As required by Geotech's policies and procedures, Geotech personnel on site will have successfully completed a pre-placement or periodic/update physical examination. This examination complies with OSHA 29 CFR 1910.20, 1910.120, and 1910.1000 requirements for hazardous-waste-site operations.

The Geotech Medical Surveillance Program examinations comply with 29 CFR 1910.120 and consist of

- Medical and Occupational History Questionnaire (a detailed questionnaire for new employees, a short questionnaire for employees who have previously completed the longer questionnaire)
- Physical Examination
- Complete Blood Count with Differential
- SMAC 23 (Blood Test)
- Urinalysis (dipstick and microscopic)
- Chest X-Ray, as clinically indicated
- Pulmonary Function Test (FEV/FVC)
- Audiogram
- 12-Lead Electrocardiogram
- Visual Acuity Test
- Baseline Tests for Heavy Metals
- Baseline Radiological Bioassay

Physical examination of Geotech employees will be conducted by a physician who can demonstrate experience in occupational medicine. Written verification of the examination will be provided to a representative of the Geotech Occupational Medical Program prior to commencement of on-site work.

Subcontractor personnel working on the site who have the potential for being exposed to hazardous materials will have successfully completed an examination equal to the pre-placement physical as specified by OSHA 29 CFR 1910.120 requirements for hazardous-waste site operations. In addition, a physician's statement is required for all

subcontractor employees certifying completion of the medical surveillance. The physician's statement shall include the physician's printed name, license number, the State where the license was issued, and the physician's signature. This certification shall be presented to Geotech immediately after a "Notice of Award" is given to the subcontractor.

6.2 MEDICAL SURVEILLANCE

Employee Responsibilities

Employees shall check with OMP to ensure they have met the required medical surveillance protocols for their assigned job duties and responsibilities prior to commencing those tasks. In addition to completing all medical surveillance protocols designated by the OMP Manager, employees shall complete Occupational Medical Program Information (Form 1763) before access to the millsite is permitted.

Line Management Responsibilities

Line managers shall ensure that subordinate employees have completed the medical surveillance requirements before allowing those employees to access the millsite.

Manager, OMP, Responsibilities

The Manager, OMP, shall ensure a weekly access list of the personnel who have completed the designated medical surveillance protocols. This list shall be kept current.

On-Site Field Supervisor and SHSC Responsibilities

The On-Site Field Supervisor shall instruct the millsite guard to deny access to any employee unless the employee's name appears on the current Millsite Medical Surveillance List.

When the List is not up to date (i.e., an employee has completed a required medical surveillance protocol since the last update), the On-Site Field Supervisor or SHSC shall update the list manually after obtaining verbal verification from the Manager, OMP.

Both the On-Site Field Supervisor and SHSC shall conduct spot checks for personnel medical surveillance requirements. Any employee not meeting the designated requirements shall be immediately expelled from the millsite. For each occurrence of unauthorized access, the On-Site Field Supervisor shall initiate the Off-Normal Events reporting process according to the Geotech *Health and Safety Manual*, Section 7. The reporting category for this incident is "Off-Normal Occurrence".

7.0 EXPOSURE MONITORING

7.1 EQUIPMENT AND INSTRUMENTATION

The procedures for the operation and maintenance of real-time direct-reading air monitoring instruments and personal sampling equipment for radiological and industrial hygiene parameters are in the *HS&S Desktop Procedures Manual* and the Geotech *Health and Safety Manual* (Manual 103).

7.2 MONITORING STRATEGY

Pre-Entry Monitoring

Pre-entry monitoring shall be conducted during the Initial Site Visit to the drilling and sampling sites. When warranted, air monitoring shall be conducted to identify any IDLH conditions, exposure over the permissible exposure limit or published exposure levels, and cumulative exposure to radiation or other dangerous conditions such as flammable or oxygen-deficient environments.

Initial Characterization Monitoring (nonradiological)

The SHSC shall conduct initial air monitoring to characterize the exposures for each drilling and sampling activity. The scope of this monitoring shall be based on the results of the pre-entry monitoring. Characterization monitoring, of suspected or identified hazards, will be conducted according to Table 7-1 and shall continue until at least three 8-hour samples have been collected, analyzed, and reported. Real-time analysis (RTA) instrumentation should be used whenever feasible. Documentation of RTA readings must be provided for the three 8-hour monitoring periods in sufficient intervals to support the breathing zone sampling data collected.

Characterization is not complete until results are confirmed by R&ES and documentation of this characterization is available at the project site through the SHSC. The SHSC shall maintain the documentation and make it available to the workers throughout the duration of a task.

Initial characterization monitoring shall be conducted on those workers who represent the highest exposure potential for that job classification. The number of workers included in the air monitoring shall be expanded from only high-risk workers to additional workers when exposures are suspected of exceeding action limits.

Periodic Monitoring (nonradiological)

Periodic air monitoring of hazards identified during the characterization monitoring shall be conducted after initial air monitoring has been completed. Periodic monitoring

Table 7-1. Monitoring Requirements

Type	Method	Location	Frequency
Radiation Dose Rate	Tissue Equivalent Survey Meter	At and within the general area boundaries	See Section 7.2
Radiological Surface Contamination	Survey Meter	All personnel shall be frisked prior to release from control point boundary. All tools and equipment shall be surveyed prior to release from control point boundary.	See Section 7.2
Radiological Surface Contamination	Survey Meter	Work area and area boundaries	See Section 7.2
Airborne Radioparticulates	Personal 37mm Cassette Sample	Breathing zone of up to 50% of all workers subject to highest levels.	See Section 7.2
Airborne Radioparticulates	37mm Cassette Sample	Area sample at boundary of posted airborne radioactivity area	See Section 7.2
Metals	Personal 37mm Cassette Sample per Total Dust	Breathing zone of workers subject to highest levels	Initially and Periodically
Organic Vapors	1) PID/FID 2) Various Integrated Sampling Methods	Breathing zone of workers subject to highest levels	Initially and Periodically
Respirable dust	10-mm Cyclone	Breathing zone of workers subject to highest levels	Initially and Periodically
Respirable Dust	Miniram	Air sampling representative of the breathing zone of workers subject to highest levels	Initially and Periodically
Heat Stress	WBGT	Area	As needed
Cold Stress	Calibrated Thermometer	Area	As needed

shall be conducted once each 10 working days for each job category until the completion of the task. The results of periodic monitoring are intended to be used to confirm the initial characterization of project site hazards.

