Appendix A: Data Quality Objective Process Document

Argonaut Mine Tailings Pile Assessment

Data Quality Objectives (DQO) Process Document
Objective Outputs
July 1, 2013

Contract: EP-S5-08-01
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This DQO documentation version reflects the project objectives as of July 1, 2013.

1. THE PROBLEM

Background

From the 1850s through the early 1940s, silver, gold, and other metal mining and ore processing was conducted in the Argonaut Mine area located in Jackson, California. The Argonaut Mine Tailings site (the site) is comprised of approximately 65 acres of largely undeveloped land located in Jackson and is currently prioritized as the number two site on the Abandoned Mine Site Prioritization List for the United States Environmental Protection Agency (U.S. EPA) Region 9 Superfund Division. The site is located in an alluvial valley and consists of open space characterized by soil and tailings impounded behind several berms and dams. The site is abutted by new residential development (housing) to the northwest, northeast and east, county offices and a public high school on the west side, and open undeveloped areas on the north, south, and southeast sides. The geographic coordinates for the site are Longitude 120°47'23.44"West and Latitude 38°21'26.95"North. Ore was processed both on site and at a nearby mill site using stamp millings, mercury amalgamation, and cyanide extraction with tailings impounded at the site from 1850s until 1942.

In 2008 contractors (URS Corporation) working on behalf of the California Department of Toxic Substances Control (DTSC) prepared a site investigation report that attempted to characterize the nature and extent of impacted soils throughout the 65-acre site. The site investigation report identified an approximately 5-acre area (AOC-1) of unprocessed/semi-processed ore pile (Ore Pile) and/or exposed ore in the northern portion of the site. The area, near the topographical high point, was largely devoid of plant life. Samples collected by URS from AOC-1 had an average arsenic concentration of approximately 300 milligrams per kilogram (mg/kg) and a maximum concentration of 39,000 mg/kg.

Southeast and downgradient from AOC-1 is a former cyanide processing plant designated as AOC-2 (cyanide plant). AOC-2 contains localized areas of saturated sediments with standing water occasionally present in the low-lying areas. AOC-2 also contains abandoned basins, vats, and tanks reportedly used for cyanide leaching of processed ore. Coal tars were also used in the metal extraction process in this area. it is unclear whether polycyclic aromatic hydrocarbons (PAHs) associated with the use of coal tars, cyanides, or toxic metals remain at elevated concentrations in AOC-2.

South and East of AOC-2 are two breached tailings dams that comprise the Tailings Disposal Area and Impoundments (Tailings Disposal Area). The dams were presumably built during former processing operations to create retention basins for other mine wastes. Detected concentrations of arsenic and other heavy metals were generally lower in AOC-3 than in AOC1 and AOC-2, therefore, soils in AOC-3 will not be assessed by the U.S. EPA's Region 9 Emergency Response Section. Instead, this area will be assessed by the U.S. EPA Site Assessment program under the direction of the U.S. EPA Site Assessment Manager.

In addition, the concentrations of arsenic, chromium, nickel and zinc in groundwater samples collected by URS from the site reportedly exceeded the California Maximum Contaminant levels (MCLs) for drinking water (URS 2011). Surface water discharges from the site have not been adequately characterized. Surface water discharging from the site flows to Jackson Creek. Jackson Creek flows into Lake Amador, a drinking water resource. These discharges are defined as AOC-4 Surface Water Drainage (Surface Water). .

During the site visit on February 7, 2013, what appeared to be mine waste and/or unprocessed ore was observed in a vacant residential lot at the intersection of Argonaut Lane and Pioneer Road (AOC-5). Subsequent research indicated that soil samples collected from AOC-5 yielded arsenic at concentrations up to 1,300 mg/kg and that standing water on the property had measured pH values of 1-2. The approximate extent of AOC-5 is depicted on Figure 4.

At a minimum, portions of the four areas to be addressed (AOC-1, AOC-2, AOC-4 and AOC-5) have not been adequately characterized in past investigations.

Conceptual Site Model

Crushed or partially process ore was reportedly stored in AOC-1 and mine tailings are present throughout the site. These gold bearing ores typically contain relatively high levels of arsenic and associated pyritic sulfide compounds that acidify when exposed to oxygen. Lead, arsenic, and other metals in the ore are environmentally persistent and migrate slowly; therefore, soil concentrations generally do not vary greatly over time. There is a fence around AOC-1 to prevent human trespassing, as even exposure for a periodic trespasser is a health concern. However, ecological receptors are not protected. Mine wastes (ore and /or tailings) are being

transported through portions of the site during storm events, and could potentially migrate off site. Surface water flows off site, and could be carrying contaminants with it. Short term impacts to ecological receptors may be a concern as the area is largely devoid of vegetation and is not currently considered a viable habitat for plants or wildlife (URS June 2011). There is no fence at AOC-5 and direct exposure to persons that use or travel through that yard is possible. Soil pH values as low as 2.6 were measured in AOC-1. The acidification of ore produces acid mine drainage (AMD) that typically contains high concentrations of dissolved toxic heavy metals. Gold mine tailings (processed ores) are typically fine-grained (and therefore easily erodible and relatively mobile material) with high concentrations of lead and arsenic. Human and environmental receptors may be exposed to lead, arsenic, mercury and other toxic heavy metals in the ores or tailings. Potential exposure pathways include: inhalation of fugitive dust; direct exposure to receptors through skin contact (casual trespassers and wildlife have been noted in the area); direct ingestion and or plant uptake (indirect ingestion) by browsing or grazing animals; and, ingestion of contaminated groundwater or surface water runoff.

Cyanides and PAHs were used at the cyanide processing plant in AOC-2. Cyanide is reactive and generally not persistent in nature. However, these compounds may be present in former vats and tanks located at AOC-2. Several of these tanks were observed to be leaking or partially collapsed during a February 1013 site visit and may have released process compounds to the environment. Soil or sediment in AOC-2 may contain these compounds. Exposure routes for cyanides and PAHs are presumed to be identical to those discussed above.

Areas of Concern (AOCs)

A. AOC-1: Unprocessed/Semi-Processed Ore Pile (Ore Pile):

Arsenic was present at concentrations above the assumed background concentration of 20 mg/kg in surface soil samples collected from 11 of 12 borings advanced by URS in December 2008. During the URS investigation, lead and mercury were detected above their respective U.S. EPA Region 9 Regional Screening levels for a residential scenario (r-RSLs) in the boring that contained the highest concentration of arsenic (i.e. Soil Boring SB-2). Subsurface soil samples (i.e. those collected from between 1 and 5 feet below ground surface [bgs]) were collected from 8 of the 12 soil borings. Arsenic was detected at concentrations ranging from 36 mg/kg to 7,300 mg/kg in Soil pH values in most AOC-1 samples collected by URS ranged from 2.6 to 5.6 (very acidic to slightly acidic). The URS report estimated that 106,000 cubic yards of contaminated soil are present in AOC-1. Native soil adjacent to AOC-1 (and/or other potential off-site borrow source) will be analyzed to determine applicability for cap material, since the likely remedial alternative selected will include consolidation and capping the area. The medium of concern is surface and shallow subsurface soil in AOC-1.

B. AOC-2: Cyanide Processing Plant (Cyanide Plant). No record of sampling for PAHs was encountered during research performed by START for this assessment, and it is unclear whether cyanides an heavy metals have been adequately characterized at AOC-2. This study will focus on assessing the processing area, namely the tanks, vats, and basin soil areas adjacent to the processing area for these compounds. The mediums of concern are water, sediment, and soils potentially contaminated with metals (principally lead and arsenic), PAHs, and/or cyanides.

C. AOC-4: Surface Water Drainage (Surface Water). Surface water samples collected by the DTSC in 1993 contained arsenic at concentrations of 2,070 milligrams per liter (mg/l), selenium at 4.3 mg/l, copper at 40 mg/l, and nickel at 31 mg/l. Arsenic, chromium, nickel, zinc were detected above the California Maximum Contaminant Levels for Drinking water (MCLs) in groundwater samples collected at the site (URS 2011). It is unclear whether surface waters discharging from the site have been adequately characterized. AOC-4 will include surface water runoff from the entire Argonaut Mine Tailings Pile site. Testing will be performed on ponded surface water, or from surface water discharging from the site. The COCs for AOC-4 are arsenic, chromium, lead, nickel, zinc, and mercury. Additional testing will be performed on surface water samples and/or water retained in tanks and vats to document water quality parameters for the evaluation and design of potential treatment systems.

D. AOC-5: Residential Lot – Tailings Disposal Area (Residential Lot). AOC-5 consists of a ½ acre individual property located roughly 200 feet north of AOC-1, on the corner of Argonaut Lane and Pioneer Street. AOC-5 appears to have been used to store unprocessed or partially processed ore, and consequently is barren of all vegetative growth. The COCs for this area are the same as for AOC-1, arsenic, lead, and mercury. The medium or concern is surface and shallow subsurface soil. Exposure routes include: exposure to fugitive dust, potential groundwater contamination, and direct exposure to casual trespassers. Note that this area is not fenced and therefore access is not limited.

Exposure Scenario

As discussed previously exposure pathways may include (1) direct and indirect exposure of human and/or environmental receptors to contaminants in soil, (2) exposure to contaminated soil that has migrated as particulate matter (dust), and (3) exposure to contaminated sediment and/or runoff water. A Human Health Risk Assessment (HHRA) was performed on AOC-1 (URS March 2009). The HHRA indicated that the elevated levels of contamination found at AOC-1 pose an elevated risk for the standard exposure scenarios and even for a periodic trespasser on the property.

Available Resources

The current START budget for planning, field work, and reporting for the Argonaut Mine Tailings Pile Assessment activities is approximately $37,000. Other budget constraints on U.S. EPA resources for this project have not been specified. The primary decision-maker for the project is Federal On-Scene Coordinator (FOSC) Daniel Shane.

Planning Team

Mr. Daniel Shane, U.S. EPA Region 9 FOSC
Mr. Brian Milton, E2 Consulting Engineers, Inc. (E2), Superfund Technical Assessment and Response Team (START), Project Manager and Site Safety Officer
Mr. John Loomis, Ecology and Environment Inc. (E & E), Team Member and Safety Officer
Mr. Howard Edwards, E & E START, Quality Assurance Officer

Roles and Responsibilities

- The U.S. EPA FOSC will be the primary decision-maker and will direct the project, specify tasks, and ensure that the project is proceeding on schedule and within budget. Additional duties include coordination of all preliminary and final reporting and communication with the START Project Manager and U.S. EPA Quality Assurance (QA) Office. The U.S. EPA FOSC is also responsible for access to each property to be investigated.

