

## APPENDIX J

### HEALTH AND SAFETY PLAN

#### TERMINAL 4 PHASE I REMOVAL ACTION PORT OF PORTLAND, PORTLAND OREGON

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May X, 2008

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## 1 INTRODUCTION

### 1.1 General

This health and safety plan (HASP) has been prepared as an appendix to the Port of Portland (Port) Terminal 4 Phase I Removal Action Design Analysis Report (DAR). The objective of the project is to conduct environmental investigation activities at the Terminal 4 Phase I Removal Action Area during the construction phase as described in the DAR, the Sampling and Analysis Plan (SAP; Appendix H to the DAR), and the Quality Assurance Project Plan (QAPP; Appendix I to the DAR). The purpose of the investigation activities is to collect chemical data to be used to monitor and verify construction activities during the Removal Action, as required by an Administrative Order on Consent (the AOC) between the U.S. Environmental Protection Agency (USEPA) and the Port. Field activities will include the following tasks:

- Mobilization
- Surface water sampling
- Fish deterrent installation and maintenance
- Soil sampling
- Sediment sampling
- Dive operations
- Decontamination
- Demobilization

The objective of this HASP is to provide a mechanism for establishing safe working conditions during field activities within the Phase I Removal Action Area. The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other hazardous incident.

### 1.2 Removal Action Area Description

The Terminal 4 Phase I Removal Action Area encompasses sediments within Terminal 4 at 11040 North Lombard, Portland, Oregon. The Removal Action Area extends west from the

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ordinary high water line on the northeast bank of the lower Willamette River to the edge of the navigation channel and south from the downstream end of Berth 414 to the downstream end of Wheeler Bay, including Slip 3.

The only tenant associated with these areas of Terminal 4 is Kinder Morgan. Kinder Morgan operates a bulk loading facility at Slip 3 for export of soda ash and/or unloading of bulk cargo from rail. In addition, tugboats occasionally moor at structures north of Berth 414 while they are waiting to assist vessels in Slip 3.

### 1.3 Policy Statement

This HASP prescribes the procedures that must be followed during activities at the Removal Action Area. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without prior approval of the Project Manager and the Health and Safety Officer (HSO). This document will be reviewed periodically to confirm that it is current and technically correct. Any changes in conditions at the Removal Action Area and/or the scope of work will require a review of and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the HASP.

The provisions of this HASP are mandatory for all Anchor personnel and Anchor subcontractors assigned to the project. Subcontractors may prepare their own site-specific HASPs that must meet the basic requirements of this HASP. All visitors to Anchor work areas must abide by the requirements of this HASP.

This HASP complies with applicable state and federal Occupational Safety and Health Administration (OSHA) and USEPA regulations. This plan follows the guidelines established in the references listed in Section 9.

### 1.4 Definitions

The following definitions (listed alphabetically) are applicable to this HASP:

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- Contamination-Reduction Zone (CRZ) – Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- Exclusion Zone (EZ) – Any portions of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to on-site personnel.
- Incident – All losses, including first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.
- Near Miss – An incident in which no injury, illness, motor vehicle accident, equipment or property damage, etc., occurred, but in which, under slightly different circumstances, such injury could have occurred.
- On-site Personnel – All Anchor and subcontractor personnel involved with the project.
- Project – All on-site work performed under the scope of work.
- Site – The area described in Section 1.2, Removal Action Area Description, where the work is to be performed by Anchor personnel and subcontractors.
- Support Zone (SZ) – All areas of the site, except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.
- Subcontractor – Includes contractor personnel hired by Anchor.
- Visitor – All other personnel, except the on-site personnel.
- Work Area – The portion of the site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ, and EZ. If the work area is located in an area on site that is not contaminated or suspected of being contaminated, the entire work area may be an SZ.

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## 2 ROLES AND RESPONSIBILITIES

### 2.1 All Personnel

All Anchor and subcontractor personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and for reporting any unsafe acts or conditions to his/her supervisor. No person may work in a manner that conflicts with these procedures. After due warnings, the Project Manager will dismiss from the site any person or subcontractor who violates safety procedures.

All Anchor and subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all personnel will attend an initial hazard briefing prior to beginning work at the site.

Key health and safety personnel and their responsibilities are described below. These individuals are responsible for the implementation of this HASP. Table 1 summarizes key project personnel and their contact information.

Deleted: The roles of Anchor personnel and subcontractors are outlined in the following subsections.

### 2.2 Key Port Personnel

Port Project Managers – Marcel Hermans and Nicole LaFranchise: The Port Project Managers provide overall direction for the project. The Port Project Managers are responsible for ensuring that the project meets the Port’s objectives in a safe and timely manner.

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### 2.3 Key USEPA Personnel

USEPA Project Manager – Sean Sheldrake: The USEPA Project Manager is the point of contact for incidents or deviations to approved safety protocols. The EPA project manager may shut down work in the event of unsafe work practices being observed by EPA or its field representatives until corrective actions can be taken.

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## 2.4 Key Anchor Personnel

**Project Manager—Tom Schadt:** The Project Manager has overall responsibility for the successful outcome of the project. The Project Manager will ensure that adequate resources and budget are provided for the health and safety staff to carry out their responsibilities during fieldwork. The Project Manager, in consultation with the HSO, makes final decisions concerning implementation of the HASP.

**Field Coordinator—Ben Hung:** Mr. Hung or a designee will serve as the Field Coordinator (FC). The FC will support field sampling activities and coordinate the technical and the health and safety components of the field program and has the responsibility to ensure that work is performed according to the SAP (Appendix H to the DAR). The FC also has the authority to stop work if conditions arise that pose an unacceptable health and safety risk to field crew. The FC will also be responsible for ensuring the implementation of this HASP on board the sampling vessel. The FC is responsible for initiating changes to the HASP, which must be approved by the HSO. The FC or designee shall be present during field reconnaissance and any sampling operations.