Periodic air monitoring shall be discontinued and initial characterization monitoring shall be reestablished should any of the following conditions occur:

- Initial characterization conditions significantly change; for example, the change of seasons from summer to winter.
- When work begins on a portion of the project site that has different characteristics.
- When contaminants other than those previously identified are being handled.
- When a different type of operation or task is initiated.
- When workers are performing tasks in areas of obvious liquid contamination.

Radiological Monitoring

During the Initial Site Visit to the sampling locations, area radiological monitoring for surface contamination, radiation levels, and tissue-equivalent air dose rates shall be performed in sufficient detail to characterize the exposure. Radiological areas shall be established, as required by the Geotech *Health and Safety Manual* (Manual 103), Procedure 3.3.

Periodic area radiological monitoring shall be performed to identify any significant changes in exposure levels inside and at the boundaries of posted radiological areas. Periodic monitoring of radiological areas is conducted for routine intervals independent of the previous characterization data obtained. Periodic air monitoring for airborne radioactivity shall be performed during all work in areas where there is a potential to exceed the airborne-radioactivity action levels.

8.0 PROJECT SITE CONTROL

8.1 INTRODUCTION

The site controls established shall be in accordance with the *Monticello Remedial Action Program Health and Safety Plan (Volume 3) for Characterization of the Millsite and BLM Compound*, (P-GJPO-124.3, Rev. 2). The following information is provided as a reference to the controls that must to be established.

8.2 SITE MAP

The On-Site Field Supervisor shall have documentation that is accessible to all drilling and/or sampling personnel who have a "site map" of the project site; the site map will show the following locations:

1. First Aid Stations
2. Evacuation Routes
3. Fire Control Equipment
4. Communications Equipment
5. Emergency Services

8.3 WORK ZONE DEFINITIONS AND POSTING REQUIREMENTS

8.3.1 Posted Radiological Area or Exclusion Zone

A Radiological Area and an Exclusion Zone are areas that contain safety or health hazards and could expose workers could be exposed to hazardous substances at or above the published or permissible exposure limits.

Radiological Area

A Radiological Area is a generic term used to describe any posted and barricaded area within a Controlled Area where specific radiological hazards exist. Examples of specific Radiological Areas are provided in the Geotech *Health and Safety Manual* (Manual 103), Procedure 3.3.

Exclusion Zone

An Exclusion Zone is a generic term used to describe any posted and barricaded area within a Contamination Reduction Zone where industrial hygiene hazards exist. When an area contains hazards that warrant posting as both a Radiological Area and an

Exclusion Zone, it will be posted as a Radiological Area.

8.3.2 Buffer Areas Around Posted Radiological Area or Exclusion Zone

Controlled Area

A Controlled Area is any posted and barricaded area to which access is managed to protect individuals from exposure to radiation and/or radioactive materials.

Contamination Reduction Zone

A Contamination Reduction Zone is any posted and barricaded area to which access is managed to protect individuals from exposure to industrial hygiene hazards.

Decontamination Corridor

A Decontamination Corridor is a posted and barricaded area within the Controlled Area or Contamination Reduction Zone where all decontamination of personnel and equipment will be performed. Access and egress for the Radiological Area or Exclusion Zone shall be through a control point established at the Support Zone end of the Decontamination Corridor.

8.3.3 Security Areas Around Posted Buffer Areas

Support Zone or Property Protection Area

The Support Zone or Property Protection Area is any posted and barricaded area to which access is limited or controlled to maintain physical security of the area. In this area, workers should not be exposed to safety or health hazards or hazardous substances at or above the published or permissible exposure limits.

8.4 Work Zone Establishment

Work Zones (with adequate barricades at the boundaries) must be established, as necessary, to provide protection for untrained and/or unprotected personnel. The SHSC shall assist the On-Site Field Supervisor to establish proper controls by

1. Directing the proper placement of all control barricades at the drilling and sampling locations, including the placement of the Radiological Area and/or Exclusion Area boundaries. The SHSC must approve changes to the established boundaries.

2. Directing the establishment of a Control Point at the end of the decontamination corridor. Proper operation of the Control Point will control the flow of personnel and equipment in and out of the Radiological Area and/or Exclusion Area.

3. Communicating the entry requirements for a Radiological Area and/or Exclusion Area to all personnel at the project site.

4. Maintaining the Hazardous Materials Access Log for the project.

8.5 SITE COMMUNICATIONS

Table 8-1 lists the systems that will be used to provide communications at the project site.

Table 8-1. Communications System

Type of Communication	Method	Use
Direct	Radio - Construction Base	Routine communication between the field team members and the Geotech facilities
	Megaphones	Face-to-face communication in areas where background noise inhibits voice communication.
Noise Makers	Air Horn	Evacuation signal
Visual Signals	Hand Signals	Secondary evacuation signal
	Vehicle Headlights	Secondary evacuation signal

Additional emergency communication procedures information is in Section 10, "Emergency Response" of this HSP.

8.6 SAFE WORK PRACTICES

The SHSC shall ensure that the "buddy system" is used for all operations at the project site, according to the Geotech *Health and Safety Manual* (Manual 103), Procedure 2.6.

The SHSC shall maintain the following procedural manuals to be used at the project site for Standard Operating Procedures:

1. Geotech *Health and Safety Manual* (Manual 103)

2. *HS&S Desktop Procedures Manual*

8.7 VISITOR

General

The term "Visitor" as used in this section cannot be applied to any Geotech employee. Examples of visitors are Geotech clients, Federal/State regulatory officials, parent corporation employees, etc.