- Brian Milton, the START Project Manager, will coordinate with the planning team to develop objectives and complete an approved Sampling and Analysis Plan (SAP) for the assessment. The START Project Manager will oversee development and preparation of the SAP, site safety plan, and other project deliverables.

- Howard Edwards, START QA Officer, will assist with development and preparation of the SAP and other deliverables. Mr. Edwards will provide overall project quality assurance and, if necessary, audit functions.

- START will be responsible for implementation of the SAP, coordination of project tasks, coordination of field sampling project management, and completion of all preliminary and final reporting.

- The START will use the USEPA Region 9 Laboratory or other certified Basic Ordering Agreement (BOA) Analytical Laboratory or other specialty subcontracted geotechnical laboratory as necessary to perform the specified analytical or geotechnical test according to the methods specified in the SAP.

- START will be responsible for data validation for data generated using U.S. EPA methods or other methods that specify validation. Other geotechnical testing may not require validation. Typical engineering standards and practices will be used for validation and quality assurance/quality control (QA/QC) as specified in the American Society for Testing of Materials (ASTM) or other applied method.

Other Considerations and Constraints Related to Problem and Resources

- Contamination not found during the previous soil investigations might be revealed during sampling or excavation activities.
- Access and access agreements to AOC-5 (residential property) will be necessary to implement the SAP.
- Lead and/or arsenic contamination on a property may derive from non-mining related sources that include, but are not limited to naturally occurring lead and arsenic in native soil.
- Data on the background concentrations of COCs in the site area do not exist, and an investigation of background concentrations is beyond the current scope of this removal assessment.
- During the majority of the year potentially impacted surface water does not flow through the site. Areas within the site display evidence of seepage and transport of mine tailings (change in vegetation color and evidence of scour and deposition, respectively) from AOC-1 and the Processing Area (location of tanks and vats) that likely occurs during storm events. Estimating the location or source of impacted surface water, as well as quantity and flow rate will be difficult as flow may be intermittent.
- Compliance with Section 106 of the National Historic Preservation Act (NHPA) will likely require off-site research and a physical assessment of the site by a qualified archeologist prior to performing non-emergency removal actions. Typically a report regarding the cultural significance of the site would need to be submitted to the California State Office of Historical Preservation (SHPO) and non-emergency intrusive removal actions would need to be evaluated and/or otherwise approved by the SHPO prior to implementation.
- It may be difficult to access or otherwise sample soils and or surface waters in areas away from the site. At a minimum, property owner information and access agreements may be necessary.

2. THE DECISION

Principal Study Questions at AOC-1 (Ore Pile)

A. What is the lateral and vertical extent of the COCs in AOC-1?

B. What is the extent of the elevated arsenic concentrations in surface soils detected in samples from URS Soil Boring SB-2 that are not already underneath Argonaut Lane?

C. Do soluble metals concentrations at AOC-1 exceed hazardous waste criteria for the State of California?

D. Are the detected concentrations in surface samples collected by URS accurate?

Principal Study Questions at AOC-2 (Cyanide Plant)

A. Does the water or sediment in the tanks and vats in AOC-2 contain COCs above screening levels?

B. What is the concentration of COCs in the soil adjacent to the processing area (tanks and vats)?

C. Are PAH and phenols present as contaminants in AOC-2 due to the use of coal tar in the cyanide processing.

Primary Study Questions at AOC-4 (Surface Water)

A. Are there COCs above screening levels in the surface water on site?

B. Are there COCs above screening levels in surface water or sediment migrating off site?

Principal Study Questions at AOC-5 (Residential Lot)

A. What is the average concentrations of COCs in surface and shallow subsurface soils in each decision unit at AOC-5?

Principal Study Questions for Potential Borrow Materials

A. What are the chemical and geotechnical parameters (i.e. metals concentrations, moisture-density relationships, moisture retention properties, grain size, soil strength, organic content, etc) of the potential borrow source materials and do they indicate the soil is suitable for use as cap material?

Actions that could result from resolution of the principal study questions

AOC-1

A. The volume and the lateral extent of contaminants will in part be used by the U.S. EPA to determine what form (if any) of removal or treatment of the affected areas will be implemented. Remedies may include excavation and off-site disposal, fixation, or capping.

B. The nature and extent of the hot spot will determine what form of treatment or removal (if any) might be implemented for this particular location. If concentrations are above acceptable criteria, the waste may be treated differently, including being disposed of at an off-site facility.

C. The concentrations of soluble metals may be used to determine what form of treatment or removal (if any) would be performed at AOC-1. If concentrations of soluble metals are above acceptable limits, encapsulation or off-site disposal may be necessary.

D. If the sample concentrations at AOC-1 are reasonably similar to those detected by URS, then removal or treatment of impacted soils in AOC-1 may be necessary.

AOC-2

A. If concentration of COCs in the water and sediment in the tanks and vats in the processing area exceed screening levels, then the U.S. EPA may initiate removal of water and sediment and clean or demolish the vessels.

OR

If the concentrations of the COCs are present below the screening levels for water and sediment in the tanks and vats then no further action may be deemed necessary by the U.S. EPA.

B. If the concentrations of COCs are present in soil adjacent to the processing area above the screening levels, then the U.S. EPA may initiate removal or treatment of the affected areas.

OR

If the concentrations of COCs are present below the screening levels, then no further action for the soil in the processing area may be deemed necessary by the U.S. EPA.

AOC-4

A. If concentration of the COCs in surface water exceed applicable screening levels for surface water, then the U.S. EPA may initiate removal or treatment of the affected areas or associated off-site discharges.

OR

If the concentrations of COCs are below the screening levels for surface water, then no further action may be deemed necessary by the U.S. EPA.

B. Based on the concentration of the COCs present above applicable screening levels for surface water migrating off-site, the U.S. EPA may initiate preliminary designs to treat or otherwise prevent the discharge of contaminated runoff.

OR

Based on the concentration of the COCs present below applicable screening levels for surface water migrating off site, the U.S. EPA may consider no further action is necessary.

AOC-5

A. If the concentrations of COCs are present above the screening levels, then the U.S. EPA may initiate removal or treatment of the affected areas,

OR

If the concentrations of COCs are present below the screening levels for some parts of AOC-5, then no further action for those parts of AOC-5 may be deemed necessary by the U.S. EPA.

Soil Borrow Areas

A. If the chemical and geotechnical parameters are within acceptable limits, then the U.S. EPA may use the borrow material(s) to cap the affected areas,

OR

If the chemical and geotechnical parameters are not within acceptable limits, then the U.S. EPA may decide to source other borrow material(s) to cap the affected areas or decide to implement a different removal or treatment method as necessary.

Decision Statement(s) at AOC-1

- Determine the lateral extent of concentrations of COCs in surface soils are above screening levels in order to determine whether additional investigation or removal actions are necessary.
- Determine the volume of soil with elevated arsenic concentrations near URS soil boring SB-2.
- Determine whether soluble metals are present at concentrations that may require treatment other than capping with acceptable borrow material.
- Determine whether COC concentrations in shallow soils are similar to those detected in samples collected by URS to evaluate whether unacceptable risks to human or environmental receptors are present in this area.

Decision Statement(s) at AOC-2

- Determine if the tanks and vats in the former tailings processing area contain water or sediment with concentrations of COCs above screening levels determined for this site in order to determine whether additional investigation or removal actions are necessary.
- Determine if the concentrations of COCs in the low-lying surface (basin) soils adjacent to the processing area are above screening levels in order to determine whether additional investigation or removal actions are warranted.

Decision Statement(s) at AOC-4

- Determine if the average concentrations of COCs in surface waters on site or discharging from the site are above screening levels in order to determine whether additional investigation or removal actions are necessary.

Decision Statement(s) at AOC-5

- Determine if the average concentrations of COCs in surface soils in each decision unit are above screening levels in order to determine whether additional investigation or removal actions are necessary.

3. DECISION INPUTS

Environmental data required to resolve the decision statements

- The concentrations of COC data for surface and shallow subsurface soils within the specified AOCs.
- COC data, physical parameter, and water quality data for impacted surface water samples.
- Geospatial data for the sampling locations are needed.

Sources of information to resolve the decision statements

- Data and documentation from previous sampling.
- Physical site data will be supplied by visual survey data, global positioning system surveys, and site photographs
- Analytical data for proposed soil, sediment, and surface water samples.
- Risk-based screening levels for the COCs
- Geotechnical data generated during this investigation for the potential borrow source material (i.e. adjacent native material).

Information Needed To Establish Screening Level

Potential screening levels for COCs may come from the following sources:

Soils

- January 2005 California Human Health Screening Levels (CHHSLs) for Arsenic and Mercury – Residential Soils.
- September 2009 Revised California Human Health Screening Levels (CHHSLs) for Lead – Residential and/or Industrial Soils.
- May 2013 USEPA Regional Screening Levels (RSLs) – Residential and/or Industrial Soils.
- May 2013 San Francisco Bay Regional Water Quality Control Board (RWQCB), ESLs – Residential Shallow Soils (<3 meters bgs).

Surface Water

- 40 CFR 131-Water Quality Standards; establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California (California Toxics Rule) May 18, 2000.
- Central Valley Regional Water Quality Control Board- Water Quality Goals for Jackson Creek (CVRWQCB 2013).
- Maximum Contaminant Levels, National Primary Drinking Water Regulations. U.S. EPA May 2009.
- U.S. EPA FOSC direction.

Collection methods

Soil samples (including geotechnical samples) can be collected using a trowel, plastic scoop, hand auger, or shovel.

Surface water samples will be collected using thief-type sampler such as a bailer or collected directly into the sample container, or a clean unpreserved sample container, then transferred to the appropriately container.