**Project Health and Safety Officer—Dennis Hanzlick:** The HSO has overall responsibility for preparation, approval, and revisions of this HASP. The HSO will not necessarily be present during fieldwork, but will be readily available, if required, for consultation regarding health and safety issues during fieldwork.

**Sampling Vessel Captain—Anchor Personnel:** The vessel captain and the FC will coordinate health and safety oversight of operations aboard the vessel. The captain will also have stop work authority for safety reasons. Work will be resumed after the captain and the FC agree that the situation that precipitated a stop work decision has been corrected.

**Field Crew:** All field crew have the responsibility to report any potentially unsafe or hazardous conditions to the captain or FC immediately.

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**Table 1  
Key Personnel**

Role	Name	Address/Telephone No.
<b>Port of Portland Key Personnel</b>		
Project Manager	Marcel Hermans	121 NW Everett Portland, Oregon 97209 (503) 944-7305
<u>Project Manager</u>	<u>Nicole LaFranchise</u>	<u>121 NW Everett Portland, Oregon 97209 (503) 944-7323</u>
<b>USEPA Key Personnel</b>		
<u>Project Manager</u>	<u>Sean Sheldrake</u>	<u>(206) 553-1220<sup>1</sup></u>
<b>Anchor Key Personnel</b>		
Project Manager	Tom Schadt	1423 Third Avenue, Suite 300 Seattle, Washington 98101 (206) 287-9130
Health and Safety Officer	Dennis Hanzlick	1423 Third Avenue, Suite 300 Seattle, Washington 98101 (206) 287-9130
Field Coordinator	Ben Hung	6650 SW Redwood Lane, Suite 333 Portland, Oregon 97224 (503) 670-1108
<b>Subcontractor Personnel</b>		
Laboratory Analytical Services	TBD	TBD
Sediment Sampling	TBD	TBD
Others	TBD	TBD
AINW/Archeological Oversight	John Fagan	2632 SE 162nd Avenue Portland, Oregon 97236 (503) 761-6605 (Office)

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1. In event of emergency, Sean Sheldrake's cell phone number will be used but will only be provided to personnel as needed.

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### 3 PROJECT HAZARDS AND CONTROL MEASURES

#### 3.1 Introduction

Field activities will include the following tasks:

- Mobilization/site survey
- Field activities including:
  - Surface water sampling
  - Fish deterrent installation and maintenance
  - Soil sampling
  - Sediment sampling
  - Dive operations
- Decontamination
- Demobilization

The following sections identify potential health, safety, and environmental hazards associated with each type of field activity listed above. Because of the complex and changing nature of field projects, supervisors must continually inspect the site to identify hazards that may affect on-site personnel, the community, or the environment.

Each field activity is described below, along with a discussion of potential hazards and control measures for each activity.

#### 3.2 Mobilization

Site mobilization will include the following activities:

- Establishing sampling locations
- Determining the location of utilities and other installations
- Establishing work areas

Surface water sampling, fish deterrent installation and maintenance, sediment sampling, and dive operation activities will take place on a vessel in the Willamette River at the project site. Surface water sampling activities will also take place on a vessel from the water at the location of the upland transloading facility. Soil sampling will take place at the location of

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the upland transloading facility. Break areas will be on the vessel, as well as at the mobilization and demobilization areas. Site mobilization will also include establishing sampling locations, determining the location of utilities and other installations, and establishing upland work areas. Mobilization may also include setting up equipment and establishing a temporary site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During the initial phase, project personnel will inspect the vessel and the sampling areas, confirm the existence of anticipated hazards, and identify safety and health issues that may have arisen since this HASP was written.

### 3.2.1 Hazards

The potential hazards of this phase of activity are:

- Work aboard a boat
- Heavy equipment operation
- Manual materials handling
- Installation of temporary on-site facilities
- Manual site preparation

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries. Manual materials handling may also present eye, contusion, and laceration hazards. Installation of temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work areas may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, or slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include:

- Weather, such as sunburn, lightning, rain, and heat- and cold-related illnesses
- Plants, such as poison ivy and poison oak

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- Aggressive fauna, such as ticks, fleas, wasps, spiders, and snakes
- Waterborne biological hazards, such as coliform
- Pathogens, such as rabies and blood-borne pathogens

### 3.2.2 Control of Hazards

Control procedures for these hazards are presented in Section 4, General Safety Practices.

### 3.3 Field Activities

Field activities to be undertaken during the project include:

- Surface water sampling
- Fish deterrent installation and maintenance
- Soil sampling
- Sediment sampling
- Dive operations

Hazards and control measures and procedures for each sampling activity are discussed in the following subsections.

#### 3.3.1 Surface Water Sampling, Soil Sampling, Sediment Sampling, and Fish Deterrent Installation and Maintenance

Surface water, soil, and sediment sampling involves collecting samples for subsequent field and laboratory analysis. The physical hazards of sediment surface water, soil, and sediment sampling are primarily associated with the sample collection methods, procedures used, and the environment itself. Fish deterrent installation and maintenance involves setting lead lines and anchors. The physical hazards associated with fish deterrent installation and maintenance are primarily associated with the procedures used, and the environment itself. Working on or near water also presents the risk of drowning, if proper procedures are not instituted.

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### 3.3.1.1 Hazards

The most significant hazard is that of working in or over water. Inhalation and absorption of chemicals of potential concern (COPCs) are also potential hazards due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different sampling methodologies may be used depending on equipment accessibility and the types of materials to be sampled. These sampling methods may include sampling probes, sediment traps, or sampling poles. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with sediment sampling procedures are generally limited to strains or sprains and potential eye hazards. Potential chemical hazards may include contact with media containing site COPCs and potential contact with chemicals used for equipment decontamination. In addition to the safety hazards specific to sample collection, hazards associated with working over the water or from a boat or barge will be a concern.