As the primary remedial action contractor, Geotech has accepted protecting the safety and health of visitors during project site visits. However, the extent of the activities during a project site visit shall be limited to (1) observation of activities and (2) review of documentation.

Visitor Access at the Project Site Outside of Hazardous Areas

Visitor access shall normally be restricted to the Support Zones (outside any Controlled Area\Contamination Reduction Zone boundary). This will prevent the visitors from being exposed to the hazardous substances present. Visitors shall be escorted by a Geotech Supervisor at all times. Visitors shall participate in the site-specific training provided to the workers that details the following information:

- Names of personnel and alternates responsible for site safety and health;
- Safety, health, and other hazards present on the project site;
- Work practices by which the visitor can minimize risks from hazards;
- Safe use of engineering controls and equipment on the project site;
- Recognition of symptoms and signs that might indicate overexposure to hazards; and
- The contents of *Emergency Response Plan*.

Visitor Access into Hazardous Areas

Visits should very rarely involve access into areas where the visitor will or may be exposed to the hazardous substances found at the Monticello Mill Tailings Site. Allowing a visitor to become exposed to hazardous substances violates the requirements established by the Geotech ALARA Program and good industrial hygiene practices.

There may be times when a visitor, because of requirements of a visit, absolutely must access an area where exposure will or may occur. Geotech has established the following minimum requirements, which include (1) Access Authorization, (2) Training, and (3) Medical Surveillance, to protect the safety and health of the visitor in this instance.

Access Authorization

The D&D Program Manager must insure that there is adequate reasoning for the visitor to be exposed or potentially exposed and that visitor access must be provided. The D&D Program Manager shall provide written authorization to SHSC to permit access. Access will be provided only after receipt of documentation of training and medical surveillance, in conjunction with the access authorization. Visitors and their escorts shall sign the Visitor's Log before accessing any designated site.

Training

In the event a person, normally termed a visitor, needs to perform work at the site requiring Level C or higher PPE, Geotech will document the satisfactory completion of training, as required by OSHA 29 CFR Part 1910.120(e). This visitor training will consist of the following steps:

- Provide Geotech with a certificate for either 24 or 40 hours of off-site instruction to show compliance with 29 CFR 1910.120(e)(3).

- Complete Geotech-facilitated "Introduction to Radiation Safety" and complete a Visitor Dosimetry Issue Form (GJPO Form 1772) to show compliance with DOE Order 5480.11.

- Complete Geotech facilitated "site-specific" training to show compliance with 29 CFR 1910.120(e)(2), which provides the required pre-entry briefing in compliance with 29 CFR 1910.120(b)(4)(iii).

- Complete Geotech-facilitated "Hazard Communication" training to meet 29 CFR 1910.1200(h)(2).

- During the first 8 or 24 hours at the project site, the On-Site Field Supervisor will document "actual field experience" training under his\her direct supervision to meet 29 CFR 1910.120(e)(3).

Medical Surveillance

Geotech will support the Medical Surveillance Program requirements, if one is established, by providing the visitor's employer with the following information:

- The nature, level, and degree of exposure likely as a result of participating in the site operations to meet compliance with 29 CFR 1910.120(i)

- The monitoring data gathered during the visit that represent the visitor's exposure levels, including radiation dose information.

- A description of the PPE used by the visitor.

Medical Surveillance

Geotech will support the Medical Surveillance Program requirements, if one is established, by providing the visitor's employer with the following information:

- The nature, level, and degree of exposure likely as a result of participating in the site operations to meet compliance with 29 CFR 1910.120(i)
- The monitoring data gathered during the visit that represent the visitor's exposure levels, including radiation dose information.
- A description of the PPE used by the visitor.

9.0 DECONTAMINATION

9.1 PPE AND PERSONNEL DECONTAMINATION

PPE worn during on-site work activities shall not be worn outside the Decontamination Corridor. All personnel shall use the step-off decontamination sequence, listed in Tables 9-1 through 9-3, during egress from a Controlled Area (Contamination Reduction Zone). When a Radiation Work Permit (RWP) or Safe Work Permit (SWP) has been used to modify the PPE requirements of this plan, the RWP or SWP should also contain any changes required to update the decontamination procedures listed in this section. The SHSC shall assist in establishing the decontamination stations within the Decontamination Corridor, including all requisite equipment and receptacles.

PPE removed from the Decontamination Corridor shall either be decontaminated or properly bagged to contain any contamination. All used disposable clothing shall be placed in polyethylene bags, inventoried, dated, and stored at the millsite pending arrangements for appropriate disposal. Water-proof nondisposable PPE will be properly decontaminated by the workers. After the step-off decontamination sequence is completed, personnel shall follow Procedure 3.17 in the Geotech *Health and Safety Manual* if radioactive contamination is still detected. Procedure 3.17 includes decontamination procedures for removal of radioactive contamination from nondisposable PPE and personnel.

9.2 EQUIPMENT DECONTAMINATION

Equipment decontamination shall be conducted according to the specific procedure in the Geotech *Environmental Procedures Catalog* and referenced by the OU III *Field Sampling Plan*. All visible dirt shall be removed.

Radioactive surface contamination surveys shall be performed by the SHSC, or OH&S technician designated by the SHSC, prior to release of the equipment from the Decontamination Corridor.

If radioactive contamination is detected on the sampling equipment, follow Geotech *Health and Safety Manual*, Procedure 3.17, and Geotech *Environmental Procedures Catalog*, Procedure GN-13(P).