Measurement methods

Collected soil samples (from both the specified down gradient contaminated areas on site and the borrow source material) can be analyzed to determine the COC concentrations using the following definitive SW-846 method. The method listed for PAH and phenols will be used to detect the presence of these analytes, not low concentrations. If detected in samples U.S. EPA Methods 8270 SIM and 8141 can be used to analyze for low levels of PAH and phenols respectively.:

- U.S. EPA Method 6010B for Target Analyte List (TAL) metals (all); Mercury by U.S. EPA Method 7471A.
- U.S. EPA Method 9010/9012 for Total and Amenable Cyanide (for AOC-2 sediment samples)
- pH by U.S. EPA Method 9045.
- PAH and phenols by U.S. EPA Method 8270C

Collected water samples can be analyzed to determine the water quality parameters using the following definitive SW-846 methods:

- U.S. EPA Method 6010B for TAL metals,
- U.S. EPA Method 9010C for Total and Amenable Cyanide (AOC-2 samples only)
- PAH and phenols by U.S. EPA Method 8270C

Collected water samples can also be measured in the field with field instrument for the following water quality parameters using the following less definitive field methods:

pH
Oxidation-reduction potential
Temperature
Specific Conductance

Collected borrow source materials (e.g. from adjacent to AOC-1) can be analyzed to determine the geotechnical parameters using the following definitive methods:

U.S. EPA Method 6010 for TAL Metals
ASTM 9045C for pH
ASTM D698 for Moisture Density Curve for Standard Proctor
ASTM D2434 for Saturated Hydraulic Conductivity
ASTM D2216 for Initial Volumetric Water Content
ASTM D7263-09 for Dry Bulk Density
ASTM D6836 for Determination of Soil Water Characteristic Curve
ASTM D422-63 for Particle Size
ASTM D2974-07 for Percent Organic Content

Confirm that appropriate analytical methods exist to provide the necessary data:

The definitive and non definitive U.S. EPA and ASTM methods have sufficient sensitivity, accuracy, precision, and other quality parameters to generate necessary data, provided the data are not needed within a critical timeframe. Field data collected for the pH, ORP, and conductivity can generate time-critical screening-level data; however, sensitivity, qualitative selectivity, and quantitative accuracy for these methods will require confirmation by a definitive method.

4. STUDY BOUNDARIES

Specify characteristics that define the target population being studied

- The COC concentrations in surface and shallow (less than 1.5 feet bgs) soil, sediment, and surface water within or near the specified AOCs.
- Geotechnical parameters of soil samples collected adjacent to AOC-1 or other sources of potential borrow material.
- Water quality parameters within the specified AOCs.

Spatial boundaries

AOC-1: Unprocessed/Semi-Processed Oil Pile (Ore Pile)

The areas shown on Figure 2 delineates the current approximate AOC-1 boundaries and is estimated at roughly 5 acres. The vertical extent of contaminants in shallow soils is of interest near the lateral edges of AOC-1. The lateral extent is generally distinguishable by the presence or absence of vegetation, but additional characterization of the lateral extent is needed in some areas. The depth of contaminants near the edges of AOC-1 may be useful in determining the volume of soil that may need to be removed or consolidated.

AOC-2 Cyanide Processing Plant (Cyanide Plant)

The boundary of the process area investigation will be concentrated around the tanks and vats shown on Figure 3.

AOC-4 Surface Water Drainage

The boundary of the site surface water investigation will include the southeastern portion of the site, and areas downstream of the site. If surface waters are leaving the site, samples will be taken at the site boundary and downstream at location(s) Off-site surface water sampling may include collecting samples in Jackson Creek at locations upstream and downstream of its confluence with the site drainage channel, reportedly ½ mile from the site.

AOC-5 Residential Lot – Tailings Pile Disposal Area (Residential Lot)

AOC-5 is a residential lot shown on Figure 4 roughly ¼ mile north of AOC-1. AOC-5 is a small lot in a residential neighborhood. The spatial boundaries are the lateral extent of the property, and shallow subsurface soils to a depth of approximately 1.5 feet.

Temporal boundaries
The decisions will apply to determinations of risk associated with acute and/ or chronic (long-term) exposure to contaminated surface soil and surface water from direct and indirect exposure pathways.

Lead, arsenic, and other metals are environmentally persistent and migrate slowly; therefore, soil concentrations generally do not vary greatly over time. Cyanide is reactive and generally not persistent in nature. There is a fence around AOC-1 to prevent human trespassing, as even exposure for a periodic trespasser is a health concern. However, ecological receptors are not protected and fugitive dust emissions are a potential exposure pathway. Mine wastes (ore and /or tailings) are being transported through portions of the site during storm events, and could potentially migrate off site. Surface water flows off site, and could be carrying contaminants with it. Short term impacts to ecological receptors may be a concern as the area is largely devoid of vegetation and is not currently considered a viable habitat for plants or wildlife (URS June 2011). There is no fence at AOC-5 and direct exposure to persons that use or travel through that yard is possible. Indirect exposures could occur if the area is used for food production (garden or fruit trees). Depending on the COC concentrations, the U.S. EPA may determine that a fence around AOC-5 is necessary prior to implementing removal actions.

Thus, the following assessment time-frame has been proposed:

- The SAP will be submitted to U.S. EPA FOSC by July 3, 2013, and should be reviewed, revised, and approved by July 9, 2013, the first day of proposed work.
- Sample collection will take place following SAP approval by the U.S. EPA.
- Preliminary field data collected for surface water will be available immediately after field work has been completed.
- Preliminary laboratory analytical data should be available within three weeks of sample delivery to the laboratory.
- Data packages and final geotechnical data should be reported to project management approximately 8-10 weeks after sample delivery to the laboratory.
- Laboratory data for metals in soil samples and surface water samples should be evaluated and validated following U.S. EPA Region 9 Tier 2 guidance or other method as appropriate and specified in the method. Validated data should be reported to the USEPA approximately two weeks after receipt of completed laboratory analytical package.
- Field data will be evaluated and reviewed for quality assurance/quality control prior to reporting.
- Decision statement resolutions are expected to occur within 5 weeks after sampling and should take place prior to decisions that may result in exposure of residents or workers to contaminated soil.

Scale of decision-making
The scale of decision making refers to the way the planning team delineates decision units and identifies the smallest unit of subpopulation, area, volume or time where data will be collected, aggregated, or interpreted to make a decision and control decision errors. This is critical to most environmental assessments because it can influence the ability of the decision makers to reduce site risks and can affect the cost of remediation.

AOC-1: Ore Pile:
Due to the contiguous nature of AOC-1, it is considered one decision unit consisting of discrete sampling areas no larger than approximately 15,625 square feet (125 feet by 125 feet) in area around each of the selected sampling locations identified on the grid presented on Figure 2. Although it is likely that sample results for samples on and near the perimeter of AOC-1 will affect the exact location, boundaries, and nature of potential future consolidation and capping activities, it is unlikely that waste in this area would be split and/or capped with two separate caps. Therefore, it is considered one decision unit. Additionally a volume of roughly 24,000 cubic yards of borrow material may be needed for the removal action.

AOC-2: Cyanide Plant:
Discrete tanks or vats not plumbed in parallel will be considered as individual decision units. Initially the entire AOC-2 soil area will be considered a single decision unit. However, the area around any specific sampling location might be considered a separate decision unit depending upon other data from AOC-2.

AOC-4: Surface Water Drainage:
The surface water decision unit corresponds to locations where surface water is potentially or actually discharging from the site. The need for additional sampling during wetter periods and/or the installation of wells or other data collection activities will be evaluated in consultation with subject-matter experts with the USEPA's Office of Research and Development and/or the OSC.

AOC-5 Residential Lot:
The exact extent of each decision unit within AOC-5 will be determined in the field. However, the approximate size of the decision area is based on USEPA guidance for residential parcels impacted by lead (USEPA Superfund Lead-Contaminated Residential Sites Handbook, Final: August 2003) and will not exceed approximately 2500 square feet. It is likely that a roughly evenly spaced 4-quadrant grid with a randomly cast origin will be used at AOC-5.

Practical constraints on data collection

Physical constraints

- The sampling areas are in a remote location with sloped, uneven terrain and areas of heavy vegetation, which will require additional planning and logistical effort to get resources to the site.
- The remoteness of the location may require additional sanitation considerations.
- The presence of rock may limit subsurface sampling.
- The lack of runoff may prevent surface water sampling.

Other constraints on data collection

- The turnaround times on data are always estimated and cannot be assured. Sample and system problems may indiscriminately increase data turnaround times.
- Definitive data will undergo a U.S. EPA Region 9 Tier 2 validation review prior to final reporting. Problems identified during this review may initiate additional data reviews, which will increase the time needed before data are finalized.
- Specific data may be qualified or rejected based on the results of the data review process.
- Civil constraints such as site access agreements and other applicable and relevant requirements may exist and, if so, will need to be addressed prior to sampling.

5. DECISION RULE

Statistical Parameter

The concentrations of primary COC concentrations within AOCs 1, 2, and 5 are the statistical parameter of interest. It may be necessary to consider an individual sampling data point (which is not a statistical parameter) as representing the contaminant concentration within a specific area for the Argonaut Mine Tailings site for both the surface soils and the surface water, depending on how many samples are collected through the field judgment of the sampling field team.

Screening Levels

The proposed screening levels for surface soil is 61 mg/kg for arsenic, 400 mg/kg for lead, 10 mg/kg for mercury, and 22 mg/kg for cyanide. These proposed screening levels for lead and mercury are based on the Region 9 Residential Regional Screening Levels (RRSLs) (U.S. EPA May 2013). The proposed screening level for arsenic in surface soil of 61 mg/kg is based on an excess cancer risk of 10^{-4}, not 10- as shown in the Region 9 RRSLs.

The proposed screening levels for the surface water discharges are based upon 40 CFR 131-California Toxics Rule and CVRWQCB Water Quality Goals for Jackson Creek:

- Arsenic of 150 micrograms per liter (µg/l)
- Chromium - 170 µg/l
- Lead - 2.4 µg/l
- Nickel - 44 µg/l)
- Mercury - 0.05 µg/l
- Zinc - 100 µg/l
- Cyanide - 5.2 µg/l

Typical engineering standards and practices will be used to evaluate observed geotechnical parameters; These may include minimum and maximum soil densities, observed grain size, organic content, and hydraulic conductivity and others.

General Decision Rule for Surface Soils in AOC-1, AOC-2, and AOC-5

1. If the concentrations of the COCs in the surface or subsurface soil exceed the screening levels for each of the decision units identified in the specified down gradient areas, then removal or treatment of the affected soil may be initiated by the USEPA,

   OR

   If the concentrations of the COCs in the surface or subsurface soil do not exceed the screening levels, then removal or treatment of the affected soil may be deferred to the state or local agency for further action, or no further action will occur.