Biological hazards include bacteria and viruses potentially present due to waste materials and waste residue. The work area presents slip, trip, and fall hazards from irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

### 3.3.1.2 Controls

Control procedures for environmental and general hazards are discussed in Section 4. Levels of protection for personal protective equipment (PPE) are defined in Section 5.1. To control dermal exposure during sediment sampling activities, a minimum of Modified Level D protection will be worn.

The following sections provide general safety procedures for boat-based sampling, wader use, and working near water.

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### 3.3.1.3 Hazards of Working from a Boat or Barge

Boats or barges may be utilized for sediment sampling activities. This section outlines the precautions that will be taken by Anchor personnel and subcontractors.

Working from a boat or barge presents the obvious hazard of drowning, but several other hazards exist. Powered craft carry a fuel supply, with the potential for fire or explosion if vapors accumulate and reach an ignition source. Weather, currents, and other watercraft may also pose significant hazards to the crew. In the event that a small craft advisory is issued by the National Weather Service, all work from a vessel will be halted and the vessel will return to shore. If a small craft advisory is issued before work commences, work will be rescheduled following lifting of the advisory. At all other times, on-water work is at the discretion of the vessel captain.

At a minimum, each employee working from a boat or barge is required to participate in a boating safety training session conducted prior to beginning field operations. The training session shall provide instruction on the following topics: proper boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of onboard safety equipment, including fire extinguisher, radio or cellular phone, flares, horn, etc.; proper procedures on the completion and filing of a float plan; appropriate boating “rules-of-the-road;” emergency procedures in the event of capsizing or being thrown overboard; and different types of personal flotation devices (PFD) and their proper inspection and use.

Anchor personnel working over, adjacent, or near water, where the danger of drowning exists, must wear U.S. Coast Guard (USCG)-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers must be inspected for defects that would alter their strength and buoyancy. Defective units must be removed from service. Ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. Distance from ring buoys shall not exceed 200 feet. At least one boat

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must be immediately available at locations where employees are working over or adjacent to water.

Prior to each day or shift of operations, a vessel inspection must be conducted by the vessel operator. This inspection shall be conducted in accordance with accepted USCG inspection procedures and any applicable state boating safety inspection procedures. The inspection must verify that necessary safety equipment is aboard and functioning properly and that all members of the crew are aware of proper procedures that are to be followed while on the water. In addition, this information shall be reviewed during the daily tailgate safety meeting to ensure the procedures have been followed and all crew members are satisfied as to their completion.

The following safety procedures shall be observed at all times:

- Vessels shall not be overloaded with equipment or personnel.
- Two personnel shall be on board at all times.
- Loads shall be distributed evenly throughout the vessel.
- PFD Types I, II, or III shall be worn at all times when working on or adjacent to the water.
- All PFDs shall be properly inspected to verify that appropriate USCG approvals and ratings information are available.
- At least one Type IV PFD (seat cushion, ring buoy) shall be available on board.
- An audible signal/alarm (capable of being heard up to ½ mile away) shall be maintained in each vessel.
- Each vessel shall be equipped with a ship-to-shore radio, cellular phone, and/or “walkie-talkie” capable of contacting the USCG, marine police, or another onshore station for help in an emergency.
- Each vessel shall be equipped with some type of visual display signal/device (e.g., flares or appropriate distress flag).
- All powerboats shall have a valid state registration. This registration shall be maintained on the boat and, as necessary, be made available for USCG or marine police inspection.

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- At a minimum, each powerboat shall be equipped with a Type 4-A, 10-B, C-rated fire extinguisher.
- Boats shall not be operated at night without proper lighting and the capability for making visual distress signals.

In addition to PFDs, personnel who are working from a boat or barge when water temperatures are below 50°F must be equipped with thermal protective clothing/equipment (wet suits, dry suits, etc.). The thermal protective clothing must be adequate to protect personnel from hypothermic effects of immersion in water at the temperatures encountered.

### 3.3.2 Dive Operations

Subcontracted divers will carry out commercial diving tasks as well as a number of sampling and data collection tasks. The purpose of these sections is to provide general requirements for all diving operations on the project. The specific dive procedures will be defined and implemented by the subcontractor.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR Part 1910, Subpart T) under certain conditions, which are met by some of the work planned for this project. Some of the diving performed on this project is considered scientific diving, as opposed to commercial diving. The tasks of a scientific diver are those of an observer and data gatherer. Construction and troubleshooting tasks traditionally associated with commercial diving are not included within scientific diving. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training. For the purposes of this project, all diving will be conducted under commercial diving protocols.

#### 3.3.2.1 Diving Safety Manual

A diving safety manual and dive plan(s) will be prepared by the diving subcontractor and submitted to USEPA and the Coast Guard for review a minimum

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of two weeks prior to any dive operations. The manual must present procedures covering all diving operations specific to the project, including criteria for diver training and authorization, safe diving procedures, equipment specifications, and procedures for emergency care, recompression, and evacuation. The manual must include:

- Training and medical surveillance requirements for scientific divers
- Safety procedures and checklists for diving operations
- Assignments and responsibilities of the dive team members
- Equipment procedures and checklists
- Emergency procedures

### 3.3.2.2 General Diving Safety Requirements

General diving safety requirements are summarized in the following section. Complete safety requirements and procedures should be presented in the subcontractor's diving safety manual.

- All diving activities must be conducted with two comparably equipped divers (SCUBA or surface-supplied air) in the water in constant communication.
- All diving will be conducted with similar equipment.
- No diving will be conducted in enclosed or physically confining spaces.
- No diving will be conducted against currents exceeding 1 knot unless line-tended.
- No diving will take place if visibility is less than 200 feet at the given location.
- The diver must terminate a dive while there is still sufficient cylinder pressure remaining to permit the diver to safely reach the surface, including required in-water decompression time, if applicable.