Table 9-1. Decontamination Stations for Modified Level C and Level C PPE

Station Number	Name	Action	Equipment Required
1	Segregated Equipment Drop	Deposit equipment used on the project site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
2	Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decontamination solution.	a. (2) #10 wash tub b. Decontamination solution or detergent water in a hand-held sprayer. c. 2-3 long-handled, soft-bristled scrub brushes
	Boot Cover and Glove Rinse	Rinse off decontamination solution from Station 2 using water.	
3	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Boot Cover Removal	NOT REQUIRED WHEN WEARING BATA BOOTS Remove boot cover and deposit in container with plastic liner.	
	Glove Removal	Remove outer gloves and deposit in container with plastic liner.	
4	Tyvek Suit Removal	Remove Tyvek suit and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Respirator Removal	Remove respirator face-piece and deposit in container with plastic liner.	
	Inner Glove Removal	Remove inner gloves and deposit in container with plastic liner.	
5	Radiological Contamination Monitoring	Perform monitoring for radiological contamination using Geotech *Health and Safety Manual*, Procedure 3.7.	a. Alarming contamination survey instrumentation or equivalent.
6	Field Wash	Wash hands and face before leaving the project site.	a. Basin, potable water, soap, and towels b. Table

Table 9-2. Suggested Decontamination Stations for Modified Level D Drilling PPE

Station Number	Name	Action	Equipment Required
1	Segregated Equipment Drop	Deposit equipment used on project site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
2	Boot Cover and Glove Wash	Scrub outer boot covers (if worn) and gloves with decontamination solution.	a. (2) #10 wash tub b. Decontamination solution/detergent water c. Hand-held sprayer unit d. 2-3 long-handled, soft-bristled scrub brushes
	Boot Cover and Glove Rinse	Rinse off decontamination solution from Station 2 using water.	
3	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Boot Cover Removal	NOT REQUIRED WHEN WEARING BATA BOOTS Remove boot cover and deposit in container with plastic liner.	
4	Coverall Removal	Remove coveralls and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Glove Removal	Remove gloves and deposit in container with plastic liner.	
5	Radiological Contamination Monitoring	Perform monitoring for radiological contamination using Geotech *Health and Safety Manual*, Procedure 3.7.	a. Alarming contamination survey instrumentation or equivalent
6	Field Wash	Wash hands and face before leaving the project site.	a. Basin, potable water, soap, and towels b. Table

Table 9-3. Suggested Decontamination Stations for Modified Level D Water Sampling PPE

Station Number	Name	Action	Equipment Required
1	Segregated Equipment Drop	Deposit equipment used on project site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
2	Boot Cover and Glove Wash	Scrub outer boot covers (if worn) and gloves with decontamination solution.	a. (2) #10 Wash tub b. Decontamination solution/detergent water c. Hand-held sprayer unit d. 2-3 long-handled, soft-bristled scrub brushes
	Boot Cover and Glove Rinse	Rinse off decontamination solution from Station 2 using water.	
3	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Boot Cover Removal	NOT REQUIRED WHEN WEARING BATA BOOTS Remove boot cover and deposit in container with plastic liner.	
4	Coveralls/ Apron Removal	Remove coveralls or apron and deposit in container with plastic liner.	a. Large plastic containers b. Plastic liners c. 6-mil plastic drop cloths
	Glove Removal	Remove gloves and deposit in container with plastic liner.	
5	Radiological Contamination Monitoring	Perform monitoring for radiological contamination using Geotech *Health and Safety Manual*, Procedure 3.7.	a. Alarming contamination survey instrumentation or equivalent.
6	Field Wash	Wash hands and face before leaving the project site.	a. Basin, potable water, soap, and towels b. Table

10.0 EMERGENCY RESPONSE PLAN

10.1 EMERGENCY CONTACTS AND PHONE NUMBERS

The SHSC shall post Table 10-1 that lists emergency contacts and phone numbers in a conspicuous location at the project site.

Table 10-1. Emergency Contacts and Phones Numbers

Key Person/Agency	Contact Name	Phone Number
EMT/Ambulance	N/A	801-587-2237
Fire Department	N/A	801-587-2237
Poison Center	N/A	801-587-2237 1-800-332-3072
Geotech Medical Representative	Sherry Wood	303-248-6713
San Juan Hospital	Dr. Steve Warren	801-587-2237
Sheriff's Dispatcher	N/A	801-587-2237
Geotech SHSC	Syd Pincock or designee	801-587-2153
Geotech Office Manager	John Pepin or designee	801-587-2615

If an emergency occurs, the succession of authority on the project site for the "Person in Charge" until relieved by the on-scene Emergency Director is as follows:

1. Geotech On-Site Field Supervisor

2. Geotech Site Health and Safety Coordinator

3. Subcontractor Superintendent

4. Subcontractor Safety Representative

The On-Site Field Supervisor shall ensure the "Site Map" has the areas within the boundaries of the Support Zone that are considered Areas of Safe Refuge to be used when evacuation is not possible.

10.2 EMERGENCY ALARMS

The SHSC shall ensure that Table 10-2 is posted and accessible to personnel at the project site.

Table 10-2. Emergency Alarms

Alarm	Device/Sound Pattern	Actions to be Taken
Evacuation	Steady blast from Air Horn for 3 Minutes	Evacuate the controlled area - or - move to an area of safe refuge until evacuation can be effected.
Take Cover	Intermittent blasts from Air Horn for 3-Minutes	Move to an area of safe refuge until "All Clear" is sounded.
All Clear	One blast from an air horn in 10-second intervals	Move to Support Zone with caution.

10.3 EMERGENCY MEDICAL PROCEDURES

Emergency Action Principles

When a medical emergency occurs, the following steps shall be taken by American Red Cross CPR/First Aid trained workers until the Person-in-Charge arrives. These steps have been developed by the American Red Cross as "Emergency Action Principles."

1. Survey the scene (Is it safe?).

2. Do a Primary Survey (check the victim for unresponsiveness).

   A - AIRWAY B - BREATHING C - CIRCULATION

3. Phone the appropriate Emergency Medical Service (EMS) listed on the emergency contacts posting.

4. Perform a Secondary Survey (interview, vital signs, head-to-toe exam).

5. Follow with the appropriate American Red Cross First Aid procedure for any follow-up care required until EMS arrives.

Signs and Symptoms of Exposure

The early warning signs, symptoms, and effects of exposure to the hazardous chemicals that are present at the project site are presented in Chemical Data Sheets in Appendix A.