Decision Rule for Surface Water (AOC-4)

1. If the concentrations of COCs in the surface water discharges exceed the screening levels, then removal or treatment of the affected surface water may be initiated by the USEPA,

   OR

   If the average concentrations of the primary COCs in the surface water discharges do not exceed the screening levels, then no further action will occur.

Decision Rule for Potential Borrow Soil

1. If the average concentrations of the primary COCs in the specified samples collected from the potential borrow materials do not exceed the screening levels for each of the decision units, and the materials are not likely to generate AMD, and they meet typical engineering specifications, then the USEPA may elect to use this material for treatment of impacted areas in AOC-1 and or AOC-5,

   OR

   If the average concentrations of the primary COCs in the borrow soil exceed the screening levels, or may generate AMD or not meet minimum engineering criteria, then this material may not be suitable for use for treatment purposes and the USEPA will need to identify and investigate an alternative source(s).

6. LIMITS ON DECISION ERRORS

Range of the parameter(s) of interest

For all investigation areas and parameters that involve risk assessment for the protection of human or ecological receptors, the range of interest for the COC is from ½ the screening level to anything above the screening level. Quantitatively precise and accurate determinations of COC concentrations that are significantly above (i.e., >10 times) the screening level are not necessary.

Baseline Condition *(the Null Hypothesis)*

The COC concentrations in soil, sediment, and surface water discharging from the site at the specified AOCs are equal to or greater than the screening levels. The contaminant concentrations in soils from the potential borrow source are less than screening levels.

Alternative Condition *(the Alternative Hypothesis)*

The contaminant concentrations in soil, sediment, and surface water discharging from the site at the specified AOCs are less than screening levels. The contaminant concentrations in soils from the potential borrow source are greater than or equal to screening levels.

Decision Error

A discussion of decision error is presented in Table 1.

Table 1 – Decision Error
Argonaut Mine Tailings Site
Jackson, California

E & E Project No.: EE-002693-2213 TDD No.: TO2-09-13-01-0004

Decision Error	Deciding that COC concentrations in soil and the surface water exceed screening level when in fact they do not.	Deciding that COC concentrations in soil and surface water do not exceed screening levels when in fact they do.
True Nature of Decision Error	The sample concentrations are either not representative or are biased high.	The sample concentrations are either not representative or are biased low.
The Consequence of Error	Site will undergo additional removal activities, costing additional resources of time, money, and human resources.	The decision error could result in a threat to human health and the environment if the existing contaminants are not treated.
Which Decision Error Has More Severe Consequences Near the screening Level?	**Less Severe** to human health, but with appreciable economic consequences.	**More Severe** since the contaminated soil may pose risks to human health and the environment.
Error Type Based on Consequences	**False Acceptance Decisions-** A decision that the area is contaminated when it is not.	**False Rejection Decisions** A decision that the area is not contaminated when it is.

Definitions
A false acceptance decision error occurs when the null hypothesis is not rejected when it is false.
A false rejection decision error occurs when the null hypothesis is rejected when it is true.

Decision Error Limit Goals

Decision error limit goals for soil, sediment and water data presented in Table 2. In order to address the study questions, decisions will be made on AOCs where there is little to no previous sampling data (i.e. AOC-2 and AOC-4).

No decision errors will be evaluated for geotechnical sampling as these are for engineering purposes and do not determine whether removal actions will occur.

Table 2 – Decision Error Limit Goals (All Decision Unit other that Borrow Area)
Argonaut Mine Tailings Site
Jackson, California

E & E Project No.: EE-002693-2213 TDD No.: TO2-09-13-01-0004

True Average Concentration of Property or Property Portion (% of Screening Level)	Decision Error	Typical Decision Error Probability Goals (Based on Professional Judgment)	Type of Decision Error
< 75	A decision that the decision unit is contaminated when it is not.	< 5%	False Acceptance
75 to < 100	A decision that the decision unit is contaminated when it is not.	Gray Area[1]	False Acceptance
100 to 150	A decision that the decision unit is not contaminated when it is.	10%[2]	False Rejection
> 150	A decision that the decision unit is not contaminated when it is.	less than 1%	False Rejection

[1]Gray Area is where relatively large decision errors are acceptable.

[2]The large probability for the decision error is expected when the true contaminant concentrations are between 100% and 150% of the screening level. Decreasing the probability is possible only by significantly increasing sampling number and quality assurance sampling, since sampling and analytical uncertainties and biases cannot be eliminated.

7. OPTIMIZED DESIGN FOR OBTAINING DATA

Design

Background soil samples will not be collected for this sampling event to determine naturally occurring levels of COCs in soils. The estimated sample summary is presented in Table 3. The analysis summary for the estimated soil, sediment, and waste aqueous liquid samples are presented in Table 4. The analysis summary for the estimated water samples are presented in Table 5.

AOC-1: Ore Pile:

Grid sampling will be proposed on approximately 125-foot spaced grid nodes over the entire AOC-1 to characterize surface and shallow subsurface (less than 1-foot bgs) soil. Because the ore is visually apparent, some samples in areas obviously contaminated with ore and near the middle of AOC-1 may be omitted to save time and budget. Samples will be proposed for collection from the surface (0-2 inches bgs) soils and in selected perimeter locations, at 1-foot bgs). Depending on topographical features, the lateral extent of visible mine waste, and apparent mechanism of definition, limited shallow subsurface sampling (up to 1.5 feet bgs) may be conducted to define the vertical extent of larger waste piles. However, in general site topography suggests impacts are relatively shallow (less than 10-feet) near the edges of AOC-1 and related to surface erosion and subsequent deposition or previous mine operations.

To further define an apparent "hot spot", additional discrete judgmental sampling may be performed in the northwestern portion of AOC1 near URS soil boring SB-02. The detected arsenic concentration in the surface soil sample collected at SB-02 was 39,000 mg/kg.

AOC-2: Cyanide Plant:

Aqueous liquid samples will be collected from all discrete tanks and vats (i.e. those not plumbed in common/parallel) containing liquid. Sediment samples will be taken from all discrete tanks and vats with sediment or solids in them. A number of discrete soil samples will be taken around the tank and vat process area in the former Thickening Basin to try and characterize the soils in the former processing area.

AOC-4: Surface Water:

It is anticipated that the only surface water available for evaluation at the site during the investigation will be located within a small creek discharging from beneath the dam at the southeast corner of the site. Two samples shall be taken from this creek, one as the water leaves the site, the other near the source of the seep. This sample will be collected at the center of the creek and at approximately 2/3 of the maximum depth using a bailer or other appropriate collection device. The field team should take care not to disturb the pool bed and suspend settled sediment in order to get a true representative reading of the surface water contamination. However, if possible a duplicate will be collected for quality assurance. A GPS coordinate (latitude and longitude) will be taken of the sample location.

Two surface water samples will be collected from Jackson Creek. One sample will be located upstream of the confluence of the site surface water and Jackson Creek, the other will be located downstream of the confluence.

AOC-5: Residential Lot:

Residential area sampling design will be based on upon the strategy used in *EPA Lead-Contaminated Residential Sites Handbook, Final, OSWER 9285.7-50, August 2003.* Each decision unit in the residential yard area will be sampled by creating a five point composite sample. If composite samples are collected, the first sampling point will be collected from a centrally located point within each decision unit that shows evidence of visual contamination (discoloration of soil). The 4 additional sampling points will be collected approximately 90 degrees from each other, at a point halfway between the center point and the decision unit boundary (which will be assumed to be 10-20 feet from the center). Samples will be collected at intervals between 0 and 2 inches below ground surface (bgs) and at 1-foot bgs using trowels or disposable scoops.

The field sampling team will homogenize all soil samples by thoroughly mixing the collected soil for an interval. All samples will be placed in coolers on ice for storage and shipping.

Potential Borrow Source Material

Samples will be collected from potential borrow source materials to evaluate for chemical and geotechnical parameters. Sample locations will be based on access agreements, available type and amount of material, and proximity to the site.

Table 3 Estimated Sample Summary[1]
Argonaut Mine Tailings Pile Assessment
Jackson, California

Project No. EE-002693-2213 **TDD No. TO-02-09-13-01-0004**

Sampling Locations	Aqueous Liquid and Surface Water Samples	Aqueous Liquid and Surface Water Field Duplicates	Estimated 0-2 inch, and 12-18 inch depth Discrete Soil/Sediment Samples	Estimated 0-2 inch, and 12-18 inch depth Composite Soil/Sediment Samples	Soil or Sediment Field Duplicates	Unique Samples for analysis	Collected Soil Samples	Collected Water Samples
AOC-1	0	0	66	0	7	66	73	0
Borrow Area	0	0	0	3[2]	1	3	4	0
AOC-2	15	2	31	0	4	31	35	17
AOC-4	10	1	10		1	10	11	11
AOC-5	0	0	0	8	1	8	9	0
Total	**25**	**3**	**107**	**11**	**14**	**118**	**132**	**28**

Notes: 2013 ecology & environment, inc

(1) Does not include any additional sampling based on field generated data or observations or aliquots analyses as described is section 4.2.

(2) Sample from borrow area is collected between 0 and 18 inches in depth.