The following subsections summarize requirements for training and medical surveillance, dive planning, dive site preparation, pre-dive briefing, equipment inspections, water entry and exit, and emergency procedures.

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### 3.3.2.3 Training and Medical Surveillance

Each diver must possess a nationally recognized diving certificate. Tasks must be assigned in accordance with the experience and training of the diver. Each diver must be trained, qualified, and authorized for the diving mode and specialized equipment being used, the diving activity to be performed, and the depths at which the dive is to be conducted.

Tasks may be assigned to an employee who has not previously performed the specific task, provided that these tasks are performed under the direct supervision of an experienced dive team member.

All dive team members must be trained in cardiopulmonary resuscitation (CPR) and first aid (American Red Cross standard course or equivalent) and have current certification in these areas.

Divers performing commercial diving activities must meet additional requirements as specified in the diving subcontractor's diving safety manual.

### 3.3.2.4 Dive Planning

Planning of each diving operation will include an assessment of the safety and health aspects of each task. Planning elements include:

- Diving mode
- Vessel use of waterway (use of ship's safe procedure checklist if dive operations are conducted while a ship is in port)
- Surface and underwater conditions and hazards
- Breathing gas supply (including reserves)
- Thermal protection
- Decontamination procedure
- Diving equipment and systems
- Dive team assignments and physical fitness of dive team members

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To minimize hazards to the dive team, diving operations must be coordinated with other activities in the vicinity that could potentially interfere with the diving operation. To the extent possible, diving activities will be scheduled when vessels are not in port.

### 3.3.2.5 Dive Site Preparation

For field efforts that require using divers for river bottom observations, appropriate protocols, such as dive flagging will be used to alert boaters where diving operations are under way. In addition the contractor shall request a determination for USCG regarding the need for a notice to mariners and submit a dive plan to USCG upon request.

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When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least 1 meter in height must be displayed at the dive location in a manner that allows all-around visibility. The flag must be illuminated during night-diving operations.

Additional dive site preparation requirements will be listed in the diving subcontractor's diving safety manual.

### 3.3.2.6 Pre-Dive Briefing

All dive team members must be briefed on the following topics:

- Tasks to be undertaken
- Safety procedures for the diving mode
- Any unusual hazards or environmental conditions likely to affect the safety of the diving operation
- Any modifications to operating procedures necessitated by the specific diving operation

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### 3.3.2.7 *Equipment Inspection*

The procedures listed below must be followed when conducting equipment inspection.

- Each diver must conduct a functional check of his/her diving equipment. Each diver must ensure that his/her equipment is in proper working order, and that the equipment is suitable and sufficient for the type of diving operation planned.
- Each diver must have a submersible pressure gauge for monitoring SCUBA cylinder pressure that is capable of being monitored by the diver during the dive or a surface monitor air regulator.
- Each diver must have the capability of achieving and maintaining positive buoyancy on the surface.
- Each diver must have the capability to execute a controlled neutrally buoyant ascent, through the use of an approved buoyancy control device.
- The entire dive apparatus for each diver must be inspected by the diver prior to the dive.
- Critical inspection points include the breathing gas supply system, masks, thermal protection, and weights.
- The proper function of the cylinder pressure gauge must be inspected by each SCUBA diver.

### 3.3.2.8 *Water Entry and Exit*

The procedures listed below must be followed when entering and exiting the water.

- A means capable of supporting the diver will be provided for entering and exiting the water, unless the entry is in water of wading depth. The means provided for exiting the water must extend below the water surface.
- A means will be provided to assist an injured diver from the water.

### 3.3.2.9 *Emergency Procedures*

The procedures listed below must be followed in the event of an emergency during underwater operations.

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- A standby diver must be available any time a diver is in the water. The standby diver may not also be the dive master. For a two-person buddy team, this necessitates a 4-person dive crew. For tethered solo diving, a 3-person crew is needed: a dive master, a diver, and a standby diver.
- Divers must be in contact with the surface or accompanied by another diver in the water in continuous visual contact during the diving operations.
- A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
- A diver-carried reserve breathing gas supply must be provided for each diver. Each diver is to carry their own backup air supply separate from their main tank. A J valve primary tank will not constitute an emergency air supply.
- The valve of the reserve breathing gas supply must be in the closed position prior to the dive.

**Deleted:** The reserve must be either a manual reserve (J valve) or an independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.

Additional emergency procedure requirement details will be listed in the diving subcontractor's diving safety manual.

### 3.4 Equipment Decontamination

All equipment is to be decontaminated before leaving the site. In addition, all operations that have the potential to generate or release hazardous material will be conducted in a controlled area using the appropriate engineering controls. Specific decontamination techniques will be established based on site conditions. Decontamination procedures will be reviewed with all personnel on site. A decontamination pad on a suitable surface (concrete or paved area) with polyethylene sheeting or other appropriate containment system will be established. Pressure washing with manual scrub brushing as needed will be used to decontaminate equipment. COPC-impacted equipment will be determined "clean" through visual inspection of all equipment.

Personnel involved in decontamination activities may be exposed to skin contact with contaminated materials and chemicals brought to the site as part of the project work. All

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personnel will review the operating procedures and PPE prior to decontamination. Personnel involved in decontamination activities must wear PPE that is appropriate for the task and no more than one level below the level worn by personnel working in the EZ.

### 3.5 Demobilization

Demobilization involves removing all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

#### 3.5.1 Hazards

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards and hot surfaces to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies and blood-borne pathogens.

#### 3.5.2 Control

Control procedures for these hazards are discussed in Section 4.