Medical Evacuation Procedures

The SHSC shall ensure that the evacuation routes to the Medical Treatment Facility are indicated on the site map, and posted according to Section 8, Project Site Control. The approximate time for travel and distance for travel to the EMS shall also be indicated on the site map. A map of the evacuation routes to the Medical Treatment Facility (San Juan County Hospital) are shown in Figure 10-1.

Treatment Without Decontamination

When an injured person is contaminated, the Person in Charge shall decide what priority to give to medical treatment and decontamination. The decision aid in the Geotech *Health and Safety Manual*, Procedure 8.2, should be used when making this decision.

When it is determined that decontamination will not take precedence over the treatment of the injury, notify OMP to inform the medical personnel of the contamination. If time does not permit involvement of the Medical Section, the Person in Charge or the on-scene Emergency Director may inform the emergency medical personnel of the contamination.

10.4 FIRE RESPONSE PROCEDURE

The following steps shall be taken when a fire occurs at the project site.

1. Use the available communications equipment — telephone or radio — to contact the Monticello Fire Department.

2. Small, localized fires may be handled using the appropriate fire extinguisher to bring the occurrence under control.

3. If the fire involves material that could potentially release toxic gases, or radioactive particulate, all persons in the immediate vicinity shall be evacuated (sound the evacuation alarm), then inform the Monticello fire department of the potential radioactive/toxic gas hazard.

Large, uncontrolled fires shall be handled by the Monticello Fire Department. All personnel shall evacuate the area, isolate the area, and deny entry of unauthorized personnel to the area.

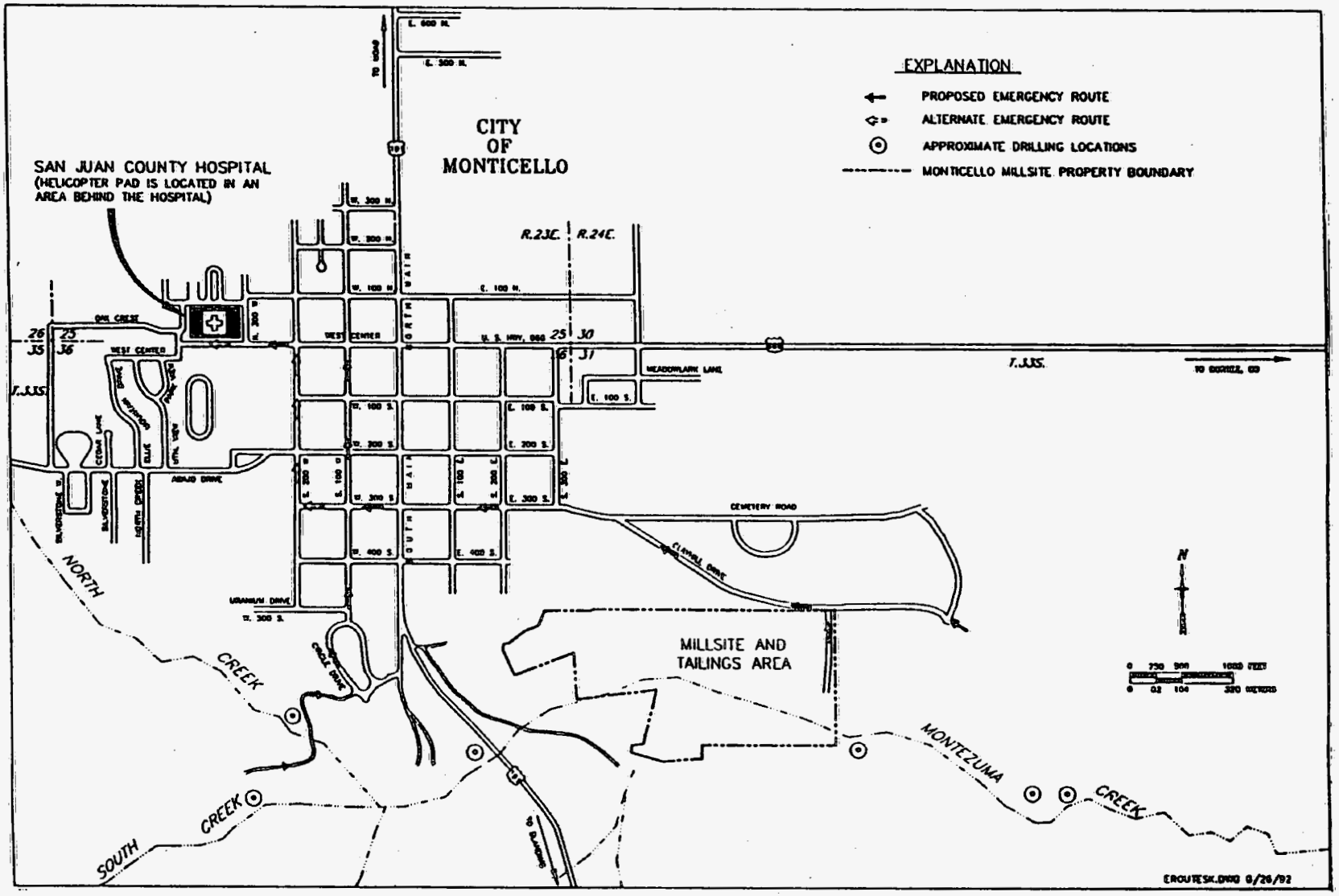

Figure 10-1. Hospital Location and Emergency Route Map

10.5 NOTIFICATION AND REPORTING

The employee discovering the emergency is responsible for immediately reporting the situation by the most expeditious means available to the Person in Charge at the project site. The Person in Charge shall follow the requirements in the Geotech *Health and Safety Manual* (Manual 103), Procedure 7.1, for notification and reporting.