Table 4 Estimated Soil,Sediment, and Waste Aqueous Liquid Analysis Summary
Argonaut Tailings Pile Assessment
Jackson, California

Project No. EE-002693-2213 **TDD No. TO-02-09-13-01-0004**

Method	Lead, Arsenic, and Mercury by XRF Field Analysis	TAL[1] Metals by U.S. EPA 6010B extraction by U.S. EPA 3050B (Mercury by U.S. EPA 7471A)	STLC[2] Metals and Mercury by U.S. EPA 1311/1312	Total and Amenable Cyanide by U.S. EPA 9010/9012	pH by U.S. EPA 9045	PAH and Phenols by U.S. EPA 8270C
Soil/Sediment Sample Size and Container Submitted for Preparation and Analysis	100 grams of soil in plastic sample bag, glass jar, or plastic jar. Sieved through a 250 micron sieve and stored in a 5-gram XRF sample cup	100 grams of soil in plastic sample bag, glass jar or plastic jar.	50 grams of soil in plastic sample bag, glass jar or plastic jar.	4 oz glass jar.	4 oz glass jar.	4 oz glass jar
Waste Aqueous Liquid Sample Size and Container Submitted for Preparation and Analysis	NA	500 ml in plastic bottle; preserved with HNO_3	NA	1 L HDPE; preserved with NaOH to >12 pH	NA	NA
Preservation	4°C[3]	4°C	4°C	4°C	4°C	4°C
Analysis Holding Time	Mercury is 28 days 180 days other metals			14 days	asap	14 days
Estimated Number of Unique Discrete Samples for Analysis	107	11	10	41	66	41
Estimated Number of Composite Samples for Analysis	11	2	0	0	8	0
Estimated Number of Aqueous Liquid Samples	N/A	15	0	15	0	15
Estimated Number of Field Duplicate Samples	14	4	1	7	8	6
Estimated Total Initial Analyses	**132**	**32**	**11**	**63**	**82**	**62**
Matrix Spike/Matrix Spike Duplicate	N/A	2	1	3	4	3

Notes:

L = liter

HDPE = high density polyethylene

(1) TAL = Target Analyte List

(2) STLC = Soluble Threshold Limit Concentration

(3) Samples will be maintained at 4°C in case the XRF vs. laboratory correlation is not valid and all samples must be sent to the laboratory for analysis.

Table 5 Estimated Surface Water Analysis Summary
Argonaut Tailings Pile Assessment
Jackson, California

Project No. EE-002693-2213 **TDD No. TO-02-09-13-01-0004**

Method	TAL[1] Metals by U.S. EPA 200.7; lead by 200.8 (Mercury by U.S. EPA 245.1)	Alkalinity by Standard Method 2320-B	Iron Speciation by U.S. EPA 200.7	Anions by U.S. EPA 300.0	PAH and Phenols by U.S. EPA 8270C
Sample Size and Container Submitted for Preparation and Analysis	500 ml plastic bottle	500 ml plastic bottle	500 ml plastic bottle	500 ml in plastic bottle	1 L amber glass bottle
Preservation	HNO_3; 4°C	4°C	4°C	4°C	4°C
Analysis Holding Time	28 days[2]	14 days	6 months	48 hrs	7 days
Estimated Number of Unique Discrete Surface Water Samples for Analysis	10	10	10	10	10
Estimated Number of Field Duplicate Samples	1	1	1	1	1
Matrix Spike/Matrix Spike Duplicate[3]	1	1	1	1	1
Estimated Total Initial Analyses	**11**	**11**	**11**	**11**	**11**

Note:

L = liter

PAH = Polycyclic Aromatic Hydrocarbons

(1) TAL = Target Analyte List

(2) Holding time for mercury is 28 days, 180 days for all other metals.

(3) Not included in Estimated Total Initial Analyses.

General Requirements

All activities and documentation related to the project should proceed under a Quality Management Plan. All sampling, analytical, and quality assurance activities will proceed under a U.S. EPA-approved SAP. A record of sampling activities and deviation from the SAP must be documented in a bound field log book. Prior to sample collection, all project sampling personnel will review relevant sampling procedures and relevant quality assurance and control requirements for selected analytical methods.

Replicates and equipment blanks will be collected per specified method frequency. Additional volumes for matrix spike and spike duplicate samples will be collected and are required by method. Data review independent of the laboratory will be performed on all START-generated analytical data that may be used in decision making. Whenever possible, the GPS coordinates (latitude and longitude) of each sampling location will be determined and documented during sampling.

General Consideration for Decision Error Minimization

Average concentrations

To minimize a decision error related to data uncertainty, the decision-maker should consider average concentrations within the context of a statistical evaluation that accounts for concentration variance.

Data from individual sample locations collected in the specified AOCs and surface water

The decision-maker should consider data uncertainty when making decisions using sampling data and associated estimated values from a single location. An individual data value reported below the screening level may be biased low, while a data value reported above the screening level may be biased high. The probability of decision error increases when COC concentrations are around the screening level due to both data uncertainty and data bias. Due to the nature of the contamination, it is unknown whether data from any individual sample location within a decision unit can represent a larger area. There are insufficient data to determine confidence of any single sampling location. Thus the decision-maker should consider discrete data points as potentially not representative of any greater area.

Contamination hot-spot locations for all AOCs

Individual sample data that are above the screening level and show contaminant concentrations more than three times greater than results from adjacent sampling locations should be considered separately to determine whether they represent a contamination hot-spot.

Data from composite sample locations collected from the potential borrow source material

The decision-maker should consider data uncertainty when making decisions using an average value derived from composite sample locations. Using an average value to represent a single decision area can introduce data uncertainty when concentration variance is high, wherein the number of samples selected for the composite may not be great enough to achieve representative sampling. To minimize decision errors around the screening level, for soil data in which composite samples have a reported concentration between 75% and 99% of the screening level, the concentrations of the samples used to make up the composite should be evaluated individually to identify whether sample variance is within acceptable ranges. Otherwise, the area should be treated as potentially exceeding the screening level.

Contamination distribution map

Data from sampling locations can be used to create a contaminant distribution map. The mapped COC concentrations within an area should generally be based on the sample data from that area and the sample data from adjacent locations, particularly if discrete sample data are being used. The generated map model could be used to estimate the concentration of contamination throughout the property. The decision-maker should consider the data source and statistical sophistication of the distribution map prior to making decisions based on the map.

Appendix B: Site Specific Health and Safety Plan

Revision 8
January 2008

ECOLOGY AND ENVIRONMENT, INC.

SITE-SPECIFIC
HEALTH AND SAFETY PLAN, NEW LONDON MINE TBA

Project: Argonaut Mine Site Walk

Project No.: _____

TDD/PAN No.: _____

Project Location: Argonaut Lane at Hoffman Street, Jackson, CA

Proposed Date of Field Activities: February 7, 2013

Project Director: Cindy McLeod

Project Manager: Brian Milton

Prepared by: Kate Villars Date Prepared: 02/01/13

Approved by: _____ Date Approved: _____

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1. INTRODUCTION

1.1 POLICY

It is E & E's policy to ensure the health and safety of its employees, the public, and the environment during the performance of work it conducts. This site-specific health and safety plan (SHASP) establishes the procedures and requirements to ensure the health and safety of E & E employees for the above-named project. E & E's overall safety and health program is described in *Corporate Health and Safety Program* (CHSP). After reading this plan, applicable E & E employees shall read and sign E & E's Site-Specific Health and Safety Plan Acceptance form.

This SHASP has been developed for the sole use of E & E employees and is not intended for use by firms not participating in E & E's training and health and safety programs. Subcontractors are responsible for developing and providing their own safety plans.

This SHASP has been prepared to meet the following applicable regulatory requirements and guidance:

Applicable Regulation/Guidance
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER)
Other:

1.2 SCOPE OF WORK

Description of Work:

START will conduct an initial site walk to review accessibility, topography and hydrology throughout the site, determine sample locations, and assess stability of an on site dam. After the site walk, START will collect surface soil and surface water samples for laboratory analysis. Non-dedicated sampling equipment, such as trowels, will be decontaminated between samples.

Equipment/Supplies: Attachment 1 contains a checklist of equipment and supplies that will be needed for this work.

The following is a description of each numbered task:

Task Number	Task Description
1	Initial Site Walk
2	Surface Soil Sampling
3	Equipment Decontamination

1.3 SITE DESCRIPTION

Site Map: A site map is attached showing the general location of the site and site features.

Site History/Description (see field sampling plan for detailed description): The Argonaut Mine site is a former gold mine, where ore was mined and processed. Ore was processed on site using a stamp mill, oil flotation, mercury amalgamation and cyanide vat leaching techniques. Tailings were held on site in a surface impoundment and stockpiled for processing. A concrete dam was constructed on the eastern edge of the site to prevent tailings from entering Jackson Creek and tailings and sediment have migrated to fill the basin. This dam is to be evaluated for stability during this site walk.

Is the site currently in operation? ☐ Yes ☒ No

Locations of Contaminants/Wastes: Arsenic and lead levels are expected to be elevated in tailings impounded throughout the site. However, data from previous DTSC studies the source area for arsenic appears to be a 5 acre area void of vegetation in the northwest portion of the site. This area has documented concentrations of arsenic in surface soils up to 39,000 mg/kg.

Types and Characteristics of Contaminants/Wastes:

☐ Liquid	☒ Solid	☐ Sludge	☒ Gas/Vapor
☐ Flammable/Ignitable	☐ Volatile	☐ Corrosive	☐ Acutely Toxic
☐ Explosive	☐ Reactive	☒ Carcinogenic	☐ Radioactive
☐ Medical/Pathogenic	Other:		

2. ORGANIZATION AND RESPONSIBILITIES

E & E team personnel shall have on-site responsibilities as described in E & E's standard operating procedure (SOP) for Site Entry Procedures (GENTECH 2.2). The project team, including qualified alternates, is identified below.

Name	Site Role/Responsibility
Brian Milton	Project/Task Manager/Site Safety Officer
Kate Villars	Field Team Member

3. TRAINING

Prior to work, E & E team personnel shall have received training as indicated below. As applicable, personnel shall have read the project work plan, sampling and analysis plan, and/or quality assurance project plan prior to project work.

Training	Required
40-Hour OSHA HAZWOPER Initial Training and Annual Refresher (29 CFR 1910.120)	X
Annual First Aid/CPR	X
Hazard Communication (29 CFR 1910.1200)	X
40-Hour Radiation Protection Procedures and Investigative Methods	
8-Hour General Radiation Health and Safety	
Radiation Refresher	
DOT and Biannual Refresher	
Other:	

4. MEDICAL SURVEILLANCE

4.1 MEDICAL SURVEILLANCE PROGRAM

E & E field personnel shall actively participate in E & E's medical surveillance program as described in the CHSP and shall have received, within the past year, an appropriate physical examination and health rating.

E & E's health and safety record (HSR) form will be maintained on site by each E & E employee for the duration of his or her work. E & E employees should inform the site safety officer (SSO) of any allergies, medical conditions, or similar situations that are relevant to the safe conduct of the work to which this SHASP applies.

Is there a concern for radiation at the site? ☐ Yes ☒ No

If no, go to 5.1.

4.2 RADIATION EXPOSURE (Not Applicable)

4.2.1 External Dosimetry

Thermoluminescent Dosimeter (TLD) Badges: TLD badges are to be worn by all E & E field personnel on all field projects.