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### 3.6 Chemical and Biological Hazards

#### 3.6.1 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to site COPCs.

Site COPCs may include metals (cadmium, lead, and zinc) and polycyclic aromatic hydrocarbons (PAHs). Exposure to these materials is possible by inhaling vapors or contacting sediments or dusts containing COPCs. Sediment or other media contaminated with COPCs may be ingested or may come in contact with exposed skin. Excessive dermal exposure to these materials may cause dermatitis, hyperpigmentation of the skin, and skin irritation. Excessive inhalation exposure to these metals may cause respiratory tract irritation, headache, dizziness, and nausea. Ingestion may cause abdominal pain, nausea, vomiting, and diarrhea.

The potential for ingesting COPCs, sediment, or other impacted media is low. The potential for inhaling impacted media is also low. The potential for dermal exposure is moderate.

#### 3.6.2 Biological Hazards

Diving poses risks of exposure to biological contaminants such as coliform bacteria. Numerous forms of pollution are present in almost every body of water in the United States. Non-point source pollution includes any biological waste that flows with the runoff from rain into lakes, streams, rivers, and oceans. One of the major problems with diving in polluted water is that the contaminants are frequently suspended in the water and therefore surround the diver. Some chemicals may float on the surface and others may sink to the bottom, but biological hazards are in suspension and can enter through any weak point in the diver's gear.

Protection against these contaminants involves isolation of the diver during the dive and careful decontamination upon leaving the water. Ingestion of and dermal contact with water must be avoided. The best protection is to totally encapsulate the diver with

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either a full face mask or a full coverage diving helmet, a vulcanized rubber dry suit, and dry gloves. This type of gear affords excellent protection from virtually all biohazards, as well as from many chemicals.

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## 4 GENERAL SAFETY PRACTICES

### 4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the project site that is readily available to personnel, and all project personnel must review the plan prior to starting work.
- Food, beverages, chewing gum, and tobacco products may be consumed or used only in the SZ or other designated area outside the EZ and CRZ. Cosmetics must not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and confirm closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COPCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed.
- Divers will utilize equipment that will keep them completely dry: a dry suit, dry gloves, and a mask that mates directly to a hood (e.g. Viking pro turbo suit with AGA mask) or helmet that mates directly to the suit (and not a neck dam).
- Divers will receive at a minimum a thorough potable water rinse after each dive.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COPCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COPC-containing materials.
- At the end of each shift, or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in receptacles designated for this purpose.
- Do not remove soil containing site COPCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air.

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- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, fire, or other hazards.
- Report all injuries, illnesses, near misses, and unsafe conditions or work practices.
- Use the “buddy system” during all operations requiring Level C PPE and, when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so and in accordance with the manufacturer’s directions.
- Personnel are to perform only tasks for which they have been properly trained and must advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Do not take prescription or over-the-counter drugs when assigned to tasks with the potential for absorption, inhalation, or ingestion of hazardous substances, unless given written approval by an appropriate health care professional.
- Remain upwind during site activities whenever possible.

#### 4.2 Buddy System

On-site personnel must use the “buddy system” as required by operations. Use of the buddy system is required during all operations requiring Level C to Level A PPE and, when appropriate, during Level D operations. Crew members must observe each other for signs of chemical exposure and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern

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Crew members must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crew members of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, pre-arranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

### 4.3 Heat Stress

Heat stress is caused by several interacting factors, including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

#### 4.3.1 Heat Rashes

Heat rash is one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to

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a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

#### **4.3.2 Heat Cramps**

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be related to a lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3 percent NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

#### **4.3.3 Heat Exhaustion**

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Headache
- Vertigo
- Weakness

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- Thirst
- Giddiness

Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, given fluid replacement, and be encouraged to get adequate rest.

#### **4.3.4 Heat Stroke**

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails, and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are:

- Confusion
- Irrational behavior
- Loss of consciousness
- Convulsions
- A lack of sweating (usually)
- Hot, dry skin
- An abnormally high body temperature (e.g., a rectal temperature of 41°C [105.8°F])

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If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

#### **4.3.5 Heat Stress Safety Precautions**

Heat-stress monitoring and work-rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work-rest regimen and procedures for calculating ambient adjusted temperature are described in Table 2.

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**Table 2**  
**Work/Rest Schedule<sup>1</sup>**

Adjusted Temperature <sup>2</sup>	Work/Rest Regimen Normal Work Ensemble <sup>3</sup>	Work/Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (30.8°-32.2°C)	After each 150 minutes of work	After each 120 minutes of work

- For work levels of 250 kilocalories/hour (light to moderate type of work)
- Calculate the adjusted air temperature (ta adj) by using this equation:  $ta\ adj\ oF = ta\ oF + (13 \times \% \text{ sunshine})$ . Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)
- A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Source: The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values [TLV] Handbook 2003.

To determine whether the work-rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and is mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen provides adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.

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- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek®-type garments.
- All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat-stress disorders.

#### 4.4 Cold Stress

Cold stress normally occurs in temperatures at or below freezing or under certain circumstances in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold-weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at 18°F. An equivalent chill temperature chart relating the actual dry-bulb temperature and wind velocity is presented in Table 3.

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**Table 3  
Chill Temperature Chart**

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

This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA.  
[Source: ACGIH TLV Handbook 2003]

**4.4.1 Frostbite**

Local injury resulting from cold is included in the generic term “frostbite.” There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- Frost Nip or Incipient Frostbite — Characterized by sudden blanching or whitening of skin.
- Superficial Frostbite — Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite — Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

1. Shivering

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2. Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F
3. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate
4. Freezing of the extremities
5. Death

#### 4.4.2 Hypothermia

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be used to prevent cold stress.