10.6 EMERGENCY RESPONSE EQUIPMENT

Communications

Table 10-3 lists the communication equipment that will be used between the exclusion zone and the Support Zone and between the project site and the medical facility and the Monticello Fire Department.

Table 10-3. Emergency Communications Equipment

Communication Equipment	Location
Two-Way Radios (3)	Millsite Trailers and on Each Drilling Rig
Telephones (private or pay)	Millsite Trailers
Air Horn	Millsite Trailers
Bull Horn	Millsite Trailers

Fire Suppression

The SHSC will ensure that a 5-pound ABC dry chemical fire extinguisher is available in all Geotech vehicles and a 10-pound 4A:60B:C dry chemical fire extinguisher is at all established control points.

Emergency PPE

Table 10-4 lists the PPE that will be kept in reserve for use during an emergency.

Table 10-4. Emergency Use PPE

PPE		Location
Type	Amount	
Nitrile Gloves	5 Pair (sizes 10-11)	Millsite Trailers
Rubber Overshoes	5 Pair (L and XL)	Millsite Trailers
Tyvek Coveralls	5 Sets (various)	Millsite Trailers
Safety Glasses	5 Pair	Millsite Trailers
Tape	6 rolls	Millsite Trailers

First Aid Kits

The SHSC shall ensure that the first aid kits available at the millsite conform to OSHA requirements and contain the items listed in Table 10-5.

Table 10-5. Approved First Aid Kit Contents

Components		Quantity
Bandages	3-Inch Ace	2
	3-Inch Kling	2
	Bandaids	20
	Triangular Bandage	2
	Oval-Size Pads	2
	4-Inch Bandage Compress	2
Tape	2-Inch Adhesive	1
	2-Inch Paper	1
Disposable Gloves		2
Betadine Wipes		2
Scissors		1
Thumb Forceps		1
Instant Cold Pack		1
Splints	Wire	1
	Finger	2
Irrigation Water	Eye	2
	Other	2
Ointments - Neosporin		5
Paper Cup		3

11.0 CONFINED SPACE ENTRY

11.1 INTRODUCTION

Confined space is defined in the Geotech *Health and Safety Manual*, Procedure 2.7, as follows:

> *Refers to a space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include but are not limited to storage tanks, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.*

All work performed in a confined space shall be in compliance with this procedure (Procedure 2.7).

11.2 EVALUATION

The On-Site Field Supervisor shall ensure that the requirements for work in a confined space are followed and that a Safe Work Permit (See Geotech *Health and Safety Manual*, Procedure 2.4) is obtained prior to the start of any work conducted in a confined space.

12.0 SPILL CONTAINMENT PROGRAM

12.1 EVALUATION

No tasks currently planned at the millsite warrant a Spill Containment Program.

13.0 REFERENCES

Chem-Nuclear Geotech, Inc., 1992. *Draft Monticello Mill Tailings Site, Operable Unit III, Surface- and Ground-Water Remedial Investigation/Feasibility Study, Work Plan*, P-GJPO-751, U. S. Department of Energy, Grand Junction Projects Office.

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Appendix A

Acronyms and Abbreviations

Acronyms and Abbreviations

This list is supplied as an easy-reference guide to the acronyms and abbreviations most used throughout this *Health and Safety Plan.*

ACGIH ..... American Conference of Governmental Industrial Hygienist
ALARA ..... As Low As Reasonably Achievable
ANSI ..... American National Standards Institute
APR ..... Air Purifying Respirator
BTEX ..... Benzene, Toluene, Ethylbenzene, Xylene
Bq ..... becquerel = 1 disintegration per second
BLM ..... Bureau of Land Management
CFR ..... Code of Federal Regulations
DAC ..... Derived Air Concentration
DOE ..... U.S. Department of Energy
EMS ..... Emergency Medical Service
EMT ..... Emergency Medical Technician
FSP ..... Field Sampling Plan
GJPO ..... Grand Junction Projects Office
g ..... gram
Gy ..... Gray = 100 RAD
HEPA ..... High Efficiency Particulate Air
HS&S ..... Health, Safety, and Security Section
HSP ..... Health and Safety Plan
IDLH ..... Immediately Dangerous to Life or Health
IARC ..... International Agency for Research on Cancer
JSA ..... Job Safety Analysis
MRAP ..... Monticello Remedial Action Project
MSDS ..... Material Safety Data Sheet
MVP ..... Monticello Vicinity Properties
NIOSH ..... National Institute for Occupational Safety and Health
NRC ..... Nuclear Regulatory Commission
OH&S ..... Operational Health and Safety Subsection
OMP ..... Occupational Medical Program Subsection
OSHA ..... Occupational Safety and Health Administration
pCi ..... picocuries
PCB ..... polychlorinated biphenyl
PCN ..... Page Change Notice
PEL ..... Permissible Exposure Limit
PPE ..... Personal Protective Equipment
RCRA ..... Resource Conservation and Recovery Act
REA ..... Radiological and Engineering Assessment
R&ES ..... Radiological and Environmental Safety Subsection
ROD ..... Record of Decision
RWP ..... Radiation Work Permit
SCBA ..... Self-Contained Breathing Apparatus

ACRONYMS AND ABBREVIATIONS (continued)

SFMP ..... Surplus Facilities Management Program
SHSC ..... Site Health and Safety Coordinator
STEL ..... Short-Term Exposure Limit
SWP ..... Safe Work Permit
TCLP ..... Toxicity Characteristic Leachate Procedure
TLD ..... Thermoluminescent Dosimeter
TLV ..... Threshold Limit Value
TWA ..... Time Weighted Average
VOC ..... Volatile Organic Compound
WBGT ..... Wet Bulb Globe Thermometer

Appendix B

Chemical Data Sheets

ANTIMONY

CAS#: 7440-36-0 RTECS: CC4025000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.5	-	-	-	-	-	80	-	0.25
NIOSH REL	-	0.5 skin	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.5	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.50 - 5.00 mg/m³	Half-Face Air Purified with HEPA Cart.
> 5.00 - 25.0 mg/m³	Full-Face Air Purified with HEPA Cart.
> 25.0 mg/m³	Full-Face Supplied Air /SCBA press demand -or- positive pressure.