Pocket Dosimeters: _____

Other: _____

4.2.2 Internal Dosimetry

☐ Whole body count ☐ Bioassay ☐ Other

Requirements: _____

4.2.3 Radiation Dose

Dose Limits: E & E's radiation dose limits are stated in the CHSP. Implementation of these dose limits may be designated on a site specific basis.

Site-Specific Dose Limits: _____

ALARA Policy: Radiation doses to E & E personnel shall be maintained as low as reasonably achievable (ALARA), taking into account the work objective, state of technology available, economics of improvements in dose reduction with respect to overall health and safety, and other societal and socioeconomic considerations.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: Will be updated during site reconnaissance, A site map is attached showing site features. The source area, drainages, and dam area areas for anticipated sampling and study.

Site Access Requirements and Special Considerations: Site is easily accessible from adjacent roadway. Access agreements have been obtained from the property owner by EPA OSC Shane.

Illumination Requirements: No special requirements are currently known to exist.

Sanitary Facilities (e.g., toilet, shower, potable water): A portable toilet will be available during the assessment.

On-Site Communications: Primary method: verbal. Secondary method: cell phones or radios.

Other Site-Control Requirements:

5.2 SAFE WORK PRACTICES

Daily Safety Meeting: A daily safety meeting will be conducted for all E & E personnel and documented on the Daily Safety Meeting Record form or in the field logbook.

Work Limitations: Work shall be limited to a maximum of 12 hours per day. If 12 consecutive days are worked, at least one day off shall be provided before work is resumed. Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Weather Limitations: Work shall not be conducted during electrical storms. Work conducted in other inclement weather (e.g., rain, snow) will be approved by project management and the regional safety coordinator or designee.

Other Work Limitations:

Buddy System: Field work will be conducted in pairs of team members according to the buddy system.

Line of Sight: Each field team member shall remain in the line of sight and within verbal communication of at least one other team member.

Eating, Drinking, and Smoking: Eating, drinking, smoking, and the use of tobacco products shall be prohibited in the exclusion and contamination reduction areas, at a minimum, and shall only be permitted in designated areas.

Contamination Avoidance: Field personnel shall avoid unnecessary contamination of personnel, equipment, and materials to the extent practicable.

Sample Handling: Protective gloves of a type designated in Section 7 will be worn when containerized samples are handled for labeling, packaging, transportation, and other purposes.

Other Safe Work Practices:

6. HAZARD EVALUATION AND CONTROL

6.1 PHYSICAL HAZARD EVALUATION AND CONTROL

Potential physical hazards and their applicable control measures are described in the following table for each task.

Hazard	Task Number	Hazard Control Measures
Biological (flora, fauna, etc.)	1,2	■ Potential hazard: ■ Establish site-specific procedures for working around identified hazards. ■ Other:
Cold Stress	1,2,3	■ Provide warm break area and adequate breaks. ■ Provide warm noncaffeinated beverages. ■ Promote cold stress awareness. ■ See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders		■ Use caution when moving or storing cylinders. ■ A cylinder is a projectile hazard if it is damaged or its neck is broken. ■ Store cylinders upright and secure them by chains or other means. ■ Other:
Confined Space		■ Ensure compliance with 29 CFR 1910.146. ■ See SOP for Confined Space Entry. Additional documentation is required. ■ Other:
Drilling		■ See SOP for Health and Safety on Drilling Rig Operations. Additional documentation may be required. ■ Landfill caps will not be penetrated without prior discussions with corporate health and safety staff. ■ Other:
Drums and Containers		■ Ensure compliance with 29 CFR 1910.120(j). ■ Consider unlabeled drums or containers to contain hazardous substances and handle accordingly until the contents are identified. ■ Inspect drums or containers and assure integrity prior to handling. ■ Move drums or containers only as necessary; use caution and warn nearby personnel of potential hazards.
Drums and Containers (Opening)		■ Open, sample, and/or move drums or containers in accordance with established procedures; use approved drum/container-handling equipment. ■ Level C PPE will be used
Electrical		■ Ensure compliance with 29 CFR 1910 Subparts J and S. ■ Locate and mark energized lines. ■ De-energize lines as necessary. ■ Ground all electrical circuits. ■ Guard or isolate temporary wiring to prevent accidental contact. ■ Evaluate potential areas of high moisture or standing water and define special electrical needs. ■ Other:
Excavation and Trenching		■ Ensure that excavations comply with and personnel are informed of the requirements of 29 CFR 1926 Subpart P. ■ Ensure that any required sloping or shoring systems are approved as per 29 CFR 1926 Subpart P.

Hazard	Task Number	Hazard Control Measures
		■ Identify special personal protective equipment (PPE) (see Section 7) and monitoring (see Section 8) needs if personnel are required to enter approved excavated areas or trenches. ■ Maintain line of sight between equipment operators and personnel in excavations/trenches. Such personnel are prohibited from working in close proximity to operating machinery. ■ Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results. ■ Other:
Fire and Explosion		■ Inform personnel of the location(s) of potential fire/explosion hazards. ■ Establish site-specific procedures for working around flammables. ■ Ensure that appropriate fire suppression equipment and systems are available and in good working order. ■ Define requirements for intrinsically safe equipment. ■ Identify special monitoring needs (see Section 8). ■ Remove ignition sources from flammable atmospheres. ■ Coordinate with local fire-fighting groups regarding potential fire/explosion situations. ■ Establish contingency plans and review daily with team members. ■ Other:
Heat Stress		■ Provide cool break area and adequate breaks. ■ Provide cool noncaffeinated beverages. ■ Promote heat stress awareness. ■ Use active cooling devices (e.g., cooling vests) where specified. ■ See *Heat Stress Prevention and Treatment* (attached at the end of this plan if heat stress is a potential hazard).
Heavy Equipment Operation		■ Define equipment routes, traffic patterns, and site-specific safety measures. ■ Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. ■ Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. ■ Identify special PPE (Section 7) and monitoring (Section 8) needs. ■ Ensure that field personnel do not work in close proximity to operating equipment. ■ Ensure that lifting capacities, load limits, etc., are not exceeded. ■ Other:
Heights (Scaffolding, Ladders, etc.)		■ Ensure compliance with applicable subparts of 29 CFR 1910. ■ Identify special PPE needs (e.g., lanyards, safety nets, etc.) ■ Other:
Noise		■ Establish noise level standards for on-site equipment/operations. ■ Inform personnel of hearing protection requirements (Section 7).

Hazard	Task Number	Hazard Control Measures
		■ Define site-specific requirements for noise monitoring (Section 8). ■ Other:
Overhead Obstructions		■ Wear hard hat. ■ Other:
Power Tools		■ Ensure compliance with 29 CFR 1910 Subpart P. ■ Other:
Sunburn	1,2,3	■ Apply sunscreen. ■ Wear hats/caps and long sleeves. ■ Other:
Utility Lines		■ Identify/locate existing utilities prior to work. ■ Ensure that overhead utility lines are at least 25 feet away from project activities. ■ Contact utilities to confirm locations, as necessary. ■ Other:
Weather Extremes		■ Potential hazards: ■ Establish site-specific contingencies for severe weather situations. ■ Provide for frequent weather broadcasts. ■ Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). ■ Identify special PPE (Section 7) needs. ■ Discontinue work during severe weather. ■ Other:
Other:		■ ■
Other:		■ ■

6.2 CHEMICAL HAZARD EVALUATION AND CONTROL

6.2.1 Chemical Hazard Evaluation

Potential chemical hazards are described by task number in Table 6-1. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

6.2.2 Chemical Hazard Control

An appropriate combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below published exposure levels (see Section 6.2.1).

Applicable Engineering/Administrative Control Measures: _____

_____

PPE: See Section 7. _____

6.3 RADIOLOGICAL HAZARD EVALUATION AND CONTROL (Not Applicable)

6.3.1 Radiological Hazard Evaluation

Potential radiological hazards are described below by task number. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

Task Number	Radionuclide	DAC (μCi/ml)	Route(s) of Exposure	Major Radiation(s)	Energy(s) (MeV)	Half-Life

6.3.2 Radiological Hazard Control (Not Applicable)

Engineering/administrative controls and work practices shall be instituted to reduce and maintain employee exposures to a level at or below the permissible exposure/dose limits (see sections 4.2.3 and 6.3.1). Whenever engineering/administrative controls and work practices are not feasible or effective, any reasonable combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below permissible exposure/dose limits.

Applicable Engineering/Administrative Control Measures: _____

_____

PPE: See Section 7. _____

TABLE 6-1

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1,2,3	Mercury	100,000 ng/m^3	50,000 ng/m^3	25,000 ng/m^3	Yes	Inhalation, Absorption., Ingestion, Skin/Eye Contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	None/Liquid/ Vapor		NA
1,2,3	Lead	0.050 mg/m^3	0.050 mg/m^3		Yes	Inhalation, Ingestion, Skin/Eye Contact	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic;	None/Solid		NA

							anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension			
1,2,3	Arsenic	0.010 mg/m^3	0.002 mg/m^3 (15 Minute ceiling)	0.01 mg/m3	Yes	Inhalation, Absorption., Ingestion, Skin/Eye Contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin	None/Solid		NA
1,2,3	Cyanide (as Sodium Cyanide)	5 mg/m^3	4.7 ppm	2 mg/m^3	Yes	Inh, Abs, Ing, Con	Irrit eyes, skin, resp; eye, skin burns	Low/solid		10.65 eV

Note: Use an asterisk (*) to indicate known or suspected carcinogens.

7. LEVEL OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

7.1 LEVEL OF PROTECTION

The following levels of protection (LOPs) have been selected for each work task based on an evaluation of the potential or known hazards, the routes of potential hazard, and the performance specifications of the PPE. On-site monitoring results may be used to modify these LOPs and the PPE, as necessary, to ensure sufficient personnel protection. The authorized LOP and PPE shall only be changed with the approval of the regional safety coordinator or designee. Level A is not included below because Level A activities, which are performed infrequently, will require special planning and addenda to this SHASP.

Task Number	B	C	D	Modifications Allowed
1		(X)	X	
2		(X)	X	
3		(X)	X	

Note: Use "X" for initial levels of protection. Use "(X)" to indicate levels of protection that may be used as site conditions warrant.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The PPE selected for each task is indicated below. E & E's PPE program complies with 29 CFR 1910.120 and 29 CFR 1910 Subpart I and is described in detail in the CHSP. Refer to 29 CFR 1910 for the minimum PPE required for each LOP.