#### 4.4.3 Cold Stress Safety Precautions

The following safety precautions should be followed to prevent cold stress:

- For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must confirm that their clothing is not wet as a consequence of sweating. If clothing is wet, field personnel must change into dry clothes prior to entering the cold area.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

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- Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

#### 4.4.4 Safe Work Practices

The following safe work practices must be employed to prevent cold stress:

- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.
- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.
- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.
- Work should be arranged in such a way that sitting or standing still for long periods is minimized.
- During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

#### 4.5 Flora/Fauna Hazards

Hazards may include poisonous plants, snakes, ticks, spiders, and mosquitoes.

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## 4.5.1 Poisonous Plants

### 4.5.1.1 Hazards

Poisonous plants may be present in the work area. Personnel should be alerted to their presence and instructed on methods to prevent exposure.

### 4.5.1.2 Control

The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

## 4.5.2 Snakes

### 4.5.2.1 Hazards

The possibility of encountering snakes exists, specifically for personnel working in wooded or vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include:

- Neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties
- Cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs
- Defects in coagulation
- Effects from local release of substances by enzymatic actions.

Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

### 4.5.2.2 Control

To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes and the need to avoid actions that may result in encounters, such as turning over logs. If a snakebite occurs, an

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attempt should be made to identify the snake via markings and size. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

### 4.5.3 Ticks

#### 4.5.3.1 Hazards

Rocky Mountain Spotted Fever (RMSF) is a disease that is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for 2 to 3 weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

#### 4.5.3.2 Control

Tick repellent containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every 3 or 4 hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

### 4.5.4 Spiders

#### 4.5.4.1 Hazards

Personnel may encounter spiders during work activities. Two spiders of concern are the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and woodpiles or other scattered

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debris. The black widow is shiny black, approximately 1 inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful, and the bite site ulcerates and takes many weeks to heal completely.

#### 4.5.4.2 Control

To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

### 4.5.5 Mosquitoes

#### 4.5.5.1 Hazards

Personnel may be exposed to mosquitoes during work activities. Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area, exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in individuals with compromised immune systems.

#### 4.5.5.2 Control

To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.

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- Prevent accumulation of standing water at the work site.
- Apply an insect repellent that contains DEET to exposed skin and to clothing.
- Wear light-colored clothes, preferably with long sleeves and full-length pants.
- Do not touch any dead birds or animals that are encountered.

If dead birds are detected near the site, report them to the local County Health Department. If flu-like symptoms are present, contact your doctor or the HSO for more information.

## 4.6 Noise

### 4.6.1 Hazards

Exposure to noise over the appropriate action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increase with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

### 4.6.2 Control

All personnel must wear hearing protection, with a noise reduction rating (NRR) of at least 20 dBA, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Whenever possible, equipment that does not generate excessive noise levels will be selected. If the use of noisy equipment is unavoidable, barriers or increased distances will be used to minimize worker exposure to noise, if feasible.

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## 4.7 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations.

Spill control equipment and materials will be located on site in the areas that present the potential for discharge. All sorbent materials used to clean up spills will be containerized and labeled appropriately. In the event of a spill, the emergency provisions in Section 8 will be followed to contain and control released materials and to prevent their spread to off-site areas.

## 4.8 Sanitation

Site sanitation will be maintained according to appropriate federal, state, and local requirements as described in the following sections.

### 4.8.1 Break Area

Breaks must be taken in the SZ or on the vessel, away from the active work area, after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

### 4.8.2 Potable Water

The following rules regarding potable water apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media and contaminated clothing or equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) or removed from the container by dipping.
- Containers used for drinking water must be clearly marked and must not be used for any other purpose.

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Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

#### **4.8.3 Sanitary Facilities**

Access to facilities for washing before eating, drinking, or smoking, or alternative methods such as waterless hand cleaner and paper towels, will be provided.

#### **4.8.4 Lavatory**

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

This requirement does not apply to mobile crews or to normally unattended site locations as long as employees at these locations have transportation immediately available to nearby toilet facilities.

### **4.9 Emergency Equipment**

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on site prior to commencing project activities. Personnel will be provided with access to emergency equipment including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926
- Industrial first aid kits of adequate size for the number of personnel on site
- Emergency eyewash and/or shower if required by operations being conducted on site

### **4.10 Electrical Safety**

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

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General electrical safety requirements include:

- All electrical wiring and equipment must be of a type listed by Underwriters Laboratory (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code, the National Electrical Code, or USCG regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground-fault-circuit interrupters.
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

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#### 4.11 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

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## 5 PERSONAL PROTECTIVE EQUIPMENT

### 5.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COPCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. Table 4 summarizes the available levels of personal protection.

#### 5.1.1 Level D Protection

The minimum level of protection that is required of Anchor personnel and subcontractors at the site is Level D, which is worn when site conditions present minimal dermal exposure hazard and no inhalation hazard. Level D protection includes the following equipment:

- Work clothing as prescribed by weather
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic, and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Steel-toed work boots, meeting American National Standards Institute (ANSI) Z41
- Safety glasses with side shields or goggles, meeting ANSI Z87
- Hard hat, meeting ANSI Z89, when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- PFD if working over or near water

#### 5.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves
- Latex/polyvinyl chloride (PVC) overboots when contact with COPC-impacted media is anticipated

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- Steel-toed work boots, meeting ANSI Z41
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Safety glasses or goggles, meeting ANSI Z87
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist
- Hard hat, meeting ANSI Z89 when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COPC-impacted media is anticipated
- PFD if working on or near the water

### 5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COPCs reaches one-half of the OSHA Permissible Exposure Limit (PEL) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value. The following equipment will be used for Level C protection:

- Full-face, National Institute for Occupational Safety and Health- (NIOSH-) approved air-purifying respirator with appropriate cartridges for site COPCs
- Tyvek® suit with ankles and cuffs taped to boots and gloves
- Nitrile outer gloves worn over nitrile surgical gloves
- Steel-toed work boots, meeting ANSI Z41
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic, and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Chemical-resistant boots with steel toes or latex/PVC overboots over steel-toe boots
- Hard hat, meeting ANSI Z89

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- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- PFD if working on or near the water

**5.2 PPE Selection**

PPE will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COPCs present on site.