Classification

None

Target Organs

Respiratory system, cardiovascular system, skin, eyes

Characteristics

Silver-white lusterous metal
MF: Sb MW: 121.8 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)
Irritated nose, throat, mouth; coughing, dizziness, nausea, vomiting, diarrhea, stomach cramps, insomnia, irritated skin, olfactory fatigue.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed, get medical attention immediately.

ARSENIC

CAS#: 7440-38-2 RTECS: CG0525000RCRA RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.01	-	-	-	0.002	-	-	-	0.005
NIOSH REL	-	0.01	-	-	-	0.002	-	-	-	0.005
ACGIH TLV	-	0.02	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.01 - 0.10 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.10 - 0.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 0.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-1, NCI/NTP-1 Carcenogen
OSHA Regulated Carcenogen - 1910.1018

Target Organs

Liver, Kidneys, Skin, Lymph System

Characteristics

MF: As MW: 75 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)
Dryness of nasal passages, gastrointestinal problems, muscle spasms, vertigo, delirium, coma, fatigue, hyperpigmentation, peripheral neuropath, anemia.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE:
Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15-min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed, get medical attention immediately.

BERYLLIUM

CAS#: 7440-4171 RTECS: DS1750000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.002	-	0.025	-	0.005	-	10	-	0.001
NIOSH REL	-	-	-	-	-	0.0005	-	-	-	-
ACGIH TLV	-	0.002	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.002- 0.01 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.01 - 0.10 mg/m³	Full-Face Air Purified with HEPA Cart.
> 0.10 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-2A, NCI/NTP-2 Carcinogen
ACGIH-A2 Carcinogen

Target Organs
Lungs, skin, eyes, mucous membranes

Characteristics
Hard, brittle, grey-white solid

MF: Be MW: 9.0 SG: N/A VP: N/A IP: N/A

ODOR THRESHOLD: N/A

SYMPTOMS: (Inh)
Symptoms vary depending on compound; respiratory symptoms are weakness, fatigue, and weight loss.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed, get medical attention immediately.

CADMIUM

CAS#: 7440-43-9 RTECS: EU9800000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.2	-	-	-	0.6	-	-	-	0.025
NIOSH REL	-	-	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.05	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.05 - 0.50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.50 - 2.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 2.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-2A, NCI/NTP-2 Carcinogen
ACGIH-A2 Carcinogen

Target Organs
Resparatory system, kidneys, prostate, blood.

Characteristics
Silvery-white, blue-tinged lusterous metal
MF: Cd MW: 112 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing)
Pulmonary edema, dyspnea, cough, tight chest, substantial pain, headache, chills, muscle aches, nauseousness, diarrhea, anosmia, emphysema, proteinuria.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

COPPER

CAS#: 7440-50-8 RTECS: GL5325000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	1	-	-	-	-	-	-	-	0.5
NIOSH REL	-	1	-	-	-	-	-	-	-	-
ACGIH TLV	-	1	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 1.00 - 5.00 mg/m³	Half-Face Air Purified with HEPA Cart.
> 5.00 - 50.0 mg/m³	Full-Face Air Purified with HEPA Cart.
> 50.0 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

Target Organs

Respiratory system, skin, liver, increased risk of Wilsons disease, kidneys.

Characteristics

MF: Cu MW: 63.5 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing,Contact)
Irritates mucous membrane and pharynx; nasal perforation; eye irritation; metallic taste;, dermatitas.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

LEAD

CAS#: 7439-92-1 RTECS: OF7525000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.05	-	-	-	-	-	-	-	0.03
NIOSH REL	-	0.15	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.1	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.05 - 0.50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.50 - 2.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 2.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-2B Carcinogen
OSHA Regulated Carcinogen- 1910.1025

Target Organs
Gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue.

Characteristics
A heavy ductile, grey soft metal

MF: Pb MW: 207 SG: 11.34 VP: 0mm
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing,Contact)
Lassitude, insomnia, pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, hypertension, anemia, gingival lead line, trembling, paralysis.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min) no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

MERCURY

CAS#: 7439-97-6 RTECS: OV4550000 RCRA Waste Number: N/A

Synonyms: Quicksilver

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.05	-	-	-	0.1	-	-	-	0.025
NIOSH REL	-	0.05	-	-	-	0.1	-	28	-	0.025
ACGIH TLV	-	0.05	-	-	-	-	-	-	-	0.025

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.05 - 0.50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.50 - 2.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 2.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

OSHA Skin Notation

Target Organs

Skin, respiratory system, central nervous system, kidneys, and eyes.

Characteristics

Appearance varies depending on the alkyl compound combined with.

MF: Hg MW: N/A SG: N/A VP: N/A

ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)

Coughing, chest pains, dyspnea, bronchitis, pneumonia, tremors, insomnia, irritability, indecision, headaches, fatigue, stomatitis, salivation, gastrointestinal disorders, anorexia, weight loss, irritation of the eyes, and skin.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

MOLYBDENUM

CAS#: 7439-93-7 RTECS: QA4680000 RCRA Waste Number:N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	5	-	-	-	-	-	-	-	2.5
NIOSH REL	-	-	-	-	-	-	-	-	-	-
ACGIH TLV	-	5	-	-	-	-	-	-	-	2.5

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL	
> 5.00 - 50.0 mg/m³	Half-Face Air Purified with HEPA Cart.
> 50.0 - 500 mg/m³	Full-Face Air Purified with HEPA Cart.
> 500 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

None

Target Organs

None

Characteristics

Dark grey or black powder with metallic luster
MF: Mo MW: 95.9 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing)