PPE	Task Number/LOP					
	1	2	3			
Full-face APR	(X)	(X)	(X)			
PAPR						
Cartridges:						
P100	(X)	(X)	(X)			
GMC-P100						
GME-P100						
Other:						
Positive-pressure, full-face SCBA						
Spare air tanks (Grade D air)						
Positive-pressure, full-face, supplied-air system						
Cascade system (Grade D air)						
Manifold system						
5-Minute escape mask						

PPE	Task Number/LOP					
	1	2	3			
Safety glasses	X	X	X			
Monogoggles						
Coveralls/clothing						
Protective clothing:						
Tyvek		(X)	(X)			
Saranex						
Other:						
Splash apron						
Inner gloves:						
Cotton						
Nitrile		X	X			
Latex						
Other:						
Outer gloves:						
Viton						
Rubber						
Neoprene						
Nitrile						
Other:						
Work gloves						
Safety boots (as per ANSI Z41)	X	X	X			
Neoprene safety boots (as per ANSI Z41)						
Boot covers (type: latex)						
Hearing protection (type: _____)						
Hard hat						
Face shield						
Other:						
Other:						

8. HEALTH AND SAFETY MONITORING

Health and safety monitoring will be conducted to ensure proper selection of engineering/administrative controls, work practices, and/or PPE so that employees are not exposed to hazardous substances at levels that exceed permissible exposure/dose limits or

published exposure levels. Health and safety monitoring will be conducted using the instruments, frequency, and action levels described in Table 8-1. Health and safety monitoring instruments shall have been appropriately calibrated and/or performance-checked prior to use.

9. DECONTAMINATION PROCEDURES

All equipment, materials, and personnel will be evaluated for contamination upon leaving the exclusion area. Equipment and materials will be decontaminated and/or disposed and personnel will be decontaminated, as necessary. Decontamination will be performed in the contamination reduction area or any designated area such that the exposure of uncontaminated employees, equipment, and materials will be minimized. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): Wipe electronic equipment used with phosphate-based detergent wipes. Non-dedicated sampling equipment will be decontaminated using a three step 5-gallon bucket process utilizing alconox and distilled water.

Ventilation: All decontamination procedures will be conducted in a well-ventilated area.

Personnel Decontamination Procedures: Site reconnaissance: dry decontamination, with spot-decontamination to be performed using disinfectant hand wipes if necessary.

PPE Requirements for Personnel Performing Decontamination: Level D using tyvek suit, nitrile gloves, and safety glasses.

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and face with soap and potable water. Personnel should shower at the end of each work shift.

Disposition of Disposable PPE: Disposable PPE must be rendered unusable and disposed as indicated in the work plan.

Disposition of Decontamination Wastes (e.g., dry wastes, decontamination fluids, etc.): The only decontamination wastes that will be generated are minimal quantities of rinsate, which shall be dispersed at the site.

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]
X PID (e.g., RAE mini RAE) ☐ FID (e.g., OVA 128-) ☐ TVA 1000	1	Unknown VOCs	Throughout Site	Initial Screen	**Unknown Vapors** Background to 1 ppm above background: Level D 1 to 5 ppm above background: Level C 5 to 500 ppm above background: Level B >500 ppm above background: Level A
HCN (ToxiRae)	1,2,3	Hydrogen cyanide	Mine, Mill, Watercourse	Throughout Site Walk	≥4 ppm: Leave area and consult with SSO.
Micro R Meter	1	Radioactive material	Throughout the site	Initial Screen	<2 mR/hr: Continue work in accordance with action levels for other instruments. 2 to 5 mR/hr: In conjunction with a radiation safety specialist, continue work and perform stay-time calculations to ensure compliance with dose limits and ALARA policy. >5 mR/hr: Evacuate area to reassess work plan and evaluate options to maintain personnel exposures ALARA and within dose limits.
Mercury (Lumex Mercury Vapor Analyzer)	1	Mercury	Mine, Mill, Watercourse	Initial Screen	<12,500 ng/m^3: Continue work in accordance with action levels for other instruments. 12,500 ng/m^3 – 50,000 ng/m^3: Continue work with full face APR w/ mersorb P100 combination cartridges. >50,000 ng/m^3 - Leave area and consult with SSO.

a Unless stated otherwise, airborne contaminant concentrations are measured as a time-weighted average in the worker's breathing zone. Acceptable concentrations for known airborne contaminants will be determined based on OSHA/NIOSH/ACGIH and/or NRC exposure limits. As a guideline, 1/2 the PEL/REL/TLV, whichever is lower should be used.

10. EMERGENCY RESPONSE

This section contains additional information pertaining to on-site emergency response and does not duplicate pertinent emergency response information contained in earlier sections of this plan (e.g., site layout, monitoring equipment, etc.). Emergency response procedures will be rehearsed regularly, as applicable, during project activities.

10.1 EMERGENCY RESPONSIBILITIES

All Personnel: All personnel shall be alert to the possibility of an on-site emergency; report potential or actual emergency Situations to the team leader and SSO; and notify appropriate emergency resources, as necessary.

Team Leader: The team leader will determine the emergency actions to be performed by E & E personnel and will direct these actions. The team leader also will ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other: _____

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: 911

Hospital: Sutter Amador Hospital, 200 Mission Boulevard, Jackson, CA (209) 223-7555.

Directions to Hospital (map attached at the end of this plan): A map and directions are attached at the end of this Safety Plan. Head southeast on Hoffman St, turn right onto CA-49 S, take the 2nd left on CA-88 E, turn right onto Mission Blvd.

Poison Control: (800) 222-1222

Police Department: 911

Fire Department: 911

Client Contact: EPA R9 OSC Dan Shane (415) 971-6461

Site Contact: N/A

On-Site Telephone Number: N/A

Cellular Telephone Number: (415) 264-5510 (START PM Brian Milton)

Radios Available: _____

Other: _____

10.3 E & E EMERGENCY CONTACTS

E & E Emergency Operations Center (24 Hours): 716/684-8060

Corporate Health and Safety Director, Dr. Paul Jonmaire: 716/684-8060 (office)
716/655-1260 (home)

Regional Office Contact: Cindy McLeod, Regional Safety Coordinator (415) 238-3379 (cell)
(510) 893-6700 (office)
(510) 654-6250 (home)

a. E & E Emergency Response Center: 716/684-8060

b. Corporate Health and Safety Director, Dr. Paul Jonmaire: 716/684-8060 (office)
716/655-1260 (home)

c. Assistant Corporate Safety Director, Tom Siener, CIH: 716/684-8060 (office)
716/662-4740 (home)
716/597-5868 (Cell)

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): 3 blasts of car horn or air horn

On-Site Assembly Area: Superior County Traffic Court parking lot.

Emergency Egress Route to Get Off Site: TBD.

Off-Site Assembly Area: TBD.

Preferred Means of Reporting Emergencies: Call 911

Site Security and Control: In an emergency situation, personnel will attempt to secure the affected area and control site access.

Spill Control Procedures:

Emergency Decontamination Procedures: Dry decon, wipe down any dust. Remove and secure any contaminated PPE of clothing. Perform additional gross decontamination or any localized decontamination as needed. Inform medical personnel of any known or suspected contamination or exposure.

PPE: Personnel will don appropriate PPE when responding to an emergency situation. The SSO and Section 7 of this plan will provide guidance regarding appropriate PPE.

Emergency Equipment: Appropriate emergency equipment is listed in Attachment 1. Adequate supplies of this equipment shall be maintained in the support area or other approved work location.

Incident Reporting Procedures: Report all injuries and/or exposures to the FOSC and the E&E Regional Safety Coordinator (RSC) immediately. The SSO or PM must complete an Injury/Exposure Report as soon as possible for submission to the RSC and Corporate Health & Safety.

ATTACHMENT 1

EQUIPMENT/SUPPLIES CHECKLIST

	No.
INSTRUMENTATION	
FID	
Thermal desorber	
O_2/explosimeter w/cal. Kit	
Photovac tip	
PID (probe: 10.6 eV)	1
Magnetometer	
Pipe locator	
Weather station	
Draeger tube kit (tubes: HCN, H2S, SO2)	
Brunton compass	
Real-time cyanide monitor	1
Real-time H_2S monitor	
Heat stress monitor	
Noise equipment	
Personal sampling pumps and supplies	
MiniRam dust monitor	
Mercury monitor	1
Spare batteries (type: for ToxiRae HCN Monitor)	2
RADIATION EQUIPMENT/SUPPLIES	
Documentation forms	
Portable ratemeter	
Scaler/ratemeter	
1" NaI gamma probe	
2" NaI gamma probe	
ZnS alpha probe	
GM pancake probe	
Tungsten-shielded GM probe	
Micro R meter	X
Ion chamber	
Alert monitor	
Pocket dosimeter	
Dosimeter charger	
Radiation warning tape	

	No.
Radiation decon supplies	
Spare batteries (type: _____)	
SAMPLING EQUIPMENT See QASP for full bottle list	
8-oz. bottles	
Half-gallon bottles	
VOA bottles	
String	
Hand bailers	
Thieving rods with bulbs	
Spoons	
Knives	
Filter paper	
Bottle labels	
Plastic Scoops	
MISCELLANEOUS	
Pump	
Surveyor's tape	
100' Fiberglass tape	
300' Nylon rope	
Nylon string	
Surveying flags	
Camera	1
Film	
Bung wrench	
Soil auger	
Pick	
Shovel	
Catalytic heater	
Propane gas	
Banner tape	
Surveying meter stick	
Chaining pins and ring	
Logbooks (_2___ large, _____ small)	2