The PPE selection matrix is presented in Table 4. This matrix is based on information available at the time this plan was written.

**Table 4  
PPE Selection Matrix**

Task	Anticipated Level of Protection
Mobilization	Level D
Field Sampling	Modified Level D
Decontamination	Modified Level D
Demobilization	Level D/Modified Level D

**5.3 Site Respiratory Protection Program**

Respiratory protection is an integral part of employee health and safety at the site due to potentially hazardous concentrations of airborne COPCs. The site respiratory protection program will consist of the following elements (at a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit-tested and trained in the use of a full-face air-purifying respirator within the past 12 months.
- All on-site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator.

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Documentation of the medical certification must be provided to the HSO or a designee prior to commencing site work.

- Only cleaned, maintained, NIOSH-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected and a negative-pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location in a manner that will not distort the face piece.

#### 5.4 Using PPE

Depending on the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must don the required PPE in accordance with the requirements of this HASP. When leaving the EZ, personnel will remove the PPE in accordance with the doffing procedures to minimize the spread of COPCs.

##### 5.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on site:

- Remove bulky outerwear. Remove street clothes and store in clean location.
- Put on work clothes or coveralls.
- Put on the required chemical-protective coveralls.
- Put on the required chemical-protective boots or boot covers.

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- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical-protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to face piece (Level C).
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to confirm that each person entering has the proper protective equipment.

#### **5.4.2 Doffing Procedures**

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags that are labeled with contaminated-waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing.
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags labeled for disposal. See Section 6 for detailed information on decontamination stations.

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## 6 WORK ZONES AND DECONTAMINATION

### 6.1 Work Zones

#### 6.1.1 Authorization to Enter

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project site.

#### 6.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the HSO, or designee, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards; protective equipment; safe work procedures; and emergency procedures for the project. Following this initial meeting, safety meetings will be held each day before work begins.

#### 6.1.3 Entry Log

A log-in/log-out sheet will be maintained on site by the FC. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the FC may document entry and exit in the field notebook.

#### 6.1.4 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any work area unless they are wearing the minimum PPE as described in Section 5.

#### 6.1.5 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a safe area for a head count.

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### 6.1.6 Contamination-Control Zones

Contamination-control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

#### 6.1.6.1 Exclusion Zone

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram will identify the location of each EZ.

#### 6.1.6.2 Contamination-Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. All personnel will be decontaminated on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

#### 6.1.6.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

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## 6.2 Decontamination

### 6.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations, at a minimum:

- Station 1 — Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.
- Station 2 — Personnel will remove their outer garment and gloves and dispose of them in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand-carried to the next station.
- Station 3 — Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

### 6.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of the vehicle and equipment may be required.

### 6.2.3 PPE Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed on site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water or by using a spray disinfectant.

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## 7 TRAINING

### 7.1 General

All on-site project personnel who work in areas where they may be exposed to site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The site supervisor must have completed an additional 8 hours of supervisory training and must have current first aid and CPR certificates.

### 7.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures
- Physical hazards (fall protection, noise, heat stress, cold stress)
- Names and job descriptions of key personnel responsible for site health and safety
- Safety, health, and other hazards typically present at hazardous waste sites
- Use, application, and limitations of PPE
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements
- Recognition of symptoms and signs that might indicate overexposure to hazards
- Worker right-to-know (Hazard Communication OSHA 1910.1200)
- Routes of exposure to contaminants
- Engineering controls and safe work practices
- Components of a health and safety program and a site-specific HASP
- Decontamination practices for personnel and equipment
- Confined-space entry procedures
- General emergency response procedures

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### 7.3 Supervisor Course

Managers and supervisors must receive an additional 8 hours of training, which typically includes:

- General site safety and health procedures
- PPE programs
- Air monitoring techniques

### 7.4 Site-Specific Training

Site-specific training will be accomplished by having on-site personnel read this HASP or through a thorough site briefing on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; protective equipment and safety procedures; and emergency procedures.

### 7.5 Daily Safety Meetings

Daily safety meetings will be held to cover the work to be accomplished, hazards anticipated, PPE and procedures required to minimize site hazards, and emergency procedures. No work will be performed in an EZ before the daily safety meeting has been held. The daily safety meeting must also be held prior to new tasks and repeated if new hazards are encountered.

### 7.6 First Aid and CPR

At least one employee current in first aid and CPR will be assigned to the work crew and will be on site during operations. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens. The first aid and CPR training should include AED training. At least one AED should be present and available on site.

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## 8 EMERGENCY PROCEDURES

### 8.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic events. Unusual conditions or events, activities, chemicals, and conditions will be reported.

The HSO will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of these routes and assembly areas.

### 8.2 Emergency Response

If an incident occurs, the following steps will be taken:

- Evaluate the incident and assess the need for assistance and/or evacuation.
- Call for outside assistance as needed.
- Confirm that the Project Manager is notified promptly of the incident.
- Take appropriate measures to stabilize the incident scene.

#### 8.2.1 Fire

In the case of a fire on site, site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

#### 8.2.2 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- Evacuate immediate area of release.
- Conduct air monitoring to determine needed level of PPE.
- Don required level of PPE and prepare to implement control procedures.

### 8.3 Medical Emergency

All employee injuries must be promptly reported to the HSO, who will:

- Confirm that the injured employee receives prompt first aid and medical attention.

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- In emergency situations, see that the worker is transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room).