Animals have exhibited irritated eyes, nose, and throat; anorexia; diarrhea, weight loss; listlessness; and liver and kidney damage.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: None Required

GOGGLES: None Required

WASH: None Required

CHANGE: None Required

REMOVE: None Required

RECOMMENDED FIRST AID RESPONSE:

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

NICKEL

CAS#: 7440-02-0 RTECS: QR5950000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.1	-	-	-	-	-	-	-	0.5
NIOSH REL	-	0.015	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.1	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 1.00 - 50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 50 - 250 mg/m³	Full-Face Air Purified with HEPA Cart.
> 250 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-1, NCI/NTP-2 Carcinogen
ACGIH-A1 Carcinogen

Target Organs
Nasal cavities, lungs, skin

Characteristics
Lustrous silvery solid
MF: Ni MW: 59 SG: 8.9 VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing,Contact)
Sensitization, dermatitas, allergic asthma, nasal perforations, pneumonitis.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

SELENIUM

CAS#: 7782-49-2 RTECS: VS7700000 RCRA Waste Number:P120

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.2	-	-	-	-	-	-	-	0.1
NIOSH REL	-	0.2	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.2	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.20 - 1.00 mg/m³	Half-Face Air Purified with HEPA Cart.
> 1.00 - 10.0 mg/m³	Full-Face Air Purified with HEPA Cart.
> 10.0 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

IARC-3 Carcinogen

Target Organs

Upper respiratory system, eyes, skin, liver, kidneys, blood

Characteristics

MF: Se MW: 193 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)
Irritated eyes, nose, throat; headache; chills; fever; bronchitis; metallic taste; garlic breath.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: N/A

GOGGLES: N/A

WASH: N/A

CHANGE: N/A

REMOVE: N/A

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

SILVER

CAS#: 7440-22-4 RTECS: VW3500000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.01	-	-	-	-	-	-	-	0.005
NIOSH REL	-	0.01	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.1	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

>0.01 - 0.05 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.05 - 0.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 0.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification
None

Target Organs
Nasal septum, skin, eyes

Characteristics
White lusterous solid
MF: Ag MW: 107.9 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Ing,Contact)
Argyria (nasal septum and throat), skin irritation, ulceration, gastrointestinal.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

PROVIDE: Eye Wash Stations

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min) no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

THALLIUM

CAS#: 7440-28-0 RTECS: XG3425000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.1	-	-	-	-	-	-	-	0.05
NIOSH REL	-	0.1	-	-	-	-	-	-	-	-
ACGIH TLV	-	0.1	-	-	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.01 - 0.05 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.05 - 0.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 0.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

OSHA Skin Designation

Target Organs

Eyes, central nervous system, liver kidneys, GI tract, hair, body

Characteristics

Appearance varies depending on the specific compound

MF: N/A MW: N/A SG: N/A VP: N/A

ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)

Nausea, diarrhea, abdominal pain.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: Daily if there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted nonimpervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

NATURAL URANIUM

CAS#: 7440-61-1 RTECS: YR3590000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.05	-	0.6	-	-	-	-	-	0.025
NIOSH REL	-	-	-	-	-	-	-	30	-	-
ACGIH TLV	-	0.2	-	0.6	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.05 - 0.50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.50 - 2.5 mg/m³	Full-Face Air Purified with HEPA Cart.
> 2.5 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

None

Target Organs

Skin, bone marrow, lymphatics

Characteristics

Silvery-white malleable, ductile solid
MF: U MW: 238 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)
Dermatitis, skin irritation.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

VANADIUM PENTOXIDE

CAS#: 1314-62-1 RTECS: YW2450000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	0.05	-	-	-	-	-	-	-	0.025
NIOSH REL	-	-	-	0.05	-	-	-	70	-	-
ACGIH TLV	-	0.05	-	-	-	-	-	-	-	0.025

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 0.05 - 0.50 mg/m³	Half-Face Air Purified with HEPA Cart.
> 0.50 - 2.50 mg/m³	Full-Face Air Purified with HEPA Cart.
> 2.50 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

None

Target Organs

Respiratory system, skin, eyes

Characteristics

Yellow orange powder or dark gray flakes.
MF: V_2O_5 MW: 182 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Contact)
Irritated eyes, green tongue, metallic taste, irritates throat, cough, fine rales, wheeze, bronchitis, dyspnea, eczema.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: If there is any possibility that clothing may become contaminated.

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 min); no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water; if clothing breakthrough occurs, promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is swallowed get medical attention immediately.

ZINC OXIDE DUST

CAS#: 1314-13-2 RTECS: ZH4810000 RCRA Waste Number: N/A

Synonyms: None

Breathing Zone Limits	TWA ppm	TWA mg/m3	STEL ppm	STEL mg/m³	CEIL ppm	CEIL mg/m³	IDLH ppm	IDLH mg/m³	Action Level ppm	Action Level mg/m³
OSHA PEL	-	10	-	-	-	-	-	-	-	5
NIOSH REL	-	5	-	-	-	-	-	-	-	-
ACGIH TLV	-	10	-	-	-	15	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

>10.0 - 50.0 mg/m³	Half-Face Air Purified with HEPA Cart.
>10.0 - 500 mg/m³	Full-Face Air Purified with HEPA Cart.
>500 mg/m³	Full-Face Supplied Air / SCBA press demand -or- positive pressure.

Classification

None

Target Organs

Respiratory System

Characteristics

Fine white odorless particles
MF: ZnO_2 MW: 81.4 SG: N/A VP: N/A
ODOR THRESHOLD: N/A

SYMPTOMS: (Inh,Abs,Ing,Contact)
Metallic taste, dry throat, cough, chills, fever, tight chest, dyspnea, rales, reduced pulmonary function.

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: N/A

GOGGLES: N/A

WASH: N/A

CHANGE: N/A

REMOVE: N/A

RECOMMENDED FIRST AID RESPONSE:

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped, perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.