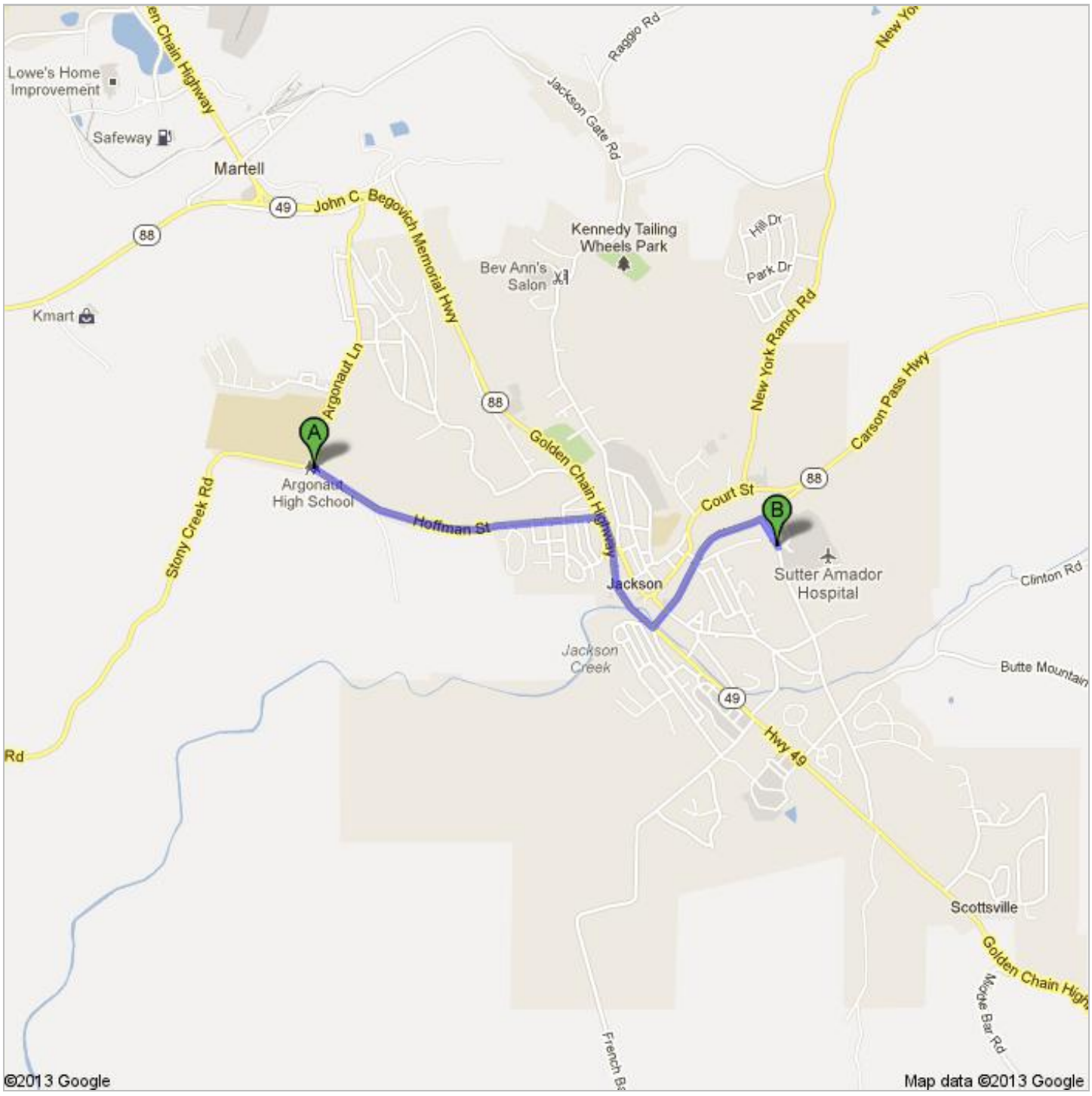
	No.
Required MSDSs	
Intrinsically safe flashlight	
Potable water	1 cs
Gatorade or equivalent	
Tables	
Chairs	
Weather radio	
Two-way radios	
Binoculars	
Megaphone	
Cooling vest	
EMERGENCY EQUIPMENT	
First aid kit	X
Stretcher	
Portable eye wash	
Blood pressure monitor	
Fire blanket	
Fire extinguisher	
Thermometer (medical)	
Spill kit	
DECONTAMINATION EQUIPMENT	
Wash tubs	
Buckets	X
Scrub brushes	
Pressurized sprayer	
Spray bottle	X
Detergent (type: alconox)	X
Solvent (type: _____)	
Plastic sheeting	X
Tarps and poles	
Trash bags	X
Trash cans	
Masking tape	
Duct tape	X

	No.
Paper towels	X
Face mask	
Face mask sanitizer	X
Step ladders	
Distilled water	
Deionized water	
SHIPPING EQUIPMENT	
Coolers	
Paint cans with lids, 7 clips each	
Vermiculite	
Shipping labels	
DOT labels:	
"Up"	
"Danger"	
"Inside Container Complies ..."	
Hazard Group	
Strapping tape	
Baggies	
Custody seals	
Chain-of-custody forms	
Express shipment forms	
Clear packing tape	
Permanent markers	


Source Area
High School
Site Boundary
Berms
Dam
Pioneer St
Amador St
Spunn Rd
Buena Vista Dr
Argonaut Dr
Argonaut Ln
Westview Dr
Desert Ln
Vegan Toll Rd
Stoney Creek Rd
Save Mart
Floors To Go
Play It Again Sports
88

Google

Directions to Sutter Amador Hospital
200 Mission Blvd, Jackson, CA 95642
1.9 mi – about **5 mins**



Hoffman St & Argonaut Ln, Jackson, CA 95642

	1. Head **southeast** on **Hoffman St** toward **Blue Oak Ln** About 2 mins	go 0.9 mi total 0.9 mi
49	2. Turn right onto **CA-49 S** About 1 min	go 0.4 mi total 1.3 mi
88	3. Take the 2nd left onto **CA-88 E** About 2 mins	go 0.5 mi total 1.8 mi
	4. Turn right onto **Mission Blvd** Destination will be on the left	go 0.1 mi total 1.9 mi

Sutter Amador Hospital
200 Mission Blvd, Jackson, CA 95642

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Arsenic (inorganic compounds, as As)

Synonyms & Trade Names Arsenic metal: Arsenia
Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite and all inorganic compounds containing arsenic except ARSINE.]

CAS No. 7440-38-2 (metal)	**RTECS No.** CG0525000 (metal) (/niosh-rtecs/CG802C8.html)	**DOT ID & Guide** 1558 152 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152) (http://www.cdc.gov/Other/disclaimer.html) (metal) 1562 152 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152) (http://www.cdc.gov/Other/disclaimer.html) (dust)
Formula As (metal)	**Conversion**	**IDLH** Ca [5 mg/m³ (as As)] See: 7440382 (/niosh/idlh/7440382.html)
Exposure Limits **NIOSH REL** : Ca C 0.002 mg/m³ [15-minute] See Appendix A (nengapdxa.html) **OSHA PEL** : [1910.1018] TWA 0.010 mg/m³		**Measurement Methods** **NIOSH** 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 7900 (/niosh/docs/2003-154/pdfs/7900.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf); **OSHA** ID105 (http://www.osha.gov/dts/sltc/methods/inorganic/id105/id105.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Silver-gray or tin-white, brittle, odorless solid.

MW: 74.9	**BP:** Sublimes	MLT: 1135°F (Sublimes)	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 5.73 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.

Incompatibilities & Reactivities Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

arsine to form the highly toxic gas arsine.]

Exposure Routes inhalation, skin absorption, skin and/or eye contact, ingestion

Symptoms Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]

Target Organs Liver, kidneys, skin, lungs, lymphatic system

Cancer Site [lung & lymphatic cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0013 (/niosh/ipcsneng/neng0013.html)
See MEDICAL TESTS: 0017 (/niosh/docs/2005-110/nmed0017.html)

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Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Lead

Synonyms & Trade Names Lead metal, Plumbum

CAS No. 7439-92-1	RTECS No. OF7525000 (/niosh-rtecs/OF72D288.html)	DOT ID & Guide
Formula Pb	**Conversion**	**IDLH** 100 mg/m3 (as Pb) See: 7439921 (/niosh/idlh/7439921.html)

Exposure Limits

NIOSH REL *: TWA (8-hour) 0.050 mg/m3 See Appendix C (nengapdxc.html) [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

OSHA PEL *: [1910.1025] TWA 0.050 mg/m3 See Appendix C (nengapdxc.html) [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods

NIOSH 7082 (/niosh/docs/2003-154/pdfs/7082.pdf), 7105 (/niosh/docs/2003-154/pdfs/7105.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 7700 (/niosh/docs/2003-154/pdfs/7700.pdf), 7701 (/niosh/docs/2003-154/pdfs/7701.pdf), 7702 (/niosh/docs/2003-154/pdfs/7702.pdf), 9100 (/niosh/docs/2003-154/pdfs/9100.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf), 9105 (/niosh/docs/2003-154/pdfs/9105.pdf);

OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html), ID206 (http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description A heavy, ductile, soft, gray solid.

MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 11.34	Fl.P: NA	UEL: NA	LEL: NA		

Noncombustible Solid in bulk form.

Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)
NIOSH/OSHA

Up to 0.5 mg/m3:
(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 2.5 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0052 (/niosh/ipcsneng/neng0052.html) See MEDICAL TESTS: 0127 (/niosh/docs/2005-110/nmed0127.html)

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Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Mercury compounds [except (organo) alkyls] (as Hg)

Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.

CAS No. 7439-97-6 (metal)	**RTECS No.** OV4550000 (metal) (/niosh-rtecs/OV456D70.html)	**DOT ID & Guide** 2809 172 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=172) (http://www.cdc.gov/Other/disclaimer.html) (metal)
Formula Hg (metal)	**Conversion**	**IDLH** 10 mg/m3 (as Hg) See: 7439976 (/niosh/idlh/7439976.html)
Exposure Limits **NIOSH REL** : Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin] **OSHA PEL** † (nengapdxg.html): TWA 0.1 mg/m3	**Measurement Methods** **NIOSH** 6009 (/niosh/docs/2003-154/pdfs/6009.pdf); **OSHA** ID140 (http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)	

Physical Description Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

MW: 200.6	**BP:** 674°F	**FRZ:** -38°F	**Sol:** Insoluble	**VP:** 0.0012 mmHg	**IP:** ?
Sp.Gr: 13.6 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Metal: Noncombustible Liquid

Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis;

tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

Target Organs Eyes, skin, respiratory system, central nervous system, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor:

NIOSH

Up to 0.5 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 2.5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0056 (/niosh/ipcsneng/neng0056.html) See MEDICAL TESTS: 0136 (/niosh/docs/2005-110/nmed0136.html)

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