### 8.3.1 Emergency Care Steps

Upon entering an accident area, site personnel must follow these emergency care steps:

- Survey the scene. Determine whether it is safe to proceed. Try to determine whether the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's or victims' condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.
- Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

## 8.4 First Aid — General

All persons must report any injury or illness to their immediate supervisor or the site supervisor. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The site supervisor and HSO must conduct an incident investigation as soon as emergency conditions no longer exist and first aid and/or medical treatment has been confirmed. Incident investigations must be completed and submitted to the Project Manager within 24 hours after the incident.

If first aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the

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injured person is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance and/or paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

#### **8.4.1 First Aid — Inhalation**

Any employee complaining of symptoms of chemical overexposure as described in Section 4 will be removed from the work area and transported to the designated medical facility for examination and treatment.

#### **8.4.2 First Aid — Ingestion**

Call EMS and consult a poison control center for advice. If available, refer to the Material Safety Data Sheets (MSDS) for treatment information. If the victim is unconscious, keep him/her on his/her side and clear the airway if vomiting occurs.

#### **8.4.3 First Aid — Skin Contact**

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ to the wash area. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

#### **8.4.4 First Aid — Eye Contact**

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

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## 8.5 Reporting Injuries, Illnesses, and Near-Miss Incidents

Injuries and illnesses, however minor, will be reported to the HSO immediately. The HSO will complete an injury report and submit it to the Project Manager within 24 hours.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported and investigated in the same manner. A Safe Performance Self-Assessment (SPSA) must be done immediately after an injury, illness, near miss, or other incident to determine whether it is safe to proceed with the work.

## 8.6 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in Table 5. Contact information for key project personnel is also provided in Table 5. For urgent issues (e.g., water quality exceedances), project staff will contact Sean Sheldrake's cell phone number (provided only to pertinent project staff).

**Table 5**  
**Emergency Contacts**

Emergency/Contingency Contact Telephone List	
Emergency Contacts	Phone Number
<b>Local Contacts</b>	
Coast Guard	911 or 1-800-424-8802 or Channel 16 on VHF-FM radio
Fire Department	911
Local Police	911
Sheriff	911
State Police:	911
Hospital: Legacy Emanuel Children's Hospital 2801 N Gantenbein Avenue, Portland	503-413-2500
<b>Project Contacts</b>	
Anchor Project Manager: Tom Schadt	(206) 287-9130
USEPA Project Manager: Sean Sheldrake	(206) 553-1220
Anchor Health and Safety Officer: Dennis Hanzlick	(206) 287-9130
Anchor Site Supervisors: Ben Hung	(503) 670-1108

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**8.6.1 Directions to Medical Facilities**

Directions to Legacy Emanuel Children’s Hospital from Terminal 4 site:

1. Turn right out of the Terminal onto Lombard.
2. Continue on Lombard until North Ivanhoe, bear right.
3. Turn right on to St. Helens and cross St. Johns Bridge.
4. At the end of the bridge, bear left and then bear right onto US 30.
5. Take left ramp onto I-405 toward The Dalles/Seattle.
6. Stay straight toward Kerby Avenue, turn right onto Kerby.
7. Turn left onto North Graham, continue on until Gantenbein.

Directions to the closest hospital from Upland Transloading Facility site:

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Directions to the nearest hyperbaric chamber will be provided in the diving subcontractor’s diving safety manual.

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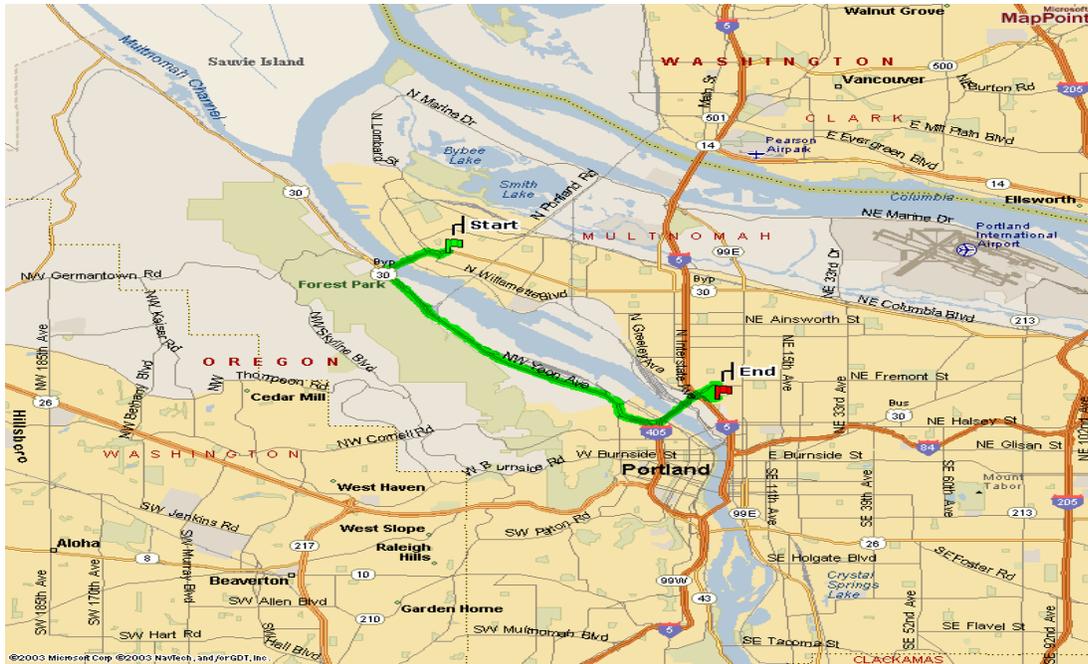


Figure 1  
Map to Legacy Emanuel Children's Hospital

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